EXHIBIT 121

Mobile's Bender shipyard to change hands; company sought bankruptcy protection in early July

Updated: Oct. 01, 2009, 10:30 a.m. | Published: Oct. 01, 2009, 9:30 a.m.

By Kaija Wilkinson

Press-Register/Kate Mercer Bender's operations along the Mobile River are seen Wednesday afternoon. Some 80 percent of the operations, including three dry docks and six repair/construction yards, are set to change hands by December. Tom Bender said the shipyard will keep going.

MOBILE, Ala. -- Most of Bender Shipbuilding & Repair Co.'s Mobile operations will have a new owner by Dec. 15, according to documents obtained by the Press-Register and the shipbuilder's chief executive, Tom Bender.

The shipyard, which sought Chapter 11 bankruptcy protection in early July, has hired New Orleans-based Global Hunter Securities LLP to handle the sale of about 80 percent of its property along the Mobile riverfront.

That came after three Bender creditors tried to force liquidation of shipyard assets in an attempt get tens of millions they said they are owed. Court records indicate that the company had liabilities of $100.7 million versus assets of $98.3 million at the time of its bankruptcy filing.

According to an information package sent to potential buyers, the for-sale property includes six repair/construction yards, three steel floating dry docks, and other equipment on 26 acres.

The property has 3,300 feet of deepwater frontage, according to the documents.

Bender's Mexican shipyard and a local steel processing center will be sold in separate auctions, according to the documents.

Tom Bender said Wednesday that the transaction is part of a bankruptcy auction that allows an initial bidder, known colloquially as a stalking horse, special privileges such as expense reimbursements. He said Dallas private-equity firm SunTx Capital Partners will be announced as the initial bidder in mid-October, but added that SunTx is "in it to get it and have an ongoing business."

He said that neither he nor members of his family plan to submit bids. But should SunTx win, he said, "the management of the shipyard will go to work for the new company."

Bender declined to reveal the minimum bid, but said that information should be public later this month.

According to the information package, interested parties are to sign and return non-disclosure agreements by Oct. 2, and meet with Bender managers by Oct. 23. A due diligence period, which could include a site visit, should be complete by Nov. 13. Bids are due about a week before the targeted mid-December closing date.

Bender said SunTx had already performed its due diligence.

Tom Bender said his company now operates with the aid of a two-year, $5 million line of credit from a Ross Perot-backed investment company, "which allows us to assure our customers that we have sufficient working capital."

Bender said the company has performed about 60 small repair jobs since the filing, and is pursuing much larger jobs. The local yard, where as many as 1,000 people have worked, now has about 225 employees, he said. Bender said SunTx would keep those employees should it buy the shipyard.

EXHIBIT 122

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(/en/)

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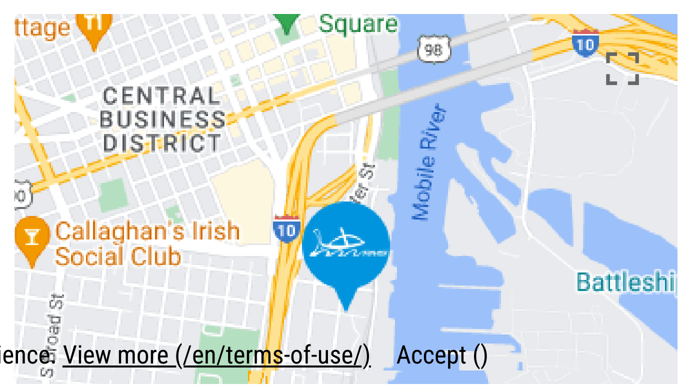
WORLD MARINE



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Signal International, LLC was organized in 2002 as a limited liability company after acquiring the offshore division of Friede Goldman Halter. Signal International, Inc. was incorporated in 2007 and began operations of offshore fabrication with shipyards in Texas and Mississippi. In 2010, the company entered into the US Gulf Coast ship repair business with the asset acquisition of Bender Shipbuilding and Repair in Mobile, Alabama. It is now Signal Ship Repair. With a family of three yards strategically located along the Gulf of Mexico in Alabama, Mississippi and Texas, Signal offers new construction, repair, offshore and technical services.

Dry Dock Capacities	22,000-ton steel Panamax floating dry dock Lift capacity: 22,000 tons at maximum lift Length overall: 692 ft. (210.8 meters) Clear between wing walls: 118 ft. (36 meters) Draft over blocks: 32 ft. (9.7 meters) – maximum 4,500-ton steel floating dry dock

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- Lifting and turning arrangements
- Piping system
- HVAC/ventilation system diagrams
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- Intact and damage stability analysis
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- Launch plans
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- Piping arrangement development complete with spool sheets
- HVAC/ventilation arrangement and details
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- Field Engineering services include:
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- In-process work monitoring

	Lift capacity: 4,500 tons at maximum lift Length overall: 240 ft. (73 meters) Clear inside wall fenders: 83 ft. (25.3 meters) Draft over blocks: 20 ft. (6 meters) – maximum 100 ton Revolving Floating Crane (10) Hydraulic, crawler and rubber tire cranes ranging from 15 to 250 tons lifting capacity (20) Overhead cranes with 5 to 80 tons lifting capacity for a combined 200 ton capacity
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EXHIBIT 123

October 4, 2018

Avondale Shipyard sold, now called Avondale Marine

by Ken Hocke in News, Shipbuilding

The 254-acre property formerly known as Avondale Shipyard will reopen as Avondale Marine. Northrup Grumman photo

Avondale Marine LLC has purchased the 254-acre property formerly known as **Avondale Shipyard** from **Huntington Ingalls Industries**. The sale of the New Orleans area shipyard was finalized on Oct. 3. It had been idle since 2014. Financial terms of Wednesday's sale were not disclosed.

Avondale Marine is a joint venture between Virginia-based **T. Parker Host** and Illinois-based **Hilco Redevelopment Partners.** The Avondale facility, part of Huntington Ingalls Shipbuilding division, ceased its Navy shipbuilding operations in December 2014. Avondale's UNO Maritime Center of Excellence has remained open and continues to do engineering and design work in support of Ingalls' shipbuilding programs.

"We are very proud of our legacy at Avondale and the many contributions that generations of its shipbuilders made to our national security," said Ingalls Shipbuilding President Brian Cuccias. "Ingalls will continue to maintain a presence in Louisiana, not only at the UNO Center, but also through the many Louisiana residents who commute to Pascagoula each day to help us build the ships we produce for our nation's defense. We are pleased that Avondale Marine plans to put the facility back into commerce and look forward to its success."

The site offers approximately 8,000' of deepwater riverfront access and connection to six Class I railroads. Avondale Marine plans to redevelop the site's crane, dock and terminal assets while connecting global waterborne commerce with manufacturing, fabrication and distribution facilities onshore. The company plans to develop a modern, world-class global logistics hub, with value-added manufacturing at its core, to maximize job growth and investment in the Jefferson Parish, La., area.

T. Parker Host is one of the U.S.'s largest terminal operators, specializing in agency, terminal operations, and marine assets. The company has been in business for over 90 years.

Hilco Redevelopment is known for remediating and redeveloping large-scale industrial facilities across North America such as **Tradepoint Atlantic**, which it transformed into an East Coast multimodal port. Hilco identified Avondale as a potential redevelopment site several years ago and began working toward its acquisition.

Avondale Shipyard served as one of the nation's most significant shipbuilding assets from before World War II until the first decade of the 21st century. Known for building large naval destroyers, the shipyard was once the largest private employer in Louisiana, with 26,000 workers at its peak. In 2010, the shipyard's closing was announced to consolidate and reduce costs. On Feb. 3, 2014, the *USS Somerset*, the final Navy vessel built at the shipyard, departed from the facility.

"For generations, Avondale Shipyards has been a source of pride for the community that generated jobs and economic development," said Adam Anderson, president and CEO of T.P. Host and principal of Avondale Marine. "Our team will unleash its potential by transforming the shipyard into a global logistics hub for intermodal commerce."

In the coming months, Avondale Marine will begin its planning process for the site in partnership with local, regional and state stakeholders.

Tagged Under:

Maritime Industry

About the Author

Ken Hocke

Ken Hocke has been the senior editor of WorkBoat since 1999. He was the associate editor of WorkBoat from 1997 to 1999. Prior to that, he was the editor of the Daily Shipping Guide, a transportation daily in New Orleans. He has written for other publications including The Times-Picayune. He graduated from Louisiana State University with an arts and sciences degree, with a concentration in English, in 1978.

EXHIBIT 124

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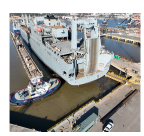
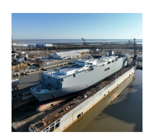

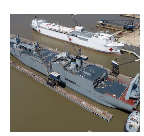
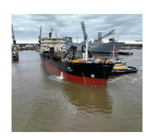


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EXHIBIT 125

Ship
Technology

News

Epic Alabama Shipyard acquires BAE Systems Southeast Shipyards Alabama

Epic Alabama Shipyard has acquired BAE Systems Southeast Shipyards Alabama and all of its associated shipyard facilities in Mobile, Alabama, US.

October 19, 2018

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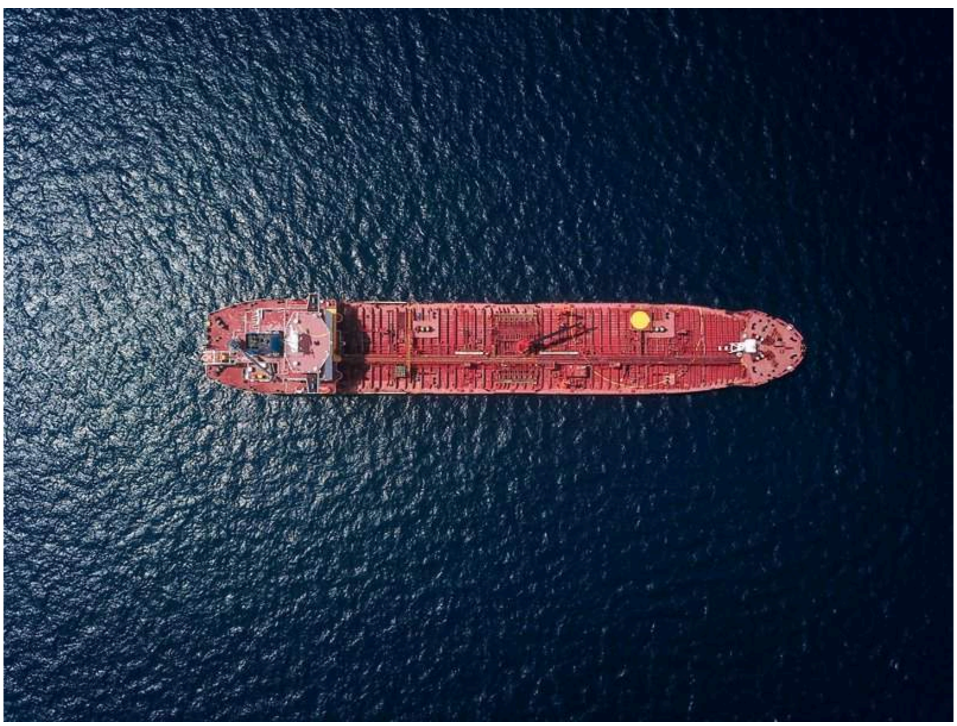

Epic provides ship repair and maintenance services. Credit: Shaah Shahidh via Unsplash.

Epic Alabama Shipyard has acquired BAE Systems Southeast Shipyards Alabama and all of its associated shipyard facilities in Mobile, Alabama, US.

Financial details of the deal have not been disclosed.

Epic offers ship repair and maintenance services to its customers through existing facilities, including the Alabama Dry Dock.

Epic is owned by Texas-based Epic Companies, which is an offshore construction and decommissioning company. It will service vessels from its own fleet in Mobile.

The firm is currently exploring opportunities to fabricate offshore structures and newbuild barges in Mobile.

Epic executive Rob Gilbert said: "Mobile is perfectly situated to support the maritime and energy sector, both in the Gulf of Mexico and throughout the Caribbean."

Epic will work closely with Mobile City officials to expand its local workforce as its operations grow.

"Mobile is perfectly situated to support the maritime and energy sector, both in the Gulf of Mexico and throughout the Caribbean."

Epic Companies offers support services to the offshore energy sector, including diving, pipelaying, and plugging and abandonment of wells.

The company also provides wireline and downhole well services, cutting, platform and pipeline decommissioning, in addition to the construction of offshore structures such as LNG offshore terminals.

In July, EPIC Companies announced that its two heavy-lift derrick barges have successfully mobilised for the 2018 Decommissioning Campaign.

Epic Hedron weighs 1,760 short tonnes, while Epic Arapaho weighs 800 short tonnes. They were mobilised to carry out a variety of works such as platform removals, equipment lifts, well/caisson removals, and downed vessel recovery.

In June, EPIC Companies' Diving and Marine Division secured a substantial pipeline construction project contract in the Gulf of Mexico.

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EXHIBIT 126

Employment Data for NAICS 336611: Shipbuilding and Repair

	2008	2009	2010	2011	2013	2014
Number of employees	107,300	104,545	100,955	103,487	105,314	105,532
PRW average	70,889	66,937	62,605	66,380	68,269	69,528
PRW hours (1000)	139,014	132,624	124,227	125,416	142,112	142,506

	2015	2016	2018	2019	2020	2021
Number of employees	105,544	101,445	95,452	94,743	97,596	98,340
PRW average	68,476	65,354	60,625	58,524	60,776	60,307
PRW hours (1000)	140,025	134,801	119,020	119,202	112,365	111,929

Source: U.S. Census Bureau, Annual Survey of Manufactures

EXHIBIT 127

The Economic Importance of the U.S. Private Shipbuilding and Repairing Industry

Maritime Administration (MARAD)

March 30, 2021

Table of Contents

Figures

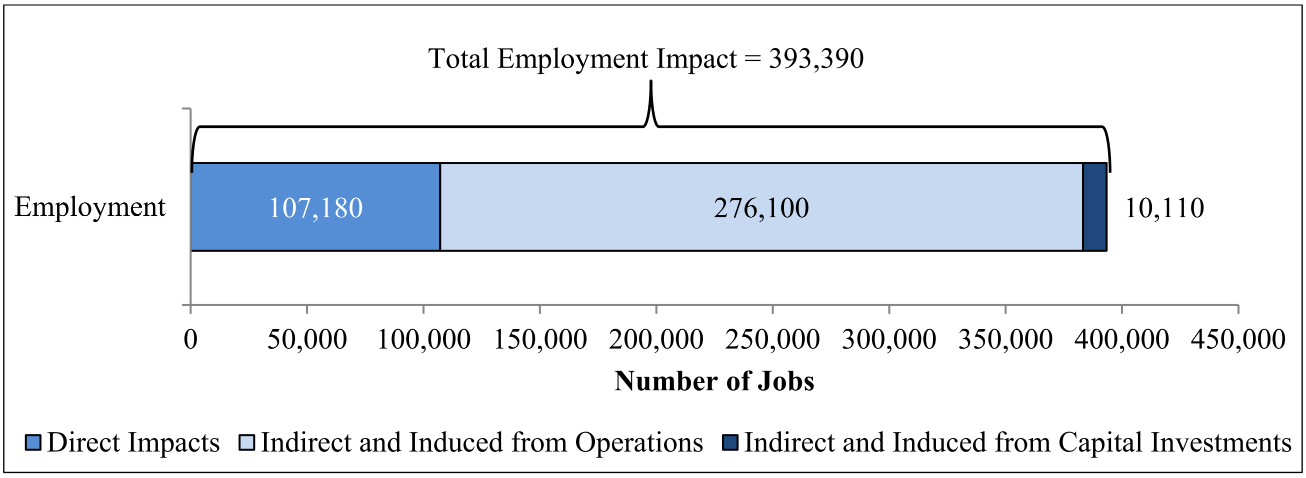
Tables

Executive Summary

The U.S. private shipbuilding and repairing industry is comprised of establishments that are primarily engaged in operating shipyards, which are fixed facilities with drydocks and fabrication equipment. Shipyard activities include ship construction, repair, conversion and alteration, as well as the production of prefabricated ship and barge sections and other specialized services. The industry also includes manufacturing and other facilities outside of the shipyard, which provide parts or services for shipbuilding activities within a shipyard.

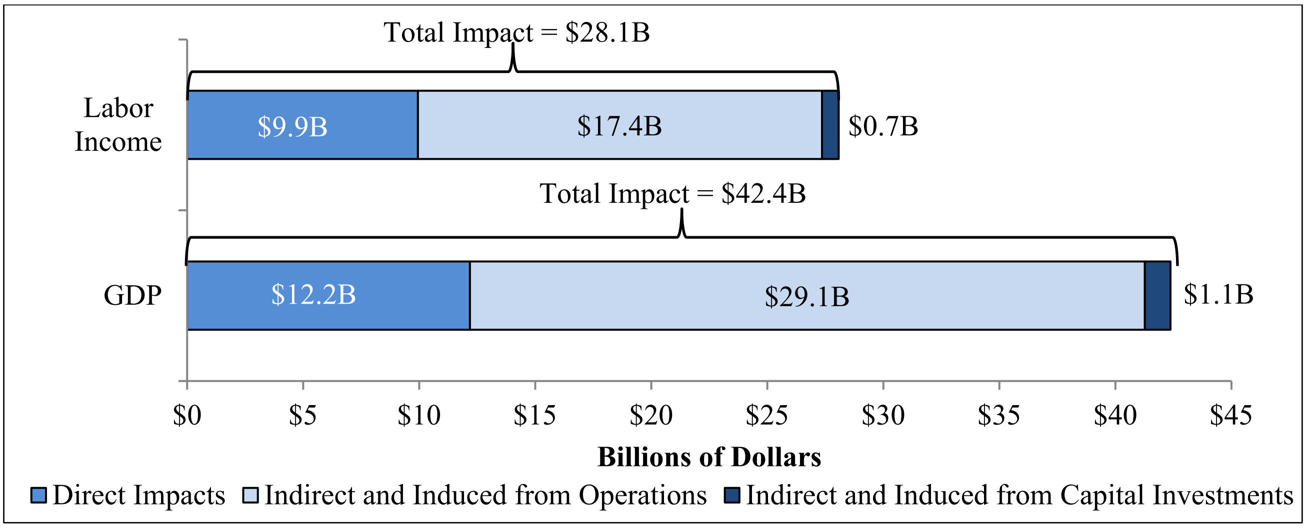
In 2019, the U.S. private shipbuilding and repairing industry directly provided 107,180 jobs (see **Figure E1**, below), $9.9 billion in labor income, and $12.2 billion in gross domestic product, or GDP, to the national economy (see **Figure E2**, below). Including direct, indirect, and induced impacts, on a nationwide basis, total economic activity associated with the industry reached 393,390 jobs, $28.1 billion of labor income, and $42.4 billion in GDP in 2019.

Figure E1: Total Employment Impact Attributable to the U.S. Private Shipbuilding and Repairing Industry, 2019



Source: Calculations using the IMPLAN modeling system (2019 database).

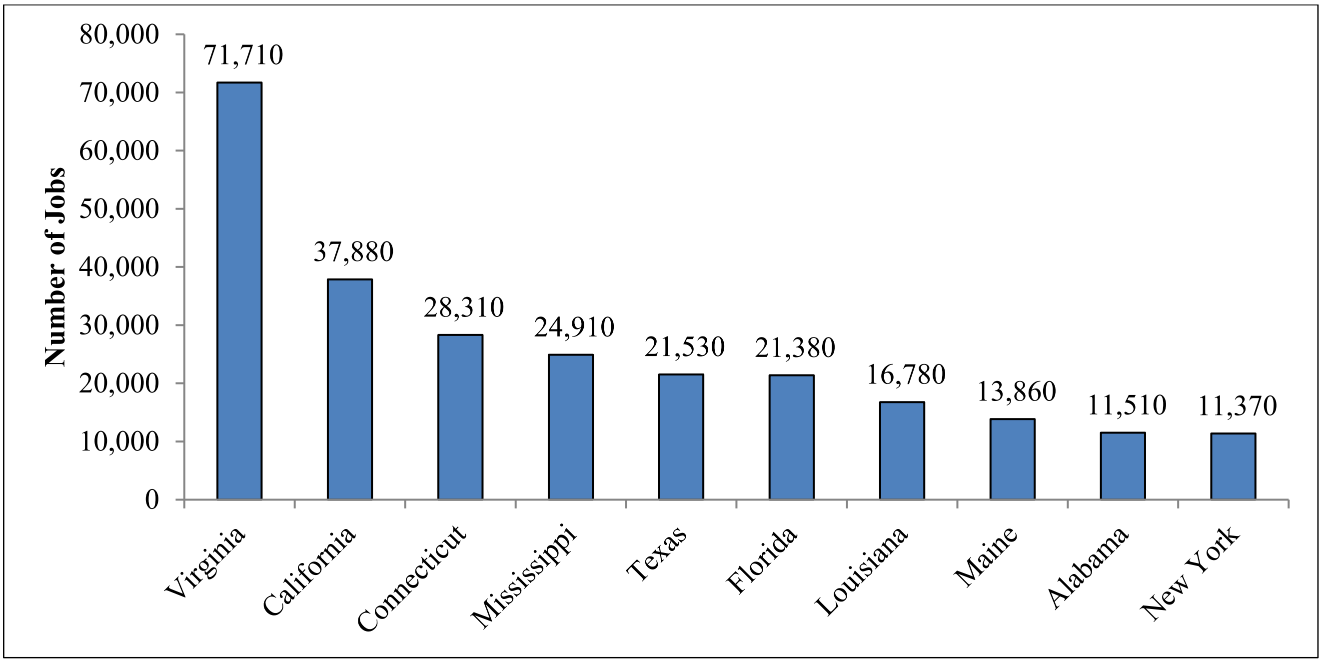
Figure E2: Total Labor Income and GDP Impacts Attributable to the U.S. Private Shipbuilding and Repairing Industry, 2019



Source: Calculations using the IMPLAN modeling system (2019 database).

The industry impact by state varies based on the level of direct activity and the share of the supply chain included in the state. The states with the highest levels of overall direct, indirect, and induced employment associated with the industry are Virginia, California, Connecticut, Mississippi, and Texas (see **Figure E3**).

Figure E3: Total (Direct, Indirect, and Induced) Employment Impact Attributable to the U.S. Private Shipbuilding and Repairing Industry: Top Ten States, 2019



Source: Calculations using the IMPLAN modeling system (2019 database).

Considering the indirect and induced impacts, each direct job in the U.S. private shipbuilding and repairing industry is associated with another 2.67 jobs in other parts of the U.S. economy; each dollar of direct labor income and GDP in the U.S. private shipbuilding and repairing industry is associated with another $1.82 in labor income and $2.48 in GDP, respectively, in other parts of the U.S. economy.

Currently there are 154 private shipyards in the United States, spread across 29 states and the U.S. Virgin Islands, that are classified as active shipbuilders. In addition, there are more than 300 shipyards engaged in ship repairs or capable of building ships but not actively engaged in shipbuilding.[1] The majority of shipyards are located in the coastal states, but there also are active shipyards on major inland waterways such as the Great Lakes, the Mississippi River, and the Ohio River. Employment in shipbuilding and repairing is concentrated in a relatively small number of coastal states, with the top five states accounting for 64 percent of all private employment in the shipbuilding and repairing industry.

The Federal government, including the U.S. Navy, U.S. Army, and U.S. Coast Guard, is an important source of demand for U.S. shipbuilders. While less than three percent of the vessels delivered in 2020 (16 of 608) were delivered to U.S. government agencies, 14 of the 15 deliveries of large deep-draft vessels were to the U.S. government: seven to the U.S. Navy and seven to the U.S. Coast Guard.

[1] See www.shipbuildinghistory.com for details. www.shipbuildinghistory.com is maintained by Tim Colton, a professional with more than 60 years of experience in the shipbuilding industry. His resume is accessible at http://shipbuildinghistory.com/resume.htm.

The purpose of this report is to measure the economic importance of the U.S. private shipbuilding and repairing industry at the national and state levels for calendar year 2019. The importance of the industry is not limited to the direct output and employment it generates (i.e., "direct impact"). Companies in the shipbuilding and repairing industry purchase inputs from other domestic industries, contributing to economic activity in those sectors (i.e., "indirect" impact). Employees spend their incomes, helping to support the local and national economies (i.e., "induced" impact). Thus, the economic importance of the U.S. private shipbuilding and repairing industry includes direct, indirect, and induced effects. Put differently, the report seeks to document what happens in the U.S. private shipbuilding and repairing industry and its relationships to the broader economy. It is important to note that the term "economic impacts" as used in this report reflects the association of employment, labor income, and gross domestic product (GDP) with the U.S. private shipbuilding and repairing industry (including the economic effects of services performed for the government), but does not imply that some of this economic activity would not otherwise exist without the industry.

The IMPLAN model, an input-output (I-O) model based on Federal government data, was used to estimate the industry's overall economic impact. I-O modeling is typically employed to analyze how a change in economic activity in one sector of the economy affects activities in other sectors of the economy. In a so-called "marginal" impact analysis, I-O model results can be viewed as showing the impact of small changes in activity in one sector (e.g., shipbuilding) on the rest of the economy before any price adjustments and any adjustments away from other sectors of the economy. The ultimate economic impact of a change in activity can be less pronounced than shown in initial I-O results, particularly if induced price changes are large.

I-O models can also be used in an economic contribution analysis, as done in this study. By simulating a "complete shutdown" of an existing industry, an economic contribution study attempts to quantify the portion of a region's economy that can be attributed to such an existing industry. It uses the I-O model to identify all backward (i.e., upstream) linkages in the study area. An economic contribution analysis, when compared with the entire study area economy, offers insights into the relative extent and magnitude of the industry in the study area. However, this is not to say that a complete shutdown of the shipbuilding and repairing industry would result in the permanent loss of the jobs and output attributable to the industry through this exercise. In this unlikely event, the resources currently allocated to the shipyards may find employment in other industries, which would compensate in part for the loss of the jobs and output from the shipyard sector.

The study disaggregates the industry's economic activity into two components: operational and capital investment impacts. The operational impact is from purchases of intermediate goods and services, and the capital investment impact is from investment in new structures and equipment.[2] These economic impacts represent all of the backward linkages of the U.S. shipbuilding and repairing industry to its suppliers. They do not capture any forward linkages (i.e., the economic impact on production in sectors that use ships or other shipyard products as an input).

[2] The IMPLAN model results were adjusted to include the economic activity attributable to capital spending by the shipbuilding and repairing sector.

I. Introduction

The purpose of this report is to quantify the economic importance of the U.S. private shipbuilding and repairing industry in 2019, in terms of employment, labor income, and GDP.[3] The study quantifies the industry's ***operational impact*** (due to its purchases of intermediate inputs) and ***capital investment impact*** (due to its investment in new structures and equipment) at the national and state level. These economic impacts represent all of the backward linkages of the U.S. shipbuilding and repairing industry to its suppliers. They do not capture any forward linkages (i.e., the economic impact on production in sectors that use ships as an input). All economic impacts are reported in gross terms, which means they do not take account of what would have taken place in the absence of the shipbuilding and repairing industry.

In describing the economic importance of the U.S. private shipbuilding and repairing industry through its employment and purchases of goods and services, this report considers three separate channels—the direct impact, the indirect impact, and the induced impact—that in aggregate provide a measure of the economic importance of the U.S. private shipbuilding and repairing industry.

- **Direct impact** is measured as the jobs, labor income, and GDP within the U.S. private shipbuilding and repairing industry.
- **Indirect impact** is measured as the jobs, labor income, and GDP occurring throughout the supply chain of the U.S. private shipbuilding and repairing industry. The indirect impact also includes suppliers to the companies providing goods and services to the U.S. private shipbuilding and repairing industry.
- **Induced impact** is measured as the jobs, labor income, and GDP resulting from household spending of labor income earned either directly or indirectly from the U.S. private shipbuilding and repairing industry's spending under standard input-output modeling assumptions. It should be interpreted with caution as it involves personal spending decisions by employees of shipyards and its supply chain that are further removed from direct shipyard expenditure activities and are more difficult to estimate.

Together these effects demonstrate the private shipbuilding and repairing industry's economic importance and relationship to all sectors of the U.S. economy.

The IMPLAN model, an input-output (I-O) model based on Federal government data, was used to estimate the industry's overall economic impact. I-O modeling is typically employed to analyze how a change in economic activity in one sector of the economy affects activities in other sectors of the economy. In a so-called "marginal" impact analysis, I-O model results can be viewed as showing the impact of small changes in activity in one sector (e.g., shipbuilding) on the rest of the economy before any price adjustments and any adjustments away from other sectors of the economy. The ultimate economic impact of a change in activity can be less pronounced than shown in initial I-O results, particularly if induced price changes are large.

I-O models can also be used in an economic contribution analysis, as done in this study. By simulating a "complete shutdown" of an existing industry, an economic contribution study attempts to quantify the portion of a region's economy that can be attributed to such an existing industry. It uses the I-O model to identify all backward (i.e., upstream) linkages in the study area. An economic

[3] Gross domestic product (GDP) reflects the income earned by labor (e.g., wages and salaries) and capital (e.g., profits) and any indirect business taxes (including excise taxes, property taxes, fees, licenses, and sales taxes paid by businesses).

contribution analysis, when compared with the entire regional economy, offer insights into the relative extent and magnitude of the industry in the study area. However, this is not to say that a complete shutdown of the shipbuilding and repairing industry would result in the permanent loss of the jobs and output attributable to the industry as these resources may find employment in other industries.

The rest of this report is organized as follows. **Section II** provides a brief overview of the U.S. private shipbuilding and repairing industry. **Section III** presents estimates of the industry's economic impact in 2019 in terms of employment, labor income, and GDP at the national and state levels. **Appendix A** provides additional details on the industry's economic impact at the state level. **Appendix B** provides a description of the data sources and methodology used for the study.

II. Overview of the U.S. Private Shipbuilding and Repairing Industry

A. Industry Definition

Economic activity directly associated with the U.S. private shipbuilding and repairing industry is primarily captured in government data under the North American Industry Classification System (NAICS) sector 336611, Shipbuilding and Repairing. According to the U.S. Census Bureau, this industry comprises establishments that are primarily engaged in operating shipyards, which are fixed facilities with drydocks and fabrication equipment. Shipyard activities include ship construction, repair, conversion, and alteration. They also include the production of prefabricated ship and barge sections, and other specialized services.[4] The industry may also include manufacturing and other facilities outside of the shipyard, which provide parts or services for ship building activities within a shipyard.

The industry also includes a portion of NAICS sector 488390, Other Support Activities for Water Transportation. Among other activities, NAICS sector 488390 includes routine repair and maintenance of ships from floating drydocks, as well as ship scaling services not done in a shipyard. According to the 2017 Economic Census, approximately 76.7 percent of the revenues of NAICS sector 488390 were derived from routine repairs and maintenance of maritime vessels.[5]

B. Description of the Industry

Currently there are 154 private shipyards in the United States, spread across 29 states and the U.S. Virgin Islands, that are classified as active shipbuilders. In addition, there are more than 300 private shipyards engaged in ship repairs or capable of building ships but not actively engaged in shipbuilding.[6] As shown in **Figure 1**, below, the majority of active shipbuilders are located in the coastal states. However, there also are active shipyards on major inland waterways such as the Great Lakes, the Mississippi River, and the Ohio River. The industry also includes manufacturing and other facilities outside of these shipyards that provide parts or services for the shipbuilding and repairing industry. Furthermore, the industry includes routine maintenance and repairs conducted from floating drydocks. As a result, the scope of economic activity directly attributable to the U.S. shipbuilding and repairing industry[7] is wider than the 29 states with active private shipyards, as displayed in **Figure 1**, below.

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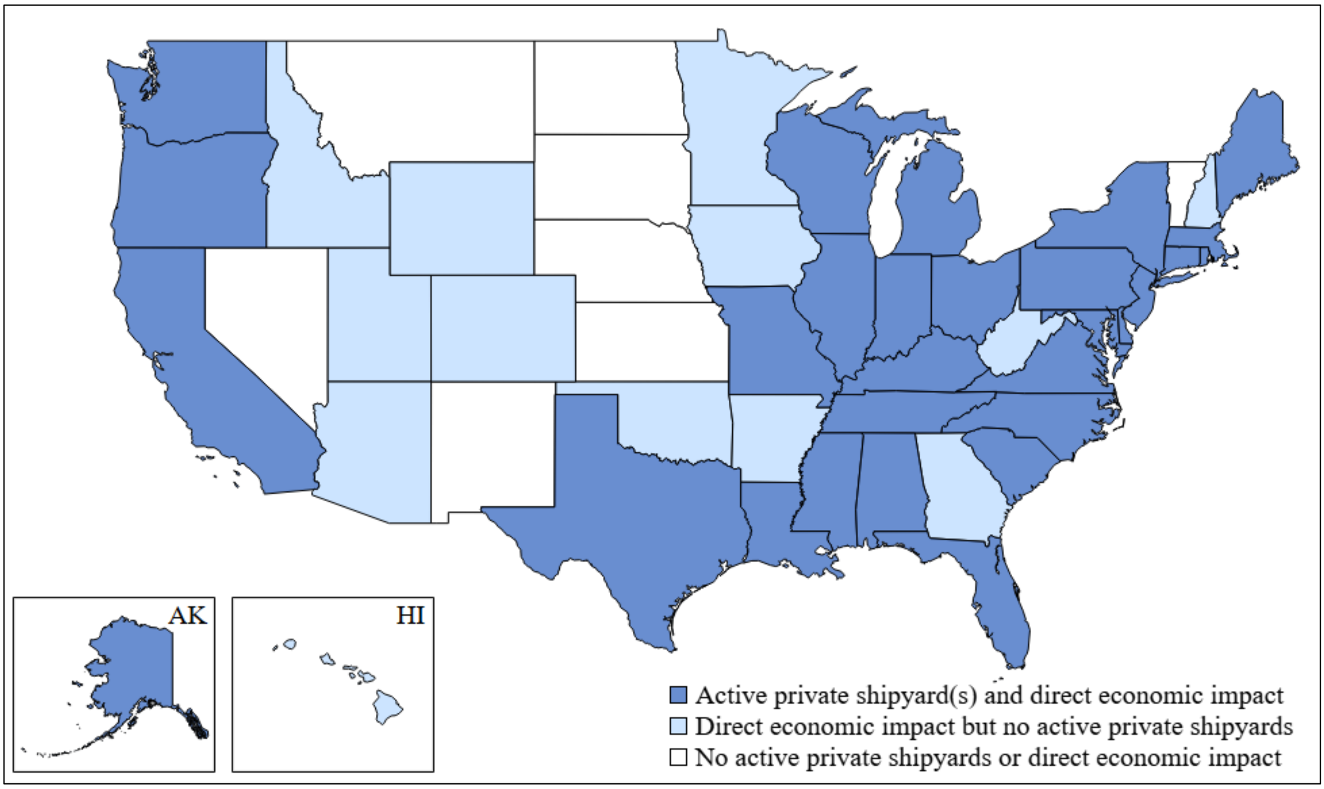
[4] https://www.census.gov/cgi-bin/sssd/naics/naicsrch?chart=2017

[5] U.S. Census Bureau, 2017 Economic Census, "All Sectors: Industry by Products for the U.S.: 2017."

[6] See the directory of shipyards at http://shipbuildinghistory.com. Of the 154 private shipyards summarized in Figure 1, 25 are mid-sized to large shipyards capable of building naval ships and submarines, oceangoing cargo ships, drilling rigs and high-value, high-complexity mid-sized vessels, and 129 are smaller yards capable of building the simpler types of smaller commercial vessels, such as tugs, towboats, offshore service vessels, fishing vessels, ferries and barges. In addition to these 154 private shipyards, there are five public shipyards operated by the U.S. Navy or U.S. Coast Guard and eight shipyards that actively or occasionally produce large yachts. Shipbuildinghistory.com also lists more than 300 shipyards and boatyards that are classified as inactive.

[7] Information on the BLS definition of the scope of activities included in the industry can be found at https://data.bls.gov/cew/apps/bls_naics/v2/bls_naics_app.htm#tab=search&naics=2017&keyword=336611&searchType=titles&fromHier=true&filter=nothing&sort=text_asc&resultIndex=0

Figure 1: States with Active Private Shipbuilders and Direct Economic Impact from the Private Shipbuilding and Repairing Industry



Source: Directory of shipyards at http://shipbuildinghistory.com and data from the U.S. Census Bureau, U.S. Bureau of Labor Statistics, and U.S. Bureau of Economic Analysis.

1. Private Employment

The U.S. private shipbuilding and repairing industry accounted for an estimated 107,180 jobs in 2019, including both payroll employees and self-employed workers and both full-time and part-time workers. The vast majority of these jobs (100,830) were in shipbuilding and repairing (NAICS sector 336611), with the remainder (6,350) accounted for by routine maintenance and repair conducted outside of a shipyard (NAICS sector 488390).[8]

Employment in private shipbuilding and repairing is concentrated in a relatively small number of states (see **Figure 2**, below). As shown in **Table 1**, below, 64 percent of all private direct employment in the industry is located in just five states: Virginia, Connecticut, Mississippi, California, and Louisiana.

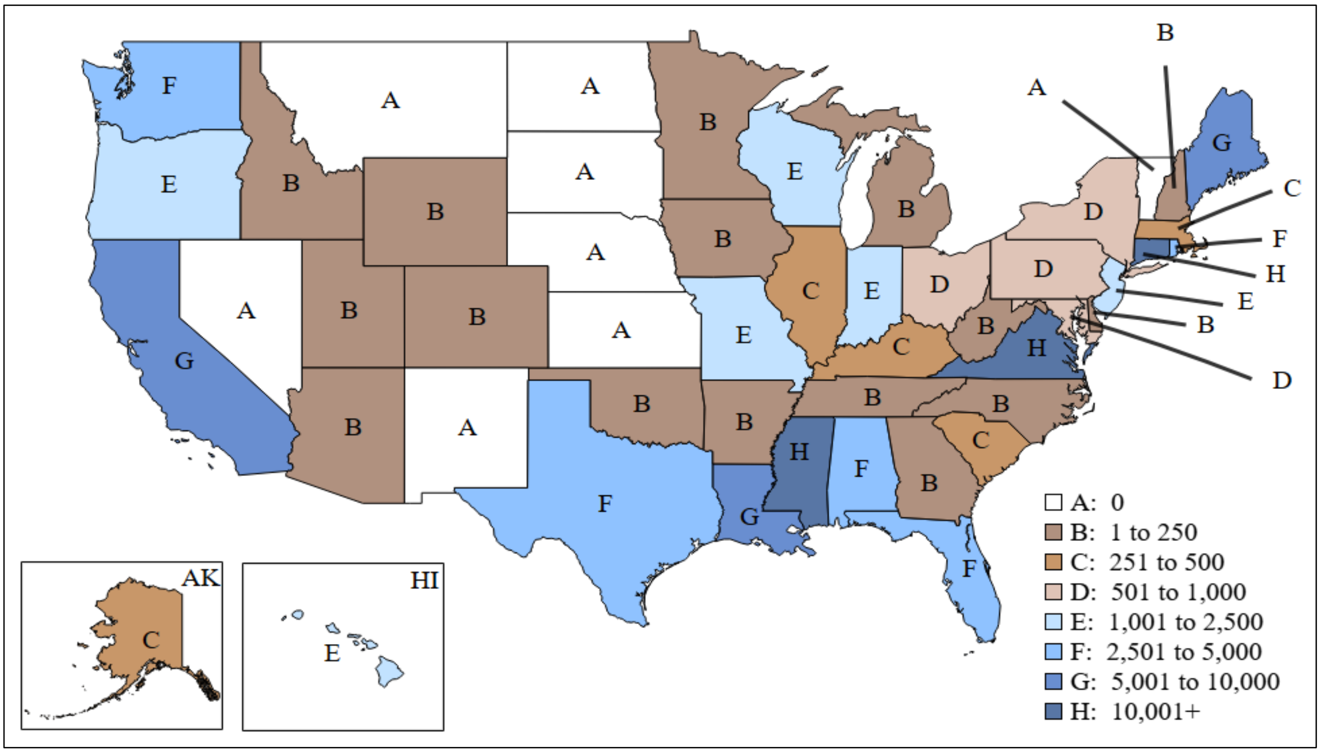
[8] These numbers do not include Federal government employment. According to the U.S. Bureau of Labor Statistics, total employment at Federal government-operated shipyards was 39,156 in 2019.

Table 1: Total Direct Employment in the U.S. Private Shipbuilding and Repairing Industry: Top 10 States, 2019

State	Private Employment[a]	Percent of U.S. Total
Virginia	30,270	28.2%
Connecticut	11,820	11.0%
Mississippi	11,190	10.4%
California	8,490	7.9%
Louisiana	6,620	6.2%
Maine	5,700	5.3%
Florida	4,700	4.4%
Alabama	4,290	4.0%
Texas	3,400	3.2%
Rhode Island	2,580	2.4%
All other states combined	18,120	16.9%
U.S. Total	**107,180**	**100%**

Source: Estimates based on data from the U.S. Census Bureau, U.S. Bureau of Labor Statistics, and U.S. Bureau of Economic Analysis.
Note: Details may not add to totals due to rounding.
[a] Employment is defined as the number of payroll and self-employed jobs, including part-time jobs.

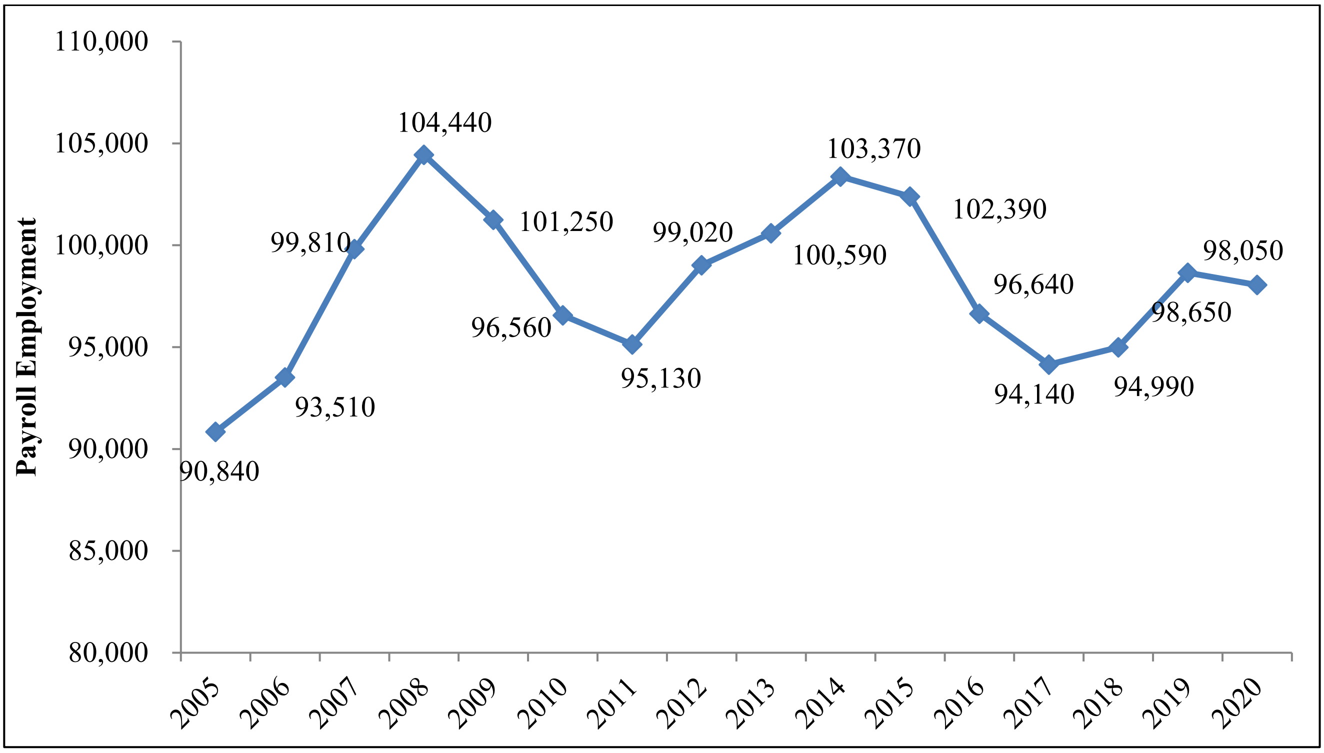
Figure 2: Direct Employment in the U.S. Private Shipbuilding and Repairing Industry by State, 2019



Source: Estimates based on data from the U.S. Census Bureau, U.S. Bureau of Labor Statistics, and U.S. Bureau of Economic Analysis.

Nearly all jobs in the U.S. private shipbuilding and repairing industry are payroll jobs. In 2019, private payroll employment accounted for 98,650 of the total 100,830 jobs in NAICS sector 336611, or 98 percent of the total, with self-employed jobs accounting for the remainder. Private sector payroll employment in NAICS 336611 grew rapidly between 2005 and 2008, from 90,840 to 104,440 (see **Figure 3**). As a result of the global recession that began in the United States in 2008, the industry contracted, losing more than 9,000 payroll jobs between 2008 and 2011, before rebounding in 2012. After 2014, private sector payroll employment in NAICS sector 336611 started to decline again, reaching a low of 94,140 in 2017, before rebounding to 98,650 in 2019. For the first six months of 2020, private sector payroll employment declined by 600 jobs due to the Covid-19 pandemic to 98,050.

Figure 3: Direct Payroll Employment in the U.S. Private Shipbuilding and Repairing Industry, 2005 to 2020*



Source: Total private sector payroll employment for NAICS sector 336611 from U.S. Bureau of Labor Statistics, *Quarterly Census of Employment and Wages* (Downloaded March 1, 2021). Excludes the portion of the industry classified in NAICS sector 488390.
*Data for 2020 is average for January through June.

2. *Labor Income*

Total labor income in the U.S. private shipbuilding and repairing industry (including wages and salaries and benefits as well as proprietors' income) amounted to $9.9 billion in 2019. As with private employment, industry labor income is concentrated in a relatively small number of states, with five states (Virginia, Connecticut, Mississippi, California, and Louisiana) accounting for 67 percent of all direct labor income for the private U.S. shipbuilding and repairing industry (see **Table 2**, below).

Average labor income per job was approximately $92,770 in 2019, 49 percent higher than the national average for the private sector economy ($62,090).

Table 2: Total Direct Labor Income in the U.S. Private Shipbuilding and Repairing Industry: Top 10 States, 2019

State	Private Labor Income[a] ($ millions)	Percent of U.S. Total
Virginia	$3,101.4	31.2%
Connecticut	$1,347.0	13.5%
Mississippi	$952.8	9.6%
California	$748.0	7.5%
Louisiana	$541.2	5.4%
Maine	$465.1	4.7%
Alabama	$368.0	3.7%
Florida	$344.8	3.5%
Texas	$280.4	2.8%
Washington	$237.1	2.4%
All other states combined	$1,324.0	13.3%
U.S. Total	**$9,943.2**	**100%**

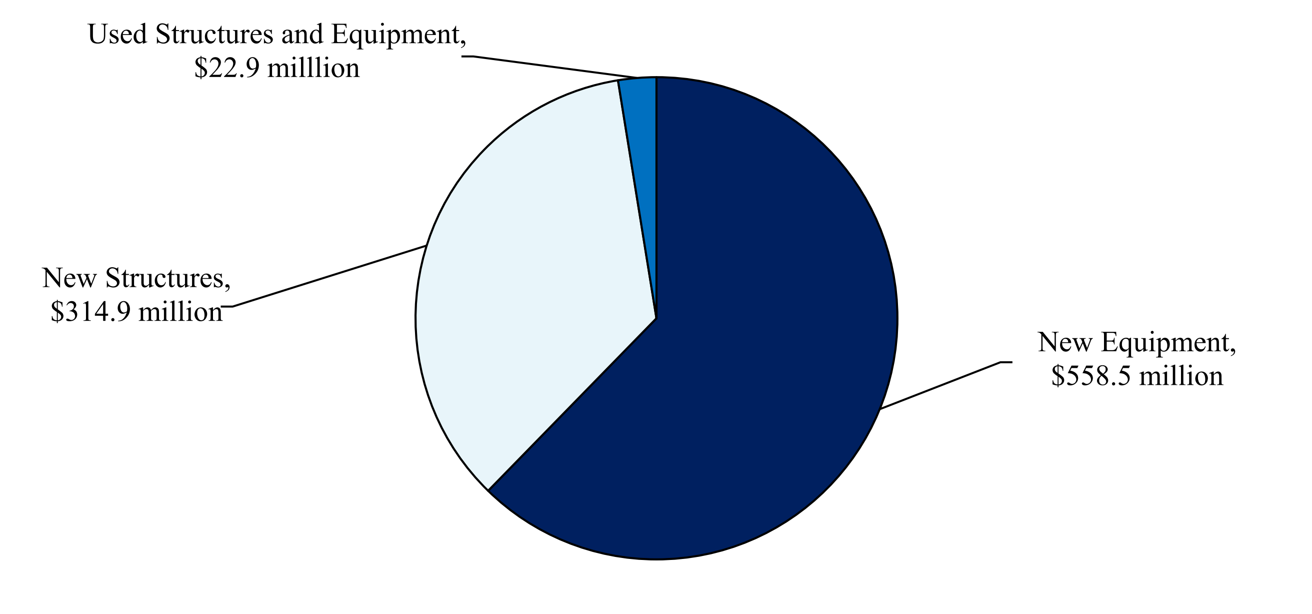
Source: Calculations using the IMPLAN Modeling system (2019 database) and data from the U.S. Census Bureau, U.S. Bureau of Labor Statistics, and U.S. Bureau of Economic Analysis.
Note: Details may not add to totals due to rounding.
[a] Labor income is defined as wages and salaries, benefits, and proprietors' income.

3. *Capital Expenditures*

Based on data from the U.S. Census Bureau, it is estimated that the U.S. private shipbuilding and repairing industry spent a total of $896.3 million on new and used capital assets in 2019. The majority of capital spending for the industry is spending on new structures and equipment. In 2019, the industry spent an estimated $873.4 million on new capital assets ($558.5 million on new equipment and $314.9 million on new structures) and $22.9 million on used structures and equipment (see **Figure 4**, below).[9]

9 The industry's spending on used structures and equipment is not taken into account in modeling the industry's capital investment impact.

Figure 4: Capital Expenditures by U.S. Private Shipbuilding and Repairing Industry by Type, 2019



Source: Estimated based on the U.S. Census Bureau's 2019 *Annual Survey of Capital Expenditures* and the 2017 *Economic Census*.

4. Industry Output

U.S. shipbuilders delivered 608 vessels of all types in 2020, up from 577 vessels in 2019 (see **Table 3**). More than 60 percent of vessels delivered during the last six years have been inland tank and dry cargo barges. However, deliveries of inland tank barges and dry cargo barges showed the greatest decrease in terms of vessels delivered between 2015 to 2020.

Table 3: Deliveries by U.S. Shipyards, by Type of Vessel, 2015–2020

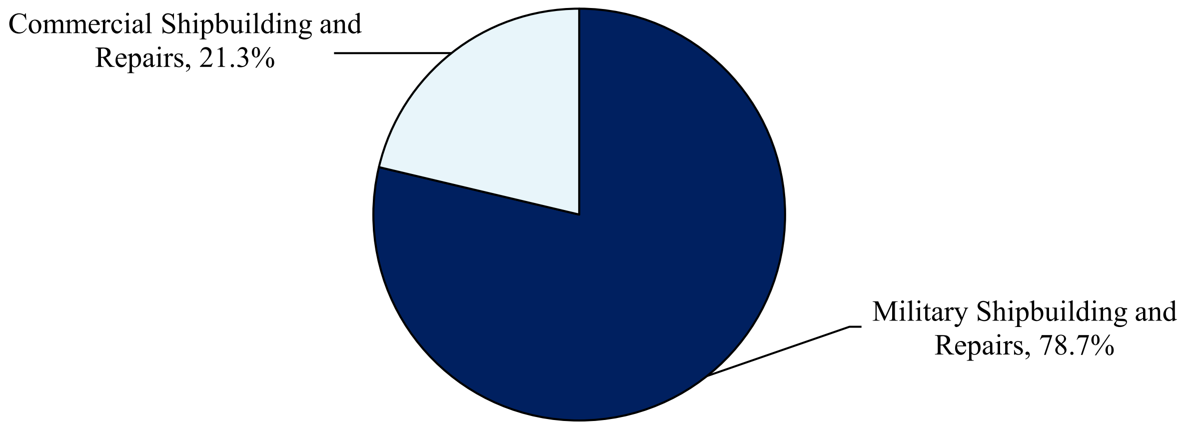
Type of Vessel	2015	2016	2017	2018	2019	2020
Deep-Draft Vessels and Structures	18	28	18	20	14	15
Offshore Service Vessels	43	21	11	5	5	1
Tugs and Towboats	122	110	88	85	87	122
Passenger Vessels (>50 feet)	25	32	51	46	47	40
Commercial Fishing Vessels (>50 feet)	7	16	9	7	6	4
Other Self-Propelled Vessels (>50 feet)	8	9	11	3	12	13
Large Oceangoing Barges	7	11	10	7	0	5
Inland Tank Barges	268	117	87	84	182	135
Inland Dry Cargo Barges	940	985	301	229	224	273
Total Delivered	**1,438**	**1,329**	**586**	**486**	**577**	**608**

Source: www.shipbuildinghistory.com
Note: The delivery date for a vessel was determined by the date on which its Certificate of Documentation was issued, which should be, but may not be, the date on which the shipyard made delivery.

The Federal government, including the U.S. Navy, U.S. Army, and U.S. Coast Guard, remains an important source of demand for private U.S. shipbuilders. While only 16 of the 608 vessels delivered in 2020 were delivered to the U.S. government, nearly all deliveries of large deep-draft vessels (14 of 15) were to U.S. government agencies (seven to the U.S. Navy and seven to the U.S. Coast Guard).

Total revenues for the U.S. shipbuilding and repairing industry are estimated to be $27.9 billion in 2019, up from $26.9 billion in 2018.[10] In 2019, 78.7 percent of these revenues came from military shipbuilding and repairs, and 21.3 percent from commercial shipbuilding and repairs (see **Figure 5**).

Figure 5: U.S. Private Shipbuilding and Repairing Industry Revenues by Product Type, 2019

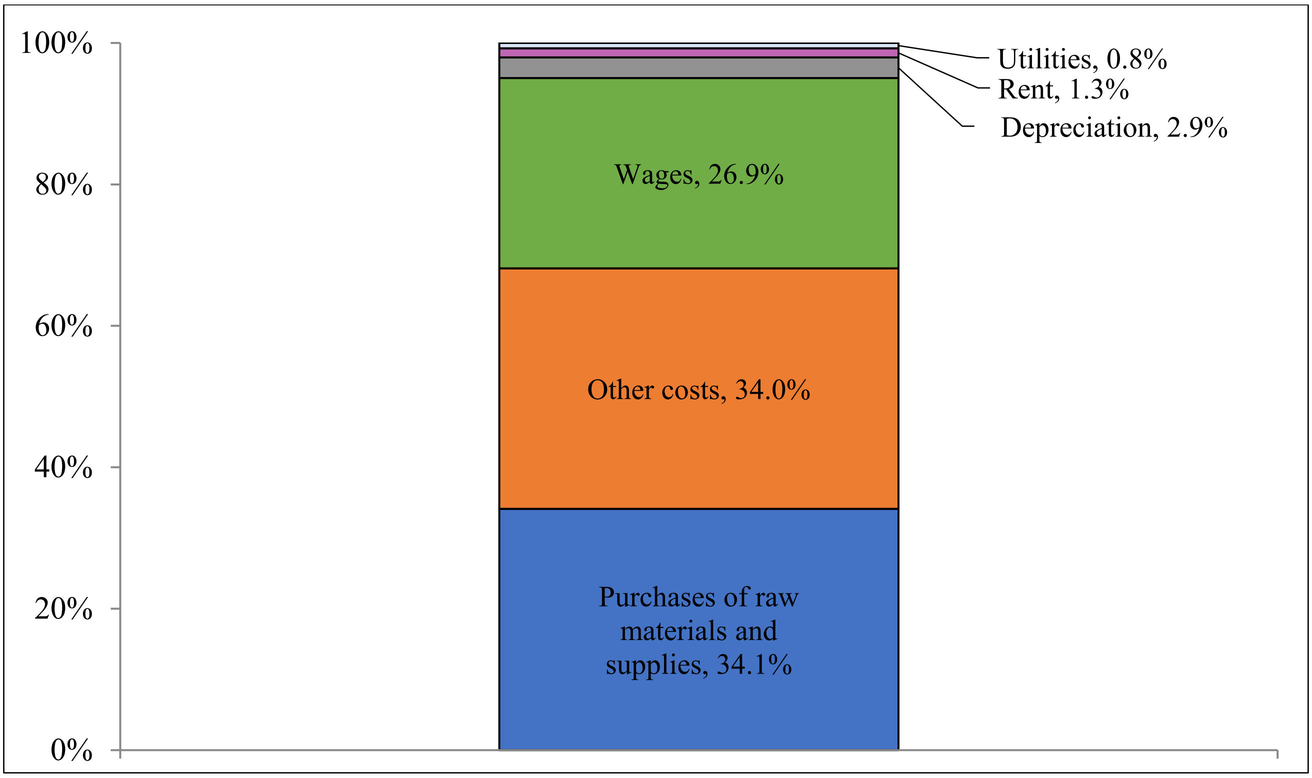


Source: IBISWorld, "Staying Afloat: Steady Demand from Defense Spending, Oil Production and Freight Transport Will Likely Drive Growth." Industry Report 33661a, September 2020.

Figure 6, below, provides a breakdown of industry costs. The largest expense for ship builders is purchases of raw materials and supplies used in the construction and repair of ships, including paints, steel plates, copper tubing, aluminum, and iron castings. These purchases account for an estimated 34.1 percent of total industry costs. Other costs (which include research and development, insurance, security, cleaning costs, equipment repairs, and site maintenance) are the second largest expenditure for the industry, amounting to approximately 34.0 percent of industry costs. Wages account for 26.9 percent of industry costs. Depreciation, rent, and utilities account for the remaining 5.0 percent of industry costs.

[10] U.S. Census Bureau, *Annual Survey of Manufacturers* for 2018 and 2019; *Service Annual Survey* for 2018 and 2019; and *Economic Census* for 2017. These data points include the private and public shipbuilding and repairing industry.

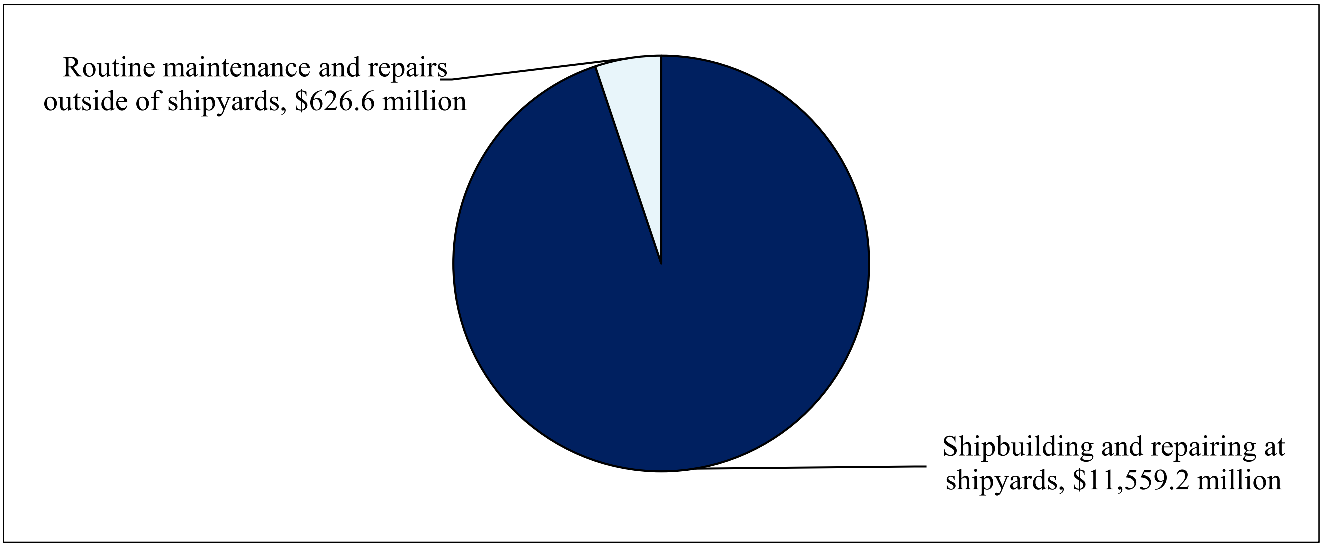
Figure 6: U.S. Private Shipbuilding and Repairing Industry Costs by Type, 2019



Source: IBISWorld, "Staying Afloat: Steady demand from defense spending, oil production and freight transport will likely drive growth" Industry Report 33661a, September 2020.

Total GDP in the U.S. private shipbuilding and repairing industry (including routine maintenance and repairs conducted outside of shipyards) amounted to $12.2 billion in 2019. As with employment, the majority of the industry's GDP ($11.6 billion) was related to shipbuilding and repairing tied to shipyards (NAICS sector 336611), compared to $0.6 billion for routine maintenance and repairs conducted outside of a shipyard (see **Figure 7**).

Figure 7: Total Direct GDP in U.S. Private Shipbuilding and Repairing Industry, 2019



Source: Calculations based on the IMPLAN Modeling system (2019 database).

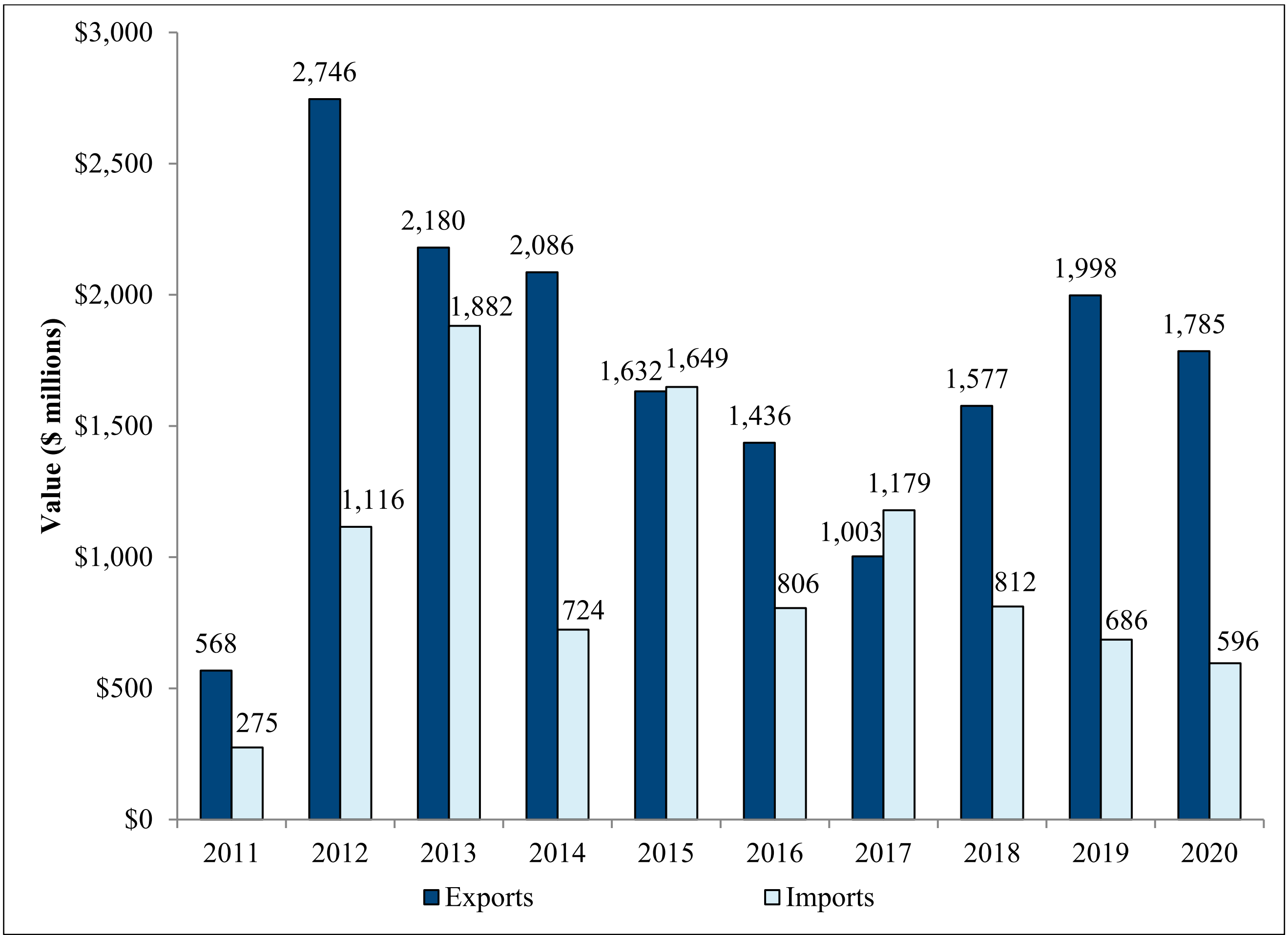
5. *Foreign Trade*

The value of imports and exports of ships and repair services varies considerably over time, in part due to the long lead time associated with manufacturing and delivering finished ships (see **Figure 8**).

Imports of finished ships, inputs, and repair services amounted to $596 million in 2020, down from $686 million in 2019. Industry imports are limited by regulation; in particular, the Jones Act (section 27 of the Merchant Marine Act of 1920) requires that all vessels carrying goods between U.S. ports be manufactured (or rebuilt) in the United States and be owned, operated, and crewed by U.S. citizens. In addition, imports for U.S. government needs are generally limited because defense contracts typically require access to sensitive military technology and information.

In contrast, exports by U.S. shipbuilders have remained relatively strong in recent years, reaching $1.8 billion in 2020 and $2.0 billion in 2019 (representing 7.5 percent of industry revenues in 2019). As a result, the U.S. shipbuilding industry has run a trade surplus in eight out of the last ten years and a cumulative trade surplus of $7.3 billion over this period.

Figure 8: Imports and Exports for the U.S. Shipbuilding and Repairing Industry, 2011–2020



Source: IBISWorld, "Staying Afloat: Steady demand from defense spending, oil production and freight transport will likely drive growth" Industry Report 33661a, September 2020.

III. The Economic Impact of the U.S. Private Shipbuilding and Repairing Industry

In this study, the economic impact of the U.S. private shipbuilding and repairing industry is measured in terms of its direct, indirect and induced impacts at the national and state levels.

The IMPLAN model, an input-output (I-O) model based on Federal government data, is used to quantify these linkages.[11] The IMPLAN model does not track capital expenditures (such as spending on equipment) by industry; consequently, the activity associated with capital spending by the shipbuilding and repairing industry has been separately calculated. See **Appendix B** for a more detailed description of the methodology used for this study.

A. National Impact

In 2019, on a national basis, the U.S. private shipbuilding and repairing industry directly provided 107,180 jobs (see **Table 4)**. Including direct, indirect, and induced impacts, 393,390 jobs were supported by the industry. Total labor income associated with all direct, indirect, and induced jobs was $28.1 billion. The industry directly and indirectly contributed $42.4 billion to GDP in 2019.

Table 4: Economic Importance of the U.S. Private Shipbuilding and Repairing Industry, 2019

	Direct Impacts	Indirect & Induced Impacts		Total Impacts	Total / Direct ("Multiplier")[c]
		Operational Impacts	Capital Investment Impacts		
Employment (jobs)[a]	107,180	276,100	10,110	393,390	3.67
Labor Income ($ billions)[b]	$9.9	$17.4	$0.7	$28.1	2.84
GDP ($ billions)	$12.2	$29.1	$1.1	$42.4	3.48

Source: Calculations using the IMPLAN Modeling system (2019 database) and data from the U.S. Census Bureau, U.S. Bureau of Labor Statistics, and U.S. Bureau of Economic Analysis.
Note: Details may not add to totals due to rounding.
[a] Employment is defined as the number of payroll and self-employed jobs, including part-time jobs.
[b] Labor income is defined as wages and salaries and benefits as well as proprietors' income.
[c] Economic multiplier represents the overall impact (including direct, operational, and capital investment contributions) relative to the direct impact.

By segment, over 90 percent of the direct economic activity is in the primary industry code, shipbuilding and repairing (NAICS 336611), which was responsible for 100,830 direct jobs, paid $9.4 billion in labor income, and generated $11.6 billion in GDP in 2019. Routine ship maintenance and repair activities (part of NAICS 488390) directly accounted for 6,350 jobs, $588 million in labor income, and $627 million in GDP (see **Table 5**, below).

[11] The IMPLAN model is based on input-output (I-O) tables that map the flow of value along the supply chain for the different industries in the economy. For example, for the shipbuilding and repairing industry these tables provide the value of inputs purchased from other industries that supply the shipbuilding and repairing industry. The supplying industries also purchase inputs from other industries to deliver their products; these impacts are also captured. See **Appendix D** for a description of the model.

Table 5: Direct Economic Impact of the U.S. Private Shipbuilding and Repairing Industry, by Segment, 2019

NAICS	Segment Description	Employment [a] (jobs)	Labor Income [b] ($ millions)	GDP ($ millions)
336611	Shipbuilding and repairing	100,830	$9,355	$11,559
488390	Routine ship maintenance and repairs	6,350	$588	$627
	Total	**107,180**	**$9,943**	**$12,186**

Source: Calculations using the IMPLAN Modeling system (2019 database) and data from the U.S. Census Bureau, U.S. Bureau of Labor Statistics, and U.S. Bureau of Economic Analysis.
[a] Employment is defined as the number of payroll and self-employed jobs, including part-time jobs.
[b] Labor income is defined as wages and salaries and benefits as well as proprietors' income.

Most of the indirect and induced economic impact of the industry is associated with the industry's ongoing operations, as its capital expenditures account for less than five percent (see **Table 6**, below). The largest amount of indirect and induced economic activity associated with the industry is in the services sector.[12] Other significant indirect and induced activities occur in wholesale and retail trade; finance, insurance and real estate; and manufacturing.

Considering the indirect and induced impacts, each direct job in the U.S. private shipbuilding and repairing industry is associated with another 2.67 jobs in other parts of the national economy; each dollar of direct labor income and GDP is associated with another $1.82 in labor income and $2.48 in GDP, respectively, outside of the U.S. private shipbuilding and repairing industry.

[12] The services sector, such as management of companies, architectural, engineering, and related services, other professional services, employment services, and business support services, received nearly half of the indirect impact due to its importance in the supply chain to the shipbuilding and repairing industry. The services sector further received more than half of the induced impact from consumer spending attributable to the industry.

Table 6: Indirect and Induced Activities Attributable to the U.S. Private Shipbuilding and Repairing Industry, by Industry, 2019

Sector Description	Employment (jobs)[a]	Labor Income ($ millions)[b]	GDP ($ millions)
Direct Impact	**107,180**	**$9,943**	**$12,186**
Indirect and Induced Impact on Other Industries	**286,210**	**$18,135**	**$30,184**
Operational Impact	***276,100***	***$17,412***	***$29,083***
Agriculture	3,380	$108	$168
Mining	910	$110	$231
Utilities	1,130	$196	$597
Construction	2,430	$160	$205
Manufacturing	27,250	$2,264	$3,972
Wholesale and retail trade	33,960	$2,011	$3,687
Transportation and warehousing	18,680	$1,041	$1,298
Information	5,310	$724	$1,607
Finance, insurance, real estate, rental and leasing	30,300	$2,040	$6,591
Services	148,740	$8,424	$10,296
Other	4,010	$334	$432
Capital Investment Impact	***10,110***	***$723***	***$1,101***
Agriculture	90	$3	$4
Mining	30	$3	$7
Utilities	30	$5	$15
Construction	1,010	$66	$68
Manufacturing	1,850	$160	$249
Wholesale and retail trade	1,220	$78	$141
Transportation and warehousing	530	$30	$37
Information	200	$30	$69
Finance, insurance, real estate, rental and leasing	730	$47	$155
Services	4,390	$299	$350
Other	30	$3	$5
Total Economic Impact	**393,390**	**$28,078**	**$42,370**

Source: Calculations using the IMPLAN Modeling system (2019 database).
Note: Details may not add to totals due to rounding.
[a] Employment is defined as the number of payroll and self-employed jobs, including part-time jobs.
[b] Labor income is defined as wages and salaries and benefits as well as proprietors' income.

In 2019 the U.S. private shipbuilding and repairing industry generated a total of $2.4 billion in Federal, state, and local taxes. Including the additional taxes supported by the industry's supply chain and its employees, the industry's total tax contribution was $8.5 billion in 2019 (see **Table 7**, below).

Table 7: Direct, Indirect, and Induced Taxes Supported by the U.S. Private Shipbuilding and Repairing Industry, 2019

Tax Level	Tax Category	Direct ($ millions)	Indirect ($ millions)	Induced ($ millions)	Total ($ millions)
Federal	Corporate Income Taxes	$47.7	$98.1	$123.7	$269.5
	Personal Income Taxes	$751.8	$636.7	$692.7	$2,081.3
	Excise Taxes	$13.5	$57.5	$96.1	$167.1
	Customs Duties	$6.7	$28.5	$47.6	$82.8
	Social Insurance Contributions	$1,138.4	$896.6	$957.0	$2,992.0
	Other	$1.0	$4.5	$7.4	$12.9
	Federal Total	**$1,959.2**	**$1,721.8**	**$1,924.5**	**$5,605.6**
State & Local	Corporate Income Taxes	$18.9	$38.9	$49.0	$106.8
	Personal Income Taxes	$195.3	$165.4	$180.0	$540.7
	Property Taxes	$70.4	$300.8	$502.1	$873.2
	Sales Taxes	$77.2	$329.8	$550.6	$957.6
	Social Insurance Contributions	$19.8	$15.0	$15.9	$50.7
	Other	$68.9	$104.8	$146.6	$320.3
	State & Local Total	**$450.5**	**$954.7**	**$1,444.2**	**$2,849.3**
	Federal, State & Local Total	**$2,409.7**	**$2,676.5**	**$3,368.7**	**$8,454.9**

Source: Calculations using the IMPLAN Modeling system (2019 database).
Note: Details may not add to totals due to rounding.

B. State Impacts

State-level IMPLAN models were used to estimate the U.S. private shipbuilding and repairing industry's state-by-state impacts. The study also estimates interstate spillover effects (i.e., indirect and induced impacts in a given state resulting from direct shipbuilding and repair activities in another state).

The U.S. private shipbuilding and repairing industry directly provided employment in 42 states in 2019. The five states with the largest direct employment impacts are Virginia, Connecticut, Mississippi, California, and Louisiana (see **Table 8**, below). Operations in these states represented approximately 64 percent of total industry operations in 2019.

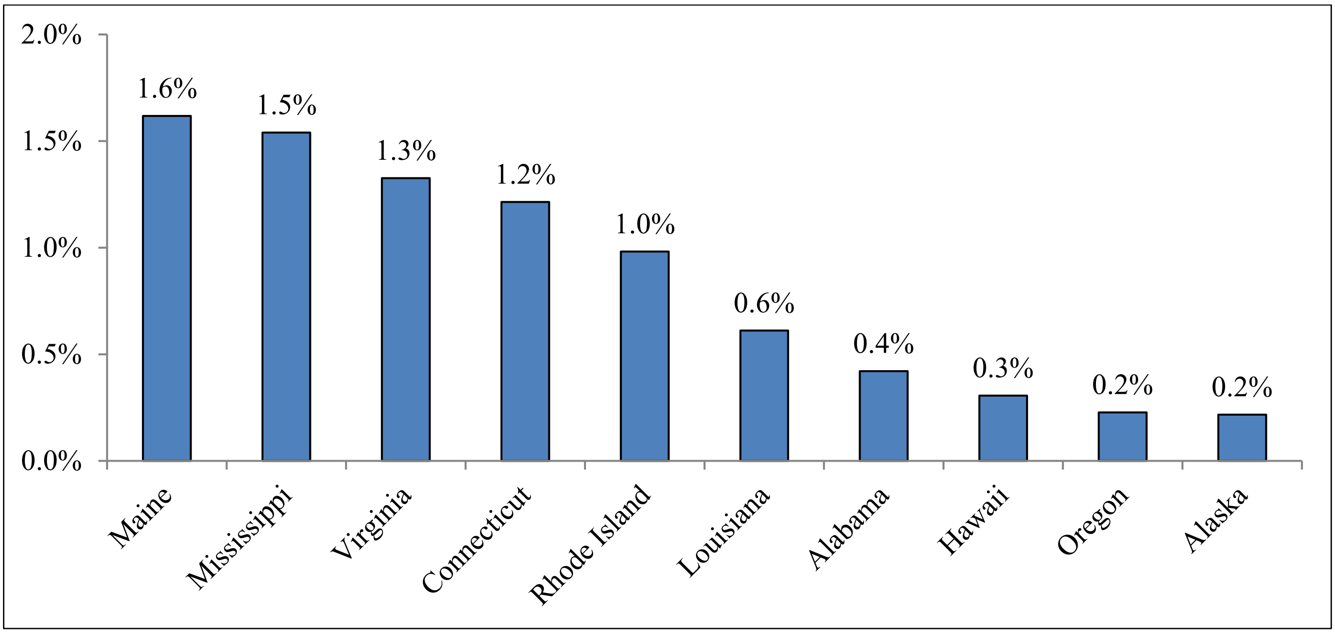
Table 8: Direct Impact of the U.S. Private Shipbuilding and Repairing Industry, by State, 2019

State	Direct Employment [a]		Direct Labor Income [b]		Direct GDP	
	Jobs	% of U.S. Total	($ millions)	% of U.S. Total	($ millions)	% of U.S. Total
Alabama	4,290	4.0%	$368	3.7%	$453	3.7%
Alaska	420	0.4%	$28	0.3%	$29	0.2%
Arizona	120	0.1%	$9	0.1%	$10	0.1%
Arkansas	40	0.0%	$3	0.0%	$4	0.0%
California	8,490	7.9%	$748	7.5%	$906	7.4%
Colorado	*	0.0%	$1	0.0%	$0	0.0%
Connecticut	11,820	11.0%	$1,347	13.5%	$1,467	12.0%
Delaware	10	0.0%	$1	0.0%	$1	0.0%
District of Columbia	-	-	-	-	-	-
Florida	4,700	4.4%	$345	3.5%	$383	3.1%
Georgia	140	0.1%	$13	0.1%	$14	0.1%
Hawaii	1,110	1.0%	$92	0.9%	$111	0.9%
Idaho	70	0.1%	$3	0.0%	$4	0.0%
Illinois	440	0.4%	$27	0.3%	$31	0.3%
Indiana	1,720	1.6%	$156	1.6%	$204	1.7%
Iowa	10	0.0%	$0	0.0%	$0	0.0%
Kansas	-	-	-	-	-	-
Kentucky	470	0.4%	$39	0.4%	$45	0.4%
Louisiana	6,620	6.2%	$541	5.4%	$691	5.7%
Maine	5,700	5.3%	$465	4.7%	$554	4.5%
Maryland	560	0.5%	$45	0.5%	$61	0.5%
Massachusetts	310	0.3%	$22	0.2%	$23	0.2%
Michigan	70	0.1%	$5	0.1%	$6	0.0%
Minnesota	30	0.0%	$2	0.0%	$3	0.0%
Mississippi	11,190	10.4%	$953	9.6%	$1,143	9.4%
Missouri	1,410	1.3%	$79	0.8%	$77	0.6%
Montana	-	-	-	-	-	-
Nebraska	-	-	-	-	-	-
Nevada	-	-	-	-	-	-
New Hampshire	40	0.0%	$3	0.0%	$3	0.0%
New Jersey	1,620	1.5%	$123	1.2%	$139	1.1%
New Mexico	-	-	-	-	-	-
New York	970	0.9%	$136	1.4%	$145	1.2%
North Carolina	60	0.1%	$3	0.0%	$6	0.0%
North Dakota	-	-	-	-	-	-
Ohio	530	0.5%	$46	0.5%	$53	0.4%
Oklahoma	40	0.0%	$2	0.0%	$3	0.0%
Oregon	1,540	1.4%	$175	1.8%	$182	1.5%
Pennsylvania	750	0.7%	$67	0.7%	$73	0.6%
Rhode Island	2,580	2.4%	$233	2.3%	$425	3.5%
South Carolina	490	0.5%	$47	0.5%	$51	0.4%
South Dakota	-	-	-	-	-	-
Tennessee	210	0.2%	$20	0.2%	$22	0.2%
Texas	3,400	3.2%	$280	2.8%	$336	2.8%
Utah	240	0.2%	$17	0.2%	$21	0.2%
Vermont	-	-	-	-	-	-
Virginia	30,270	28.2%	$3,101	31.2%	$3,981	32.7%
Washington	2,530	2.4%	$237	2.4%	$299	2.5%
West Virginia	50	0.0%	$5	0.1%	$6	0.0%
Wisconsin	2,140	2.0%	$156	1.6%	$222	1.8%
Wyoming	*	0.0%	$0	0.0%	$0	0.0%
U.S. Total	**107,180**	**100%**	**$9,943**	**100%**	**$12,186**	**100%**

Source: Calculations using the IMPLAN modeling system (2019 database).
Note: Details may not add to totals due to rounding.
* Indicates less than 5 jobs.
[a] Employment is defined as the number of payroll and self-employed jobs, including part-time jobs.
[b] Labor income is defined as wages and salaries and benefits as well as proprietors' income.

In five states the total (direct, indirect, and induced) economic activity attributable to the shipbuilding and repairing industry is 1 percent or more of total state employment (see **Figure 9**).

Figure 9: Private Shipbuilding and Repairing Industry's Total Employment Impact as a Percent of Total State Employment: Top Ten States, 2019

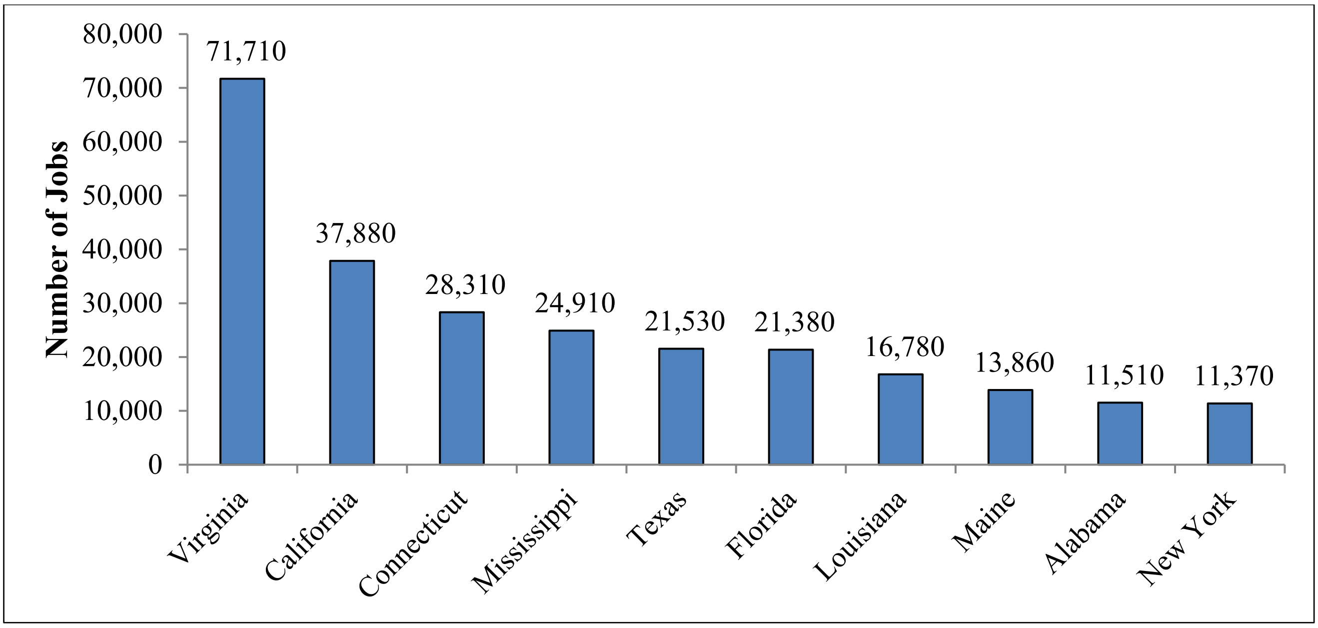


Source: Calculations using the IMPLAN modeling system (2019 database).

In terms of the total number of direct, indirect, and induced jobs, employment associated with the operations of the U.S. private shipbuilding and repairing industry is highest in Virginia, California, Mississippi, Louisiana, Texas, Connecticut, and Florida (see **Figure 10** and **Table 9**, below).

Additional detail is provided in **Appendix A**.

Figure 10: Total (Direct, Indirect, and Induced) Employment Impact Attributable to the U.S. Private Shipbuilding and Repairing Industry: Top Ten States, 2019



Source: Calculations using the IMPLAN modeling system (2019 database).

Table 9: Total (Direct, Indirect, and Induced) Economic Activities Attributable to the U.S. Private Shipbuilding and Repairing Industry, 2019

State	Total Employment [a]		Total Labor Income [b]		Total GDP	
	Jobs	% of U.S. Total	($ millions)	% of U.S. Total	($ millions)	% of U.S. Total
Alabama	11,510	2.9%	$716	2.5%	$1,038	2.4%
Alaska	1,000	0.3%	$63	0.2%	$93	0.2%
Arizona	3,110	0.8%	$192	0.7%	$314	0.7%
Arkansas	1,400	0.4%	$75	0.3%	$128	0.3%
California	37,880	9.6%	$2,999	10.7%	$4,650	11.0%
Colorado	2,690	0.7%	$186	0.7%	$293	0.7%
Connecticut	28,310	7.2%	$2,539	9.0%	$3,421	8.1%
Delaware	420	0.1%	$29	0.1%	$60	0.1%
District of Columbia	550	0.1%	$62	0.2%	$84	0.2%
Florida	21,380	5.4%	$1,238	4.4%	$1,881	4.4%
Georgia	5,060	1.3%	$316	1.1%	$547	1.3%
Hawaii	2,850	0.7%	$188	0.7%	$278	0.7%
Idaho	870	0.2%	$46	0.2%	$73	0.2%
Illinois	7,310	1.9%	$530	1.9%	$870	2.1%
Indiana	7,570	1.9%	$500	1.8%	$792	1.9%
Iowa	1,730	0.4%	$110	0.4%	$191	0.5%
Kansas	1,400	0.4%	$84	0.3%	$141	0.3%
Kentucky	2,950	0.7%	$177	0.6%	$273	0.6%
Louisiana	16,780	4.3%	$1,043	3.7%	$1,546	3.6%
Maine	13,860	3.5%	$871	3.1%	$1,214	2.9%
Maryland	3,670	0.9%	$264	0.9%	$424	1.0%
Massachusetts	4,140	1.1%	$347	1.2%	$525	1.2%
Michigan	4,800	1.2%	$317	1.1%	$492	1.2%
Minnesota	3,000	0.8%	$210	0.7%	$333	0.8%
Mississippi	24,910	6.3%	$1,491	5.3%	$2,081	4.9%
Missouri	6,030	1.5%	$347	1.2%	$505	1.2%
Montana	450	0.1%	$22	0.1%	$38	0.1%
Nebraska	980	0.2%	$62	0.2%	$108	0.3%
Nevada	1,440	0.4%	$81	0.3%	$143	0.3%
New Hampshire	810	0.2%	$61	0.2%	$91	0.2%
New Jersey	7,640	1.9%	$589	2.1%	$864	2.0%
New Mexico	680	0.2%	$33	0.1%	$64	0.2%
New York	11,370	2.9%	$1,072	3.8%	$1,718	4.1%
North Carolina	4,580	1.2%	$277	1.0%	$490	1.2%
North Dakota	390	0.1%	$24	0.1%	$43	0.1%
Ohio	6,990	1.8%	$458	1.6%	$746	1.8%
Oklahoma	1,740	0.4%	$103	0.4%	$161	0.4%
Oregon	5,970	1.5%	$443	1.6%	$627	1.5%
Pennsylvania	7,870	2.0%	$573	2.0%	$860	2.0%
Rhode Island	6,440	1.6%	$450	1.6%	$789	1.9%
South Carolina	3,350	0.9%	$200	0.7%	$310	0.7%
South Dakota	440	0.1%	$25	0.1%	$45	0.1%
Tennessee	3,780	1.0%	$244	0.9%	$374	0.9%
Texas	21,530	5.5%	$1,477	5.3%	$2,305	5.4%
Utah	2,080	0.5%	$121	0.4%	$202	0.5%
Vermont	310	0.1%	$17	0.1%	$26	0.1%
Virginia	71,710	18.2%	$5,553	19.8%	$8,150	19.2%
Washington	8,560	2.2%	$683	2.4%	$1,067	2.5%
West Virginia	740	0.2%	$44	0.2%	$73	0.2%
Wisconsin	8,140	2.1%	$509	1.8%	$800	1.9%
Wyoming	260	0.1%	$16	0.1%	$31	0.1%
U.S. Total	**393,390**	**100.0%**	**$28,078**	**100.0%**	**$42,370**	**100.0%**

Source: Calculations using the IMPLAN modeling system (2019 database).
Note: Details may not add to totals due to rounding.
[a] Employment is defined as the number of payroll and self-employed jobs, including part-time jobs.
[b] Labor income is defined as wages and salaries and benefits as well as proprietors' income.

Appendices

Appendix A: Economic Impact Breakdown: State-Level Detail

Tables A1, A2, and A3 provide the state-by-state breakout of the direct, indirect, and induced impacts attributable to the U.S. private shipbuilding and repairing industry.

Table A1: Employment Attributable to the U.S. Private Shipbuilding and Repairing Industry, 2019

State	Direct Contribution	Indirect Contribution	Induced Contribution	Total Contribution	Total State Percentage
Alabama	4,290	3,440	3,780	11,510	0.4%
Alaska	420	240	340	1,000	0.2%
Arizona	120	1,170	1,820	3,110	0.1%
Arkansas	40	590	770	1,400	0.1%
California	8,490	12,270	17,120	37,880	0.2%
Colorado	*	1,020	1,660	2,690	0.1%
Connecticut	11,820	6,520	9,960	28,310	1.2%
Delaware	10	140	270	420	0.1%
District of Columbia	-	170	380	550	0.1%
Florida	4,700	7,070	9,610	21,380	0.2%
Georgia	140	2,020	2,900	5,060	0.1%
Hawaii	1,110	690	1,050	2,850	0.3%
Idaho	70	310	500	870	0.1%
Illinois	440	2,940	3,930	7,310	0.1%
Indiana	1,720	2,660	3,190	7,570	0.2%
Iowa	10	780	940	1,730	0.1%
Kansas	-	570	830	1,400	0.1%
Kentucky	470	1,080	1,410	2,950	0.1%
Louisiana	6,620	4,620	5,530	16,780	0.6%
Maine	5,700	3,480	4,680	13,860	1.6%
Maryland	560	1,210	1,900	3,670	0.1%
Massachusetts	310	1,430	2,390	4,140	0.1%
Michigan	70	2,190	2,540	4,800	0.1%
Minnesota	30	1,220	1,740	3,000	0.1%
Mississippi	11,190	6,750	6,970	24,910	1.5%
Missouri	1,410	2,010	2,610	6,030	0.2%
Montana	-	150	300	450	0.1%
Nebraska	-	370	610	980	0.1%
Nevada	-	540	900	1,440	0.1%
New Hampshire	40	360	410	810	0.1%
New Jersey	1,620	2,430	3,590	7,640	0.1%
New Mexico	-	220	460	680	0.1%
New York	970	3,650	6,750	11,370	0.1%
North Carolina	60	1,860	2,660	4,580	0.1%
North Dakota	-	150	240	390	0.1%
Ohio	530	2,910	3,550	6,990	0.1%
Oklahoma	40	710	990	1,740	0.1%
Oregon	1,540	1,780	2,650	5,970	0.2%
Pennsylvania	750	2,920	4,210	7,870	0.1%
Rhode Island	2,580	1,640	2,220	6,440	1.0%
South Carolina	490	1,280	1,580	3,350	0.1%
South Dakota	-	160	280	440	0.1%
Tennessee	210	1,520	2,050	3,780	0.1%
Texas	3,400	7,710	10,410	21,530	0.1%
Utah	240	760	1,070	2,080	0.1%
Vermont	-	110	200	310	0.1%
Virginia	30,270	17,970	23,470	71,710	1.3%
Washington	2,530	2,470	3,560	8,560	0.2%
West Virginia	50	280	410	740	0.1%
Wisconsin	2,140	2,860	3,140	8,140	0.2%
Wyoming	*	100	160	260	0.1%
U.S. Total	**107,180**	**121,480**	**164,730**	**393,390**	**0.2%**

Source: Calculations using the IMPLAN modeling system (2019 database).
Note: Details may not add to totals due to rounding.
* Less than five jobs.
Employment is defined as the number of payroll and self-employed jobs, including part-time jobs.

Table A2: Labor Income Attributable to the U.S. Private Shipbuilding and Repairing Industry, 2019

State	Direct Contribution ($ millions)	Indirect Contribution ($ millions)	Induced Contribution ($ millions)	Total Contribution ($ millions)	Total State Percentage
Alabama	$368	$184	$164	$716	0.4%
Alaska	$28	$16	$19	$63	0.2%
Arizona	$9	$85	$98	$192	0.1%
Arkansas	$3	$37	$36	$75	0.1%
California	$748	$1,091	$1,160	$2,999	0.2%
Colorado	$1	$87	$98	$186	0.1%
Connecticut	$1,347	$552	$640	$2,539	1.2%
Delaware	$1	$11	$17	$29	0.1%
District of Columbia	-	$23	$40	$62	0.1%
Florida	$345	$427	$466	$1,238	0.2%
Georgia	$13	$142	$161	$316	0.1%
Hawaii	$92	$40	$56	$188	0.3%
Idaho	$3	$19	$23	$46	0.1%
Illinois	$27	$248	$256	$530	0.1%
Indiana	$156	$178	$167	$500	0.2%
Iowa	*	$60	$49	$110	0.1%
Kansas	-	$40	$44	$84	0.1%
Kentucky	$39	$70	$69	$177	0.1%
Louisiana	$541	$260	$242	$1,043	0.6%
Maine	$465	$190	$215	$871	1.6%
Maryland	$45	$102	$117	$264	0.1%
Massachusetts	$22	$147	$179	$347	0.1%
Michigan	$5	$170	$141	$317	0.1%
Minnesota	$2	$101	$107	$210	0.1%
Mississippi	$953	$276	$262	$1,491	1.5%
Missouri	$79	$135	$133	$347	0.2%
Montana	-	$9	$13	$22	0.1%
Nebraska	-	$27	$35	$62	0.1%
Nevada	-	$35	$46	$81	0.1%
New Hampshire	$3	$32	$26	$61	0.1%
New Jersey	$123	$220	$246	$589	0.1%
New Mexico	-	$13	$20	$33	0.1%
New York	$136	$386	$550	$1,072	0.1%
North Carolina	$3	$131	$143	$277	0.1%
North Dakota	-	$11	$13	$24	0.1%
Ohio	$46	$218	$194	$458	0.1%
Oklahoma	$2	$51	$50	$103	0.1%
Oregon	$175	$129	$140	$443	0.2%
Pennsylvania	$67	$240	$266	$573	0.1%
Rhode Island	$233	$104	$113	$450	1.0%
South Carolina	$47	$80	$73	$200	0.1%
South Dakota	-	$11	$15	$25	0.1%
Tennessee	$20	$105	$118	$244	0.1%
Texas	$280	$599	$597	$1,477	0.1%
Utah	$17	$50	$54	$121	0.1%
Vermont	-	$7	$10	$17	0.1%
Virginia	$3,101	$1,266	$1,185	$5,553	1.3%
Washington	$237	$206	$240	$683	0.2%
West Virginia	$5	$19	$20	$44	0.1%
Wisconsin	$156	$192	$162	$509	0.2%
Wyoming	*	$8	$8	$16	0.1%
U.S. Total	**$9,943**	**$8,839**	**$9,297**	**$28,078**	**0.2%**

Source: Calculations using the IMPLAN modeling system (2019 database).
Note: Details may not add to totals due to rounding.
* Less than $0.5 million.
Labor income is defined as wages and salaries and benefits as well as proprietors' income.

Table A3: GDP Attributable to the U.S. Private Shipbuilding and Repairing Industry, 2019

State	Direct Contribution ($ millions)	Indirect Contribution ($ millions)	Induced Contribution ($ millions)	Total Contribution ($ millions)	Total State Percentage
Alabama	$453	$297	$288	$1,038	0.4%
Alaska	$29	$29	$35	$93	0.2%
Arizona	$10	$139	$164	$314	0.1%
Arkansas	$4	$65	$60	$128	0.1%
California	$906	$1,716	$2,028	$4,650	0.1%
Colorado	*	$131	$162	$293	0.1%
Connecticut	$1,467	$849	$1,105	$3,421	1.2%
Delaware	$1	$23	$36	$60	0.1%
District of Columbia	-	$29	$55	$84	0.1%
Florida	$383	$688	$810	$1,881	0.2%
Georgia	$14	$248	$286	$547	0.1%
Hawaii	$111	$63	$104	$278	0.3%
Idaho	$4	$31	$38	$73	0.1%
Illinois	$31	$398	$440	$870	0.1%
Indiana	$204	$299	$288	$792	0.2%
Iowa	*	$101	$89	$191	0.1%
Kansas	-	$65	$76	$141	0.1%
Kentucky	$45	$112	$116	$273	0.1%
Louisiana	$691	$418	$438	$1,546	0.6%
Maine	$554	$289	$370	$1,214	1.8%
Maryland	$61	$162	$201	$424	0.1%
Massachusetts	$23	$220	$283	$525	0.1%
Michigan	$6	$256	$231	$492	0.1%
Minnesota	$3	$156	$174	$333	0.1%
Mississippi	$1,143	$455	$483	$2,081	1.8%
Missouri	$77	$206	$222	$505	0.2%
Montana	-	$15	$23	$38	0.1%
Nebraska	-	$47	$62	$108	0.1%
Nevada	-	$58	$84	$143	0.1%
New Hampshire	$3	$47	$42	$91	0.1%
New Jersey	$139	$325	$399	$864	0.1%
New Mexico	-	$26	$38	$64	0.1%
New York	$145	$623	$950	$1,718	0.1%
North Carolina	$6	$222	$262	$490	0.1%
North Dakota	-	$20	$23	$43	0.1%
Ohio	$53	$350	$343	$746	0.1%
Oklahoma	$3	$76	$82	$161	0.1%
Oregon	$182	$211	$233	$627	0.2%
Pennsylvania	$73	$362	$425	$860	0.1%
Rhode Island	$425	$163	$201	$789	1.2%
South Carolina	$51	$131	$127	$310	0.1%
South Dakota	-	$18	$27	$45	0.1%
Tennessee	$22	$164	$188	$374	0.1%
Texas	$336	$984	$986	$2,305	0.1%
Utah	$21	$86	$95	$202	0.1%
Vermont	-	$11	$16	$26	0.1%
Virginia	$3,981	$1,981	$2,188	$8,150	1.5%
Washington	$299	$341	$428	$1,067	0.2%
West Virginia	$6	$33	$35	$73	0.1%
Wisconsin	$222	$302	$276	$800	0.2%
Wyoming	*	$15	$15	$31	0.1%
U.S. Total	**$12,186**	**$14,057**	**$16,127**	**$42,370**	**0.2%**

Source: Calculations using the IMPLAN modeling system (2019 database).
Note: Details may not add to totals due to rounding.
* Less than $0.5 million.

Appendix B: Data Sources and Methodology

This Appendix describes the methodology used to derive the results for the study. It first discusses the data sources used to develop the estimates of the U.S. private shipbuilding and repairing industry's direct economic impacts. It then describes the development of the indirect and induced impact estimates for the industry.

I. Estimates of the Industry's Direct Economic Impacts

The definition of the U.S. private shipbuilding and repairing industry is based on the *North American Industry Classification System* (NAICS) and combines NAICS sector 336611 ("Shipbuilding and repairing") and a portion of NAICS sector 488390 ("Other support activities for water transportation"). Among other activities, NAICS sector 488390 includes routine repair and maintenance of ships from floating drydocks, as well as related activities not done in a shipyard.

This study uses data on employment and self-employment from the U.S. Bureau of Labor Statistics (BLS) and Bureau of Economic Analysis (BEA) to estimate direct employment in NAICS sectors 336611 and 488390. In particular, direct employment was estimated by combining counts of payroll employees from the BLS' *Quarterly Census of Employment* with estimates of self-employment based on data from the BEA. For some states, the count of payroll employees was suppressed because of the small number of establishments in the industry in the state. Relying on employment counts available for the sector at the national-level and for higher-level industries at the state-level, a two-stage "raking" process was used to estimate the state-level employee count. The raking process uses information from known sectors within a state and across states to impute information for the sectors with suppressed data.[13] Because the BEA data are only available for more aggregated industries, self-employment was first estimated for the aggregated industries and then allocated across the subsectors according to each industry's share of paid employment.

Direct employment was separately estimated for the United States as a whole and for each of the 50 states and the District of Columbia. The state-level estimates were then scaled to match the national level estimates.

As noted above, only a portion of NAICS sector 488390 is part of the shipbuilding and repairing industry. Based on data from the 2017 Economic Census, it is estimated that approximately 76.7 percent of the employment in NAICS sector 488390 is for routine repair and maintenance of ships not conducted at a shipyard. As such, the initial estimates of employment in NAICS sector 488390 (based on the BLS and BEA data) were multiplied by 76.7 percent to derive our final estimates of direct employment.

A similar approach was used to estimate the national direct labor income associated with the industry's direct employment. The IMPLAN model was used to estimate the industry's direct GDP at the national and state levels. The state-level direct labor income was first estimated using the IMPLAN state models, and then controlled to the national direct labor income estimate.

Estimates of the U.S. private shipbuilding and repairing industry's new capital investment in 2019 were developed using data from the Census Bureau's *Annual Capital Expenditure Survey* and the 2017 *Economic Census*. In particular, expenditures on new capital for "other transportation equipment manufacturing" (comprised of NAICS sectors 3365, 3366, and 3369) were obtained from

[13] Oh, H.L. and Scheuren, F. (1987). Modified Raking Ratio Estimation. *Survey Methodology*, vol. 13, no. 2, pp. 209-219.

the 2019 *Annual Capital Expenditure Survey* database. The ratio of total capital spending in shipbuilding and repairing (NAICS sector 336611) to other transportation equipment manufacturing from the 2017 *Economic Census* was used to estimate the portion of new capital investment in other transportation equipment manufacturing that is attributable to private shipbuilding and repairing. In addition, a portion of the capital expenditures on new structures and equipment by the support activities for transportation sector (NAICS 488) is allocated to the U.S. private shipbuilding and repairing industry.

The U.S. private shipbuilding and repairing industry's capital investment was translated into purchases of capital assets by type through use of the "capital flow matrix" from the U.S. Department of Commerce.[14]

II. Estimates of Indirect and Induced Economic Activities

The initial round of output, income, and employment generated by shipbuilding and repairing leads to successive rounds of re-spending in the chain of production. Such indirect and induced economic impacts by the shipbuilding and repairing industry can be measured using various approaches. The most common is multiplier analysis. In broad terms, a multiplier is an index that indicates the overall change in the level of economic activity that results from a given initial change. It effectively adds up all the successive rounds of re-spending, based on a number of assumptions that are embedded in the method of estimation.

There are different methods available for calculating multipliers. The method used in this report is *input-output* analysis. It is the most commonly used approach in regional economic impact studies. The input-output model developed by IMPLAN is a well-known input-output model for conducting regional economic studies in the United States and is widely used by government, academics and private-sector researchers. The IMPLAN modeling system is similar to the Regional Input-Output Modeling System developed by the U.S. Department of Commerce. The IMPLAN model is developed by IMPLAN Group LLC.[15]

The IMPLAN database represents a consistent set of economic data processed from various published sources (such as the BEA's *National Income and Product Accounts* and *Regional Economic Information System* , the Census Bureau's *County Business Patterns*, and the BLS' *Covered Employee and Wages Program*) in a variety of formats and under varying disclosure restrictions.

Estimates of indirect and induced economic impacts by the U.S. shipbuilding and repairing industry were derived based on the IMPLAN model for the national economy and IMPLAN regional models for each of the 50 states and the District of Columbia.

IMPLAN uses an "input-output" framework that relates the output of each industry to inputs purchased from other industries. Output in one industry requires purchases of inputs from other industries, and these supply industries in turn make purchases from their suppliers, and so on. Employees and business owners make personal purchases out of the income that is generated by this process, which ripple through the economy. Multipliers describe these relationships. The Type I multiplier measures the direct and indirect effects of a change in economic activity. It captures the inter-industry effects only, i.e., industries buying from local industries. The Type II (Social Accounting Matrix or SAM) multiplier captures the direct and indirect effects and, in addition, it also reflects induced effects. The indirect and induced impacts of the shipbuilding and repairing industry

[14] http://www.bea.gov/newsreleases/industry/capflow/capitalflownewsrelease.htm
[15] More information on IMPLAN is available at www.implan.com.

on other sectors of the economy in terms of employment, labor income (including wages and salaries and benefits as well as proprietors' income), and GDP were calculated using the IMPLAN model.[16]

Because individual state models do not account for cross-state impacts, the sum of the state indirect and induced impacts will not add to the national totals. The indirect and induced effects crossing state borders ("cross-state spillover effects") were allocated across the 50 states and the District of Columbia in proportion to each state's share of the total national employment, labor income, and GDP in each industry. The state indirect and induced effects reported throughout this study include the allocation of these cross-state spillover effects.

[16] Because the IMPLAN models are used for total impact analysis (as opposed to marginal impact analysis) in this study, necessary adjustments are made to the initial indirect and induced impact estimates to prevent double counting. For instance, any indirect or induced effects from the initial estimates for IMPLAN sectors that are fully mapped to the shipbuilding and repairing industry are removed. Similarly, indirect and induced effects for IMPLAN sectors that are partially mapped to the shipbuilding and repairing industry are proportionately adjusted.

Appendix C: Longitudinal Data Comparison

This appendix compares key data points from the 2015 and 2021 iterations of this report.[17]

Table A4: Longitudinal Data Comparison (2015 and 2021 Reports)

Data Point	2015 Report	2021 Report
Total GDP (Direct, Indirect, and Induced) Impacts	$37.3B	$42.4B
Direct GDP Impacts	$10.7B	$12.2B
Indirect and Induced GDP Impacts	$26.6B	$30.2B
GDP Total/Direct ("Multiplier")	3.49	3.48
Total Labor Income (Direct, Indirect, and Induced) Impacts	$25.1B	$28.1B
Direct Labor Income Impacts	$9.2B	$9.9B
Indirect and Induced Labor Income Impacts	$15.9B	$18.1B
Labor Income Total/Direct ("Multiplier") Impacts	2.73	2.84
Total Employment Impact (Direct, Indirect, and Induced)	399,420	393,390
Direct Employment Impacts	110,390	107,180
Indirect and Induced Employment Impacts	289,030	286,210
Employment Total/Direct ("Multiplier")	3.62	3.67
Private Shipyards[18]	119	154
Military Ship Purchases (Large Deep-Draft Vessels)	10	14

[17] The 2015 report predominately conveys 2013 data and the 2021 report predominately conveys 2019 data. Exceptions are for the private shipyards (2015 and 2020 values are reported) and the military ship purchases figures (2014 and 2020 values are reported).

[18] The 2015 report lists 124 active shipyards in the United States, 119 of which were private. This table displays only the private shipyards.

EXHIBIT 128

NOTES

U.S. Department of Transportation

Maritime Transportation

Summary Tables: United States Flag Privately-Owned Merchant Fleet, 2000 - 2019*

Oceangoing Self-Propelled, Cargo-Carrying Vessels of 1,000 Gross Tons and Above

Fleet is as of January of each year

(Tonnages in Thousands)

Coverage

This report contains summary tables of the number of of oceangoing, self-propelled, privately-owned, cargo-carrying vessels of 1,000 gross tons or greater differentiated by Jones Act Eligible, Non-Jones Act Eligible and Overall Fleet.

Table 1 - Summary Table: United States Flag Privately-Owned **Overall** Merchant Fleet, 2000 - 2019*

Table 2 - Summary Table: United States Flag Privately-Owned **Jones-Act Eligible** Merchant Fleet, 2000 - 2019*

Table 3 - Summary Table: United States Flag Privately-Owned **Non Jones-Act Eligible** Merchant Fleet, 2000 - 2019*

Vessel Types

The vessel categories used for this report include the following types of vessels:

Tankers: Petroleum Tankers, Chemical Carriers, LNG Carriers, LNG/LPG Carriers, LPG Carriers.

Container: Fully Cellular Containerships

Dry Bulk: Bulk Vessels, Bulk Containerships, Cement Carriers, Wood Chip Carriers, Ore/Bulk/Oil Carriers, and Bulk/Oil Carriers.

Ro-Ro: Ro-Ro Vessels, Ro-Ro/Containerships, Vehicle Carriers.

General Cargo: General Cargo Carriers, Partial Containerships, Refrigerated Ships.

Capacities

Vessel capacities are expressed in gross tons (GT) and deadweight tons (DWT).

Gross Tonnage is volume of all ship's enclosed spaces (from keel to funnel) measured to the outside of the hull framing. 1 GT = 100 cubic feet.

Deadweight is the total weight (metric tons) of: Cargo, fuel, fresh water, stores and crew which a ship can carry when immersed to its load line.

Jones Act Eligible

Vessels that are eligible to participate in domestic trade. Jones Act eligible vessels are built in the United States, owned by United States citizens and crewed by U.S. Mariners.

Source

IHS Maritime, Sea-Web. www.sea-web.com

Maritime Administration Vessel Inventory Lists

U.S. Department of Transportation

Maritime Transportation

Table 1 - Summary Table: United States Flag Privately-Owned**Overall** Merchant Fleet, 2000 - 2019*

Oceangoing Self-Propelled, Cargo-Carrying Vessels of 1,000 Gross Tons and Above

Fleet is as of January of each year

(Tonnages in Thousands)

Year	Total			Containership			Dry Bulk			General Cargo			Integrated Tug/Barge			Roll-On/Roll-Off			Tanker		
	#	GT	DWT	#	GT	DWT	#	GT	DWT	#	GT	DWT	#	GT	DWT	#	GT	DWT	#	GT	DWT
2019	182	7,113	8,277	65	2,859	3,166	5	130	226	21	174	179	0	0	0	28	1,466	594	63	2,481	4,109
2018	182	7,024	8,246	62	2,679	2,958	5	130	226	21	169	178	0	0	0	29	1,469	597	65	2,575	4,284
2017	176	6,773	8,015	63	2,713	3,009	5	130,686	226	20	151	167	0	0	0	28	1,350	575	60	2,426	4,035
2016	169	6,670	7,797	63	2,744	2,998	6	158	260	17	153	179	2	23	15	28	1,339	577	53	2,253	3,768
2015	170	6,722	7,754	67	2,960	3,230	6	129	260	16	129	161	2	23	15	29	1,378	585	50	2,103	3,504
2014	179	6,912	7,802	69	2,986	3,257	6	159	260	21	185	231	2	23	15	32	1,520	652	49	2,039	3,386
2013	187	7,073	7,903	75	3,079	3,357	6	159	260	22	192	239	2	23	15	34	1,611	692	48	2,010	3,340
2012	198	7,386	8,257	80	3,222	3,554	8	231	388	22	183	224	2	23	15	37	1,726	751	49	2,001	3,326
2011	214	7,892	9,175	79	3,199	3,537	12	316	533	20	156	191	4	61	99	39	1,800	799	60	2,360	4,016
2010	221	8,014	9,547	80	3,256	3,596	12	316	533	18	142	174	9	179	324	40	1,723	814	62	2,398	4,104
2009	217	7,710	9,134	76	2,961	3,219	12	316	533	19	174	229	9	179	324	42	1,766	862	59	2,315	3,966
2008	225	7,989	9,459	78	3,032	3,306	12	316	533	19	187	250	12	242	462	43	1,780	879	61	2,341	4,028
2007	220	7,616	9,123	70	2,745	2,952	12	316	533	20	225	297	12	242	462	43	1,770	877	63	2,316	4,001
2006	229	7,957	9,411	73	2,872	3,106	12	313	533	20	225	297	12	242	462	49	2,030	1,029	63	2,274	3,984
2005	231	7,920	9,597	81	3,174	3,428	15	498	875	17	211	284	12	242	462	43	1,725	893	63	2,072	3,655
2004	233	7,665	9,264	75	2,901	3,104	14	468	823	22	265	335	12	242	462	43	1,711	884	67	2,078	3,655
2003	246	7,935	10,083	78	2,955	3,124	14	468	823	18	217	296	12	242	462	40	1,530	820	84	2,523	4,558
2002	261	8,368	10,912	79	2,868	3,019	14	468	823	20	294	411	12	242	462	40	1,530	817	96	2,966	5,379
2001	274	9,267	11,866	77	2,784	2,932	11	388	685	23	398	563	12	242	462	40	1,562	839	111	3,895	6,385
2000	282	9,583	12,408	81	2,857	3,004	11	387	685	22	389	555	12	242	462	39	1,538	847	117	4,171	6,854

Note 1: There have been vessel additions to, and removals from, the U.S.-flag fleet during the current year. For the latest U.S.-flag fleet, please visit: http://www.marad.dot.gov/resources/data-statistics/

Note 2: Integrated Tug/Barges (ITBs) consists of vessels carrying both dry and liquid cargoes.

Note 3: Totals may not sum correctly due to rounding.

U.S. Department of Transportation
Maritime Transportation
Table 2 - Summary Table: United States Flag Privately-Owned**Jones-Act Eligible** Merchant Fleet, 2000 - 2019*
Oceangoing Self-Propelled, Cargo-Carrying Vessels of 1,000 Gross Tons and Above
Fleet is as of January of each year
(Tonnages in Thousands)

Year	Total			Containership			Dry Bulk			General Cargo			Integrated Tug/Barge			Roll-On/Roll-Off			Tanker		
	#	GT	DWT	#	GT	DWT	#	GT	DWT	#	GT	DWT	#	GT	DWT	#	GT	DWT	#	GT	DWT
2019	99	3,452	4,845	24	741	754	2	44	73	9	18	15	0	0	0	7	314	139	57	2,332	3,862
2018	100	3,476	4,973	23	672	707	2	44	73	9	18	15	0	0	0	7	314	139	59	2,427	4,037
2017	97	3,386	4,762	23	672	707	2	44	73	9	18	15	0	0	0	9	373	177	54	2,277	3,788
2016	92	3,272	4,577	23	656	696	3	72	107	7	14	11	2	23	15	9	373	177	48	2,134	3,571
2015	89	1,312	4,306	23	648	695	3	72	107	7	14	11	2	23	15	9	357	171	45	198	3,307
2014	90	3,084	4,226	24	667	715	3	73	107	7	14	11	2	23	15	10	386	187	44	1,922	3,192
2013	92	3,126	4,240	26	706	758	3	73	107	7	14	11	2	23	15	11	417	203	43	1,893	3,146
2012	92	3,126	4,213	26	706	758	3	73	107	7	14	11	2	23	15	12	449	221	42	1,861	3,102
2011	107	3,656	5,055	26	706	758	4	91	137	7	14	11	4	61	99	12	449	221	54	2,245	3,830
2010	115	3,760	5,381	26	706	758	4	91	137	7	14	11	9	179	324	13	494	246	56	2,276	3,905
2009	115	3,735	5,326	27	725	779	4	91	137	9	53	73	9	179	324	13	494	246	53	2,193	3,767
2008	124	3,996	5,647	28	743	796	4	91	137	9	67	94	12	242	462	16	629	318	55	2,224	3,840
2007	123	3,956	5,601	27	731	783	4	91	137	8	66	93	12	242	462	16	629	318	56	2,197	3,807
2006	129	4,125	5,721	28	764	825	4	91	137	8	66	93	12	242	462	20	808	408	57	2,158	3,795
2005	130	3,975	5,546	27	731	787	5	199	352	8	64	93	12	242	462	19	770	395	59	1,969	3,457
2004	134	3,853	5,349	27	718	771	5	199	352	10	86	120	12	242	462	19	756	387	61	1,852	3,257
2003	151	4,328	6,405	30	808	843	5	199	352	8	64	93	12	242	462	17	626	342	79	2,390	4,313
2002	167	4,789	7,174	33	866	907	5	199	352	11	150	218	12	242	462	17	626	342	89	2,707	4,894
2001	183	5,762	8,243	33	866	907	4	176	315	13	218	320	12	242	462	17	626	342	104	3,634	5,897
2000	193	6,162	8,827	37	940	978	4	176	315	12	215	318	12	242	462	18	678	387	110	3,911	6,367

Note 1: There have been vessel additions to, and removals from, the U.S.-flag fleet during the current year. For the latest U.S.-flag fleet, please visit: http://www.marad.dot.gov/resources/data-statistics/
Note 2: Integrated Tug/Barges (ITBs) consists of vessels carrying both dry and liquid cargoes.
Note 3: Totals may not sum correctly due to rounding.

U.S. Department of Transportation
Maritime Transportation
Table 3 - Summary Table: United States Flag Privately-Owned**Non Jones-Act Eligible** Merchant Fleet, 2000 - 2019*
Oceangoing Self-Propelled, Cargo-Carrying Vessels of 1,000 Gross Tons and Above
Fleet is as of January of each year
(Tonnages in Thousands)

Year	Total			Containership			Dry Bulk			General Cargo			Integrated Tug/Barge			Roll-On/Roll-Off			Tanker		
	#	GT	DWT	#	GT	DWT	#	GT	DWT	#	GT	DWT	#	GT	DWT	#	GT	DWT	#	GT	DWT
2019	83	3,661	3,431	41	2,117	2,411	3	86	153	12	156	164	0	0	0	21	1,152	455	6	148	246
2018	82	3,548	3,273	39	2,006	2,251	3	86	153	12	150	162	0	0	0	22	1,155	458	6	148	246
2017	79	3,387	3,253	40	2,040	2,302	3	86	153	11	133	152	0	0	0	19	977	398	6	148	246
2016	77	3,398	3,220	40	2,088	2,302	3	86	153	10	139	168	0	0	0	19	965	399	5	118	197
2015	81	3,652	3,450	44	2,312	2,535	3	86	153	9	115	151	0	0	0	20	1,020	414	5	118	197
2014	89	3,827	3,576	45	2,319	2,542	3	86	153	14	170	221	0	0	0	22	1,135	465	5	117	194
2013	95	3,947	3,664	49	2,372	2,599	3	86	153	15	178	229	0	0	0	23	1,194	489	5	117	194
2012	106	4,260	4,043	54	2,516	2,795	5	158	281	15	168	213	0	0	0	25	1,277	530	7	140	224
2011	107	4,327	4,119	53	2,493	2,779	8	225	396	13	142	179	0	0	0	27	1,352	579	6	115	186
2010	106	4,254	4,165	54	2,550	2,838	8	225	396	11	128	164	0	0	0	27	1,229	568	6	122	199
2009	102	3,975	3,808	49	2,236	2,440	8	225	396	10	121	156	0	0	0	29	1,272	616	6	122	199
2008	101	3,902	3,812	50	2,288	2,510	8	225	396	10	121	156	0	0	0	27	1,151	561	6	117	188
2007	97	3,660	3,522	43	2,014	2,169	8	225	396	12	160	204	0	0	0	27	1,141	559	7	120	194
2006	100	3,831	3,690	45	2,108	2,281	8	225	396	12	160	204	0	0	0	29	1,222	621	6	116	189
2005	101	3,946	4,051	54	2,443	2,642	10	298	523	9	147	191	0	0	0	24	954	498	4	103	198
2004	99	3,813	3,914	48	2,183	2,333	9	269	471	12	179	215	0	0	0	24	954	498	6	227	398
2003	95	3,606	3,678	48	2,147	2,281	9	269	471	10	153	203	0	0	0	23	905	478	5	133	245
2002	94	3,579	3,738	46	2,002	2,122	9	269	471	9	144	193	0	0	0	23	905	476	7	259	486
2001	91	3,505	3,623	44	1,917	2,025	7	211	370	10	180	243	0	0	0	23	936	497	7	260	488
2000	89	3,421	3,581	44	1,917	2,025	7	211	370	10	173	238	0	0	0	21	859	461	7	260	488

Note 1: There have been vessel additions to, and removals from, the U.S.-flag fleet during the current year. For the latest U.S.-flag fleet, please visit: http://www.marad.dot.gov/resources/data-statistics/
Note 2: Integrated Tug/Barges (ITBs) consists of vessels carrying both dry and liquid cargoes.
Note 3: Totals may not sum correctly due to rounding.

EXHIBIT 129

U.S. Department of Transportation
Maritime Administration
United States-Flag Privately-Owned Merchant Fleet Report
Oceangoing, Self-Propelled Vessels of 1,000 Gross Tons and Above that Carry Cargo from Port to Port

To provide any updates for this list, please e-mail DATA.MARAD@DOT.GOV

Coverage
This report contains a listing of oceangoing, self-propelled, privately-owned U.S.-flag vessels of 1,000 gross tons and above that carry cargo from port to port for commercial and government customers. New vessels are considered to have entered the fleet once they are "In Service."

Vessel Types
The vessel categories used for this report include the following types of vessels:
Tankers: Petoleum Tankers, Chemical Carriers, LNG Carriers, LNG/LPG Carriers, LPG Carriers.
Container: Fully Cellular Containerships
Dry Bulk: Bulk Vessls, Bulk Containerships, Cement Carriers, Wood Chip Carriers, Ore/Bulk/Oil Carriers, and Bulk/Oil Carriers.
Ro-Ro: Ro-Ro Vessels, Ro-Ro/Containerships, Vehicle Carriers.
General Cargo: General Cargo Carriers, Partial Containerships, Refrigerated Ships.

Capacities
Vessel capacities are expressed in gross tons (GT) and deadweight tons (DWT).
Gross Tonnage is volume of all ship's enclosed spaces (from keel to funnel) measured to the outside of the hull framing, calculated using the International Tonnage Convention.
Deadweight is the total weight (metric tons) of: Cargo, fuel, fresh water, stores and crew which a ship can carry when immersed to its load line.

Operator - Company responsible for the commercial decisions concerning the employment of a ship and therefore who decides how and where that asset is employed. The direct beneficiary of the profits from the operations of the ship, this company may also be responsible for purchasing decisions on bunkers and port services. A medium to long-term time or bareboat charterer is considered to be the operator of the ship. Companies heading operator pools are Operators of the ships in the pool.

MSP - Maritime Security Program
VISA - Voluntary Intermodal Sealift Agreement
VTA - *Voluntary Tanker Agreement
Jones Act Eligible - Vessels that are eligible to participate in domestic trade . Jones Act eligible vessels are built in the United States, owned by United States citizens and crewed by U.S. Mariners.

Militarily Useful Sealift Vessels
The following definition is based on the Joint Publication 4-01.2, Sealift Support to Joint Operations, Chairman of the Joint Chiefs of Staff, 22 June 2012.

These criteria are for planning purposes only. During execution any vessel offered for sealift may be considered.

General criteria - all active and inactive oceangoing ships within the following types and criteria and a minimum speed of 12 knots including:

A. Dry cargo - All dry cargo ships, including integrated tug/barges (ITB) with a minimum capacity of 2,000 deadweight tons (DWT) capable of carrying, without significant modification, any of the following cargoes: unit equipment, ammunition, or sustaining supplies. Examples of ship types included in this category are; containerships, breakbulk, Roll-on/Roll-off, and heavy lift vessels. Dry Bulk Carriers are generally not considered to be militarily useful.

B. Tankers - All tankers, including ITB and chemical carriers, capable of carrying refined petroleum, oils, and lubricants with a capacity range from 2,000 to 100,000 DWT.

C. Other specially selected vessels, including any vessel approved by the Department of Defense for participation in the Voluntary Intermodal Sealift Agreement (VISA) or Voluntary Tanker Agreement (VTA) programs.
Source
IHS Maritime, Sea-Web. www.sea-web.com

U.S. Department of Transportation
Maritime Administration
United States Flag Privately-Owned Merchant Fleet Report
Oceangoing, Self-Propelled Vessels of 1,000 Gross Tons and Above that Carry Cargo from Port to Port
As of: February 17, 2021
Please send any updated information on the U.S.-Flag Fleet to DATA.MARAD@DOT.GOV
See notes page for definition on Militarily Useful vessels

Count	
Total Ships	180
Jones Act Eligible	96
Non-Jones Act Eligible	84

IMO NUMBER	Vessel Name	Ship Type	Gross Tons	Deadweight Tons	Year of Build	Operator	MSP	VISA	VTA*	Jones Act Eligible	Militarily Useful
9244661	ALASKAN EXPLORER	Tanker	110,693	193,049	2005	Alaska Tanker Co LLC	N	N	N	Y	N
9244659	ALASKAN FRONTIER	Tanker	110,693	193,049	2004	Alaska Tanker Co LLC	N	N	N	Y	N
9271432	ALASKAN LEGEND	Tanker	110,693	193,048	2006	Alaska Tanker Co LLC	N	N	N	Y	N
9244673	ALASKAN NAVIGATOR	Tanker	110,693	193,048	2005	Alaska Tanker Co LLC	N	N	N	Y	N
9303546	ALLIANCE FAIRFAX	Ro-Ro	59,705	19,670	2005	Maersk Line, Limited	Y	Y	N	N	Y
9332547	ALLIANCE NORFOLK	Ro-Ro	57,280	21,179	2007	Farrell Lines Incorporated	Y	Y	N	N	Y
9285500	ALLIANCE ST. LOUIS	Ro-Ro	57,280	21,081	2005	Farrell Lines Incorporated	Y	Y	N	N	Y
9759886	AMERICAN ENDURANCE	Tanker	29,801	49,828	2016	American Petroleum Tankers LLC	N	N	N	Y	Y
9759898	AMERICAN FREEDOM	Tanker	29,801	49,828	2017	Crowley Petroleum Services Inc	N	N	N	Y	Y
9763851	AMERICAN LIBERTY	Tanker	29,801	49,828	2017	American Petroleum Tankers X	N	N	N	Y	Y
9564578	AMERICAN PHOENIX	Tanker	30,718	49,035	2012	Seabulk Tankers Inc	N	N	N	Y	Y
9763863	AMERICAN PRIDE	Tanker	29,801	49,828	2017	Crowley Petroleum Service Inc	N	N	N	Y	Y
9229609	APL GUAM	Containership	13,764	16,400	2001	APL Maritime, Ltd.	Y	Y	N	N	Y
9239874	APL GULF EXPRESS	Containership	16,916	20,944	2002	APL Marine Services, Ltd.	Y	Y	N	N	Y
9239850	APL SAIPAN	Containership	16,916	20,979	2002	APL Marine Services, Ltd.	Y	Y	N	N	Y
9332925	ARC INDEPENDENCE	Vehicles Carrier	71,583	30,200	2007	American Roll-on Roll-off	Y	Y	N	N	Y
9332949	ARC INTEGRITY	Vehicles Carrier	71,583	30,386	2008	American Roll-on Roll-off	Y	Y	N	N	Y
9316141	ARC RESOLVE	Vehicles Carrier	60,942	22,564	2006	American Roll-on Roll-off	Y	Y	N	N	Y
9698018	BAY STATE	Tanker	29,923	49,130	2016	American Petroleum Tankers LLC	N	N	N	Y	Y
9144926	BRENTON REEF	Tanker	30,770	45,656	1999	Seabulk Tankers Inc	N	N	N	Y	Y
9642095	CALIFORNIA	Tanker	62,318	114,756	2015	Crowley Alaska Tankers LLC	N	N	N	Y	N
9710206	CALIFORNIA VOYAGER	Tanker	29,923	49,160	2016	Chevron Shipping Co LLC	N	N	N	Y	Y
9123037	CAPT DAVID I LYON	Containership	16,856	22,878	1996	Sealift Inc	N	N	N	N	Y
9243162	CHARLESTON EXPRESS	Containership	40,146	40,478	2002	Hapag-Lloyd USA, LLC	Y	Y	N	N	Y
6806444	CHEMICAL PIONEER	Tanker	21,760	35,489	1968	USCS Chemical Chartering	N	N	N	Y	Y
9010498	COASTAL NAVIGATOR	General Cargo	1,904	1,500	1991	Coastal Transportation Inc	N	N	N	Y	N
8213249	COASTAL NOMAD	General Cargo	1,920	1,200	1983	Coastal Transportation Inc	N	N	N	Y	N
8855463	COASTAL PROGRESS	General Cargo	1,920	2,133	1988	Coastal Transportation Inc	N	N	N	Y	N
9782493	COASTAL STANDARD	General Cargo	2,451	2,565	2016	Coastal Transportation Inc	N	N	N	Y	Y
5408491	COASTAL TRADER	General Cargo	1,823	1,825	1963	Coastal Transportation Inc	N	N	N	Y	N
7119678	COASTAL VENTURE	General Cargo	1,301	1,383	1971	Stevens Transportation LLC	N	Y	N	Y	N
9719056	DANIEL K. INOUYE	Containership	48,409	51,400	2018	Matson Navigation Co Inc	N	Y	N	Y	Y
9010486	EASTERN WIND	General Cargo	1,495	1,500	1990	Trident Seafoods Corp	N	N	N	Y	N
9721968	EL COQUI	Containership	37,462	26,410	2018	Crowley Liner Services Inc	N	Y	N	Y	Y
9408126	EMPIRE STATE	Tanker	29,527	48,635	2010	Crowley Petroleum Service Inc	N	N	N	Y	Y
9121273	ENDURANCE	Ro-Ro	72,708	48,988	1996	Fidelio Limited Partnership	Y	Y	N	N	Y
9408138	EVERGREEN STATE	Tanker	29,606	48,641	2010	Crowley Petroleum Service Inc	N	N	N	Y	Y
9568469	FLORIDA	Tanker	29,242	46,696	2013	Crowley Petroleum Service Inc	N	N	N	Y	Y

9118630	FLORIDA VOYAGER	Tanker	30,415	46,094	1998	Chevron Shipping Co LLC	N	N	N	Y	Y
9129706	FREEDOM	Ro-Ro	49,821	19,884	1997	Fidelio Limited Partnership	Y	Y	N	N	Y
9698006	GARDEN STATE	Tanker	29,923	49,172	2016	American Petroleum Tankers LLC	N	N	N	Y	Y
7710733	GEYSIR	General Cargo	2,266	2,000	1980	Marco Marine LLC	N	N	N	Y	Y
9407562	GOLDEN STATE	Tanker	29,527	48,632	2009	Crowley Petroleum Service Inc	N	N	N	Y	Y
9339818	GREEN BAY	Ro-Ro	59,250	18,312	2007	Waterman Transport, Inc.	Y	Y	N	N	Y
9181560	GREEN COVE	Ro-Ro	57,566	22,747	1999	Waterman Transport, Inc.	Y	Y	N	N	Y
9158288	GREEN LAKE	Ro-Ro	57,623	22,799	1998	Waterman Transport, Inc.	Y	Y	N	N	Y
9177428	GREEN RIDGE	Ro-Ro	57,449	21,523	1998	Waterman Transport, Inc.	Y	Y	N	N	Y
9126297	HONOR	Ro-Ro	49,814	19,844	1996	Fidelio Limited Partnership	Y	Y	N	N	Y
7617905	HORIZON ENTERPRISE	Containership	28,219	31,423	1980	Pasha Hawaii Holdings LLC	N	Y	N	Y	Y
7617890	HORIZON PACIFIC	Containership	28,219	31,213	1979	Pasha Hawaii Holdings LLC	N	Y	N	Y	Y
7729461	HORIZON RELIANCE	Containership	34,077	45,895	1980	Pasha Hawaii Holdings LLC	N	Y	N	Y	Y
7729459	HORIZON SPIRIT	Containership	34,077	46,154	1980	Pasha Hawaii Holdings LLC	N	Y	N	Y	Y
8220761	HOUSTON	Tanker	21,471	32,689	1985	USS Chartering LLC	N	N	N	Y	Y
9710191	INDEPENDENCE	Tanker	29,923	49,181	2016	Seabulk Tankers Inc	N	N	N	Y	Y
9680841	ISLA BELLA	Containership	36,751	33,106	2015	TOTE Puerto Rico	N	Y	N	Y	Y
9233167	JEAN ANNE	Ro-Ro	37,548	12,561	2005	Pasha Hawaii Holdings LLC	N	Y	N	Y	Y
9719068	KAIMANA HILA	Containership	48,409	51,400	2019	Matson Navigation Co Inc	N	Y	N	Y	Y
9232979	KAMOKUIKI	Containership	6,368	8,627	2000	Matson Navigation Co Inc	N	Y	N	N	Y
9310109	LIBERTY	Ro-Ro	61,321	19,628	2006	Fidelio Limited Partnership	Y	Y	N	N	Y
9278753	LIBERTY EAGLE	Dry Bulk	28,762	51,812	2004	Liberty Maritime Corp	N	Y	N	N	N
9228136	LIBERTY GLORY	Dry Bulk	28,836	50,601	2001	Liberty Maritime Corp	N	Y	N	N	N
9228148	LIBERTY GRACE	Dry Bulk	28,836	50,601	2001	Liberty Maritime Corp	N	Y	N	N	N
9777888	LIBERTY PASSION	Ro-Ro	58,107	20,352	2017	Liberty Global Logistics LLC	Y	Y	N	N	Y
9777890	LIBERTY PEACE	Ro-Ro	58,107	20,397	2017	Liberty Global Logistics LLC	N	Y	N	N	Y
9448114	LIBERTY PRIDE	Ro-Ro	57,030	21,233	2009	Liberty Global Logistics LLC	Y	Y	N	N	Y
9448425	LIBERTY PROMISE	Ro-Ro	57,030	21,359	2010	Liberty Global Logistics LLC	Y	Y	N	N	Y
9697985	LONE STAR STATE	Tanker	29,923	49,151	2015	American Petroleum Tankers LLC	N	N	N	Y	Y
9704790	LOUISIANA	Tanker	29,801	49,828	2016	Crowley Petroleum Service Inc	N	N	N	Y	Y
9215660	LTC JOHN U.D. PAGE	Containership	40,085	51,101	2001	Sealift Inc	N	Y	N	N	Y
9814600	LURLINE	Containership	59,522	44,200	2019	Matson Navigation Co Inc	N	Y	N	Y	Y
9348649	MAERSK ATLANTA	Containership	74,642	84,705	2006	Maersk Line, Limited	Y	Y	N	N	Y
9332975	MAERSK CHICAGO	Containership	74,642	84,775	2007	Maersk Line, Limited	Y	Y	N	N	Y
9332987	MAERSK COLUMBUS	Containership	74,642	84,704	2007	Maersk Line, Limited	Y	Y	N	N	Y
9332999	MAERSK DENVER	Containership	74,642	84,771	2007	Maersk Line, Limited	Y	Y	N	N	Y
9333034	MAERSK DETROIT	Containership	74,642	84,626	2008	Maersk Line, Limited	Y	Y	N	N	Y
9299044	MAERSK DURBAN	Containership	25,406	33,750	2005	Maersk Line, Limited	Y	Y	N	N	Y
9333008	MAERSK HARTFORD	Containership	74,642	84,783	2007	Maersk Line, Limited	Y	Y	N	N	Y
9193264	MAERSK IDAHO	Containership	50,698	61,986	2000	Maersk Line, Limited	Y	Y	N	N	Y
9298686	MAERSK IOWA	Containership	50,686	61,454	2006	Farrell Lines Incorporated	Y	Y	N	N	Y
9333010	MAERSK KENSINGTON	Containership	74,642	84,688	2007	Maersk Line, Limited	Y	Y	N	N	Y
9333022	MAERSK KINLOSS	Containership	74,642	84,835	2008	Maersk Line, Limited	Y	Y	N	N	Y
9255244	MAERSK MICHIGAN	Tanker	28,517	47,047	2003	Maersk Line, Limited	N	N	Y	N	Y
9573658	MAERSK MISAKI	Tanker	28,777	47,980	2011	Maersk Tanker MR K/S	N	N	N	N	Y
9305312	MAERSK MONTANA	Containership	50,686	61,499	2006	Farrell Lines Incorporated	Y	Y	N	N	Y
9298698	MAERSK OHIO	Containership	50,686	61,454	2006	Farrell Lines Incorporated	Y	Y	N	N	Y
9278492	MAERSK PEARY	Tanker	25,487	38,177	2004	Maersk Line Ltd-USA	N	N	Y	N	Y
9342176	MAERSK PITTSBURGH	Containership	74,642	84,688	2008	Maersk Line, Limited	Y	Y	N	N	Y

9289207	MAERSK SARATOGA	Containership	24,488	28,844	2004	Maersk Line, Limited	Y	Y	N	N	Y
9315197	MAERSK SELETAR	Containership	80,503	87,545	2007	Maersk Line, Limited	Y	Y	N	N	Y
9315202	MAERSK SENTOSA	Containership	80,503	87,618	2007	Maersk Line, Limited	Y	Y	N	N	Y
9289192	MAERSK YORKTOWN	Containership	24,488	28,897	2004	Maersk Line, Limited	Y	Y	N	N	Y
9697997	MAGNOLIA STATE	Tanker	29,923	49,076	2016	American Petroleum Tankers LLC	N	N	N	Y	Y
7907996	MAHIMAHI	Containership	41,036	30,825	1983	Matson Navigation Co Inc	N	Y	N	Y	Y
8320559	MAJOR BERNARD F. FISHER	Ro-Ro	34,318	24,500	1985	Sealift Inc	N	N	N	N	Y
9210309	MAJOR RICHARD WINTERS	General Cargo	6,170	7,725	2000	Sealift Inc	N	Y	N	N	Y
7907984	MANOA	Containership	41,036	30,825	1982	Matson Navigation Co Inc	N	Y	N	Y	Y
9244130	MANUKAI	Containership	32,575	38,261	2003	Matson Navigation Co Inc	N	Y	N	Y	Y
9273674	MANULANI	Containership	32,575	38,261	2005	Matson Navigation Co Inc	N	Y	N	Y	Y
9619684	MARJORIE C	Ro-Ro	47,279	24,750	2015	Pasha Hawaii Holdings LLC	N	Y	N	Y	Y
8419142	MATSON ANCHORAGE	Containership	20,965	21,282	1987	Matson Navigation Co Inc	N	Y	N	Y	Y
8419166	MATSON KODIAK	Containership	20,965	20,668	1987	Matson Navigation Co Inc	N	Y	N	Y	Y
8419154	MATSON TACOMA	Containership	20,965	20,668	1987	Matson Navigation Co Inc	N	Y	N	Y	Y
7334204	MATSONIA	Ro-Ro	33,095	22,501	1973	Matson Navigation Co Inc	N	N	N	Y	Y
9814612	MATSONIA	Containership	59,522	44,200	2020	Matson Navigation Co Inc	N	Y	N	Y	Y
9273686	MAUNALEI	Containership	25,324	34,026	2006	Matson Navigation Co Inc	N	Y	N	Y	Y
9268538	MAUNAWILI	Containership	32,575	38,261	2004	Matson Navigation Co Inc	N	Y	N	Y	Y
9232278	MIDNIGHT SUN	Ro-Ro	65,314	22,437	2003	TOTE Maritime Alaska Inc	N	Y	N	Y	Y
9131369	MISSISSIPPI VOYAGER	Tanker	30,415	46,069	1998	Chevron Shipping Co LLC	N	N	N	Y	Y
9161168	MOHAWK	General Cargo	13,066	20,406	1997	Military Sealift Command	N	Y	N	N	Y
7908005	MOKIHANA	Ro-Ro	57,379	30,652	1983	Matson Navigation Co Inc	N	Y	N	Y	Y
8302246	NATIONAL GLORY	Containership	11,652	12,418	1988	National Shipping of America	N	Y	N	Y	Y
9232280	NORTH STAR	Ro-Ro	65,314	22,437	2003	TOTE Maritime Alaska Inc	N	Y	N	Y	Y
9506722	OCEAN FREEDOM	General Cargo	12,810	14,359	2010	Fidelio Limited Partnership	Y	Y	N	N	Y
9437335	OCEAN GIANT	General Cargo	15,549	17,590	2012	Waterman Steamship Corporation	Y	Y	N	N	Y
9418987	OCEAN GLADIATOR	General Cargo	15,549	17,704	2010	Ocean Gladiator Shipping Trust	Y	N	N	N	Y
9681833	OCEAN GLORY	General Cargo	18,410	19,410	2015	Patriot Shipping LLC	Y	Y	N	N	Y
9681821	OCEAN GRAND	General Cargo	18,410	19,436	2015	Patriot Shipping LLC	Y	Y	N	N	Y
9509970	OCEAN JAZZ	General Cargo	17,538	10,662	2010	Intermarine LLC	N	Y	N	N	Y
9457218	OCEAN TRADER	Ro-Ro	29,429	11,325	2011	Military Sealift Command	N	N	N	N	Y
9704776	OHIO	Tanker	29,801	49,828	2015	Crowley Petroleum Service Inc	N	N	N	Y	Y
9118628	OREGON	Tanker	30,415	46,103	1997	Crowley Petroleum Services Inc	N	N	N	Y	Y
9353591	OVERSEAS ANACORTES	Tanker	29,242	46,666	2010	Overseas Shipholding Group	N	N	N	Y	Y
9353565	OVERSEAS BOSTON	Tanker	29,242	46,802	2009	OSG Ship Management Inc	N	N	N	Y	Y
9475935	OVERSEAS CASCADE	Tanker	29,234	46,287	2009	OSG Ship Management Inc	N	N	N	Y	Y
9432218	OVERSEAS CHINOOK	Tanker	29,234	46,666	2010	Overseas Shipholding Group	N	N	N	Y	Y
9351062	OVERSEAS HOUSTON	Tanker	29,242	46,814	2007	Overseas Shipholding Group	N	N	N	Y	Y
9144914	OVERSEAS KEY WEST	Tanker	30,770	45,671	1999	OSG Ship Management Inc	N	N	N	Y	Y
9353527	OVERSEAS LONG BEACH	Tanker	29,242	46,911	2007	OSG Ship Management Inc	N	N	N	Y	Y
9353539	OVERSEAS LOS ANGELES	Tanker	29,242	46,817	2007	OSG Ship Management Inc	N	N	N	Y	Y
9353589	OVERSEAS MARTINEZ	Tanker	29,242	46,653	2010	OSG Ship Management Inc	N	N	N	Y	Y
9435894	OVERSEAS MYKONOS	Tanker	29,433	51,711	2010	Mykonos Tanker LLC	Y	N	Y	N	Y
9353541	OVERSEAS NEW YORK	Tanker	29,242	46,810	2008	OSG Ship Management Inc	N	N	N	Y	Y
9353577	OVERSEAS NIKISKI	Tanker	29,242	46,666	2009	OSG Ship Management Inc	N	N	N	Y	Y
9435909	OVERSEAS SANTORINI	Tanker	29,433	51,711	2010	Santorini Tanker LLC	Y	N	Y	N	Y
9353606	OVERSEAS TAMPA	Tanker	29,242	46,666	2011	OSG Ship Management Inc	N	N	N	Y	Y
9353553	OVERSEAS TEXAS CITY	Tanker	29,242	46,817	2008	OSG Ship Management Inc	N	N	N	Y	Y

9747584	PALMETTO STATE	Tanker	29,923	49,045	2017	CITGO Petroleum Corp	N	N	N	Y	Y
9316139	PATRIOT	Ro-Ro	60,979	22,564	2006	Fidelio Limited Partnership	Y	Y	N	N	Y
9408102	PELICAN STATE	Tanker	29,527	48,598	2009	Crowley Petroleum Service Inc	N	N	N	Y	Y
9486958	PENNSYLVANIA	Tanker	29,242	45,760	2012	Crowley Petroleum Service Inc	N	N	N	Y	Y
9680853	PERLA DEL CARIBE	Containership	36,912	33,127	2016	TOTE Maritime Alaska Inc	N	Y	N	Y	Y
9243203	PHILADELPHIA EXPRESS	Containership	40,146	40,478	2003	Hapag-Lloyd USA, LLC	Y	Y	N	N	Y
9244063	POLAR ADVENTURE	Tanker	85,387	141,740	2004	Polar Tankers Inc	N	N	N	Y	N
9206114	POLAR DISCOVERY	Tanker	85,387	141,740	2003	Polar Tankers Inc	N	N	N	Y	N
9193551	POLAR ENDEAVOUR	Tanker	85,387	141,740	2001	Polar Tankers Inc	N	N	N	Y	N
9250660	POLAR ENTERPRISE	Tanker	85,387	141,740	2006	Polar Tankers Inc	N	N	N	Y	N
9193563	POLAR RESOLUTION	Tanker	85,387	141,740	2002	Polar Tankers Inc	N	N	N	Y	N
9526502	PRESIDENT CLEVELAND	Containership	75,015	84,155	2012	APL Marine Services, Ltd.	Y	Y	N	N	Y
9295220	PRESIDENT EISENHOWER	Containership	82,794	93,558	2005	APL Marine Services, Ltd.	Y	Y	N	N	Y
9400069	PRESIDENT FD ROOSEVELT	Containership	75,752	81,002	2010	APL Marine Services, Ltd.	Y	Y	N	N	Y
9295218	PRESIDENT KENNEDY	Containership	82,794	93,594	2005	APL Marine Services, Ltd.	Y	Y	N	N	Y
9538658	PRESIDENT TRUMAN	Containership	75,015	84,153	2014	APL Marine Services, Ltd.	Y	Y	N	N	Y
9218686	PRESIDENT WILSON	Containership	65,792	67,987	2002	APL Marine Services, Ltd.	Y	Y	N	N	Y
9002037	R. J. PFEIFFER	Containership	32,664	28,555	1992	Matson Navigation Co Inc	N	Y	N	Y	Y
9080297	RESOLVE	Ro-Ro	49,443	13,548	1994	Fidelio Limited Partnership	N	Y	N	N	Y
9301823	RIO GRANDE EXPRESS	Containership	39,941	50,869	2006	Hapag-Lloyd USA, LLC	N	Y	N	N	Y
9198501	ROCKETSHIP	Ro-Ro	8,679	3,950	2000	Foss Maritime Co	N	Y	N	Y	Y
9314210	SAFMARINE MAFADI	Containership	50,686	61,433	2007	Maersk Line, Limited	Y	Y	N	N	Y
9356074	SAFMARINE NGAMI	Containership	25,904	35,119	2008	Maersk Line, Limited	Y	Y	N	N	Y
9322009	SAGAMORE	Containership	16,803	22,749	2008	Sealift Inc	N	Y	N	N	Y
7517698	SEA TRADER	General Cargo	3,485	1,496	1976	Trident Seafoods Corp	N	N	N	Y	N
9131371	SEABULK ARCTIC	Tanker	30,415	46,103	1998	Seabulk Tankers Inc	N	N	N	Y	Y
7816551	SEABULK CHALLENGE	Tanker	29,823	49,636	1981	Seabulk Tankers Inc	N	N	N	Y	Y
9222352	SLNC CORSICA	General Cargo	5,548	6,404	2001	Schuyler Line Navigation Co	N	N	N	N	Y
9448334	SLNC GOODWILL	Tanker	30,241	50,326	2009	Schuyler Line Navigation Company, LLC	N	N	N	N	Y
9418975	SLNC MAGOTHY	General Cargo	15,549	17,478	2010	Schuyler Line Navigation Co	N	Y	N	N	Y
9383663	SLNC PAX	Tanker	5,720	7,985	2008	Military Sealift Command	N	N	N	N	Y
9629988	SLNC SEVERN	Dry Bulk	33,729	57888	2017	Schuyler Line Navigation Co	N	Y	N	N	Y
9538907	SLNC YORK	General Cargo	12,679	9,503	2010	Argent Marine Operations, Inc.	Y	Y	N	N	Y
9215696	SSG EDWARD A. CARTER JR	Containership	40,085	51,087	2001	Sealift Inc	N	Y	N	N	Y
9243186	ST LOUIS EXPRESS	Containership	40,146	40,478	2002	Hapag-Lloyd USA, LLC	Y	Y	N	N	Y
9077044	SULPHUR ENTERPRISE	Tanker	16,771	21,649	1994	Savage Marine Management Co	N	N	N	Y	N
9408114	SUNSHINE STATE	Tanker	29,527	48,633	2009	Crowley Petroleum Service Inc	N	N	N	Y	Y
9721970	TAINO	Containership	37,462	26,306	2018	Crowley Liner Services Inc	N	Y	N	Y	Y
9704788	TEXAS	Tanker	29,801	49,827	2015	Crowley Petroleum Service Inc	N	N	N	Y	Y
9719886	TEXAS VOYAGER	Tanker	29,923	49,382	2017	Chevron Shipping Co LLC	N	N	N	Y	Y
9642083	WASHINGTON	Tanker	62,318	114,814	2014	Crowley Alaska Tankers LLC	N	N	N	Y	N
9243198	WASHINGTON EXPRESS	Containership	40,146	40,478	2003	Hapag-Lloyd USA, LLC	Y	Y	N	N	Y
9704805	WEST VIRGINIA	Tanker	29,801	49,828	2016	Crowley Petroleum Service Inc	N	N	N	Y	Y
9243174	YORKTOWN EXPRESS	Containership	40,146	40,478	2002	Hapag-Lloyd USA, LLC	Y	Y	N	N	Y

Consolidated Fleet Summary and Change List

United States Flag Privately-Owned Merchant Fleet

Oceangoing, Self-Propelled Vessels of 1,000 Gross Tons and Above that Carry Cargo from Port to Port

Type	# of Vessels	GT	DWT
Jones Act Eligible	96	3,467,510	4,796,522
Non-Jones Act Eligible	84	3,749,555	3,505,246
Total U.S.-Flag Fleet	**180**	**7,217,065**	**8,301,768**

MARAD Programs

Program	# of Vessels	GT	DWT
MSP	60	3,121,344	2,763,073
VISA	102	4,554,434	4,024,552
VTA	4	112,870	188,646

U.S.-Flag Fleet Overall

Ship Type	# of Vessels	GT	DWT
Containership	63	2,853,511	3,123,531
Dry Bulk	4	120,163	210,902
General Cargo	20	169,843	176,279
Ro-Ro	26	1,358,868	550,221
Vehicles Carrier	3	204,108	83,150
Tanker	64	2,510,572	4,157,685
Total U.S.-Flag Fleet	**180**	**7,217,065**	**8,301,768**

Jones Act Eligible

Ship Type	# of Vessels	GT	DWT
Containership	23	801,373	778,884
Dry Bulk	0	0	0
General Cargo	9	18,565	15,602
Ro-Ro	7	314,608	139,288
Vehicles Carrier	0	0	0
Tanker	57	2,332,964	3,862,748
Total Jones Act Eligible	**96**	**3,467,510**	**4,796,522**

Non-Jones Act Eligible

Ship Type	# of Vessels	GT	DWT
Containership	40	2,052,138	2,344,647
Dry Bulk	4	120,163	210,902
General Cargo	11	151,278	160,677
Ro-Ro	19	1,044,260	410,933
Vehicles Carrier	3	204,108	83,150
Tanker	7	177,608	294,937
Non-Jones Act Eligible	**84**	**3,749,555**	**3,505,246**

Militarily-Useful

Ship Type	# of Vessels	GT	DWT
Containership	63	2,853,511	3,123,531
General Cargo	13	155,995	165,242
Ro-Ro	26	1,358,868	550,221
Tanker	52	1,499,458	2,425,572
Vehicles Carrier	3	204,108	83,150
Militarily Useful	**157**	**6,071,940**	**6,347,716**

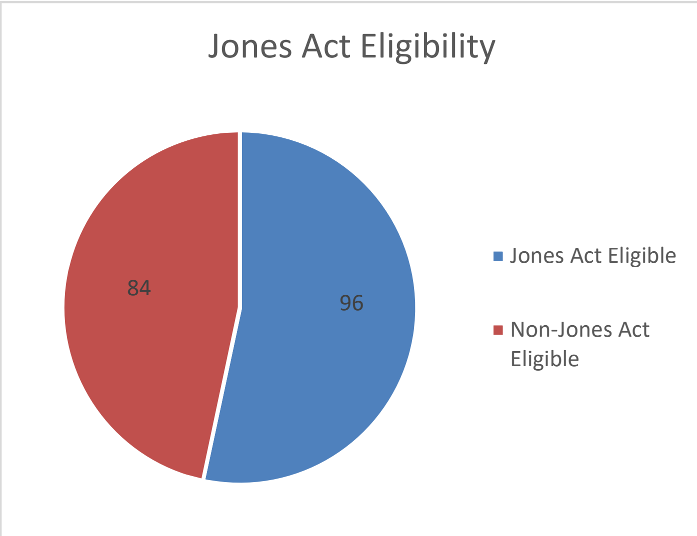
GT – Gross Tons

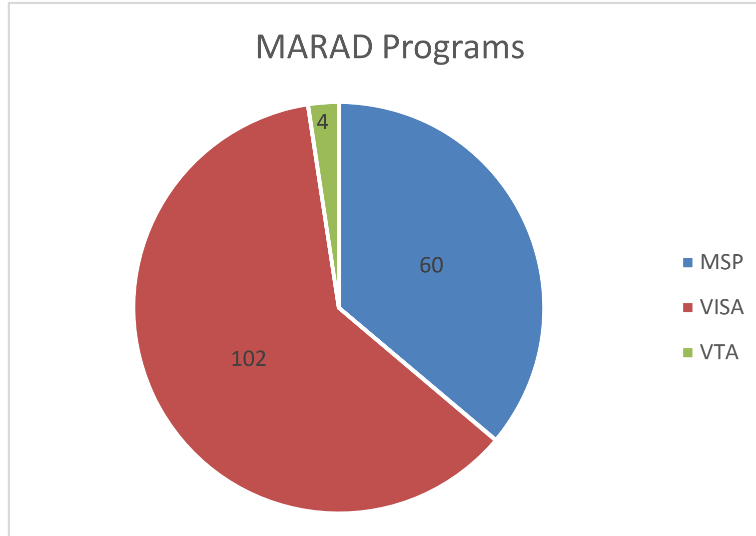
DWT – Deadweight Tons

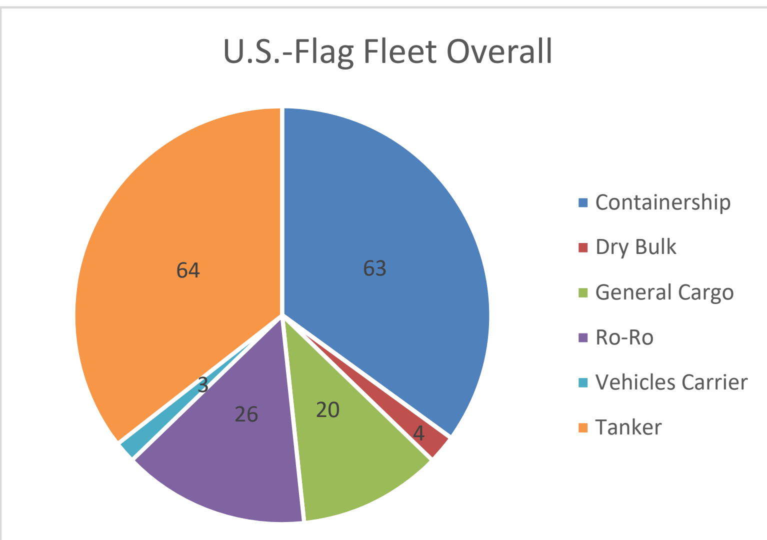
MSP – Maritime Security Program

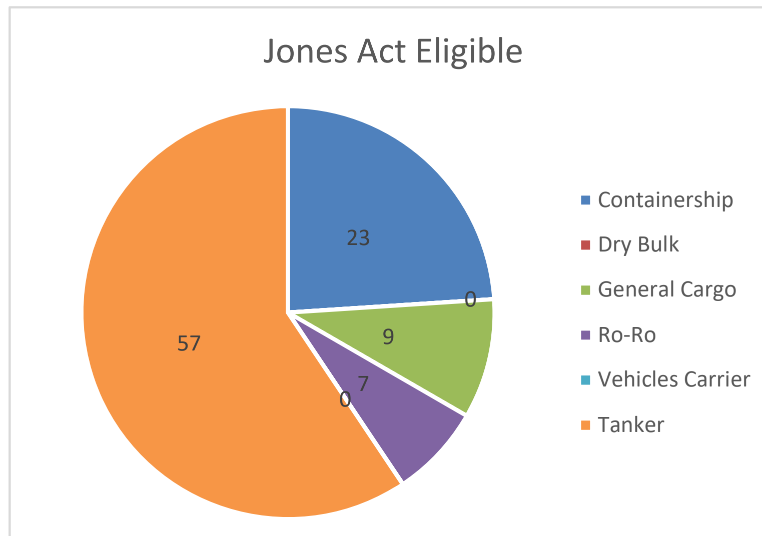
VISA – Voluntary Intermodal Sealift Agreement

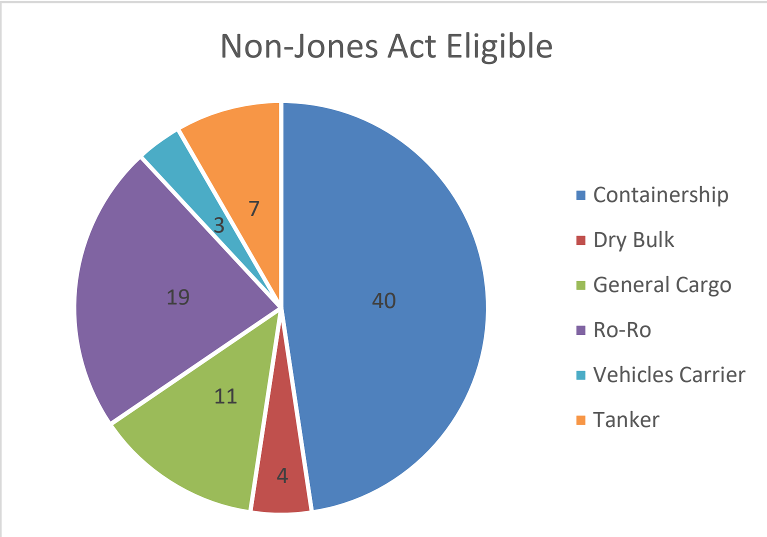
VTA – Voluntary Tanker Agreement

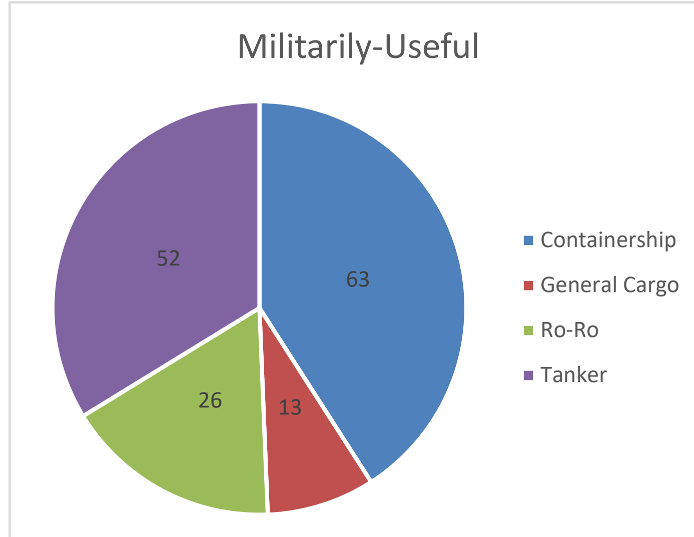

Jones Act Eligibility
84
96
Jones Act Eligible
Non-Jones Act Eligible


MARAD Programs
4
60
102
MSP
VISA
VTA


U.S.-Flag Fleet Overall
64
63
3
26
20
4
Containership
Dry Bulk
General Cargo
Ro-Ro
Vehicles Carrier
Tanker


Jones Act Eligible
23
0
9
57
7
0
Containership
Dry Bulk
General Cargo
Ro-Ro
Vehicles Carrier
Tanker


Non-Jones Act Eligible
40
4
11
19
3
7
Containership
Dry Bulk
General Cargo
Ro-Ro
Vehicles Carrier
Tanker


Militarily-Useful
63
13
26
52
Containership
General Cargo
Ro-Ro
Tanker

U.S. Department of Transportation
Maritime Administration - Office of Policy and Plans

03/16/2021

Consolidated Changes March 2021

Oceangoing, Self-Propelled Vessels of 1,000 Gross Tons and Above that Carry Cargo from Port to Port

Type	Current Month	Previous Month	Change
Jones Act Eligible	96	97	-1
Non-Jones Act Eligible	84	84	0
Total U.S.-Flag Fleet	**180**	**181**	**-1**

MARAD Programs

Program	Current Month	Previous Month	Change
MSP	60	60	0
VISA	102	102	0
VTA	4	4	0

U.S.-Flag Fleet Overall

Ship Type	Current Month	Previous Month	Change
Containership	63	63	0
Dry Bulk	4	5	-1
General Cargo	20	20	0
Ro-Ro	26	26	0
Vehicles Carrier	3	3	0
Tanker	64	64	0
Total U.S.-Flag Fleet	**180**	**181**	**-1**

Jones Act Eligible

Ship Type	Current Month	Previous Month	Change
Containership	23	23	0
Dry Bulk	0	1	-1
General Cargo	9	9	0
Ro-Ro	7	7	0
Vehicles Carrier	0	0	0
Tanker	57	57	0
Total Jones Act Eligible	**96**	**97**	**-1**

Non-Jones Act Eligible

Ship Type	Current Month	Previous Month	Change
Containership	40	40	0
Dry Bulk	4	4	0
General Cargo	11	11	0
Ro-Ro	19	19	0
Vehicles Carrier	3	3	0
Tanker	7	7	0
Non-Jones Act Eligible	**84**	**84**	**0**

Militarily-Useful

Ship Type	Current Month	Previous Month	Change
Containership	63	63	0
General Cargo	13	13	0
Ro-Ro	26	26	0
Tanker	52	52	0
Vehicles Carrier	3	3	0
Militarily Useful	**157**	**157**	**0**

GT – Gross Tons
DWT – Deadweight Tons
MSP – Maritime Security Program
VISA – Voluntary Intermodal Sealift Agreement
VTA – Voluntary Tanker Agreement

EXHIBIT 130

OECD Science, Technology and Industry Working Papers
2019/08

Global value chains and the shipbuilding industry

Karin Gourdon,

Christian Steidl

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OECD Science, Technology and Industry Working Papers

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GLOBAL VALUE CHAINS AND THE SHIPBUILDING INDUSTRY

Karin Gourdon[1] and Christian Steidl

Abstract

This paper provides an initial assessment of the shipbuilding industry in the context of global value chains by presenting new descriptive evidence on value added generation and sourcing patterns of intermediate inputs for ship construction of major shipbuilding economies. The findings reveal that shipbuilding relies heavily on intermediate inputs as around 70-80% of the final output value of ship production is generated through supplier sectors. Concerning sourcing activity, China appears to be the most self-sufficient among the four jurisdictions studied, followed by Japan and the EU28, while Korea seems to be more globally integrated. The analysis also explores variations among the four economies in the cost structure of shipbuilding inputs, which might partly be explained by differences in the ship types produced.

Keywords: global value chains, input output tables, shipbuilding, value added

JEL Classification: F14, L23, L62

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Table of contents

Figures

Boxes

Executive Summary

Production networks are becoming increasingly global. Decreasing transportation costs as well as advances in information and communication technology (ICT) have helped facilitate the creation and notable expansion of global value chains (GVCs). This international fragmentation of production stages is a powerful driver of efficiency and firm competitiveness, and can partly explain product mix differences across countries.

The present report contributes to the literature on global value chains by providing a preliminary analysis of international production networks in the shipbuilding industry using Inter-Country Input-Output (ICIO) data. The work draws on a break-down of the latest update of the OECD ICIO database and the Trade in Value Added (TiVA) indicators to the level of the shipbuilding industry. This allows a comparison of value creation and bilateral trade flows across economies and time, and provides descriptive evidence about differences in sourcing patterns.

The study's results reveal the following stylised facts:

- Shipbuilding, as an assembly industry, relies heavily on intermediate inputs, similar to the automotive industry. In major shipbuilding economies, direct value added accounts for between 20% and 30% of shipbuilding output value. In turn 70-80%, the lion's share of the value of output, comes from intermediate inputs.
- With increasingly globalised production networks, not all of this value generation takes place domestically. While the People's Republic of China (hereafter "China"), Japan and the European Union (EU28) each had a domestic value added share of over 80% in 2015, the same measure, as expected for smaller economies, was lower in Korea with 65%.
- The top five supplier industries to shipbuilding are iron and steel, shipbuilding (i.e. intra-industry transactions), wholesale trade, machinery and equipment, as well as fabricated metal products. The differences in cost shares across economies may partly be a result of variations in the product mix of ship yards.
- An analysis of differences in sourcing patterns reveals that China is rather self-sufficient and inward-focused, followed by Japan and the EU28. Korea, in contrast, seems to be more globally integrated and participates more strongly as a user of foreign intermediate inputs.

This work provides an overview of the position of different economies' shipbuilding industries in global value chains and their sourcing patterns, with a view to help policy makers assess differences in their industry's production activity.

1. Introduction

In the past, almost the entire production process usually took place in one country. This organisation of production has become more complex nowadays, as sourcing networks increasingly internationalised and supply chains span over multiple economies. Rather than being manufactured and assembled in a single country, products today are "made in the world", adding value to the end-product at each step of the process (OECD, 2013[1]).

In the last few decades, developments in information and communication technologies have substantially contributed to the creation and expansion of such international production networks, i.e. global value chains (GVCs). The increasing efficiency in information sharing, communication and transportation of goods made it possible for firms to collaborate over long distances throughout the supply chain. [1] These technological improvements, together with trade policy reforms (e.g. reduction in trade tariffs) as well as the incentive to access resources and markets, advanced the integration and acceleration of economic activity across national borders and connect firms, workers and consumers around the world (Sturgeon, 2013[2]; OECD, 2013[1]).

Due to the participation of many firms and countries throughout the production process, these international networks can result in rather complex supply-chain structures. In view of such intricate cross-border networks, it is informative to analyse the domestic and foreign value added, i.e. contributions of domestic and foreign production to the final product value (Elms and Low, 2013[3]), moving beyond using traditional trade statistics alone. Two indicators of GVC participation are commonly distinguished: Exporting firms taking part in global value chains as users of foreign inputs (backward linkage) or as suppliers of intermediate goods and services which are subsequently used in other countries' exports (forward linkage). Inter-Country Input-Output (ICIO) tables enable researchers to undertake detailed analyses of each country's contribution to a product's (final) value through these and other indicators. Research in this area has extensively used such information to analyse the effect of GVCs on a country's development (see for instance OECD (2013[1]); World Bank (2017[4])).

Latest research on the industry- and firm-level depicts these global value chains as a powerful driver of productivity growth and competitiveness, job creation, and living standards. Ways in which companies can enhance their productivity include the possibility to specialise in core tasks (by outsourcing ancillary tasks), to access cheaper inputs and to benefit from spill-over effects from foreign firms (Criscuolo and Timmis, 2017[5]). Recently, Constantinescu, Mattoo and Ruta (2017[6]) found in an industry-level cross-country analysis that "an increase by 10 percent in the level of GVC participation increased average [labour] productivity by 1.7 percent". Furthermore, the results by Kummritz (2016[7]) suggest that an increase by 1% in GVC participation through forward linkages "leads […] to 0.33% higher labour productivity".[2]

An OECD study (2015[8]) on the impact of GVCs on job creation[3] shows that for the industry category "other transport equipment" (which includes shipbuilding) jobs embodied in gross exports amount to around 125% of that domestic industry's employment.[4] This value implies that, due to additional employment effects in upstream sectors, more jobs are supported by exports than total employment in the "other transport equipment" industry itself. This result thus shows that total jobs sustained by an industry extend far beyond just its direct employment.

Despite the documented benefits of GVCs, the growing dependence on global production networks also bears risks: Situations where disruptions in one part of the supply chain have substantial consequences in subsequent production steps are not uncommon (Elms and Low, 2013[3]). [5] Well-functioning supply chains are thus undoubtedly a necessary precondition for firms to be successful. From an employment perspective, further risks include loss of domestic employment for certain job and skill categories due to trends in production offshoring, [6] and downward pressure on wages [7], although the overall employment effect of GVC participation has been shown to be positive (OECD, 2013[1]).

While trade and GVCs can generate economic welfare, as illustrated above, the full range of these employment and growth benefits can only materialise when complementary policies are implemented (OECD, 2015[8]). For example, policy settings need to enable and facilitate adjustments in the economy, resulting from outsourcing and offshoring activities, "through labour market and social policies and through investment in education and skills" (OECD, 2013[1]).

The following analysis aims to provide a better understanding of GVCs in general and of value chains in the shipbuilding industry in particular, with a focus on major shipbuilding economies. The work draws on the results obtained from the OECD Inter-Country Input-Output (ICIO) database and the Trade in Value Added (TiVA) indicators.

The study reveals several interesting results. Shipbuilding as an assembly industry relies heavily on intermediate inputs, similar to the automotive industry. In major shipbuilding economies, between 20% and 30% of value added[8] as share of final output is generated in the shipbuilding industry itself. Hence, with 70-80% the lion's share of the final output value of ship production is generated through supplier sectors.[9] In light of increasingly globalised production networks, not all of this value generation takes place domestically. While China, the EU28 and Japan each had a domestic value added share of over 80% in 2015, the same measure, as expected for smaller economies, was lower in Korea with 65%.

The top five supplier industries to shipbuilding are iron and steel, shipbuilding (i.e. intra-industry transactions), wholesale trade, machinery and equipment as well as fabricated metal products. The differences in cost shares across countries may partly be a result of variations in the product mix of ship yards and the disparities in input cost shares across these ship types. For instance, while bulkers, containerships and oil tankers require comparatively more steel components and propulsion & power generation parts as inputs, LNG and offshore vessels need more cargo handling equipment (Brun and Frederick, 2017[9]).

An analysis of differences in sourcing patterns reveals that China sources more than 90% of the value of the top five intermediate inputs for ship production domestically. Similarly, Japan and the EU28 also appear to be comparatively inward focused regarding its major inputs. Finally, Korea seems to be more globally integrated and participates more strongly as a user of foreign intermediate inputs.

The remainder of this paper is structured as follows: Section 1 provides a general explanation of GVCs, drivers, challenges and recent trends. Section 2 presents the features of GVCs in the shipbuilding industry followed by an analysis of GVC indicators for a selection of major shipbuilding economies. The final section concludes on the results and provides further remarks.

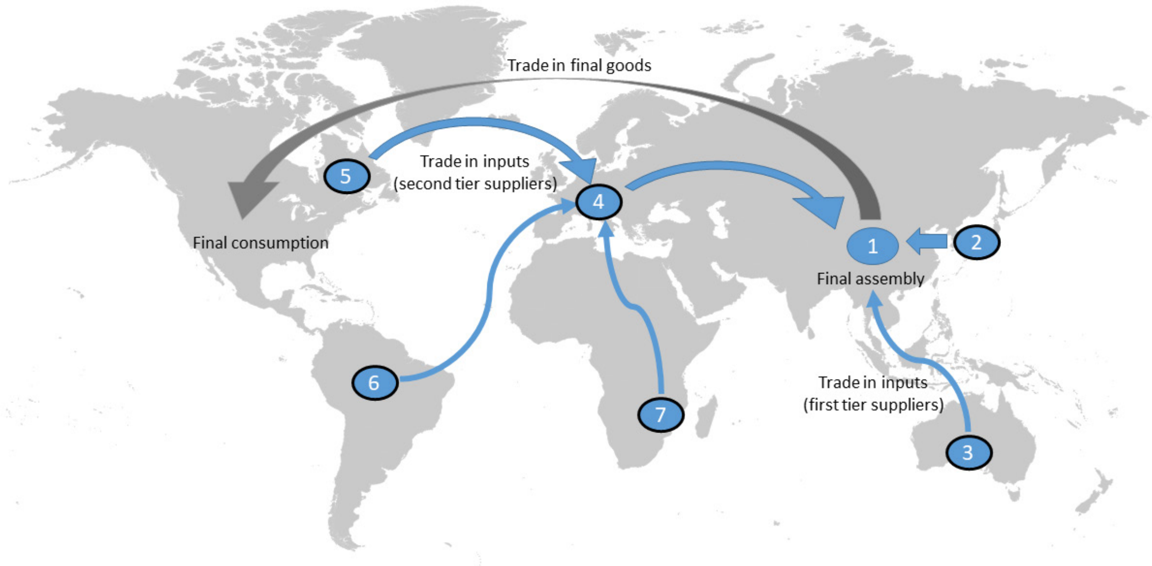
2. A General Overview of Global Value Chains[10]

2.1. Concept

A value chain comprises all stages of production, from the initial design of the product to its end use. These tasks can be undertaken by one vertically integrated firm or by multiple firms, in which case each can be specialised in one single production step. In both instances, value (or supply) chains have become increasingly international, giving rise to the concept of "global value chains" [11] (OECD, 2013[1]).

Figure 1 illustrates a global value chain in a simplified way. As the production of goods is often split into various steps and located in the country with a comparative advantage in this particular activity, the whole production process spans over several economies before a final product is assembled. In practice, this often means that inputs are sourced from various supplier countries, which in turn source from second tier suppliers in third countries, etc. (OECD, 2013[1]).

Figure 1. A simplified representation of a global value chain



Note: 2, 3 and 4 represent intermediate products which are combined into 1 (i.e. the final product); 4 as an intermediate product itself is composed of inputs 5, 6 and 7.
Source: Authors' representation based on OECD (2013[1]).

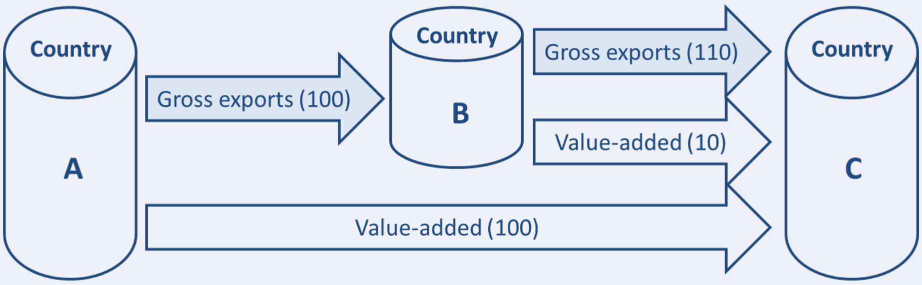
Two indicators of GVC participation are commonly distinguished: Exporting firms taking part in global value chains as users of foreign inputs (backward linkage) or as suppliers of intermediate goods and services which are subsequently used in other countries' exports (forward linkage). [12] These participations can become very complex and in-depth data is required to meaningfully analyse such production linkages. Compared to traditional trade data, Inter-Country Input-Output (ICIO) tables allow to better track each country's participation in GVCs. Box 1 describes the concept and the databases in more detail.

Box 1. Measuring trade in value added

ICIO data helps to deal with double counting which occurs implicitly in current gross trade statistics. This data allows measuring the flows of value added by a country in the production of a good or service.

For instance, as depicted in Figure 2, country A exports USD 100 worth of goods, which were produced entirely in A, to country B, which further adds USD 10 to the product's value and then exports a product worth USD 110 to C. Traditional trade data shows total global exports and imports of USD 210 and would track a trade deficit of C with B of USD 110 and no trade at all between A and C. However, in fact only USD 110 of value added has been created. Traditional measures would thus neither reveal that A is the major beneficiary of C's consumption, which ultimately caused A's exports of USD 100 to B, nor that B benefits from only USD 10 in value added from C's consumption. (OECD, 2013[1])

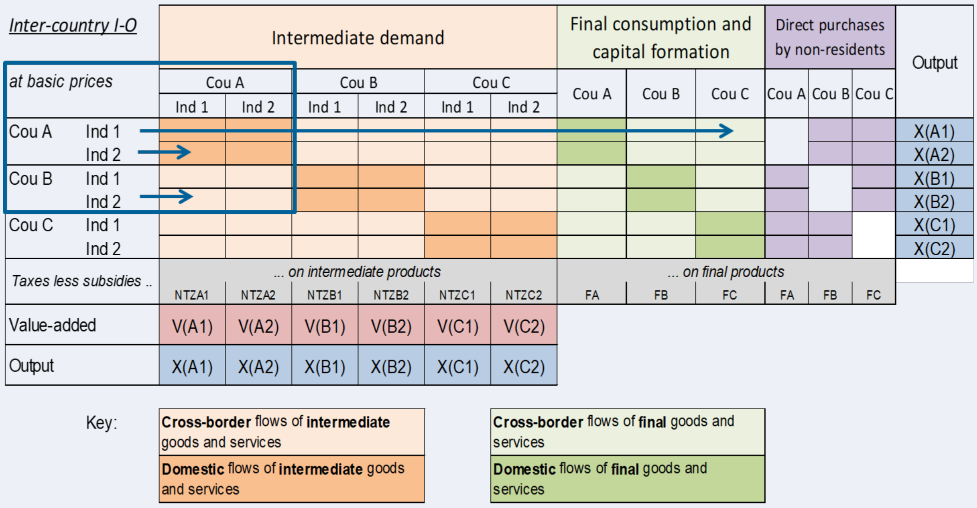
Figure 2. Illustration of value flows



Source: Authors' representation based on OECD (2013[1]).

OECD indicators on Trade in Value Added are based on this idea elaborated above and are derived from an ICIO table (Figure 3). Its latest version was updated in 2018 and covers the years 2005 to 2015. This ICIO table describes interactions between industries and consumers for 64 economies and 36 industries. Each cell of the table shows the value of a transaction, which is an output of the industry denoted in the row and an input for the industry in a specific country shown in the column. Additional columns to the right of the intermediate demand part of the table represent the use of outputs for final consumption (including capital formation and household) as well as consumption by non-residents. All those transactions can be domestic as well as international, which are shown in the diagonal and off-diagonal blocks respectively. Additional rows at the bottom indicate taxes and the value added creation by the corresponding industry.

Figure 3. Inter-Country Input-Output (ICIO) structure



Source: Presentation by Mr Colin WEBB at the OECD Committee on Industry, Innovation and Entrepreneurship (CIIE) in April 2018.

Derived from the ICIO, the OECD Trade in Value Added database includes, among others, the following indicators: breakdowns of gross exports by industries into their domestic and foreign content (with the domestic content split into direct, indirect and re-imported components); the services content of gross exports by exporting industry (broken down by foreign/domestic origin); bilateral trade balance in value added terms; and intermediate imports embodied in exports, as a percentage of total intermediate imports.[13]

2.2. Drivers

When describing the rise of international production, two phases of that development can generally be distinguished. In what Baldwin (2012[10]) describes as the "first unbundling", trade costs fell substantially thanks to new railroads and steamships, tariff liberalisation and containerisation. At the same time, he argues that the complexity of the production process implied that tasks could not be split up among various countries due to the problem of coordinating those steps of production. Thus, the forces favouring agglomeration (e.g. scale economies) were stronger than the wage differential that would have favoured dispersion of production and the allocation of each task in the economy where its execution would be cheapest (Baldwin, 2012[10]).

This changed with the rapid rise of Information and Communication Technology (ICT), which led to what Baldwin (2012[10]) calls the "second unbundling". As coordination became simpler, wage differentials between countries at different stages of development started to drive dispersion and production steps were allocated in the economies with the respective cost advantages (Baldwin, 2012[10]). Nowadays, economies of scale still play an important role, but rather at one stage of production (OECD, 2013[1]).

Firms that decide to no longer source (some of their) inputs domestically can offshore production and consequently import their intermediate inputs from abroad, either from their own factories located in another jurisdiction or from a foreign supplier. In the former case, the production of a certain (input) good (or a certain stage of production) is located in another country through foreign direct investment (FDI). Various factors can inform this decision, for instance cost considerations (e.g. lower wages, tax incentives), better access to upstream inputs (including raw materials) or to specialised local human capital. While the product is still made by the same company, different stages of production are divided internationally and are thus contributing to the international trade in intermediate products. Alternatively, a company may also decide to source inputs from a foreign supplier, which equally increases trade in intermediates. These sourcing activities oftentimes result in "access to cheaper, more differentiated and better quality inputs" and can enhance firms' export competitiveness (OECD, 2013[1]).

2.3. Risks and Challenges

Despite the advantages that led to the spread of global value chains, there are also several risks and challenges associated with this form of production. Many companies have adopted lean structures such as just-in-time deliveries to reduce inventory costs. This, however, makes them more vulnerable to disruptions in their supply chain. If the disruption affects a critical input that is sourced without having an alternative supplier, production could break down and consequently also affect downstream industries. As firms might not necessarily have an overview of their complete supply chain, they might also be exposed to risks they are not immediately aware of (OECD, 2013[1]).

An example of the repercussions of disruptions in the GVC system are the consequences experienced by many industries in the aftermath of the earthquake and tsunami in Japan in 2011. Because of the immediate damage after the disaster, some Japanese factories had to slow down production or close plants entirely. As Japan is a crucial supplier of higher value intermediate goods, these disruptions were felt by many downstream companies such as automotives (OECD, 2013[1]; Gereffi and Luo, 2014[11]).

Another challenge that studies have revealed is an uneven distribution between jurisdictions with regards to the value added created along a value chain, with lower value added creation in assembly than in upstream industries (such as R&D) or downstream industries (such as marketing). The graphical representation of this phenomenon has been coined the "smiling curve" by Acer's founder Stan Shih to describe the characteristics of the IT industry (OECD, 2013[1]). As will be outlined in more detail in a later section, shipbuilding, which in principle is an assembly industry, is located rather at the lower end of a spectrum of value creation in most economies. The perceived problem that the assembly industry itself tends to be a segment of rather low value added has led many governments to pursue policies addressing the challenge to "move up the value chain" in order to capture more of the value creation within the production process, partly by resorting to local content requirements (LCRs). From a social standpoint, however, it should be noted that employment is likely to be the inverse of the "smiling curve", as manufacturing tends to provide more, albeit often lower paid, jobs than up- or downstream industries (Lopez Gonzalez, 2016[12]). It has furthermore been argued that the domestic *share* of value added might be less important than the *total amount* of domestic value creation (ibid.).

2.4. Recent Trends

While GVC integration has increased steadily until 2008, estimations indicate that the expansion of GVCs might have levelled off since 2011 (ECB, 2016[13]; OECD, 2018[14]).[14] Several reasons may have led to this development. Regulatory measures such as LCRs, for instance, might encourage multinational companies to locate production within their export economy. Two thirds of respondents to a survey conducted by the European Central Bank (ECB), for instance, name LCRs as one main reason for relocation of production outside the European Economic Area and to their export markets, leading to local sourcing patterns that may substitute previous trade flows (ECB, 2016[13]). Other studies similarly argue that with manufacturers relocating to the market of final demand, supply industries might eventually follow, curbing trade in intermediates (McKinsey, 2014[15]). Recent OECD work furthermore underscores that automation and robotics might decrease the tendency for offshoring and thus could be slowing the rate of GVC expansion (De Backer et al., 2018[16]).[15] Moreover, in order to improve risk management and reduce the vulnerability to disruptions in their supply chains outlined above, some companies reportedly shorten their supply chains and/or engage in re-shoring. This also has the positive side-effect that it allows for more flexibility in view of changing demand patterns (OECD, 2013[1]).

3. Global Value Chains and the Shipbuilding Industry

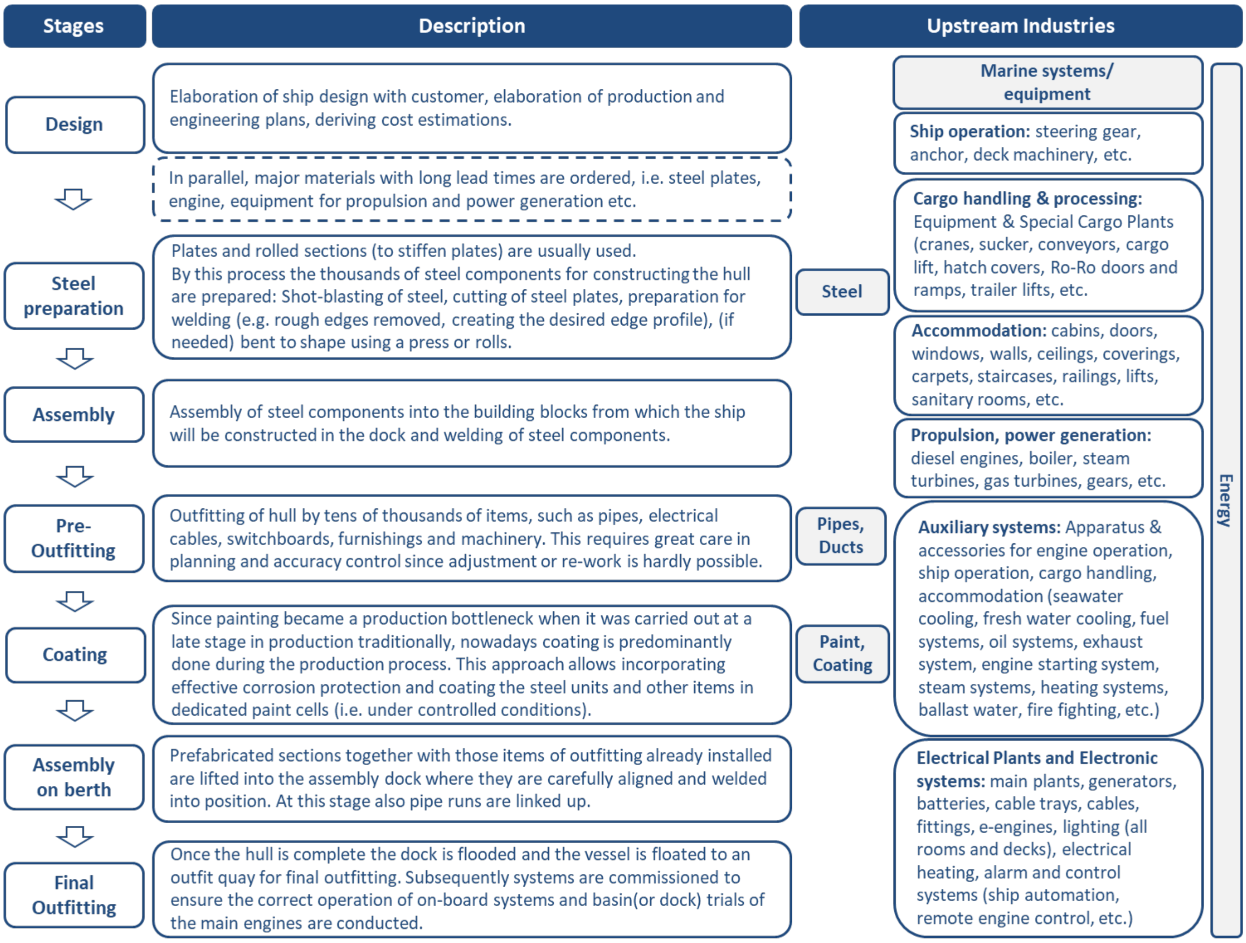
3.1. Features of the Shipbuilding Industry

Recent decades have witnessed an increasing concentration of shipbuilding in China, Korea and Japan, which together deliver more than 80% of ships in terms of compensated gross tons (CGT).[16] While these three economies dominate the market for bulkers, tankers and containerships, cruise ships are mainly built at European yards.

Despite the differences among economies regarding the types of ships produced, the shipbuilding process itself remains nevertheless similar in the sense that it is a complex task which necessitates considerable coordination skills: workers need to assemble thousands of different components which have to be correctly manufactured and arrive just in time at the right place. For example, ships are assembled from up to 550 000 parts for a complex research vessel or 900 000 parts for cruise ships (SEA Europe, 2017[17]).[17] Shipyards thus need to possess effective systems as well as management and organisational skills in order to generate information, develop production plans, control materials and achieve high quality standards in the production of components.

Figure 4 illustrates the general steps of the shipbuilding process. In reality, each ship yard organises its production differently that may also vary according to the ship type produced[18] and decides on which stage to outsource. This description, which is taken from Stopford (2003[18]), therefore aims to provide a general overview of the process and a mention of upstream industries involved in the value generation process. Every ship production starts with a design period during which the yard works closely together with the customer to elaborate the ship design. At this stage, long lead-time items, such as steel and main engines, are ordered to arrive on time for the outfitting phase. Once the ordered steel has arrived, workers weld several steel parts and usually assemble the components into building blocks, which are subsequently used for ship construction. After that, the hull is outfitted with thousands of different items. As the painting stage was found to create bottlenecks when it was carried out at a late stage of production it is nowadays usually done throughout the production stages. The prefabricated items are lifted into the assembly dock where they are aligned and welded. Once the hull is completed, the dock is flooded and the ship is brought to an outfit quay. Finally, systems are commissioned to ensure the correct functioning of on-board systems, and main engine trials are conducted (Stopford, 2003[18]).

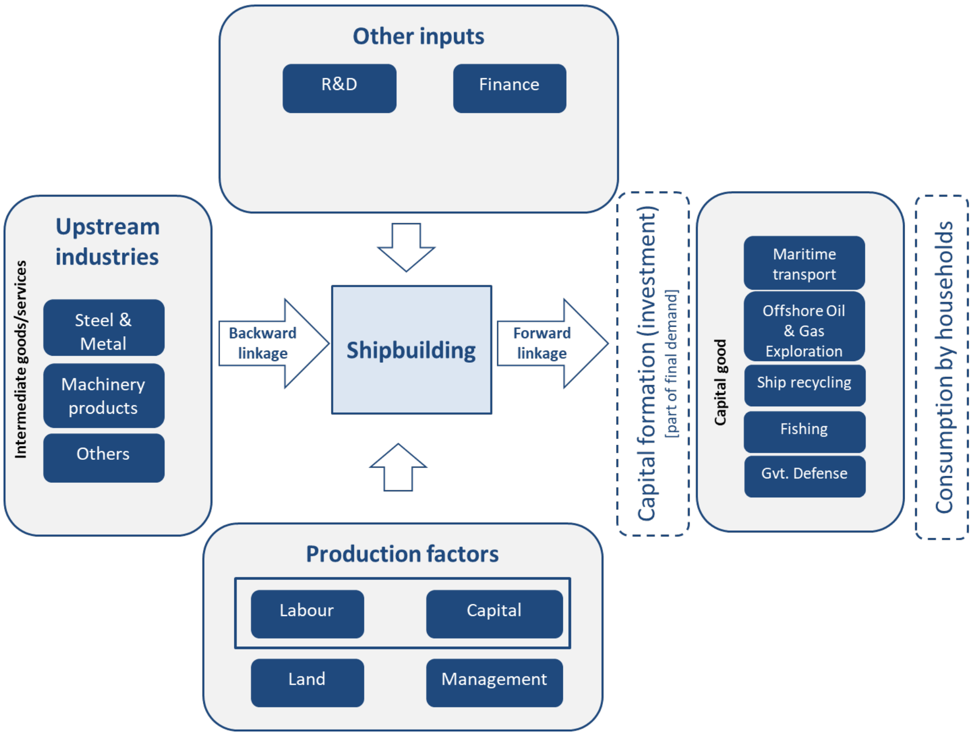
Figure 4. General steps of a shipbuilding production process



Source: OECD based on Stopford (2003[18]); Brodda (2014[19])

There are various industries involved in the production process. Figure 5 provides an overview of the main industries with steel and metals, and machinery products as major suppliers as well as maritime transport, offshore oil & gas, and ship recycling etc. as end-users. In the next section we will analyse to what extent a country's shipbuilding industry is involved in GVCs through backward linkages. At the final stage, households and governments purchasing goods and services "consume" ships through the indirect usage of maritime transportation services.

Figure 5. Overview of main industries involved in the shipbuilding value chain



Source: Authors' representation.

3.2. Value Creation in the Shipbuilding Industry

This section provides preliminary insights into the interconnectedness of the shipbuilding industry in global value chains. The rich dataset of "Trade in Value Added" (TiVA) developed by the OECD allows for an analysis of sectoral value added generation and international sourcing patterns across time and economies. In order to analyse the shipbuilding industry specifically, a more detailed version of TiVA comprising 75 industries has been used for this report (OECD, 2018[20]). Annex A provides an overview of the items included in the shipbuilding industry classification.

Before proceeding to the analysis, however, a few caveats about the data and its interpretation in connection with the shipbuilding industry need to be highlighted. As TiVA data is in current prices, differences over time might come from price developments, for instance changing costs for inputs, which in turn may affect some of the reported percentages. Furthermore, economies are specialised in the production of different ship types, giving rise to discrepancies in sourcing behaviour and making results across economies less comparable. The analysed category of shipbuilding also includes the manufacturing of warships, which is likely to alter the results for those jurisdictions where naval shipbuilding is more prevalent. Moreover, the precision of the data depends on the level of aggregation. More disaggregated results tend to entail a larger margin of error. Some of these caveats will also be highlighted at the respective steps of the analysis. Finally, yet importantly, the analysis in this paper has been based on a preliminary version of the TiVA 2018 update. Future studies using the final database might thus come to slightly different results.

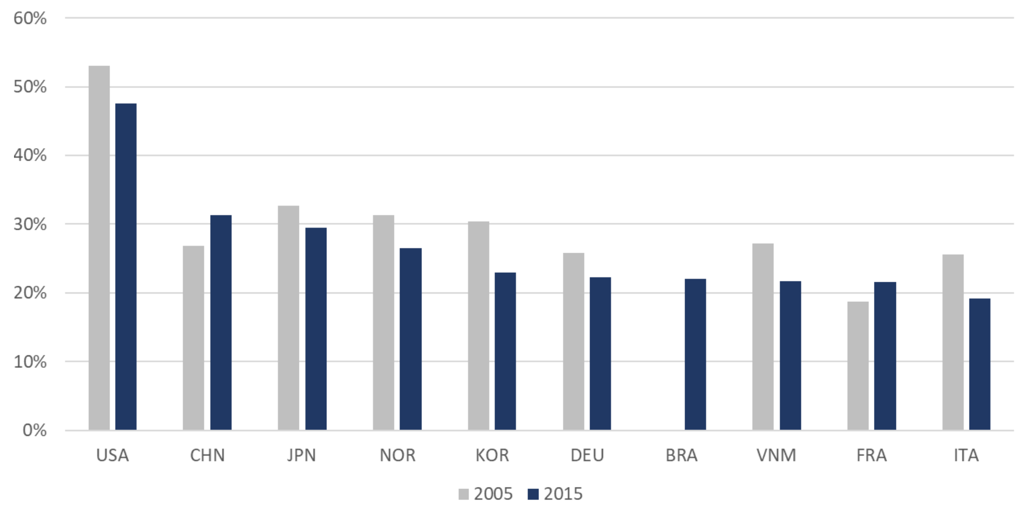
Given the high share that inputs represent in the manufacturing process, shipbuilding can be qualified as an assembly industry. The contribution to the final value of the ship can thus be meaningfully separated into intermediate inputs and shipbuilding assembly. In the main shipbuilding economies, between 20% and 30% of the value of the final product is created in the shipbuilding industry itself, while intermediate inputs account for the rest. In other words, the lion's share of the final output value of ship production (70-80%) is generated through supplier sectors.[19]

To put the ratios of the shipbuilding industry into perspective, similar ratios are reported for the category "Motor vehicles, trailers and semi-trailers" (~25%). The lowest value added as share of final output in manufacturing in 2015 was recorded in the industry classification "Coke and refined petroleum products" (~20%), while one of the highest shares was associated with pharmaceutical products (~45%). The shipbuilding industry itself is thus situated rather at the lower end of value creation in most economies, which might be due to the fact that it is an assembly-intensive industry. Box 2 illustrates another perspective of the fragmentation of value chains across industries.

Figure 6 illustrates the value added contribution of the final ship assembly as share of final shipbuilding output by economy. For the majority of economies in 2015 the ratio amounts to around 20%, while China, Japan and Norway are located rather at the higher end of the spectrum. With the exceptions of France and China, the ratio decreased from 2005 to 2015 for all economies depicted in the figure.

The results for the United States (hereafter "USA") require further explanation. The country stands out with one of the highest shares of value added over output with 48% in 2015. This may partly result from the abovementioned data constraint, as the product category used in this analysis also includes military shipbuilding, which plays a significant role in the USA, accounting for 60% of revenue in the shipbuilding industry in 2012 (IBIS World [2012], as cited in United States Maritime Administration (2013[21])).[20] Another noteworthy idiosyncrasy of the USA is the Jones Act – a local content requirement in place since 1920 that obliges local shipbuilding firms to source domestically the majority of input factors for the construction of Jones Act compliant vessels.[21]

Figure 6. Ratio of shipbuilding value added to final output

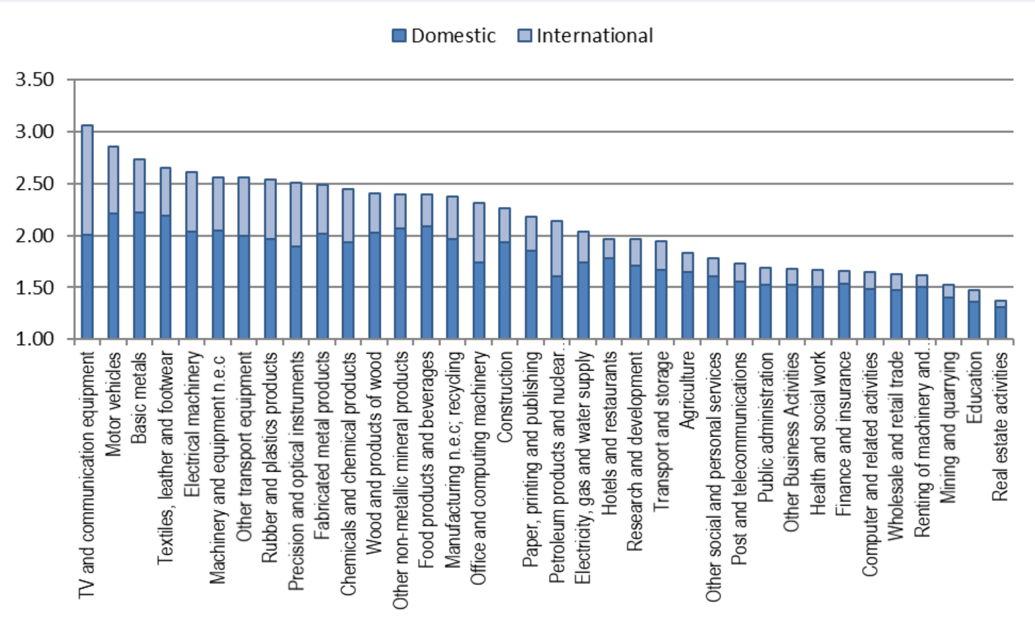


Note: Results for Brazil are omitted for the year 2005 because of data limitations.
Source: OECD Trade in Value Added (2018).

Box 2. Fragmentation of value chains

Figure 7 shows a fragmentation index for a selection of industries that illustrates to what extent some sectors involve more supplier industries for the production of a good or service than others. The five industries with the highest number of intermediate industries involved in the production (i.e. most fragmented industries) are "TV and communication equipment", "motor vehicles", "basic metals", "textiles, leather and footwear" and "electrical machinery", while service industries tend to be less fragmented (De Backer and Miroudot, 2013[22]). The shipbuilding industry is part of the category "other transport equipment" and located at the higher end of the spectrum. Although these results are based on data from 2008 they are still relevant today and useful for an illustration of fragmentation aspects across sectors.

Figure 7. Length of GVCs by industry, 2008



Note: The minimum value of the index is 1 when no intermediate inputs are used to produce a final good or service.
Source: De Backer and Miroudot (2013[22]).

While the analysis above has focused mainly on the value contribution of ship production, the inclusion of upstream industries can give interesting insights into how much of total value added can actually be attributed to the economy where the ship is assembled. While changes over time could to some extent result from technological changes, they might nevertheless give some indication about the general developments in the industry.

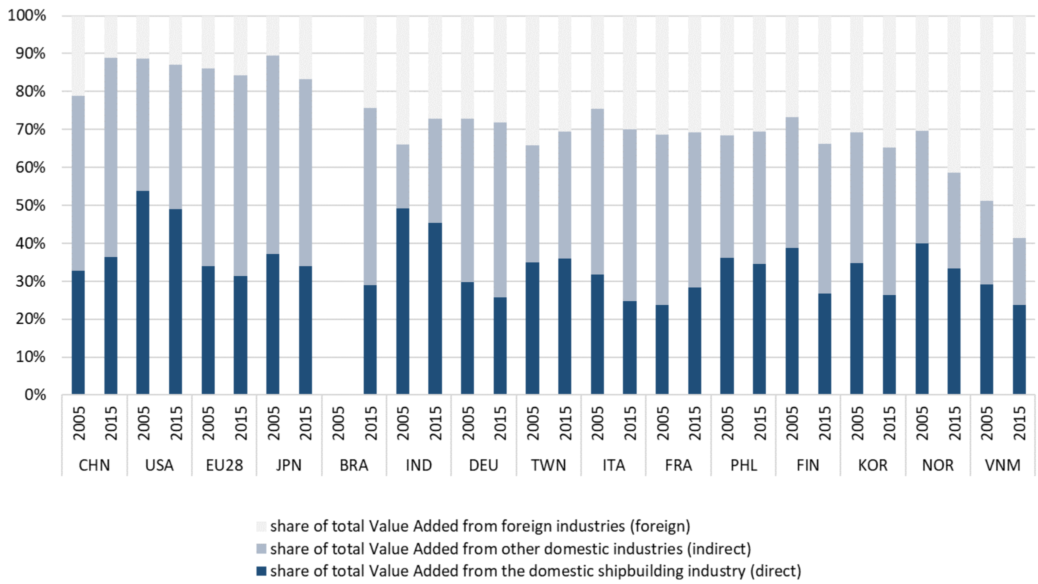
For this exercise, Figure 8 provides an overview of the domestic and foreign shares of value added in ship production across economies for 2005 and 2015. In contrast to Figure 6, inputs are now decomposed into their value added components, and percentages are expressed in terms of total value added in the whole value chain of ship manufacturing. The domestic value added content is disaggregated into one part related to the domestic shipbuilding industry (direct) and another part attributable to other domestic upstream sectors (indirect).

The results show that China, the EU28 and Japan all have a domestic value added share of over 80%.[22] The same measure is markedly lower for Korea with 65%. This difference could be explained by the fact that smaller economies tend to have higher foreign value added shares of exports (Kowalski et al., 2015[23]). Analyses regarding sourcing patterns from domestic compared to foreign suppliers, which will be presented in Section 3.4, try to further investigate these discrepancies.

While most of the economies record a decline of their domestic value added shares between 2005 and 2015, China increased its share. This development might be driven by China's policy developments in the context of its 11th Five Year Plan which was launched in 2006. The programme explicitly recognised the importance of the shipbuilding industry with an aim to improve domestic supply (Tsai, 2011[24]). Increasing domestic content in shipbuilding still remains an important goal of China today, as "maritime equipment and high-tech ships" are key technologies outlined in the "Made in China 2025" strategic plan (MERICS, 2016[25]).

Treating intra-EU trade as domestic, the EU28 domestic share of value added accounts for 84% of total value creation in the shipbuilding industry in 2015 and is thus just as high as the corresponding value for Japan. This share has not changed significantly since 2005, when it stood at 86% (Figure 8).[23]

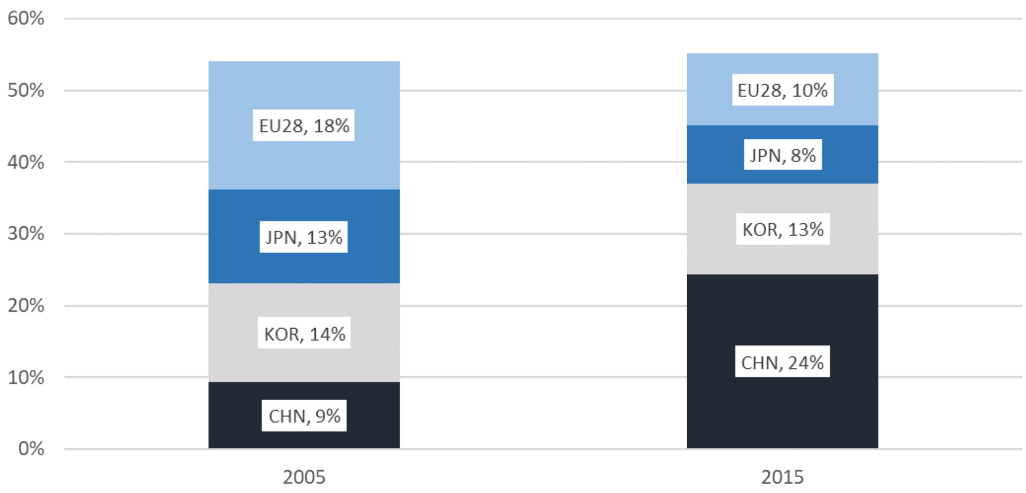
Figure 8. Sources of value added in ship manufacturing



Note: Economies are sorted left to right according to their share of domestic value added contribution to total value added in 2015. Results for Brazil are omitted for the year 2005 because of data limitations.
Source: OECD Trade in Value Added (2018).

While these results focus primarily on the level of one economy, it is also informative to discuss these figures in a global context. Total value added creation in the shipbuilding industry itself increased from around USD 65 billion in 2005 to 108 billion in 2015, which coincided with an almost twofold increase of output values from USD 192 billion in 2005 to USD 346 billion (in terms of deliveries an increase is recorded from 29 million CGT to 39 million CGT during the same period[24]). An analysis of value added in the global shipbuilding industry in different years suggests that the shares of economies' value added for Japan and EU28 have declined while it has more than doubled in China (Figure 9). At the same time, China also increased its share of global shipbuilding output value from 12% to almost one quarter (Figure 10), which corresponds to an increase in terms of CGT from 16% to 35%. Thus, China accounts for more value creation primarily by virtue of production increase, which is fuelled through the growth of its heavy manufacturing industries.[25]

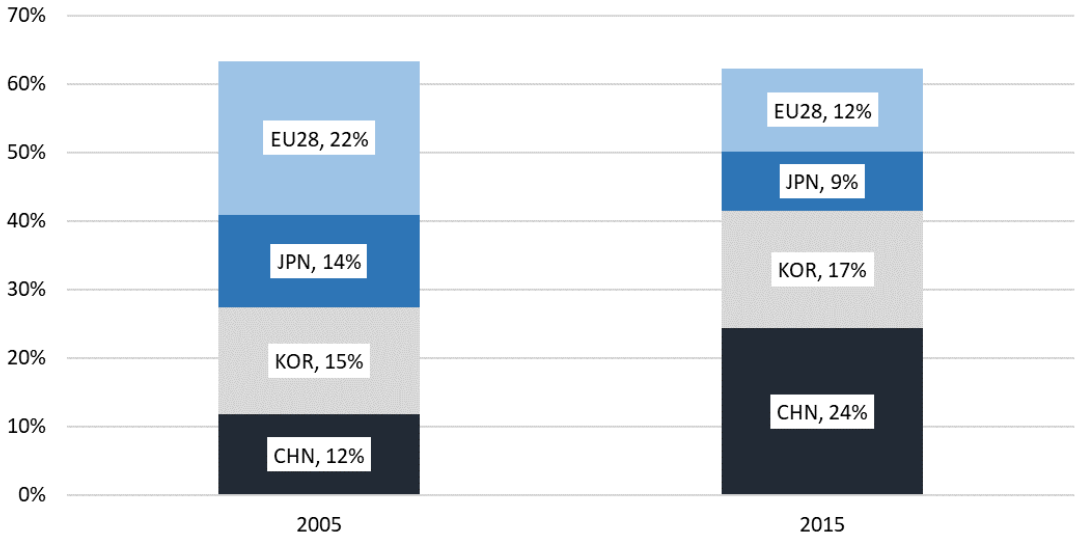
Figure 9. Domestic value added as share of global value added, shipbuilding industry



Note: For comparability, all current 28 EU member states are included in the number for 2005 and 2015.
Source: OECD Trade in Value Added (2018).

Over the same period, Korea maintained its share of global value added of approximately 13%, which is in line with the fact that Korea's share of global output value also remained relatively stable at around 16% in 2005 and 2015 (Figure 10), corresponding to a share in CGT of 33% in both years.[26] On the other hand, Japan and the EU28 recorded a decline in their share of global value creation in shipbuilding, also in line with a decrease in share of production value in USD, as illustrated in Figure 10 (14% to 9% in Japan, 22% to 12% in the EU28) and deliveries in CGT (28% to 18% in Japan, 12% to 4% in the EU28). Finally, the value added share of the USA decreased from 21% in 2005 to 16% in 2015, while its output share declined from 13% to 10%. These values may primarily be a result of the country's naval production as mentioned previously, which is part of the industry category for this analysis (see Annex A for a description of the industry code). However, this fact makes the country's shares hardly comparable with those of other analysed shipbuilding economies and are therefore excluded from the graph.

Figure 10. Domestic output as share of global output value, shipbuilding industry



Note: For comparability, all current 28 EU member states are included in the number for 2005 and 2015.
Source: OECD Trade in Value Added (2018).

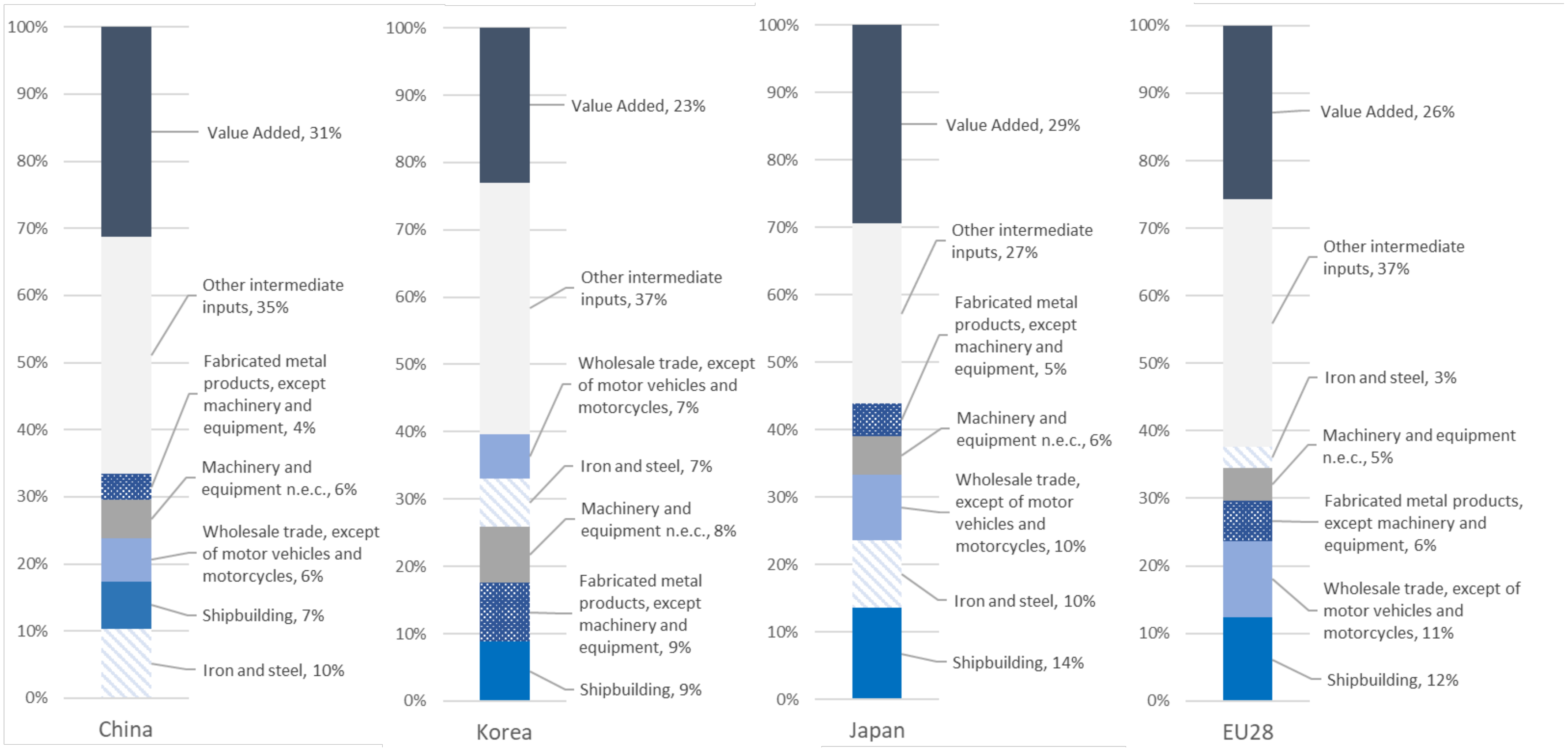
3.3. A Focus on Intermediate Inputs

While the preceding results focused on the value added generation of the shipbuilding industry, the following analysis provides more insights into the cost structure of intermediate inputs to ship assembly across economies. Figure 11 shows the results of intermediate input costs as shares of total ship production value for 2015. Despite the difference in shares across the four economies, the top five supplier industries consistently are iron and steel (ISIC 241), shipbuilding itself (ISIC 301), wholesale trade[27] (ISIC 46), machinery and equipment (ISIC 28) as well as fabricated metal products (ISIC 25).

The shares of iron and steel costs are relatively similar for the three major shipbuilding economies, making up between 7% and 10% (China 10%, Korea 7% and Japan 10%) of total ship production value. In contrast, this share is relatively low for the EU28 with only 3%. Possible reasons for these differences in cost shares will be outlined below by relating the results to the economies' product mix.

The cost share of intra-shipbuilding transactions ranges between 7% for China and 14% for Japan with Korea (9%) and the EU28 (12%) in the middle. Intra-sector transactions in the shipbuilding industry can be a result of outsourcing activities to other ship yards (e.g. production of vessel hulls), or yard collaboration for the construction of offshore platforms or warships (e.g. companies specialised in naval construction source certain inputs from commercial shipbuilders and vice versa). Such cases might not be unusual, as recent examples may indicate. Japan's Mitsui E&S Shipbuilding decided to contract commercial shipbuilding to partner Tsuneishi Shipbuilding, while another part of the shipyard will focus on producing naval vessels (Nikkei Asian Review, 2018[26]), which could result in intra-industry transactions.

Figure 11. Disaggregation of total output into value added and costs of intermediate inputs for 2015



Note: n.e.c. stands for "not elsewhere classified", only the five biggest intermediate inputs are disaggregated, which are calculated in basic prices. Shares might not add up to 100% because of rounding.
Source: OECD Trade in Value Added (2018).

Wholesale trade comprises a variety of different products, including among others the wholesale of machinery, equipment and supplies such as computers, telecommunications equipment, specialised machinery for all kinds of industries and general-purpose machinery (United Nations, 2008[27]). The share across economies ranges from 6% for China to 11% for the EU28 with Korea (7%) and Japan (10%) between the two.

Machinery and equipment includes, among others, the manufacture of general-purpose and special-purpose machinery, such as engines and turbines (except for aircraft, vehicle and cycle engines), marine engines, hydraulic components, lifting and handling equipment (United Nations, 2008[27]) used for ship production. The share is similar across economies with 6% for China and Japan, 8% for Korea, and 5% for the EU28.

The category "fabricated metal products" (except machinery and equipment discussed above) contains, among others, the manufacture of metal products such as metal frameworks or parts for construction, as well as metal container-type objects such as reservoirs, tanks and central heating boilers, and steam generators (United Nations, 2008[27]). The shares are relatively similar for China (4%), Japan (5%) and the EU28 (6%), with a slightly higher result for Korea (9%).

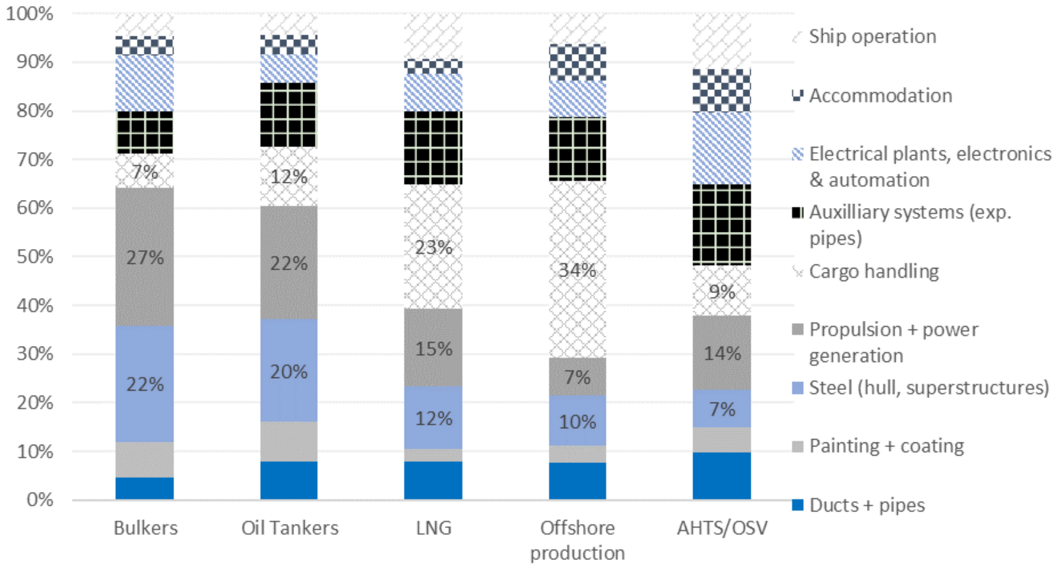
The results provide a first overview of the shares of intermediate input costs across economies. Yet, it is important to highlight that a direct comparison is not possible and the results shall be viewed with caution. For instance, as outlined in Figure 12, the cost shares of inputs into shipbuilding vary between ship types. While bulkers, containerships and oil tankers require comparatively more steel components and propulsion & power generation parts as inputs, LNG and offshore vessels need more cargo handling equipment (Brun and Frederick, 2017[9]).

These variations in cost shares across ship types might partly explain the differences in cost shares and input costs across economies as discussed earlier in relation to Figure 11, in particular in view of the diversity of the four shipbuilding economies' product mix. In 2015, the year considered in Figure 11, China's ship production consisted mainly of the two ship types bulkers and tankers, which made up 48% and 10% of the country's deliveries in terms of CGT, respectively.[28] As presented in Figure 12, these two ship categories stand out with their steel input required for production. This in turn might be one reason why the iron and steel input costs account for a slightly larger share (10%) of China's intermediate input costs for ship production compared to other economies, especially the EU28 and Korea.

In the case of Korea, gas carriers accounted for a substantial part of deliveries in terms of CGT in 2015 (24%), after containerships (31%) and tankers (28%).[29] As depicted in Figure 12, steel makes up a much smaller portion of the material and equipment costs of LNG carriers compared to bulkers, possibly being one reason for the relatively lower share of iron and steel of total ship costs in Korean shipbuilding. Furthermore, the category "fabricated metal products (except machinery and equipment)" features more prominently in Korea than in the other analysed economies. As this category includes items such as reservoirs and tanks, the Korean focus on gas carriers might explain part of this difference given the need for such inputs for the production of this ship category. There is evidence, however, that subcontracting is increasingly widespread in the Korean shipbuilding industry in an effort to reduce labour costs (Hassink and Shin, 2005[28]),[30] which could imply that any of these costs might enter the statistic not under the direct input category but through other categories related to subcontracting activities.

The focus of EU28 shipbuilders on high-value vessels, such as cruise ships, arctic vessels etc. could also help explain their cost structure. The cost share of steel, for instance, is significantly lower than in other jurisdictions, possibly because of the higher overall costs, reducing the cost share of steel products relative to the other high value inputs for this ship type. The high value of components in cruise ships, for instance related to tourism activities on deck, might also explain the relatively higher share of wholesale trade products depicted in Figure 11.

Figure 12. Cost shares of materials and equipment/systems by ship types



Note: The graph has been reproduced from Brun and Frederick (2017[9]). The authors of the report calculated the shares from (European Commission, 2014[29]) which is based on purchase forecasts for 2013-17. The "materials" category consists of steel, painting/coating, and pipes + ducts. The "equipment/systems" category consists of all other physical input categories.
"AHTS" stands for Anchor Handling Tug Supply vessels, and "OSV" for Offshore Support Vessel
Source: Authors' representation based on Brun and Frederick (2017[9])

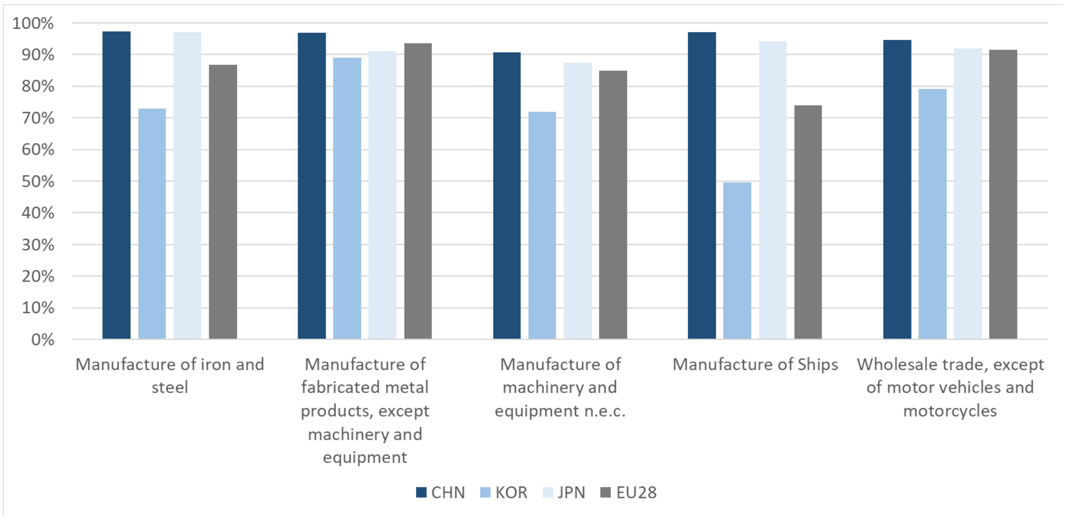
Supplier networks and negotiated contract-prices will furthermore influence the cost shares across firms and economies. Owing to data limitations, an analysis at such a disaggregated data level was not possible, however. Besides, ship production usually takes several years depending on demand for newbuilt vessels and ship yard capacity. In combination with different production cycles across economies (related to differences in the timing of purchase of various inputs) the cost structure can vary.

Finally, it is worth noting that the different results across jurisdictions can also be influenced by national accounting standards despite the international efforts made to standardise industrial classification tables (United Nations, 2008[27]). For instance, the cost share of "shipbuilding" in Japan is higher than in other economies possibly also because of the fact that Japanese statistics include "internal combustion engines for vessels" as a subcategory of "shipbuilding". In other economies, these ship engines might potentially be classified under "machinery", for instance. A similar case applies for Korea, where "ship repair and ship parts" are included in the classification "shipbuilding". These and similar caveats presumably also have to be taken into account when looking at other sectors and other economies, meaning that a direct comparison of cost shares should be undertaken with caution.

3.4. Sourcing Patterns of Main Shipbuilding Economies

After a general overview and comparison between the four major shipbuilding economies in the previous section, this part takes a closer look at those economies' sourcing patterns. Among the four jurisdictions studied for this purpose, China appears to be the most self-sufficient and inward focused in its sourcing activity, which is also reflected in its high share of domestic value added discussed above (89% in 2015). Korea, in contrast, seems to be more globally integrated and features more strongly as a user of foreign intermediate inputs, which is also mirrored in its lower share of domestic value added content (65% in 2015).[31] With a share of less than 10% of the total output, foreign inputs are also comparatively low in Japan and the EU28 when compared to Korea, but still higher than in the case of China. Figure 13 provides a comparison of the shares of domestically[32] sourced intermediates for the five main inputs to shipbuilding that were detailed in Figure 11 and are the same for all four studied economies.

Figure 13. Domestically sourced share of five major intermediate inputs



Note: Values relate to the year 2015.
Source: OECD Trade in Value Added (2018).

Beginning with the currently biggest ship producer,[33] China sourced more than 90% of its inputs for ship production domestically in 2015 – the highest share amongst its peers. This value does not only pertain for the major inputs detailed in Figure 13, but also applies to a broad range of intermediates, resulting in the total share of foreign intermediate inputs in terms of total output value not exceeding 4% (see also Figure 14). Among the five inputs studied, China's foreign share of machinery and equipment seems to be highest with around 10% (although this share is still relatively low compared to the other jurisdictions studied). Under its "Made in China 2025" initiative, the country aims to further increase, among others, its domestic share of high-tech ship components (MERICS, 2016[25]) and its global market share of maritime equipment (US Chamber of Commerce, 2017[30]). Further studies on this topic could analyse in more detail whether and to what extent Chinese policies aiming for more domestic value added content could explain this high share of domestic sourcing behaviour – also in comparison to its peers.

In contrast to China's high share of domestically sourced intermediates, Korea's considerably lower corresponding values are quite noteworthy.[34] Particularly striking is the fact that approximately half of intra-shipbuilding transactions are sourced from abroad, which is in line with Korea's general tendency to sub-contract a large part of its shipbuilding activity as discussed above. In addition, the country sources more than one-fourth of machinery and equipment from foreign suppliers, implying that the domestic supplier network for marine equipment is not sufficient to meet domestic demand. More detailed results reveal that Korea sources this foreign share mainly from the EU28, China and Japan. This is in line with the fact that particularly Europe has a strong position in marine equipment worldwide and acts as a net exporter (Ecorys, 2009[31]). Besides, with more than 25% compared to less than 5% in both China and Japan, Korea sources a relatively high share of iron and steel from abroad, despite being the world's 6th largest steel producer in 2015 (World Steel Association, 2016[32]). There is anecdotal evidence that, faced with low profits, major Korean ship producers such as Hyundai Heavy Industries and Samsung Heavy Industries considered increasing their steel imports from China, which reportedly were cheaper than Korean domestic supplies (SEAISI, 2012[33]).[35] This may partly explain the larger share of foreign steel input in the case of Korea.

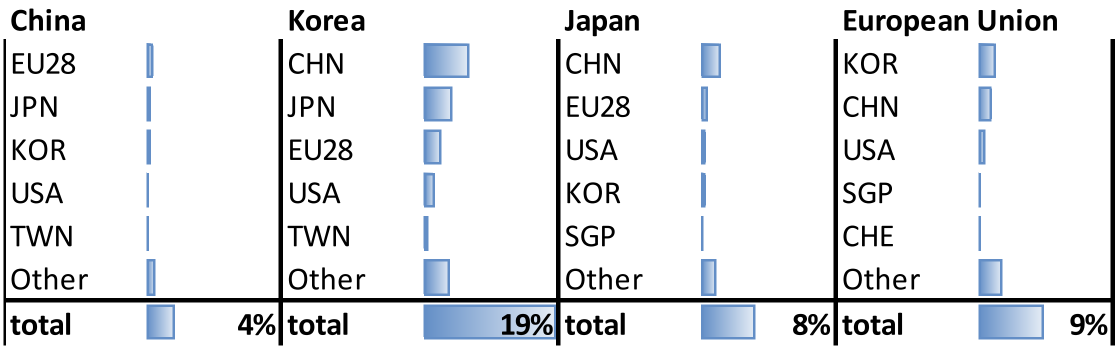
In Japan, iron and steel is sourced to around 97% domestically, a share just as high as in China. The reason for this high value in the case of Japan might partly be due to the long term relationships that certain Japanese shipbuilders have established with domestic steel producers in order to ensure a stable supply of high quality steel. A further explanation could be that new ship specific steel has been developed in cooperation with steel mills, making these relationships strategically important.[36] Furthermore, Japan's results show that the highest share of foreign sourced intermediates is found in the category of machinery and equipment. Further analysis shows that Japan likely sources those inputs from China and Europe. Nevertheless, according to exchanges with the Shipbuilders' Association of Japan (SAJ) there are instances where certain engines are produced in Japan under licencing from European companies.

A closer look at the supplier economies for ship production shows that the major four shipbuilding economies basically seem to be sourcing their foreign intermediate inputs from each other (Figure 14). While China relies heavily on domestic suppliers (only ~4% of final production value is sourced from abroad), the country is also interlinked with the EU28, Japan, Korea and the USA. Korea's major trading partners with respect to intermediate inputs used for ship production are China, followed by Japan, the EU28 and the USA. Japan predominantly sources its foreign inputs from China and to a lesser extent from the EU28, the USA and Korea. Finally, the EU28 has exposure in sourcing activity for ship construction with Korea, China and the USA. The USA thus appears as a major supplier for all four jurisdictions.

Overall, the results highlight the interconnectedness of ship production across economies in general, and across major shipbuilding economies in particular. It is therefore important to understand that government measures applied to a domestic industry may affect the activity and functioning of industries in major supplier countries, and potentially even in third countries.

Figure 14. Major trading partners for intermediate inputs

Share of intermediate inputs originating from foreign economies as percentage of total output value



Note: Values relate to the year 2015.
Source: OECD Trade in Value Added (2018).

4. Concluding Remarks

The emergence of Global Value Chains (GVCs) during the last few decades has also moved the shipbuilding industry towards an interconnected production approach. Intermediate goods are to some degree sourced from foreign economies, locally assembled into a final vessel and exported to other economies. Based on a unique Inter-Country Input-Output (ICIO) dataset broken down to the level of the shipbuilding industry, this paper provides new descriptive evidence about value generation and sourcing patterns in the shipbuilding industry across jurisdictions and time. While this study provides an initial description of the position of economies' shipbuilding industries in the global market, the next step would be to understand which factors drive domestic value generation, differences in sourcing patterns and costs.

While the report does not explicitly discuss policy implications of the international fragmentation of the shipbuilding sector, it does bring to the fore how different policies across countries will have impacts on the structure of GVCs, and highlights their impacts throughout the economy and across countries. In particular, in view of the interconnected production networks associated with shipbuilding, the results underscore that government measures affecting a specific sector in one country can have implications for upstream or downstream sectors of other economies.

Localisation-based policies are a case in point as highlighted in a recent OECD report on Local Content Requirements in the shipbuilding industry (Gourdon and Guilhoto, 2019[34]). Similarly, trade policy actions against third countries could eventually affect the country implementing the action, for instance, if domestically produced intermediate goods are exported and re-imported in the form of downstream products. It is through the lens of a data infrastructure such as Trade in Value Added (TiVA) that such indirect impacts can be understood. Therefore, the discussion about trade and industrial policy in the shipbuilding industry across countries needs to take a value chain perspective.

Annex A. Description of Industry Classification of Shipbuilding

The analysis is based on the industry classification codes 3011 "Building of Ships and Floating Structures" and 3012 "Building of Pleasure and Sporting Boats" of the International Standard Industrial Classification of All Economic Activities (ISIC), Rev. 4 (United Nations, 2008[27]):

3011 - Building of ships and floating structures: This class includes the building of ships, except vessels for sports or recreation, and the construction of floating structures. The following items are included:

- building of commercial vessels:
  - passenger vessels, ferry boats, cargo ships, tankers, tugs etc.
- building of warships
- building of fishing boats and fish-processing factory vessels
- building of hovercraft (except recreation-type hovercraft)
- construction of drilling platforms, floating or submersible
- construction of floating structures:
  - floating docks, pontoons, coffer-dams, floating landing stages, buoys, floating tanks, barges, lighters, floating cranes, non-recreational inflatable rafts etc.
- manufacture of sections for ships and floating structures

3011 - Building of pleasure and sporting boats: This class includes:

- manufacture of inflatable boats and rafts
- building of sailboats with or without auxiliary motor
- building of motor boats
- building of recreation-type hovercraft
- manufacture of personal watercraft
- manufacture of other pleasure and sporting boats:
  - canoes, kayaks, rowing boats, skiffs

Notes

[1] Throughout the report, we use the terms "supply chain" and "value chain" interchangeably.

[2] Further studies dealing with the effect of GVC on productivity are, among others, Baldwin and Yan (2014[36]) on the Canadian manufacturing sector; Bas and Strauss-Kahn, (2013[45]) or Caliendo and Rossi-Hansberg (2012[37]).

[3] See also Marcolin, Miroudot and Squicciarini (2016[43]).

[4] The industry with the highest value in that regard is coke, petroleum with almost 300% followed by chemicals (~150%), motor vehicles (~140%) and basic metals (~135%).

[5] Examples include the consequences of a lightning strike on cell phone production (Sheffi, 2007[38]) or the repercussions of the 2011 earthquake in Japan on the global auto industry (Gereffi and Luo, 2014[11]); Sheffi and Rice (2005[40]) describe the impact of the closure of US borders for incoming and outgoing flights due to the September 11, 2001 terrorist attacks on the global auto industry.

[6] For instance, the Norwegian shipbuilding industry increasingly outsources the hull production or other steel work to countries with lower factor costs to be able to "focus on the more advanced outfitting tasks, such as the installation and commissioning of machinery and deck equipment, electrical systems, and accommodation" (Semini et al., 2018[39]).

[7] Workers performing manual or cognitive tasks that can rather easily be automated are most likely to be affected by GVCs since many of these functions can be offshored (OECD, 2013[1]). OECD (2013[1]) work estimates that "at least 10% of the decline of the share of labour in national income is due to increasing globalisation, and in particular to pressure from the relocation of parts of GVCs and from import competition from companies that produce in countries with low labour costs"

[8] Value added is measured as the sum of employee compensation, operating surplus, depreciation of fixed capital and other net taxes on production (less subsidies).

[9] As a comparison, the share of value added over final output for the industry classification "Motor vehicles, trailers and semi-trailers" (which includes automobiles) in 2015 was around 25%.

[10] For more details on GVCs please see OECD (2013[1]), upon which most of this section is based.

[11] For early work on this see for instance Gary Gereffi (1994[44]), who introduced the concept of the "global commodity chain".

[12] For more information, an explanatory note describes these linkages as follows: "Backward GVC participation refers to the ratio of the "Foreign value added content of exports" to the economy's total gross exports. This is the "Buyer" perspective or sourcing side in GVCs, where an economy imports intermediates to produce its exports. Forward GVC participation corresponds to the ratio of the "Domestic value added sent to third economies" to the economy's total gross exports. It captures the domestic value added contained in inputs sent to third economies for further processing and export through value chains. This is the "Seller" perspective or supply side in GVC participation." (OECD-WTO, 2018[35]).

[13] For more information on the database please visit: http://oe.cd/tiva.

[14] GVC participation also dropped significantly in 2009, but then increased again in 2010 and 2011. The ECB estimate approximates GVC participation by the share of intermediate goods in total goods imports for recent years as input-output tables were not yet available.

[15] While the authors have not found proof that robotics lead to reshoring (sometimes also called back-shoring or on-shoring) of production, this lack of evidence might be due to the quite recent increase in the use of robotics.

[16] CGT data in this report, absolute or relative, are based on Clarkson World Fleet Register.

17 With new environmental regulations entering into force, the complexity of ships and thus the shipbuilding value chain is likely to increase even further in the future.

18 i.e. standardised vessels, such as containerships, bulkers, tankers or specialised vessels, such as LNG/LPG carriers, cruise ships etc.

19 These results are in line with the earlier studies finding that "50-70% of the value added comes from external subcontractors and suppliers, whereas for more complex ships this can be as high as 70-80%" (results by IKEI (2009[47]), as described in Ecorys (2009[31])). The study by Ecorys does not, however, discuss a country comparison and the ratios refer to 2009.

20 See Annex A for more details on the industry classification used in the analysis.

21 The impact of this policy on the US economy is analysed in more detail in Gourdon and Guilhoto (2019[34]).

22 All transactions between EU28 countries are treated as domestic for this comparison.

23 In order to improve comparability of results, this calculation treats Bulgaria, Rumania and Croatia as EU members in 2005 although they joined thereafter.

24 It should be noted, however, that comparisons to CGT values in this section are only illustrative, as they are taken from a different data source, namely Clarkson World Fleet Register.

25 Further reasons that could explain the increase in the share of domestic value added of China might be related to an increase in value added factors, such as salaries, profits (for instance due to quality improvements of vessels) or taxes.

26 It has to be noted, however, that Korea's share varied between these dates.

27 "Wholesale is the resale (sale without transformation) of new and used goods to retailers, to industrial, commercial, institutional or professional users, or to other wholesalers, or involves acting as an agent or broker in buying goods for, or selling goods to, such persons or companies" (United Nations, 2008[27]).

28 Calculated from Clarkson World Fleet Register.

29 Calculated from Clarkson World Fleet Register.

30 In addition, Ecorys (2009[31]) describes the case of subcontracting in Korean shipbuilding on the example of Samsung. In 2003, the company had sub-contractors that either contributed directly from the shipyard or were located elsewhere. The total workforce of all of these firms together was able to produce approximately two-thirds of Samsung's overall shipbuilding output.

31 For the figures referred to see Figure 8 in the previous section.

32 Intra-EU transactions are again treated as domestic transactions in this calculation.

33 In 2018, China was the largest ship producer in terms of CGT, followed by Korea and Japan, according to data from Clarkson World Fleet Register.

34 At the same time, as noted previously, this lower share of domestic sourcing might not be surprising to some extent given the smaller size of the Korean economy.

35 This finding stands in contrast to earlier anecdotal evidence that Hyundai sourced 90% of its steel demand from the Korean company POSCO, as quoted in Eich-Born (2005, p. 114[46]).

36 This information is based on exchanges between the Secretariat and the Shipbuilder's Association of Japan. It is further supported by an article by Suzuki et al. (2004[41]), which describes several steel products that JFE has to offer specifically for the shipbuilding industry, as well as examples of steel products that Nippon Steel developed in cooperation with Imabari Shipbuilding and Mitsubishi Heavy Industry (Hayakawa, 2010[42]).

References

Baldwin, J. and B. Yan (2014), *Global value chains and the productivity of Canadian manufacturing firms*, Statistics Canada. [36]

Baldwin, R. (2012), "Global Supply Chains: Why They Emerged, Why They Matter, and Where They Are Going", *Fung Global Institute* Working Paper FGI-2012-1, https://pdfs.semanticscholar.org/a060/496c28496be89dee84d64eea98370afa814d.pdf (accessed on 4 April 2018). [10]

Bas, M. and V. Strauss-Kahn (2013), "Input-Trade Liberalization, Export Prices and Quality Upgrading", *Sciences Po Economics Discussion Papers 2013-13*. [45]

Brodda, J. (2014), *The Shipbuilding and Offshore Marine Supplies Industries*, http://www.oecd.org/sti/ind/oecd-shipbuilding-workshop-brodda.pdf. [19]

Brun, L. and S. Frederick (2017), *Korea and the Shipbuilding Global Value Chain*, https://gvcc.duke.edu/wp-content/uploads/Duke_KIET_Korea_and_the_Shipbuilding_GVC_CH_4.pdf (accessed on 30 October 2018). [9]

Caliendo, L. and E. Rossi-Hansberg (2012), "The impact of trade on organization and productivity", *Quarterly Journal of Economics*, Vol. 127/3, pp. 1393-1467, http://dx.doi.org/10.1093/qje/qjs016. [37]

Constantinescu, C., A. Mattoo and M. Ruta (2017), *Does Vertical Specialization Increase Productivity?*, World Bank Group, https://openknowledge.worldbank.org/handle/10986/26145. [6]

Criscuolo, C. and J. Timmis (2017), "The Relationship Between Global Value Chains and Productivity", *International Productivity Monitor*, Vol. 32, pp. 61-83. [5]

De Backer, K. et al. (2018), "Industrial robotics and the global organisation of production", *OECD Science, Technology and Industry Working Papers*, No. 2018/03, OECD Publishing, Paris, http://dx.doi.org/10.1787/dd98ff58-en. [16]

De Backer, K. and S. Miroudot (2013), *Mapping Global Value Chains*, OECD Publishing, Paris, https://doi.org/10.1787/5k3v1trgnbr4-en. [22]

ECB (2016), *Understanding the weakness in global trade - What is the new normal?*, https://www.ecb.europa.eu/pub/pdf/scpops/ecbop178.en.pdf (accessed on 5 April 2018). [13]

Ecorys (2009), *Study on Competitiveness of the European Shipbuilding Industry*, https://ec.europa.eu/docsroom/documents/10506/attachments/1/translations/en/renditions/native. [31]

Eich-Born, M. (2005), *Transformation der ostdeutschen Schiffbauindustrie: Anpassungsprozesse in einem global-lokalen Institutionengefüge*, Münster : LIT. [46]

Elms, D. and P. Low (eds.) (2013), *Global value chains in a changing world*, World Trade Organisation Publishing, https://www.wto.org/english/res_e/booksp_e/aid4tradeglobalvalue13_e.pdf (accessed on 17 October 2018). [3]

European Commission (2014), *Study on Competitive Position and Future Opportunities for the European Marine Supplies Industry*, https://publications.europa.eu/en/publication-detail/-/publication/df9d2276-cb29-4c6d-84a7-e454922e8297. [29]

Gereffi, G. (1994), *The organization of buyer-driven global commodity chains: how US retailers shape overseas production networks*, in G. Gereffi and M. Korzeniewicz (eds), "Commodity Chains and Global Capitalism", Westport, CT: Praeger, pp. 95-122. [44]

Gereffi, G. and X. Luo (2014), *Risks and Opportunities of Participation in Global Value Chains*, http://documents.worldbank.org/curated/en/914141468325443509/pdf/WPS6847.pdf (accessed on 17 October 2018). [11]

Gourdon, K. and J. Guilhoto (2019), "Local Content Requirements and their Economic Effect on Shipbuilding - A Quantitative Assessment", *OECD Science, Technology and Industry Policy Papers*, OECD Publishing, Paris, https://doi.org/10.1787/90316781-en. [34]

Hassink, R. and D. Shin (2005), "South Korea's shipbuilding industry: From a couple of Cathedrals in the desert to an innovative cluster", *Asian Journal of Technology Innovation*, Vol. 13/2, pp. 133-155, http://dx.doi.org/10.1080/19761597.2005.9668611. [28]

Hayakawa, K. (2010), *Steel for shipbuilding in Japan*, http://news.nost.jp/2010/03/steel-for-shipbuilding-in-japan/ (accessed on 3 November 2018). [42]

IKEI (2009), *Comprehensive sectoral analysis of emerging competencies and economic activities in the European Union: building and repairing of ships and boats sector*, Office for Official Publications of the European Communities. [47]

Kowalski, P. et al. (2015), "Participation of Developing Countries in Global Value Chains - Implications for Trade and Trade-Related Policies", *OECD Trade Policy Papers*, No. 179, OECD Publishing, Paris, https://doi.org/10.1787/5js33lfw0xxn-en. [23]

Kummritz, V. (2016), "Do global value chains cause industrial development?", *CTEI Working Paper No. 2016-01*, https://repository.graduateinstitute.ch/record/293917/files/CTEI-2016-01.pdf. [7]

Lopez Gonzalez, J. (2016), "Using Foreign Factors to Enhance Domestic Export Performance: A Focus on Southeast Asia", *OECD Trade Policy Papers*, No. 191, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jlpq82v1jxw-en. [12]

Marcolin, L., S. Miroudot and M. Squicciarini (2016), "GVCs, Jobs And Routine Content Of Occupations"*, OECD Trade Policy Papers*, No. 187, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jm0mq7kr6s8-en. [43]

McKinsey (2014), *Global flows in a digital age: How trade, finance, people, and data connect the world economy*, McKinsey Global Institute, https://www.mckinsey.com/~/media/McKinsey/Global%20Themes/Globalization/Global%20flows%20in%20a%20digital%20age/Global_flows_in_a_digital_age_Full_report%20March_2015.ashx (accessed on 6 April 2017). [15]

MERICS (2016), *Made in China 2025 - The making of a high-tech superpower and consequences for industrial countries*, https://www.merics.org/sites/default/files/2018-07/MPOC_No.2_MadeinChina2025_web.pdf (accessed on 29 August 2018). [25]

Nikkei Asian Review (2018), *Mitsui's main shipyard quits commercial vessels*, https://asia.nikkei.com/Business/Companies/Mitsui-s-main-shipyard-quits-commercial-vessels (accessed on 3 November 2018). [26]

OECD (2018), *Development of the OECD Inter-Country Input-Output Database 2018 Edition*. [20]

OECD (2018), *The changing nature of international production: Insights from Trade in Value Added and related indicators*, https://www.oecd.org/industry/ind/tiva-2018-flyer.pdf (accessed on 25 September 2019). [14]

OECD (2015), *Global value chains and trade in value-added: an initial assessment of the impact on jobs and productivity*, OECD Publishing, Paris, https://doi.org/10.1787/5jlvc7sb5s8w-en. [8]

OECD (2013), *Interconnected Economies: Benefiting from Global Value Chains*, OECD Publishing, Paris, https://doi.org/10.1787/9789264189560-en. [1]

OECD-WTO (2018), *Trade in Value-Added and Global Value Chains profiles - An explanatory note*, https://www.wto.org/english/res_e/statis_e/miwi_e/Explanatory_Notes_e.pdf (accessed on 28 March 2018). [35]

SEA Europe (2017), *Presentation made at the WP6 meeting on 21 November 2017*. [17]

SEAISI (2012), *South Korean shipbuilding companies to buy more steel plate from China*, http://www.seaisi.org/News/2109/South+Korean+shipbuilding+companies+to+buy+more+steel+plate+from+China (accessed on 3 November 2018). [33]

Semini, M. et al. (2018), "Offshoring Strategies in Norwegian Ship Production", *Journal of Ship Production and Design*, Vol. 34/1, pp. 59-71, https://doi.org/10.5957/JSPD.160035. [39]

Sheffi, Y. (2007), *Building a Resilient Organization*, National Academy of Engineering of the National Academies, pp. 30-36, https://www.nae.edu/File.aspx?id=7405&v=70df971. [38]

Sheffi, Y. and J. Rice (2005), *A Supply Chain View of the Resilient Enterprise*, MIT Sloan Management Review, https://www.researchgate.net/publication/255599289_A_Supply_Chain_View_of_the_Resilient_Enterprise (accessed on 17 October 2018). [40]

Stopford, M. (2003), *Maritime Economics*, Routledge, London and New York. [18]

Sturgeon, T. (2013), *Global Value Chains and Economic Globalization*, http://ec.europa.eu/eurostat/documents/7828051/8076042/Sturgeon-report-Eurostat.pdf (accessed on 28 March 2018). [2]

Suzuki, S. et al. (2004), "Steel Products for Shipbuilding", *JFE Technical Report* No.2, http://www.jfe-steel.co.jp/en/research/report/002/pdf/002-05.pdf. [41]

Tsai, Y. (2011), "The shipbuilding industry in China", *OECD Journal: General Papers*, Vol. 2010/3, http://dx.doi.org/10.1787/gen_papers-2010-5kg6z7tg5w5l. [24]

United Nations (2008), *International Standard Industrial Classification of All Economic Activities (ISIC), Revision 4*, https://www.bundesbank.de/resource/blob/612626/067f5294c6df434ea4528bdb62551f9b/mL/isic-rev-4-data.pdf. [27]

United States Maritime Administration (2013), *The Economic Importance of the U.S. Shipbuilding and Repairing Industry*, https://3snn221qaymolkgbj4a0vpey-wpengine.netdna-ssl.com/wp-content/uploads/2014/04/MARAD_Econ_Study_Final_Report_2013.pdf (accessed on 30 June 2019). [21]

US Chamber of Commerce (2017), *Made in China 2025: Global Ambitions Built on Local Protections*, https://www.uschamber.com/sites/default/files/final_made_in_china_2025_report_full.pdf (accessed on 22 February 2019). [30]

World Bank (2017), *Measuring and analyzing the impact of GVCs on economic development*, World Bank Group, http://documents.worldbank.org/curated/en/440081499424129960/Measuring-and-analyzing-the-impact-of-GVCs-on-economic-development. [4]

World Steel Association (2016), *World Steel in Figures 2016*, https://www.worldsteel.org/en/dam/jcr:4f060d8b-3602-4ffe-9e87-7e93e0659449/Word+Steel+in+-Figures+2016.pdf (accessed on 3 November 2018). [32]