EXHIBIT 41

The “14th Five-Year Plan” for the Development of the Shipbuilding and Ocean Engineering Equipment Industry in Shandong Province

Ships and marine engineering equipment are an important support for understanding and managing the ocean. They are an important part of our province’s modern marine industry system and are of great significance for accelerating the construction of a strong marine province in the new era. In order to conscientiously implement the requirements of the Party Central Committee and the State Council on the deployment of a maritime power and the "Shandong Province's Fourteenth Five-Year Plan for National Economic and Social Development and the Outline of Long-term Goals for 2035" and "Shandong Province's "14th Five-Year Plan" for the Construction of a Strong Manufacturing Province, This plan is formulated based on the actual situation of the shipbuilding and marine engineering equipment industry in our province, and the planning period is from 2021 to 2025.

1. Current situation

(1) Development status

The pace of industrial transformation continues to accelerate. According to statistics, the province's shipbuilding and offshore engineering equipment industry achieved operating income of 45.06 billion yuan in 2020, ranking third in the country after Jiangsu and Shanghai. The province's shipbuilding completion volume, new orders, and orders on hand accounted for 8.3%, 4.7%, and 7.9% of the country's total respectively. The construction capacity of large bulk carriers and luxury ro-ro passenger ships has been continuously improved. Yacht exports account for about 50% of the country's total. It has successively delivered the first-generation 400,000-ton ultra-large ore ship "Tianjin" and the large luxury ro-ro passenger ship "Zhonghua Fuxing" and other international leading ship types. The level of offshore oil and gas equipment assembly and construction has been further improved. The delivery volume of deepwater semi-submersible drilling platforms accounts for 78% of the country's total. The country's first deep-water semi-submersible drilling platform "Viking Dragon" suitable for operation in Arctic waters was built, and the world's largest tonnage floating platform was built. The production, storage and offloading unit "P70" and the country's largest deep-sea floating production, storage and offloading unit "Offshore Oil 119" were assembled and delivered in our province; participating

in the implementation of the Sino-Russian Yamal LNG project, the LNG core process module construction capacity was significantly enhanced. Accelerating the transformation into the field of new marine engineering equipment, delivering 8 iconic deep-sea fishery breeding equipment such as "Shenlan 1" and "Long Whale 1"; the country's first comprehensive modern ecological marine ranch complex platform "Genghai 1", China’s first maritime space launch platform was put into use in our province.

Industrial innovation capabilities continue to increase. The scientific and technological support capabilities of the shipbuilding and marine engineering equipment industry have been further improved, and major innovation platforms in the industry such as Qingdao Marine Science and Technology Pilot National Laboratory, China State Shipbuilding Corporation Marine Equipment Research Institute, and China Ocean Engineering Research Institute (Qingdao) have been deployed in Shandong. A number of "national treasures" and major equipment were built. "Blue Whale 1" and "Blue Whale 2" successfully undertook the trial mining tasks of combustible ice in the South China Sea, marking that my country's deepwater oil and gas exploration and development capabilities have entered the world's advanced ranks; the implementation of " Major projects such as the "Transparent Ocean" and "Sea Questioning Plan" have been put into use, and deep-sea scientific research and detection equipment such as the Jiaolong, Xiangyanghong 01, Science, and the Hailong and Qianlong have been put into use.

The supporting supply system continues to improve. Breakthroughs have been made in key supporting products in the province. The development capabilities of large-scale casting and forging products such as low-speed diesel engines, deck machinery and marine crankshafts have been greatly improved. Supporting equipment such as medium- and high-speed marine diesel engines and integrated electric propulsion systems have been successfully launched on the market. Inland and coastal marine engines occupy 60% of the domestic market. With a market share of more than %, it has broken through the key technology of the national second-stage emission of natural gas engines and successfully equipped the Yangtze River transport ships; the three-dimensional CNC bending machine has successfully solved the key technology of "stuck neck" in the cold bending processing of complex curved multi-dimensional plates, reaching the world's leading level. ; The international market share of ship ballast water treatment systems is 35%, and products such as marine turbochargers, marine electric motors, special hoses for

marine engineering equipment, anchor chains, ropes, lead-acid power batteries, air bags, and anti-corrosion materials have a strong market Competitiveness.

The level of agglomeration development has been significantly improved. The three major ship and marine engineering equipment manufacturing bases of Qingdao, Yantai and Weihai have accelerated their development, accounting for more than 70% of the province's output value, and the industry concentration has further increased. Qingdao has formed a trend of coordinated development of ship and marine engineering equipment assembly and construction enterprises and supporting enterprises, and the advantages of Haixi Bay's shipbuilding and ship repair agglomeration have been continuously highlighted; Yantai's offshore oil and gas resource development equipment and new marine engineering equipment have coordinated development, forming a leading marine engineering company in the country. Equipment R&D and manufacturing industry cluster; Weihai has formed a cluster of specialty products such as high-end ro-ro passenger ships, ocean-going fishing boats and yachts; Jining's inland river shipping base has accelerated its development, forming the largest inland river shipping industry cluster north of the Yangtze River; Jinan, Qingdao, Zibo, Weifang The marine power equipment industry is accelerating its growth, and Dongying’s offshore oil and gas equipment industry is accelerating its concentration.

Policy support continues to increase. It has successively issued the "Implementation Opinions on Deepening Structural Adjustment and Accelerating Transformation and Upgrading of Shandong Province's Shipbuilding Industry", "Shandong Province Ship Mortgage Financing Measures for Ships Under Construction", "Shandong Province High-end Equipment Manufacturing Development Plan (2018-2025)", "Shandong Province Maritime Powerful Province" Construction Action Plan" and a series of policy documents, built a number of enterprise technology centers, technology innovation centers, marine engineering technology collaborative innovation centers and national green factories, cultivated a number of manufacturing single champion enterprises, specialized and special new and Little Giant enterprises, and successively strived for policy support from the national high-tech ship scientific research plan, insurance compensation for the first (set) of major technical equipment, etc.

(2) Existing problems

The ability to innovate is not strong. The core R&D and design capabilities are insufficient, the research on basic common technologies is not systematic and in-depth enough,

and the focus is still on imitation, and high-performance key components or systems rely on imports; the province's innovation resources are scattered, the collaborative innovation capabilities are insufficient, and the industry-university-research cooperation and interoperability mechanism is still incomplete. Improvement; industrial application of new technologies, new materials, and new products lags behind. The product structure is not optimal. Compared with Jiangsu, Shanghai and other provinces and cities, there are fewer high value-added ship types and a lack of high-end ship construction capabilities such as large container carriers and large gas carriers. The supporting industry is small in scale and has few product types. Key supporting equipment is not as advanced as domestic and foreign leaders. Shipbuilding is not efficient. The high-end ship design capability is not strong, the level of digital production and manufacturing is low, and the segment assembly rate is not high; the integration level of design, manufacturing and production management is low, and the full life cycle management capability is weak. The industrial chain is not well connected. The province lacks a smooth upstream and downstream collaborative supporting mechanism for the industrial chain, and the connection between final assembly and construction enterprises and material, parts and components and supporting enterprises and shipping companies and other shipowners and port enterprises is insufficient. Talent constraints are prominent. The industry is not very attractive, there is a serious loss of professionals who master key technologies, there is a shortage of strategic talents and comprehensive engineering talents, and the problems of difficulty in recruiting, expensive employment and difficulty in retaining employees are prominent.

(3) Current situation

When General Secretary Xi Jinping attended the deliberation of the Shandong delegation at the first session of the 13th National People’s Congress, he emphasized that “it is necessary to speed up the construction of world-class marine ports, a complete modern marine industry system, and a green and sustainable marine ecological environment to contribute to the construction of a maritime power." The "14th Five-Year Plan" period is a critical period for our province to accelerate the construction of a strong maritime province. The development of the shipbuilding and marine engineering equipment industry is facing new situations and new tasks.

First, profound changes in the international environment have had a new impact on the shipbuilding and offshore engineering equipment industry. The pattern of global trade and industrial division of labor has been profoundly adjusted. In the field of shipbuilding and

offshore engineering equipment, China, Japan and South Korea are three pillars, and competition is obviously intensifying. Europe and the United States have mastered the core technologies of R&D, design and key supporting equipment. The risk of "stuck neck" in the industrial chain has increased, and supply chain security issues have arisen. Highlighted; new standards and regulations for safety and environmental protection of the International Maritime Organization are constantly being introduced, the trend of low-carbon energy transformation is obvious, and the pace of product upgrading is accelerating; factors such as the sharp rise in raw material prices, the appreciation of the RMB, and the continued rise in labor costs have seriously affected the profitability and viability of enterprises. threaten. At the same time, the global economy is recovering, the shipping market is recovering, new ship orders are growing, and demand for container ships, liquefied natural gas ships, and floating production, storage and offloading units is strong, bringing new opportunities to industry development.

Second, accelerating the construction of a new development pattern puts forward new requirements for high-quality development of the marine economy. Accelerating the construction of a new development pattern with the domestic cycle as the main body and the domestic and international dual cycles reinforcing each other requires the shipbuilding and offshore engineering equipment industry to continue to deeply explore overseas markets, while fully tapping the domestic market, cultivating new growth points, optimizing products and Business structure, enhance the endogenous power of the enterprise, and reduce the impact of the external market environment. With the implementation of my country's "carbon peaking and carbon neutrality" strategy, "green and low carbon" has become a "must have" and "ticket" for the entire industry. The development of deep sea, polar and South China Sea resources and the protection of maritime rights and interests are becoming increasingly urgent. Strategies such as becoming a maritime power, a manufacturing power, and a transportation power are being implemented in depth. my country's shipbuilding and marine engineering equipment industry will strengthen scientific and technological self-reliance, improve the industrial chain supply chain system, and comprehensively improve the level of design, construction and management puts forward higher requirements.

Third, the construction of a strong maritime province in the new era has brought new opportunities to the development of the shipbuilding and marine engineering equipment industries. Shandong's greatest advantage lies in the ocean, and its greatest potential lies in the

ocean. In recent years, Shandong has unswervingly implemented the strategy of building a strong maritime province, and clearly proposed to "build a complete modern marine industry system" during the "14th Five-Year Plan" period, "promote the independence of core equipment for high-end marine equipment manufacturing, and create a world-leading offshore equipment manufacturing base" ". Shandong has superior natural conditions, a solid foundation for marine scientific research and industry, and obvious advantages in offshore oil and gas, port transportation, marine fisheries, offshore wind power, and marine culture and tourism. It has gathered China State Shipbuilding Corporation, China National Offshore Oil Corporation, China Merchants Group, and CIMC Group, COSCO Shipping Group and other large state-owned enterprises in the field of marine equipment, Shandong Ocean Group is developing into a leading comprehensive marine industry group in China. National strategies such as “One Belt and One Road”, ecological protection and high-quality development in the Yellow River Basin, Shandong Comprehensive Pilot Zone for the conversion of old and new driving forces, China-Shanghai Cooperation Organization Local Economic and Trade Cooperation Demonstration Zone, and China (Shandong) Free Trade Pilot Zone are superimposed on our province, providing Shandong provides major opportunities for building a world-leading new ship and marine engineering equipment industrial base, accelerating the construction of a modern marine equipment industry system, and exploring and cultivating new business forms and models for marine economic development.

2. Overall idea

(1) Guiding ideology

Guided by Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, we will fully implement the spirit of the 19th National Congress of the Communist Party of China and all the plenary sessions of the 19th CPC National Congress, thoroughly implement the spirit and important instructions of General Secretary Xi Jinping’s important speech during his inspection of Shandong, and anchor the “Being at the forefront and comprehensively pioneering” "Three ahead", based on the new development stage, fully, accurately and comprehensively implement the new development concept, actively serve and integrate into the new development pattern, take deepening the supply-side structural reform as the main line, use reform and innovation as the driving force, and conscientiously implement The Provincial Party Committee and the Provincial Government's new round of action plans for building a strong maritime

province adheres to the national strategic needs, the main battlefield for the development of a strong maritime province, and the people's yearning and needs for the ocean, aiming at the direction of deep sea, polar, green, and intelligent development. Efforts will be made to overcome a number of "national important weapons" and "stuck-neck" technical equipment that meet the national strategic needs, strive to create a new marine engineering equipment product system with reasonable structure and distinctive features, and strive to build a green, intelligent, intensive, efficient, safe and environmentally friendly construction system. , strive to improve the coordinated development mechanism of the industrial chain that connects production and demand, lead as a leader, and support cooperation, strive to build a high-end ship and marine engineering equipment industry cluster in the Shandong Peninsula, launch the "Shandong Offshore Engineering" brand, and build Shandong into a shipbuilding industry in China's Bohai Rim region An important support for industry and the world's leading R&D and manufacturing base for marine engineering equipment, Shandong contributes to the construction of a maritime power.

(2) Main principles

Drive demand and highlight features. Focusing closely on the national strategic needs, the development needs of Shandong as a strong maritime province, and the people's yearning and demand for the ocean, we will give full play to Shandong's advantages in marine resources, scientific and technological talents, basic manufacturing advantages, industrial applications and market demand advantages to create a number of in- Develop new marine engineering equipment and high-end ship types that are leading nationally and globally, and build a R&D, manufacturing and demonstration application system for ships and marine engineering equipment products with Shandong characteristics.

Innovation leads, green development. Adhere to innovation-led development, strengthen the collaborative innovation of industry, academia, and research, aim at the direction of "safety, green, economy, and comfort", strive to promote design innovation, technological innovation, product innovation, and management innovation, and vigorously implement digital improvement and intelligent manufacturing. Actively implement the "dual carbon" strategy, integrate the "green" development concept into the entire process of design, construction, management and service, use "green" standard requirements to force industry changes, product iterations and model innovations, and unswervingly follow the path of green development.

Layout along the chain and develop collaboratively. Efforts will be made to improve the working mechanism of the "chain leader system", further build an industrial chain community, and accelerate the integrated development of the upstream and downstream industrial chains. Deploy an innovation chain around the industrial chain, promote the integration of innovation resources and the rational allocation of elements, overcome a number of key technologies and "stuck" technical equipment, and improve the modernization level of the industrial chain and supply chain. Support leading enterprises to become bigger and stronger, improve the coordinated development mechanism of large and medium-sized enterprises, give full play to the leading role of final assembly construction, and promote supporting industries to move up to the high end.

Three cores lead and multiple points support. Focus on building a high-end ship and marine engineering equipment industry cluster in the Shandong Peninsula, adhere to the coordination of land and sea, and linkage between land and sea, and give full play to the core leading role of Qingdao, Yantai, and Weihai in final assembly and construction, industrial supporting, collaborative innovation, and demonstration applications. Efforts will be made to enhance the supporting supporting role of Jinan, Zibo, Dongying, Weifang, Jining, Tai'an, Rizhao, Dezhou, Liaocheng, Binzhou and other cities, strengthen regional interaction and exchanges, promote regional coordination and linkage, and avoid homogeneous competition and duplication of layout.

(3) Development goals

By 2025, the province's shipbuilding completion volume, new orders, and handheld orders will remain at more than 10% of the country's total, and the scale of the shipbuilding and offshore engineering equipment industry will remain among the top three in the country. The output value of marine engineering equipment accounts for about 30% of the country's total, inland river ships account for about 50% of the domestic market share, yacht exports account for about 70% of the country's total, and the average annual growth rate of the output value of ships and marine engineering supporting equipment remains at about 10%. Investment in innovation continues to increase. The proportion of R&D investment in sales revenue of key enterprises above designated size remains at more than 3%. The level of digital and intelligent construction continues to improve, and the numerical control rate of key processes reaches more than 80%. Achieve breakthroughs in high value-added ship types such as large container carriers,

large gas carriers, high-standard ocean-going fishing vessels, green medium and large high-end ro-ro passenger ships, cruise ships, luxury yachts, green intelligent inland river ships, new river-sea direct ships, and cultivate 1-2 types Featured brand products with an international market share of more than 35%, and a number of brand products with independent intellectual property rights have been formed in the core supporting equipment field. The leading advantages of offshore oil and gas equipment have been consolidated and improved, and new leading advantages have been formed in the fields of new marine engineering equipment such as marine energy development, marine fisheries, deep-sea mining, maritime cultural tourism, and maritime space launch.

3. Regional layout

(1) Highlight “three-core leadership”

Qingdao City: Efforts will be made to promote the upgrading of the shipbuilding and marine engineering equipment industry cluster with Haixi Bay as the core, further gather advantageous innovative resources in the field of marine equipment at home and abroad, strengthen upstream and downstream collaboration in the industrial chain, actively carry out pilot demonstrations, and create a world-leading Comprehensive marine equipment innovation base.

Yantai City: Focus on coordinating the coastline resources, industrial foundation and innovative resources of Zhifu District, High-tech Zone, Penglai, Haiyang and Longkou, further improve and strengthen offshore oil and gas exploration equipment and ocean-going fishing vessels, and accelerate offshore wind power, deep-sea aquaculture, marine We will develop cultural tourism and other new types of offshore engineering equipment, and strive to build a global offshore engineering equipment city.

Weihai City: Further consolidate and improve its advantages in high-end ro-ro passenger ships, ocean-going fishing boats, yachts, green ship repairs, etc., give full play to the role of the National Marine Comprehensive Test Site (Weihai), vigorously develop a series of integrated sea, air, space and submersible equipment, and strive to create It is an internationally renowned unique ship and marine equipment manufacturing base with Shandong characteristics.

(2) Strengthen “multi-point support”

Jinan City and Rizhao City focus on the development of steel for shipbuilding and offshore engineering equipment, offshore wind power main shafts, flanges, airbags, etc.; Zibo City and Weifang City focus on the development of marine power equipment, anchor chains,

marine electronic equipment, and key components of offshore wind power gearboxes. etc.; Dongying City and Weifang City focus on developing offshore oil and gas drilling equipment and offshore wind power equipment; Tai'an City focuses on developing rope and ship plate processing equipment; Jining City strives to improve the inland river system integrating R&D and design, assembly and construction, operation management, and maintenance support. In the shipping industry chain, actively carry out demonstration pilot projects for green intelligent inland river ships to build the country's leading inland river ship industry base; Dezhou City focuses on the development of offshore wind turbine blade molds, marine motors, etc.; Liaocheng City focuses on the development of high-end yachts and supporting industries; Binzhou City focuses on the development of offshore Complete wind power industry chain equipment such as wind turbines, blades, spindles, and large castings, as well as pistons for ships, surface engineering treatment equipment and forgings for ships, ocean photovoltaic components, and offshore oil and gas extraction pipe fittings, to create a new energy equipment industry cluster worth hundreds of billions.

4. Development priorities

(1) Specialized high-end ship types

Closely focusing on the deployment requirements for building a strong maritime province and the basic advantages of our province, we will aim at high-tech, high-reliability, and high-value-added ships to further enhance ship development, design, and construction capabilities. Consolidate and upgrade advantageous products such as large bulk carriers, high-end ro-ro passenger ships, ocean-going fishing vessels, platform supply ships, and high-performance law enforcement ships, and accelerate the development of large gas carriers, medium and large container ships, semi-submersible ships, multi-functional rescue ships, and unmanned aerial vehicles. ships, river-sea direct ships, etc., and make breakthroughs in the development of polar ships, ocean drilling ships and multi-purpose medical ships. Promote the green and intelligent development of inland river ships, promote the demonstration application of new energy and clean energy-powered ships, and provide equipment support for promoting the renewal and transformation of old ships and accelerating the development of green shipping. Support the development of small and medium-sized cruise ships, promote the popularization of yacht consumption, and better meet society's growing demand for water tourism.

Column 1 Featured high-end ship models

1. Three mainstream ship types. Promote and apply comprehensive energy saving, lightweight structure, extremely thick plate/high-strength steel welding, vibration and noise reduction, green energy power and other technologies, develop new ship types with advanced green and environmentally friendly technologies such as clean energy, energy saving and environmental protection, and create green, energy-saving and intelligent ships The three main independent brands of bulk carriers, container carriers and oil product carriers have increased the market share of large bulk carriers. Medium and large oil tankers have achieved full coverage of ship type design and construction, enabling oil and gas carriers and trunk and branch line container transportation. The ship types are serialized and batched, forming a certain brand awareness.

2. High-end ro-ro passenger ship. Develop the overall design, new materials, new energy power, intelligent control, vibration and noise reduction, comfort, safety and other technologies of high-end ro-ro passenger ships, enhance the independent design and construction capabilities of high-end ro-ro passenger ships, expand brand advantages, develop high-end ro-ro passenger ships and formed a complete industrial chain system.

3. Ocean fishing boats. Develop anti-icing and automatic de-icing, cold-chain processing, storage, transportation, heat recovery and other technologies for offshore fishing vessels, and develop integrated Antarctic krill fishing and processing vessels, large-scale tuna seine vessels, and large-scale saury using new materials and new energy Squid fishing boats, refrigerated transport and processing ships and other offshore fishing equipment.

4. Wind power installation ship. Develop key technologies such as overall ship shape design, structural lightweight optimization design, gear force balance, rapid pile pulling system optimization, complex working condition coupling analysis, new energy power application and other key technologies for wind power installation ships, and develop deep water efficient and suitable for high-power wind turbine installation wind power installation equipment.

5. Car roll-off transport ship. Develop technologies such as ship type research and development, configuration and general layout, new energy power application, structural optimization, vehicle boarding and disembarkation, vehicle mooring and fixation, and loading stability in special environments for vehicle ro-ro transport ships, and promote the upgrading of vehicle ro-ro transport ships.

6. Polar ships. Focusing on the needs of polar navigation, scientific research and transportation, develop key technologies such as ice resistance and icebreaking, antifreeze and cold protection, emergency treatment, coating protection, low temperature and icebreaking structure construction, and develop polar heavy icebreakers, new polar transportation equipment and polar deep sea exploration ships.

7. Ocean drilling ship. Develop a deep-water scientific research drilling vessel capable of marine scientific research and seabed resource drilling, using new energy and comprehensive electric drive systems, equipped with full-rotation propulsion and DP-3 level dynamic positioning system, and capable of riser and riserless drilling operations.

8. Multi-purpose hospital ship. Develop the overall design of multi-purpose hospital ships, special air conditioning and ventilation, vibration and noise control and other technologies, and develop integrated multi-purpose hospital ships with maritime medical rescue and other capabilities.

9. Green and intelligent inland river ships. Develop LNG power, hydrogen power, ammonia power, methanol power, electric and hybrid power, magnetic levitation pump and other technologies, develop energy-saving, environmentally friendly, economical, intelligent inland river ships and river-sea direct ships, in order to promote the renewal and transformation of old inland river ships and build a new A first-generation domestic shipping system provides equipment support.

10.Cruise yacht. Develop key technologies such as the overall design of cruise yachts, high-quality interior materials, vibration and noise control, new energy power applications, and lightweight hull structures. Focus on the development of small and medium-sized luxury cruise ships, promote the application of new yacht materials, promote the popularization of yachts, and build design, A full industry chain development system including construction, supporting facilities, maintenance, installation, and operation support.

(2) Marine energy equipment

Closely follow the national deep sea, polar and other major strategic needs and our province's marine energy development layout, promote the research and development and production of new technologies and new equipment such as drilling and processing, and upgrade deepwater semi-submersible drilling/production platforms, polar ice platform, liquefied natural gas The design and construction capabilities of complete sets of equipment such as floating

production storage and offloading units (FLNG), floating production storage and offloading units (FPSO), and underwater oil and gas production systems, accelerate the intelligent development of offshore oil and gas equipment, and provide strong support for the development of deep-sea oil and gas resources. Assure. Vigorously develop offshore wind power equipment, marine renewable energy equipment, and seawater desalination comprehensive utilization platforms, and promote the development and application of offshore wind power hydrogen production, deepwater natural gas hydrate development equipment, offshore carbon capture and storage, clean energy floating islands, and offshore floating nuclear power plant platforms.

Column 2 Marine energy equipment

1. Deep-sea polar oil and gas resource development equipment. Develop independent design of deepwater and polar platforms, large drilling depth drilling system integration and control technology, severe cold drilling technology, and anti-freeze and cold protection technology, improve corresponding specifications and standards, enhance domestic supporting capabilities, and maintain and continue to expand brand influence. Develop offshore oil and gas fracturing system layout and vibration reduction technology, and develop offshore fracturing ships. Develop intelligent completion downhole multi-layer flow control, underwater all-electric intelligent control and underwater cutting technology, develop offshore oil and gas intelligent completion systems, underwater all-electric Christmas trees, submarine mud lifting equipment, underwater connectors and underwater Work equipment. Break through the underwater coiled tube drilling technology and mining sand control technology of permanent magnet direct-drive electric drilling tools, and develop a complete set of equipment for economical development of deepwater natural gas hydrates on the seabed.

2. Floating oil and gas production, storage and offloading equipment. Develop FPSO, LNG-FPSO overall plan, overall hull structure and overall performance, crude oil/natural gas processing technology, processing device design and upper module layout, mooring system and structural design, natural gas dehydration technology, natural gas recovery zero emission, natural gas compression liquefaction and Storage, fluid vibration and key structure monitoring technology to improve domestic supporting capabilities and standardized construction levels.

3. Offshore wind power equipment. Develop key technologies in the fields of offshore wind power design, construction, installation, operation and maintenance, develop large-megawatt offshore wind turbines and deep-sea floating wind turbines, booster stations, converter

stations, large wind power installation ships and wind power operation and maintenance mother ships, and upgrade blades , spindles, flanges, bearings, towers, gearboxes and other supporting equipment manufacturing levels, promote the application of equipment such as offshore wind power hydrogen production, wind, solar and fishery integration, and form a complete offshore wind power equipment industry chain.

4. Marine renewable energy equipment. Develop key technologies such as energy capture, collection and conversion, and intelligent operation and maintenance, develop integrated power generation devices for large structures such as wave energy, tidal energy, temperature difference energy, and floating photovoltaics, miniaturized power generation devices, power conversion devices, and other equipment to create integrated power generation devices. Offshore clean energy floating islands with floating integrated power system design, power and freshwater external transmission, centralized energy control and unit on/off position promote the application in the fields of ocean observation, marine fishery and other fields, forming a complete offshore renewable energy Equipment industry chain.

5. Seawater desalination comprehensive utilization platform. Focusing on the development of deep-water extraction, seawater desalination, brackish water reuse and freshwater export technology, develop and construct a seawater desalination comprehensive utilization platform to promote seawater desalination and comprehensive utilization research and development design, complete machine manufacturing, equipment integration, equipment processing, and key material components. Integrated development with pharmaceutical production, general engineering contracting and other related industries.

6. Offshore floating nuclear power plant platform. Develop technologies such as overall program design, structural and personnel safety, radiation protection, marine anti-corrosion, intelligent control, module construction and overall installation, commissioning, operation and maintenance of floating nuclear power generation platforms, and formulate design and construction standards for floating nuclear power generation platforms.

(3) New marine engineering equipment

Focusing on the new trends in my country's marine economic development and the new demands for marine engineering equipment from the new model of marine resource development, we actively carry out research on the development of cutting-edge technologies for new marine engineering equipment. Accelerate the development of integrated installation and

dismantling equipment for large ocean facilities, ocean drilling ships, and offshore rocket launch platforms. Strengthen technical reserves for deep sea and polar mineral development, and accelerate the development of deep-sea intelligent mining equipment and polar floating mineral development ships. Focusing on meeting the people's needs for high-quality marine protein and closeness to the ocean, orderly promote the development and demonstration application of deep-sea aquaculture equipment such as intelligent aquaculture cages and large-scale aquaculture work ships, and promote the development of the aquaculture industry towards the deep sea; actively develop maritime culture brigade complex, underwater sightseeing equipment, etc. to improve the level of marine space development and utilization.

Column 3 New Marine Engineering Equipment

1. Deep-sea fishery breeding equipment. Carry out research on the design of large-scale support structures for deep-sea breeding equipment, safety design of net clothing systems, construction of intelligent breeding systems, establishment of platform safety monitoring systems and high-precision construction technology, and develop equipment with intelligent sensing, automatic lifting of net clothing, automatic feeding, Underwater monitoring, net cleaning, adult fish recovery and other intelligent equipment and production management systems, and the development of a new generation of bottom-mounted, semi-submersible, fully submersible and other large-scale deep-sea intelligent breeding cages and large-scale breeding work vessels to achieve ecological Green smart breeding.

2. Maritime space launch/recovery platform/ship. Develop key technologies such as overall design, stability control, vibration and impact protection, fueling, and remote control of launch vehicle sea launch and recovery ships/platforms, develop special ship models that are solid-liquid compatible, and integrate launch and recovery functions, and demonstrate their applications.

3. Maritime cultural tourism complex. Develop key technologies such as overall design, creative configuration, three-dimensional perception network, comfort, safety and reliability, intelligent ecological breeding and green construction of offshore permeable structures and offshore cultural and tourism complexes, and develop small water vehicles, high-end water entertainment and leisure equipment, water and underwater shuttle tools, create a maritime cultural tourism complex that integrates leisure tourism, green farming, and digital operations, and form corresponding standards.

4. Deep-sea mineral resource development equipment. Carry out the design of deep-sea exploration, sampling, and ore collection systems, develop key technologies such as intelligent perception, vision and control, and intelligent monitoring, break through technologies such as advanced materials, manufacturing processes, non-destructive testing, installation and laying of mining pipes, and develop technologies that meet the requirements of 6,000-meter seabed detection, Intelligent sampling equipment, mining machines and composite mining pipes.

5. Marine facilities installation and dismantling equipment. Carry out research on key technologies for offshore installation and dismantling construction operations, overcome key technologies such as multi-body coupling analysis, wave motion compensation, and multi-body coordinated control for offshore construction operations, develop integrated installation and dismantling equipment for large-scale marine facilities, and improve my country's major offshore projects. Construction work ability.

(4) Marine intelligent equipment

Aiming at the country's major needs for safeguarding maritime rights and interests and our province's "smart ocean" construction and deployment, we will strengthen the development of new ocean core sensors, underwater unmanned vehicles, intelligent underwater robots and other devices and equipment, and promote engineering demonstration applications. Strengthen the overall design of ship intelligence systems, focus on breakthroughs in key technologies such as intelligent sensing and monitoring, network and communication, intelligent navigation, and power management and control, develop intelligent management of the ship's full life cycle, develop new marine equipment with highly integrated information and control, and enhance ship intelligence level.

Column 4 Marine Intelligent Equipment

1. New ocean core sensor. Adopt the "device, edge, and cloud" combination model to develop key technology research on ocean hydrology, meteorology, dynamics, ecological environment, hydroacoustics, and multi-element measurement and in-situ observation of laser, microwave, gravity, magnetic field and other core sensors, and develop shore-based core sensors. , core sensors and high-end instruments such as sea surface, underwater and seabed.

2. Intelligent underwater robot. Develop key technologies such as functional design of underwater robots, optimized design of overall and retractable and retractable subsystems, intelligent perception and collaboration, green power, high-precision navigation control, path

planning, seabed target recognition and positioning, and manufacturing processes, and develop autonomous underwater robots (AUV), cable-controlled underwater vehicle (ROV) and other intelligent observation and operation robots and complete sets of equipment for various scenarios.

3. Intelligent ships. Develop key technologies such as intelligent ship design, intelligent perception of environmental situations, intelligent route planning, autonomous navigation control, and digital twins, and develop core components/systems and new models such as intelligent engine rooms, full power integration, intelligent engines, comprehensive energy efficiency management and control, and intelligent sails. High-performance unmanned ships form a ship-shore integrated ship data service platform and ship-borne intelligent monitoring and processing terminals to promote the application of intelligent ships in the fields of ocean observation, safety management, energy conservation and emission reduction.

4. Marine information technology equipment. Accelerate the application of new generation information technology equipment such as 5G in the marine field, vigorously develop key deep-sea technologies and equipment such as seabed detection, deep-sea sensors, unmanned and manned deep diving, and seabed communication positioning, and actively develop satellites, drones, and smart ships. , ocean remote sensing and navigation and other key technical equipment for maritime situational awareness, promoting three-dimensional ocean information collection, integrated transmission, intelligent processing and presentation, and visualization of the entire management and control process.

5. Marine artificial intelligence equipment. Focusing on the common demands for artificial intelligence technology and equipment such as marine hydrology and meteorology, electromagnetic sound fields, resources and environment, etc., develop intelligent computing equipment that is independent and controllable, integrated with all specialties, cloud-integrated, and efficient in service, and promote the construction of a marine intelligence platform "Deep Sea Brain".

(5) Ship and marine engineering supporting equipment

Comprehensively promote the research and development of marine system equipment such as marine power, deck machinery, cabins, power and electrical, communication and navigation. Vigorously promote the demonstration application of LNG-powered ships, orderly promote the research and development and application of new power sources such as methanol,

ammonia fuel, hydrogen fuel, and biofuels, and accelerate the use of ultra-high-strength steel, ultra-low-temperature structural steel, high-performance alloys, and new composite materials for ships and offshore engineering equipment R&D and application of key materials, vigorously develop special coatings and welding materials, enhance local supporting capabilities, and expand industrial scale. Vigorously promote the construction of comprehensive marine test sites and test verification platforms to provide strong support for the research and development and industrialization of ships and marine engineering equipment.

Column 5 Ship and marine engineering supporting equipment

1. Marine power equipment. Develop technologies such as new power fuel supply for marine engines, carbon capture and treatment, waste heat utilization, methane escape control, injection system control and dual-fuel mode switching, and develop marine LNG and battery hybrid systems, LNG/diesel dual-fuel engines, methanol /New power equipment such as diesel dual-fuel engines and ammonia fuel engines, and develop high-power medium-speed marine diesel engines and megawatt-class electric propulsion devices.

2. High-end materials for shipbuilding and offshore engineering equipment. Develop low- and ultra-low-temperature-resistant materials for oil and gas drilling equipment, deep-sea pipelines, ocean engineering platforms, deep submersibles, and high-performance ocean engineering steel and alloy materials. Develop environmentally friendly and long-lasting coating preparation technology to form a new high-end anti-corrosion coating system suitable for ships and marine engineering equipment. Develop low-density and high-strength solid buoyancy material technology and high-performance deep-sea drilling riser manufacturing technology. Develop thermoplastic composite deep-sea intelligent mining pipes, new composite flexible pipes and other products.

3. Marine ballast water treatment equipment. Develop ballast water filtration, sterilization, control and monitoring, flow sensing and other technologies, develop marine ballast water treatment equipment that complies with new standards and specifications, increase the localization rate of core components, and promote the use of ships along domestic coasts and rivers.

4. Marine communication and navigation system. Develop multi-mode communication integration technologies based on 5G, Beidou, Tiantong, etc., develop multi-mode intelligent communication terminal equipment for different ship types and different application scenarios,

and promote the development of communication navigation and automatic driving equipment such as electronic charts and navigation systems, autopilots, etc. application.

5. Other marine supporting equipment. Develop new deck machinery, energy-saving pumps, shot blasting equipment, anchor chains, motors, cables, rigging and other ancillary equipment, develop eddy current pulse water jet cleaning equipment, high-power multi-degree-of-freedom wave compensation devices, and large centrifugal mud pumps, new supporting equipment such as cranes for new offshore engineering platforms and aluminum helicopter platforms.

6. Marine equipment testing experimental device platform. Build engineering experimental pools such as ship and marine engineering towing pools and comprehensive pools, extreme ocean omnidirectional flow field pools, and large-scale wind and wave flow deep-water experimental pools to support innovative equipment design and model testing, hydrodynamic mechanism exploration, and scientific experiments.

5. Main tasks

(1) Actions to improve innovation capabilities

1. Carry out key technology research and industrial application. Facing the country's major strategic needs and relying on relevant major national and provincial projects, we will overcome a number of "stuck" products and key core technologies in the field of ships and marine engineering equipment. Focus on green, intelligent, deep sea, polar and other development directions, keep a close eye on the industry frontier and market demand, focusing on deep sea oil and gas mineral resource development equipment, the improvement of green intelligence level of large bulk carriers, green intelligent inland river ships, new fuel ship engines, new low-speed Carry out R&D and innovation activities in the fields of two-stroke engines, offshore wind power installation vessels, floating offshore wind power, intelligent deep-sea fishery breeding equipment, digital transformation of ship assembly and construction, and marine equipment testing and verification, and coordinate basic research, cutting-edge technology and engineering technology research and development , promote the connection between the transformation of scientific and technological achievements and the needs of industrial transformation and upgrading, and promote the overall leap of the entire industry chain.

2. Build a multi-level innovation platform system. Promote the accelerated development of innovation carriers such as national and provincial laboratories, large scientific installations, scientific research institutions, and industrial innovation platforms in the field of shipbuilding and marine engineering equipment, and actively strive to create various national-level innovation platforms. Promote universities such as Ocean University of China, China University of Petroleum (East China), Shandong University, Harbin Institute of Technology (Weihai), Harbin Engineering University Yanqing Base, Qingdao Marine Science and Technology Pilot National Laboratory, Weihai Electronic Information Technology of the Ministry of Industry and Information Technology Research institutes such as the Comprehensive Research Center, China Academy of Ocean Engineering (Qingdao), Shandong Academy of Sciences Marine Instrumentation Institute, Shandong Academy of Marine Sciences, Shandong Marine Information Technology Research Institute, Shandong Ship Technology Research Institute and other research institutes have given full play to the field of marine equipment It serves as the origin and leading role of original technologies, strengthens research on key common technologies in the industry, and cultivates a number of major innovation achievements. Promote enterprise innovation platforms such as China State Shipbuilding Corporation Marine Equipment Research Institute, CIMC Offshore Engineering Research Institute, Shandong Ship and Offshore Engineering Equipment Innovation Center, Shengli Petroleum Engineering Co., Ltd. Drilling Technology Research Institute to better serve enterprises and integrate upstream and downstream enterprises Innovation resources stimulate the vitality of enterprise innovation entities and promote the integration and innovation of large and medium-sized enterprises.

3. Promote collaborative innovation among industry, academia, and research. Give full play to the main role of enterprises in innovation, further improve the collaborative innovation mechanism of industry, academia and research, and support universities, colleges and enterprises to build joint laboratories, industry technology innovation centers, collaborative innovation centers, entrepreneurship and innovation communities and other innovation platforms in the field of shipbuilding and marine engineering equipment. , strive to integrate user resources, policy resources, innovation resources and application scenario resources, build an operation and management model for collaborative research and deep integration, promote the implementation of a number of forward-looking and strategic major science and technology projects, and promote the transformation of scientific and technological achievements, new technologies and

new technologies. Product demonstration applications and key technology collaborative research will guide domestic and foreign superior innovative resources in the field of shipbuilding and offshore engineering equipment to gather high-quality enterprises in the province.

4. Stimulate the innovation vitality of talents. Focusing on the development needs of the shipbuilding and marine engineering equipment industry, strengthen the construction of characteristic colleges and disciplines in the field of shipbuilding and marine engineering equipment in ordinary universities in our province; encourage the development of various forms of vocational training, support the identification of vocational skill levels, and give full play to the province's new and old momentum to transform the public It serves as a training base to cultivate innovative, compound and applied talents. We will improve and establish an incentive mechanism that is tailored to local conditions and talents, strictly implement the "Green Channel Regulations for High-level Talent Services", and increase support in the Taishan Industry Leading Talent Project Blue Talent Special Project and the Enterprise Management Talent Special Project. Promote the connection of career development channels for highly skilled talents and professional and technical talents, and improve the treatment of skilled talents. Support the introduction of domestic and foreign leading talents and top teams to develop in Shandong and create a talent gathering highland.

(2) Manufacturing model transformation actions

5. Accelerate the development of digital shipbuilding. Support enterprises to develop intelligent manufacturing, focus on ship segment manufacturing, improve digital design capabilities, optimize key manufacturing processes and processes such as cutting, welding, and painting, focus on breakthroughs in key processes and manufacturing equipment, and accelerate the advancement of digital production lines, digital workshops, and digitalization Factory construction. Promote the construction of industry-specific industrial Internet platforms, promote the application of big data, cloud computing, 5G communications, artificial intelligence and other technologies in enterprise production, operations, management and marketing, and promote the development and application of independent industrial software.

Column 6 Digital shipbuilding

1. Improve the digitalization level of ship assembly and construction. Research and formulate intelligent shipyard system solutions based on advanced technologies such as industrial Internet of Things, machine vision, machine haptics, and intelligent algorithms to

increase the interconnection of data between design, process, and management software to achieve transparency in the production process, standardization of management processes, and Intelligent decision-making and analysis, and building a number of digital, networked, intelligent equipment, production lines and workshops in major production processes such as cleaning, plate processing, welding, and painting.

2. Build an industry industrial Internet platform. Promote the internal platforms of key enterprises to improve their various functions, realize the full life cycle of internal projects and interconnection and online collaboration between external upstream and downstream customers, cultivate 1-2 industrial Internet platforms for the shipbuilding and offshore engineering equipment industry, and enhance the digitalization and Intelligent and networked level.

3. Promote the intelligent ship plate processing center model. In response to the ship plate processing needs of shipbuilding enterprises, develop and promote new key technology and equipment for three-dimensional cold bending of ship curved plates, realize intelligent ship plate design, processing, and inspection, explore and carry out intelligent processing and distribution services, and improve the efficiency of ship construction and plates in the entire industry. Utilization.

4. Promote the development and application of independent industrial software. Demand-oriented, guide universities and enterprises to develop software in terms of design analysis, construction and installation, operation and maintenance management, etc., to solve the underlying key technologies and "stuck neck" problems, from functional modules, system architecture, data standards, user application experience At other levels, establish industry data standards, underlying core technologies and unified software architecture, promote intelligent applications throughout the product life cycle, and improve the level of independent controllability of industrial software in the shipbuilding and offshore engineering equipment industry.

6. Comprehensively promote green shipbuilding. Implement green manufacturing specifications and standard systems in the shipbuilding industry and guide enterprises to develop in the direction of high efficiency, low carbon and recycling. Encourage shipbuilding enterprises to upgrade and transform high-energy-consuming and high-emission equipment, accelerate the promotion and application of energy-saving and environmentally friendly materials and equipment in manufacturing processes such as material processing, welding and painting, build

green factories, promote clean energy factory demonstrations, and reduce energy consumption and pollution. Promote the application of green surface paint removal, rust removal, and decontamination technologies such as ultra-high-pressure water, laser, and ultrasonic waves. Strengthen the prevention and control of pollution such as waste gas, waste water, noise, and solid waste, and continuously improve the level of environmental protection management. Encourage the promotion of distributed control and other technologies, implement dynamic monitoring, control and optimization management of energy consumption, and achieve digitalization and refinement of energy management.

Column 7 Green Shipbuilding

1. Carry out green design. Carry out research on the entire process of green ship design, manufacturing, and management, and carry out green design focusing on ship type, structure, functional redundancy, energy saving, and rational selection of materials.

2. Promote green products. Adopt green process technology and equipment, increase the use of energy-saving and emission-reduction technologies, promote the use of green and environmentally friendly materials, and improve the waste reuse rate in the shipbuilding industry.

3. Strengthen green management. Promote upgrading in the direction of environmental protection and energy saving, improve the production efficiency and safety factor of enterprises, and create a number of green factories, green supply chain management demonstration enterprises and green design products.

7. Accelerate the development of service-oriented manufacturing. With the goal of improving shipbuilding efficiency, quality and benefits, and customer demand as the guide, we promote innovation in construction models and build comprehensive services covering the entire process of ship design, shipbuilding ordering, ship construction, product testing, production management and post-delivery services. The system has transformed from a single product offering to a "product + service" model. Accelerate the development of producer services for the shipbuilding and marine engineering equipment industry, improve the industrial chain collaborative service system, and actively develop research and development experiments (tests), engineering technology, installation and commissioning, comprehensive integration, marine network and information operations, technology transfer, and scientific and technological consulting Waiting for service. Cultivate market-oriented service organizations and improve

service levels around industrial Internet, R&D and design, digital empowerment, brand building, online marketing, management consulting, supply chain finance, talent training, etc.

(3) Industrial chain optimization actions

8. Create a modern industrial chain. Adhere to planning along the chain, focus on forging strong areas and making up for weak areas, accelerate the modernization of the industrial chain, and enhance the industrial chain support capabilities. In accordance with the overall idea of "building strong chains, building characteristic chains, extending service chains, and supporting supporting chains" and the development focus of "7+2+2+1", we will focus on optimizing large bulk carriers, high-end ro-ro passenger ships, and ocean-going fishing vessels. , special cruise ships and yachts, green inland river ships, offshore oil and gas exploration equipment, and marine power equipment. We have conquered a number of key supporting technologies and equipment to further consolidate and enhance the core competitiveness of final assembly and construction. Focusing on the "chain construction" of two emerging characteristic industries, namely deep-sea aquaculture equipment and offshore wind power equipment, we will strengthen the cultivation of the entire industry chain and build the country's leading deep-sea aquaculture and offshore wind power industry cluster. Focusing on the "extended chain" of improving the two capabilities of R&D, design and service support, we will further enhance the design capabilities of ships and offshore engineering equipment, and improve the level of financing services and after-sales support. Focusing on building a "replenishing chain" of supporting systems with strong supporting capabilities, we will strengthen technological research on "stuck necks" in the fields of deck machinery, communication equipment, high-strength steel, drilling systems, dynamic positioning systems, and underwater equipment, and cultivate marine engines. , ballast water treatment systems, marine crankshafts, marine ropes, lead-acid power batteries, anti-corrosion materials and a number of characteristic ancillary products, striving to create an advantageous industrial cluster for supporting products for ships and offshore engineering equipment.

9. Improve the industrial chain promotion mechanism. Comprehensively implement the "chain leader system" working mechanism, give full play to the role of the province's shipbuilding and marine engineering equipment industry chain community, improve "chain owner" enterprise-led consultations, alliance unit cooperation and exchanges, industry-university-research collaboration and other working mechanisms to jointly discuss Propose

industrial chain cooperation projects, determine a list of key products (technologies), and jointly build an industrial chain service system. Relying on the industrial chain community and the "chain leader system", we will further enhance the driving force and competitiveness of the "chain owner" enterprises, expand and integrate the upstream and downstream resources of the industrial chain, and work together to create government guidance and support, large and medium-sized enterprises to cooperate with each other, user units, and general assembly A good industrial ecology with coordinated and linkage between units and supporting units, and close collaboration between universities, scientific research institutes, innovation platforms, and industry associations.

(4) Quality brand cultivation actions

10. Continuously improve product quality levels. Consolidate the technical infrastructure of quality standards, improve the level of standardization and measurement support capabilities, strengthen the certification and accreditation of systems, equipment and measurement facilities related to quality and safety and the construction of quality informatization, and promote the establishment of quality management systems and technologies covering the entire life cycle of products Standard specification system. Strengthen the precision management of the design and construction process, strengthen product quality monitoring and on-site monitoring of the production process, develop a remote operation and maintenance platform that monitors the real-time operating status of equipment, research equipment self-diagnosis and fault warning system platforms, and realize product after-sales quality tracking management and services.

11. Launch the "Shandong Offshore Engineering" brand. Aiming at market demand, we develop products in large bulk carriers, ocean-going fishing vessels, high-end ro-ro passenger ships, luxury yachts, offshore wind power installation ships, floating offshore wind power equipment, deep-sea aquaculture equipment, offshore oil and gas drilling platforms, floating production storage and offloading devices, Create a number of internationally renowned brands with advanced technology, cost-effectiveness, efficient construction, excellent quality, and high credibility in the fields of offshore engineering work ships and auxiliary ships, and expand brands in core supporting fields such as new fuel marine engines and ballast water treatment systems. Influence. Guide qualified enterprises to continuously improve overseas marketing service channels and global service systems and build brand images. Enterprises are encouraged to adopt various methods to integrate brands, develop brand communication channels, and

expand brand influence. Actively learn from the experience of well-known exhibitions in the field of marine equipment such as Shanghai Maritime Exhibition and Dalian Maritime Exhibition to create a Shandong shipbuilding and marine engineering equipment exhibition with strong influence at home and abroad.

(5) Actions to expand openness and cooperation

12. Increase the intensity of “bringing in”. On the basis of the existing layout of central enterprises such as China State Shipbuilding Corporation, CIMC, China Merchants Group, and China National Offshore Oil Corporation in our province, we will increase the industrial layout of central enterprises in the province and expand the breadth and scope of cooperation with central enterprises. depth. Rely on existing international cooperation platforms, actively connect global innovation resources, promote international cooperation in cutting-edge industrial technologies, and encourage overseas companies and scientific research institutions to establish global R&D institutions in our province. Encourage enterprises and scientific research institutes in the province to carry out joint design, technical exchanges and cooperation and talent training with relevant foreign institutions.

13. Accelerate the pace of “going out”. Give full play to the role of the free trade pilot zone, enhance the level of international cooperation in the field of marine equipment, deepen regional economic cooperation between China, Japan and South Korea, strengthen complementation of advantages, and explore joint development of third-party markets. Seize the opportunities of the “Belt and Road” construction and the new round of opening up, continue to implement the “going out” strategy, encourage key enterprises to acquire or acquire shares of foreign enterprises and R&D institutions, invest and build factories overseas, establish overseas R&D centers, experimental bases and global Marketing and after-sales service system.

6. Safeguard measures

(1) Strengthen organizational leadership

Under the overall leadership of the Provincial Party Committee's Marine Development Committee, the shipbuilding and marine engineering equipment industry will be regarded as one of the province's strategic industries for the conversion of new and old kinetic energy and the high-quality development of the marine economy, and further improve the provincial high-end equipment special class and modern marine industry special class and the "chain length system" working mechanism of the shipbuilding and offshore engineering equipment industry chain,

strengthen communication and connection between departments, strengthen guidance and supervision of plan implementation, and coordinate and solve major issues in the development and mechanism innovation of the shipbuilding and offshore engineering equipment industry. Relevant provincial departments and relevant cities must clarify the division of responsibilities in accordance with the goals and tasks determined in the plan, further study and refine policies and measures to support industry development, form a joint effort, and promote the implementation of the plan.

(2) Increase policy support

Implement national policies and measures to support the development of the shipbuilding and marine engineering equipment industry, support enterprises in undertaking major national projects, and strive to create a national innovation platform. Make full use of the national and provincial first, first batch, and first edition insurance compensation policies to promote the industrial application of scientific and technological achievements. Strengthen provincial policy coordination, increase support for the fields of ships and marine engineering equipment in terms of major scientific and technological innovation projects, technological innovation centers and marine engineering technology collaborative innovation center cultivation, and prioritize those that meet the conditions to be included in major provincial projects, new and old provincial projects Kinetic energy conversion preferred project. Give full play to the driving role of industrial guidance funds such as the Provincial New and Old Kinetic Energy Conversion Fund and the Land-Sea Linkage Investment Fund to attract venture capital to increase investment in the field of ships and marine engineering equipment. Support shipbuilding companies and shipowners to jointly carry out ship research and development, construction and operation, explore the establishment of long-term and stable upstream and downstream cooperation mechanisms with steel companies, deepen cooperation in the fields of technology research and development, product promotion and application, and form a risk-sharing, mutually beneficial and win-win situation community of interests.

(3) Improve financial services

Improve the government-finance-enterprise cooperation mechanism, regularly promote high-quality projects to banks, fund companies and other financial institutions, encourage innovative financial products and services in the field of ships and offshore engineering equipment, and implement differentiated credit and other policies. Deeply implement the

"Shandong Province Ship Mortgage Financing Measures Under Construction" and further expand the scope of financing enterprises. Promote the listing and financing of key enterprises, issue various bond financing instruments, optimize the financing structure, and enhance the potential for enterprise development. Give full play to the role of export credit insurance, reasonably reduce premiums, and actively protect the risk of order cancellation before shipment. Encourage enterprises to use RMB for pricing and settlement in foreign trade and related investment and financing activities to reduce exchange rate risks and exchange costs.

(4) Create a good environment

Strengthen coordination and interaction between departments and units such as transportation, maritime affairs, agriculture and rural areas, natural resources, industry and information technology, and classification societies, increase innovation in systems and mechanisms such as ship inspection, maritime management, and integrated maritime registration, and optimize approvals process to improve service efficiency; improve the construction inspection, registration management, and maritime transportation management systems of new marine engineering equipment such as offshore platforms, deep-sea intelligent breeding cages, and breeding work ships. Implement the national shipbuilding industry statistical survey system, strengthen the monitoring and analysis of the operation of the shipbuilding and offshore engineering equipment industry, and establish and improve the industry early warning mechanism. Strictly implement work safety and ecological environment protection responsibilities, and promote safe and green development of the industry. Support industry organizations such as the Shandong Shipbuilding Industry Association to play their role and create a new think tank that serves government decision-making and industry development, a new professional service provider for industrial chains and industrial clusters, and a resource integration platform for open cooperation and sharing.

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山东省船舶与海洋工程装备产业发展“十四五”规划

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船舶与海洋工程装备是认识海洋、经略海洋的重要支撑，是我省现代海洋产业体系的重要组成部分，对加快推动新时代海洋强省建设具有重要意义。为认真落实党中央、国务院关于海洋强国部署要求和《山东省国民经济和社会发展第十四个五年规划和2035年远景目标纲要》《山东省“十四五”制造强省建设规划》，结合我省船舶与海洋工程装备产业实际，制定本规划，规划期由2021年至2025年。

一、现状与形势

（一）发展现状

产业转型步伐不断加快。据统计，2020年全省船舶与海洋工程装备行业实现营业收入450.6亿元，列江苏、上海之后，居全国第三位。全省造船完工量、新接订单量、手持订单量，分别占全国的8.3%、4.7%、7.9%。大型散货船、豪华客滚船建造能力不断提升，游艇出口量约占全国的50%，先后交付了新一代40万吨超大型矿砂船首制船“天津”号、大型豪华客滚船“中华复兴”号等一批国际领先船型。海洋油气装备总装建造水平进一步提升，深水半潜式钻井平台交付量占全国的78%，建造了国内首座适合北极海域作业的深水半潜式钻井平台“维京龙”号，世界最大吨位浮式生产储卸油装置“P70”和国内最大作业水深浮式生产储卸油装置“海洋石油119”在我省总装交付；参与实施中俄亚马尔液化天然气项目，液化天然气核心工艺模块建造能力显著增强。向新型海洋工程装备领域加速转型，交付“深蓝1号”“长鲸1号”等8座具有标志性的深远海渔业养殖装备；全国首座综合性现代生态海洋牧场综合体平台“耕海1号”、国内首个海上航天发射平台在我省投入使用。

产业创新能力不断增强。船舶与海洋工程装备产业科技支撑能力进一步提升，青岛海洋科学与技术试点国家实验室、中国船舶集团海洋装备研究院、中国海洋工程研究院（青岛）等行业内重大创新平台在山东布局。建造了一批“国之重器”和重大装备，“蓝鲸1号”“蓝鲸2号”成功承担我国南海可燃冰试采任务，标志着我国深水油气勘探开发能力进入世界先进行列；实施“透明海洋”“问海计划”等重大工程，蛟龙号、向阳红01、科学号以及海龙号、潜龙号等深海科考探测装备投入使用。

配套供应体系持续完善。省内重点配套产品取得突破，低速柴油机、甲板机械和船用曲轴等大型铸锻件产品研制能力大幅提升，中高速船用柴油机、综合电力推进系统等配套设备成功推向市场，内河沿海船用发动机占据国内60%以上的市场份额，突破了天然气发动机国家二阶段排放关键技术，成功配套长江运输船；三维数控弯板机成功解决了复杂曲面多维度板材冷弯加工“卡脖子”关键技术，达到世界领先水平；船舶压载水处理系统国际市场占有率35%，船用涡轮增压器、船用电动机、海洋工程装备专用软管、锚链、绳索、铅酸动力电池、气囊、防腐材料等产品具有较强市场竞争力。

集聚发展水平显著提升。青岛、烟台、威海三大船舶与海洋工程装备制造基地加快发展，产值占全省的70%以上，产业集中度进一步提升。青岛形成了船舶与海洋工程装备总装建造企业与配套企业协同发展态势，海西湾造修船集聚优势不断凸显；烟台海洋油气资源开发装备、新型海洋工程装备协调发展，形成了全国领先的海洋工程装备研发制造产业集群；威海形成了高端客滚船、远洋渔船及游艇等特色产品集聚区；济宁内河船舶基地加快发展，形成了长江以北最大的内河船舶产业集群；济南、青岛、淄博、潍坊船用动力装备产业加速壮大，东营海洋油气装备产业加快集聚。

政策支持力度不断加大。先后出台《关于山东省船舶工业深化结构调整加快转型升级的实施意见》《山东省建造中船舶抵押融资办法》《山东省高端装备制造业发展规划（2018-2025年）》《山东省海洋强省建设行动方案》等一系列政策文件，建设了一批企业技术中心、技术创新中心、海洋工程技术协同创新中心和国家级绿色工厂，培育了一批制造业单项冠军企业、专精特新和小巨人企业，先后争取国家高技术船舶科研计划、首台（套）重大技术装备保险补偿等多项政策支持。

（二）存在问题

创新能力不强。核心研发设计能力不足，基础共性技术研究不够系统深入，仍以跟随模仿为主，高性能关键零部件或系统依赖进口；省内创新资源分散，协同创新能力不足，产学研用合作互通机制仍不完善；新技术、新材料、新产品产业化应用滞后。**产品结构不优。**与江苏、上海等省市相比，高附加值船型较少，缺乏大型集装箱运输船、大型气体运输船等高端船型建造能力；配套产业规模小、产品种类少，关键配套设备与国内外先进水平差距较大。**造船效率不高。**高端船型设计能力不强，生产制造数字化水平较低，分段总组率不高；设计、制造与生产管理一体化水平较低，全生命周期管理能力薄弱。**产业链衔接不畅。**省内缺少畅通的产业链上下游协同配套机制，总装建造企业与材料、零部件以及配套企业和航运公司等船东、港口企业衔接不够。**人才制约突出。**行业吸引力不强，掌握关键技术的专业人员流失严重，战略型人才、复合型工程人才缺乏，招工难、用工贵、留人难的问题突出。

（三）面临形势

习近平总书记在参加十三届全国人大一次会议山东代表团审议时强调，“要加快建设世界一流的海洋港口、完善的现代海洋产业体系、绿色可持续的海洋生态环境，为海洋强国建设作出贡献”。“十四五”时期是我省加快海洋强省建设的关键时期，船舶与海洋工程装备产业发展面临新形势新任务。

一是国际环境深刻变化对船舶与海洋工程装备产业产生新影响。全球贸易和产业分工格局深刻调整，船舶与海洋工程装备领域中日韩三足鼎立、竞争加剧态势明显；欧美掌握研发、设计和关键配套装备核心技术，产业链“卡脖子”风险上升，供应链安全问题凸显；国际海事组织安全环保新标准新规范不断推出，能源低碳转型趋势明显，产品更新换代步伐加快；原材料价格大幅上涨、人民币升值、劳动力成本持续上升等因素对企业的盈利和生存能力造成严重威胁。同时，全球经济复苏，航运市场恢复，新船订单增长，集装箱船、液化天然气船、浮式生产储卸油装置需求强劲，为产业发展带来新机遇。

二是加快构建新发展格局对海洋经济高质量发展提出新要求。加快构建以国内大循环为主体、国内国际双循环相互促进的新发展格局，要求船舶与海洋工程装备产业既要继续深耕海外市场，同时要充分挖掘国内市场，培育新的增长点，优化产品和业务结构，增强企业内生动力，降低外部市场环境带来的冲击。随着我国“碳达峰、碳中和”战略的实施，“绿色低碳”已经成为全行业的“必选项”和“入场券”。深海、极地和南海资源开发、海洋权益维护形势日益紧迫，海洋强国、制造强国、交通强国等战略深入实施，对我国船舶与海洋工程装备产业加强科技自立自强、完善产业链供应链体系、全面提升设计建造和管理水平提出了更高要求。

三是新时代海洋强省建设为船舶与海洋工程装备产业发展带来新机遇。山东最大的优势在海洋，最大的潜力在海洋。近年来，山东坚定不移实施海洋强省战略，明确提出“十四五”时期“建设完善的现代海洋产业体系”“推动海洋高端装备制造核心设备自主化，打造世界领先的海工装备制造基地”。山东自然条件优越，海洋科研和产业基础雄厚，海洋油气、港口运输、海洋渔业、海上风电、海洋文旅等方面优势明显，聚集了中国船舶集团、中国海洋石油集团、招商局集团、中集集团、中远海运集团等一批海洋装备领域的大型央企，山东海洋集团正发展成为国内领先的综合性海洋产业集团。“一带一路”、黄河流域生态保护和高质量发展、山东新旧动能转换综合试验区、中国-上海合作组织地方经贸合作示范区、中国（山东）自由贸易试验区等国家战略在我省叠加，为山东打造国际领先的新型船舶与海洋工程装备产业基地、加快构建现代海洋装备产业体系、探索培育海洋经济发展新业态新模式提供了重大机遇。

二、总体思路

（一）指导思想

以习近平新时代中国特色社会主义思想为指导，全面贯彻党的十九大和十九届历次全会精神，深入落实习近平总书记视察山东重要讲话精神和重要指示要求，锚定“走在前列、全面开创”“三个走在前”，立足新发展阶段，完整、准确、全面贯彻新发展理念，主动服务和融入新发展格局，以深化供给侧结构性改革为主线，以改革创新为动力，认真落实省委、省政府新一轮海洋强省建设行动部署，坚持面向国家战略需求、面向海洋强省发展主战场、面向人民群众对海洋的向往和需要，瞄准深海、极地、绿色、智能发展方向，着力攻克一批满足国家战略需求的“国之重器”和“卡脖子”技术装备，着力打造结构合理、特色鲜明的新型海洋工程装备产品体系，着力构建绿色智能、集约高效、安全环保的建造体系，着力完善产需衔接、龙头带动、配套协作的产业链协同发展机制，全力打造山东半岛高端船舶与海洋工程装备产业聚集区，打响“山东海工”品牌，把山东建设成为我国环渤海地区船舶工业的重要支撑、全球领先的海洋工程装备研发制造基地，为海洋强国建设作出山东贡献。

（二）主要原则

需求牵引，突出特色。紧紧围绕国家战略需求、山东海洋强省发展需求以及人民群众对海洋的向往和需求，充分发挥山东海洋资源优势、科技人才优势、制造业基础优势、产业应用与市场需求优势，打造一批在全国、全球具有引领作用的新型海洋工程装备和高端船型，构建具有山东特色的船舶与海洋工程装备产品研发制造与示范应用体系。

创新引领，绿色发展。坚持以创新引领发展，强化产学研用协同创新，瞄准“安全、绿色、经济、舒适”方向，着力推动设计创新、技术创新、产品创新、管理创新，大力实施数字化提升和智能化制造。积极落实“双碳”战略，将“绿色”发展理念融入设计、建造、管理、服务全过程，以“绿色”标准要求倒逼行业变革、产品迭代和模式创新，坚定不移走绿色发展之路。

沿链布局，协同发展。着力完善“链长制”工作机制，进一步打造产业链共同体，加快产业链上下游融通发展。围绕产业链部署创新链，推进创新资源整合和要素合理配置，攻克一批关键技术和“卡脖子”技术装备，提升产业链供应链现代化水平。支持龙头企业做大做强，完善大中小企业协同发展机制，发挥总装建造带动作用，推动配套产业向高端攀升。

三核引领，多点支撑。聚焦打造山东半岛高端船舶与海洋工程装备产业聚集区，坚持陆海统筹、海陆联动，充分发挥青岛、烟台、威海三市在总装建造、产业配套、协同创新、示范应用等方面的核心引领作用，着力增强济南、淄博、东营、潍坊、济宁、泰安、日照、德州、聊城、滨州等市的配套支撑作用，加强区域互动交流，推进区域协同联动，避免同质竞争和重复布局。

（三）发展目标

到2025年，全省造船完工量、新接订单量、手持订单量保持在全国的10%以上，船舶与海洋工程装备产业规模保持在全国前三位。海洋工程装备产值占全国的30%左右，内河船舶占国内市场份额的50%左右，游艇出口占全国的70%左右，船舶与海洋工程配套装备产值年均增长率保持在10%左右。创新投入持续加大，规模以上骨干企业研发投入占销售收入的比重保持在3%以上，数字化、智能化建造水平不断提升，关键工艺流程数控化率达80%以上。大型集装箱运输船、大型气体运输船、高标准远洋渔船、绿色中大型高端客滚船、邮轮、豪华游艇、绿色智能内河船舶、新型江海直达船等高附加值船型实现突破，培育1-2型国际市场占有率超过35%的特色品牌产品，核心配套装备领域形成一批具有自主知识产权的品牌产品。海洋油气装备领先优势巩固提升，在海洋能源开发、海洋渔业、深海采矿、海上文旅、海上航天发射等新型海洋工程装备领域形成新的领先优势。

三、区域布局

（一）突出“三核引领”

青岛市：着力推动以海西湾为核心的船舶与海洋工程装备产业集群提档升级，进一步聚集国内外海洋装备领域优势创新资源，强化产业链上下游协作，积极开展试点示范，打造全球领先的综合性海洋装备创新基地。

烟台市：着力统筹芝罘区、高新区、蓬莱、海阳、龙口的岸线资源、产业基础和创新资源，进一步做优做强海洋油气开采装备和远洋渔船，加快海上风电、深远海养殖、海洋文旅等新型海洋工程装备发展，着力打造全球海工装备名城。

威海市：进一步巩固提升在高端客滚船、远洋渔船、游艇、绿色修船等方面的优势，充分发挥国家海洋综合试验场（威海）作用，大力发展海空天潜一体化系列装备，着力打造具有山东特色、国际知名的特色船舶与海洋装备制造基地。

（二）强化“多点支撑”

济南市、日照市着力发展船舶与海洋工程装备用钢、海上风电主轴、法兰、气囊等；淄博市、潍坊市着力发展船用动力装备、锚链、船用电子设备、海上风电齿轮箱关键零部件等；东营市、潍坊市着力发展海洋油气钻采装备和海上风电装备；泰安市着力发展绳

索、船板加工设备；济宁市着力完善集研发设计、总装建造、运营管理、维修保障为一体的内河船舶产业链，积极开展绿色智能内河船舶示范试点，打造全国领先的内河船舶产业基地；德州市着力发展海上风电叶片模具、船用电机等；聊城市着力发展高端游艇及配套产业；滨州市着力发展海上风电整机、叶片、主轴、大型铸件等风力发电全产业链装备，以及船舶用活塞、船舶用表面工程处理设备和锻件、海洋光伏组件和海洋油气开采管件，打造新能源装备千亿级产业集群。

四、发展重点

（一）特色高端船型

紧紧围绕海洋强省建设部署要求和我省基础优势，瞄准高技术、高可靠性、高附加值船舶，进一步提升船型开发、设计与建造能力。巩固提升大型散货船、高端客滚船、远洋渔船、平台供应船、高性能执法船等优势产品，加快发展大型气体运输船、中大型集装箱船、半潜船、多功能救援船、无人船、江海直达船等，突破发展极地船舶、大洋钻探船和多用途医疗船。推动内河船舶绿色化、智能化发展，推进新能源、清洁能源动力船舶示范应用，为推动老旧船舶更新改造、加快发展绿色航运提供装备保障。支持发展中小型邮轮，推动游艇消费大众化发展，更好满足社会日益增长的水上旅游需求。

专栏1 特色高端船型
1.三大主流船型。推广和应用综合节能、结构轻量化、极厚板/高强钢焊接、减振降噪、绿色能源动力等技术，研发清洁能源和节能环保等先进绿色环保技术新船型，打造绿色、节能、智能型的散货运输船、集装箱运输船、油品运输船三大主流船型自主品牌，提升大型散货船市场占有率，中大型油船实现船型设计与建造全覆盖，实现油气运输船和干支线集装箱运输船船型系列化、批量化，形成一定的品牌知名度。 **2.高端客滚船。**发展高端客滚船的总体设计、新材料、新能源动力、智能控制、减振降噪、舒适性、安全性等技术，提升高端客滚船自主设计建造能力，扩大品牌优势，打造高端客滚船谱系化产品，形成完善的产业链体系。 **3.远洋渔船。**发展远洋渔业船舶防结冰和自动除冰、冷链加工、储藏、运输、热能回收等技术，开发应用新材料、新能源的南极磷虾捕捞加工一体船、大型金枪鱼围网船、大型秋刀鱼鱿鱼钓船、冷藏运输加工船等远洋渔业装备。 **4.风电安装船。**发展风电安装船的船型总体设计、结构轻量化优化设计、齿轮受力均衡、快速拔桩系统优化、复杂工况耦合分析、新能源动力应用等关键技术，开发深水高效、适用于大功率风机安装的风电安装装备。 **5.汽车滚装运输船。**发展汽车滚装运输船的船型研发、构型和总布置、新能源动力应用、结构优化、车辆登离、车辆系泊固定、特殊环境下的装载稳定性等技术，推动车辆滚装运输船升级换代。 **6.极地船舶。**围绕极地航行、科考和运输需求，发展抗冰破冰、防冻防寒、应急处理、涂层防护、低温及破冰结构建造等关键技术，开发极地重型破冰船、新型极地运输成套装备和极地深远海勘探船。 **7.大洋钻探船。**开发具备海洋科考、海底资源钻探的深水科考钻探船，采用新能源及综合电力驱动系统，配备全回转推进和DP-3级动力定位系统，具备隔水管和无隔水管钻探作业能力。 **8.多用途医院船。**发展多用途医院船总体设计、专用空调通风、震动与噪声控制等技术，开发具有海上医疗救助等一体化多用途医院船。 **9.绿色智能内河船舶。**发展LNG动力、氢动力、氨动力、甲醇动力、电动及混合动力、磁悬浮泵等技术，开发节能、环保、经济、智能的内河船和江海直达船，为推动老旧内河船舶更新改造，构建新一代国内航运体系提供装备保障。 **10.邮轮游艇。**发展邮轮游艇的总体设计、高品质内饰材料、振动噪声控制、新能源动力应用、船体结构轻量化等关键技术，重点发展中小型豪华邮轮，推广游艇新材料应用，推动游艇大众化，构建设计、建造、配套、维修、安装、运营支持等全产业链发展体系。

（二）海洋能源装备

紧扣国家深海、极地等重大战略需求和我省海洋能源发展布局，推动钻采、处理等新技术、新装备的研发生产，提升深水半潜式钻井/生产平台、极地冰区平台、液化天然气浮式生产储卸装置（FLNG）、浮式生产储卸油装置（FPSO）、水下油气生产系统等成套装备的设计建造能力，加快推进海洋油气装备智能化发展，为深海油气资源开发提供有力保障。大力发展海上风电装备、海洋可再生能源装备、海水淡化综合利用平台，推动海上风电制氢、深水天然气水合物开发装备、海上碳捕捉及封存、清洁能源浮岛和海上浮式核电站平台等研制应用。

专栏2 海洋能源装备
1.深海极地油气资源开发装备。发展深水和极地平台的自主设计、大钻深钻井系统集成与控制技术、严寒钻采工艺、防冻防寒技术，完善相应规范和标准，提升国产配套能力，保持并持续扩大品牌影响力。发展海洋油气压裂系统布置和减振技术，开发海上压裂船。发展智能完井井下多层流动控制、水下全电智能控制和水下切割技术，开发海洋油气智能完井系统、水下全电采油树、海底泥浆举升装备、水下连接器和水下作业装备。突破永磁直驱电动钻具水下连续管钻井工艺和开采防砂技术，开发深水天然气水合物经济化开发海底钻采成套装备。 **2.浮式油气生产储卸装备。**发展FPSO、LNG-FPSO总体方案、总体船体结构和总体性能、原油/天然气处理工艺、处理装置设计及上部模块布置、系泊系

统与结构设计、天然气脱水技术、天然气回收零排放、天然气压缩液化及存储、流体振动与关键结构监测技术，提升国产配套能力和规范化建造水平。

3.海上风电装备。发展海上风电设计、建造、安装、运维等领域关键技术，开发大兆瓦级海上风机及深远海浮式风机、升压站、换流站、大型风电安装船和风电运维母船，提升叶片、主轴、法兰、轴承、塔筒、齿轮箱等配套装备制造水平，推动海上风电制氢、风光渔一体化等装备应用，形成完善的海上风电装备产业链。

4.海洋可再生能源装备。发展能量捕获、汇集与变换和智能化运维等关键技术，开发波浪能、潮流能、温差能、浮式光伏等大型结构物发电集成装置、小型化发电装置、电力变换装置等装备，打造集漂浮式综合电力系统设计、电力和淡水外输、能源集控和机组就/离位等技术的海上清洁能源浮岛，推动在海洋观测、海洋渔业等领域的应用，形成完善的海上可再生能源装备产业链。

5.海水淡化综合利用平台。围绕深层取水、海水淡化、苦咸水再利用及淡水外输技术的发展，开发建设海水淡化综合利用平台，推动海水淡化与综合利用研发设计、整机制造、装备集成、设备加工、关键材料部件与药剂生产、工程总包等相关产业融合发展。

6.海上浮式核电站平台。发展浮式核发电平台总体方案设计、结构和人员安全、防辐射、海洋防腐、智能控制、模块建造和整体安装、调试、运维等技术，制定浮式核发电平台设计及建造标准。

（三）新型海洋工程装备

围绕我国海洋经济发展新趋势和海洋资源开发新模式对海洋工程装备的新需求，积极开展新型海洋工程装备前沿性技术开发研究。加快大型海洋设施一体化安装和拆解装备、大洋钻探船、海上火箭发射平台等研制。加强深海、极地矿产开发技术储备，加快深海智能采矿装备、极地浮式矿产开发船等研制。围绕满足人民群众对优质海洋蛋白和亲近海洋的需求，有序推进深远海智能养殖网箱、大型养殖工船等深远海养殖装备研制和示范应用，推动养殖产业发展走向深远海；积极发展海上文旅综合体、水下观光装备等，提升海洋空间开发利用水平。

专栏3 新型海洋工程装备

1.深远海渔业养殖装备。开展深远海养殖装备的大型支撑结构设计、网衣系统安全设计、智能化养殖系统搭建、平台安全监控体系建立和高精度建造技术等研究，研发配备智能感知、网衣自动提升、自动投饵、水下监测、网衣清洗、成鱼回收等智能化装备和生产管理系统，发展新一代坐底式、半潜式、全潜式等大型深远海智能养殖网箱和大型养殖工船，实现生态绿色智慧养殖。

2.海上航天发射/回收平台/船。发展运载火箭海上发射与回收船/平台总体设计、稳性控制、振动冲击防护、燃料加注、远程控制等关键技术，开发固液兼容、发射与回收多功能于一体的专用船型并示范应用。

3.海上文旅综合体。发展海上透水结构物和海上文旅综合体总体设计、创意构型、立体感知网、舒适性、安全可靠性、生态养殖智能化和绿色建造等关键技术，开发小型水上交通工具、高端水上娱乐休闲装备、水上水下穿梭工具，打造集休闲旅游、绿色养殖、数字化运营于一体的海上文旅综合体，形成相应规范标准。

4.深海矿产资源开发装备。开展深海探测、采样、集矿系统的设计，发展智能感知、视觉与控制、智能监测等关键技术，突破采矿管先进材料、制造工艺、无损检测、安装铺设等技术，开发满足6000米海底探测、智能采样装备、集矿机和复合材料采矿管。

5.海洋设施安装拆解装备。开展海上安装、拆解施工作业关键技术研究，攻克海上施工作业多体耦合分析、波浪运动补偿、多体协同控制等关键技术，开发大型海洋设施一体化安装和拆解装备，提升我国重大工程海上施工作业能力。

（四）海洋智能装备

瞄准国家维护海洋权益重大需求和我省“智慧海洋”建设部署，加强新型海洋核心传感器、水下无人航行器、智能水下机器人等器件与装备研制，推进工程示范应用。加强船舶智能系统总体设计，重点突破智能感知和监测、网络与通信、智能航行、动力管控等关键技术，发展船舶全生命周期智能化管理，开发信息和控制高度集成的新型船用设备，提升船舶智能化水平。

专栏4 海洋智能装备

1.新型海洋核心传感器。采用“端、边、云”结合的模式，发展海洋水文、气象、动力、生态环境、水声以及激光、微波、重力、磁场等多要素测量、原位观测核心传感器关键技术研究，开发岸基、海面、水下及海底等核心传感器与高端仪器。

2.智能水下机器人。发展水下机器人功能设计、总体及收放等子系统的优化设计、智能感知与协同、绿色动力、高精度导航控制、路径规划、海底目标识别定位和制造工艺等关键技术，开发自主水下机器人（AUV）、有缆遥控水下机器人（ROV）等各场景智能观测和作业机器人及成套装备。

3.智能船舶。发展船舶智能方案设计、环境态势智能感知、智能航路规划、自主航行控制、数字孪生等关键技术，开发智能机舱、全电力集成、智能发动机、能效能量综合管控、智能风帆等核心部件/系统和新型高性能无人船，形成船岸一体化的船舶数据服务平台和船载智能监测处理终端，推广智能船舶在海洋观测、安全管理、节能减排等领域的应用。

4.海洋信息技术装备。加快5G等新一代信息技术装备在海洋领域的应用，大力发展海底探测、深海传感器、无人和载人深潜、海底通信定位等深海关键技术和设备，积极发展卫星、无人机、智能船、海洋遥感与导航等海上态势感知关键技术装备，推动海洋信息采集立体化、传输一体化、处理与呈现智能化、管控全过程可视化。

5.海洋人工智能装备。围绕海洋水文气象、电磁声场、资源环境等对人工智能技术装备的共性需求，研制自主可控、通专一体、云端融合、服务高效的智能计算装备，推动构建海洋智能平台“深海大脑”。

（五）船舶与海洋工程配套装备

全面推进船用动力、甲板机械、舱室、电力电气、通讯导航等船用系统装备研发。大力推动LNG动力船舶示范应用，有序推进甲醇、氨燃料、氢燃料、生物燃料等新型动力研发应用，加快船舶与海洋工程装备用超高强度钢、超低温结构钢、高性能合金、新型复合材料等关键材料的研发应用，大力发展特种涂料和焊接材料，提升本地化配套能力，壮大产业规模。大力推进海洋综合试验场、测试验证平台建设，为船舶与海洋工程装备研发和产业化提供有力支撑。

专栏5 船舶与海洋工程配套装备

1.船用动力装备。发展船用发动机新型动力燃料供给、碳捕集与处理、废气余热利用、甲烷逃逸治理、喷射系统控制和双燃料模式切换等技术，开发船用LNG与电池混合动力系统、LNG/柴油双燃料发动机、甲醇/柴油双燃料发动机、氨燃料发动机等新型动力装备，发展大功率中速船用柴油机和兆瓦级电力推进装置。

2.船舶与海洋工程装备高端材料。开发油气钻采装备、深海管线、海洋工程平台、深潜器的耐低温超低温材料、高性能海洋工程用钢和合金材料。发展环保、长效涂料制备技术，形成适用于船舶与海洋工程装备的新型高端防腐涂料体系。发展低密高强固体浮力材料技术和高性能深海钻井隔水管制造技术。开发热塑性复合材料深海智能采矿管、新型复合材料柔性管等产品。

3.船用压载水处理装备。发展压载水过滤、灭菌、控制与监测、流量传感等技术，开发符合新标准规范的船用压载水处理装备，提高核心部件国产化率，推进在国内沿海沿江船舶使用。

4.船用通讯导航系统。发展基于5G、北斗、天通等多模通讯融合技术，开发针对不同船型、不同应用场景的多模态智能通讯终端设备，推动电子海图与导航系统、自动舵等通讯导航和自动驾驶设备的应用。

5.其它船用配套装备。发展新型甲板机械、节能型机泵、抛丸设备、锚链、电机、线缆、索具等配套装备，开发涡流脉冲水射流清洗设备、大功率多自由度波浪补偿装置、大型离心式泥泵、新型海工平台用吊机、铝制直升机平台等新型配套装备。

6.海洋装备测试实验装置平台。建设船舶与海洋工程拖曳水池及综合水池、极端海洋全向流场水池、大型风浪流深水实验水池等工程实验水池，支撑装备创新设计与模型测试、水动力学机理探索和科学试验。

五、主要任务

（一）创新能力提升行动

1.开展关键技术攻关和产业化应用。面向国家重大战略需求，依托国家和省有关重大专项，攻克一批船舶与海洋工程装备领域“卡脖子”产品和关键核心技术。聚焦绿色、智能、深海、极地等发展方向，紧盯产业前沿和市场需求，重点围绕深海油气矿产资源开发装备、大型散货船绿色智能水平提升、绿色智能内河船舶、新型燃料船舶发动机、新型低速二冲程发动机、海上风电安装船、漂浮式海上风电、智能化深远海渔业养殖装备、船舶总装建造数字化转型、海洋装备测试与验证等领域开展研发创新活动，统筹基础研究、前沿技术和工程技术研发，推进科技成果转化与产业转型升级需求衔接，促进全产业链整体跃升。

2.构建多层次创新平台体系。推动船舶与海洋工程装备领域国家和省实验室、大科学装置、科研机构、产业创新平台等创新载体加快发展，积极争创各类国家级创新平台。推动中国海洋大学、中国石油大学（华东）、山东大学、哈尔滨工业大学（威海）、哈尔滨工程大学烟青基地等高校，青岛海洋科学与技术试点国家实验室、工业和信息化部威海电子信息技术综合研究中心、中国海洋工程研究院（青岛）、山东省科学院海洋仪器仪表研究所、山东省海洋科学研究院、山东海洋信息技术研究院、山东船舶技术研究院等科研院所发挥好海洋装备领域原创技术策源地和引领带动作用，强化行业关键共性技术攻关，培育一批重大创新成果。推动中国船舶集团海洋装备研究院、中集海洋工程研究院、山东省船舶与海洋工程装备创新中心、胜利石油工程有限公司钻井工艺研究院等企业创新平台更好发挥服务企业作用，整合上下游企业创新资源，激发企业创新主体活力，促进大中小企业融通创新。

3.推动产学研用协同创新。充分发挥企业创新主体作用，进一步健全产学研用协同创新机制，支持高校院所与企业围绕船舶与海洋工程装备领域共建联合实验室、行业技术创新中心、协同创新中心、创业创新共同体等创新平台，着力整合用户资源、政策资源、创新资源和应用场景资源，构建协同攻关、深度融合的运行管理模式，推进实施一批具有前瞻性、战略性的重大科技项目，促进科技成果转化、新技术新产品示范应用和关键技术协同攻关，引导船舶与海洋工程装备领域国内外优势创新资源向省内优质企业集聚。

4.激发人才创新活力。围绕船舶与海洋工程装备产业发展需要，加强我省普通高校船舶与海洋工程装备领域特色学院、学科专业建设；鼓励开展多种形式的职业培训，支持开展职业技能等级认定，发挥省新旧动能转换公共实训基地作用，培养创新型、复合型、应用型人才。完善建立因地制宜、因才制宜的激励机制，严格落实“高层次人才服务绿色通道规定”，在泰山产业领军人才工程蓝色人才专项、企业经营管理人才专项等方面加大支持力度。推动高技能人才与专业技术人才职业发展通道贯通，提高技能人才待遇。支持引进国内外领军人才、顶尖团队来山东发展，打造人才集聚高地。

（二）制造模式转型行动

5.加快发展数字化造船。支持企业发展智能制造，以船舶分段制造为重点，提升数字化设计能力，优化切割、焊接、涂装等关键制造工序和流程，重点突破关键工艺和制造装备，加快推进数字化生产线、数字化车间、数字化工厂建设。推动建设行业特色工业互联网平台，促进大数据、云计算、5G通信、人工智能等技术在企业生产、运营、管理和营销中的应用，推动自主化工业软件开发和应用。

专栏6 数字化造船
1.提升船舶总装建造数字化水平。研究制定基于工业物联网、机器视觉、机器触觉、智能算法等先进技术的智能船厂系统解决方案，加大设计、工艺、管理软件之间数据的互联互通，实现生产过程透明化，管理流程标准化、决策分析智能化，在清洗、板材加工、焊接、涂装等主要生产工艺流程上，建设一批数字化、网络化、智能化设备、生产线和车间。 **2.打造行业工业互联网平台。**推动骨干企业内部平台完善自身各项功能，实现公司内部项目全生命周期、外部上下游客户之间互联互通、在线协同，培育1-2家船舶与海洋工程装备行业工业互联网平台，提升行业数字化、智能化、网络化水平。 **3.推广船板智能化加工中心模式。**面向造船企业船板加工需求，研发推广新型船舶曲板三维冷弯成形关键技术装备，实现船板设计、加工、检测的智能化，探索开展智能化加工配送服务，提升全行业船舶建造效率和板材利用率。 4.**推动自主化工业软件开发和应用。**以需求为导向，引导高校和企业，面向设计分析、建造安装、运维管理等方面进行软件开发，解决底层关键技术及“卡脖子”问题，从功能模块、系统架构、数据标准、用户应用体验等层面，建立行业数据标准、底层核心技术和统一软件架构，推动产品全生命周期智能化应用，提升船舶与海洋工程装备行业工业软件自主可控水平。

6.全面推行绿色造船。落实船舶行业绿色制造规范与标准体系，引导企业向高效、低碳、循环方向发展。鼓励造船企业升级改造高耗能高排放设备，在材料加工、焊接和涂装等制造环节加快推广应用节能环保材料和设备，建设绿色工厂，推动清洁能源的厂区示范，降低能耗和污染。推动超高压水、激光、超声波等绿色表面除漆、除锈、除污技术应用。强化废气、废水、噪声、固体废物等污染防治，不断提升环保治理水平。鼓励推广分布式控制等技术，实施能源消耗动态监测、控制和优化管理，实现能源管理数字化和精细化。

专栏7 绿色造船
1.开展绿色设计。开展绿色船舶设计、制造、管理的全过程研究，围绕船型、结构、功能冗余、节能以及材料的合理选用开展绿色设计。 **2.推广绿色产品。**采用绿色工艺技术与装备，加大节能减排技术使用，推广使用绿色环保材料，提高船舶制造业的废物再利用率。 **3.加强绿色管理。**推动向环保节能型方向升级换代，提高企业的生产效率和安全系数，打造一批绿色工厂、绿色供应链管理示范企业和绿色设计产品。

7.加快发展服务型制造。以提升船舶建造效率、质量和效益为目标，以客户需求为导向，推进建造模式创新，构建涵盖船舶设计、造船订货、船舶建造、产品试验、生产管理和交船后服务等全过程的综合服务体系，由单一提供产品向“产品+服务”模式转变。加快发展面向船舶与海洋工程装备产业的生产性服务业，完善产业链协同服务体系，积极发展研发实验（试验）、工程技术、安装调试、综合集成、海洋网络与信息运营、技术转移、科技咨询等服务。培育市场化服务机构，围绕工业互联网、研发设计、数字赋能、品牌建设、网络营销、管理咨询、供应链金融、人才培养等方面提升服务水平。

（三）产业链条优化行动

8.打造现代化产业链。坚持沿链谋划，着力锻长板、补短板，加快提升产业链现代化水平、增强产业链保障能力。按照“建造强链、特色建链、服务延链、配套补链”的总体思路和“7+2+2+1”发展重点，着力围绕做优大型散货船、高端客滚船、远洋渔船、特色邮轮和游艇、绿色内河船舶、海洋油气开采装备、船用动力设备7个优势产业“强链”，攻克一批关键配套技术装备，进一步巩固提升总装建造核心竞争力。围绕做大深远海养殖装备、海上风电装备2个新兴特色产业“建链”，强化全产业链培育，打造全国领先的深远海养殖和海上风电产业集群。围绕提升研发设计、服务保障2个能力“延链”，进一步增强船舶与海洋工程装备设计能力，提升融资服务、售后保障水平。围绕构建1个支撑能力强的配套体系“补链”，加强甲板机械、通导设备、高强度用钢、钻井系统、动力定位系统、水下设备等领域“卡脖子”技术攻关，培育船用发动机、压载水处理系统、船用曲轴、船用绳索、铅酸动力电池、防腐材料等一批特色配套产品，着力打造船舶与海洋工程装备配套产品优势产业集群。

9.完善产业链推进机制。全面推行“链长制”工作机制，发挥好全省船舶与海洋工程装备产业链共同体作用，完善“链主”企业牵头会商、联盟单位合作交流、产学研协同推进等工作机制，共同会商提出产业链合作项目、确定重点攻关产品（技术）清单、共建产业链服务体系。依托产业链共同体和“链长制”，进一步提升“链主”企业的带动力和竞争力，拓展整合产业链上下游资源，聚力打造政府引导支持，大中小企业相互协作，用户单位、总装单位、配套单位协调联动，高校、科研院所、创新平台、行业协会紧密协同的良好产业生态。

（四）质量品牌培育行动

10.不断提升产品质量水平。夯实质量标准技术基础建设，提升标准化水平和计量保障能力，加强对涉及质量安全的体系和装备、计量设施的认证认可工作和质量信息化建设，推动建立覆盖产品全生命周期的质量管理体系和技术标准规范体系。加强设计建造环节精度管理，强化产品质量监测和生产过程的现场监控，开发监控设备实时运行状态的远程运维平台，研究设备自诊断及故障预警系统平台，实现产品售后质量跟踪管理与服务。

11.打响“山东海工”品牌。瞄准市场需求，在大型散货船、远洋渔船、高端客滚船、豪华游艇、海上风电安装船、漂浮式海上风电装备、深远海养殖装备、海洋油气钻井平台、浮式生产储卸油装置、海洋工程作业船和辅助船等领域打造一批技术先进、成本经济、建造高效、质量优良、有较高信誉度的国际知名品牌，扩大新型燃料船用发动机、压载水处理系统等核心配套领域品牌影响力。引导有条件的企业不断完善海外营销服务渠道和全球服务体系，打造品牌形象。鼓励企业采取多种方式整合品牌，开拓品牌传播渠道，扩大品牌影响力。积极借鉴上海海事展、大连海事展等海洋装备领域知名展会经验，打造在国内外具有较强影响力的山东船舶与海洋工程装备展会。

（五）开放合作扩大行动

12.加大“引进来”力度。在中国船舶集团、中集集团、招商局集团、中国海洋石油集团等中央企业在我省现有布局的基础上，加大中央企业在省内的产业布局力度，拓展与中央企业合作的广度和深度。依托已有国际合作平台，积极对接全球创新资源，推动产业前

沿技术国际领域合作，鼓励境外企业和科研机构在我省设立全球研发机构。鼓励省内企业、科研院所与国外相关机构开展联合设计、技术交流合作和人才培养。

13.加快“走出去”步伐。发挥自贸试验区作用，提升海洋装备领域国际合作水平，深化中日韩区域经济合作，强化优势互补，探索共同开拓第三方市场。抢抓“一带一路”建设和新一轮扩大开放机遇，持续实施“走出去”战略，鼓励骨干企业并购或参股国外企业和研发机构，在海外投资建厂、建立海外研发中心、实验基地和全球营销及售后服务体系。

六、保障措施

（一）加强组织领导

在省委海洋发展委员会的统筹领导下，将船舶与海洋工程装备产业作为全省新旧动能转换和海洋经济高质量发展的战略性产业之一，进一步完善省高端装备专班、现代海洋产业专班和船舶与海洋工程装备产业链“链长制”工作机制，加强部门间沟通衔接，强化对规划实施的指导和监督，统筹解决船舶与海洋工程产业发展与机制创新中的重大问题。省直有关部门和有关市要按照规划确定的目标任务，明确责任分工，进一步研究细化支持行业发展的政策措施，形成工作合力，推进规划落地实施。

（二）加大政策扶持

落实国家支持船舶与海洋工程装备产业发展的政策措施，支持企业承担国家重大专项，争创国家级创新平台。用足用好国家和省首台套、首批次、首版次保险补偿政策，促进科技成果产业化应用。加强省内政策统筹，在重大科技创新工程、技术创新中心和海洋工程技术协同创新中心培育等方面，加大对船舶与海洋工程装备领域的支持力度，符合条件的优先纳入省重大项目、省新旧动能转换优选项目。发挥省新旧动能转换基金、陆海联动投资基金等产业引导基金带动作用，吸引风险投资加大对船舶与海洋工程装备领域的投入。支持造船企业和船东用户联合开展船舶研发、建造、运营，探索与钢铁企业建立长期稳定的上下游合作机制，深化在技术研发、产品推广应用等领域的合作，形成风险共担、互利共赢的利益共同体。

（三）完善金融服务

完善政金企合作机制，定期向银行、基金公司等金融机构推送优质项目，鼓励在船舶与海洋工程装备领域创新金融产品和服务，实施差别化授信等政策。深入落实《山东省建造中船舶抵押融资办法》，进一步扩大融资企业范围。推进骨干企业上市融资、发行各类债券融资工具，优化融资结构，增强企业发展后劲。充分发挥出口信用保险作用，合理降低保费，积极保障出运前订单被取消的风险。鼓励企业在对外贸易及相关投融资活动中使用人民币计价结算，降低汇率风险，减少汇兑成本。

（四）营造良好环境

加强交通运输、海事、农业农村、自然资源、工业和信息化、船级社等部门、单位的协调联动，在船舶检验、海事管理、海域一体化登记等体制机制方面加大创新力度，优化审批流程，提升服务效率；完善海上平台、深远海智能养殖网箱、养殖工船等新型海洋工程装备建造审验、登记管理以及海上交通运输等管理制度。落实国家船舶工业统计调查制度，加强船舶与海洋工程装备产业运行监测分析，建立完善产业预警机制。严格落实安全生产、生态环境保护工作责任，推动行业安全绿色发展。支持山东省船舶工业行业协会等行业组织发挥作用，打造成为服务政府决策和行业发展的新型智库、面向产业链和产业集群的新型专业化服务商、开放合作共享的资源整合平台。

相关信息

- 山东新增13个省级战略性新兴产业集群
- 【部门解读】《山东省虚拟现实产业高质量发展三年行动计划（2022-2024年）》解读
- 烟台强化服务保障 助力产业链供应链畅通

EXHIBIT 42

VOXEU COLUMN | INTERNATIONAL TRADE | PRODUCTIVITY AND INNOVATION

Detection and impact of industrial subsidies: The case of Chinese shipbuilding

Myrto Kalouptsidi / 9 Sep 2017

China's shipbuilders have doubled their market share in recent years. It is hard to determine the role of industrial policy, particularly subsidies, in this because we do not know what policies are in place. This column argues that subsidies decreased shipyard costs in China by between 13% and 20% between 2006 and 2012. These policy interventions have led to substantial misallocation of global production with no significant consumer surplus gains. Japan, in particular, has lost market share.

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In recent years, Chinese firms have rapidly come to dominate a number of capital intensive industries, such as steel, auto parts, solar panels and shipbuilding.The share of labor intensive products in Chinese exports fell from 37% to 14% between 2000 and 2010 . On a monthly basis, in 2011 the US imported advanced-technology products from China 560% more than it exported to China. By contrast, the monthly US-China trade surplus in scrap (used as raw material) grew by 1187% between 2000 and 2010 . (U.S.-China Economic and Security Review Commission 2011). We can see these rapid changes in trade statistics. The share of labour-intensive products in Chinese exports fell from 37% to 14% between 2000 and 2010. In 2011, on a monthly basis, the US imported advanced-technology products from China 560% more than it exported to China. By contrast, the monthly US-China trade surplus in scrap, which is used as raw material, grew by 1,187% between 2000 and 2010 (US-China Economic and Security Review Commission 2011).

Government subsidies are often evoked as a possible contributing factor to China's expansion. For example:

"*China is the workshop to the world. It is the global economy's most formidable exporter and its largest manufacturer. The explanations for its success [include the] seemingly endless supply of cheap labour ... another reason for China's industrial dominance: subsidies.*" (*The Economist* 2013)

Yet, even though industrial subsidies have steered industrialisation and growth in several regions (a well-known example is East Asia), little is known about their quantitative impact on production reallocation across countries, or on industry prices, costs, and surplus. Government subsidies to industries are notoriously difficult to detect and measure. This problem is particularly acute in China (Haley and Haley 2008). International trade agreements also prohibit direct and in-kind subsidies, so it is not surprising that there is little or no explicit data. Thus, we often do not know if subsidies even exist, let alone their magnitude.

In recent work, I assess the consequences of government subsidies on industrial evolution, focusing on the recent Chinese expansion (Kalouptsidi 2017). Since measuring these subsidies would be a prerequisite to evaluating their impact, I use an empirical strategy to detect their presence, and gauge their magnitude. I apply this to the world shipbuilding industry, a long-time target of industrial policy in other countries. In 2006, the Chinese government identified shipbuilding as a strategic industry, and introduced a plan for its development. In a short time, its market share doubled from 25% to 50%, at the expense of Japan, South Korea, and the countries of Europe. Some observers asserted that China's rapid rise was driven by hidden government subsidies that reduced shipyard production costs, not least because the industry benefited from new shipyards that were constructed as a consequence of this government plan. My research is designed to analyse the relative contribution of these interventions.

Industrial policy

Government subsidies are arguably prevalent globally, and there are many subsidy disputes. China in particular, has had more trade conflicts than any other country in the world, in more industries and with more countries. But both domestic and global policymakers, such as the WTO, have difficulty in designing and implementing measures to respond to subsidies. Deciding on complaints is difficult for two reasons:

- In the words of the WTO (2006): "Systematic data (on industrial subsidies) are non-existent; reliable sources of information are scarce and mostly incomplete ... because governments do not systematically provide the information."
- Even if we can identify the subsidies, we still need to evaluate any injury caused by them. How would have the industry evolved without them?

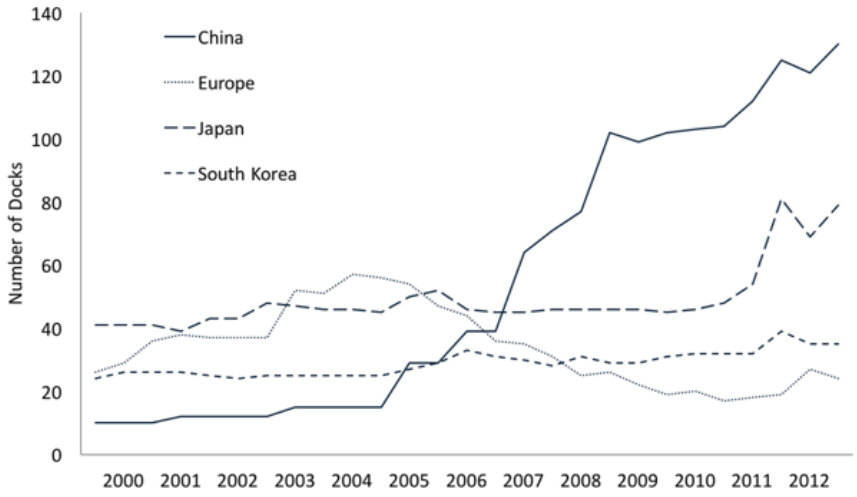
Shipbuilding in China and elsewhere

Alongside the steel, mining, and automotive industries, shipbuilding is one of the major recipients of subsidies globally. Governments tend to consider it a strategic industry, because it increases industrial and defence capacity, generates employment and has important spillovers to other industries (such as iron and steel). From the 1850s Britain was the world-leading shipbuilder, until it was overtaken by Japan in the 1950s. In turn, Japan lost its leading position to South Korea in the 1970s. Today, shipbuilding represents 4.5% of South Korea's GDP.

China's 11th National Five-year Economic Plan (2006-2010) was the first to anoint shipbuilding as a strategic industry in need of ”special oversight and support”. As part of the national plan, the National Development and Reform Commission (NDRC) and the Commission of Science, Technology and Industry for National Defence (COSTIND) introduced a medium- and long-term plan for the shipbuilding industry,The plan was introduced by the National Development and Reform Commission (NDRC) and the Commission of Science, Technology and Industry for National Defense (COSTIND). which set the goal of China becoming the largest shipbuilding nation within a decade (OECD 2008). The plan sets specific output and capacity goals involving investment in shipbuilding infrastructure and financial support for output growth, including increased credit allowance and low input prices.

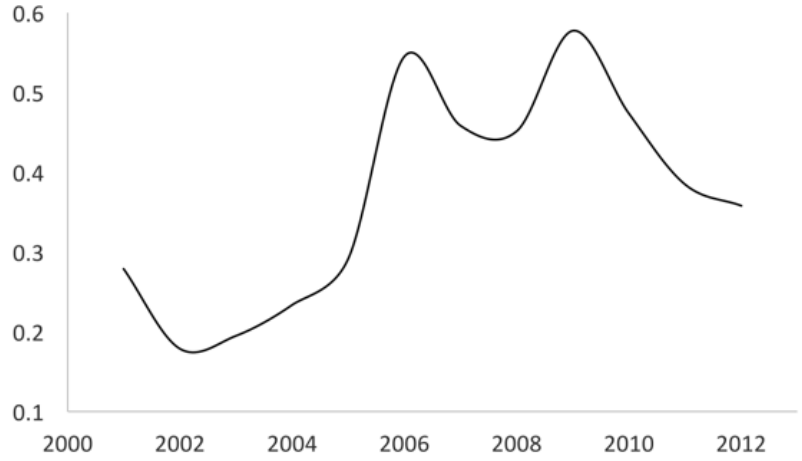
Consistent with these government programs, Figure 1 shows a rapid expansion in the number of dry docks (a measure of shipbuilding capacity). It is important to note that the majority of this expansion (82%) was realised through the construction of new facilities, so that the industry experienced a massive entry wave in 2005 and 2006.

Figure 1 Shipbuilding dry docks in China, 2001-2012



In contrast to this capital expansion, subsidies to reduce operating costs cannot be observed directly. Yet, consistent with such measures, China's production and market share increased dramatically as the programmes were announced (Figure 2).

Figure 2 China's market share in shipbuilding, 2001-2012



After 2006, China's market share more than doubled across all major ship types (Table 1). In addition, China's shipbuilding is mostly geared towards export sales which comprised about 80% of its production in 2006.

Table 1 China's average quarterly market share before and after 2006

	China market Share, pre-2006 (%)	China market share, post-2006 (%)
Bulk carriers	17	57
Tankers	15	28
Containerships	16	39
Gas carriers (LNG/LPG)	7	21

Detecting subsidies

In my paper, I estimate a dynamic model of the shipbuilding industry. The model captures the key features of this industry. In it, a large number of shipyards compete by producing ships. Their production decisions are subject to the time taken to build as ship, which is between two and five years. Shipyards accumulate backlogs, which can affect their future production cost, either positively (expertise acquisition) or negatively (capacity constraints). Production cost is also subject to steel price fluctuations, as steel is a key production input. World shipowners decide to buy new ships from world shipyards. Demand for new ships is driven by demand for international sea transport, which is uncertain and volatile. As ships are long-lived investments for shipowners, demand depends on expectations about future demand and fleet development.

The main object of interest is the cost function of firms that potentially have been subsidised. As in many industries, however, we cannot observe the costs of production. Therefore I estimate costs from changes in demand, testing for a break when China launched its shipbuilding plan in 2006.1 In the simplest example of a static, perfectly competitive framework, marginal cost is recovered directly from prices. In that case, the detection strategy amounts to testing for a break in observed ship prices in 2006.To do this, I estimate the willingness to pay for a ship, using observed new and used ship prices. I then use the observed changes in this estimated willingness to pay alongside the shipyards' optimal production choices, to obtain their underlying cost function. I employ a rich dataset consisting of global contracts for purchases of new and used ships and firm-level quarterly ship production between 2001 and 2012.

I use my framework to detect and measure changes in costs that would have been consistent with subsidies. I find a strong, significant decline in Chinese costs equal to between 13% and 20% of costs, or $1.5 to $4.5 billion at observed production levels.

Alternative explanations for the recovered cost decline could not have adequately accounted for these observations. For example, the results are robust to many specifications that control flexibly for time-variation. Moreover, costs did not change in other countries. Bulk ship production is not characterised by technological innovation, and the results held when I estimate costs on the subset of shipyards that existed prior to 2001. This implies that cost declines were not driven by different technology in new shipyards, or optimisation as a result of learning-by-doing.

The impact of subsidies

This framework can be used to quantify the contribution of government interventions in China as it seized the market:

- *Chinese interventions led to substantial reallocation in production*. In the absence of China's government plan, Chinese market share would be cut to less than half, while Japan's share would increase by 70%. If only new shipyards were removed, China's share would fall from 50% to 40%. This suggests that new shipyards played an important, but not the predominant, part in China's expansion.
- *Ship prices experienced moderate increases in all countries* in the absence of China's plan, as the latter shifted supply outward.

- *In the presence of subsidies, freight rates decreased moderately*. This is because of the larger fleet between 2006 and 2012, and more so over time due to time-to-build. As a result of China's plan, cargo shippers gained about $400 million in shipper surplus over that time. This does not support the assertion that China developed shipbuilding to benefit from low freight rates for its trade. The benefits of subsidies to shipping were minimal. Perhaps, instead, the Chinese government sees positive externalities in sectors such as steel and defence or, even, national pride (Grossman 1990).

Subsidies created a wedge in the alignment of market share and production costs. They led to a large increase in the industry average cost of production (net of subsidies) by shifting production away from low-cost Japanese shipyards towards high-cost Chinese shipyards.

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Endnotes

1 In the simplest example of a static, perfectly competitive framework, marginal cost is recovered directly from prices. In that case, the detection strategy amounts to testing for a break in observed ship prices in 2006.

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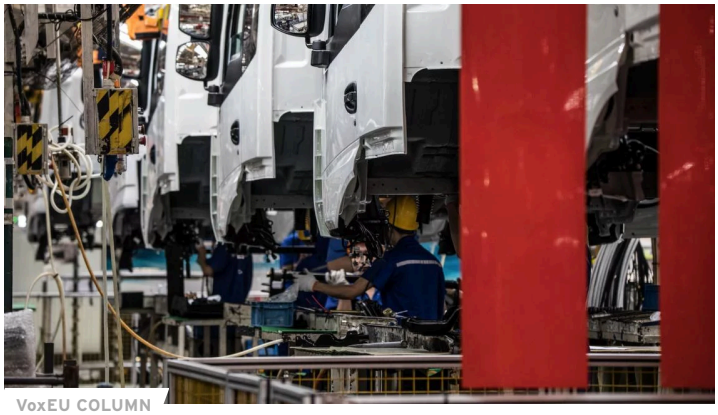

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AN ANALYSIS OF MARKET-DISTORTING FACTORS IN SHIPBUILDING

THE ROLE OF GOVERNMENT INTERVENTIONS

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AN ANALYSIS OF MARKET-DISTORTING FACTORS IN SHIPBUILDING – THE ROLE OF GOVERNMENT INTERVENTIONS

Karin Gourdon

This report analyses market-distorting factors in the shipbuilding industry with a focus on government interventions. This paper argues that government interventions in this cyclical industry do more harm than good by exacerbating and prolonging economic downturns through two channels. First, it promotes an over-ordering of vessels through lower delivery time, distorting ship buyers' investment behaviour. Second, it may maintain unproductive capacity in the market that re-enters a new economic cycle, restarting the vicious circle of industrial excess capacity. Against the background of the global nature of this industry, these channels reinforce the case for effective international disciplines on government interventions. Overall, the mature nature of the shipbuilding industry undermines the need for an active industrial policy, beyond facilitating structural adjustment, and emphasizes the necessity for a horizontal policy approach. The work seeks to provide policy makers with a better understanding of how different factors can contribute to excess capacity.

The paper was authored by Karin Gourdon from the Structural Policy Division (SPD) at the OECD Directorate for Science, Technology and Innovation (STI). Special thanks goes to Professor Myrto Kalouptsidi (Harvard University), Paul Illicenco (Delegation of Romania to the OECD Working Party 6 on Shipbuilding) and Paul Stott (Newcastle University) for their valuable inputs and feedback. Laurent Daniel (OECD/STI) and Nick Johnstone (OECD/STI) contributed with essential insights and suggestions, and supervised the project. The paper has also benefitted from feedback from Sarah Box and Dirk Pilat (OECD/STI), Julien Gourdon (OECD) on government procurement policies, and Christian Steidl (OECD).

Keywords: Excess Capacity, Government Support, Shipbuilding

Executive Summary

This study discusses the features of the shipbuilding industry, particularly the determinants of newbuilding prices and production costs, and presents the concept and relevance of "time to delivery" of ship orders. Building upon this analysis the report discusses three examples of government interventions to illustrate through which channels these may impact the shipbuilding market. These three examples encompass preferential financing instruments, and two discretionary measures, notably government procurement policies and non-enforcement of national bankruptcy laws.

This paper argues that government interventions in the shipbuilding industry not only inhibit a level-playing field, but will do more harm than good by exacerbating economic downturns in this cyclical industry through two channels.

- First, it may lead to a larger extent of over-ordering of vessels through lower time to delivery, thereby distorting the investment behaviour of ship buyers and leading to a more pronounced cyclical downturn.
- Second, during "bust" times, excess capacity may lead to government support to failing ship yards with the goal to minimize social costs. Government support to these firms that are practically insolvent (so-called "zombie firms") – through the non-enforcement of national bankruptcy laws – will however prolong these economic bust periods. As such, unproductive capacity will re-enter the market in the new cycle and restart the vicious circle of industrial excess capacity.

Against the background of the global nature of the shipbuilding and shipping industries any market-distorting government intervention in one country will ultimately affect industry developments in third economies. These channels furthermore reinforce the case for effective international disciplines on government interventions in the shipbuilding industry.

In any case, the mature nature of the shipbuilding industry undermines the need for an active industrial policy, beyond facilitating structural adjustment. As a mature industry the sector requires a horizontal policy approach, particularly one focused on: i) allowing free market entry and more importantly exit of yards; ii) upgrading the general level of labour skills and human capital through strong training policies and education programs; iii) ensuring efficient capital markets rather than targeted financial interventions inconsistent with market conditions; and, iv) enabling resources (i.e. capital stock and labour) to move easily between sectors. With respect to the latter issue, policies supporting yards to re-orientate to other business would also be conducive to address the problem of natural excess capacity associated with cyclical downturns affecting the shipbuilding industry.

1. Introduction

Why are some industries more prone to excess capacity than others? And what determines the extent of such market imbalances? The shipbuilding industry along with other heavy industry sectors are prime examples of recurring overcapacity. While certain industry features, such as capital-intensity, irreversibility of capital stock and capital construction lags, have been shown to partly explain this phenomena, the role of government interventions is less well understood.

This paper argues that government measures can have tremendous effects by aggravating the extent of an industry's excess capacity. During cyclical downturns, government actions in the shipbuilding industry will artificially maintain unused and unproductive capacity. However, less attention is often paid to government interventions during economic upturns although such actions, as will be argued in the following, can exacerbate the cyclical downturn, thereby aggravating 'naturally occurring' market imbalances.

Shipbuilding is a capital-intensive industry. Despite the large amount of labour inputs, the major input factor for ship construction remains capital stock in the form of long-term assets, such as land area, building docks, quays, steel cutting machinery and cranes. However, **cyclical downturns** affecting capital-intensive industries do not result in excess capacity per se, as long as capacity quickly adapts to new market conditions. As has been shown, investment irreversibility and long construction lags often delay exit decisions of firms despite incurred financial losses.

On the one hand, capital investments of yards are not highly reversible as unused capital stock can hardly be reused or resold profitably (i.e. they are sunk costs). On the other hand, capital stock investments (or expansions) feature long construction lags (e.g. yards and docks are not built within one day) making capacity investments slow, and thereby rendering good times even more profitable for existing firms (Kalouptsidi, 2014[1]).[1] Hence, consistent with anecdotal evidence ship yards delay exit decisions and suffer losses in anticipation of better times (i.e. yards exhibit patterns of hysteresis). Such market behaviour may lead to chronic excess capacity (Pindyck, 1991[2]) and government actions preventing or delaying industrial restructuring can artificially prolong and worsen such structural imbalances.

During **cyclical upturns**, capacity is a competitive advantage of ship yards. The net production time of a vessel takes around nine to 18 months (depending on the ship type and features).[2] However, following a rise in orders for new ships (i.e. similar to the positive demand shock prior to the economic crisis of 2008), yards will face capacity constraints which are reflected in additional waiting time for each order. Hence, during cyclical upturns several months can pass until the actual ship production starts since yards need to wait until docks become available, and the time to delivery (TTD) of ships increases with the order book (i.e. yard backlog) – a special feature of the shipbuilding industry.

In 2008, the time from order to delivery date reached on average 3 ½ years (compared to 1 ½ years in the early 2000s), and in the same year 70% of the fleet was still scheduled for delivery by 2012. During this wait, uncertain demand for sea transport can substantially alter economic conditions for shipping firms; and indeed, the crisis of 2008 led to an idling of part of the existing fleet, freight rates for shipping firms plunged and thereby rendered new ships unnecessary (Kalouptsidi, 2014[1]). In other words, long waiting time amplifies the uncertainty ship buyers face with their investment decisions in new ships (i.e. a capital

good).[3] Ship buyers therefore prefer short waiting times for their orders to be able to exploit the prosperous boom phase in the form of increased freight rates. Large yard capacity shortens the delivery time of vessels as yards have more docks available. In turn, offering shorter delivery times to ship buyers strengthens the position of yards during contract negotiations, which in turn determine newbuilding prices.[4]

Public measures supporting directly or indirectly capacity expansion in the short or long-term influence the investment behaviour of shipping firms through a reduction in waiting time (i.e. TTD). The natural increase in waiting time during periods of high ship demand has however a smoothing effect on investment. Time to delivery constrains the supply of new vessels in the short-term due to slower and lower deliveries of vessels, and thereby reduces the extent of over-ordering of new vessels. In addition, since ships are capital goods, ship buyer's investment decisions are similar to those for financial products in the sense that such decisions are usually based on net present value calculations. Expectations about future demand for transportation services and profits are crucial for ship buyers' willingness to pay. Hence in the long-term, incentives of ship buyers to invest in new ships are dampened with long time to build delays since ships that are delivered late will not be able to take advantage of the temporarily increased demand for shipping services.

Simulations by Kalouptsidi (2014[1]) show that in the scenario under pure construction time for vessels of nine to 18 months (in contrast to an increased delivery time of up to 3 ½ years due to orders queuing at yards until a new dock becomes available as observed around the year 2008), ship supply becomes more elastic in the short-term (i.e. more responsive to demand). The greater responsiveness of production levels to demand results in higher order volumes of around 2%, a twice more volatile ship production, and significantly lower ship prices. As the paper will furthermore highlight, negative demand shocks – which will certainly arise due to the cyclical nature of the shipbuilding industry (see Annex A for an overview of ship production over time) – will lead to a more severe excess capacity situation in the shipbuilding industry. Similarly, the negative consequences for the shipping industry may be more pronounced than without an artificially reduced delivery time (e.g. through government supported capacity developments). The research results show that under pure construction time (i.e. no additional waiting time due to orders queuing at yards) the fleet is larger and 45% more volatile, and freight rates are lower although less volatile (by around 2%). Indeed, due to the reduced freight rates at least consumer surplus (i.e. of shippers) is higher under these shorter delivery times.

It is worth highlighting that the aforementioned effect of government interventions on the supply elasticity is a particular feature of the shipbuilding industry for several reasons. First, in the shipbuilding sector production starts only with a secured order and yards do not build up inventory of ships. Second, ships are capital goods, i.e. financial assets. Ship buyers apply portfolio theory and discounted cash flow models in general to assess the vessels' value. Asset prices and investment decisions thereby depend on expectations about the development of key exogenous variables, such as demand for transportation services, interest rates, bunker costs, exchange rates (Karakitsos and Varnavides, 2014[3]). Purchase decisions for ships are therefore inherently different to those for intermediate goods. Third, due to the time lag of several years between investment decisions and their realization (i.e. time to delivery) along with the nature of ships being capital assets, the time dimension is particularly important as economic conditions can drastically alter between the ordering and operation of ships to generate revenues.

In short, non-market based investments into yard capacity through government measures will not only make it difficult to restore a level-playing field in the global shipbuilding

industry, but may also exacerbate economic downturns in the shipping or shipbuilding industries through two channels: first, it may lead to a larger extent of over-ordering of vessels through lower time to delivery as explained above, and thereby to a more pronounced cyclical downturn; second, during bust times excess capacity may lead to government support to failing ship yards in order to minimize social costs. Given the global nature of the shipbuilding and shipping industries any market-distorting government intervention in one country will ultimately affect industry developments in third countries. These channels furthermore reinforce the case for effective international disciplines on government interventions in the shipbuilding industry.

It is important to note that this study does not define – much less attempts to measure – the extent of excess capacity present in the shipbuilding industry. The challenge in defining the term (and measuring) excess capacity lies in the fact that firms rarely employ capital stock and labour at maximum settings, since doing so would be economically inefficient. Firms rather operate at the maximum effective utilisation, which will however vary across firms and time, and is not observed directly. More generally, since excess capacity in the shipbuilding industry has a cyclical component it is virtually impossible to disentangle the part of these market imbalances arising from cyclical factors, from those arising from structural factors (i.e. the part resulting from government interventions).

Instead, this paper is a continuation of the work conducted by the Secretariat to analyse factors that affect supply and demand of ships, and thereby industrial capacity in the long term. OECD (2016[4]) analysed the causes of excess capacity with respect to the features of the shipbuilding industry and derived policy recommendations based on past-experience of a selection of shipbuilding economies. The objective of the following analysis is to provide a better understanding of the channels through which various public support measures can lead to market distortions[5] and affect industrial capacity.

To discuss these mechanisms in more detail, section 1 of the report first lays the basis for the subsequent analysis by describing the specificities of the shipbuilding industry in terms of supply and demand. Section 2 then describes the effect of a selection of government measures on supply primitives. The last section concludes on the results and provides further remarks.

2. Market dynamics in shipbuilding

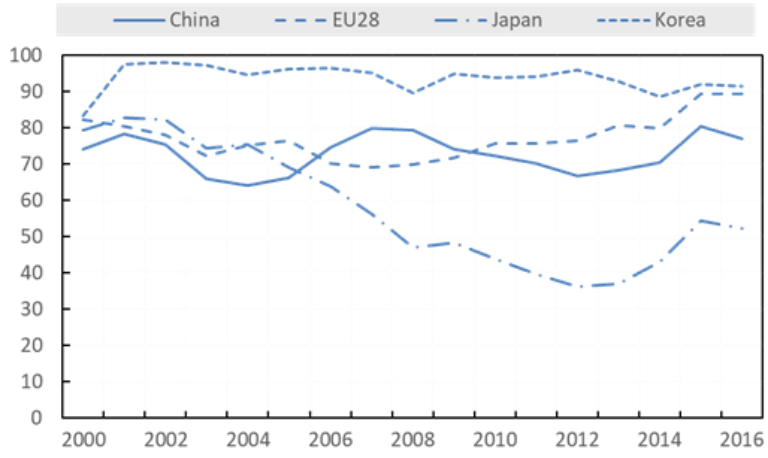
This section provides the basis for the subsequent discussion on government measures. The first part of this section describes the global character of the shipbuilding market, and discusses major determinants of newbuilding prices. The second part of this section has a focus on the supply side by describing the industry maturity of ship production, capital intensity, and presents the concept and the relevance of time to delivery. The section finishes with an analysis of determinants of production costs.

2.1. Global shipbuilding market and major determinants of newbuilding prices

Commercial shipbuilding operates in an integrated global market where ship yards usually compete for contracts outside their own countries. As Figure 1 shows, over the last two decades, the lion's share of ship production of major shipbuilding economies has been purchased by foreign owners (with the exception of Japan – a case which requires a separate explanation as outlined in Box 1). The fact that a new ocean-going vessel can load its first freight independent of the location where it has been built adds to the flexibility of ship buyers to order at their preferred yard around the world and leads at the same time to more competition across ship yards. In other words, provided that the ship order features the same conditions in terms of, among others, prices, time to delivery, quality aspects, financing, or post delivery services (see more on contract conditions below), there was no economic reason for buyers to prefer domestic over foreign built ships.

Figure 1. Export share of ship production (CGT) by region

In %



Note: Export shares are calculated as the shares of a given country's production sold to a foreign owner. EU28's export share is calculated as the share of EU28's production sold to non-EU28 countries.
Source: based on Clarkson World Fleet Register (2018).

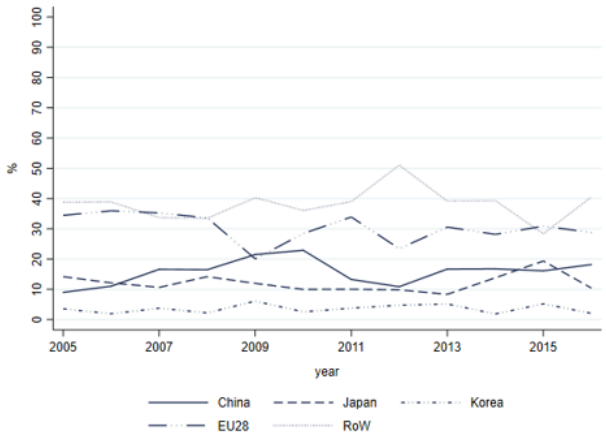
Box 1. Japan's decline in export share

Japan constitutes an exception; from 2005 its industry faced a continuous decline in export share and saw finally around 2009 a drop below 50%, indicating an increased dependence on domestic orders. This decline happened in a period when global competition intensified. As one example, around the year 2003 China entered the shipbuilding industry under a national government programme (see next section). The country's product mix most closely resembles the Japanese one with its largest exposure to bulker production. The average share of similar ship type orders amounts to around 80% between 2005 and 2015 (calculated on the basis of a similarity index that is often used in export basket analysis of two countries, see Annex B). In short, Japan's yards were seemingly confronted with increased direct competition from China for orders of similar ship types – this was the case to only a lower extent for other economies.

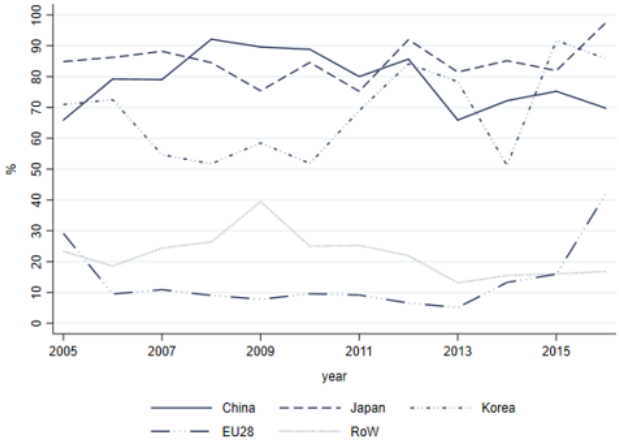
Yet, the global character of the shipbuilding industry certainly depends on the development of the country's downstream industry, i.e. shipping companies. Figure 2 (a) indicates a measure for the size of shipping industries across countries. Along with EU 28 states (in particular Greece), Japan and China represent the leading owner countries that ordered vessels at world shipyards during 2005 and 2016. For 2016, the owner countries' shares for new orders amount to around 30% for EU 28 countries and 20% for China and Japan each. In contrast, Korea holds only a share of about 5%, suggesting a relatively small commercial shipping industry. Irrespective of the size of the domestic shipping industry, shipping firms usually purchase vessels from domestic ship yards (Figure 2 (b)). Between 2005 and 2016, ship buyers placed the majority of orders at domestic yards; take the example of 2015 where around 90% of Korean owners ordered from Korean yards, 80% of Japanese buyers and 70% of Chinese owners did so at their respective national yards. The result for EU 28 countries requires a separate interpretation; although EU 28 countries, in particular Greece, have a strong shipping industry the majority of orders are placed outside of the EU. This may result from the fact that Greece is active in dry/bulk shipping while EU countries were initially mainly active in container and tanker production and subsequently specialised more on passenger ship production as well as offshore service vessels and platforms (OECD (2017[5]), OECD (2018[6]) and OECD (2015[7])). Lower transaction costs certainly play a role in the decision to order domestically, such as no language barriers, shorter distances to travel to meetings with the yard, in some cases cost advantages for purchases in local currency and public policies.

Figure 2. Orders by owner country and builder country

(a) Share of orders* by owner country



(b) Share of owners' orders* at domestic yards

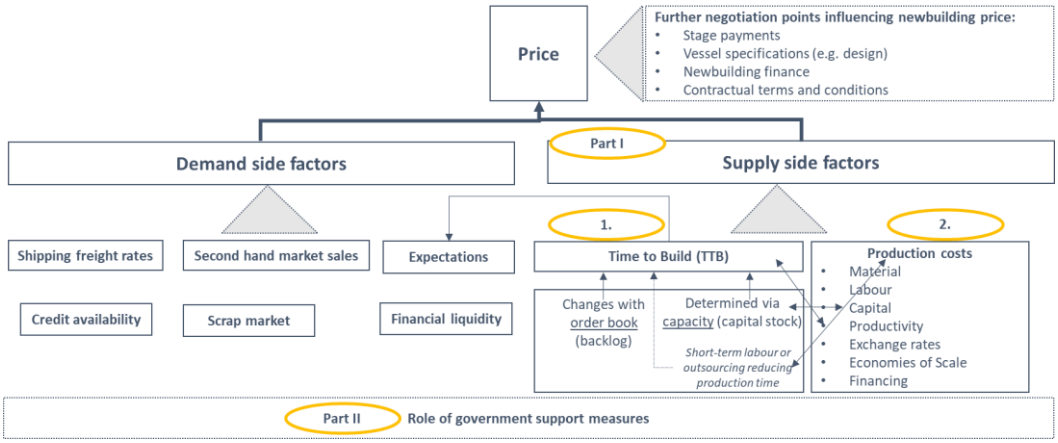


Note: *Orders are corrected for cancellations.
Source: based on Clarkson World Fleet Register (2018).

In such an international environment for vessel purchases, ship owners either contact ship brokers to facilitate the transaction, or they get directly in contact with some shipbuilders (often through yards sales' offices based in buyer countries). In both cases, a common procedure is to invite a selection of yards to submit tenders that set out a precise specification of the ship.[6] Buyers select the most competitive bids and make a final selection after a detailed discussion of the design, specifications and terms. Usually this process takes between six months to a year, in particular in a buyers' market. In contrast, in a sellers' market this approach is hardly possible since buyers compete fiercely for the few available berths, and yards set to a large extent their own terms and conditions (e.g. often yards take advantage of a firm market to insist upon the sale of a standard design) (Stopford, 2003[8]).

Major negotiation points of the contract are the price, stage payments, the "makers'list" (i.e. manufacturers of the main items of machinery and equipment), vessel design, newbuilding finance offered for the buyer, and other contractual terms and conditions. The vessel price is by far the most important aspect of the negotiations (Stopford, 2003[8]). In a weak market, buyers will seek to extract the maximum benefit from their negotiating position in each area. Conversely, in a strong market the shipbuilder will negotiate for the maximum price possible on a standard vessel, with favourable stage payments. Figure 3 outlines for the buyer's and supplier's side the major determinants of ship contracts, which in turn influence newbuilding prices.

Figure 3. Determinants of newbuilding prices



Note: Capacity drives capital costs but reduces time to build which is a competitive advantage of yards. Short term labour or outsourcing activities reduce production time and thereby time to build, however such short-term services are usually more expensive and therefore increase production costs (trade off: either increasing prices and weakening a yard's competitive advantage or reducing profit margins weighing on a yard's profitability). Higher yard productivity may decrease production time (and costs, or increase output while keeping production costs constant) and thereby reduces time to build. In turn, time to build influences expectations since with increased delivery time ship owners need to predict profits that are further in the future.
Source: based on Stopford (2003[8]).

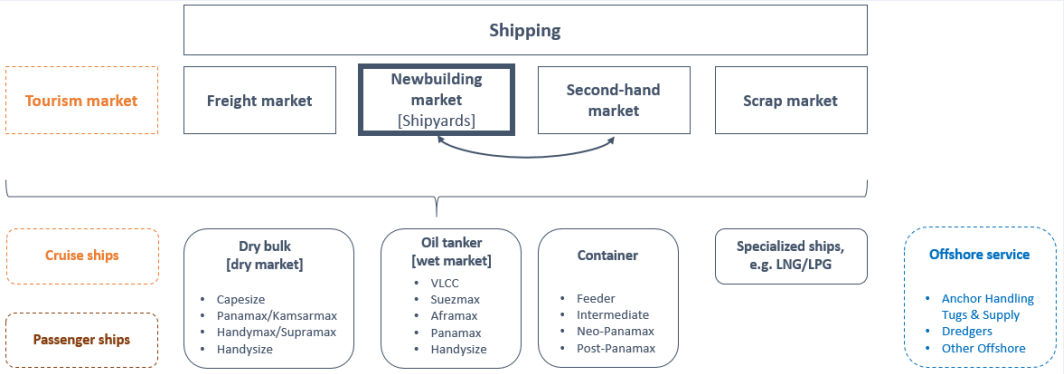
Demand side factors

According to Stopford (2003[8]), key factors on the demand side are current freight rates, the price of modern second-hand ships, financial liquidity of buyers, the availability of credit and, most importantly, expectations (Figure 3). *Expectations* about future profits (through freight rates, e.g. time charter or voyage charters) determine the willingness of ship owners to invest in a new vessel (i.e. a capital asset). The net present value (discounted cash flows less cash outflows) must be positive, otherwise there would be no economic reason for a ship owner to invest.[7] For more information on drivers of investment decisions of ship buyers see Box 2. Demand for shipping services is uncertain as well as highly volatile and cyclical, and driven by seaborne trade which in turn is tied to global economic growth as well as heavily affected by geographic trade patterns (influenced by trade barriers) and geopolitical events (Greenwood and Hanson, 2015[9]).

Box 2. Four distinct shipping markets

Shipping is organised in the form of four markets and investment decisions are the results of an interaction between them (Figure 4): freight, newbuilding (shipbuilding industry), second-hand and scrap. Increasing freight rates (i.e. earnings for ship owners) and a positive outlook of demand for maritime transport incentivise shipping firms to expand their fleet either through newbuilding or second-hand ships to exploit increasing profits. Demolishing a vessel is less attractive during these times since each owner aims to operate at the highest possible fleet capacity. In contrast, decreasing freight rates and a negative outlook of future demand incline owners to either sell their vessel at the second-hand market or collect the scrap values (i.e. mostly steel see Gourdon (2019[10])).

Figure 4. Distinct markets for ship demand



Source: based on Karakitsos and Varnavides (2014[3]).

While this structure pertains to the ship types for dry bulk, oil tanker, container and other specialized vessels (e.g. LNG/LPG carriers), the freight market is not applicable to cruise and passenger ships as well as offshore service vessels. The demand drivers are different. The cruise and passenger ship market is an exception and falls out of the scope of this paper. Demand drivers in the tourism market substantially differ from those of the market for water transportation of goods insofar as they are less volatile and depend directly on disposable income of cruise passengers.

In other words, the shipping industry is closely linked to boom and bust cycles. Recent empirical findings suggest that overinvestment in booms usually occur because of two recurring forecasting errors of firms. Firstly, firms mistakenly believe that abnormally high profits will persist into the future. Secondly, firms underestimate the investment response of their competitors (i.e. so-called "competition neglect").[8] As a result, shipping firms overinvest during booms and are predictably disappointed by low future earnings (Greenwood and Hanson, 2015[9]).[9]

Time to delivery, which varies with order book (i.e. the higher the order book the longer the waiting time from order to delivery and vice versa), has a smoothing effect on investment (new orders of ships). Time to delivery constraints the supply of new vessels in the short-term due to slower and lower deliveries of vessels. In addition, incentives of ship owners to invest in new ships are dampened with long time to build delays as ships that are delivered late will not be able to take advantage of the temporarily increased demand for shipping services.[10] Since longer time to build renders ship buyers less likely to respond to demand shocks, it will lead to a smoother investment process into new ships and in turn less volatility in the fleet (Kalouptsidi, 2014[1]).

These time lags between order and delivery make it far riskier for ship owners to invest in new ships in booms than it was in busts. During prosperous periods when ship buyers prefer to take advantage of the profitable market conditions immediately they favour the purchase of second hand vessels to avoid the time lag in the construction of newbuilt ships.

Supply side factors

From the viewpoint of shipyard supply the key issues are the production costs and the time to delivery (Figure 3). Time to delivery is determined in the short-term[11] by capital stock (e.g. the number of docks and berths available) and the size of the order book (i.e. backlog). A yard with three years' work cannot offer a realistic delivery, while another yard constructing their last ship on order will be desperately keen to find new business. This

balance is what drives shipyard prices. During booms when the yards have built up long order books and many owners are competing for the few berths available, prices rise sharply. In a recession the opposite happens. Shipyards are short of work and there are fewer buyers, so the yards have to drop their prices to tempt in buyers (Stopford, 2003[8]).

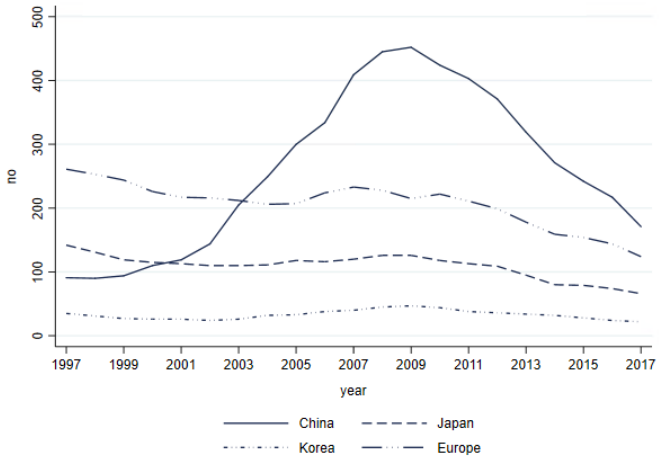
The trade-offs ship builders face are (Figure 3): either increase capacity to decrease time to delivery but face increased production costs (i.e. variable capital costs), or use short-term services such as temporary workforce or outsourcing that reduce production time (and in turn time to delivery) but increases production costs. Finally, increased productivity reduces delivery time and influences production costs (i.e. a firm can produce the same output with lower input costs). As described above, time to delivery determined on the supply side impacts the demand side as it influences expectations and thereby investment decisions (i.e. new orders) and newbuilding prices.[12] As Adland and Jia (2015[11]) state there exists a term structure of newbuilding prices, describing the combinations of cost and time to delivery between which ship owners would be indifferent. If ship buyers have an opportunity cost through waiting time for a ship (i.e. missed profits through freight contracts), time to delivery will be a downward sloping function with respect to prices such that early delivery slots command a premium over deliveries further into the future.

2.2. Supply side – Features of the shipbuilding industry

2.2.1. Industry maturity

In the early 2000s the shipbuilding industry was characterised by a large wave of new ship yards (Figure 5), specifically from China. Indeed, Europe and Japan showed a decline in the number of active yards in the same period. The expansion of China's shipbuilding industry is mainly a result of its industrial development plans starting in the early 2000s (Box 3). Historically, Japan and Korea entered the shipbuilding industry already in the 1950s and 1970s, respectively.[13]

Figure 5. Number of active firms



Note: China includes Hong Kong. Europe includes: Albania, Andorra, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bulgaria Croatia, Cyprus[14], Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Kazakhstan, Kosovo, Latvia, Lithuania, Liechtenstein, Luxembourg, Macedonia, Malta, Moldova, Monaco, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom. Active yards include all yards that either receive a new order or are currently working on the production of existing orders.

Source: based on Clarkson World Fleet Register (2018).

Box 3. Chinese development plans involving the shipbuilding industry

- 2003 National Marine Economic Development Plan
- 2006 The 11th Five-Year Plan for National Economic and Social Development
- 2006 The Medium and Long Term Development Plan of Shipbuilding Industry
- 2007 The 11th Five-Year Plan for the Development of Shipbuilding Industry
- 2007 The 11th Five-Year Plan for the Development of Shipbuilding Technology
- 2007 The 11th Five-Year Plan for the Development of Ship Equipment Industry
- 2007 Guideline for Comprehensive Establishment of Modern Shipbuilding (2006-10)
- 2007 Shipbuilding Operation Standards
- 2009 Plan on the Adjusting and Revitalizing the Shipbuilding Industry
- 2010 The 12th Five-Year Plan for National Economic and Social Development
- 2012 The 12th Five-Year Plan for the Development of the Shipbuilding Industry
- 2013 Plan on Accelerating Structural Adjustment and Promoting Transformation and Upgrading of the Shipbuilding Industry
- 2013 Shipbuilding Industry Standard and Conditions
- 2015 Made in China 2025

Source: Kalouptsidi and Barwick (Fall 2017[12]).

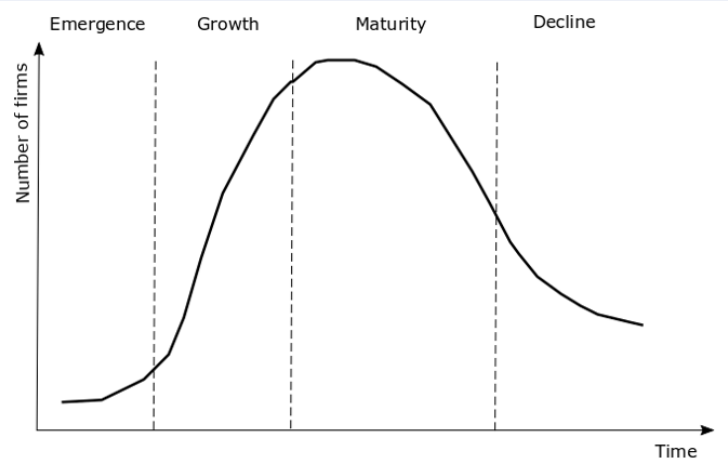
Relating the development of the number of active yards to a life-cycle analysis indicates that the shipbuilding industry in the major shipbuilding economies seems to be in a declining stage and China entered the declining part of the mature life-cycle stage (see Box 4 and Figure 6). These models are based on the observed tendency for the number of firms in an industry to be relatively low and stable in the initial years, followed by a period of rapid growth, before the number peaks and subsequently declines as the market for the industry eventually decays.

Livesey (2012[13]) introduces the idea of relative industry maturity by contrasting a country's position in the industry life cycle with the position of the industry abroad.[15] For Europe, Japan, Korea and China in 2018, the domestic shipbuilding industry most closely relates to sectors that are either in the mature or declining stage at home and where the same is true on a world scale. According to Warwick (2013[14]) this is the area where the need for selective industrial policy is least urgent and a horizontal approach is best – particularly one focused on allowing free entry and exit, upgrading the general level of labour skills and other capabilities, and enabling resources (i.e. capital stock and labour) to move easily between sectors.

Box 4. Life Cycle Analysis

Livesey (2012[13]) first discusses the concept of phases of industrial maturity based on industry life-cycle models. Figure 6 illustrates a typical pattern of emergence, growth, maturity and decline for a sector, using the number of firms as an indicator, although the concept could be generalised to include other indicators of the stage of an industry's development (Warwick, 2013[14]).

Figure 6. Stages of industry life-cycle



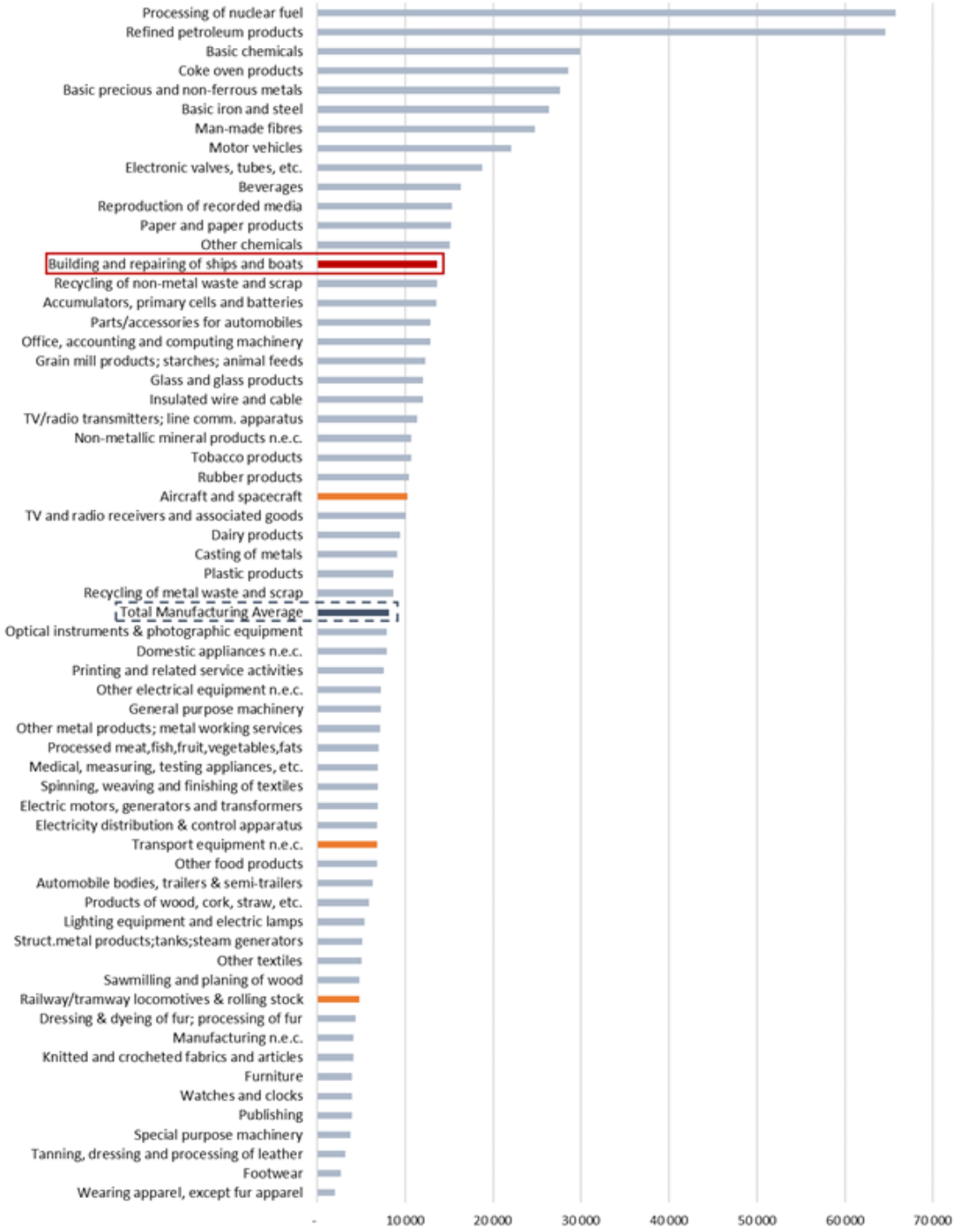
Source: based on Livesey (2012[13]).

2.2.2. Capital intensity

Shipbuilding is a capital-intensive industry. The production of ships requires long-term assets, especially land area, building docks, quays, machines for steel preparation and cutting, cranes.[16] As an illustrative example of capital intensity across sectors, the ratio of capital stock (i.e. gross fixed capital formation) to employment is much higher than the average ratio of the manufacturing sector (Figure 7). Most capital-intensive industries are nuclear fuel processing, petroleum refining, chemicals, iron and steel while at the lower end of industrial capital intensity are textiles and publishing.

Figure 7. Illustrative capital intensity across sectors

Ratio of Gross Fixed Capital Formation (GFCF) over Employment

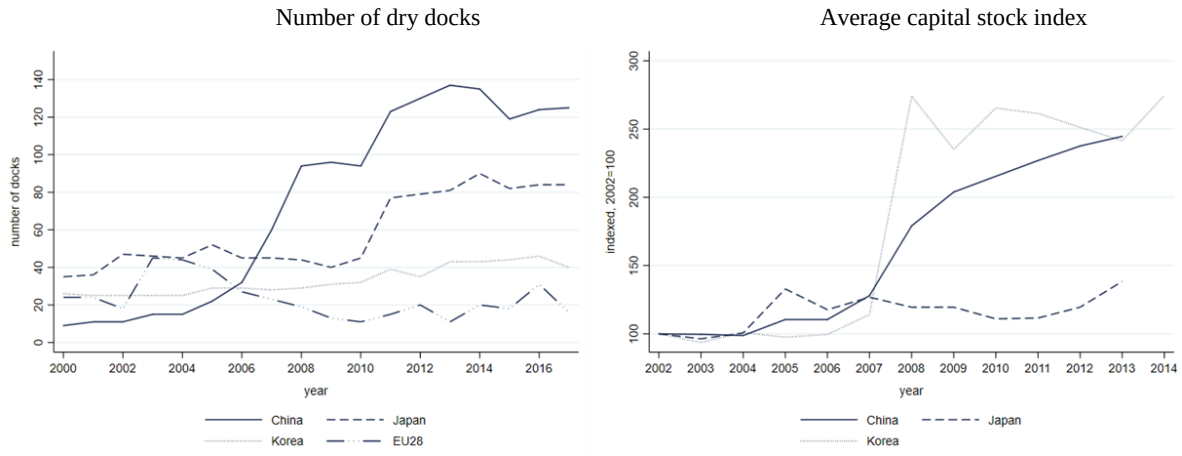


Note: Ratio of average GFCF and average employment (does not include short-term labour) by sector across country and year.
Source: based on United Nations Industrial Development Organization (UNIDO) 3 Digit-level industry classification of ISIC Rev. 3.

Shipyard capacity steadily increased for the majority of shipbuilding countries over the last two decades. The number of dry docks per country as a capacity measure illustrates that in particular China and Japan expanded its production ability (Figure 8 lhs). At a broader level, ship yard capacity can be approximated by a yard's deflated capital stock[17] representing fixed assets, such as. docks, quays, cranes, buildings, land area, machinery for steel cutting and welding and so on (Figure 8 rhs). Average capital stock increased in particular in China and Korea from 2006/07 onwards while for Japan the increase in capital stock started around 2010 – which is in line with the development of Japan's number of dry docks. Strikingly, despite the cyclical downturn as a result of the economic crisis of 2008 both capacity measures continued increasing rather than adapting to the new market conditions.

The observation that capacity adapts only sluggishly is reminiscent of the discussion on investment irreversibility and long construction lags of new capacity that often delay exit decisions of firms. On the one hand, capital investments of yards are barely irreversible as unused capital stock represents sunk costs, hence, it can hardly be reused or resold profitably. On the other hand, capital stock investments (or expansions) feature long construction lags (e.g. yards, docks, cranes are not built within one day) making capacity investments slow, and thereby rendering good times even more profitable for existing firms (Kalouptsidi, 2014[1]).[18] Hence, consistent with anecdotal evidence ship yards delay exit decisions and suffer losses in anticipation of better times (i.e. yards exhibit patterns of hysteresis).

Figure 8. Shipbuilding capacity indicators by country

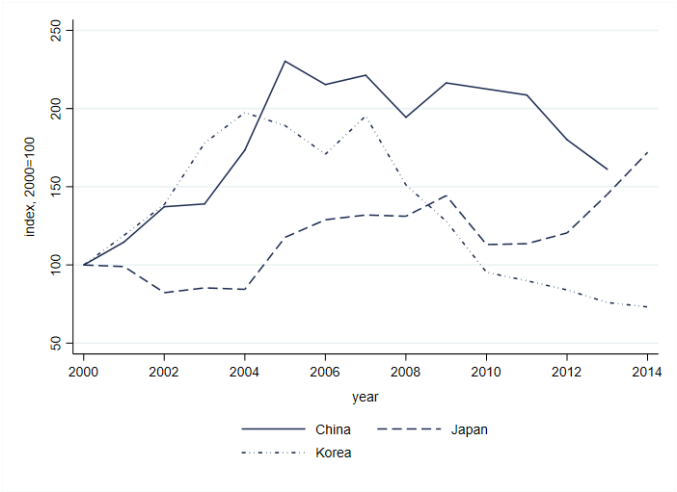


Source: lhs based on monthly publication of Clarkson Shipyard Monitor.; rhs based on ORBIS 2016-1 and 2016-2, and Kalouptsidi and Barwick (Fall 2017[12]).

This is also reflected in the decline in capacity utilisation rates since capacity does not adapt rapidly to the drop in demand. Figure 9 shows an approximation of utilisation rates of plant and equipment (i.e. capital stock utilisation) for the three major shipbuilding economies calculated on the basis of real gross output over real capital stock. In China, capital stock utilisation increased since 2000 and stabilized thereafter until it declined around 2010. In contrast, Korea saw a major drop in 2007/08 and Japan seems to have been able to increase its utilisation levels of the year 2000. It seems that at least in China and Korea capital utilisation is below its potential, i.e. at the country-specific peak.

Figure 9. Median yard utilisation rates of capital stock

Indexed at 2000=100



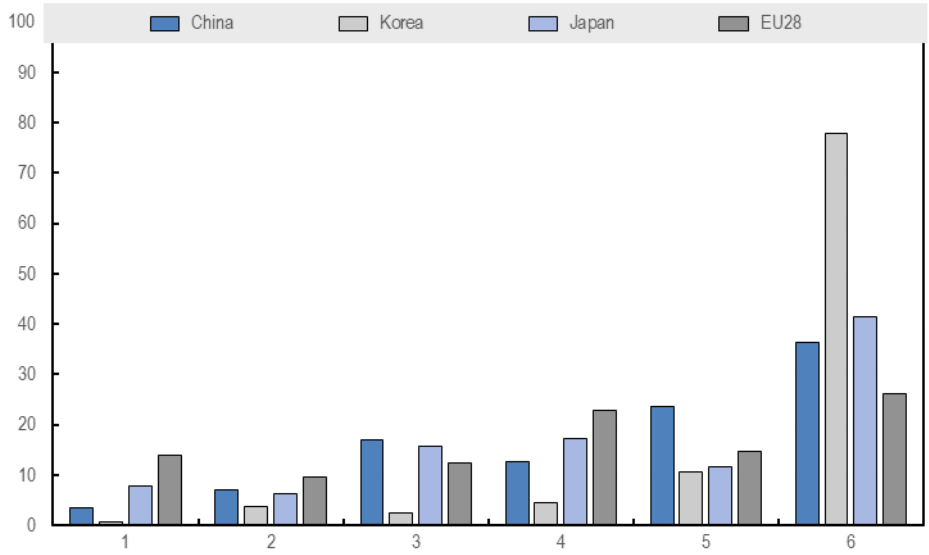
Note: For another approach estimating yard capacity see the report by the OECD on Imbalances in the Shipbuilding industry (OECD, 2016[15]).
Source: based on ORBIS 2016-1 and 2016-2, and Kalouptsidi and Barwick (Fall 2017[12]).

In contrast to the shipping industry (demand side) which features several distinct markets (i.e. container, tanker, bulker etc.), there is a large supply substitutability of ship yards. In other words, yards can more easily switch the production from one to another standardized ship type – at least to some extent.[19] Therefore, yard capacity cannot be subdivided by ship type and must be seen as an aggregate production capacity since most of the yards produce a certain number of ship categories.

Figure 10 highlights that ship yards are multi-product firms, in particular the largest yards are able to produce six or more types, such as in Korea. Strikingly, the single product yards (i.e. producing only one ship type) observed in the data are yards which likely produce cruise ships only, which indicates that the cruise ship production is not frictionless. In this case shipbuilders may not be able to move easily from one market to another as their facilities may be unsuited for this vessel type or more importantly due to entry barriers in the form of experience in cruise ship production and a well-connected supplier base. For further discussion about the cruise ship market see OECD (2015[7]). This observation is also supported by Stopford (2003[8]), stating that most yards are extremely flexible and will bid for a wide range of business. In adverse markets major shipyards have been known to bid for anything from floating production platforms to research vessels. Moreover, Adland and Jia (2015[11]) highlight that since different ship types will compete for the same slots available the delivery lag for bulkers, for instance, will be influenced by the demand for other ship types, such as tankers and gas carriers. Any government intervention in a ship yard will affect all ship types. Even if it is targeted at only one ship type in principle, it will be difficult in practice to derive the effect of the public intervention on this specific market.

Figure 10. Share of yard's output by number of ship types

During contract years 1990-2016

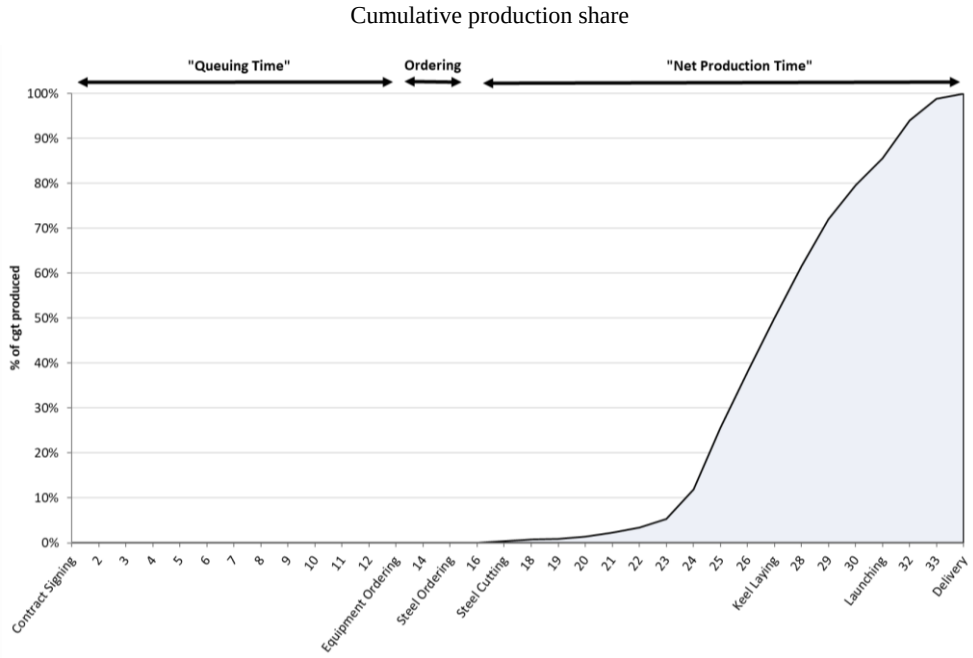


Note: 13 product categories: bulker, cruise ships, containerships, gas carrier, offshore services, pure car carriers, passenger, reefer, ro-ro, tankers, other dry cargo, other non-cargo, miscellaneous.
Source: based on Clarkson World Fleet Register (2018).

2.2.3. Time to Delivery

Figure 11 illustrates an example of a ship production process. Several years can elapse between contract signing and the ordering of equipment and material, during which the order essentially is queuing for a dock to become available. Typically the net production time of a vessel takes around nine to 18 months (depending on the ship type and features).[20] However, following a rise in orders for new ships (i.e. similar to the positive demand shock prior to the economic crisis of 2008), yards will face capacity constraints which are reflected in additional waiting time for each order. Hence, during cyclical upturns several months can pass until the actual ship production starts since yards need to wait until docks become available, and the time to delivery of ships increases with the order book (i.e. yard backlog) – a special feature of the shipbuilding industry.

Figure 11. Illustrative example of a ship production process



Note: Ship yards may organize their production processes differently. This graph aims to show only an illustrative example of the delivery time comprising "queuing time" and "net production time". The production shares do not reflect actual numbers.
Source: Author's elaboration based on information obtained through interviews with ship yards.

Figure 12 shows the increase in delivery time during periods of high demand (i.e. around 2006-08) as a consequence of yard capacity constraints. While in the early 2000s the delivery time amounted to around 18 months, on average, during the peak ship buyers were required to wait up to 3 ½ years.

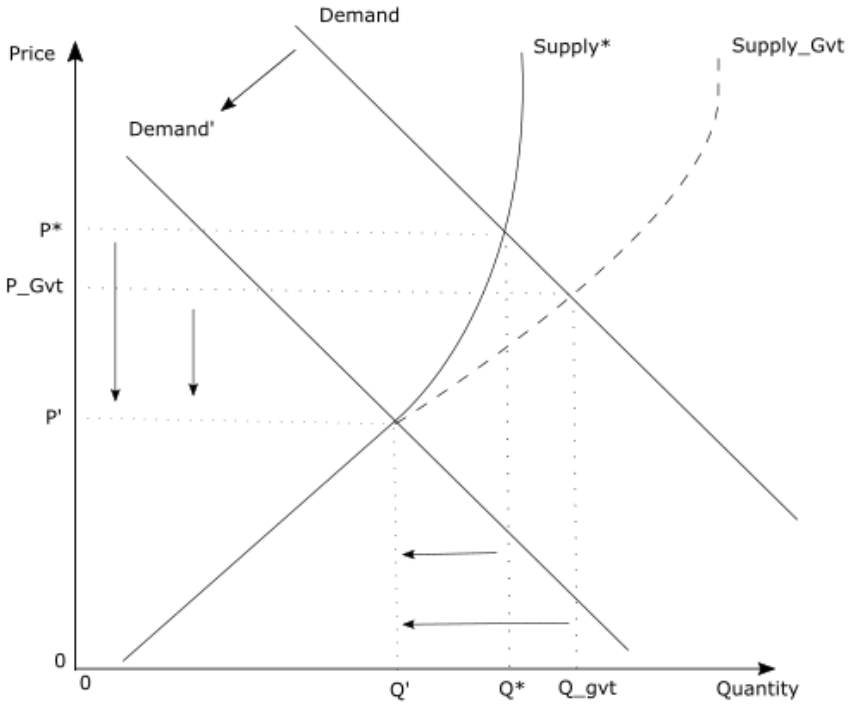
Figure 12. Average Time to Delivery

Source: based on Clarkson World Fleet Register (2017).

Artificially stimulated capacity expansions through government measures make the supply of vessels more elastic (i.e. more reactive to demand). As Figure 13 shows, the solid supply line (i.e. solid line for *Supply** indicating ship supply without government intervention) indicates that once ship yards reach their capacity constraint they are not able anymore to produce ships in the short-term. Hence, the supply curve becomes very inelastic, i.e. even if a ship buyer would accept to pay an extraordinarily high price the yard will not be able to produce the ship in the short-term by virtue of unavailable docks. In this situation prices are higher (*P**) und production (*Q**) is lower than in the case of government interventions stimulating directly or indirectly capacity increases (i.e. dotted line for *Supply_Gvt* representing ship supply with government involvement). In the latter case, with artificially increased capacity the supply curve becomes more elastic (i.e. more reactive to increased demand), so that ship yards are able to supply their ships faster than in the first case under capacity constraints. Following a negative demand shock (i.e. downward shift of the demand curve to *Demand'*), such as it was the case following the economic crisis of 2008, the extent of a drop in production will be more severe in the case of elastic supply than it would be in the case of inelastic supply. Formally, the decline from *Q_Gvt* to *Q'* is much larger than the drop from *Q* to *Q'*, indicating the extent of unused capacity following a cyclical downturn. Indeed, the drop in ship prices due to a cyclical downturn is smaller in the case of government intervention, but only since ship prices were already much lower compared to the natural market price (under *Supply**), making the decline less pronounced. This highlights the market distorting effect of government interventions on ship prices.

In conclusion, the natural increase in waiting time during periods of high ship demand has a smoothing effect on investment. Time to delivery constrains the supply of new vessels in the short-term due to slower and lower deliveries (i.e. inelastic supply curve *Supply**), and thereby reduces the extent of over-ordering of new vessels. In addition, since ships are capital goods, ship buyers' investment decisions are similar to those for financial products in the sense that such decisions are usually based on net present value calculations. Expectations about future demand for transportation services and profits are crucial for ship buyers' willingness to pay. Hence, incentives of ship buyers to invest in new ships are dampened with long time to build delays since ships that are delivered late will not be able to take advantage of the temporarily increased demand for water transportation. In addition, since production is less responsive to demand shocks the extent of excess capacity as a result of a cyclical downturn will be less severe in the absence of any government intervention in the shipbuilding industry.

Figure 13. Negative demand shock: Effect of elastic supply on production



Note: This reasoning would not change when the *Supply_Gvt* curve would additional shift downards (implying reductions in production costs reflected in lower prices).
Source: Author's elaboration.

2.2.4. Production costs

Lower prices can be a result of a(n) (unexpected) decline in production costs. This section discusses the impact of several factors on production costs.[21] Our empirical results on a data sample of European and Asian shipbuilding companies shows that Chinese firms have on average significantly lower costs compared to German, Finnish, French, Italian, Korean and Norwegian firms while Romanian and Russian ones have on average lower costs than Chinese ones (Annex E for an overview of the data sample and Annex F for results).

The most interesting findings are probably that:

i. Costs increase in a convex manner[22]: by reaching a yard's capacity constraint, costs increase per unit produced since the firm needs to hire more expensive short-term labour and/or existing workers need to work extra hours as well as maintenance costs for machines increase due to the increased workload.

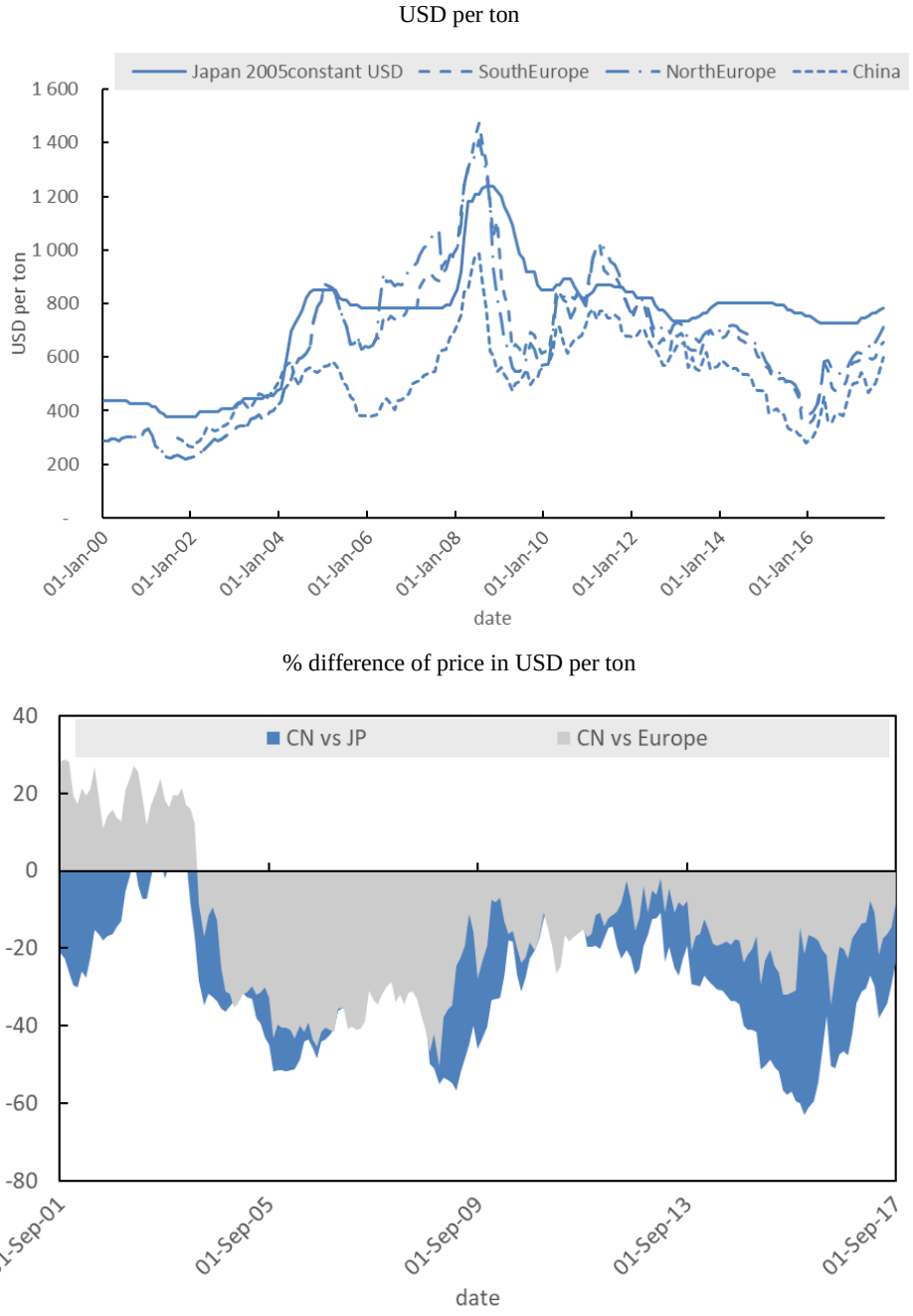
ii. Firms with large capital stock can benefit from efficiencies by producing the same quantity (i.e. CGT) at significantly lower marginal costs compared to firms with smaller capital stock. An increase of firm capital stock by 1% decreases on average firms' costs by around 0.01%.

iii. Prices for steel, ship's main input factor, have a significant impact on production costs and are considered to be very volatile (Figure 14, upper graph). A 1% increase in steel prices increases production costs by on average 0.5%.[23] Chinese steel prices are significantly lower than Japanese and European ones (Figure 14, lower graph) – in some periods up to 50% compared to (South) European prices

and 60% lower than Japanese prices. Although the figures compare the same steel category there may be differences in quality across countries.

iv. Productivity plays an important role in cost developments. More productive firms can decrease their production costs. An increase in total factor productivity decreases production costs by on average 0.7% (all other factors constant).

Figure 14. Steel plate prices (upper) and price difference to Chinese steel prices (bottom)

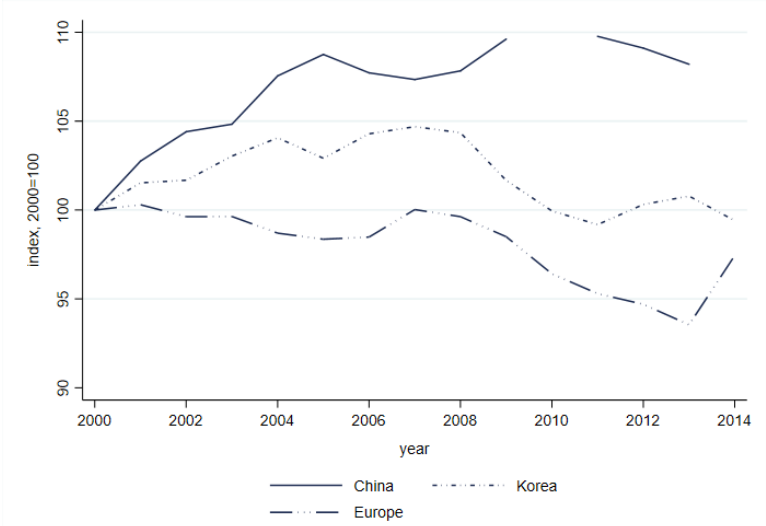


Note: Steel plates are major input factor for ship construction. Chinese and European prices are traded in USD per ton, while Japanese prices are converted from Yen to 2005 constant USD.
Source: S&P Platts (2017[16]) and Japan Metal Daily (2017[17]) for Japanese prices.

Total factor productivity (TFP) provides a good indication of how efficiently firms can convert inputs into outputs (see Box 5) and plays a role in changes in production costs.

Figure 15. Total Factor Productivity

Index of country average firm-level productivity, 2000=100



Note: There are no observations for Japan's material costs. Therefore, for Japan it is not possible to derive reliable total factor productivity estimates.
Source: based on ORBIS 2016-1 and 2016-2, and Kalouptsidi and Barwick (Fall 2017[12]).

Box 5. Total Factor Productivity

Total Factor Productivity (or also called multi-factor productivity) reflects the overall efficiency with which labour and capital inputs are used together in the production process. Changes in TFP reflect the effects of changes in management practices, technological advancements, organizational change, general knowledge, network effects, spill-over effects from production factors, adjustment costs, economies of scale or the effects of imperfect competition.

Since TFP measures the change in output relative to changes in labour and capital and thereby assessing the efficiency with which both inputs are used, it is a better measure of productivity than labour productivity or capital efficiency alone.

For example, instances where one company generates more output with the same amount of labour and capital inputs than one of its competitors, may reflect changes in TFP. Growth in TFP is measured as a residual, i.e. that part of production growth that cannot be explained by changes in labour and capital inputs (including material). This indicator is usually measured as an index and in annual growth rates.

Source: OECD Productivity Statistics (2018[18])

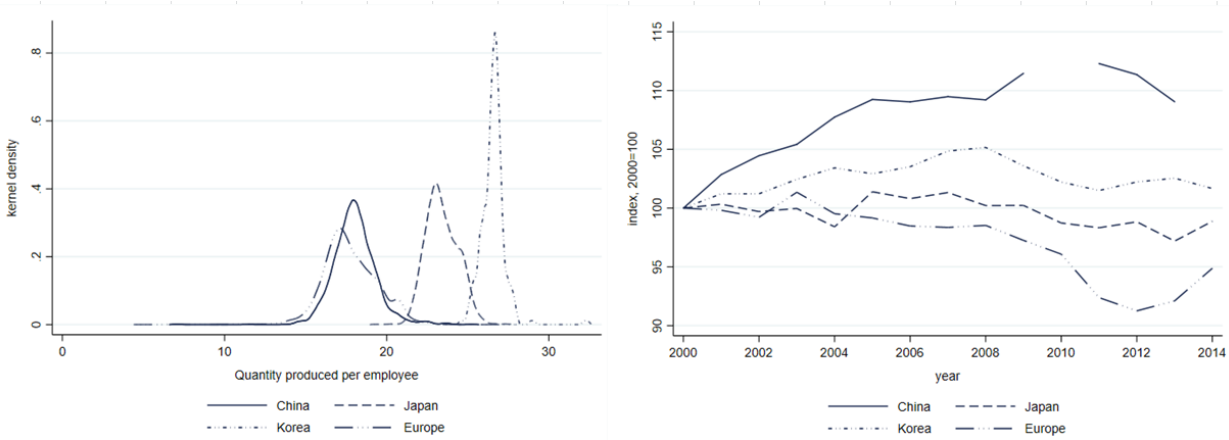
The results indicate that China's shipbuilding industry experienced a strong increase in TFP compared to its levels in the year 2000, while European countries faced a decline during the same period. Similar to China, Korean ship yards showed an increase in TFP until 2009 that subsequently declined below its level in 2000 (Figure 15).

Still China's TFP levels are on average lower than those of Korean and European firms, but they grow more rapidly.[24] In our sample for the period from 2000 to 2013, the weighted annual growth for China's shipbuilding firms amounts to 7% while for European ones it amounted to only about 0.9% and for Korea to approximately 2.1%. TFP growth of China's shipbuilding industry is significantly higher than for the total Chinese manufacturing industry as found by Brandt et al. (2012[19]).[25] The authors derived TFP developments of China's manufacturing industry as a whole and showed a weighted average annual productivity growth of 2.8%. In addition, China targeted the shipbuilding industry as one of its strategic sectors for which it aimed to dedicate resources for industrial development during several development plans (Box 3). Such industrial policy measures may have supported investments in the (targeted) industry that in turn boosted productivity growth.

The same pattern is observed for growth of labour productivity and the fact that labour productivity of China's yards are on average lower than of Korean and Japanese ones (Figure 16). All estimation results for TFP and labour productivity are listed in Annex G.

Figure 16. Average firm-level labour productivity

2000-14



Note: China does not cover the year 2010. Labour productivity is defined as quantity produced per worker.
Source: based on ORBIS 2016-1 and 2016-2, and Kalouptsidi and Barwick (Fall 2017[12]).

3. The Role of Government Support Measures in Explaining Market Distortions

Governments and other public institutions can implement various measures to support their domestic industries and firms specifically or indirectly (i.e. horizontal policies that do not target any specific industry). The significant challenge in analysing the effect of government interventions in the shipbuilding industry and in general lies in the fact that systematic data (at the firm-level) is virtually non-existent, and thus the presence and extent of public interventions are often unknown.

The objective of the following work is to provide a better understanding of the channels through which various public support measures can lead to market distortions and affect industrial capacity. The previous section details the features of the shipbuilding industry and along these lines the following section will discuss three government interventions as examples to illustrate through which channels these may impact the shipbuilding market. These three examples encompass preferential financing instruments, and two discretionary measures, notably government procurement policies and non-enforcement of national bankruptcy laws.

To illustrate the potential market-distorting effects of the selected public measures on supply side primitives, this study differentiates between their impact on firm output (i.e. mainly production), earned income, cost of intermediate goods and services (i.e. inputs from upstream sectors, such as steel, marine equipment and so on), labour (i.e. employment and salaries), land area and natural resources (renewable and non-renewable), physical (e.g. machinery, buildings, other equipment) and financial capital (i.e. in general debt and equity), and knowledge (i.e. research and development capacity, (acquisition) of skills, education, etc.) (Table 1). This structure is derived from the OECD taxonomy used in the areas of fossil fuel and agriculture (OECD, 2018[20]).[26]

Table 1. Effect of governmental transfer on supply side primitives

Supply						
Direct	Indirect	Through cost factors				
A: Output	B: Company income	C: Cost of intermediate inputs	D: Labour	E: Land and natural resources	F: Capital	G: Knowledge
					physical financial	

Source: based on OECD (2018[20]).

3.1. Preferential financing inconsistent with market-based conditions

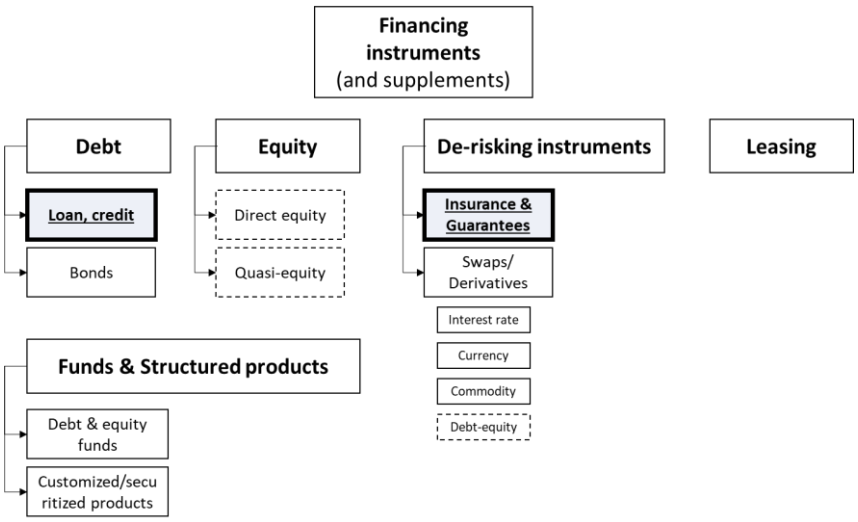
Background

Firms can use various forms of financing instruments (Figure 17). The basic ones include debt (loans, credits or bonds) and equity (direct and quasi-direct[27]). Beyond those, there

exists also funds, such as debt or equity funds, and structured products that are customized, such as options or indices. As part of financing solutions there are also so-called *de-risking instruments* that help firms reduce or manage financing risks, such as insurance and guarantees as well as swaps on interest rates, currency, commodities or debt-equity. Guarantees lower the risk of a transaction and enable lenders to enter into a financing contract which might not be possible otherwise (e.g. due to credit or jurisdictional issues). Swaps and derivatives are typically financial agreements that supplement other financing instruments to help manage different types of risk faced by an investor or borrower (World Resources Institute, 2012[21]). Alternatively, there are leasing options whereby the lessor purchases an asset on behalf of the lessee in return for a contractually agreed series of payments with interest rate (Deloitte, 2018[22]).

Governments or public institutions in general can provide financing solutions to firms. The most widely discussed financing alternatives are probably loans and credits, as well as equity instruments along with insurance and guarantees (as part of financing solutions) (Figure 17).

Figure 17. Indicative glossary of financing instruments



Note: Financing instruments highlighted in blue and bold frame are discussed in this report. Items in a dashed frame will be discussed as part of an upcoming report on state-ownership. The remaining items can be included in a revised version of this report should their analysis be of interest to the delegates.
Source: based on World Resources Institute (2012[21]).

The analysis will focus on debt financing in the form of loans/credits and supplement financing solutions, particularly guarantees (highlighted in bold in Figure 17). The analysis discusses these financing solutions for both parties, the ship yard and the ship buyer. Equity solutions provided by the government (i.e. equity financing and debt-equity swaps)[28] enter essentially the discussion of state-ownership – a topic which will be addressed in an upcoming report. For more information about financing instruments used in the shipbuilding industry see the OECD report on ship finance which also discusses financial leasing.

Potential effects

Through the public provision of preferential financing instruments that are inconsistent with market-based conditions, governments may indirectly understate their cost of capital

because they treat risk-bearing as costless. Still it is important to highlight that governments may allocate through preferential financing a significant share of societies' capital and risk to support a country's domestic industry (Lucas (2018[23]) and (2014[24])). Beyond that, such government interventions can distort the shipbuilding and shipping markets in the long-term and make it difficult to achieve a global level-playing field. In the following the analysis discusses the effect of preferential financing provided by the government inconsistent with market conditions to ship suppliers and ship buyers.

Supplier side

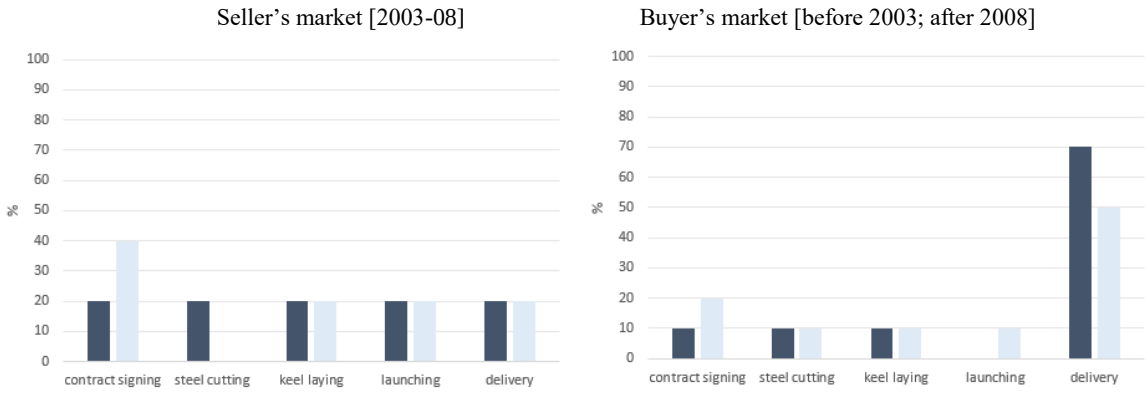
Preferential (concessional) **loans** often feature extended terms that are substantially more generous than financing instruments available in the market. The concessionality is achieved either through interest rates below those available on the market or by longer grace periods, or a combination of these (OECD (2006[25]), IMF (2003[26])).

Measuring the "concessionality level" of financing instruments provided by governments or government-affiliated authorities is a challenging task: first, there is the difficulty to identify the interest rates charged as well as other contractual terms, which are hardly disclosed by public institutions; second, a counterfactual analysis needs to be conducted in order to derive the interest rate (and financing costs in general) the firm would have paid in private markets. For the latter aspect, usually a benchmark interest rate is derived by constructing the firm specific risk profile plus the risk free interest rate. Useful information sources to estimate those capital costs are financial statements to derive, for instance, the interest rates paid on other debt or the firm leverage (in order to assess the firm risk), or credit ratings to project loan cash flows and derive credit spreads for the estimation of discount rates (Lucas, 2018[23]). Alternatively, the risk premium can be derived on the basis of the Capital Asset Pricing Model (CAPM) introduced by Sharpe (1964[27]), Lintner (1965[28]) and Mossin (1966[29]). This model allows the determination of the firm specific *beta-factor* which represents the non-diversifiable (systematic) risk of the firm.

A shipbuilding firm may use the loan for different purposes. For instance, it may invest in physical capital goods, such as additional docks, machinery or equipment, or expand its land area ("investment loans"). It can also pay back an old loan for refinancing purposes, affecting the company's financial capital position.

Alternatively, the company may use the loan to cover its working capital requirements ("working capital loans"), which are usually very high in ship production. Ships are typically contracted for a fixed price, payable in a series of 'stage payments' that spread payments over the period of vessel construction, which can take several years (Stopford, 2003[8]). The shipyard's aim is to be paid as the ship is built, so that working capital is not needed. Hence, the shipyard will aim for stage payments along the lines shown in Figure 18 (lhs) in a seller's market (i.e. periods in which demand for ships is very high and the yard has a stronger negotiation power). In a buyer's market (Figure 18, rhs), however, the up-front payments are rather low with for instance 10-20% of the ship price at contract signing and 10% for each milestone of steel cutting, keel laying and launching, while the major payment of up to 70% of the ship price will be paid by the ship buyer only at delivery.

Figure 18. Common stage payment terms of newbuilding contracts



Note: Dark and light lines highlight in each market the two possibilities of stage payments. For instance, in a seller's market, payment profiles with 5x20% stage payments at contract signing, steel cutting, keel laying, launching and delivery were observed, as well as payments of 40% at contract signing and 3x20% at keel laying, launching and delivery.
Source: based on information obtained from shipbrokers.

Stage payments determine the financing needs and thereby financing costs as illustrated in the example in Table 2. Let's assume cash expenditures of around 87% of newbuilding price, accruing during the construction period as follows: 10% at four months prior to steel cutting in order to pay the required steel ordered, 30% at steel cutting, 40% at keel laying and 7% at launching. In a buyer's market the stage payments will not cover the cash expenditures accruing during the steel cutting, keel laying and launching phases (highlighted in red). In this example, the yard needs to finance the entire cash expenditures of 87% of newbuilding price. In contrast, in the example of a seller's market with more favourable stage payments for the builder, the financing volume with 27% is much lower. Keeping in mind that ships cost several million USD (e.g. a gas carrier around USD 350 million, and cruise ships almost USD 1 billion) variances in stages payments can lead to large differences in financing costs, hence, production costs. Indeed, yards usually have several ships on order, each providing stage payments at different times, which may compensate working capital requirements across orders. However, it requires organizational skills and a good timing to avoid any financing to cover cash expenditures.

Table 2. Illustrative example of stage payments and cash expenditures

In %

		Contract signing	Contract signing + 3M	Steel cutting - 4M	Steel cutting	Keel laying	Launch	Delivery	SUM
Cash expenditures (%)				**10**	**30**	**40**	**7**		**87**
Stage/Advanced payments (%)	Buyer's market	20			10	10	10	50	100
	Seller's market	40				20	20	20	100
Accumulated advanced payments (%)	Buyer's market	20	20	20	30	40	50	100	
	Seller's market	40	40	40	40	60	80	100	
Sufficient/ insufficient cash (%)	Buyer's market	20	20	10	**-10**	**-40**	**-37**		
	Seller's market	40	40	30	0	**-20**	**-7**		

Note: The numbers are made up for illustrating the example only.
Source: derived from exchanges with shipbuilding contacts.

The potential effects of preferential financing instruments inconsistent with market-based conditions arise through various channels (Table 3). First, cheaper financing options in the form of investment loans may provoke firms to invest in capital stock and land, hence, to increase capacity. Depending on the degree of the preferential terms and the amount of free money associated with it for the purchase of new capital stock, the government intervention in question may lead to increased productivity levels for the firm. Essentially, the firm would get a generous capacity expansion without the need to cover (part of) its capital costs enabling it to produce more output at same costs (or the same output at lower costs). As discussed in the previous section, increased productivity levels can decrease production costs by on average 0.7% (*ceteris paribus*). Besides, as outlined previously firms with large capital stock can benefit from efficiencies by producing the same quantity at significantly lower marginal costs compared to firms with smaller capital stock. An increase of a firm's capital stock by 1% decreases firm's costs by on average 0.01%. These are potential cost reductions of not negligible magnitude.

Second, if the loan is used to cover the working capital requirements during ship construction it can decrease production costs. Such indirect support lowering production costs can either lead to reduced ship prices offered by the yard (in case of cost-pass-through to the buyer, hence, by keeping the profit margin constant), which in turn can lead to increased demand (i.e. firm output), or higher company income if the firm increases its profit margin instead of passing on the cost reduction to its buyers (no cost-pass-through).[29] Both effects depend on the price sensitivity of ship buyers. If this sensitivity is high (i.e. rather elastic demand) a firm may opt for the first case as it tries to capture the increased demand following price reductions. If this sensitivity is weak (i.e. rather inelastic demand) the firm may opt for the second case as the costs associated with the decline in demand (as a consequence of increased prices) will outweigh the gains (resulting from reduced production costs).

In view of the fact that in practice ship prices are typically determined at contract signing (and there is only a narrow leeway for ship yards to adjust prices post-order date) and the actual financing costs become only known with certainty during ship production, it is more likely that gains from cost reductions are reflected in increased enterprise income rather than output.

Table 3. Potential effect of preferential financing on supply primitives

Supply							
Direct	Indirect	Through cost factors					
A: Output	B: Company income	C: Cost of intermediate inputs	D: Labour	E: Land and natural resources	F: Capital		G: Knowledge
					physical	financial	
x	x			x	x	x	

Source: based on OECD (2018[20]).

Finally, **guarantees** provided by the government to shipbuilders (with or without preferential terms, such as reduced fees) would essentially enter the discussion above on estimating the extent of the subsidy-equivalent to the reduced risk premium provided by the bank. In other words, if the presence of a government guarantee or insurance will change the assessment of the bank about the firm's (default) risk (e.g. non-payment of the loan) and thereby reducing the risk premium for the loan charged by the bank, this

government intervention would essentially lead to reduced financing costs for the firm (i.e. at non-market conditions) and would imply a subsidy-equivalent. Otherwise, if the pure presence of the government as a guarantor is a necessary and sufficient condition for the firm in order to get a bank loan at all, and this is not accompanied by a change in the risk assessment of the bank (i.e. the risk premium charged is consistent with market conditions), then there would not be any concern about an implied subsidy.

Buyer side

Ship transactions are typically international as ship buyers and producers are located in different jurisdictions. As shown in the previous section, over the last two decades the lion's share of ship production of major shipbuilding economies has been purchased by foreign owners. In the light of the global character of the shipbuilding and shipping industry, "governments provide official export credits support through Export Credit Agencies (ECAs)[30] for national exporters competing for overseas sales" (OECD, 2018[30]). Such support can take the form either of (i) "official financing support", i.e. direct credits/loans, refinancing or interest-rate support to foreign buyers, (ii) "pure cover support", i.e. insurance or guarantees for credits provided by private financial institutions, or (iii) any combination of the two (OECD, 2017[31]).[31] While guarantees usually protect the lenders financing the purchase of the ship (or any export good) against repayment of their loan in certain circumstances, an insurance protects a shipbuilder (or exporter in general) against non-payment by the overseas purchaser of its products (Thomson Reuters, 2018[32]).

Ill-designed export credit practices that are inconsistent with market conditions can artificially stimulate demand for new vessels (Table 4). This reasoning complements the discussion presented above, but from a demand side perspective. If a public financing support measure (i.e. direct credits/financing, refinancing or interest-rate support along with guarantees to foreign buyers) implies cost advantages in the form of a subsidy-equivalent to the ship buyer, it will indirectly reduce the costs of ship purchases. With a large enough subsidy-equivalent, such publicly supported financing forms may stimulate ship purchases from buyers not willing to invest in newbuilt vessels in the absence of the indirect support, and may thereby indirectly aggravate the cyclical downturn as elaborated in the beginning of the paper. Only a framework for the orderly use of officially supported export credits can ensure a global level-playing field and eliminate trade distortions and subsidies. The role of the OECD Arrangement on Officially Supported Export Credits is precisely to provide a healthy market environment where exporters compete on the basis of the price and quality of their products rather than on the financial terms provided. The role of the OECD in export credits first and foremost involves the maintenance and developments of the international disciplines of the Arrangement which stipulate the financial terms and conditions for official export credits (OECD, 2018[30]).

Table 4. Potential effect of preferential financing on demand primitives

Supply							Demand
Direct	Indirect	Through cost factors					
A: Output	B: Company income	C: Cost of intermediate inputs	D: Labour	E: Land and natural resources	F: Capital	G: Knowledge	
					physical financial		
x							x

Source: based on OECD (2018[20]).

3.2. Discretionary policy measures

This category encompasses horizontal policy measures including the non-application of market based policy measures. This section neither discusses state-owned enterprises (as it will be analysed in an upcoming report) nor local content requirements (as this measure is analysed in Gourdon and Guilhoto (2019[33])).

3.2.1. Government procurement

Background

Government procurement (GP) encompasses the purchase of goods and services with public funds for public purposes by government institutions. In these transactions, 'value for money' plays a primary goal since public money is involved. In order to achieve this objective the World Trade Organisation (WTO) considers an open, transparent and non-discriminatory procurement process as the best tool since this approach optimises competition among suppliers.

Nonetheless governments may use government procurement transactions to achieve other domestic policy goals, such as supporting the development of specific local industries or social groups. The provision of preferential treatment for domestic goods, services and suppliers acts as a discriminatory barrier (Gourdon and Guilhoto, 2019[33]).

Government procurement falls in a wide range of instances. The OECD developed a taxonomy classifying government procurement policies in order to better understand whether and how such measures may impact foreign suppliers. The classification is structured in nine different sets of measures, whereof the first four are usually explicitly mentioned in a law and openly give preference to domestic suppliers. The remaining group of measures or practices are rather implicit in the sense that they do not expressly target foreign bidders but may, indirectly or potentially, affect cross-border procurement (Gourdon, Bastien and Folliot-Lalliot, 2017[34]):

Taxonomy of GP group or practices

1. Market access restrictions,
2. Domestic price preferences,
3. Local content requirement (LCR),
4. Collateral restriction/restrictive effects,
5. Conduct of procurement,
6. Qualification criteria,
7. Evaluation criteria,
8. Review/complaint system and
9. Transparency and information.

For the scope of this paper the analysis concentrates on the explicit measures, especially market access restrictions, domestic price preferences, and LCR. A description of the remaining GP groups of the taxonomy are displayed in Annex H.

Market access restrictions

Market access restrictions shown in Table 5 encompass all practices that intentionally restrict access to government procurement only to domestic suppliers, or which oblige joint ventures with a national/local entity (**M11-M13**). Reciprocity access provisions include provisions which allow foreign suppliers to bid only if the domestic supplier grants reciprocal access (**M14**) (i.e. following the WTO GP agreement). As an example of the latter, national treatment in GP is only granted to foreign firms if the same treatment is offered by the country of the foreign firm. Under the commercial presence requirement (**M15**), a supplier can participate in a bid only if its business is established locally in the procuring country (either through a subsidiary (ownership) or lease of premises (franchise, etc.). **M16** captures the occurrence observed where countries use national security reasons to exclude foreign firms from projects which are not directly linked to security matters. Measures pertaining to thresholds (**M17**) entitle foreign firms to bid in the country only for contracts above or below a given threshold (Gourdon, Bastien and Folliot-Lalliot, 2017[34]).

Table 5. Market access restrictions

Subgroup	Sub-category
M1: Market access restriction	**M11**: To national supplier
	M12: To local supplier
	M13: To joint ventures with national supplier
	M14: Access based on reciprocity
	M15: Commercial presence required
	M16: Exclusion for national security or safety reasons
	M17: Thresholds

Note: The taxonomy distinguishes between national and local suppliers. The term "national" is broadly understood as including any domestic suppliers, anywhere within the country where the procurement takes place. The term "local" refers to a particular group of domestic suppliers within a specific region or locality within the country. This distinction applies to M1 but also to M2 and M3.
Source: Gourdon, Bastien and Folliot-Lalliot (2017[34]).

The potential effect of such market restrictions are primarily reflected in a protection of the domestic industry against international competition in the context of orders placed by the government or government-related authorities. Although public procurement policies do not stimulate ship production at the aggregate level *per se* (i.e. the order would have been placed in any case) it may stimulate ship production for the domestic shipbuilding industry. Since the tender process includes preferential access for national firms, those national firms may not have won the order in the absence of the GP policy. In other words, national firms increase their production and thereby income not on the basis of market principles but of government intervention.

Table 6. Potential effect of market access restrictions on supply primitives

Supply						
Direct	Indirect	Through cost factors				
A: Output	B: Company income	C: Cost of intermediate inputs	D: Labour	E: Land and natural resources	F: Capital	G: Knowledge
					physical financial	
x	x					

Source: based on OECD (2018[20]).

Domestic price preferences

The second set of measures covers provisions that explicitly favour domestic firms by allocating a price preference (M2) to national suppliers (M21), local suppliers (M22) and joint ventures with national companies (M23). As an example for such policies, governments prefer national bids to foreign ones that are of equal quality where national bids' price does not exceed an additional 10% of the price quoted in the foreign one.

Table 7. Domestic Price Preferences

Subgroup	Sub-category
M2: Domestic price preferences	**M21**: For national supplier
	M22: For local supplier
	M23: For joint ventures with national entity

Source: Gourdon, Bastien and Folliot-Lalliot (2017[34]).

Similarly to the previous case, such government interventions increase the production and income of national shipbuilding firms although cheaper offers of equal quality would have been available to the government. In this case, a less competitive producer won the project and the government acts against the 'value for money' principle. In the long-term, if less competitive firms repeatedly win orders (at higher prices), those firms will be more likely to expand their capacity in the market, crowding out more productive firms.

Table 8. Potential effect of domestic price preferences on supply primitives

Supply						
Direct	Indirect	Through cost factors				
A: Output	B: Company income	C: Cost of intermediate inputs	D: Labour	E: Land and natural resources	F: Capital	G: Knowledge
					physical financial	
x	x			x	x	

Source: based on OECD (2018[20]).

Local Content Requirements

Local Content Requirements in the context of government procurement transactions require bidders to purchase domestically manufactured goods or domestically supplied services, for instance as a percentage of value added or as intermediate inputs. The requirements could be to use inputs or to store data locally (**M31**), use local services (**M32**), hire staff

from the country (**M33**), or subcontract national firms/experts (**M34**). Offsets requirements (M35) are generally measures that require or encourage suppliers to provide additional economic benefits to the local economy, such as in-country investments, transfers of technology, production under license, or marketing/exporting assistance. Under the WTO GPA, offsets are only authorized for developing countries as transitional provisions.

Table 9. Local Content Requirement

Subgroup	Sub-category
M3: Local content requirement	**M31**: Inputs and data storage
	M32: Services
	M33: Staff requirement
	M34: Subcontract requirement
	M35: Offsets

Source: Gourdon, Bastien and Folliot-Lalliot (2017[34]).

The knowledge about existing measures in the shipbuilding industry related to government procurement with a local content clause is rather scarce. The probably most widely known GP measure with a local content provision is Brazil's localisation based policy in its oil and gas sector, affecting ship production. As Gourdon and Guilhoto (2019[33]) show Brazil's proposed policy reform reflected in a significant reduction of local content rates can result in long-term benefits for the total economy and for different sectors in particular.

Research results on LCR policies in general highlight the long-run inefficiencies associated with these measures (Stone, Messent and Flaig (2015[35]); Gourdon and Guilhoto (2019[33])). With the LCR policy in place, firms are obliged to purchase less competitive and more expensive intermediate inputs domestically than those they could acquire on the international market. The policy results in the intended increase in output of the local upstream sector, increasing welfare, but only in the short-term. In the long-term, the higher prices of domestically procured components will increase the price of the final good and, as a result, the quantity sold will decline as will domestic welfare (in case the government is sensitive to increased price changes and will subsequently reduce its orders).

The potential effects of GP policies with a local content condition are less obvious. The need to source domestically may lead to increased intermediate input prices, lowering the firm's profit margin in case it is not able to increase its prices accordingly. In the long-term such policies can weigh on firms' financial health.

Table 10. Potential effect of local content requirements on supply primitives

Supply							
Direct	Indirect	Through cost factors					
A: Output	B: Company income	C: Cost of intermediate inputs	D: Labour	E: Land and natural resources	F: Capital		G: Knowledge
					physical	financial	
x	x	x		x	x	x	

Source: based on OECD (2018[20]).

3.2.2. Weak national bankruptcy laws or their non-enforcement

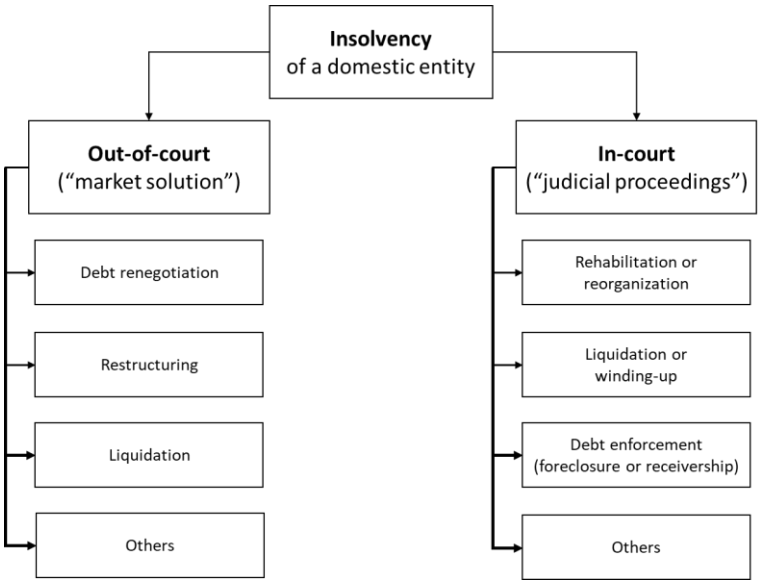
This section starts with a general outline of informal and formal insolvency proceedings, whereof the latter one is primarily guided by national bankruptcy laws. Subsequently the section describes which difficulties may arise through weak insolvency regimes or the non-enforcement of (even well-designed) bankruptcy laws in the form of government-designed rescue systems (i.e. bail-outs). Ultimately, the section analyses the potential effects of both instances in the context of the shipbuilding industry.

Background

Financially distressed firms need to find solutions with their stakeholders about how to fully repay corporate debts. In these situations, there are generally informal and formal insolvency proceedings available to companies (Figure 19). In an informal approach, the insolvent company negotiates and finds an agreement with its creditors out-of-court ("market-solution"), for instance by renegotiating the loan terms, firm restructuring or out-of-court liquidation. Since informal agreements do not involve a contract that legally binds the creditors to the agreement, there is the risk that stakeholders may back out of the agreement at any time. As an example, creditors may pursue legal actions against the company. It may be furthermore the case that an independently proposed arrangement will be less likely accepted by the firm's creditors.

Official proceedings may, however, be more likely to be approved. Besides, if there are too many creditors to negotiate an informal out-of-court workout or the stakeholders cannot agree on certain arrangements, a judicial proceeding may be more appropriate to determine the entity's future. In these cases, negotiations among stakeholders take place in-court and resolutions are backed by legal actions. In-court proceedings generally result in rehabilitation or reorganization of the business, liquidation or winding-up, or debt-enforcement (foreclosure or receivership).

Figure 19. Illustrative overview of insolvency proceedings



Note: This overview is not comprehensive and does not represent the complex structure of insolvency proceedings. It rather provides a general structure to insolvency proceedings resulting in negotiations among stakeholders either out-of-court (i.e. market-solution) or in-court (i.e. judicial solution").
Source: Author's compilation partly based on World Bank (2017[36]).

Efficient insolvency procedures to restructure financially distressed businesses are important to protect creditors' rights. Court rulings (i.e. formal proceedings) are a particularly powerful tool to enforce an agreement among stakeholders. On the one hand, bankruptcy regulations need to prevent the premature liquidation of sustainable businesses, and discourage lenders from issuing high-risk loans to the company along with managers from taking imprudent loans and making risky financial decisions. Through business reorganization, creditors can recover a part of their investment, more employees may be able to keep their jobs, and supplier and customer networks are preserved. On the other hand, well-functioning bankruptcy regimes need to correctly classify unsustainable businesses and enforce liquidation processes to protect creditor rights. By contrast, ineffective mechanisms for business exit will likely maintain unprofitable and unproductive capacity in the market, create a higher cost of capital and heightened risk perception among investors and financial institutions. Hence, only a systematic approach and coherent framework to insolvency and debt resolution can strengthen the investment climate, lead to economic growth and a healthy business environment (World Bank, 2017[37]).

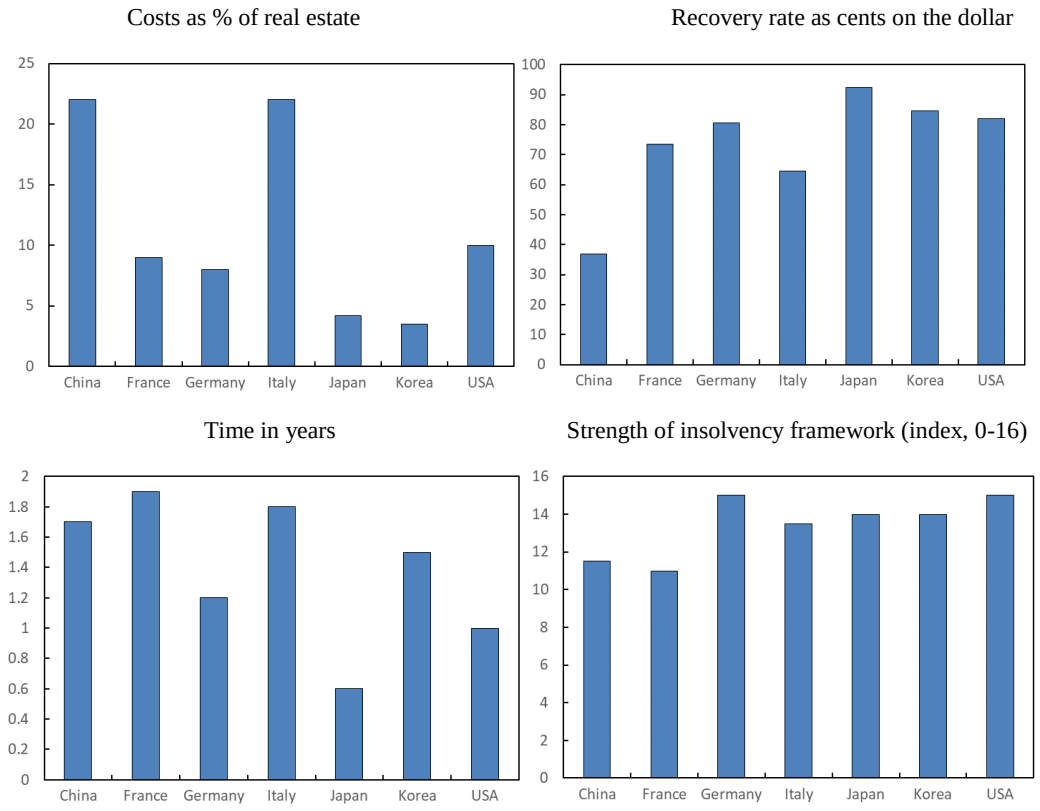
National insolvency laws along with institutions executing the law (i.e. judicial systems) differ across jurisdictions, and thereby may result in different decisions made for similar insolvency cases. The World Bank (2018[38]) publishes every year a comparison of insolvency regime indicators (see Figure 19 for a selection of four of these indicators) illustrating the average outcomes of comparable insolvency cases.[32] The results show that China's insolvency regime is the one with highest costs (more than 20% of real estate value) and the lowest recovery rate (below 40%) compared to other major shipbuilding economies. It is one of the regimes taking the longest time (more than 1 ½ years) and one with the lowest strength (next to France) in terms of commencement of proceedings, management of debtors' assets, reorganization proceedings and creditor participation. Korea's insolvency framework appears better than China's: Admittedly, resolving bankruptcy also takes relatively long (1 ½ years on average), but the regime appears less expensive with costs below 5% of real estate, the recovery rate of more than 80% is relatively high and it is one of the strongest regimes compared to other displayed shipbuilding economies. Japan's insolvency regime seems to be strong in all four categories: it costs only a low share of the real estate at stake (similar to Korea below 5%), it has the highest recovery rate of 90% across all analysed shipbuilding economies, it is the fastest one with only half a year of duration, and among the strongest ones. European Union countries show a diverse picture: in particular Italy is striking in the sense that its regime entails high costs similar to the Chinese one, the second lowest recovery rate with around 60%, more than 1 ½ years of duration, but with a relatively strong framework. In contrast, Germany's regime seems to be less costly with a higher recovery rate and faster proceedings among EU countries and is the strongest one across all analysed economies.

Weak bankruptcy laws can delay insolvency in general and may discourage firms to enter formal insolvency proceedings. Of particular concerns are formal proceedings that have been shown to offer very low creditors' protection (weak insolvency framework), to be very costly for creditors (high % of real estate costs involved), to have very low recovery rates, and to be extremely time-consuming. The World Bank therefore elaborated principles for an effective national insolvency and creditor rights systems (Box 6).

Box 6. World Bank Principles for Effective Insolvency and Creditor Rights Systems

In an effort to advice jurisdictions about well-designed bankruptcy laws the World Bank (2015[39]) has developed a catalogue of "Principles and Guidelines for Effective Insolvency and Creditor Rights Systems". This manuscript compiles 33 principles that countries should adopt to promote more efficient resolution of financial distress. These are separated into four categories: A. Legal Framework for Creditor Rights; B. Risk Management and Corporate Workout; C. Legal Framework for Insolvency; D. Implementation: Institutional and Regulatory Frameworks.

Figure 20. Insolvency proceedings (in-court), 2018



Note: In the context of the World Bank, the terminology used for insolvency proceedings equals the general term of bankruptcy proceedings. The World Bank Doing Business indicators are calculated as follows: Cost of the proceedings is recorded as a percentage of the value of the debtor's estate. The cost is calculated on the basis of questionnaire responses and includes court fees and government levies; fees of insolvency administrators, auctioneers, assessors and lawyers; and all other fees and costs. The recovery rate is recorded as cents on the dollar recovered by secured creditors through judicial reorganization, liquidation or debt enforcement (foreclosure or receivership) proceedings. The period of time is from the company's default until the payment of some or all of the money owed to the bank. The strength of insolvency framework index is based on four other indices: commencement of proceedings index, management of debtor's assets index, reorganization proceedings index and creditor participation index. The results for each country does not change over years since insolvency regimes are rather sticky and amendments are rare or only slowly implemented.
Source: World Bank (2018[38]).

While there is no direct government involvement in the formal and informal proceedings discussed above, there can be cases where the government may have a compelling interest in intervening in insolvency procedures. The national bankruptcy law may or may not allow governments to intervene in specific cases. There may also exist other legal frameworks under which public authorities could potentially discuss certain corporate bankruptcy proceedings.

Such government designed rescue systems ("bail-outs") are often justified by the government insofar as they could prevent a financial contagion to other parts of the economy ("too big to fail" argument) that results in large economic costs, or to solve the financial distress of systemically important firms. For instance, during the financial crisis of 2008 the US government arranged different solutions to ailing financial institutions with varying degrees of public support, such as public funds facilitating a merger, substantial direct loans or declining any support at all so that the firm ultimately filed for formal reorganization/restructuring (Chapter 11) (Ayotte and Skeel, 2010[40]). However, as shown in the following, public rescue support can lead to several unintended effects causing large economic costs.

Potential effects

Weak bankruptcy laws can delay insolvency and may discourage firms to enter formal insolvency proceedings. Non-enforcement of (even well-designed) bankruptcy laws through interference by governments can generally lead to principal incentive problems of stakeholders in the form of moral hazard (Box 7) that result in unexpected massive economic costs and will likely distort the market through various channels.

Box 7. Moral Hazard in the context of Government-aligned Rescue Efforts

The concept of moral hazard describes the concern that someone who is protected against any consequences of a risk has less incentives to take precautions against this risk. In the case of government aligned rescue efforts, if *creditors* anticipate that the firm they invested in will be rescued by the government if it runs into trouble, they may extend their funding volume beyond what they would have otherwise. This continued funding to companies on the edge of bankruptcy may also encourage *managers* to deliberately fail to take necessary steps to prepare for bankruptcy and continue with high risk projects. Besides, *potential acquirer* of the distressed firm may be inclined to wait until the target's condition is so desperate that it can argue for taxpayer assistance as a prerequisite for completing the deal. Hence, due to moral hazard the rescue funding may contribute ultimately to the instability the government backing was trying to prevent. In some instances, governments made attempts to control moral hazard by designing "hybrid" solutions that limit the systematic risks that come from one stakeholder group while at the same time solving some of the moral hazard concerns described above. Ayotte and Skeel (2010[40]) discuss some of these solutions in the context of the financial crisis and the intervention of the US government.

Source: Ayotte and Skeel (2010[40])

As summarized in Table 11, weak or non-enforcement of national bankruptcy laws will likely maintain unproductive capacity in the market and thereby aggravating the problem of industrial excess capacity. In particular, labour, land (yard area) as well as physical and financial capital are sunk in these insolvent firms rather than being allocated to and used for more efficient purposes. In addition, since mainly cost factors for the production of

ships are concerned it may likely be the case that weak or non-enforcement of national bankruptcy laws lead to a decline in ship prices of the company in question. If this company has enough market power it might pressure the market price of similar ships downwards.

Table 11. Potential effect of weak or non-enforcement of national bankruptcy law

Supply							
Direct	Indirect	Through cost factors					
A: Output	B: Company income	C: Cost of intermediate inputs	D: Labour	E: Land and natural resources	F: Capital		G: Knowledge
					physical	financial	
			x	x	x	x	

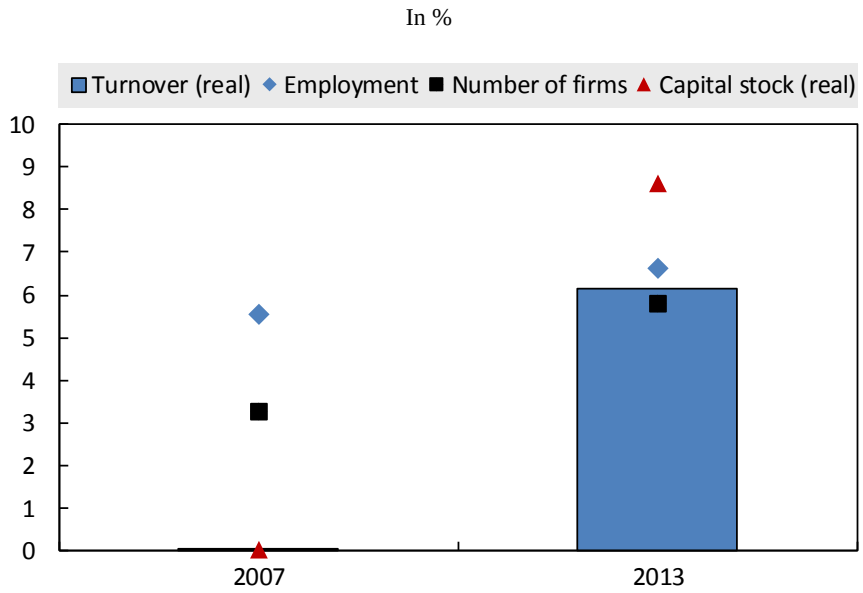
Source: based on OECD (2018[20]).

Measuring the extent of insolvent firms present in the shipbuilding industry is a challenging task. In the seminal work of Caballero, Hoshi and Kashyap (2008[41]), the authors show that firms in Japan, which are kept artificially alive through, for instance subsidized bank credit (firms they call "zombies"), reduce the profits of healthy firms, exhibit more depressed job creation and destruction, and lower productivity levels. McGowan, Andrews and Millot (2017[42]) draw on the topic of zombie firms and reshape the methodology and approach to be applied to the data available for OECD countries (i.e. ORBIS database). By further adapting this work to the shipbuilding industry, we follow their classification of (theoretically) insolvent firms that have an interest coverage (i.e. operating profit over interest paid) below 1 in three consecutive years and of age equal or above 10 years.[33] This financial indicator shows to what extent earnings can decline without the firm becoming unable to meet its annual interest costs. The higher the ratio the better the firm is able to cover its interest expenses through its operations.

Figure 21 shows the share of (theoretically) insolvent shipbuilding firms of our sample in 2007 and 2013. The share of firms that cannot cover their interest expenses by using operational income increased between the years 2007 and 2013. While in 2007, around 3% of all firms in the sample were below the threshold, this share increased to 6% in 2013. Most strikingly, 9% of shipbuilding capital stock in 2013 is sunk in these firms, which is an increase from close to 0% in 2007, indicating that mostly firms large in capital stock were not able anymore to cover their interest payments in 2013. In addition, in 2013 those firms cover around 6% of total shipbuilding turnover indicating their large size (and/or market power). Although the results are not based on recent data they provide implications about the situation in the shipbuilding industry following the economic crisis. Possible reasons for an increase in the share of insolvent firms staying in the market are manifold, such as weak or non-enforcement of bankruptcy laws, as well as subsidized bank lending to otherwise insolvent firms, or government guarantees to raise additional financing.

Misdirected bank lending may have distorting effects on foreign and domestic healthy firms that were competing with these unprofitable borrowers. In the absence of cheap bank financing these firms may not be able to survive in the long-term.[34] Since they continue operating they congest the market and prevent more profitable firms to enter and force more productive firms to exit. Statistical results show that these theoretically insolvent firms have significantly lower productivity levels (total factor productivity) of around 18% when controlling for country, time and firm-specific effects (i.e. age, size) (Annex I).

Figure 21. Share of insolvent firms by turnover, capital stock and employment



Note: In line with other OECD work we define insolvent firms as those with an interest coverage below 1 in three consecutive years and of age equal or above ten years McGowan, Andrews and Millot (2017[42]).
The analysis is based on countries highlighted in green in Table A E.1. Due to a limited sample period for China the analysis covers only the years up to 2013.
Source: based on ORBIS; Kalouptsidi and Barwick (Fall 2017[12])

4. Conclusion and further remarks

This paper argues that government interventions in the shipbuilding industry make it not only difficult to restore a level-playing field, but will do more harm than good by exacerbating economic downturns in this cyclical industry through two channels. First, it may lead to a larger extent of over-ordering of vessels through lower time to delivery altering the investment behaviour of ship buyers – leading to a more pronounced cyclical downturn. Second, during bust times excess capacity may lead to government support to failing ship yards with the goal to minimize social costs. Government support to these practically insolvent firms (so-called "zombie firms"), for instance through the non-enforcement of national bankruptcy laws, will however prolong these economic bust periods and unproductive capacity will re-enter the new cycle, restarting the vicious circle. Not to forget that maintaining these zombie-firms in the market can largely reduce overall industrial productivity and, hence, profitability in the long-term. These government actions are rather illusive insofar as the social costs incurring in the long-term will likely outweigh any short-term benefits.

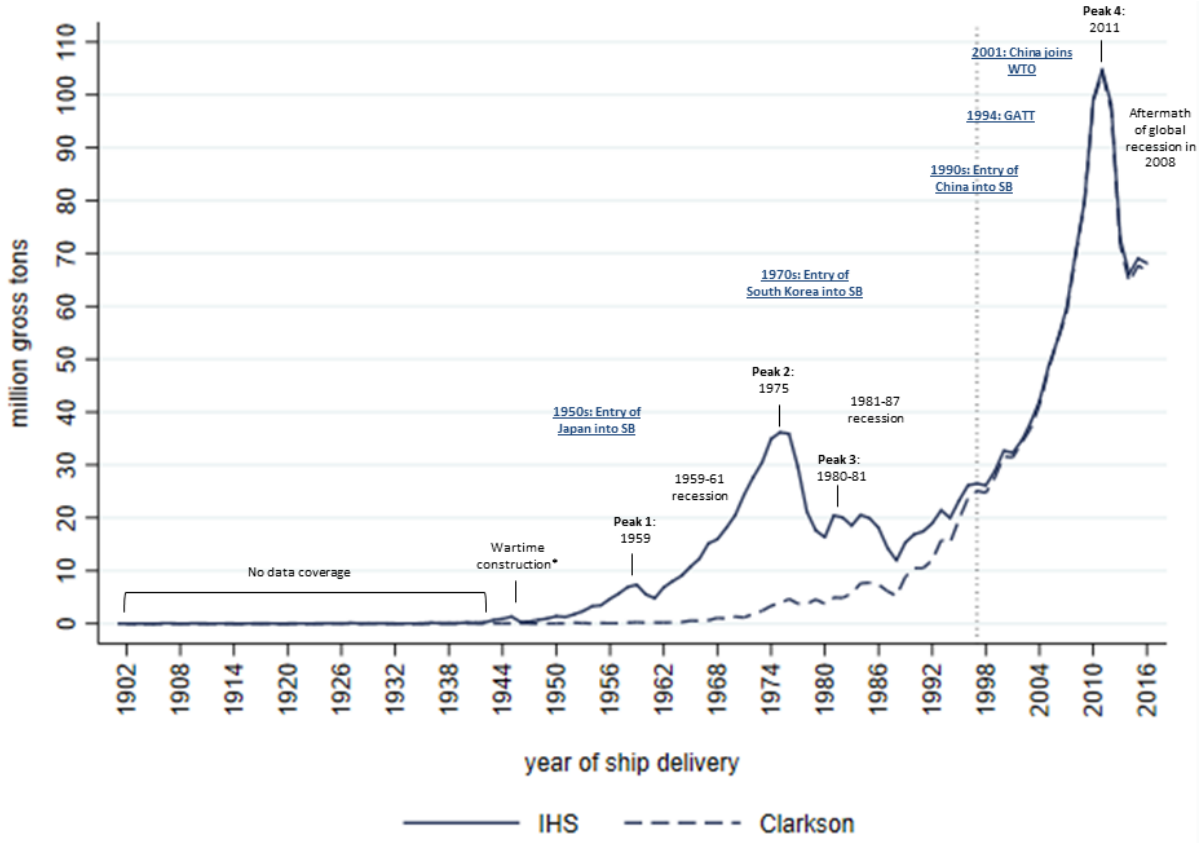
In any case independent of the cyclical stage, market-based investment decisions of yards into capital stock, for instance, and shipping firms into new vessels are based on expectations about future business. Government interventions will bias these forward looking assessments as they distort investment behaviour and harm investment efficiency. In other words, government intervention in shipbuilding can be seen as another form of a market friction distorting firms' optimal assessment of investment opportunities.

Against the background of the global nature of the shipbuilding and shipping industries any market-distorting government intervention in one country will ultimately affect industry developments in third countries. These channels furthermore reinforce the case for effective international disciplines on government interventions in the shipbuilding industry. In any case, the mature nature of shipbuilding undermines the case for an active industrial policy, beyond facilitating structural adjustment. More than that, as a mature industry the sector requires a horizontal policy approach, particularly one focused on: (i) allowing free market entry and more importantly exit of yards, (ii) upgrading the general level of labour skills and other capabilities through strong training policies and education programs; (iii) ensuring efficient capital markets rather than targeted financial interventions inconsistent with market conditions; and (iv) enabling resources (i.e. capital stock and labour) to move easily between sectors. With respect to the latter issue, policies supporting yards to re-orientate to other business would also be conducive to address the problem of natural excess capacity associated with cyclical downturns affecting the shipbuilding industry.

A consequent continuation of this work would be reflected in an analysis of how governments can minimize the social costs associated with industrial excess capacity as a result of cyclical downturns in general. Moreover, a better understanding of anti-competitive firm behaviour decoupled from government interventions (i.e. in the area of competition law) would provide a clearer picture of market-distortions in general.

Annex A. Cyclicality of ship production

Figure A A.1. Shipbuilding output across time

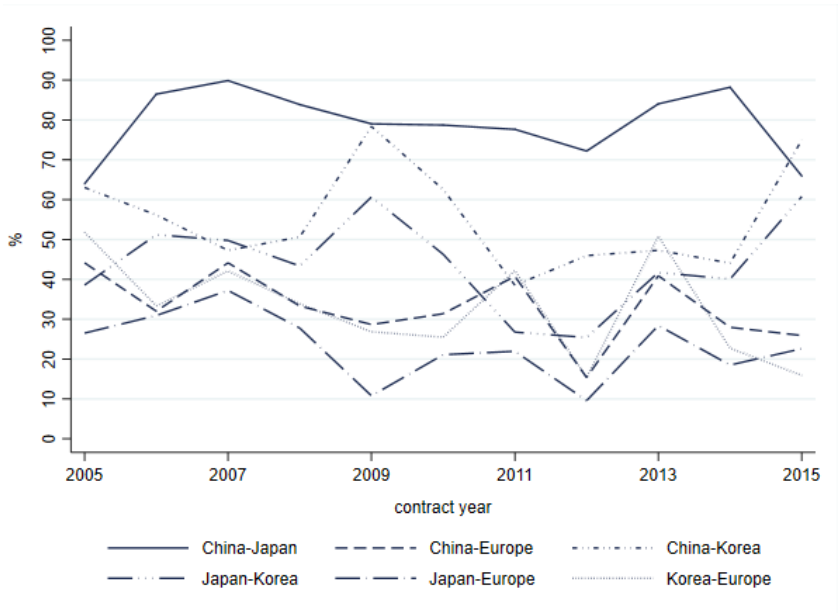


Note: *Data during wartime construction is not covered by IHS.
Source: based on IHS Seaweb and Clarkson World Fleet Register.

Annex B. Product Mix Similarity Index

In the early 2000s China slowly entered the production of tankers and bulkers, and since 2006/2007 the country's product mix consists mostly of bulkers. Between 2006 and 2016 China's ship production consisted of on average ~60% of bulkers similar to Japan with an average share of ~62% during the same period.

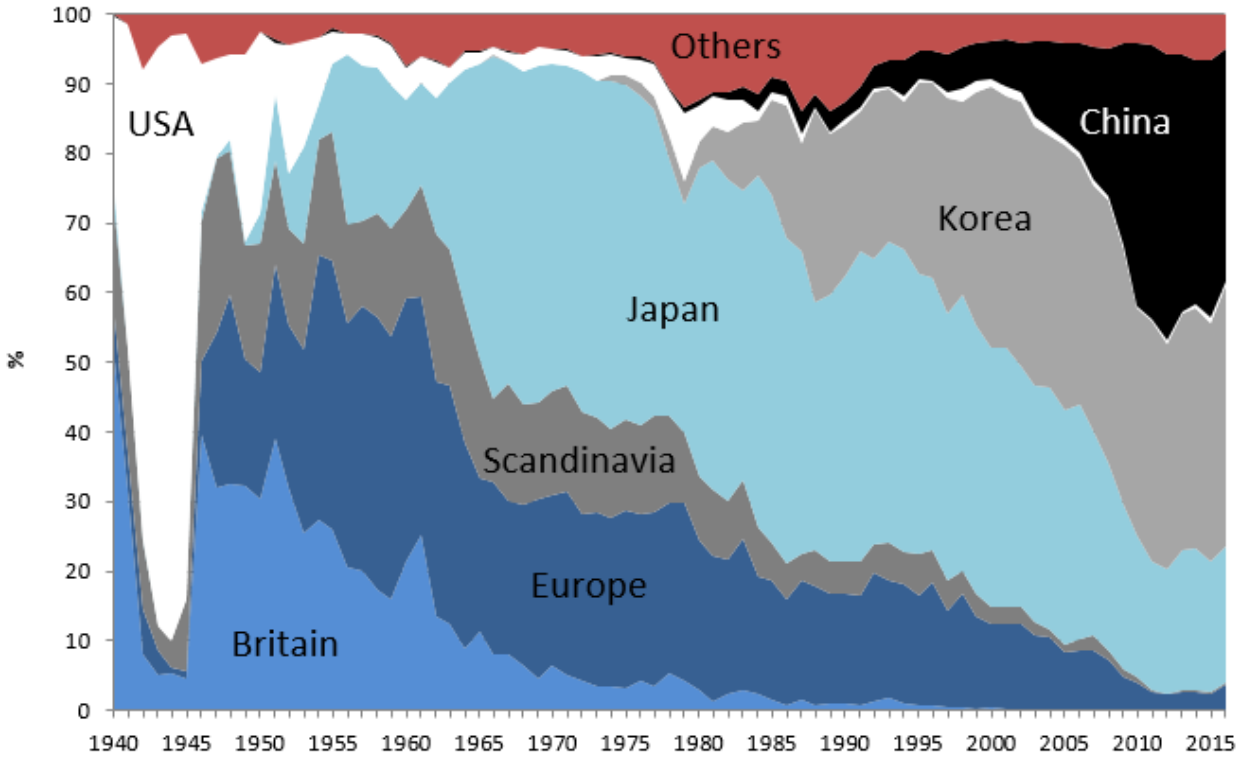
Figure A B.1. Finger-Kreinin index (in %) for product mix analysis



Note: There may exist differences at lower levels of product aggregation. The calculation is based on the following 13 product categories: bulker, cruise ships, containerships, gas carrier, offshore services, pure car carriers, passenger, reefer, ro-ro, tankers, other dry cargo, other non-cargo, miscellaneous.
Source: based on Clarkson World Fleet Register, 2018.

Annex C. History of shipbuilding

Figure A C.1. Market shares (% of deliveries in gross tons) by region



Note: Britain includes United Kingdom, British Guiana, British Honduras, British India; Europe includes Albania, Andorra, Armenia, Austria, Austria-Hungary, Azerbaijan, Belarus, Belgium, Bulgaria, Croatia, Cyprus[1], Czech Republic, Estonia, France, Georgia, Germany, Greece, Hungary, Ireland, Italy, Kazakhstan, Kosovo, Latvia, Lithuania, Liechtenstein, Luxembourg, Macedonia, Malta, Moldova, Monaco, Montenegro, Netherlands, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine, Scandinavia includes Sweden, Denmark, Norway, Finland, Iceland; China includes China P.R., Kuomintang Mainland, Hong Kong.
Source: based on IHS Seaweb (2017), and following (Stopford, 2003[8]).

Annex D. Constructing real capital stock at the firm-level

Real capital stock K for firm *i* in time *t* is derived via:

$$K_{it} = K_{i,t-1}(1 - \delta_{it}) + I_{it}$$

where real investment I is the difference between the book value of fixed tangible assets in the current period t and the previous period t-1, plus depreciation and deflated by country and industry-specific investment deflators:

$$I_{it} = (K_{it}^{bv} - K_{i,t-1}^{bv} + D_{it})/\boldsymbol{\rho}_t$$

With K_{it}^{bv} as the book value of fixed tangible assets of firm i in time t, D depreciation from ORBIS and $\boldsymbol{\rho}$ as investment price deflator at the 2 digit level.

The depreciation rate is derived via:

$$\delta_{it} = D_{it}/K_{i,t-1}^{bv}$$

For the first observation of each firm in the dataset (i.e. t=0) it is not possible to derive the real capital stock via our formulations above. Therefore, the real capital stock for t=0 is approximated by the observed net capital stock in the data deflated by the investment price index:

$$K_{i0} = K_{i0}^{bv}/\boldsymbol{\rho}_t$$

Source: Gal (2013[43]).

Annex E. Data coverage

Table A E.1. Number of companies per year and country

co	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CN*	99	102	113	122	158	172	192	227	284	241		268	266	218		
DE	2	3	5	8	12	21	33	30	47	51	51	50	50	38	3	
FI	42	38	48	56	59	58	60	59	46	53	53	56	60	53	53	30
FR	43	48	54	57	55	54	40	41	37	34	35	33	24	26	26	3
IT	98	107	154	115	61	73	140	177	230	200	166	361	365	346	312	60
JP	36	41	99	116	122	120	131	131	143	148	166	169	169	166	129	
KR	5	5	11	12	12	13	14	15	15	15	14	15	15	14	13	15
NO	133	156	155	119	183	4	1	3	6	14	12	6	14	197	186	
PL	20	27	25	26	25	24	41	56	56	85	36	24	16	9	3	1
PT	4	3	3	2	1		58	49	50	50	44	44	46	44	43	
RO	67	75	92	118	169	198	213	242	236	185	178	189	195	219	248	
RU	2	15	17	127	142	120	145	127	146	150	132	129	265	368	348	19
total sample of # of firms of included countries	452	518	663	756	841	685	876	930	1012	985	887	1076	1219	1480	1364	128
*China from Kalouptsidi and Barwick (Fall 2017[12]).	99	102	113	122	158	172	192	227	284	241		268	266	218		
Total sample	**551**	**620**	**776**	**878**	**999**	**857**	**1068**	**1157**	**1296**	**1226**	**887**	**1344**	**1485**	**1698**	**1364**	**128**

Note: Bold highlighted countries are major shipbuilding economies. The results do not change if we restrict the sample only to those firms or analyse the shipbuilding market by including all available firms as in the table above. This sample has no missing data on interest coverage, employment and capital stock. I used the ORBIS version with the highest number of firms for each country, and only with firms in the shipbuilding sector as primary industry.
Source: based on ORBIS version 2016-1 and 2016-2; *China is based on Kalouptsidi and Barwick (Fall 2017[12]).

Annex F. Cost factors

Estimation is based on:

$$\ln(C_{it}) = \alpha + \beta_1 * \ln(Q_{it}) + \beta_2 * \ln(Q_{it}^2) + \beta_3 * \ln(K_{it}) + \beta_4 * \ln(K)_{it}\ln(Q)_{it} + \beta_5 * \ln(omega_{it}) + \beta_6 \ln(SteelJP_t) + \delta_c + \delta_t + \varepsilon_{it}$$

with δ_c, δ_t and ε_{it} as country-, time-fixed effects and robust standard errors respectively. Please note, the firm-fixed effects model does not include a country-fixed effect.

Table A F.1. Cost curve estimates

		(1)	(2)
		Country-fixed effects	Firm-fixed effects
	VARIABLES	ln_cost	ln_cost
Quantity	**ln_Q**	**0.647*** **	**0.564*** **
		[0.0618]	**[0.0311]**
Quantity^2: shape of curve	**c.ln_Q#c.ln_Q**	**0.0167*** **	**0.0186*** **
		[0.00209]	**[0.000951]**
Quantity*Capital stock	**c.ln_Q#c.ln_K**	**-0.0129*** **	**-0.0143*** **
		[0.00197]	**[0.00129]**
Capital stock	**ln_K**	**0.168*** **	**0.197*** **
		[0.0402]	**[0.0271]**
Total Factor Productivity	**ln_omega**	**-0.702*** **	**-0.723*** **
		[0.0162]	**[0.0100]**
Japanese steel prices	**ln_JPsteelplatericeUSDton**	**0.530*** **	**0.568*** **
		[0.0398]	[0.0411]
	2001.year	-0.0149	-0.00628
		[0.0235]	[0.0248]
	2002.year	0.0268	0.0398
		[0.0230]	[0.0253]
	2003.year	-0.0318	-0.0398*
		[0.0236]	[0.0237]
	2004.year	-0.282***	-0.309***
		[0.0255]	[0.0234]
	2005.year	-0.299***	-0.344***
		[0.0312]	[0.0285]
	2006.year	-0.194***	-0.232***
		[0.0274]	[0.0242]
	2007.year	-0.209***	-0.204***
		[0.0283]	[0.0240]
	2008.year	-0.447***	-0.480***
		[0.0453]	[0.0410]
	2009.year	-0.118***	-0.135***
		[0.0319]	[0.0264]
	2010.year	-0.127***	-0.139***
		[0.0351]	[0.0277]
	2011.year	-0.121***	-0.165***
		[0.0353]	[0.0290]

	2012.year	-0.0577*	-0.0917***
		[0.0322]	[0.0242]
	2013.year	0.0623**	0.0192
		[0.0279]	[0.0202]
	2014o.year	0	0
		[0]	[0]
	DE	0.512***	
		[0.0278]	
	FI	0.833***	
		[0.0239]	
	FR	0.680***	
		[0.0250]	
	IT	0.563***	
		[0.0181]	
	KR	2.235***	
		[0.0958]	
	NO	1.560***	
		[0.0211]	
	PL	0.0106	
		[0.0410]	
	RO	-0.321***	
		[0.0216]	
	RU	-0.248***	
		[0.0440]	
	Constant	0.264	1.579***
		[0.528]	[0.408]
	Observations	9,654	9,654
	R-squared	0.978	0.823
	Number of id		2,115
	Robust standard errors in brackets		
	*** p<0.01, ** p<0.05, * p<0.10		

Note: Reference year is 2000, reference country is China. I exclude Japan from the estimates due to the low number of material costs reported (in any case the results do not change significantly by excluding this country).
Source: based on ORBIS version 2016-1 and 2016-2; *China is based on Kalouptsidi and Barwick (Fall 2017[12]).

Annex G. Estimation results for Total Factor Productivity

Estimates (1) are based on a Cobb Douglas production function by drawing on the control function approach by (Levinsohn and Petrin, 2003[44])[2]and by implementing it via the Wooldridge methodology (Wooldridge, 2009[45]) for sake of simplicity and practicability (i.e. one step estimation rather than a two-step approach as in (Levinsohn and Petrin, 2003[44]). Estimates (2) are based on a simple OLS regression where TFP (ω) is the residual of a Cobb-Douglas production function (i.e. $\ln(\omega) = \ln(Q) - \ln(L) - \ln(M) - \ln(K)$. For both methods, L indicates the number of employees, M material costs, K real capital stock and Q output. The results of both methods are very similar and significant.

Table A G.1. Total Factor Productivity Estimation

	(1)	(2)
	Wooldridge GMM (based on Levinsohn and Petrin, 2003)	OLS
VARIABLES	ln_Q	ln_Q
ln_L	**0.480*** **	**0.495*** **
	[0.0162]	**[0.0111]**
ln_M	**0.342*** **	**0.400*** **
	[0.102]	**[0.00877]**
ln_K	**0.157*** **	**0.0985*** **
	[0.0337]	**[0.00766]**
ln_K_l1	-0.0361	
	[0.105]	
ln_M_l1	-0.906***	
	[0.0783]	
km_l1	0.103***	
	[0.0190]	
k2_l1	-0.0527***	
	[0.00918]	
m2_l1	-0.000228	
	[0.0142]	
k2m_l1	0.00426***	
	[0.00146]	
km2_l1	-0.00881***	
	[0.00159]	
k3_l1	7.29e-05	
	[0.000534]	
m3_l1	0.00371***	
	[0.000735]	
DE	0.163	-0.00639
	[0.0999]	[0.0625]
FI	**-0.429*** **	**-0.379*** **
	[0.103]	[0.0456]
FR	0.108	-0.149***
	[0.0799]	[0.0488]
IT	0.00127	-0.238***
	[0.0550]	[0.0325]
JP	Excluded: not enough observations on material costs	
KR	**2.939*** **	**3.992*** **
	[0.196]	**[0.0856]**

NO	**0.876*** **	**0.585*** **
	[0.0813]	**[0.0403]**
PL	**1.304*** **	**1.179*** **
	[0.0755]	**[0.0667]**
RO	**0.589*** **	**0.348*** **
	[0.0659]	**[0.0355]**
RU	**0.970*** **	**0.670*** **
	[0.0793]	**[0.0711]**
2001.year		0.0899*
		[0.0477]
2002.year		0.125***
		[0.0470]
2003.year	0.0870	0.142***
	[0.0621]	[0.0496]
2004.year	0.152**	0.141***
	[0.0701]	[0.0489]
2005.year	0.212***	0.0604
	[0.0785]	[0.0513]
2006.year	0.0630	0.132***
	[0.0670]	[0.0489]
2007.year	0.163**	0.265***
	[0.0649]	[0.0490]
2008.year	0.142**	0.264***
	[0.0619]	[0.0503]
2009.year	0.0564	0.146***
	[0.0628]	[0.0528]
2010.year	-0.136*	-0.0616
	[0.0742]	[0.0652]
2011.year	-0.154**	0.0307
	[0.0737]	[0.0504]
2012.year	-0.333***	-0.0464
	[0.0737]	[0.0554]
2013.year	-0.458***	-0.352***
	[0.0615]	[0.0487]
2014.year	-0.122*	-0.00610
	[0.0677]	[0.0500]
Constant	17.63***	12.40***
	[0.558]	[0.0985]
Observations	4,444	9,709
R-squared	0.948	0.928
Standard errors in brackets		
*** p<0.01, ** p<0.05, * p<0.10		

Note: Reference year in Wooldridge approach is 2001-2002 (due to two times lags for material) and in OLS regression 2000. China is the reference category in both approaches.
Source: based on ORBIS version 2016-1 and 2016-2; Results on China are based on Kalouptsidi and Barwick (Fall 2017[12]).

Annex H. OECD Taxonomy on Government Procurement

This annex provides an overview of the remaining GP groups part of the OECD taxonomy.

Collateral Restrictions/Restrictive effects

Table A H.1. Collateral Restrictions/Restrictive effects

Subgroup	Sub-category
M4: Collateral restrictions / Restrictive effects	**M41**: Tax on procurement for foreign entities
	M42: Barriers to FDI
	M43: Restricted eligibility to subsidies and tax preferences
	M44: Transparency measures in investment and trade

Source: Gourdon, Bastien and Folliot-Lalliot (2017[34]).

Conduct of procurement

Table A H.2. Conduct of procurement

Subgroup	Sub-category
M5: Conduct of procurement	**M51**: Design of methods of procurement
	M52: Registration mechanisms
	M53: Shortlist / pre-selected list of bidders
	M54: Direct/Limited tendering
	M55: Selective tendering
	M56: Securities
	M57: Time period

Source: Gourdon, Bastien and Folliot-Lalliot (2017[34]).

Qualification criteria

Table A H.3. Qualification criteria

Subgroup	Sub-category
M6: Qualification criteria	**M61**: Certification or license criteria
	M62: Set asides for specific groups
	M63: Past performance requirement
	M64: Prior experience requirement

Source: Gourdon, Bastien and Folliot-Lalliot (2017[34]).

Evaluation criteria

Table A H.4. Evaluation criteria

Subgroup	Sub-category
M7: Evaluation criteria	**M71**: Technical contractual conditions favour domestic firms
	M72: Financial requirements
	M73: Preference for specific groups

Source: Gourdon, Bastien and Folliot-Lalliot (2017[34]).

Review/complaint system

Table A H.5. Review/complaint system

Subgroup	Sub-category
M8: Review/ complaint system	**M81**: Challenge of bidding process or award
	M82: Choice of complaint forum
	M83: Time period
	M84: Cost
	M85 Suspension of bidding process
	M86 Sanction and remedies

Source: Gourdon, Bastien and Folliot-Lalliot (2017[34]).

Transparency and information

Table A H.6. Transparency and information

Subgroup	Subcategory
M9: Transparency & information	**M91**: Publication in Official gazette or accessible publication
	M92: Accessible e-procurement
	M93: Notification delay
	M94: Complexity of procurement rules

Source: Gourdon, Bastien and Folliot-Lalliot (2017[34]).

Annex I. Estimates of insolvent firm productivity

Table A I.1. Estimates of insolvent firms' total factor productivity

	(1)
	OLS
VARIABLES	Total factor productivity
Insolvent_firm_dummy [1=insolvent; 0 otherwise]	-0.210***
	[0.0590]
Constant	12.76***
	[0.0571]
Observations	8,863
R-squared	0.420
Robust standard errors in brackets	
*** p<0.01, ** p<0.05, * p<0.10	

Note: Since the dependent variable is in log the coefficient on zombie changes to -18% [exp(-.210)-1)*100]. In other words, zombie firms have on average a 18% lower total factor productivity. Control variables on country, time-fixed effects, firm size and firm age are suppressed for saving place.
Source: based on ORBIS version 2016-1 and 2016-2; *China is based on Kalouptsidi and Barwick (Fall 2017[12]).

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Endnotes

[1] Kalouptsidi (2014[1]) discusses this argument in the context of the shipping industry (i.e. the long delivery time for ordered ships). Moreover, following Fusillo (2003[54]), as long as the costs of supply shortage during good times is higher than the cost of carrying excess capacity during bad times the firm has stronger incentives to err on its decision to keep and/or expand capacity rather than on facing supply shortage during future periods of high demand.

[2] These numbers refer to the average of the minimum delivery time for a given ship type of yards observed in Clarkson's World Fleet Register. In addition, we received a production plan from yard contacts for three different ship types, which largely confirm the net production time stated.

[3] For an overview of concepts and conclusions on the topic of investments taken under uncertainty see Dixit and Pindyck (1994[55]). The literature on investment behaviour stresses in general that the demand uncertainty and adjustment costs (e.g. in the form of time to delivery) are closely linked and are both necessary to affect investment behaviour.

[4] Indeed, yards with large capacity could also decide to produce more vessels instead of reducing the delivery time. However, once time becomes an important constraint for ship buyers (i.e. during cyclical upturns) early delivery will command a premium insofar that ship buyers would accept to pay to a certain extent a price premium for faster delivery. Adland and Jia (2015[11]) state "There exists, in fact, a term structure of newbuilding prices, describing the combinations of cost and time to delivery between which ship owners would be indifferent. If the opportunity cost of time for the operation of modern vessels is positive, this term structure will be downward sloping such that early delivery slots (and resales) command a premium over deliveries further into the future."

[5] Market-distortions can be manifold. For the scope of this work market-distortive government interventions "[…] reinforce or counteract the allocative effects that the existing market would otherwise produce." This definition is based on Rodrik (2004[46]) of his description of industrial policy, which nicely applies to this analysis. Since a market is a medium where supply and demand meets to exchange goods at an agreed price, this paper uses a supply and demand framework to illustrate the channels through which public interventions distort market quantity and ship prices and in the short or long run industrial capacity.

[6] Shipbuilding is an entirely demand-driven industry; yards will start ship construction only after reception of a definite order. This differs from a wide range of other industries where producers are able to produce on inventory owing to the nature of the good (i.e. in particular homogenous goods such as intermediate inputs or raw materials that are not perishable), such as steel.

[7] An analysis of speculative orders are outside the scope of this paper.

[8] Kahnemann (2011[52]) argues that competition neglect can be particularly strong when firms receive delayed feedback about the consequences of their investment decisions (e.g. time to build).

[9] The authors study the bulk dry shipping industry, but they highlight in their paper that the rationale is applicable to other capital-intensive industries that face boom and bust cycles similar to those they documented in the bulk dry shipping industry.

[10] This result hold in particular following a positive demand shock for shipping services (e.g. reduction in trade barriers) where the shock fades away due to mean-reverting shipping earnings

(i.e. earnings will tend to move to average earnings over time) (Kalouptsidi, 2017[50]). In addition, as the model shows, freight rates are more volatile in the case of time to build. Volatility represents uncertainty that makes firms cautious about investments into new ships. Investments into new ships go along with adjustment costs which make it expensive to reverse any investment decision (i.e. the used-good discount on resale since a newbuilt ship will hardly be scrapped and reselling may involve value losses by the ship owner) (Bloom, 2014[53]). Hence, longer time to build (i.e. more volatility) may lead shipping companies to refrain from investing in new ships which in turn lead to less overinvestment.

[11] Strictly speaking, time to delivery is partly influenced in the short-run by hiring of short-term labour and/or outsourcing activity. For instance, while keeping capacity constant, an increase in the number of short-term workforce decreases time to delivery since a ship can be built faster and thereby a berth will be available quicker for the construction of a subsequent order. Since capacity expansions take time it will have a direct impact on time to delivery only in the long-term.

[12] Adland and Jia (2015[11]) state "There exists, in fact, a term structure of newbuilding prices, describing the combinations of cost and time to delivery between which shipowners would be indifferent. If the opportunity cost of time for the operation of modern vessels is positive, this term structure will be downward sloping such that early delivery slots (and resales) command a premium over deliveries further into the future."

[13] For more information on the history of shipbuilding see Annex C.

[14] Note by Turkey

The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the "Cyprus issue".

Note by all the European Union Member States of the OECD and the European Union

The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

[15] Livesey (2012[13]) presents this approach in a four-by-four grid showing the stage of maturity of the home industry along the horizontal access and the stage of maturity of the global industry along the vertical axis. Each box in the grid then represents the comparative maturity of the industry sector in the home country relative to the global norm.

[16] Some yards invest also in machinery for plate bending, automated welding, material transfer for panel fabrication, material control and distribution as well as IT systems for design development. In general these investment decisions are rather lumpy so that investments feature patterns of spikes.

[17] Real capital stock is constructed via the perpetual inventory method (PIM) based on individual firm's fixed assets following Gal (2013[43]), see Annex D.

[18] Kalouptsidi (2014[1]) discusses this argument in the context of the shipping industry (i.e. the long delivery time for ordered ships). Moreover, following Fusillo (2003[54]), as long as the costs of supply shortage during good times is higher than the cost of carrying excess capacity during bad times the firm has stronger incentives to err on its decision to keep and/or expand capacity rather than on facing supply shortage during future periods of high demand.

[19] Exceptions include specialized ship types, such as cruise ships, LNG/LPG vessels or offshore services, which require experience and a well-connected supplier base.

[20] These numbers refer to the average of the minimum delivery time for a given ship type of yards observed in Clarkson's World Fleet Register. In addition, we received from yard contacts a production plan for three different ship types, which largely confirm the net production time stated.

[21] The analysis is based on production costs equal to material, labour and capital (depreciation to reflect usage) costs. Additional yard specific direct costs in the ship production are capital, financing and insurance costs.

[22] There are basically several factors shaping the form of a firm's cost curve that are working against each other: learning by doing (reflected in productivity estimates) lead to concave cost functions, indicating that each additional output can be produced at lower marginal costs (i.e. decreasing marginal costs), while capacity constraints explain concave cost functions (i.e. increasing unit costs), indicating that each additional output is produced at a higher marginal cost.

[23] This study does not include an analysis of the use of financial instruments (e.g. future or forward contracts) to hedge risk against steel price fluctuations since this was not a usual practice according to our contacts to shipbuilders. The steel contracts are negotiated case by case with each new order. Back in 2003, when it was a very sudden and sharp increase in steel prices (from USD 270 per ton to almost USD 500 per ton), many shipyards were extremely affected for the shipbuilding contracts ongoing and some of them unsuccessfully attempted to include a "steel price indexation" clause in shipbuilding contracts. For an illustration of the mechanism of such material cost indexes the interested reader is referred to Keating et al. (2008[51]) for an example in the context of the US Navy.

[24] The Economist (2009[48]) called TFP China's secret sauce by citing a study by UBS showing that China has had the fastest annual rate of TFP growth with around 4% which is by far a rapid efficiency gain compared to other economies.

[25] Due to the lack of data availability similar results published on Chinese ship yards' TFP are rare, if not even non-existent.

[26] Note: land area is not part of physical capital as it is strictly speaking not a reproducible product of human activities, while for instance machinery, buildings, equipment indeed are.

[27] With quasi-direct equity financing we refer to hybrid solutions, such as products with a mix of debt and equity characteristics in terms of ownership and claim to assets in the case of default. Their risk-return profile typically falls between debt and equity in a firm's financial capital structure (World Resources Institute, 2012[21]).

[28] This means that the item in the discussion paper of May 15, 2018, on "Equity infusions and conversions (including debt-for-equity swaps) inconsistent with market-based conditions will be discussed as part of the report on state-ownership in the context of the PWB for 2019-2020

[29] Indeed, reduced ship prices benefit ship buyers and might increase consumer welfare (i.e. of end consumer purchasing goods transported by ships) due to lower transportation costs. However, in the long-term such market-distorting support might pressure the financial health of the shipbuilding industry and reduce producer welfare.

[30] ECAs can be government institutions or private companies operating on behalf of governments.

[31] There are also medium-and long-term export credits that may take the form of "supplier credits", which essentially extend the credit by the exporter to the overseas buyer (OECD, 2018[30]). The mechanism is different compared to "buyer credits" provided in the context of export credits. However, at the end both types enable the foreign buyer of exported good and/or services to defer payment over a period of time.

[32] For more information about the criteria and assumptions used to collect comparable cases, see World Bank (2017[36]).

[33] The Chinese State Council broadly defines nonviable "zombies" as firms that incur three years of losses, cannot meet environmental and technological standards, do not align with national industrial

policies, and rely heavily on government or bank support to survive. Other definitions in the literature include Fukuda and Nakamura (2011), which identifies zombies as firms that face persistent losses and receive subsidized credit (actual interest cost less than market prime interest rates). In practice, local governments use both financial and production benchmarks to identify zombies. For example, financial benchmarks include three years of losses, liability to asset ratios exceeding 85 percent, negative operating cash flow, and debt in arrears for more than one year. Production benchmarks include capacity utilization rates less than 50 percent, suspended production for six months, and unpaid taxes or electricity bills. In this paper, the State Council definition uses three years of cumulative losses as the criterion (Lam et al., 2017[49]).

[34] Please note that we do not have any information available about whether or not the firms follow insolvency proceedings. The statistics provided are descriptive only and do not judge whether a bankruptcy proceeding is necessary or not.

[1] Note by Turkey

The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the "Cyprus issue".

Note by all the European Union Member States of the OECD and the European Union

The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

[2] No use of the control function by Olley and Pakes (1996[47]) using investments to control for unobservable since investments in ship yards are lumpy rather than monotone.

EXHIBIT 44

OECD Council Working Party on Shipbuilding (WP6)

Developments of ship demand, supply, prices and costs

Second semester 2022

Foreword

1. This report was prepared under the Council Working Party on Shipbuilding (WP6) project on demand, supply, price and cost developments. The opinions expressed and the arguments employed herein do not necessarily reflect the official views of OECD member countries. This report is available on the WP6 website: http://www.oecd.org/sti/ind/shipbuilding.htm.

2. This document, as well as any data and any map included herein, are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

Background

3. As stipulated in its mandate, the overall objective of the Council Working Party on Shipbuilding (WP6) is to work towards the reduction of factors that distort normal competitive conditions in the shipbuilding industry and to assist governments in designing and implementing policies that foster normal competitive conditions. One of the intermediate objectives of the WP6 is to increase transparency and improve the understanding of the shipbuilding market.

4. The report is broken down into two parts:

   a. The first part focuses on ship demand which is driven both by seaborne trade expansion and ship replacement as well as ship supply notably ship production and capacity. The detailed methodology used is presented in the previous version of the report on demand, supply, price and cost developments which was published as an STI policy paper[1].

   b. The second part deals with ship prices, based on quantitative analysis by regularly keeping track of how factors affecting ship prices develop. The literature review on factors influencing newbuilding ship prices, which was developed in the previous edition[2], has identified the key factors on the demand and supply side that influence the price of a ship. It shows that factors influencing the demand for ships include freight rates, second-hand prices, market expectations and sentiment, etc., and factors influencing the supply of ships include building capacity (which is related to orderbook), construction costs (labour and materials), exchange rates and production subsidies.

[1] Shipbuilding market developments, first semester 2022

[2] Ibid

1. Ship demand and supply

Introduction

5. This first part presents a summary of selected updates and additions compared to the report mentioned above, including:

a. Updated ship demand forecasts taking into account the latest seaborne trade forecasts by the International Transport Forum (ITF);

b. Comparison of ship demand forecasts and actual ship demand;

c. Description of the impact of environmental regulations on ship replacement.

Updated ship demand forecasts

6. Expansion or reduction in seaborne trade affects demand for transportation services and therewith ship requirements. Based on ITF's seaborne trade forecast of November 2022, new ship demand for 2021-2030 is expected to be lower than that of our previous forecast in March 2022 (Table 1). Similarly, according to Clarkson's forecast released in September 2022, contracting in the period from 2022 to 2032 is expected to be 1% lower compared to that of six months ago in terms of tonnage. The forecast reflects the general concerns over the global economic outlook.

Table 1. Forecast of new ship demand by ship types based on the ITF's new seaborne trade forecasts

2021-2030 in million GT

Baseline Scenario:	November 2022 forecast (period's average)		March 2022 forecast (period's average)		2021 forecast (period's average)	
Bulkers	204	(20)	232	(23)	226	(23)
Tankers	65	(7)	108	(11)	26	(3)
Containership	45	(4)	86	(9)	43	(4)
General cargo	22	(2)	65	(7)	68	(7)

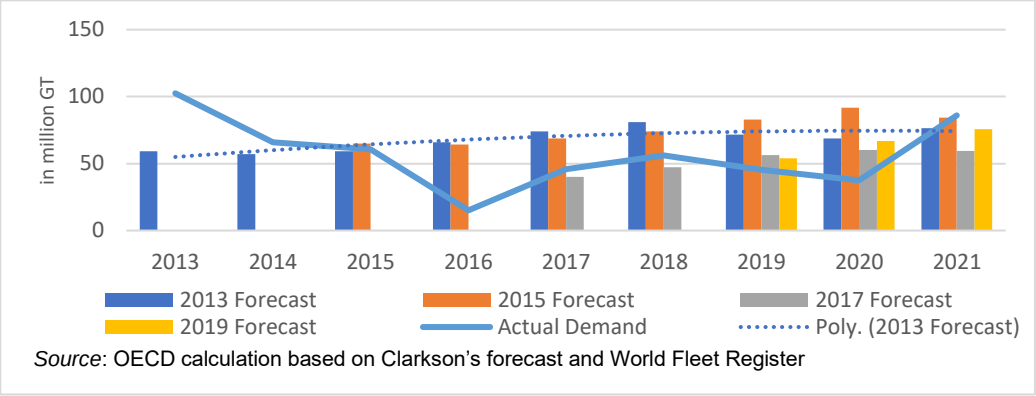
Source: OECD estimation based on ITF seaborne trade forecast (2021, 2022).

Comparison of ship demand forecasts and actual ship demand

7. To compare ship demand forecasts and actual ship demand, the annual Clarksons' spring forecasts from 2013 to 2022 and the actual contract volume by year from 2013 to 2021 were taken into consideration. It shows that the actual contract volume during the period (2013 – 2021) did not show a clear pattern while the annual forecast in a specific year which showed a moderate increase over the long term.

8. The difference between the forecast and the actual figure is probably not only due to the difficulty of the forecast itself, but also to the characteristics of the shipbuilding industry, where exogenous variables such as economic conditions and trade volume have a large influence. Furthermore, the difference between the predicted value and the actual figure does not imply that forecasts are not useful. Ship demand forecasts provide key data for stakeholders in the industry. However, unpredicted events such as the COVID-19 pandemic may occur at any time, which means that the predicted value and actual value can be different in many case.

Figure 1. Comparing Clarkson's forecasts and the actual volume (2013-2021)



Source: OECD calculation based on Clarkson's forecast and World Fleet Register

Impact of environmental regulations on ship replacement

9. Addressing the green transition has become a major issue for the shipbuilding industry. Environmental regulations often translate into requirements for the building of ships and also affects the demand for ships. First, the International Maritime Organisation (IMO) aims to reduce the carbon intensity of the global fleet by at least 40% and 70% compared to 2008 until 2030 and 2050, respectively. From January 2023, the IMO's 'short-term measures' enter into force with the introduction of the Energy Efficiency Existing Ship Index (EEXI), the Carbon Intensity Indicator (CII) and the enhanced Ship Energy Efficiency Management Plan. Secondly, environmental regulations at the national and regional level are also set to have an impact on the maritime sector such as EU's "Fit for 55" and "FuelEU Maritime".

10. To estimate ship replacement demand, the Kaplan Meier estimator is used to calculate newbuilding demand based on survival probabilities of ships. However, to follow comments by delegates to develop a new estimation method to better reflect environmental regulation and its impact on vessel value and survival expectancy in calculations, the Secretariat is reworking its methodology. As a first step to elaborate a new methodology for estimating replacement demand, the Secretariat conducted a series of stakeholder interviews on the expected impact of IMO Green House Gas (GHG)reduction measures on ship demand and retrofitting. Here are some findings from the interviews:

Newbuild vs Retrofit debate: Stakeholders expect to see a general trend towards retrofitting energy saving technologies rather than ship demolition and replacement. Relatively high cost of replacing the fleet and current high uncertainty in the market on the impact of future IMO regulation, technology developments, fuel prices and alternative fuel use are expected to reduce demand in newbuilding and result in ship owners delaying necessary investments for decarbonisation.

Market forces: Due to the increasing age of the fleet, stakeholders expect future ship demand to be linked more strongly to replacement demand than seaborne trade. Since older ships are less easily upgraded to adapt to new energy efficiency and carbon-intensity targets, they risk becoming stranded assets, which may lead to early demolitions.

Impact of regulation: Stakeholders estimated that the impact of the EEXI would be manageable but raised concerns over the effectiveness of the CII. An internationally verified ship rating can be a powerful driver for decarbonisation due to reputation cost.

2. Ship prices and costs

Introduction

11. This second part presents the latest developments of factors affecting ship prices and an overview of the price developments for the various sizes of major cargo ships (bulkers, containerships, crude tankers, product tankers and chemical tankers), which were contracted between January 2018 and July 2022, following the document [Shipbuilding market developments, first semester 2022].

Developments of several factors affecting ship prices

Second-hand price

12. Figure 2 shows the Clarksons price index. The red line shows the price of new-built ships, and the green line shows the price of second-hand vessels. The price of second-hand ships has been stagnant since mid-2011, but since 2020 the price of second-hand ships has risen sharply. Following this increase, new-build prices have increased to their highest level in a decade, driven by solid demand for ships. It is an ongoing trend, and when this peaks out will still be a matter of market interest.

Freight rate

13. Figure 3, Figure 4 and Figure 5 show the respective freight rates for bulk carriers, container ships and crude oil tankers. For bulk carriers, freight rates have risen since 2020, peaked in October 2021, and are on a declining trend, with some rebound after a sharp fall. This is probably because the turmoil for bulkers due to the Covid-19 pandemic was, to some extent, over. For containerships, freight rates have risen sharply since 2020, notably because of solid demand for manufactured goods, notably by households due to the Covid-19 pandemic, and reached a peak in January 2022 followed by a declining trend. Freight rates for crude oil tankers have been cyclical, with temporary spikes and stability, and now appear to have already bottomed out and are on an upward trend again.

Seaborne trade

14. Figure 6 and Figure 7 show the evolution of seaborne trade by cargo. Compared to 2014, the trade volume of LNG has grown the most and notably peaked in the beginning of 2022 probably due to the interruption of supply via pipelines to Europe, which was caused by Russia's war against Ukraine. While those of coal and crude oil have grown very little. It is partly because of shifts towards greener energy sources. Grain, chemicals and containerised cargoes have shown an increasing trend.

Orderbook

15. Figure 8 shows a CGT-based orderbook for the world, China (People's Republic of), Japan and Korea. This figure bottomed out during the pandemic and gradually rose as a whole, driven by China and Korea. In contrast, Japan's orderbook remained stagnant.

Ship construction cost

16. Figure 9 shows steel prices in each country. Steel prices began to rise in the spring of 2020 and soared in 2021-2022, peaking at the highest level in a decade. In particular, European steel prices were almost four times higher in April 2022 than in June 2020. This reflects high inflation levels and growing geopolitical and energy security risks which was occurred by Russia's war against Ukraine. Steel prices have then decreased compared to their peak. These increases in steel prices might affect the price of ships that use a lot of steel. Still, given that, as described below, uniformly substantial price increases have not

necessarily occurred across all ship types, shipbuilders may have been able to limit the rise in ship prices to a certain extent due to higher steel prices by devising procurement.

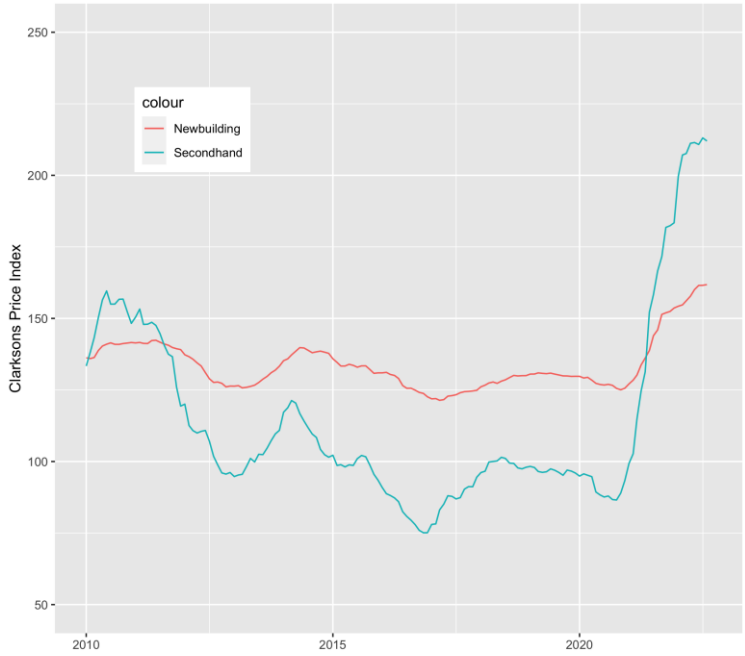
17. Figure 10 displays the changes in labour costs in the manufacturing sector in selected countries. In contrast to other indicators, there have been no significant increases.

18. Figure 11 shows each country's domestic producer price index for industrial activities. The Secretariat presents this index as a proxy for the price index for marine equipment because the cost information is unavailable. The producer price index has followed an upward trend since 2016 and has risen sharply since 2020, during the pandemic, and the rise is currently quite substantial due to global inflation.

Exchange rate

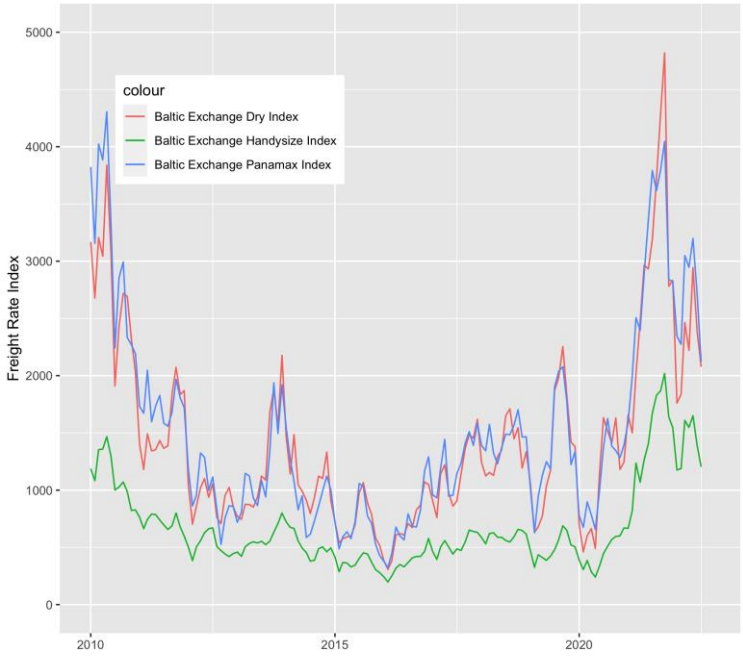
19. Figure 12 shows the exchange rate for selected countries. The exchange rate in the Republic of Türkiye (hereafter "Türkiye") has changed markedly, but the exchange rate for other selected currencies remained relatively stable. However, since 2022, currencies other than the RMB have been affected by the appreciation of the US dollar.

Figure 2. Clarksons Price Index



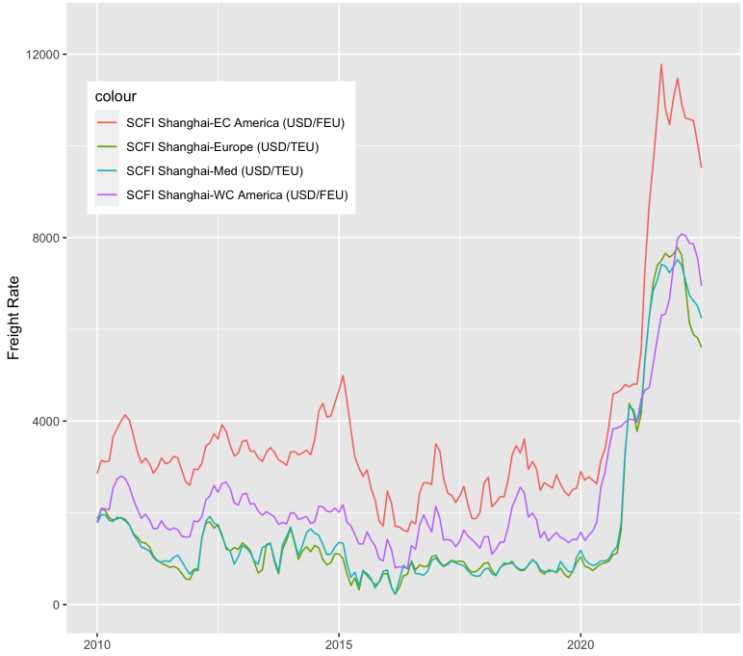
Source: Clarksons Shipping Intelligence Network

Figure 3. Freight rate (Bulkers)



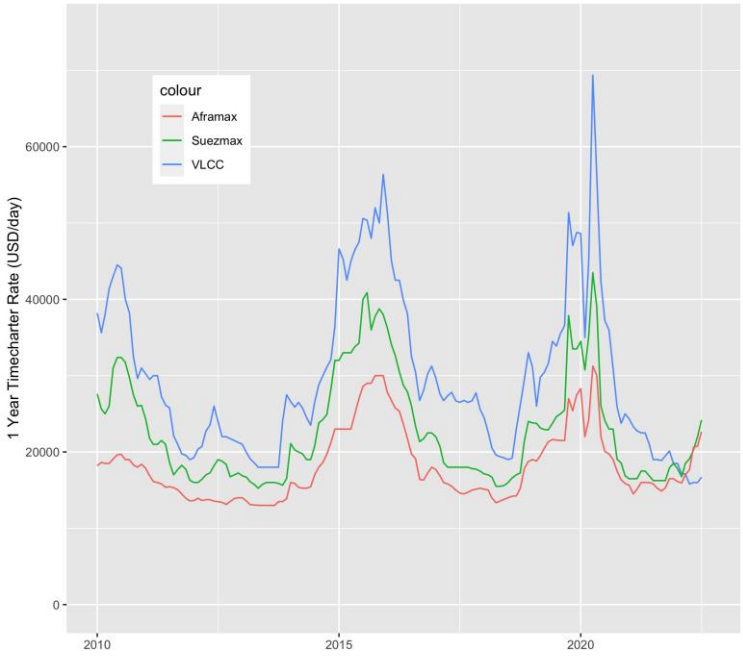
Source: Clarksons Shipping Intelligence Network

Figure 4. Freight rate (Containerships)



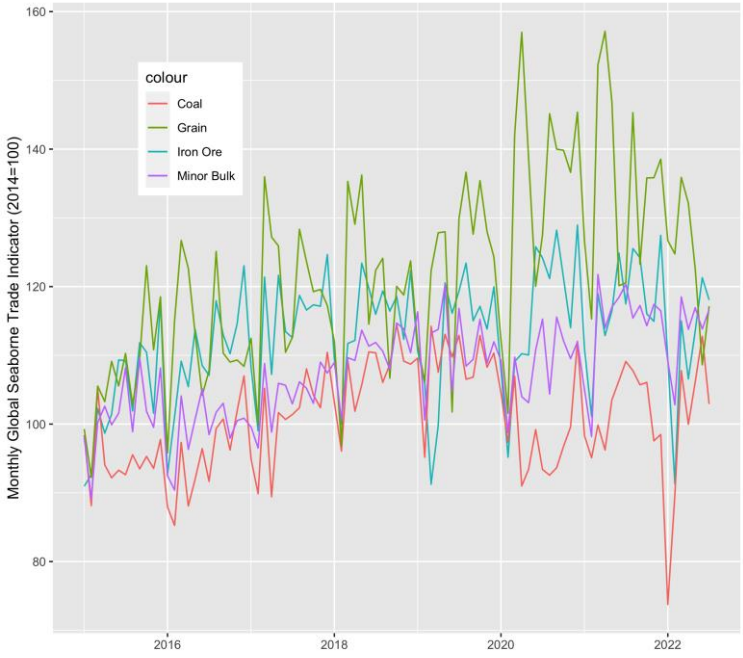
Source: Clarksons Shipping Intelligence Network

Figure 5. Freight rate (Tankers)



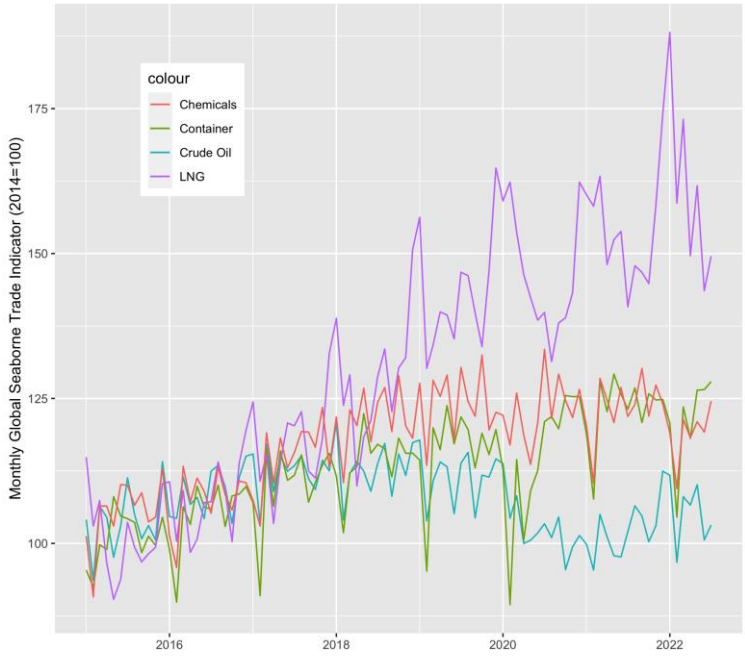
Source: Clarksons Shipping Intelligence Network

Figure 6. Seaborne trade (Coal, Grain, Iron Ore, Minor Bulk)



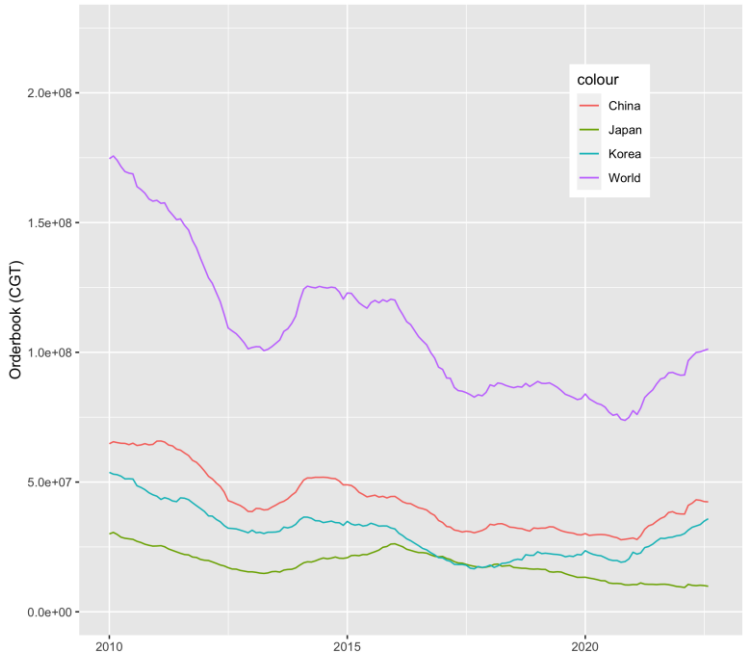
Source: Clarksons Shipping Intelligence Network

Figure 7. Seaborne trade (Chemicals, Container, Crude Oil, LNG)



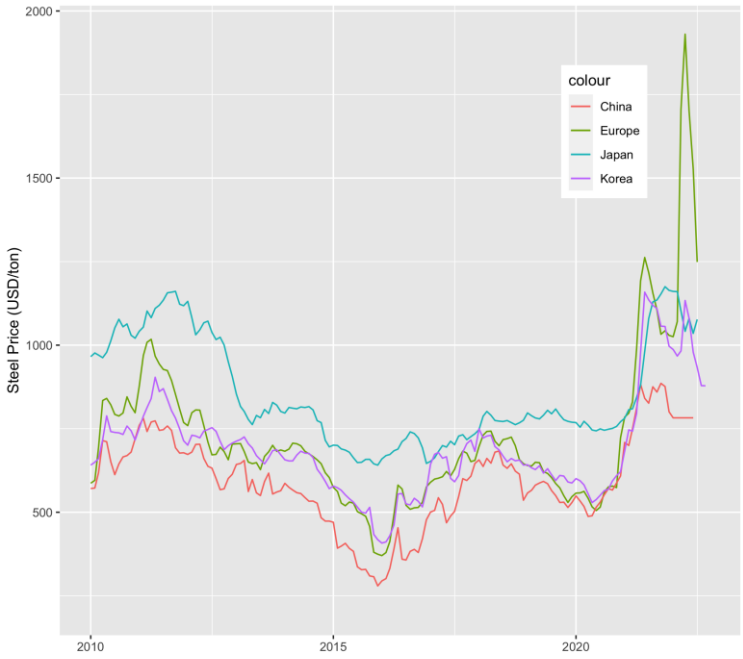
Source: Clarksons Shipping Intelligence Network

Figure 8. Orderbook



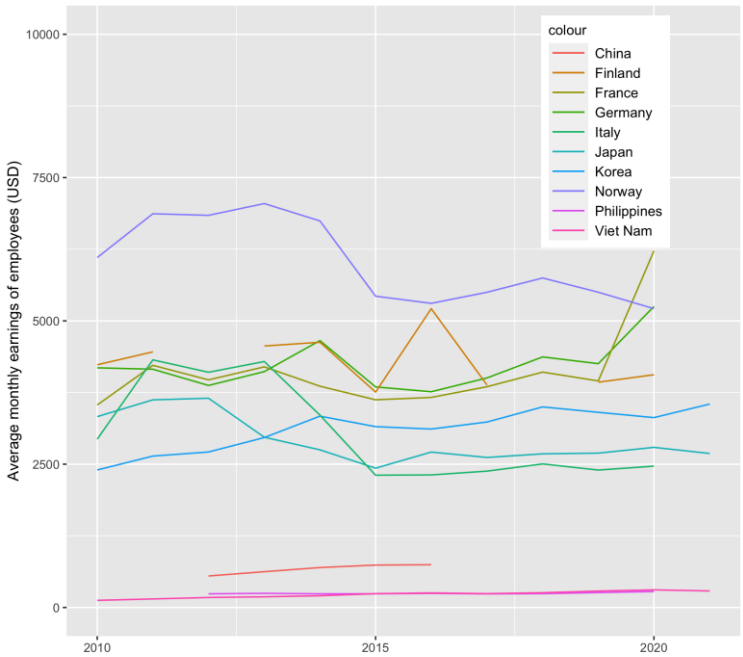
Source: Clarksons Shipping Intelligence Network

Figure 9. Steel price



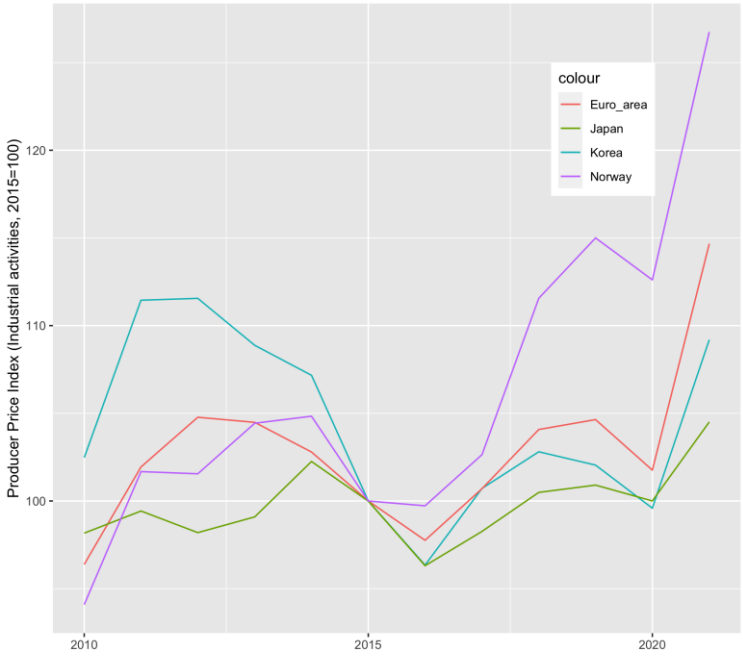
Source: OECD calculations based on SBB Steel Prices, Japan Metal Daily and Korean Steel Daily.

Figure 10. Labour costs



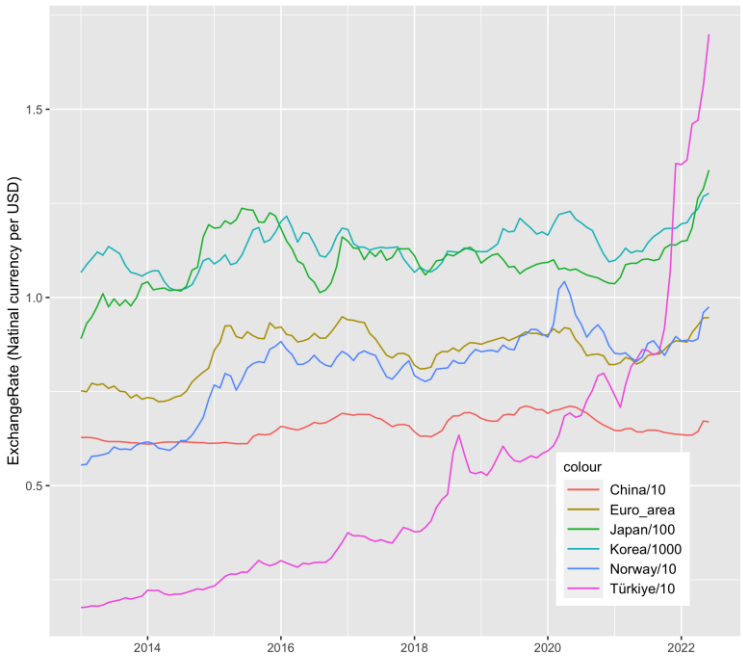
Note: This figure shows average monthly earnings of employees in the manufacturing industry as a proxy for labour costs in the shipbuilding industry which are not available.
Source: ILOSTAT

Figure 11. Producer Price Index (Industrial activities)



Source: OECD.Stat

Figure 12. Exchange rate



Note: The Secretariat has adjusted the currency units (as shown in the legend) to facilitate comparisons between currencies.
Source: OECD.Stat

Description and analysis of newbuilding prices of major ship types and ship size categories

Bulkers

20. For bulkers, information on prices was relatively difficult to obtain. There are several reasons for this. Compared to containerships and crude tankers, which are ship types for which price data was more readily available, there is 1) a wide variety of shipowners of bulkers, which cannot always be identified, and 2) less information available from charterers at the time of contracting new-built ships due to fewer time charter contracts.

21. This analysis focuses on three sizes for which the Secretariat was able to collect information on ship prices: (1) 65-70 k dwt (Panamax), (2) 179-181 k dwt (Capesize) and (3) 208-210 k dwt (Very Large Bulk Carriers).

22. The results are shown in Figure 13 to Figure 15. There is no uniform trend present for all sizes. Data on Panamax bulkers indicates a drop in prices between 2021 and 2022, from an average of 36 USD M to 32 USD M (Figure 13). Meanwhile, as Figure 14 indicates, prices for Capsize Bulk Carriers oscillate in a price range of 55 USD M and 60 USD M between 2018 and 2021, with a sharp increase to 80 USD M in 2022. However, as both the decrease in prices for Panamax and increase for Capsize Bulk Carriers are based on a single data plot their generalisability for the market is limited. Most data was available for bulkers in the 208-210 k dwt size range, with plots indicating a significant upward trend in price levels, reaching an average of 66 USD M in 2022 from 47 USD M in 2018 (Figure 15).

23. There is a significant price outlier (mean + 2σ plot) for Capesize Bulk Carriers (Figure 14). Given the small sample size, this could be due to several reasons, including specifications of ships and particularities of individual contracts.

Containerships

24. Containerships, in contrast to bulkers, are the ship type for which price information is most complete (with prices collected for 77% of the total number of containership orders in the dataset). This is likely due to the relatively limited number and mostly identified shipowners and the strong links with charterers through regular chartering. Following comments from delegates to better reflect size heterogeneity among ships and provide more information of different sizes, the Secretariat subdivided containerships into seven size classes:

- 3-4 k TEU (Intermediate)
- 6-7 k TEU (Intermediate)
- 7+ -9 k TEU (Intermediate/ Neo-Panamax)
- 11-13 k TEU (Neo-Panamax)
- 13+ -15 k TEU (Neo-Panamax)
- 15+ -17k TEU (Post-Panamax)
- 23-25 k TEU (Post-Panamax)

25. The results are shown in Figure 16 to Figure 22. Prices for containerships of all sizes follow a positive trend for the period 2018 to 2022 with the exception of 3-4 k TEU containerships, where prices sharply decrease between 2021 and 2022 (Figure 16). This trend is again based on a single data plot for 2022, raising questions over the generalisability of the result. Data on prices for 6-7 k TEU and 7+ -9 k TEU containerships is limited to 2021 and 2022, both indicating an increase in prices (Figure 17 and

Figure 18). As indicated by Figure 19, 11-13 k TEU Neo-Panamax ships experienced a drop in prices in 2021, followed by a gradual increase to an average of 125 USD M by 2022. For Post-Panamax ships of both 15+ -17 k TEU and 23-25 k TEU an upward trend in prices can be seen, reaching an average of approx. 175 USD M in both cases by 2022 (Figure 21 and Figure 22).

26. For intermediate containerships (6-7 k TEU), average containership prices show rates of standard deviation between 0 to approx. 20 USD M, with particularly high variability in yearly prices. There are no large changes in the size of price divergence between years. Significant price outliers (indicated by mean ± 2σ plots) are present for 3-4 k TEU, 7+ -9 k TEU and 13+ -15 k TEU ships, as shown in Figure 16, Figure 18 and Figure 20, respectively. Again, this dispersion of prices likely reflects particularities of ships and individual contracts.

Crude tankers

27. Similarly to containerships, price information on crude tankers was more readily available, with price data collected for 67% of ship orders. The Secretariat divided ships into three classes: (1) 111-117 k dwt (Aframax), (2) 152-160 k dwt (Suezmax), (3) 298-300 k dwt (UL/VLCC).

28. The results are shown in Figure 23 to Figure 25. Price fluctuations of crude oil tankers appear less uniform than those of bulk carriers and containerships and are likely to show variations in the studied time period. While average prices of Aframax crude tankers fluctuate in a price range from approx. 47 USD M to 60 USD M (Figure 23), Suezmax tankers experience a downward trend in average prices from a high of 58 USD M in 2019 to 48 USD M in 2020 but increase again in 2021-2022. Average prices for UL/VLCC crude tankers show very little change between 2018 and 2020, with a marked increase in 2021 (Figure 25). There is a possibility that these changes might be due to the volatility of the crude oil market and shifts in energy policy.

29. Prices for all three size classes also include significant outliers, with mean + 2σ plots in all the three figures as well as one mean - 2σ plot in Figure 25.

Product tankers

30. The Secretariat also studied two size classes of product tankers in the scope of this analysis: (1) 49-50 k dwt (MR) and (2) 110-120 k dwt (LR2).

31. The results are shown in Figure 26 to Figure 27. For both size classes, average prices follow a gradual positive trend between 2018 and 2022, with MR product tankers reaching an average of 42 USD M and LR2 tankers 64 USD M in 2022 (Figure 26 and Figure 27, respectively).

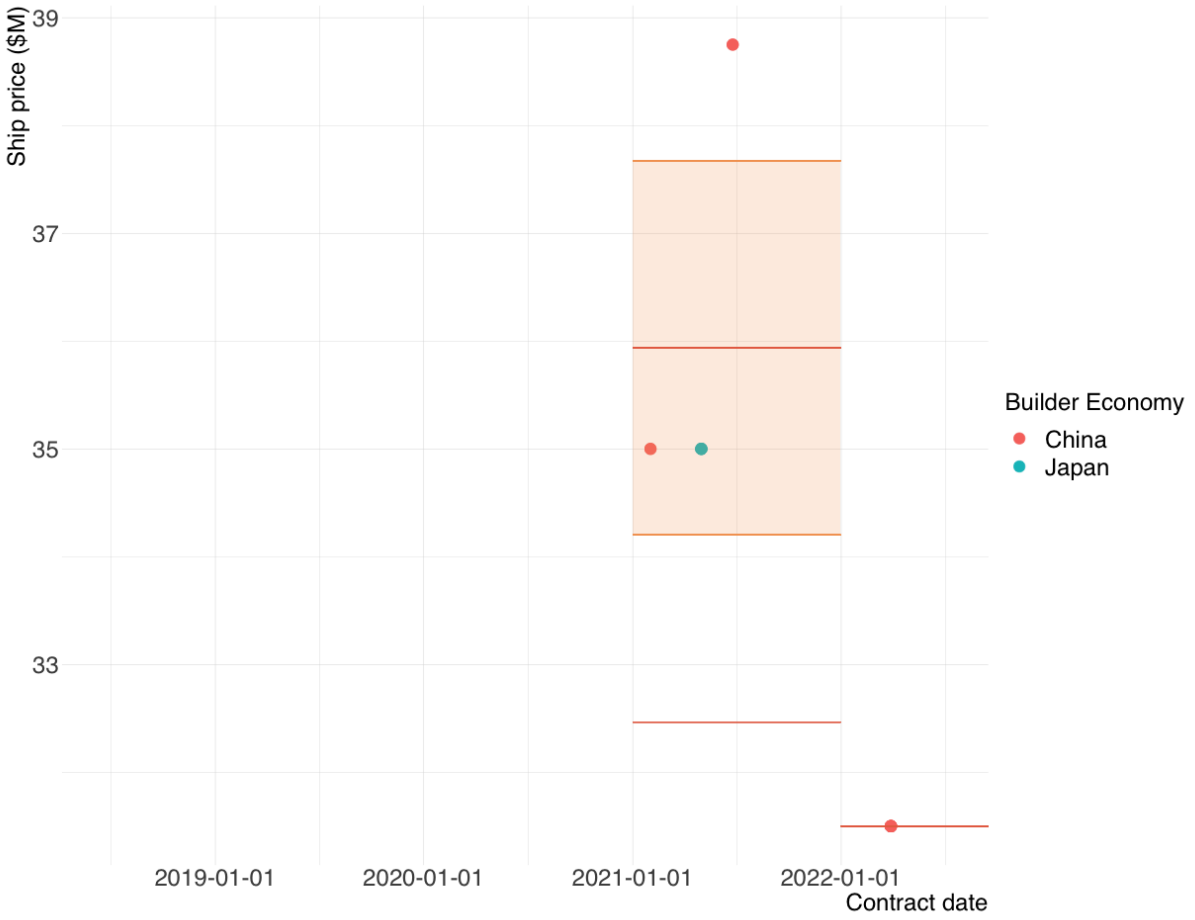
32. MR product tankers generally have higher rates of price dispersion than LR2 tankers, with four outliers (mean + 2σ plots). For LR2 tankers price dispersion was particularly high in 2021.

Chemical tankers

33. Among the five ship types analysed in this document, price information on chemical tankers was most limited (prices could be collected for 19% of ships in the dataset only). The results are shown in Figure 28 for one size class: 49-50 k dwt (MR). In Figure 28, no clear upward or downward trend can be seen, with average prices fluctuating between a high of 41 USD M in 2020 to just below 38 USD M in 2019 and 2021.

34. Limited availability of price data for chemical tankers and the very small sample size risk skewing the data, lowering the possibility to extrapolate these results for more general market trends.

Figure 13. Price developments for Bulkers (65-70 k dwt) during 2018-2022



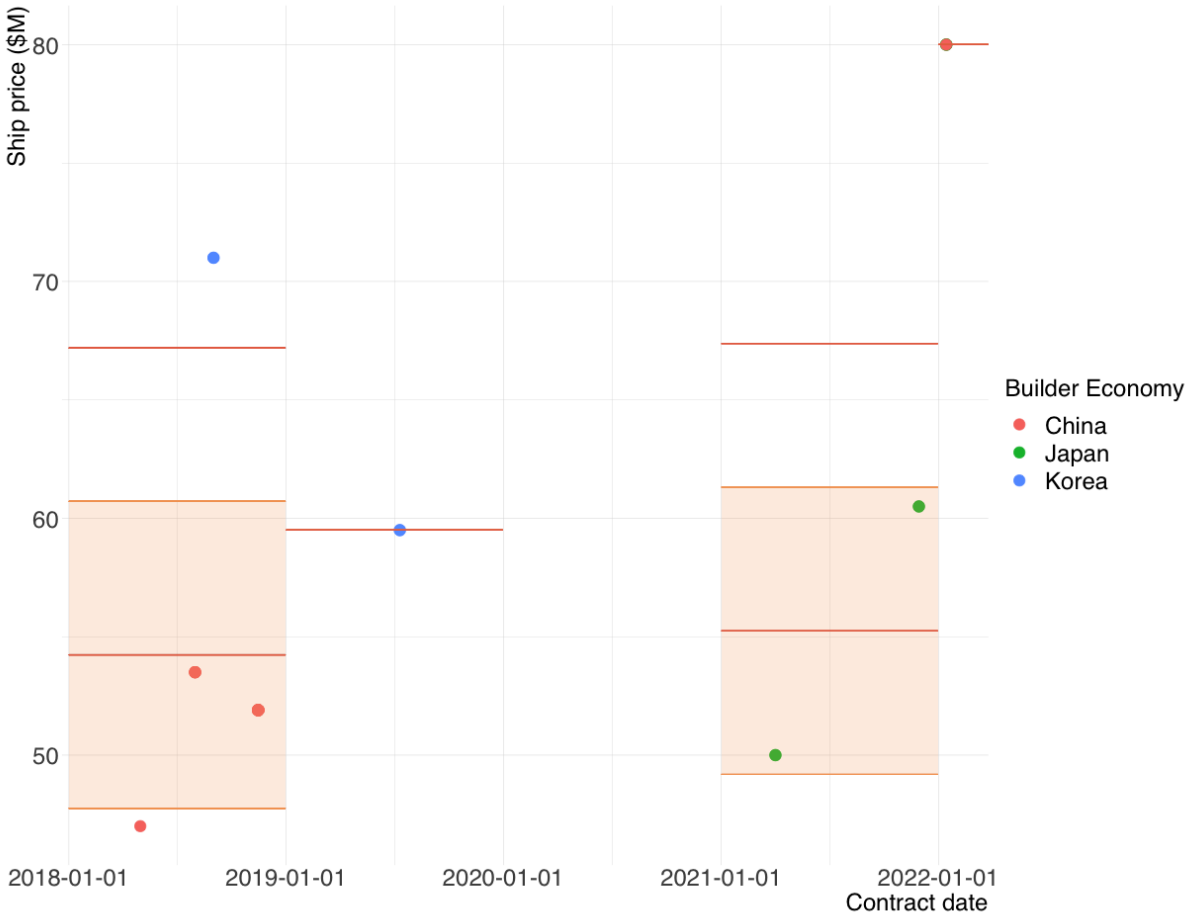
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Table 1. Details of outliers for Bulkers (65-70 k dwt) during 2018-2022

IMO_No.	Name	Dwt	Contract	Built	Price ($m)	Builder	Builder_Group	Economy	Build_period
	N/B Chengxi Shipyard	70000	6-25-2021	1-1-2023	38.75	Chengxi Shipyard	CSSC	China	555
	N/B Chengxi Shipyard	70000	6-25-2021	1-1-2024	38.75	Chengxi Shipyard	CSSC	China	920

Source: Clarksons World Fleet Register and other sources.

Figure 14. Price developments for Bulkers (179-181 k dwt) during 2018-2022



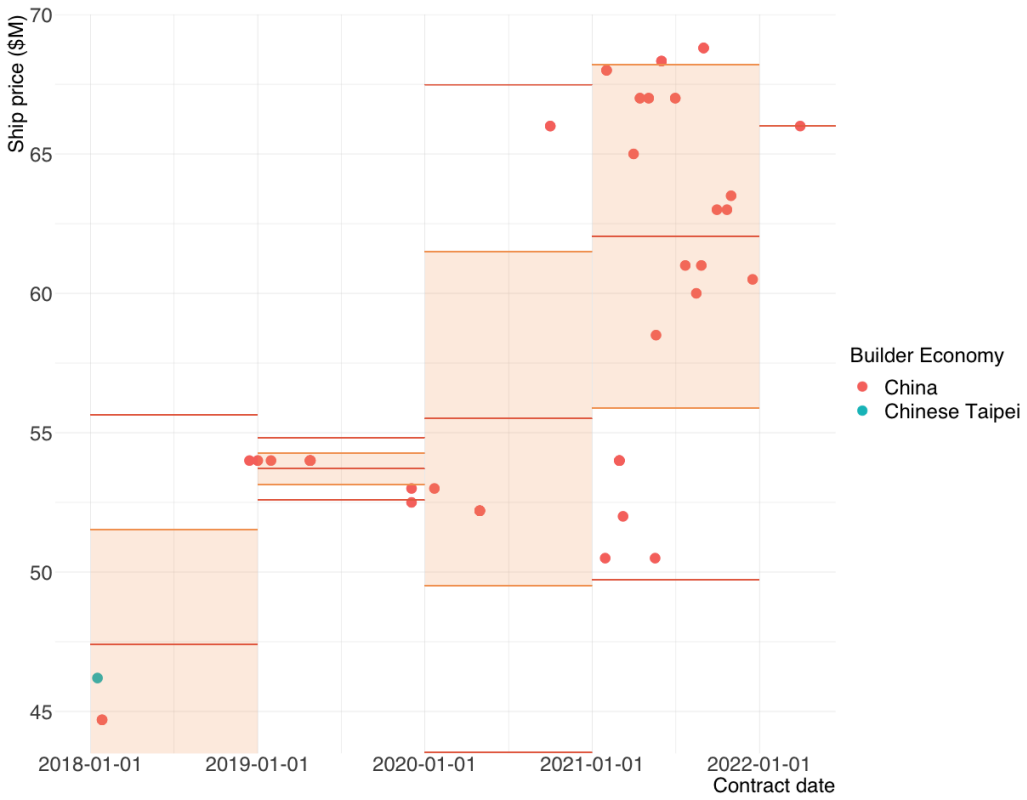
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Table 2. Details of outliers for Bulkers (179-181 k dwt) during 2018-2022

IMO_No.	Name	Dwt	Contract	Built	Price ($m)	Builder	Builder_Group	Economy	Build_period
9869332	HL Eco	179070	9-1-2018	11-1-2020	71	Hyundai Samho HI	Hyundai HI Group	Korea	792
9869344	HL Green	179649	9-1-2018	12-1-2020	71	Hyundai Samho HI	Hyundai HI Group	Korea	822
9881495	Solar Majesty	180516	5-1-2018	3-1-2020	47	Shanghai Waigaoqiao	CSSC	China	670

Source: Clarksons World Fleet Register and other sources.

Figure 15. Price developments for Bulkers (208-210 k dwt) during 2018-2022



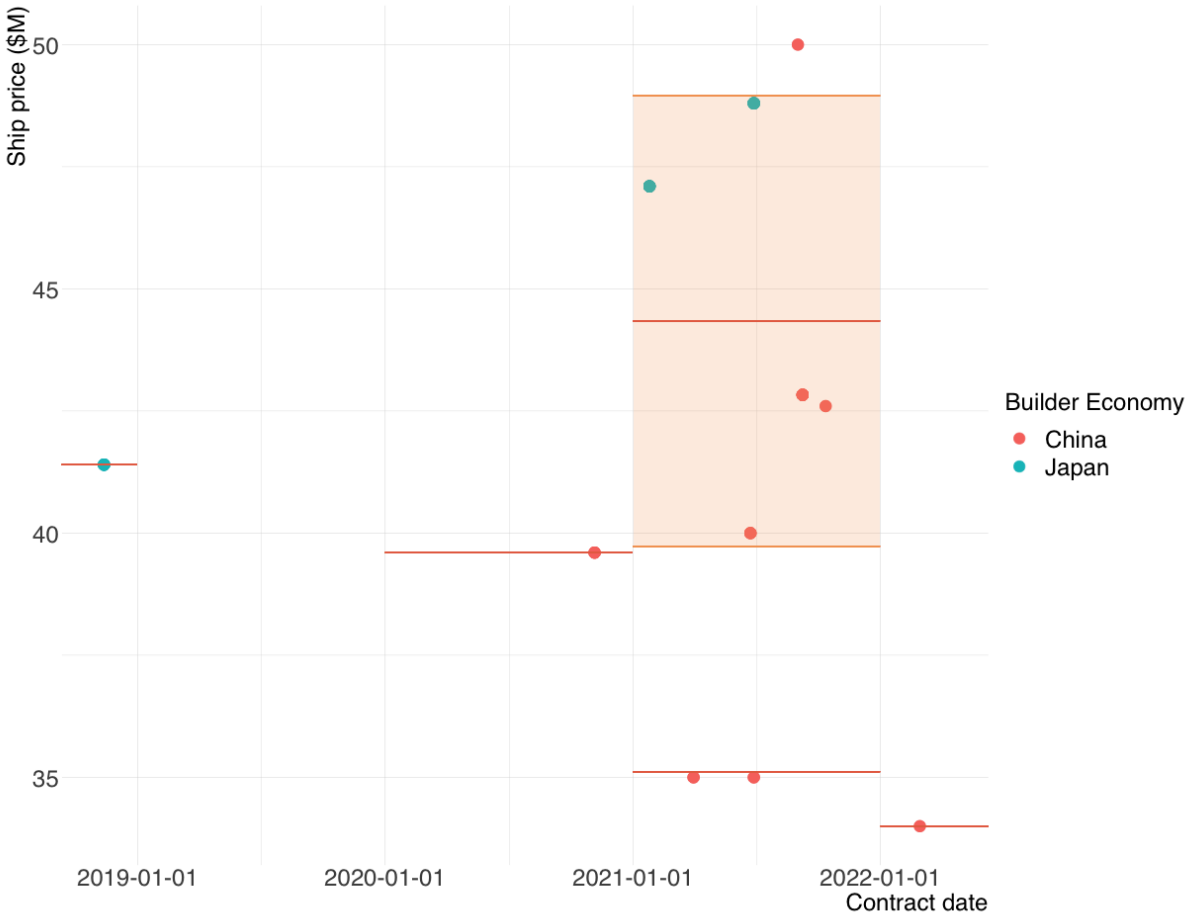
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Table 3. Details of outliers for Bulkers (208-210 k dwt) during 2018-2022

IMO_No.	Name	Dwt	Contract	Built	Price ($m)	Builder	Builder_Group	Economy	Build_period
	N/B New Times SB	208000	9-1-2021	8-1-2024	68.8	New Times SB	New Century SB Group	China	1065
	N/B New Times SB	208000	9-1-2021	9-1-2024	68.8	New Times SB	New Century SB Group	China	1096
	N/B New Times SB	208000	9-1-2021	4-1-2024	68.8	New Times SB	New Century SB Group	China	943
	N/B New Times SB	208000	9-1-2021	7-1-2024	68.8	New Times SB	New Century SB Group	China	1034
	N/B New Times SB	208000	6-1-2021	9-1-2023	68.33	New Times SB	New Century SB Group	China	822
	N/B New Times SB	208000	6-1-2021	10-1-2023	68.33	New Times SB	New Century SB Group	China	852
	N/B New Times SB	208000	6-1-2021	12-1-2023	68.33	New Times SB	New Century SB Group	China	913
	N/B New Times SB	208000	6-1-2021	2-1-2024	68.33	New Times SB	New Century SB Group	China	975
	N/B Beihai Shipyard Qingdao BC210K-15	210000	5-18-2021	8-1-2023	50.5	Beihai Shipyard	CSSC	China	805
	N/B Beihai Shipyard	210000	5-18-2021	11-1-2023	50.5	Beihai Shipyard	CSSC	China	897
	N/B Shanghai Waigaoqiao Shanghai H1529	210000	3-9-2021	9-1-2022	52	Shanghai Waigaoqiao	CSSC	China	541
	N/B Shanghai Waigaoqiao Shanghai H1530	210000	3-9-2021	11-1-2022	52	Shanghai Waigaoqiao	CSSC	China	602
	N/B COSCO HI (Yangzhou)	210000	3-1-2021	1-1-2023	54	COSCO HI (Yangzhou)	COSCO Shipping HI	China	671
	N/B COSCO HI (Yangzhou)	210000	3-1-2021	1-1-2023	54	COSCO HI (Yangzhou)	COSCO Shipping HI	China	671
9939357	N/B COSCO HI (Yangzhou) Yangzhou N1051	210000	3-1-2021	1-1-2023	54	COSCO HI (Yangzhou)	COSCO Shipping HI	China	671
9939369	N/B COSCO HI (Yangzhou) Yangzhou N1052	210000	3-1-2021	1-1-2024	54	COSCO HI (Yangzhou)	COSCO Shipping HI	China	1036
	N/B COSCO HI (Yangzhou)	210000	3-1-2021	1-1-2024	54	COSCO HI (Yangzhou)	COSCO Shipping HI	China	1036
	N/B COSCO HI (Yangzhou)	210000	3-1-2021	1-1-2024	54	COSCO HI (Yangzhou)	COSCO Shipping HI	China	1036
	N/B Beihai Shipyard Qingdao BC210K-11	210000	1-29-2021	11-1-2022	50.5	Beihai Shipyard	CSSC	China	641
	N/B Beihai Shipyard Qingdao BC210K-12	210000	1-29-2021	2-1-2023	50.5	Beihai Shipyard	CSSC	China	733
9927976	N/B New Times SB Taizhou 0120826	208000	10-1-2020	1-1-2022	66	New Times SB	New Century SB Group	China	457
9927988	N/B New Times SB Taizhou 0102827	208000	10-1-2020	1-1-2022	66	New Times SB	New Century SB Group	China	457
9927990	N/B New Times SB Taizhou 0120828	208000	10-1-2020	1-1-2023	66	New Times SB	New Century SB Group	China	822
9900772	N/B Shanghai Waigaoqiao Shanghai H1531	209000	12-3-2019	11-1-2021	52.5	Shanghai Waigaoqiao	CSSC	China	699
	N/B Shanghai Waigaoqiao Shanghai H1532	209000	12-3-2019	2-1-2022	52.5	Shanghai Waigaoqiao	CSSC	China	791
9906013	Trust Qingdao	210000	12-3-2019	2-1-2021	53	Shanghai Waigaoqiao	CSSC	China	426
9906025	Trust Shanghai	210000	12-3-2019	4-1-2021	53	Shanghai Waigaoqiao	CSSC	China	485
9881110	Solar Nova	208892	12-14-2018	1-1-2021	54	New Times SB	New Century SB Group	China	749
9881122	Solar Oak	208915	12-14-2018	1-1-2021	54	New Times SB	New Century SB Group	China	749

Source: Clarksons World Fleet Register and other sources.

Figure 16. Price developments for Containerships (3-4 k TEU) during 2018-2022



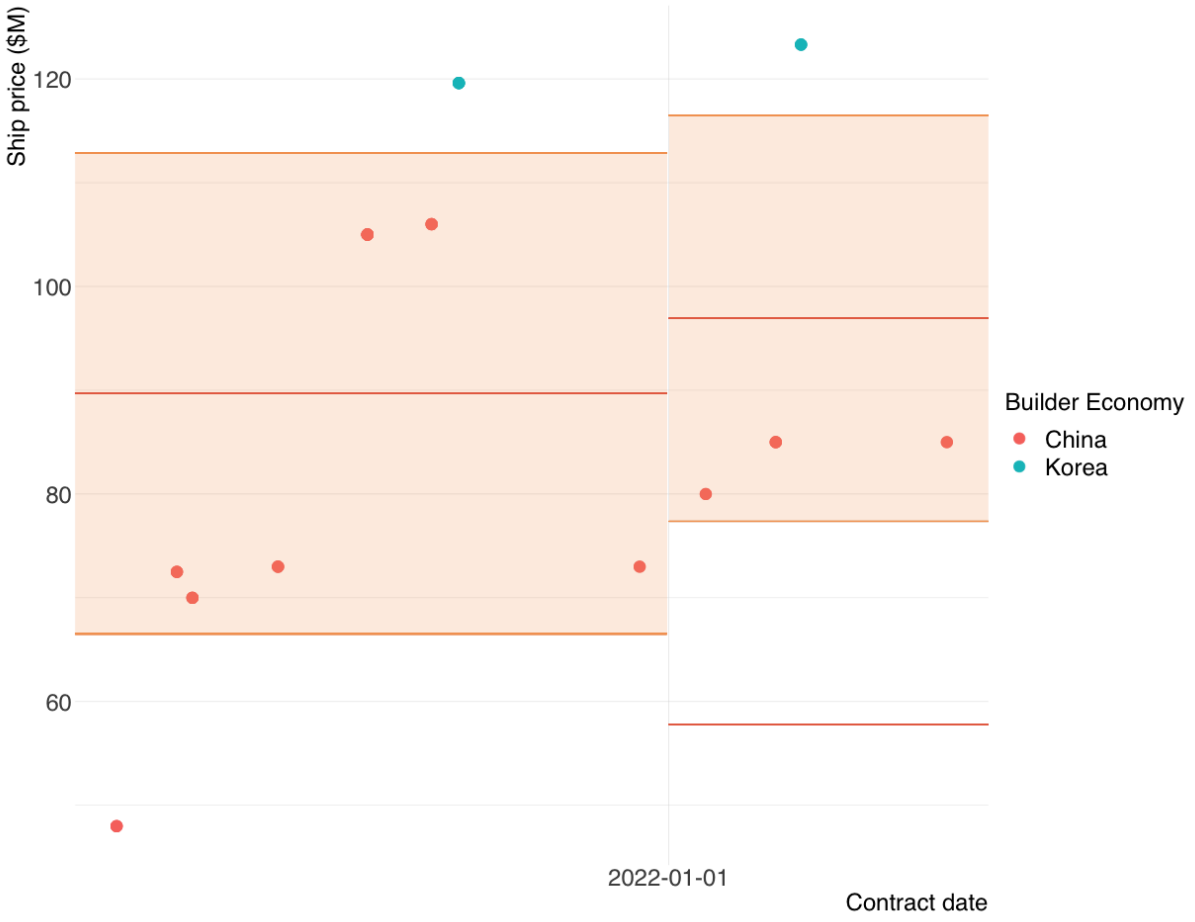
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Table 4. Details of outliers for Containerships (3-4 k TEU) during 2018-2022

IMO_No.	Name	TEU	Contract	Built	Price ($m)	Builder	Builder_Group	Economy	Build_period
	N/B Mawei SB (Mawei)	3700	9-1-2021	1-1-2024	50	Mawei SB (Mawei)	Fujian Shipbuilding	China	852
	N/B Mawei SB (Mawei)	3700	9-1-2021	1-1-2024	50	Mawei SB (Mawei)	Fujian Shipbuilding	China	852
	N/B Jiangsu New YZJ	3300	6-28-2021	11-1-2023	35	Jiangsu New YZJ	Yangzijiang Holdings	China	856
	N/B Jiangsu New YZJ	3300	6-28-2021	2-1-2024	35	Jiangsu New YZJ	Yangzijiang Holdings	China	948
	N/B Jiangsu New YZJ	3300	6-28-2021	5-1-2024	35	Jiangsu New YZJ	Yangzijiang Holdings	China	1038
	N/B Zhoushan Changhong Zhoushan CHB086	3100	3-31-2021	1-1-2023	35	Zhoushan Changhong	Zhoushan Changhong	China	641
	N/B Zhoushan Changhong Zhoushan CHB087	3100	3-31-2021	1-1-2023	35	Zhoushan Changhong	Zhoushan Changhong	China	641
	N/B Zhoushan Changhong Zhoushan CHB088	3100	3-31-2021	1-1-2023	35	Zhoushan Changhong	Zhoushan Changhong	China	641

Source: Clarksons World Fleet Register and other sources.

Figure 17. Price developments for Containerships (6-7 k TEU) during 2018-2022



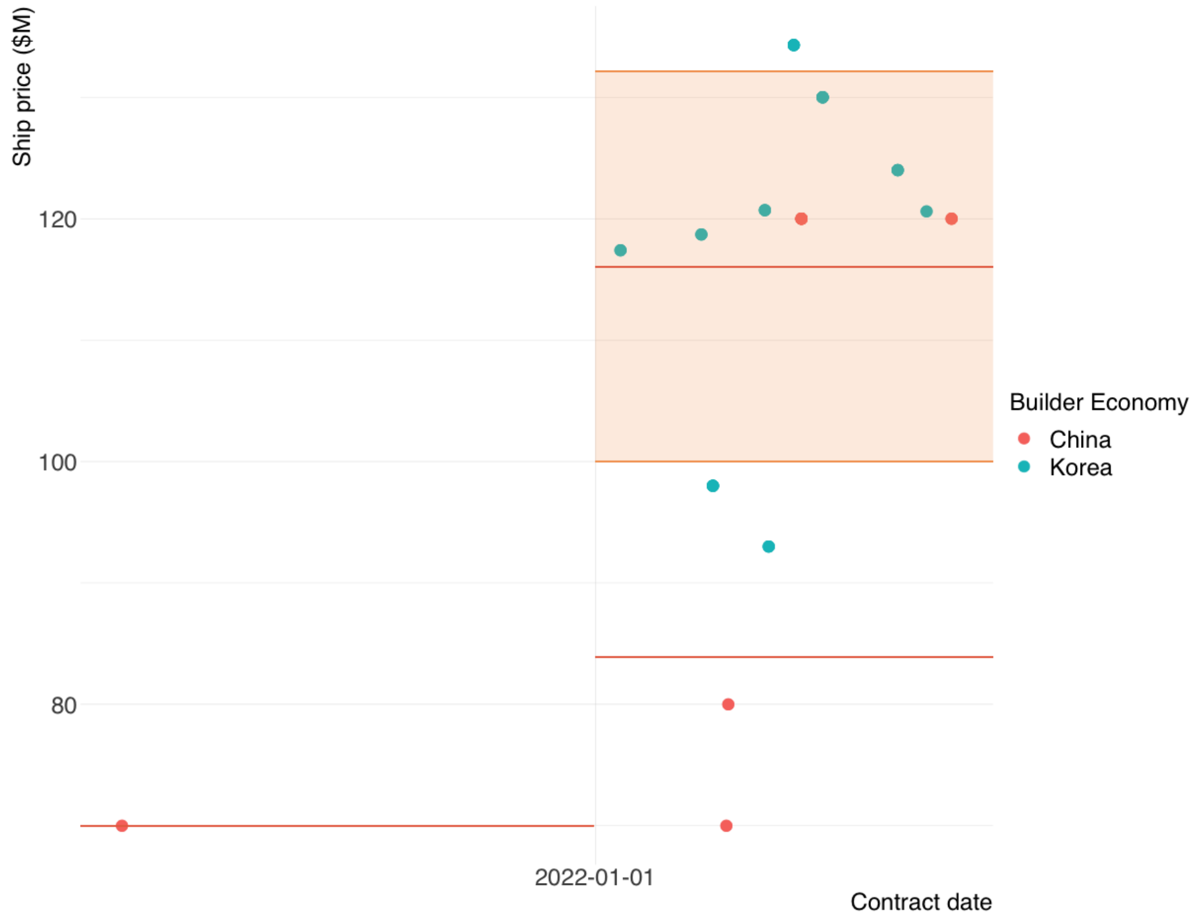
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Table 5. Details of outliers for Containerships (6-7 k TEU) during 2018-2022

IMO_No.	Name	TEU	Contract	Built	Price ($m)	Builder	Builder_Group	Economy	Build_period
	N/B Samsung HI	7000	3-10-2022	9-1-2024	123.3	Samsung HI	Samsung HI	Korea	906
	N/B Samsung HI	7000	3-10-2022	12-1-2024	123.3	Samsung HI	Samsung HI	Korea	997
	N/B Samsung HI	7000	3-10-2022	7-1-2024	123.3	Samsung HI	Samsung HI	Korea	844
	N/B Samsung HI	7000	3-10-2022	10-1-2024	123.3	Samsung HI	Samsung HI	Korea	936
	N/B Samsung HI	7000	9-15-2021	8-1-2023	119.6	Samsung HI	Samsung HI	Korea	685
	N/B Samsung HI	7000	9-15-2021	11-1-2023	119.6	Samsung HI	Samsung HI	Korea	777
	N/B Samsung HI	7000	9-15-2021	2-1-2024	119.6	Samsung HI	Samsung HI	Korea	869
	N/B Samsung HI	7000	9-15-2021	5-1-2024	119.6	Samsung HI	Samsung HI	Korea	959
	N/B Samsung HI	7000	9-15-2021	8-1-2024	119.6	Samsung HI	Samsung HI	Korea	1051
	N/B Samsung HI	7000	9-15-2021	11-1-2024	119.6	Samsung HI	Samsung HI	Korea	1143
9926192	N/B Qingdao Yangfan Qingdao CV5900-03	6014	3-23-2021	8-1-2023	48	Qingdao Yangfan	Yangfan Group	China	861
9926207	N/B Qingdao Yangfan Qingdao CV5900-04	6014	3-23-2021	11-1-2023	48	Qingdao Yangfan	Yangfan Group	China	953
9926219	N/B Qingdao Yangfan Qingdao CV5900-05	6014	3-23-2021	2-1-2024	48	Qingdao Yangfan	Yangfan Group	China	1045
9926221	N/B Qingdao Yangfan Qingdao CV5900-06	6014	3-23-2021	5-1-2024	48	Qingdao Yangfan	Yangfan Group	China	1135

Source: Clarksons World Fleet Register and other sources.

Figure 18. Price developments for Containerships (7+ - 9 k TEU) during 2018-2022



Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Table 6. Details of outliers for Containerships (7+ - 9 k TEU) during 2018-2022

IMO_No.	Name	TEU	Contract	Built	Price ($m)	Builder	Builder_Group	Economy	Build_period
	N/B K SB (Jinhae)	8000	4-29-2022	4-1-2024	130	K SB (Jinhae)	K Shipbuilding	Korea	703
	N/B K SB (Jinhae)	8000	4-29-2022	8-1-2024	130	K SB (Jinhae)	K Shipbuilding	Korea	825
	N/B K SB (Jinhae)	8000	4-29-2022	12-1-2024	130	K SB (Jinhae)	K Shipbuilding	Korea	947
	N/B K SB (Jinhae)	8000	4-29-2022	6-1-2025	130	K SB (Jinhae)	K Shipbuilding	Korea	1129
	N/B K SB (Jinhae)	8000	4-29-2022	6-1-2024	130	K SB (Jinhae)	K Shipbuilding	Korea	764
	N/B K SB (Jinhae)	8000	4-29-2022	10-1-2024	130	K SB (Jinhae)	K Shipbuilding	Korea	886
	N/B K SB (Jinhae)	8000	4-29-2022	2-1-2025	130	K SB (Jinhae)	K Shipbuilding	Korea	1009
	N/B K SB (Jinhae)	8000	4-29-2022	4-1-2025	130	K SB (Jinhae)	K Shipbuilding	Korea	1068
9970002	N/B Daehan Shipbuilding Haenam 4010	7950	4-1-2022	5-1-2024	93	Daehan Shipbuilding	Daehan Shipbuilding	Korea	761
9970026	N/B Daehan Shipbuilding Haenam 4012	7950	4-1-2022	6-1-2024	93	Daehan Shipbuilding	Daehan Shipbuilding	Korea	792
9969998	N/B Daehan Shipbuilding Haenam 4009	7950	4-1-2022	4-1-2024	93	Daehan Shipbuilding	Daehan Shipbuilding	Korea	731
9970014	N/B Daehan Shipbuilding Haenam 4011	7950	4-1-2022	5-1-2024	93	Daehan Shipbuilding	Daehan Shipbuilding	Korea	761
	N/B Shanhaiguan SB	7096	3-11-2022	5-1-2024	80	Shanhaiguan SB	CSSC	China	782
	N/B Shanhaiguan SB	7096	3-11-2022	8-1-2024	80	Shanhaiguan SB	CSSC	China	874
	N/B Dalian Shipbuilding	7100	3-10-2022	1-1-2024	70	Dalian Shipbuilding	CSSC	China	662
	N/B Dalian Shipbuilding	7100	3-10-2022	1-1-2024	70	Dalian Shipbuilding	CSSC	China	662
	N/B Hyundai HI (Ulsan)	8000	3-3-2022	1-1-2024	98	Hyundai HI (Ulsan)	HD Hyundai	Korea	669
	N/B Hyundai HI (Ulsan)	8000	3-3-2022	1-1-2024	98	Hyundai HI (Ulsan)	HD Hyundai	Korea	669
	N/B Hyundai HI (Ulsan)	8000	3-3-2022	1-1-2024	98	Hyundai HI (Ulsan)	HD Hyundai	Korea	669
	N/B Hyundai HI (Ulsan)	8000	3-3-2022	1-1-2024	98	Hyundai HI (Ulsan)	HD Hyundai	Korea	669
	N/B Hyundai HI (Ulsan)	8000	3-3-2022	1-1-2024	98	Hyundai HI (Ulsan)	HD Hyundai	Korea	669
	N/B Hyundai HI (Ulsan)	8000	3-3-2022	1-1-2024	98	Hyundai HI (Ulsan)	HD Hyundai	Korea	669

Source: Clarksons World Fleet Register and other sources.

Figure 19. Price developments for Containerships (11-13 k TEU) during 2018-2022

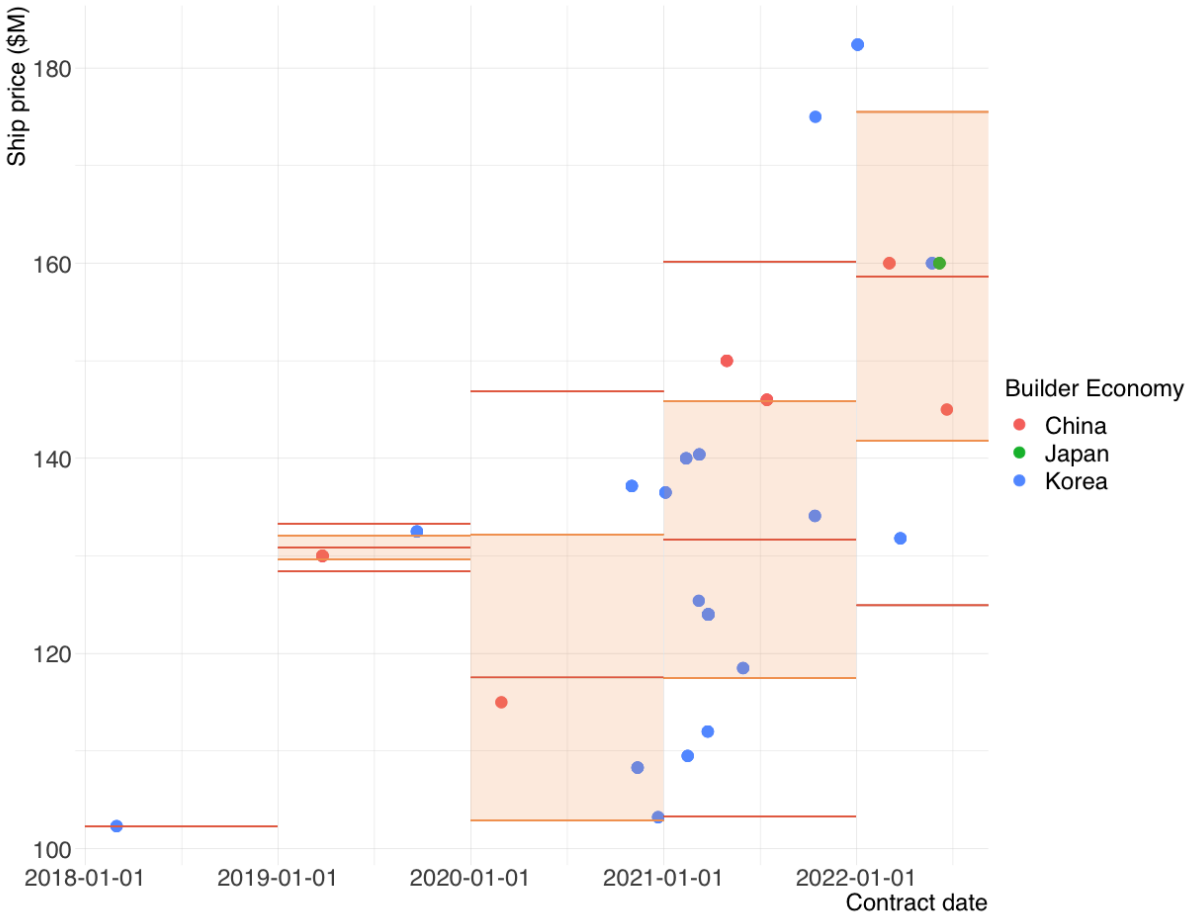
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Table 7. Details of outliers for Containerships (11-13 k TEU) during 2018-2022

IMO_No.	Name	TEU	Contract	Built	Price ($m)	Builder	Builder_Group	Economy	Build_period
	N/B Nihon Shipyard	12000	3-28-2022	12-1-2024	133	Nihon Shipyard	Imabari Shipbuilding	Japan	979
	N/B Nihon Shipyard	12000	3-28-2022	8-1-2024	133	Nihon Shipyard	Imabari Shipbuilding	Japan	857
9937311	N/B Yangzi Xinfu SB Taizhou YZJ2015-2270	11800	3-4-2021	7-1-2022	90	Yangzi Xinfu SB	Yangzijiang Holdings	China	484
9937323	N/B Yangzi Xinfu SB Taizhou YZJ2015-2271	11800	3-4-2021	8-1-2022	90	Yangzi Xinfu SB	Yangzijiang Holdings	China	515
9937335	N/B Yangzi Xinfu SB Taizhou YZJ2015-2822	11800	3-4-2021	9-1-2022	90	Yangzi Xinfu SB	Yangzijiang Holdings	China	546
9937347	N/B Yangzi Xinfu SB Taizhou YZJ2015-2823	11800	3-4-2021	10-1-2022	90	Yangzi Xinfu SB	Yangzijiang Holdings	China	576
9792682	N/B Imabari SB Marugame Marugame 2682	11714	4-27-2018	1-1-2022	85	Imabari SB Marugame	Imabari Shipbuilding	Japan	1345
9792694	N/B Imabari SB Marugame Marugame 2683	11714	4-27-2018	4-1-2022	85	Imabari SB Marugame	Imabari Shipbuilding	Japan	1435
9792709	N/B Imabari SB Marugame Marugame 2685	11714	4-27-2018	6-1-2022	85	Imabari SB Marugame	Imabari Shipbuilding	Japan	1496
	N/B Imabari SB Marugame	11714	4-27-2018	1-1-2022	85	Imabari SB Marugame	Imabari Shipbuilding	Japan	1345
	N/B Imabari SB Marugame	11714	4-27-2018	1-1-2022	85	Imabari SB Marugame	Imabari Shipbuilding	Japan	1345
9860908	YM Triumph	12690	4-27-2018	7-1-2020	85	Yangzi Xinfu SB	Yangzijiang Holdings	China	796
9860910	YM Truth	12690	4-27-2018	8-1-2020	85	Yangzi Xinfu SB	Yangzijiang Holdings	China	827
9860922	YM Totality	12690	4-27-2018	9-1-2020	85	Yangzi Xinfu SB	Yangzijiang Holdings	China	858
9860934	YM Target	12690	4-27-2018	2-1-2021	85	Yangzi Xinfu SB	Yangzijiang Holdings	China	1011
9860946	YM Tiptop	12690	4-27-2018	5-1-2021	85	Yangzi Xinfu SB	Yangzijiang Holdings	China	1100
9850537	Ever Focus	12118	2-8-2018	6-1-2020	94.4	Samsung HI	Samsung HI	Korea	844
9850549	Ever Front	12118	2-8-2018	8-1-2020	94.4	Samsung HI	Samsung HI	Korea	905
9850551	Ever Forward	12118	2-8-2018	9-1-2020	94.4	Samsung HI	Samsung HI	Korea	936
9850563	Ever Fortune	12118	2-8-2018	10-1-2020	94.4	Samsung HI	Samsung HI	Korea	966
9850575	Ever Forever	12118	2-8-2018	12-1-2020	94.4	Samsung HI	Samsung HI	Korea	1027
9850587	Ever Frank	12118	2-8-2018	2-1-2021	94.4	Samsung HI	Samsung HI	Korea	1089
9850525	Ever Faith	12118	2-8-2018	3-1-2020	94.4	Samsung HI	Samsung HI	Korea	752
9850599	Ever Future	12118	2-8-2018	4-1-2021	94.4	Samsung HI	Samsung HI	Korea	1148

Source: Clarksons World Fleet Register and other sources.

Figure 20. Price developments for Containerships (13+ -15 k TEU) during 2018-2022



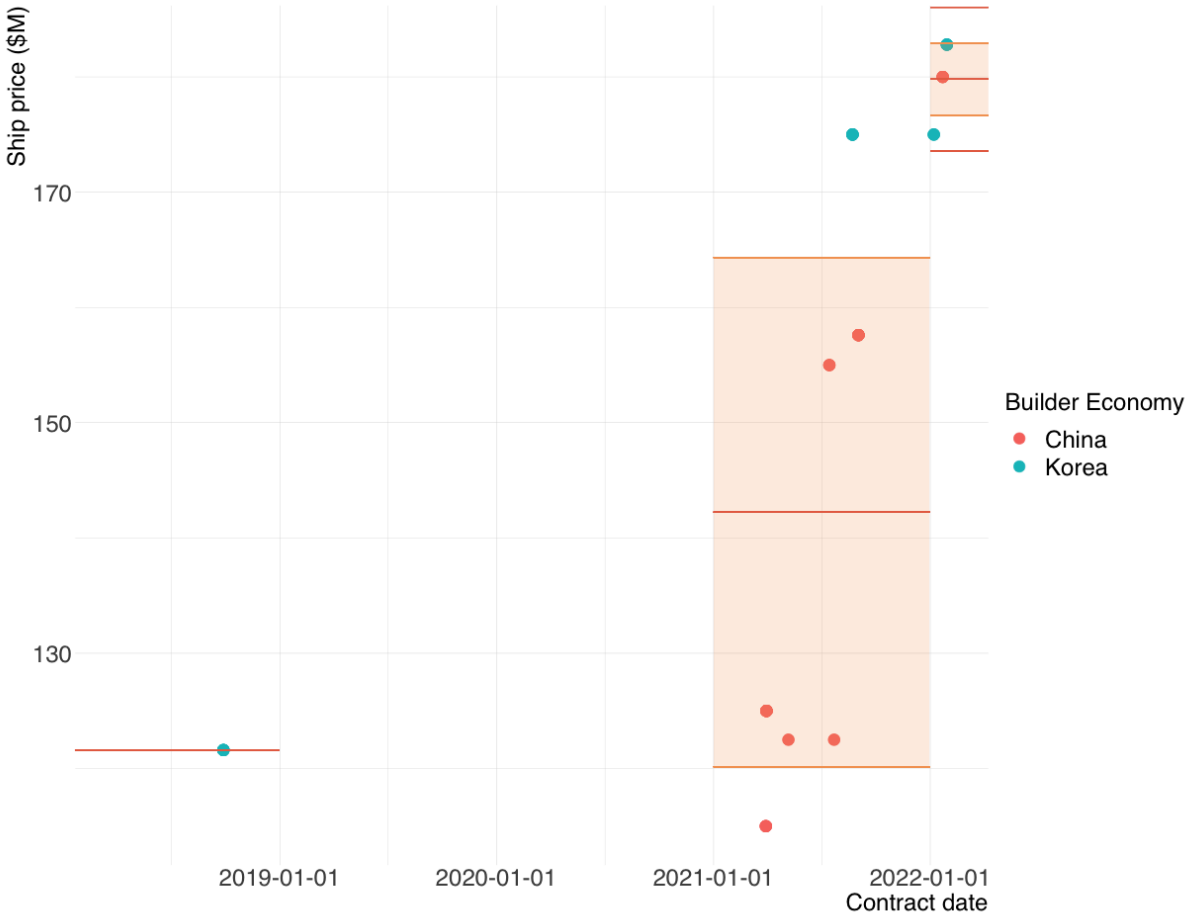
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Table 8. Details of outliers for Containerships (13+ -15 k TEU) during 2018-2022

IMO_No.	Name	TEU	Contract	Built	Price ($m)	Builder	Builder_Group	Economy	Build_period
	N/B Samsung HI	13100	3-25-2022	9-1-2024	131.8	Samsung HI	Samsung HI	Korea	891
	N/B Samsung HI	13100	3-25-2022	11-1-2024	131.8	Samsung HI	Samsung HI	Korea	952
	N/B Samsung HI	13100	3-25-2022	8-1-2024	131.8	Samsung HI	Samsung HI	Korea	860
	N/B Samsung HI	13100	3-25-2022	10-1-2024	131.8	Samsung HI	Samsung HI	Korea	921
	N/B Samsung HI	13100	3-25-2022	12-1-2024	131.8	Samsung HI	Samsung HI	Korea	982
	N/B Hyundai Samho HI	15000	1-3-2022	7-1-2024	182.4	Hyundai Samho HI	Hyundai HI Group	Korea	910
	N/B Hyundai Samho HI	15000	1-3-2022	8-1-2024	182.4	Hyundai Samho HI	Hyundai HI Group	Korea	941
	N/B Hyundai Samho HI	15000	1-3-2022	9-1-2024	182.4	Hyundai Samho HI	Hyundai HI Group	Korea	972
	N/B Hyundai Samho HI	15000	1-3-2022	10-1-2024	182.4	Hyundai Samho HI	Hyundai HI Group	Korea	1002
	N/B Hyundai Samho HI	15000	1-3-2022	11-1-2024	182.4	Hyundai Samho HI	Hyundai HI Group	Korea	1033
	N/B Hyundai Samho HI	15000	1-3-2022	12-1-2024	182.4	Hyundai Samho HI	Hyundai HI Group	Korea	1063
	N/B Hyundai Samho	15000	10-15-2021	1-1-2024	175	Hyundai Samho HI	Hyundai HI Group	Korea	808
	N/B Hyundai Samho	15000	10-15-2021	4-1-2024	175	Hyundai Samho HI	Hyundai HI Group	Korea	899
	N/B COSCO HI (Yangzhou)	14092	7-15-2021	12-1-2023	146	COSCO HI (Yangzhou)	COSCO Shipping HI	China	869
	N/B COSCO HI (Yangzhou)	14092	7-15-2021	2-1-2024	146	COSCO HI (Yangzhou)	COSCO Shipping HI	China	931
	N/B COSCO HI (Yangzhou)	14092	7-15-2021	4-1-2024	146	COSCO HI (Yangzhou)	COSCO Shipping HI	China	991
	N/B COSCO HI (Yangzhou)	14092	7-15-2021	6-1-2024	146	COSCO HI (Yangzhou)	COSCO Shipping HI	China	1052
	N/B COSCO HI (Yangzhou)	14092	7-15-2021	8-1-2024	146	COSCO HI (Yangzhou)	COSCO Shipping HI	China	1113
	N/B COSCO HI (Yangzhou)	14092	7-15-2021	9-1-2024	146	COSCO HI (Yangzhou)	COSCO Shipping HI	China	1144
	N/B Jiangnan SY Group	15000	4-30-2021	10-1-2023	150	Jiangnan SY Group	CSSC	China	884
	N/B Jiangnan SY Group	15000	4-30-2021	12-1-2023	150	Jiangnan SY Group	CSSC	China	945
	N/B Jiangnan SY Group	15000	4-30-2021	1-1-2024	150	Jiangnan SY Group	CSSC	China	976
	N/B Jiangnan SY Group	15000	4-30-2021	1-1-2024	150	Jiangnan SY Group	CSSC	China	976
	N/B Jiangnan SY Group	15000	4-30-2021	1-1-2024	150	Jiangnan SY Group	CSSC	China	976
	N/B Jiangnan SY Group	15000	4-30-2021	1-1-2024	150	Jiangnan SY Group	CSSC	China	976
9935088	N/B Hyundai HI (Ulsan) Ulsan 3388	13200	3-25-2021	3-1-2023	112	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	706
9935090	N/B Hyundai HI (Ulsan) Ulsan 3389	13200	3-25-2021	5-1-2023	112	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	767
9935105	N/B Hyundai HI (Ulsan) Ulsan 3390	13200	3-25-2021	7-1-2023	112	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	828
9935117	N/B Hyundai HI (Ulsan) Ulsan 3391	13200	3-25-2021	9-1-2023	112	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	890
9935129	N/B Hyundai HI (Ulsan) Ulsan 3392	13200	3-25-2021	11-1-2023	112	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	951
9930935	N/B Daewoo (DSME) Geoje 4366	15000	2-15-2021	3-1-2023	109.5	Daewoo (DSME)	Daewoo (DSME)	Korea	744
9930947	N/B Daewoo (DSME) Geoje 4367	15000	2-15-2021	4-1-2023	109.5	Daewoo (DSME)	Daewoo (DSME)	Korea	775
9930959	N/B Daewoo (DSME) Geoje 4368	15000	2-15-2021	5-1-2023	109.5	Daewoo (DSME)	Daewoo (DSME)	Korea	805
9930961	N/B Daewoo (DSME) Geoje 4369	15000	2-15-2021	6-1-2023	109.5	Daewoo (DSME)	Daewoo (DSME)	Korea	836
	N/B Hyundai HI (Ulsan)	14812	11-1-2020	8-1-2022	137.16	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	638
	N/B Hyundai HI (Ulsan)	14812	11-1-2020	10-1-2022	137.16	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	699
	N/B Hyundai HI (Ulsan)	14812	11-1-2020	12-1-2022	137.16	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	760
9927275	N/B Hyundai HI (Ulsan) Ulsan 3181	14812	11-1-2020	1-1-2023	137.16	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	791
9927287	N/B Hyundai HI (Ulsan) Ulsan 3182	14812	11-1-2020	2-1-2023	137.16	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	822
9927299	N/B Hyundai HI (Ulsan) Ulsan 3183	14812	11-1-2020	4-1-2023	137.16	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	881
9897755	Arcachon Bay / CMA CGM Yosemite	14812	9-21-2019	10-1-2022	132.5	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	1106
9897767	Bonavista Bay / CMA CGM Sequoia	14812	9-21-2019	11-1-2022	132.5	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	1137
9897779	Rose Bay	14812	9-21-2019	12-1-2022	132.5	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	1167
9897781	Salt Bay	14812	9-21-2019	2-1-2023	132.5	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	1229
9897793	Superior Bay	14812	9-21-2019	4-1-2023	132.5	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	1288

Source: Clarksons World Fleet Register and other sources.

Figure 21. Price developments for Containerships (15+ - 17 k TEU) during 2018-2022



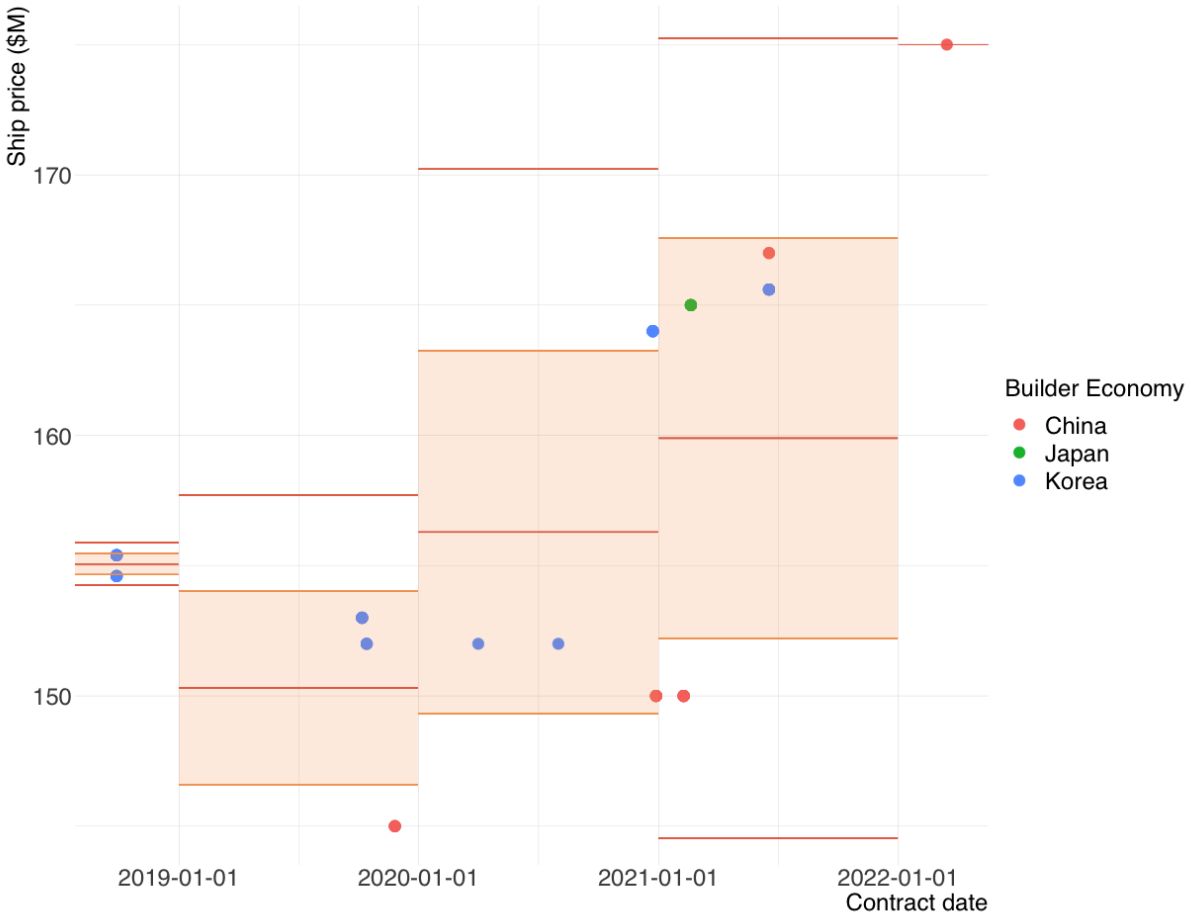
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Table 9. Details of outliers for Containerships (15+ - 17 k TEU) during 2018-2022

IMO_No.	Name	TEU	Contract	Built	Price ($m)	Builder	Builder_Group	Economy	Build_period
	N/B Hyundai HI (Ulsan)	16000	1-7-2022	1-1-2025	175	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	1090
	N/B Hyundai HI (Ulsan)	16000	1-7-2022	2-1-2025	175	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	1121
	N/B Hyundai HI (Ulsan)	16000	1-7-2022	4-1-2025	175	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	1180
	N/B Hyundai HI (Ulsan)	16000	1-7-2022	5-1-2025	175	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	1210
	N/B Hyundai HI (Ulsan)	16000	8-23-2021	2-1-2024	175	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	892
	N/B Hyundai HI (Ulsan)	16000	8-23-2021	3-1-2024	175	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	921
	N/B Hyundai HI (Ulsan)	16000	8-23-2021	5-1-2024	175	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	982
	N/B Hyundai HI (Ulsan)	16000	8-23-2021	6-1-2024	175	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	1013
	N/B Hyundai HI (Ulsan)	16000	8-23-2021	7-1-2024	175	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	1043
	N/B Hyundai HI (Ulsan)	16000	8-23-2021	9-1-2024	175	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	1105
	N/B Hyundai HI (Ulsan)	16000	8-23-2021	10-1-2024	175	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	1135
	N/B Hyundai HI (Ulsan)	16000	8-23-2021	11-1-2024	175	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	1166
	N/B Jiangnan SY Group	15500	3-30-2021	7-1-2023	115	Jiangnan SY Group	CSSC	China	823
	N/B Jiangnan SY Group	15500	3-30-2021	9-1-2023	115	Jiangnan SY Group	CSSC	China	885
	N/B Jiangnan SY Group	15500	3-30-2021	11-1-2023	115	Jiangnan SY Group	CSSC	China	946
	N/B Hudong Zhonghua	15500	3-30-2021	1-1-2024	115	Hudong Zhonghua	CSSC	China	1007
	N/B Hudong Zhonghua	15500	3-30-2021	3-1-2024	115	Hudong Zhonghua	CSSC	China	1067
	N/B Hudong Zhonghua	15500	3-30-2021	5-1-2024	115	Hudong Zhonghua	CSSC	China	1128

Source: Clarksons World Fleet Register and other sources.

Figure 22. Price developments for Containerships (23-25 k TEU) during 2018-2022



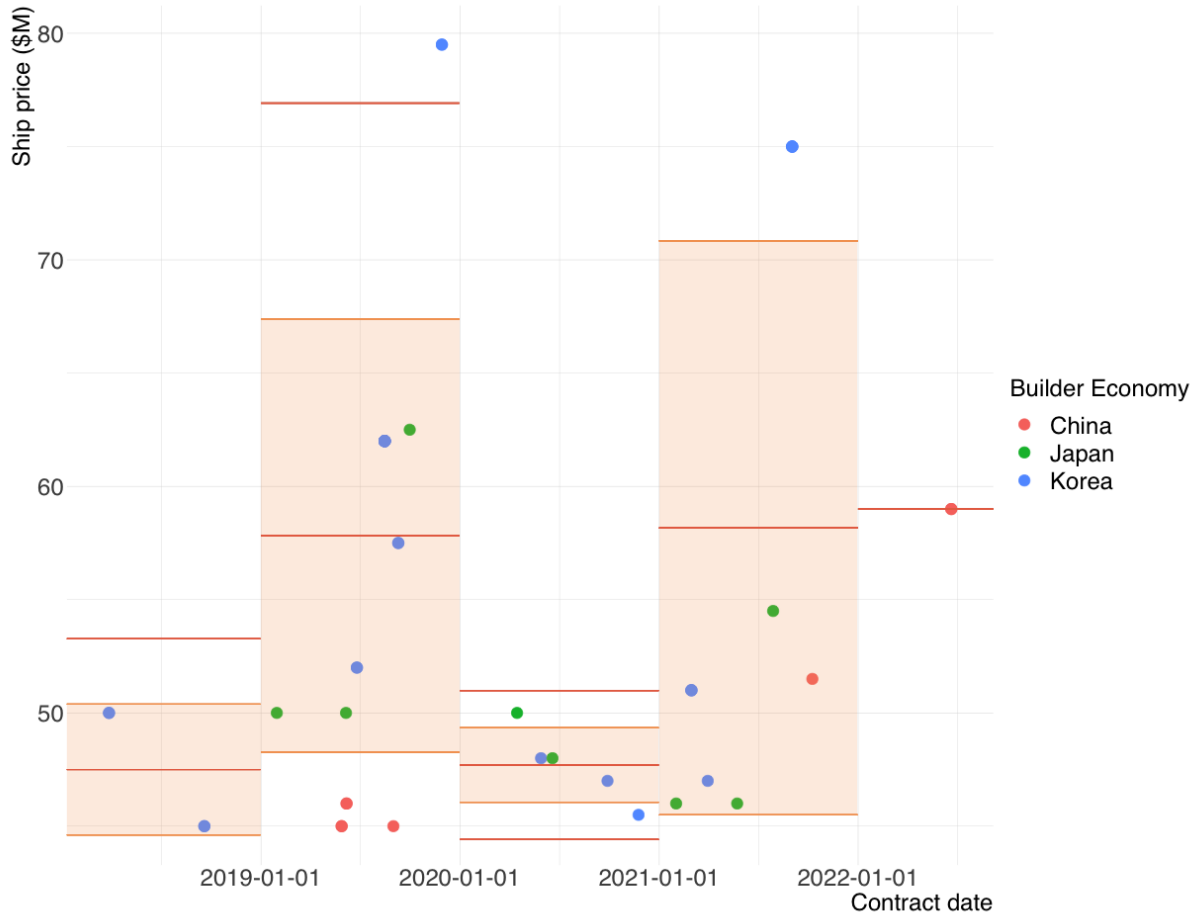
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Table 10. Details of outliers for Containerships (23-25 k TEU) during 2018-2022

IMO_No.	Name	TEU	Contract	Built	Price ($m)	Builder	Builder_Group	Economy	Build_period
	N/B Hudong Zhonghua Shanghai H1866A	24100	2-8-2021	1-1-2023	150	Hudong Zhonghua	CSSC	China	692
	N/B Hudong Zhonghua Shanghai H1867A	24100	2-8-2021	1-1-2023	150	Hudong Zhonghua	CSSC	China	692
	N/B Jiangnan SY Group Shanghai H2734	24100	2-8-2021	1-1-2023	150	Jiangnan SY Group	CSSC	China	692
	N/B Jiangnan SY Group Shanghai H2741	24100	2-8-2021	1-1-2023	150	Jiangnan SY Group	CSSC	China	692
	N/B Yangzi Xinfu SB	24000	2-8-2021	2-1-2023	150	Yangzi Xinfu SB	Yangzijiang Holdings	China	723
	N/B Yangzi Xinfu SB	24000	2-8-2021	5-1-2023	150	Yangzi Xinfu SB	Yangzijiang Holdings	China	812
	N/B Yangzi Xinfu SB Taizhou YZJ2015-2335	24000	2-8-2021	2-1-2023	150	Yangzi Xinfu SB	Yangzijiang Holdings	China	723
	N/B Yangzi Xinfu SB	24000	2-8-2021	5-1-2023	150	Yangzi Xinfu SB	Yangzijiang Holdings	China	812
9540118	N/B Daewoo (DSME) Geoje 4360	23500	12-23-2020	4-1-2023	164	Daewoo (DSME)	Daewoo (DSME)	Korea	829
9540120	N/B Daewoo (DSME) Geoje 4361	23500	12-23-2020	6-1-2023	164	Daewoo (DSME)	Daewoo (DSME)	Korea	890
9540132	N/B Daewoo (DSME) Geoje 4362	23500	12-23-2020	7-1-2023	164	Daewoo (DSME)	Daewoo (DSME)	Korea	920
9540144	N/B Daewoo (DSME) Geoje 4363	23500	12-23-2020	9-1-2023	164	Daewoo (DSME)	Daewoo (DSME)	Korea	982
9543093	N/B Daewoo (DSME) Geoje 4364	23500	12-23-2020	11-1-2023	164	Daewoo (DSME)	Daewoo (DSME)	Korea	1043
9543108	N/B Daewoo (DSME) Geoje 4365	23500	12-23-2020	12-1-2023	164	Daewoo (DSME)	Daewoo (DSME)	Korea	1073
9893979	N/B Jiangnan SY Group Shanghai H2630	23888	11-26-2019	5-1-2022	145	Jiangnan SY Group	CSSC	China	887
9893993	N/B Jiangnan SY Group	23888	11-26-2019	8-1-2022	145	Jiangnan SY Group	CSSC	China	979
9893955	N/B SCS Shipbuilding Shanghai H1858A	23888	11-26-2019	5-1-2022	145	SCS Shipbuilding	CSSC	China	887
9909132	N/B SCS Shipbuilding	23888	11-26-2019	8-1-2022	145	SCS Shipbuilding	CSSC	China	979
9868326	HMM Oslo	23792	9-28-2018	5-1-2020	154.6	Samsung HI	Samsung HI	Korea	581
9868338	HMM Rotterdam	23792	9-28-2018	6-1-2020	154.6	Samsung HI	Samsung HI	Korea	612
9868340	HMM Southampton	23792	9-28-2018	8-1-2020	154.6	Samsung HI	Samsung HI	Korea	673
9868352	HMM Stockholm	23792	9-28-2018	8-1-2020	154.6	Samsung HI	Samsung HI	Korea	673
9868364	HMM St. Petersburg	23792	9-28-2018	9-1-2020	154.6	Samsung HI	Samsung HI	Korea	704

Source: Clarksons World Fleet Register and other sources.

Figure 23. Price developments for Crude tankers (111-117 k dwt) during 2018-2022



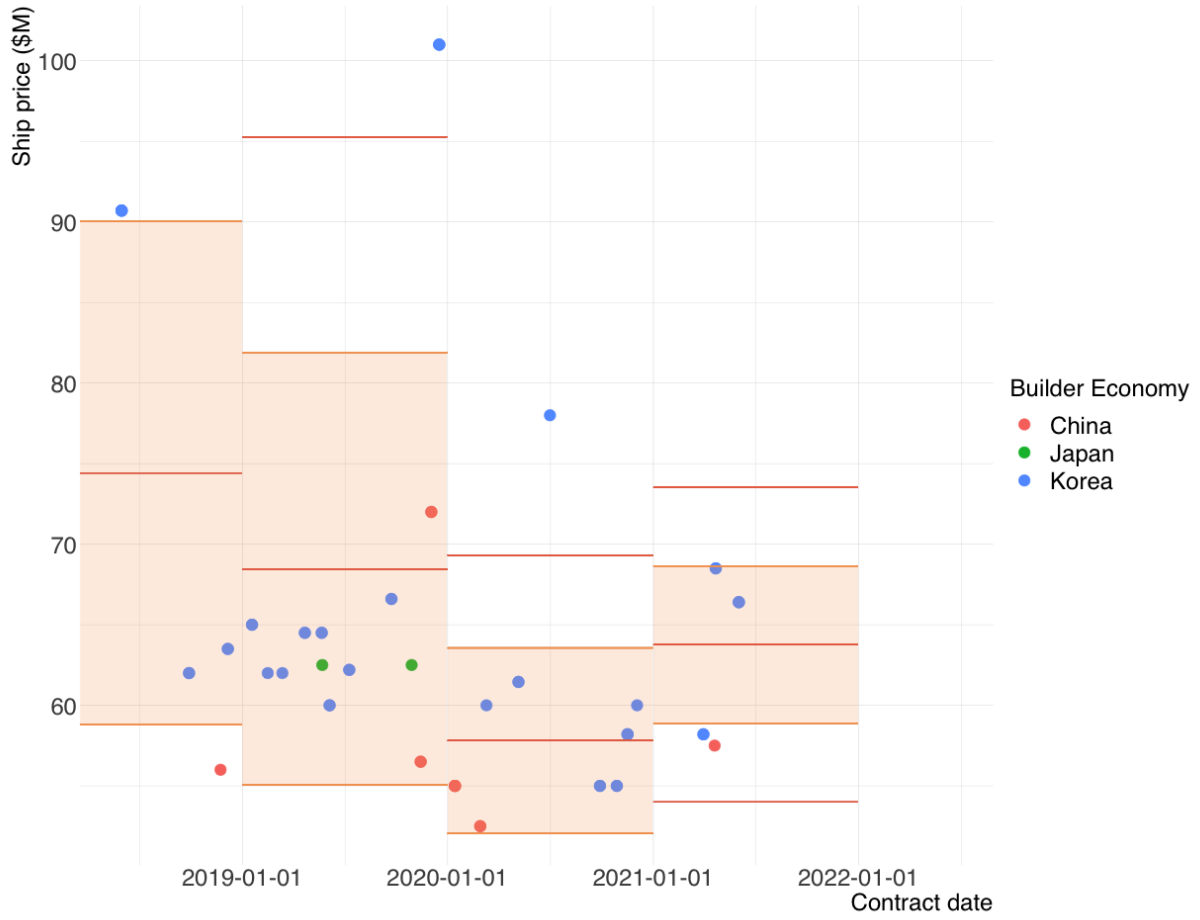
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.Source:

Table 11. Details of outliers for Crude tankers (111-117 k dwt) during 2018-2022

IMO_No.	Name	Dwt	Contract	Built	Price ($m)	Builder	Builder_Group	Economy	Build_period
	N/B Daehan Shipbuilding Haenam 5081	115000	9-2-2021	9-1-2023	75	Daehan Shipbuilding	Daehan Shipbuilding	Korea	729
	N/B Daehan Shipbuilding Haenam 5082	115000	9-2-2021	10-1-2023	75	Daehan Shipbuilding	Daehan Shipbuilding	Korea	759
	N/B Daehan Shipbuilding Haenam 5083	115000	9-2-2021	11-1-2023	75	Daehan Shipbuilding	Daehan Shipbuilding	Korea	790
	N/B Daehan Shipbuilding Haenam 5084	115000	9-2-2021	12-1-2023	75	Daehan Shipbuilding	Daehan Shipbuilding	Korea	820
	N/B Daehan Shipbuilding	115000	11-24-2020	3-1-2022	45.5	Daehan Shipbuilding	Daehan Shipbuilding	Korea	462
9910533	N/B Sumitomo (Yokosuka) Yokosuka 1408	112000	4-15-2020	1-1-2022	50	Sumitomo (Yokosuka)	Sumitomo HI	Japan	626
9901025	N/B Samsung HI Geoje 2367	114000	11-29-2019	1-1-2022	79.5	Samsung HI	Samsung HI	Korea	764
9901037	N/B Samsung HI Geoje 2368	114000	11-29-2019	3-1-2022	79.5	Samsung HI	Samsung HI	Korea	823
9903918	Sea Dragon	114000	9-1-2019	10-1-2021	45	Shanghai Waigaoqiao	CSSC	China	761
9891660	Aigeorgis	116092	6-7-2019	5-1-2021	46	New Times SB	New Century SB Group	China	694
9891672	Pegasus Star	115000	6-7-2019	8-1-2021	46	New Times SB	New Century SB Group	China	786
9886718	Sea Turtle	114085	5-29-2019	5-1-2021	45	Shanghai Waigaoqiao	CSSC	China	703
9886720	Sea Urchin	114000	5-29-2019	7-1-2021	45	Shanghai Waigaoqiao	CSSC	China	764

Source: Clarksons World Fleet Register and other sources.

Figure 24. Price developments for Crude tankers (152-160 k dwt) during 2018-2022



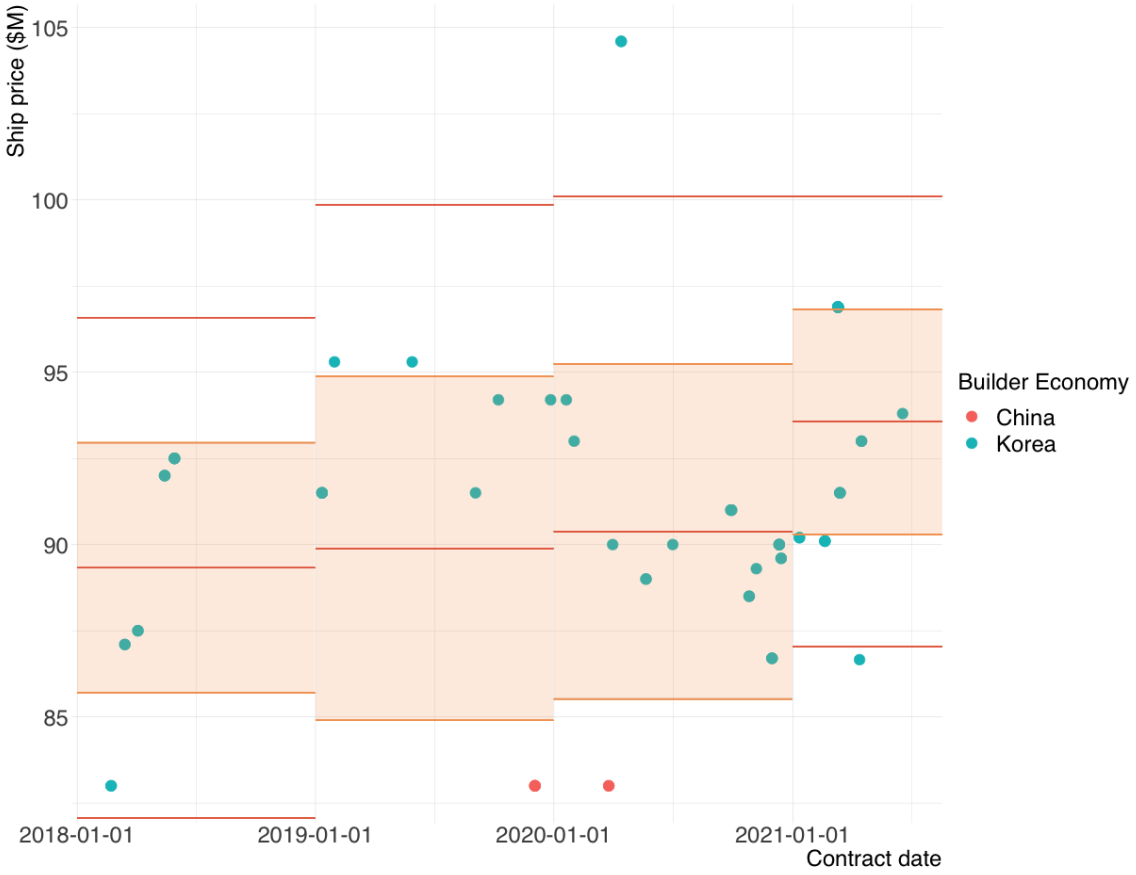
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Table 12. Details of outliers for Crude tankers (152-160 k dwt) during 2018-2022

IMO_No.	Name	Dwt	Contract	Built	Price ($m)	Builder	Builder_Group	Economy	Build_period
	N/B New Times SB	156500	4-20-2021	1-1-2023	57.5	New Times SB	New Century SB Group	China	621
	N/B Daehan Shipbuilding Haenam 5800	155000	7-1-2020	6-1-2022	78	Daehan Shipbuilding	Daehan Shipbuilding	Korea	700
9902225	Eagle Ampos	153000	12-17-2019	11-1-2021	101	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	685
9902237	N/B Hyundai HI (Ulsan) Ulsan 3196	153000	12-17-2019	1-1-2022	101	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	746
9902249	N/B Hyundai HI (Ulsan) Ulsan 3197	153000	12-17-2019	4-1-2022	101	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	836
9899363	Crude Levante	156828	11-14-2019	7-1-2021	56.5	New Times SB	New Century SB Group	China	595
9899375	Crude Zephyrus	156828	11-14-2019	7-1-2021	56.5	New Times SB	New Century SB Group	China	595
9858553	Eagle Petrolina	153227	5-31-2018	5-1-2020	90.7	Samsung HI	Samsung HI	Korea	701
9858589	Eagle Passos	153291	5-31-2018	11-1-2020	90.7	Samsung HI	Samsung HI	Korea	885
9858565	Eagle Paulinia	152700	5-31-2018	7-1-2020	90.7	Samsung HI	Samsung HI	Korea	762
9858577	Eagle Paraiso	152700	5-31-2018	9-1-2020	90.7	Samsung HI	Samsung HI	Korea	824

Source: Clarksons World Fleet Register and other sources.

Figure 25. Price developments for Crude tankers (298-300 k dwt) during 2018-2022



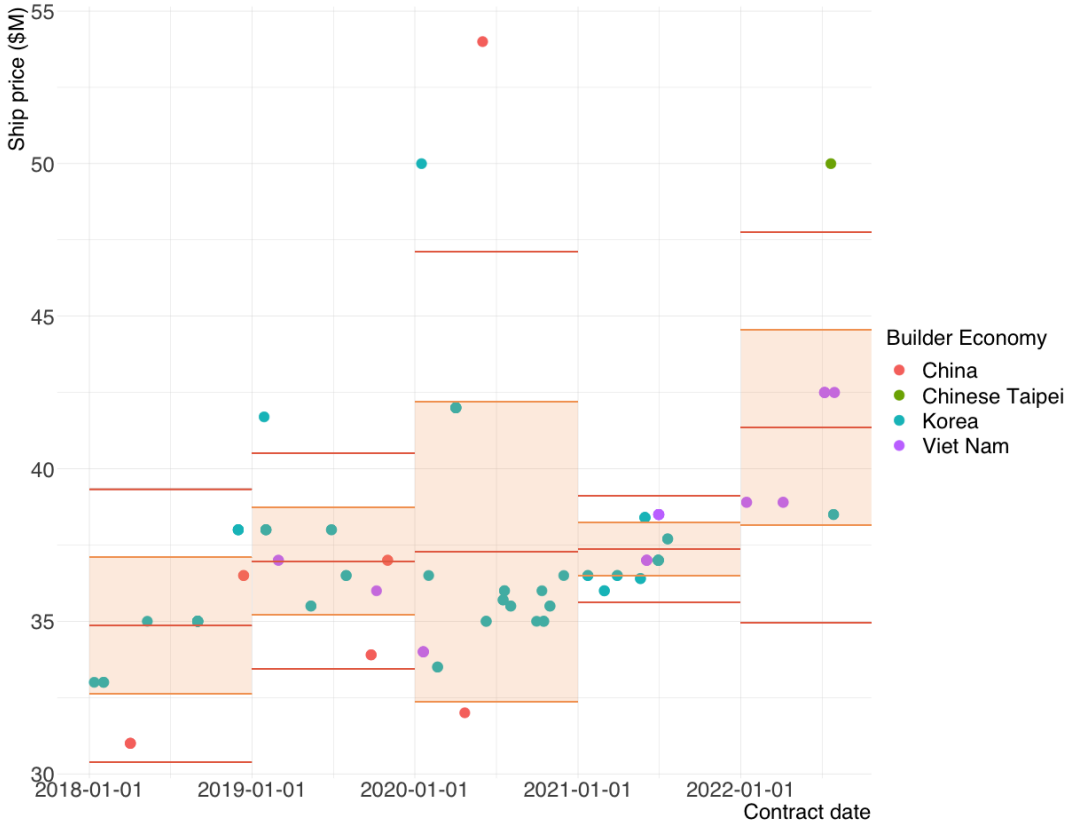
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Table 13. Details of outliers for Crude tankers (298-300 k dwt) during 2018-2022

IMO_No.	Name	Dwt	Contract	Built	Price ($m)	Builder	Builder_Group	Economy	Build_period
9937799	N/B Daewoo (DSME) Geoje 5507	300000	4-13-2021	2-1-2023	86.66	Daewoo (DSME)	Daewoo (DSME)	Korea	659
9933535	Advantage Verdict	300000	3-11-2021	9-1-2022	96.89	Daewoo (DSME)	Daewoo (DSME)	Korea	539
9933547	Advantage Victory	300000	3-11-2021	10-1-2022	96.89	Daewoo (DSME)	Daewoo (DSME)	Korea	569
9933559	Advantage Vision	300000	3-11-2021	11-1-2022	96.89	Daewoo (DSME)	Daewoo (DSME)	Korea	600
9933561	Advantage Vital	300000	3-11-2021	1-1-2023	96.89	Daewoo (DSME)	Daewoo (DSME)	Korea	661
9933573	N/B Daewoo (DSME) Geoje 5496	300000	3-11-2021	1-1-2023	96.89	Daewoo (DSME)	Daewoo (DSME)	Korea	661
9933585	N/B Daewoo (DSME) Geoje 5497	300000	3-11-2021	1-1-2023	96.89	Daewoo (DSME)	Daewoo (DSME)	Korea	661
9933597	N/B Daewoo (DSME) Geoje 5498	300000	3-11-2021	1-1-2023	96.89	Daewoo (DSME)	Daewoo (DSME)	Korea	661
9933602	N/B Daewoo (DSME) Geoje 5499	300000	3-11-2021	1-1-2023	96.89	Daewoo (DSME)	Daewoo (DSME)	Korea	661
9933614	N/B Daewoo (DSME) Geoje 5500	300000	3-11-2021	1-1-2023	96.89	Daewoo (DSME)	Daewoo (DSME)	Korea	661
9933626	N/B Daewoo (DSME) Geoje 5506	300000	3-11-2021	1-1-2023	96.89	Daewoo (DSME)	Daewoo (DSME)	Korea	661
	N/B Hyundai Samho HI	300000	2-19-2021	8-1-2022	90.1	Hyundai Samho HI	Hyundai HI Group	Korea	528
	N/B Hyundai Samho HI	300000	2-19-2021	10-1-2022	90.1	Hyundai Samho HI	Hyundai HI Group	Korea	589
	N/B Hyundai Samho HI	300000	2-19-2021	12-1-2022	90.1	Hyundai Samho HI	Hyundai HI Group	Korea	650
9928645	Hellas Fos II	299169	1-11-2021	5-1-2022	90.2	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	475
9928657	Hellas Tiger	299169	1-11-2021	8-1-2022	90.2	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	567
9910234	N/B Samsung HI Geoje 2388	300000	4-13-2020	1-1-2022	104.6	Samsung HI	Samsung HI	Korea	628
9910246	N/B Samsung HI Geoje 2389	300000	4-13-2020	3-1-2022	104.6	Samsung HI	Samsung HI	Korea	687
	N/B Dalian Shipbuilding	300000	3-25-2020	7-1-2022	83	Dalian Shipbuilding	CSSC	China	828
	N/B Dalian Shipbuilding	300000	3-25-2020	9-1-2022	83	Dalian Shipbuilding	CSSC	China	890
9900655	New Era	300000	12-3-2019	7-1-2021	83	Dalian Shipbuilding	CSSC	China	576
9900667	N/B Dalian Shipbuilding Dalian T300K-96	300000	12-3-2019	1-1-2022	83	Dalian Shipbuilding	CSSC	China	760
9900679	N/B Dalian Shipbuilding Dalian T300K-97	300000	12-3-2019	3-1-2022	83	Dalian Shipbuilding	CSSC	China	819
9900681	N/B Dalian Shipbuilding Dalian T300K-98	300000	12-3-2019	5-1-2022	83	Dalian Shipbuilding	CSSC	China	880
9885594	Halcyon	299942	5-29-2019	11-1-2020	95.3	Hyundai Samho HI	Hyundai HI Group	Korea	522
9878826	Babylon	299700	1-30-2019	6-1-2020	95.3	Hyundai Samho HI	Hyundai HI Group	Korea	488
9849851	V. Glory	299682	2-22-2018	11-1-2019	83	Hyundai Samho HI	Hyundai HI Group	Korea	617
9849863	V. Prosperity	299682	2-22-2018	1-1-2020	83	Hyundai Samho HI	Hyundai HI Group	Korea	678

Source: Clarksons World Fleet Register and other sources.

Figure 26. Price developments for Product tankers (49-50 k dwt) during 2018-2022



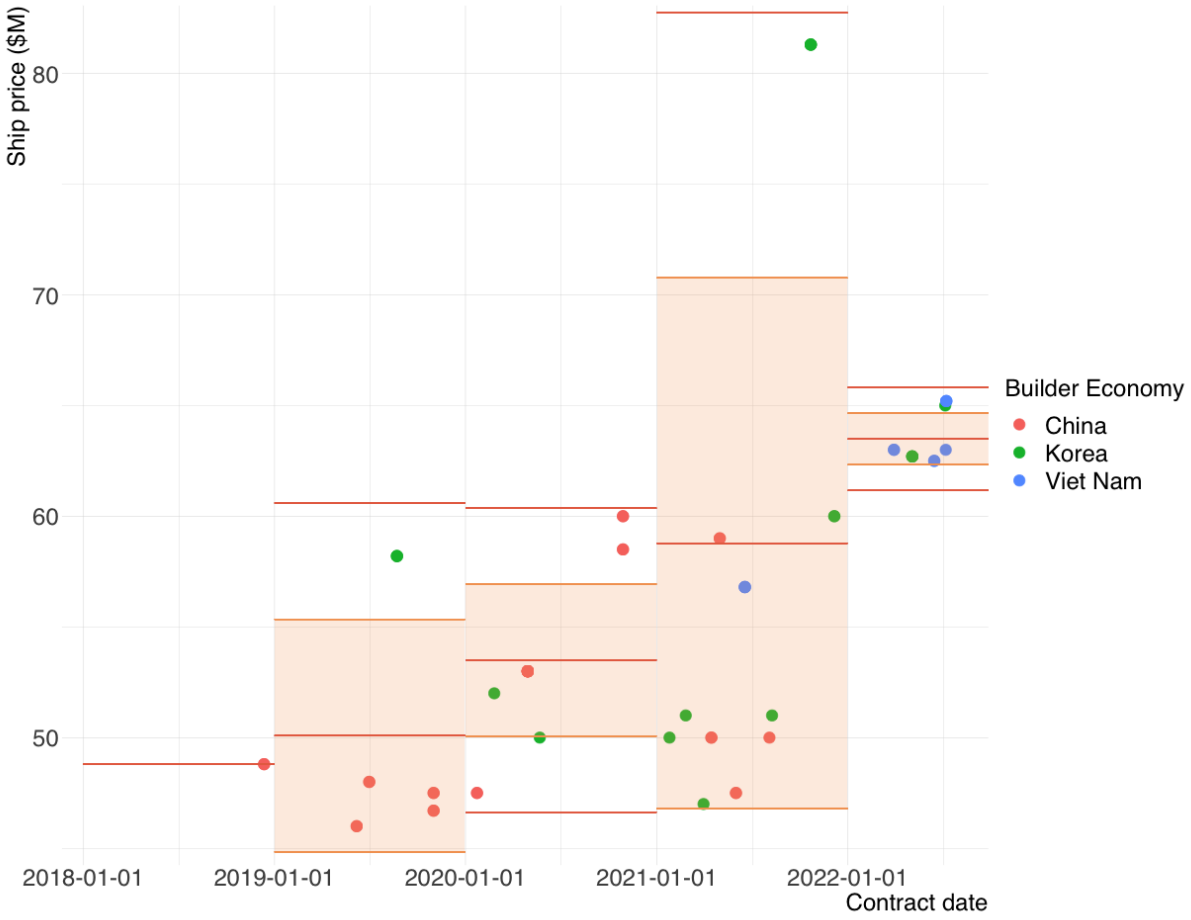
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Table 14. Details of outliers for Product tankers (49-50 k dwt) during 2018-2022

IMO_No.	Name	Dwt	Contract	Built	Price ($m)	Builder	Builder_Group	Economy	Build_period
	N/B CSBC (Kaohsiung)	50000	7-22-2022	1-1-2024	50	CSBC (Kaohsiung)	CSBC Corporation	Chinese Ta	528
	N/B Hyundai Viet Nam SB	50000	7-1-2021	5-1-2023	38.5	Hyundai Viet Nam SB	Hyundai HI Group	Viet Nam	669
	N/B Hyundai Viet Nam SB	50000	7-1-2021	8-1-2023	38.5	Hyundai Viet Nam SB	Hyundai HI Group	Viet Nam	761
9951044	N/B Hyundai Viet Nam SB Ninh Phuoc S515	50000	7-1-2021	7-1-2023	38.5	Hyundai Viet Nam SB	Hyundai HI Group	Viet Nam	730
9951056	N/B Hyundai Viet Nam SB Ninh Phuoc S516	50000	7-1-2021	9-1-2023	38.5	Hyundai Viet Nam SB	Hyundai HI Group	Viet Nam	792
9951068	N/B Hyundai Viet Nam SB Ninh Phuoc S517	50000	7-1-2021	10-1-2023	38.5	Hyundai Viet Nam SB	Hyundai HI Group	Viet Nam	822
9951070	N/B Hyundai Viet Nam SB Ninh Phuoc S518	50000	7-1-2021	12-1-2023	38.5	Hyundai Viet Nam SB	Hyundai HI Group	Viet Nam	883
	N/B Hyundai Mipo	50000	5-31-2021	1-1-2023	38.4	Hyundai Mipo	Hyundai HI Group	Korea	580
	N/B Hyundai Mipo	50000	5-31-2021	2-1-2023	38.4	Hyundai Mipo	Hyundai HI Group	Korea	611
	N/B Hyundai Mipo	50000	5-31-2021	2-1-2023	38.4	Hyundai Mipo	Hyundai HI Group	Korea	611
	N/B Hyundai Mipo	50000	5-31-2021	3-1-2023	38.4	Hyundai Mipo	Hyundai HI Group	Korea	639
	N/B Hyundai Mipo	50000	5-21-2021	10-1-2022	36.4	Hyundai Mipo	Hyundai HI Group	Korea	498
	N/B Hyundai Mipo	50000	5-21-2021	12-1-2022	36.4	Hyundai Mipo	Hyundai HI Group	Korea	559
	N/B K SB (Jinhae) Jinhae 1928	49736	3-1-2021	1-1-2022	36	K SB (Jinhae)	K Shipbuilding	Korea	306
	N/B K SB (Jinhae) Jinhae 1929	49736	3-1-2021	2-1-2023	36	K SB (Jinhae)	K Shipbuilding	Korea	702
	N/B Chengxi Shipyard	50000	6-1-2020	1-1-2022	54	Chengxi Shipyard	CSSC	China	579
	N/B Chengxi Shipyard	50000	4-22-2020	5-1-2022	32	Chengxi Shipyard	CSSC	China	739
9905162	Point Lisas	49996	1-16-2020	5-1-2021	50	Hyundai Mipo	Hyundai HI Group	Korea	471
9896244	N/B COSCO HI (Dalian) Dalian N1032	49900	9-25-2019	9-1-2021	33.9	COSCO HI (Dalian)	COSCO Shipping HI	China	707
9896256	N/B COSCO HI (Dalian) Dalian N1033	49900	9-25-2019	10-1-2021	33.9	COSCO HI (Dalian)	COSCO Shipping HI	China	737
9877810	Sunrise Glory	50000	1-28-2019	8-1-2020	41.7	Hyundai Mipo	Hyundai HI Group	Korea	551
9882396	Solar Katherine	49699	12-1-2018	6-1-2020	38	Hyundai Mipo	Hyundai HI Group	Korea	548
9882401	Solar Melissa	49699	12-1-2018	7-1-2020	38	Hyundai Mipo	Hyundai HI Group	Korea	578
9882413	Solar Madelein	49699	12-1-2018	7-1-2020	38	Hyundai Mipo	Hyundai HI Group	Korea	578
9882425	Solar Claire	49699	12-1-2018	8-1-2020	38	Hyundai Mipo	Hyundai HI Group	Korea	609
9854789	Torm Sublime	49974	4-3-2018	11-1-2019	31	GSI Nansha	CSSC	China	577
9854791	Torm Splendid	49932	4-3-2018	1-1-2020	31	GSI Nansha	CSSC	China	638
9854806	Torm Stellar	49954	4-3-2018	4-1-2020	31	GSI Nansha	CSSC	China	729

Source: Clarksons World Fleet Register and other sources.

Figure 27. Price developments for Product tankers (110-120 k dwt) during 2018-2022



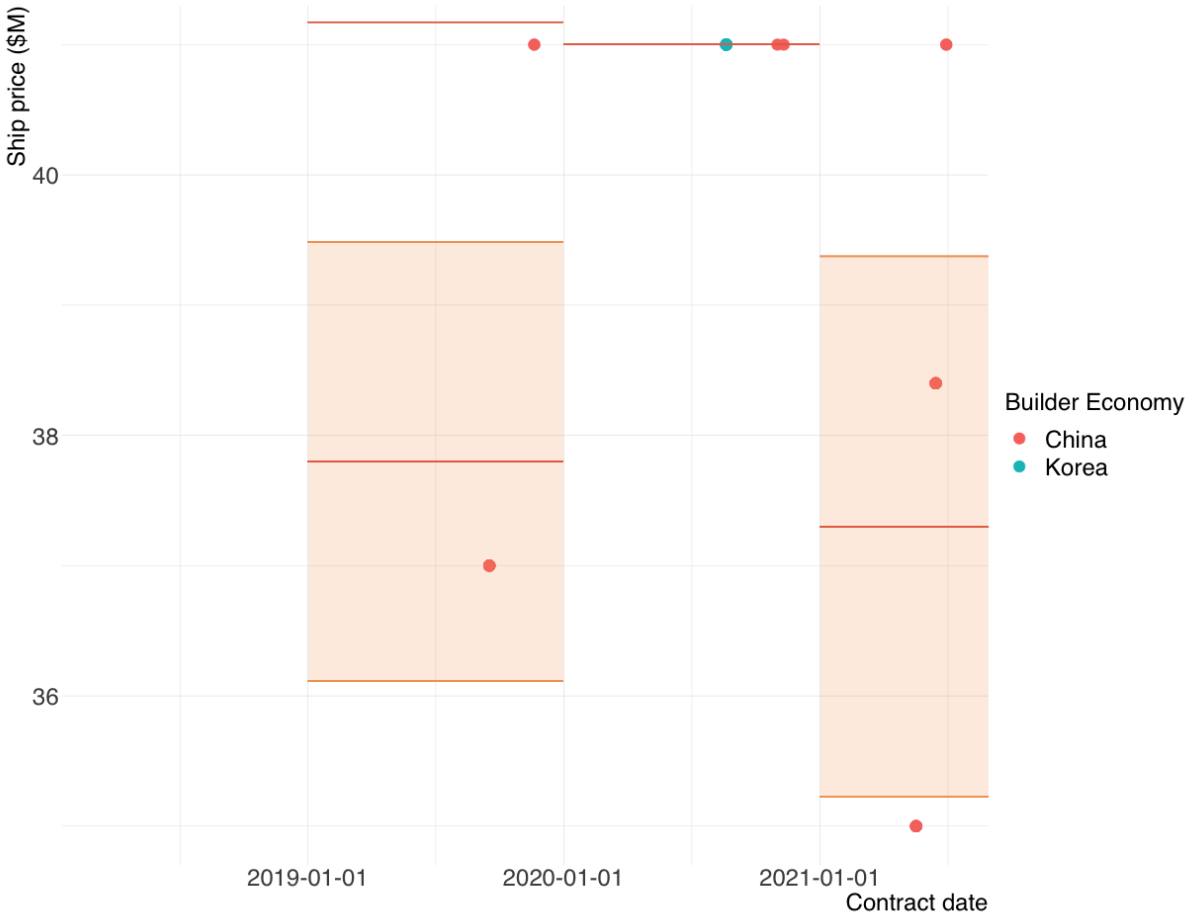
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Table 15. Details of outliers for Product tankers (110-120 k dwt) during 2018-2022

IMO_No.	Name	Dwt	Contract	Built	Price ($m)	Builder	Builder_Group	Economy	Build_period
	N/B Hyundai Viet Nam SB	115000	7-8-2022	9-1-2025	65.2	Hyundai Viet Nam SB	HD Hyundai	Viet Nam	1151
	N/B Hyundai Viet Nam SB	115000	7-8-2022	7-1-2025	65.2	Hyundai Viet Nam SB	HD Hyundai	Viet Nam	1089
	N/B Hyundai Viet Nam SB	115000	7-8-2022	12-1-2025	65.2	Hyundai Viet Nam SB	HD Hyundai	Viet Nam	1242
	N/B Daehan Shipbuilding	115000	7-6-2022	1-1-2025	65	Daehan Shipbuilding	Daehan Shipbuilding	Korea	910
	N/B Hyundai HI (Ulsan)	114000	10-22-2021	8-1-2023	81.3	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	648
	N/B Hyundai HI (Ulsan)	114000	10-22-2021	11-1-2023	81.3	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	740
	N/B Hyundai HI (Ulsan)	114000	10-22-2021	2-1-2024	81.3	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	832
	N/B Hyundai HI (Ulsan)	114000	10-22-2021	4-1-2024	81.3	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	892
	N/B GSI Nansha Guangzhou 20110031	110000	10-28-2020	1-1-2023	60	GSI Nansha	CSSC	China	795
	N/B GSI Nansha Guangzhou 20110032	110000	10-28-2020	1-1-2023	60	GSI Nansha	CSSC	China	795
	N/B GSI Nansha Guangzhou 20110035	110000	10-28-2020	1-1-2023	58.5	GSI Nansha	CSSC	China	795
	N/B GSI Nansha Guangzhou 20110036	110000	10-28-2020	1-1-2023	58.5	GSI Nansha	CSSC	China	795
9904871	N/B GSI Nansha Guangzhou 19121031	114000	1-23-2020	10-1-2021	47.5	GSI Nansha	CSSC	China	617
9904883	N/B GSI Nansha Guangzhou 19121032	114000	1-23-2020	12-1-2021	47.5	GSI Nansha	CSSC	China	678
9893204	Onex Peace	114623	8-23-2019	3-1-2021	58.2	Hyundai Samho HI	Hyundai HI Group	Korea	556
9893216	Onex Precious	114623	8-23-2019	5-1-2021	58.2	Hyundai Samho HI	Hyundai HI Group	Korea	617
9893228	Onex Phoenix	115000	8-23-2019	9-1-2021	58.2	Hyundai Samho HI	Hyundai HI Group	Korea	740

Source: Clarksons World Fleet Register and other sources.

Figure 28. Price developments for Chemical tankers (49-50 k dwt) during 2018-2022



Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Table 16. Details of outliers for Chemical tankers (49-50 k dwt) during 2018-2022

IMO_No.	Name	Dwt	Contract	Built	Price ($m)	Builder	Builder_Group	Economy	Build_period
	Provident	49900	6-30-2021	10-1-2023	41	GSI Nansha	CSSC	China	823
	Progressive	49900	6-30-2021	12-1-2023	41	GSI Nansha	CSSC	China	884
	N/B GSI Nansha	49600	5-18-2021	2-1-2024	35	GSI Nansha	CSSC	China	989
	N/B GSI Nansha	49600	5-18-2021	4-1-2024	35	GSI Nansha	CSSC	China	1049
	N/B GSI Nansha	49600	5-18-2021	6-1-2024	35	GSI Nansha	CSSC	China	1110
	N/B GSI Nansha	49600	5-18-2021	8-1-2024	35	GSI Nansha	CSSC	China	1171
	N/B GSI Nansha	49600	5-18-2021	11-1-2024	35	GSI Nansha	CSSC	China	1263
	N/B GSI Nansha	49600	5-18-2021	1-1-2025	35	GSI Nansha	CSSC	China	1324
	N/B GSI Nansha	49600	5-18-2021	3-1-2025	35	GSI Nansha	CSSC	China	1383
	N/B GSI Nansha	49600	5-18-2021	5-1-2025	35	GSI Nansha	CSSC	China	1444
	Stena ProPatria	49900	11-20-2019	1-1-2022	41	GSI Nansha	CSSC	China	773
	Stena ProMare	49900	11-20-2019	1-1-2022	41	GSI Nansha	CSSC	China	773

Source: Clarksons World Fleet Register and other sources.

EXHIBIT 45

OECD publishing

SHIPBUILDING MARKET DEVELOPMENTS, FIRST SEMESTER 2022

MONITORING DEVELOPMENTS IN SHIP SUPPLY, DEMAND, PRICES AND COSTS

OECD SCIENCE, TECHNOLOGY AND INDUSTRY
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Shipbuilding market developments First semester 2022

Monitoring developments in ship supply, demand, prices and costs

Laurent Daniel, Takuya Adachi, Sunhye Lee

Abstract

The latest OECD analysis of demand and supply in the shipbuilding industry finds significant excess capacity in the sector. Reducing this excess capacity will depend on the willingness and ability of yards to reduce existing capacity and to refrain from new capital investments. The report also presents a literature review of factors that influence newbuilding ship prices, developments affecting ship prices, and a description of newbuilding prices of major ship types and ship size categories. This report is part of a regular monitoring exercise from the OECD Council Working Party on shipbuilding (WP6) of the global shipbuilding market.

Keywords: Shipbuilding, Demand, Supply, Price, Cost

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1. Executive summary

This report is part of a regular monitoring exercise from the WP6 of the shipbuilding market. This report will be regularly updated to take into account the recent economic developments notably for the next edition those linked to the impact of Russian Federation (hereafter "Russia")'s aggression against Ukraine as well as other important factors such as the effect of environmental regulation on ship replacement.

The current results of the demand and supply analysis show that the shipbuilding industry still faces excess capacities. Despite a decline of historical shipbuilding capacity between 2012 and 2020, these will likely continue to exist at least until 2024 in the most optimistic scenario and until 2030 in the worst-case scenario.

The size of excess capacity is determined in response to declines in demand and by the willingness of and feasibility for yards to reduce existing capacity and to refrain from new capital investments. In fact, capacity utilisation rates have declined in 2020 compared to the levels observed in 2015, reflecting a drop in deliveries by 14% between 2015 and 2020 as a consequence of the COVID-19 crisis. Capacity utilisation rates have however recovered in 2021 in view of increased deliveries by 13% compared to 2020-levels but are still 3% lower than their 2019-level.

Around 60% of newbuilding demand arises from the need to replace outdated ships rather than new demand resulting from seaborne trade expansion. However, seaborne trade forecasts were recently revised upward notably for tankers and containerships and will be taken into account in the next edition of this report.

At this stage, it is difficult to forecast future oil prices following Russia's aggression against Ukraine. However, if the current high oil price environment would remain for some years, for instance with an oil price averaging at USD 100/bbl, a gradual increase of offshore vessel deliveries can be expected.

Regarding ship price and cost developments, average ship prices, both for newbuilt and second-hand vessels, have experienced a sharp increase since mid-2020 driven by the recovery of ship demand. The producer price index, an indicator that varies country-by-country, has followed, for most countries, an upward trend since 2016 and has risen sharply since 2020 notably because of a negative supply shock during the pandemic.

This report has analysed the five studied ship types (bulkers, containerships, crude tankers, product tankers, chemical tankers) for vessels of comparable size and finds ships with prices that significantly deviate from the calculated average prices.

Price differentials can result from the different characteristics of seemingly equivalent ships; for example, the period from order to delivery which can takes two years or more; customer's required specifications and equipment to be built on board; production in series which can significantly impact ship costs and prices; yards' know-how and experience; and the volatility of the ship demand which can lead shipbuilding companies to accept orders to absorb fixed cost by building ships rather than idling their docks during economic downturns.

2. Policy recommendations

Against the background of the findings of the report on demand, supply, price and cost developments in the global shipbuilding sector, and the mature nature of the shipbuilding industry, policy measures should continue to encourage the reduction of uneconomic capacity and to discourage capacity expansions that are not useful in the future. In doing so, it is important that difficulties to measure capacity accurately are taken into account. Furthermore, the need for yards to be able to build ships meeting the new environmental requirements, taking a horizontal policy approach, needs to be taken into account as well. This approach should focus on the following five aspects:

a. Allowing free market entry and exit of yards,

b. Improving and building labour skills and other competencies through strong training policies and education programs,

c. Ensuring efficient capital markets rather than targeted financial interventions inconsistent with market conditions,

d. Enabling resources (i.e. capital stock and labour) to move easily between firms and sectors.

e. Addressing non-market oriented government interventions.

Structural adjustment should ideally be undertaken by the private sector. Investment decisions of yards into capital stock, for instance, and of shipping firms into new vessels are based on expectations about future business. Government interventions can bias these forward-looking assessments aif they distort investment behaviour and harm investment efficiency. The decision to introduce direct or indirect government intervention should be made according to market principles. Due to the global nature of the shipbuilding and shipping industries, any market-distorting government intervention in one country will ultimately affect industry developments in third countries. Any measures introduced to mitigate the negative impact of the Covid-19 pandemic should be strictly necessary and proportionate and of temporary nature.

Government interventions should avoid delaying the restructuring process and/or expanding financial support. Public financial assistance, aimed at irreversible capacity reduction may be effective to facilitate physical facility disposal and/or restructuring yards, and can lead to a decline in shipbuilding capacity. Public financial contributions without a commitment of capacity reduction may tend to increase or maintain capacity.

Policy measures that aim to allow resources to move freely between sectors can help to mitigate the problem of overcapacity associated with cyclical downturns if they support yards to re-orient to other business activities. For example, some types of subsidies for R&D or alternative use of shipyard facilities can in some cases facilitate smooth restructuring to other areas. In addition, employment reallocation measures may be appropriate to help workers made redundant as a result of closures. Such aid should be available only under the condition that the capacity reduction is genuine and irreversible. The subsidy should preferably go to individuals or be provided to employees than to support production if its objective is to secure the workplace for individuals as well as to maintain their income level.

Support measures on the demand side can contribute to increasing domestic demand temporarily, but their effects are in general not sustainable and they are likely to involve high costs on public finances.

3. Introduction

As stipulated in its mandate, the overall objective of the Council Working Party on Shipbuilding (WP6) is to work towards the reduction of factors that distort normal competitive conditions in the shipbuilding industry and to assist governments in designing and implementing policies that foster normal competitive conditions. One of the intermediate objectives of the WP6 is to increase transparency and improve the understanding of the shipbuilding market [C(2018)113]. This work is part of item "E" of the Programme of Work and Budget (PWB) for the biennium 2021-22 (C/WP6(2020)7/REV2), which is one of the key outputs that contribute to these goals.

The purpose of this work is to share the understanding of the mid-to long-term developments in the shipbuilding market and provide estimates of future ship demand for six ship types until the year 2030 by taking into account economic, regulatory and technological trends. Furthermore, the work provides an estimate of historical yard capacity based on the methodology applied in OECD (2017). In addition, this work aims to inform and raise awareness among market participants and monitor the development of ship prices and costs.

The paper is structured as follows. Section 4 summarises the global economic outlook. Section 5 presents predictions of future ship demand until the year 2030 that is derived from replacement needs of obsolete ships and seaborne trade expansions and includes initial forecasts on offshore vessel demand[1]. It furthermore presents estimates of historical yard capacity. Section 6 presents a literature review on factors influencing newbuilding ship prices, developments of several factors affecting ship prices, and a description of newbuilding prices of major ship types and ship size categories.

[1] The Secretariat would like to thank Caroline Bräten, intern in the Shipbuilding Unit, who contributed to the work on offshore vessel forecasts.

4. The OECD outlook for the world economy[2]

Prior to the war between Russia and Ukraine, the global recovery from the pandemic was expected to continue in 2022 and 2023, helped by continued progress with global vaccination efforts, supportive macroeconomic policies in the major economies and favourable financial conditions. In 2022 and 2023, global GDP was projected to increase by 4.5% and 3.2%, respectively according to the OECD's Economic Outlook of December 2021 (OECD, 2021).

The war in Ukraine has created a new negative supply shock for the world economy. Even though the direct role of Russia and Ukraine in the global economy is small, they do have an important influence on the global economy via their role as major suppliers in a number of commodity markets. For example, Russia and Ukraine together account for about 30% of global exports of wheat, 20% of corn, mineral fertilisers and natural gas, and 11% of oil. The war has already resulted in sizeable economic and financial shocks, particular in commodity markets, with the prices of oil, gas and wheat soaring. The moves in commodity prices and financial markets seen since the outbreak of the war could, if sustained, reduce global GDP growth by over 1 percentage point in the first year, with a deep recession in Russia, and push up global consumer price inflation by approximately 2 ½ percentage points, according to the OECD's Interim Economic Outlook of March 2022 (OECD, 2022).

In the context of seaborne trade, Russia is estimated to account for only 5% of global seaborne exports in 2021. However, Russia accounts for 10% of seaborne oil exports, 8% of LNG exports, 13% of coal shipments and 7% of seaborne grain exports, according to Clarkson Research (March 2022).

[2] Source: OECD Economic Outlook, Interim Report March 2022: Economic and Social Impacts and Policy Implications of the War in Ukraine, https://doi.org/10.1787/4181d61b-en / Clarkson Research, March 2022, Russia - Ukraine: Shipping Context, Update No.2

5. Demand & Supply

Delegates submitted several comments on the project's part on ship supply and demand at the 132nd and 133rd sessions (virtual meetings held on 10-11 May and 24-25 November 2021). The Secretariat tried to reflect all comments in this report, which aims to assess current excess shipbuilding capacity and likely future trends. This section presents the methodology used to estimate newbuilding demand until the year 2030 and historical yard capacity, as well as the revised results of this work. Next steps for this project are proposed based on the initial estimation results.

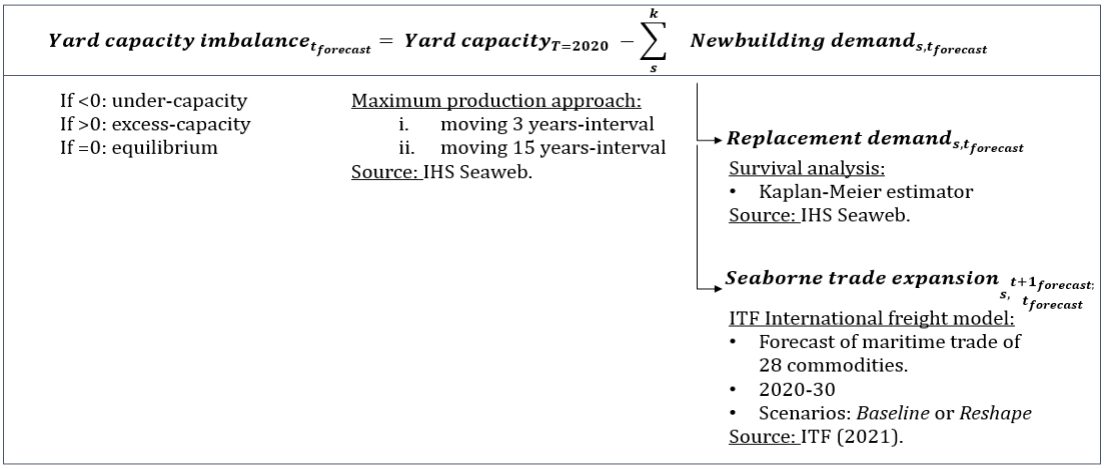
This part of the paper first presents the methodology to assess demand for newbuilt ships which is driven by seaborne trade expansion and ship replacement itself impacted by environmental regulations as well as the methodology to assess capacity. The second section of this part presents initial results on ship demand for major shiptypes including tankers, containerships, bulkers and offshore vessels as well as on capacity. The following section is on recently released seaborne trade forecasts by the ITF and forecasts of ship orders by Clarksons. And the last section of this part deals with the proposed future work on ship supply & demand.

Methodology

The estimation approach follows the methodology elaborated in OECD (2017). As described in Figure 5.1 the extent of capacity imbalance results from the difference between estimated shipbuilding capacity in 2020 (which is the latest available year T) and newbuilding demand for ships in the future with $t_{forecast}$= 2021 to 2030. Newbuilding demand is a result of predictions of new orders arising from demand to replace obsolete ships and to satisfy expansion in seaborne trade.

The analysis of historical yard capacity and newbuilding demand focuses for the time-being on six ship groups *s* of ocean-going vessels: bulk carriers, containerships, oil tankers, liquefied gas tankers (i.e. liquefied natural gas and liquefied petroleum gas), general cargo ships and chemicals tankers. These groups have in common that seaborne trade of commodities is a major determinant of newbuilding demand. Private consumer demand, and thus trade in consumer goods, also explain containership demand. In contrast, cruise ships and offshore service vessels underlie different demand drivers, such as growth in the tourism sector in the former case or extraction activity in the latter case (Gourdon, 2019). This paper presents a short discussion about these two groups in section "Estimates of seaborne trade " in Box 5..

Figure 5.1. Methodological approach to assess yard capacity imbalances



Source: OECD 2017

Newbuilding demand

Newbuilding demand consists of both replacement demand estimated from a survival analysis and seaborne trade developments derived from forecasts of maritime trade that are provided by the International Transport Forum (ITF).

Replacement demand: Survival analysis

The age of a ship is one of the major drivers for vessel disposal and is complemented by other determinants, such as the policy environment, bunker fuel costs, freight rates, new-building and second-hand prices, and demolition prices (Knapp, Kumar, & Remijn, 2008; OECD, 2017). In 2020, the average demolition age of the six ship groups ranged between 24 years and 33 years: Containerships at 24 years, bulk carriers at 28 years, chemical tankers with 29 years, oil tankers at 32 years, general cargo ships as well as liquefied gas tankers at 33 years.

To understand the number of ships to be likely demolished between 2021 and 2030, we estimate survival probabilities using the Kaplan Meier estimator by reflecting demolition activity in the fleet between 2015 and 2020.[3] In our setting, survival rates indicate the probability of a ship at a certain age to continue operating in the fleet rather than being demolished (fleet exit).

Future vessel demolitions represent all ships in the fleet that did not "survive", hence exited, so that for each ship type *s* the following applies $replacement\ demand_{s,t_{forecast}} = fleet_{s,t_{forecast}} * (1 - survival\ rate_s)$ with $fleet_{s,t+1_{forecast}} = fleet_{s,t_{forecast}} - replacement\ demand_{s,t_{forecast}}$. Deriving the future fleet by subtracting the estimated replacement demand and neglecting newbuilt ships as additions to the fleet is for reasons of simplicity and of unknown newbuilds expected in the future. As the forecast covers only ten years (from 2021 until 2030) and almost all ships of age under 10 years "survive" (as the results will show in the next section), the exclusion of newbuilds should hardly affect the estimation of future demolitions during the specified time horizon.

For the sake of simplicity of the approach, survival estimates are based on historical data on the age of ships. Following comments received at the 132nd session, Box 3.1 provides a first discussion

[3] The Kaplan-Meier estimator of the survival function is defined as follows: $\widehat{S(t)} = \prod_{i:\, t_i \le t}(1 - \frac{d_i}{n_i})$ with t_i for age when at least one demolition happened, $d_i$the number of demolitions that happened at age t_i, and n_i the vessels known to have continued to operate (i.e. survived) up to time t_i.

about the impact of environmental regulations on vessel value and its survival expectancy in the fleet.

Seaborne trade developments: ITF's International Trade Model

Expansion or reduction in seaborne trade affects demand for transportation services and therewith ship capacity. Using forecasts of maritime trade in tonnes for 28 commodities until 2030 that are provided by ITF allows for an estimation of required new ship capacity to meet changes in demand for seaborne trade. Each of these commodities is allocated to one of six ship groups and changes in seaborne trade tonnes are then converted into required fleet capacity in gross tonnes (GT).[4] Annex A classifies the 28 commodity types for each ship group.

ITF's International Trade Model (ITM) estimates the development of seaborne trade of 28 commodities for the years from 2020 until 2050 by accounting for the COVID-19 pandemic's impact. The model is designed to project international freight transport (in tonne kilometres and kilo tonnes) for all major transport modes and routes. Estimation results include the weight of commodities traded between countries by transport mode, the choice between modes and routes given the characteristics of the transport network and socio-economic variables, like transport costs and time (Halim, Kirstein, Merk, & Martinez, 2018).

Taking into account the comments received at the 132nd session to further specify the underlying assumptions of the ITF's ITM, the current version models the impact of 18 CO2 mitigating policy measures and technology developments. In some instances, the ITF's model environment only allows for incorporating outcomes of policy measures (e.g. the uptake of low emission vehicles), instead of modelling explicitly the working of the underlying policy measure. Regarding information on the emissions intensity of each transport mode, as well as their projected changes due to technological and logistical developments over time, data are drawn from the International Energy Agency's MoMo model (IEA, 2018) and the International Maritime Organization (IMO). ITF (2020) provides more information about the assumptions and CO2 mitigating measures used in this model.

The model furthermore specifies different policy scenarios. For the forecast until the year 2030 in this paper, two of these scenarios are used, which are the *Baseline* model and the *Reshape* scenario.[5] The scenarios assess the effect of different policy pathways among others on global transport demand, and reflect ambitious efforts by policy makers to decarbonise the transport sector to meet the UN's Sustainable Development Goals (SDGs) (ITF Transport Outlook, 2021).[6] The model accounts for the impact of the COVID-19 pandemic on the transportation sector through economic fallouts, behavioural shifts as well as changes in transport supply and travel patterns in the short- and long-term (ibid.). As discussed in Halim et al. (2018), the scenarios assume to a different extent reductions in fossil fuel consumption coupled with a more regionalized trade system. With an increasing number of preferential trade agreements at a regional level, trade patterns will likely shift in the future and alter global seaborne trade (ibid.). The paper furthermore highlights that the sulphur cap introduced in 2020 will lead to increased maritime transport costs making nearby sourcing activity more attractive.

[4] Conversion factors from seaborne trade tonnes to fleet gross tonnes are derived for all six ship groups separately by using the highest ratio of seaborne trade tonnes to fleet gross tonnes observed between 2015 and 2020. The ratio indicates the amount of tonnes transported per one gross ton of fleet capacity.

[5] ITF presents three policy scenarios. Two of these scenarios develop similarly until the year 2030 but start diverging afterwards. As this paper focuses on predictions until the year 2030, it considers only one of these scenarios in addition to the baseline model.

[6] ITF models three scenarios of which one differs from the Reshape scenario only after 2030 and is therefore excluded from this paper's analysis. ITF's model also assesses the impact of different policy pathways "[…] on greenhouse gas emissions (reported as CO2 equivalents), local pollutant emissions, accessibility, connectivity and resilience (depending on the sector) up to 2050".

In the *baseline* scenario, governments reinforce established economic activities as they prioritise economic recovery. The lack of policy action on technological innovation prevents cost reductions in clean energy and transport technologies to materialise to the extent it could. Governments continue to pursue the commitments they made prior to the COVID-19 crisis to decarbonise the transport sector (ITF Transport Outlook, 2021).

The *Reshape* scenario is a paradigm shift for the transport sector where governments implement transformational policies to decarbonise transportation in the post-pandemic era. These policies trigger changes in the behaviour of transport users, support the uptake of clean energy and vehicle technologies along with digitalisation to improve transport efficiency, and encourage infrastructure investment to help meet environmental and social development goals (ibid.).

Box 5.1. Potential impact of environmental regulations on vessel value and seaborne trade

Based on comments received at the 132nd session, the following sub-section aims to provide a first discussion about the impact of environmental regulations on replacement demand. For periods when they are expected to have a strong impact on replacement demand, they should be taken into account to further improve the accuracy of the analysis.

Recent IMO regulations

Addressing the green transition has become a major issue for the maritime industry. The International Maritime Organisation (IMO) aims to reduce the carbon intensity of the fleet by 40% and by 70% compared to 2008 until 2030 and 2050, respectively, with the overarching goal of zero greenhouse gas (GHG) emissions in this century. Under the IMO's International Convention for the Prevention of Pollution from Ships (MARPOL) Annex VI, mandatory measures have been adopted to foster the reduction of GHG emissions in the industry, including the Energy Efficiency Design Index (EEDI), mandatory for new ships and the Ship Energy Efficiency Management Plan (SEEMP). From January 2023, the IMO's 'short-term measures' enter into force with the introduction of the Energy Efficiency Existing Ship Index (EEXI) and the Carbon Intensity Indicator (CII) (IMO, 2021a). Environmental regulations, including at the regional level, are set to have an impact on promoting the replacement of ships in the near future, due to its impact on vessel value and seaborne trade.

The IMO's 'short-term measures' combine technical and operational approaches to improve the energy efficiency of ships. EEXI is required to be calculated for all existing ships of 400 GT and above, in accordance with the different values set for ship types and size categories. It indicates the energy efficiency of the ship compared to a baseline. Ships are required to meet a specific EEXI, which is based on a required reduction factor, expressed as a percentage relative to the Energy Efficiency Design Index (EEDI) baseline (ibid). The CII, which is required for ships of 5,000 GT and above, determines the yearly reduction factor needed to ensure continuous improvement of the ship's operational carbon intensity within a specific rating level. The actual CII is documented and verified against the required CII, allowing for a formal rating system for ships. The CII rating is given on a scale, including A (major superior), B (minor superior), C (moderate), D (minor inferior), and E (inferior). A ship rated D or E for three consecutive years would have to submit a corrective action plan to show how the required index (C or above) would be achieved. The reduction factor is set at a rate, using 2019 as the base year, of 11% by 2026 (IMO, 2021b).

Regulations on green transition, notably the IMO measures on GHG emissions, are likely to contribute to an acceleration of fleet renewal and to bigger recycling volumes. For example, around 30% of vessels in the tanker and bulk carrier sectors with a dwt of 25,000 and above are estimated to meet the EEXI's current design efficiency requirements, while an additional share of 40% of tankers and 25% of bulkers are expected to be compliant at current speed, provided that they undergo 'engine power limitations' (EPL) (Clarksons Research 2021). Ships that cannot comply with the new regulations by 2023 could be subject to a range of measures, such as reducing their operational speed, retrofitting energy saving technologies (ESTs) or recycling vessels. Beyond 2023, further emission reductions are required to meet the annually increasing CII reduction factors, which is likely to result in further compliance measures for some ships.[7]

Initial impact assessment

[7] From 2022, EEDI phase 3 is applicable for certain ship types with up to 50% carbon intensity reduction for new build large containerships. From 2025, EEDI phase 3 is applicable for all ship types with a reduction of up to 30% in carbon intensity for newbuild ships.

Cost of compliance measures decrease the vessel's net present value. Thus, they are likely to have an impact on its survival expectancy in the fleet. Ship owners compare the vessel's net present value, reflecting future earnings from transport services, current backlog and the vessel's age and other characteristics, with the current scrap value and decide on that basis between continuing operating the ship or sending it for demolition (OECD, 2019). If the cost of compliance measures per ship is known, it can be estimated how many more ships in the fleet will likely to be demolished because their value is less than their demolition value.[8] However, comprehensive studies of the required cost of compliance measures per ship segment have not been publicly available to date.

As part of the comprehensive impact assessment of the short-term measures approved by the IMO, the impact of three scenarios of short-term GHG measures on the fleet, as well as on maritime logistics costs, trade and GDP has been estimated by Det Norske Veritas (DNV) and The United Nations Conference on Trade and Development (UNCTAD) (IMO, 2021c). The three scenarios include the impact of i) EEXI requirements only, ii) EEXI and CII requirements with an average reduction requirement of 10.2% between 2019 and 2030 (low GHG reduction), and iii) EEXI and CII requirements with an average reduction requirement of 21.5% between 2019 and 2013 (high GHG reduction).[9]

The DNV's assessment on the impact on the fleet considers a number of compliance measures including different energy efficiency measures, fuels and fuel technologies, and speed reduction. The findings show that cost intensity, measured in USD cents per tonne-mile, is lower in 2030 compared to the baseline year 2019. At the same time, cost intensity increases in all scenarios when compared to a current-regulations-scenario in 2030. The high reduction scenario has the highest associated cost intensity due to the most stringent CII requirements.[10] Depending on the vessel category and vessel age, the cost impact of CO2 reduction requirements varies, with the new regulations having a greater impact on the short sea container and tanker categories, as well as on older vessels. DNV assumes that the main compliance measures for existing ships will be speed reduction and use of biofuel blends, while new ships will apply more energy efficiency measures and alternative fuels such as LNG and LPG. The average transit speed is expected to drop in 2023, mainly due to the EEXI requirements, but also due to the CII reduction requirements. Five key uncertainties may have an impact on the cost of the new policies, as defined in the study: the cost and availability of alternative low carbon fuels, the opportunity cost and impact of speed reduction, split-incentives and other financial barriers, transport demand growth and fleet renewal/scrapping rate.

UNCTAD quantified changes in maritime logistics costs and their impact on economies' trade and GDP. DNV's estimates on ship costs and speed reduction were converted into shipping costs and time at sea costs, respectively, to assess changes in total maritime logistics costs. UNCTAD's analysis shows an average increase in maritime logistics costs across all three scenarios at the aggregate level. For EEXI only, the low GHG reduction and high GHG reduction scenario, these stand at 1.6%, 3.1% and 7.6% respectively (IMO, 2021c). According to the findings, some countries and trade pairs would be more impacted than the global average. Much of the cost burden is expected to take place at a later stage of the implementation process when operational carbon intensity reduction requirements become more stringent. At the same time, minor changes are estimated for the impact on

[8] The estimation requires further information from second-hand market prices, as well as demolition prices.

[9] For further clarification, the low reduction scenario uses a demand-based metric for CII (emission per actual transport work), whereas the high reduction scenario uses a supply-based metric (emission per transport capacity) (IMO, 2021a).

[10] The cost intensity impact of new policies compared to a current regulations scenario in 2030 for i) EEXI only is a 2% increase, ii) the low reduction scenario is a 7% increase, and iii) for the high reduction scenario is a 16% increase.

trade and GDP across the three GHG scenarios. At the global level, GDP reduction is estimated to range between -0.01%, -0.02% and -0.04% under EEXI only, the low GHG reduction and high GHG reduction scenario, respectively. Furthermore, the trade reduction at the global level is expected to range between -0.10%, -0.21% and -0.49% under EEXI only, the low GHG reduction and high GHG reduction scenario, respectively (ibid).

CE Delft estimated the impact on the annual total cost of ownership (TCO) of required improvements needed to label ships to threshold C in the CII rating scale as well as the loss of revenue for existing ships by practising speed reduction.[11] The cost of improving ships labelled D into meeting the threshold label (C or above) was analysed for several ship segments. For example, the change in the TCO for small bulk carriers was estimated to increase by 55,724 USD/year while for large bulk carriers the TCO would increase by 135,502 USD/year (Faber et al., 2021). The yearly loss of revenue for these ship segments in the same category is estimated at $172,000 and $324,000, respectively (IMO, 2021c).

Shipbuilding capacity

The analysis draws on two scenarios for the development of historical shipbuilding capacity by using the maximum output approach of a moving 3- or 15-years interval at the level of individual yards (Box 5.2 for more information). The approach calculates capacity of individual yards delivering at least one of the six analysed ship groups. Capacity of yard *i* in time *t* (from 2005 until 2020) is calculated on the basis of maximum deliveries over the last T-years with *T* as 3-years (or 15-years) in the case of the 3-years-interval (or 15-years-interval):

$$\widehat{capacity}\_T_{i,t} = \max(deliveries_{i,t}; deliveries_{i,t-T})$$

Subsequently to derive global shipbuilding capacity in time *t,* the results at the yard-level are aggregated by year:

$$\widehat{capacity}\_T_{t} = \sum_{i}^{k} \widehat{capacity}\_T_{i,t}$$

As reductions in capital stock in the shipbuilding industry take time (Gourdon, 2019; OECD, 2017), the chosen time intervals of 3-years and 15-years should allow for sufficient time for yards to adjust their capacity. The methodology indirectly takes into account new capacity developments when these capacity developments are reflected in observed deliveries of yards. For instance, the approach captures capacity expansions only if these expansions lead to deliveries that are higher than the maximum deliveries over the last 3-years (15-years). Similarly, the approach captures only capacity reductions if these are reflected in lower deliveries. The differences in the results of both time-intervals are outcomes of yearly deliveries considered in the time window (either 3 or 15 years). In short, the 3-years interval follows more closely latest developments in ship deliveries while the 15-years approach assumes a slower adjustment of yard capacity. In case of declining deliveries, the former approach should therefore lead to lower capacity estimates than the latter one.

The estimation assumes that yards are able to produce different ship types and may – if they consider it as appropriate – switch capacity between these six ship groups in line with future

[11] In this analysis, the AER, defined as the mass of CO2 emitted per ship per year per distance sailed per tonne of deadweight of the ship, was chosen as the CII. For each ship, the CII reference value and the CII requirements for 2030 have been calculated based on the draft guidelines published in MEPC 76/7/5. In addition, estimations take into account the supply-based measurement of the 2030 target combined with flat reduction factors. The change in the annual total cost of ownership is defined as the additional operational expenditures per year plus the annuity of the capital expenditures minus the fuel savings.

newbuilding demand.[12] Hence, the estimation is not broken down to the level of the individual ship group but presented at the aggregated level only.

Box 5.2. WP6 work on the measurement of yard capacity

The WP6 has significant experience in measuring shipbuilding capacity. Until the early 2000s, the Secretariat collaborated closely with governments and shipbuilding associations to obtain data on national yard capacity. Since 2011, the Secretariat uses production information provided by commercial databases.

Collaboration with governments and shipbuilding associations

- Until 1999, the Secretariat sent annual questionnaires to member governments and participating non-OECD economies (C/WP6(99)7) to assess national shipbuilding capacity. This approach was discontinued because the WP6 did not consider the use of questionnaires as reliable due to the incomplete geographical coverage and some methodological weaknesses.
- From 1999 until 2004, shipbuilding associations submitted to their national governments detailed information on shipyard facilities and production data that was forwarded to the Secretariat. The Secretariat then produced capacity evaluations for the WP6 based on an agreed methodology (see Annex 1 in C/WP6(2014)11). Despite the improvements this new process brought along, it was discontinued because of technical problems related to the applied methodology in particular regarding the measurement of the productivity factors.

Data from commercial databases: The maximum production approach

In 2011, the WP6 discussion paper C/WP6(2011)13 put forward an approach to estimate shipbuilding capacity that is based on the maximum production over a pre-defined time period either aggregated at the global level or at the yard-individual level. The Secretariat uses commercial databases for this analysis, such as from Clarkson Research or IHS.

Source: C/WP6(2014)11

Estimation results

The estimation results highlight that excess shipbuilding capacity will likely continue to exist until at least the year 2024 even in the most optimistic scenario (Figure 5.2)[13]. The size of excess capacity is determined by demand factors and the willingness of and feasibility for yards to reduce existing capacity and to refrain from new capital investments.

- The most optimistic scenario implies the lowest level of yard capacity in 2020 (i.e. 3 years moving interval) and the highest-level of estimated ship demand from 2021 until 2030 (i.e. ITF's baseline scenario).
- In the worst case scenario assuming the highest level of yard capacity (i.e. 15 years moving interval) and the lowest level of newbuilding demand (i.e. ITF's Reshape

[12] Gourdon (2019) presents that yards are less likely to be specialized in the production of only one ship type but are able to produce different ship types.

[13] The word "optimistic" refers to a situation in which excess capacity declines in the future as yard capacity approaches newbuilding demand, leading to higher ship prices and profits. The term "pessimistic" refers to a situation in which excess capacity increases in the future as yard capacity remains high but newbuilding demand drops, resulting in lower ship prices and profits.

scenario), excess yard capacity for the production of the six analysed ship groups will very likely remain in the market until the year 2030.

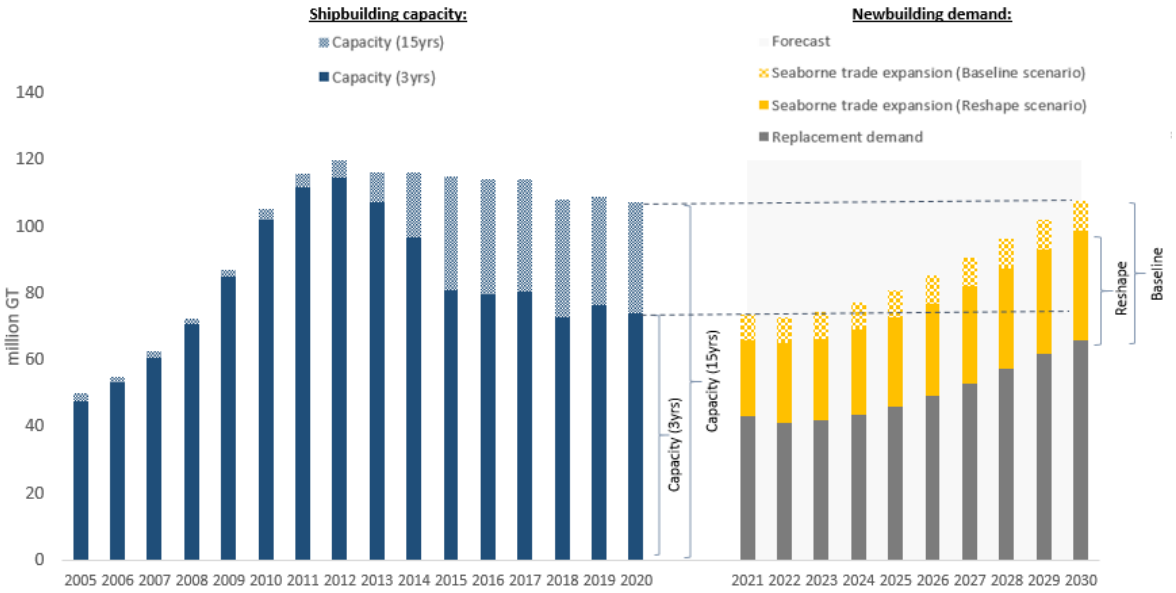
Predictions about newbuilding demand for the period 2021-30 amount to a total of between 861 and 777 million gross tonnes (GT) depending on the scenario considered. The results cover six ship groups that are bulk carriers, containerships, oil tankers, chemical tankers, liquefied gas tankers ad general cargo ships. Almost 60% of newbuilding demand likely arises from replacement needs of outdated ships rather than new demand resulting from seaborne trade expansion.

The renewal of the existing fleet with more (fuel-)efficient ships would contribute to the international community's decarbonising efforts and the SDGs. Likewise, the high-ambition scenario results in a lower level of newbuilding demand while the policies assumed to be implemented by the countries would contribute to decarbonising the (maritime) transport sector and to achieving the SDGs.

Almost half of predicted newbuilds in the same period stems from demand for bulk carriers, 20% for oil tankers, 17% from containerships, 7% from general cargo ships 6% from chemical tankers and 5% from liquefied gas tankers.

Important to note is that the results for oil tanker demand are mainly driven by replacement demand. In contrast, the results of newbuilding demand that specifically arise from seaborne trade expansion vary significantly in the considered scenarios on the development of seaborne trade in crude oil as well as petroleum and coal products that is largely affected by governments' efforts to meet the UN Sustainable Development Goals (SDGs) and to decarbonise the transport sector. Newbuilds of oil tankers arising from seaborne trade expansion is therefore expected to vary between an *increase* of about 21 GT or a *reduction* of around 23 million GT in the baseline and the *Reshape* scenario, respectively.

Figure 5.2. Ship demand likely to remain below available capacity in the medium-term



Note: The data covers only the six ship groups to estimate shipbuilding capacity and newbuilding demand.
Source: OECD estimation based on IHS Seaweb data (2021) and ITF seaborne trade forecast (2021).

The following sub-sections present separately the outcomes for newbuilding demand resulting from seaborne trade expansion and replacement needs, as well as for yard capacity to allow for a better understanding of the driving factors of the results.

Predictions of newbuild demand

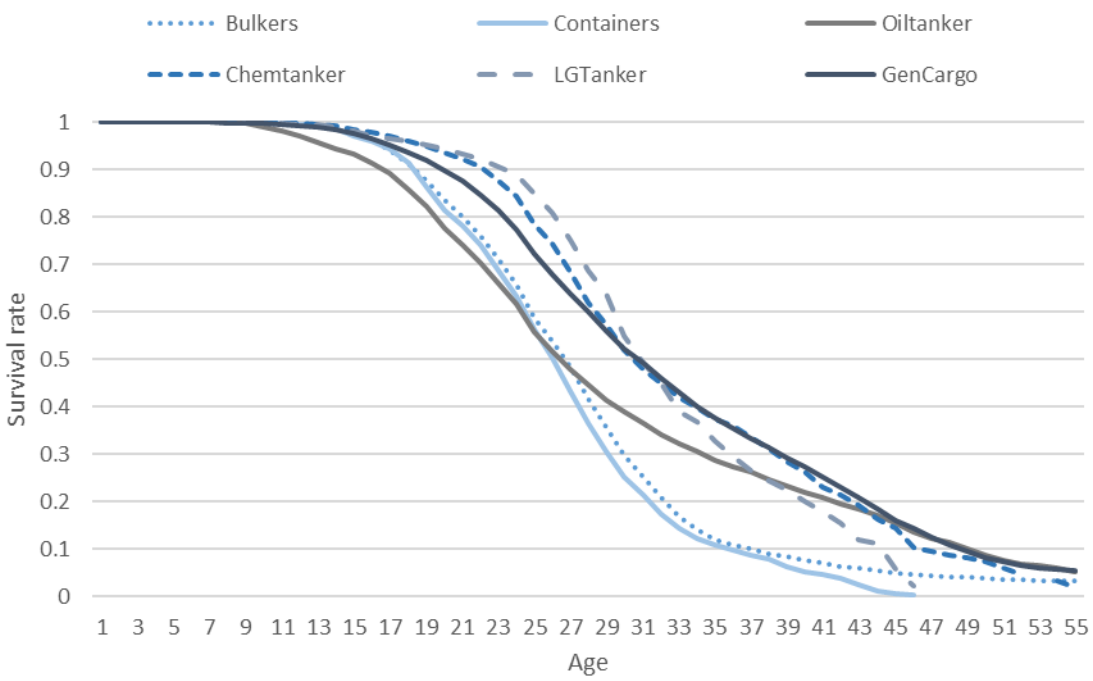
Predictions of newbuilding demand are aggregations of new orders arising from the need to replace obsolete ships and from demand for seaborne trade.

Estimates of replacement demand

Figure 5.3 illustrates the estimated survival rates for all six ship groups. Until the age of 10, all ship types have on average an almost 100% likelihood to continue operating in the fleet, hence survive. From the age of 10, the likelihood declines more significantly for oil tankers (including single and double hull), bulk carriers and containerships. Liquefied gas and chemical tankers have on average higher survival rates across years.

Figure 5.3. Survival rates across age by ship type

Kaplan-Meier estimates

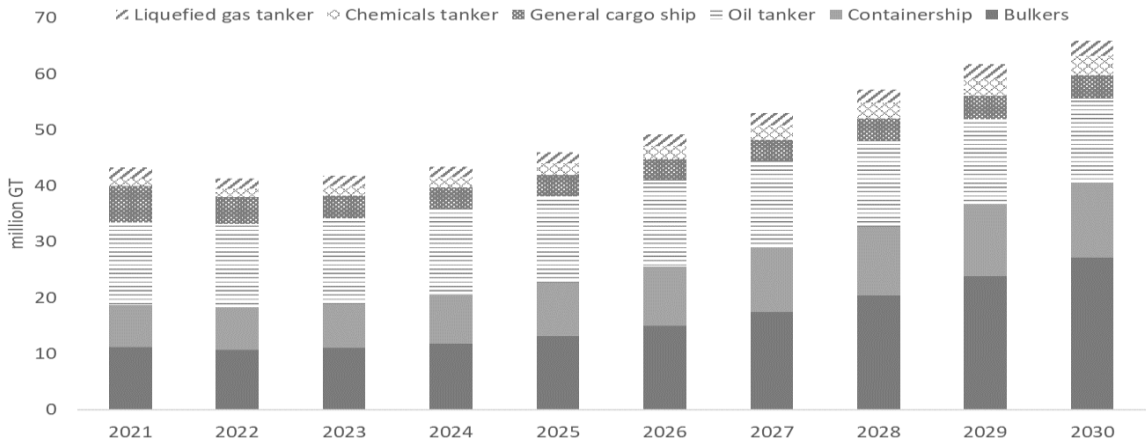


Note: Estimates of survival rates are based on ship demolitions and age that are observed in the fleet, excluding ships in service beyond the age of 45 to smooth the survival rates.
Source: OECD estimation based on IHS Seaweb (2021).

As illustrated in Figure 5.4, the results show that demand is largest for bulk carriers, containerships and oil tankers, which also make up the largest fleet. Liquefied gas and chemical tankers will likely face lower demand for replacement because of the smaller size of their fleet. Until 2030, the results indicate replacement needs in the amount of 162 million GT for bulk carriers, 102 million GT for containerships, 152 million GT for oil tankers, 43 million GT for general cargo ships, 21 million GT for liquefied gas tankers and 23 million GT for chemical tankers.

Figure 5.4. Forecast of ship demand resulting from replacement needs by ship type

2021-30



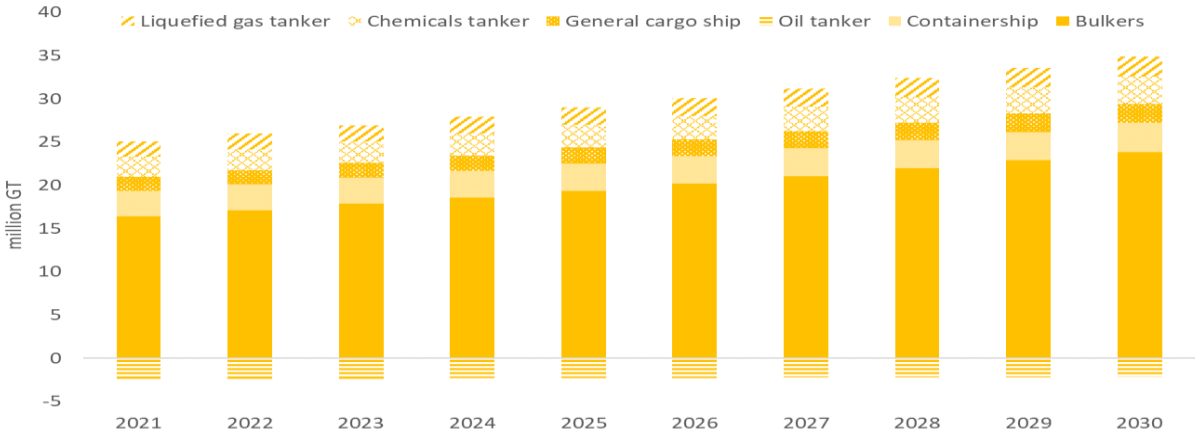
Source: OECD estimation based on IHS Seaweb data (2021).

Estimates of seaborne trade developments

Figure 5.5 shows the estimation results of future demand for ships based on the developments simulated in ITF's ITM in the *Reshape* scenario. In addition, Table 5.1 summarizes aggregate ship demand for each scenario over the forecast period from 2021 until 2030. Total new demand for bulk carriers is estimated at between 199 and 226 million GT (on average ~20 to 23 million GT per year), for containerships at between 31 and 43 million GT (~3 to 4 million GT per year), for chemical tankers between 26 and 27 million GT (~3 million GT per year), for general cargo ships between 19 and 21 million GT (~2 million GT per year), for oil tankers a drop in demand of around 23 million GT (-2 million GT per year) or new demand up to 21 million GT (2 million GT per year).

Figure 5.5. Forecast of ship demand resulting from seaborne trade expansion

Reshape scenario



Source: ITF seaborne trade forecast (2021).

Most striking is the expected drop in demand for new oil tankers owing to the ambitions of countries to reduce fossil fuel consumption. The *Reshape* scenario assumes seaborne trade of crude oil and petroleum to decline by respectively 1.2% and 1% per year until 2030, while the baseline scenario models only very modest growth of respectively 0.8% and 1.1%.[14]

Newbuilding demand for bulk carriers is mainly driven by an expected increase in food consumption and infrastructure projects in view of the growing world population along with countries' commitment to reduce coal consumption. For instance, iron and steel maritime trade is expected to grow by around 3.4% p.a., and food products by 3.4% p.a. and wheat by 4.8% p.a. Coal seaborne trade is expected to have only a modest growth by around 0.5% p.a. in the *Reshape* scenario, while it may grow by about 3.6% p.a. if governments follow the less ambitious pathway (baseline scenario).

Owing to population growth, commodities transported by containerships and general cargo ships are expected to grow in both scenarios: for instance, seaborne trade in electronic equipment may grow per year by between 1.3% and 1.8%, and textiles between 0.7% and 1.1%. Maritime trade in livestock is expected to grow by around 3.5% p.a.

Table 5.1. Forecast of new ship demand by ship group and scenario

2021-30, in million GT

Scenario:	Reshape (period's average)		Baseline (period's average)	
Bulkers	199	(20)	226	(23)
Chemicals	27	(3)	26	(3)
Containership	31	(3)	43	(4)
General cargo	19	(2)	21	(2)
Liquefied gas	21	(2)	21	(2)
Oil tanker	-23	(-2)	21	(2)

Source: OECD estimation based on ITF Transport Outlook (2021).

Box 5.3. Preliminary analysis of demand drivers for cruise/passenger ships

Not yet included in the paper's estimation, the following sub-section aims to provide a first discussion about the demand drivers for cruise/passenger ships and offshore vessels.

Cruise/passenger ships

Cruise ships carry passengers on voyages between a number of different ports, usually with the same port of departure and destination, offering high standards in accommodation and recreation (SEA Europe, 2020[15]). Demand drivers in the tourism market substantially differ from those of the market for maritime transport of goods insofar as they depend, among others, on disposable income of cruise passengers (Gourdon, 2019). Beyond income shocks, major demand shocks in this industry in the past encompass the 11 September 2001 attacks, the global economic crisis in 2008 and the Costa Concordia disaster in 2012 (Offshore Energy, 2020).[16]

[14] Annex B summarizes the growth rates per year (CAGR) and per commodity that are assumed in both scenarios. It provides a better understanding of the estimated newbuilding demand for each ship group.

[15] SEA Europe (2020): "SEA Europe Shipbuilding Market Monitoring", Report No. 50 (IH 2020).

[16] Offshore Energy (2020): „Meyer Werft: Impact of coronavirus on new cruise ship orders to be immense", https://www.offshore-energy.biz/meyer-werft-impact-of-coronavirus-on-new-cruise-ship-orders-to-be-immense/, accessed 29 March 2021.

Most recently, the COVID-19 outbreak led to a significant drop in demand for cruises. As a result of early outbreaks on cruise ships in the first quarter of 2020, worldwide travel restrictions and 'no sail bans', cruise ship port calls fell by about 90% from April to August 2020, compared to 2019 levels (Clarkson's Research, 2020[17]). Although cruise lines have made considerable efforts to demonstrate that their ships can operate safely, the recovery of demand highly depends on the overall state of the pandemic, with travel restrictions still imposed in many jurisdictions.

The downturn follows a period of sustained growth in orderbook and passenger numbers. In 2016-2019, newbuilding orders amounted to 137, totalling about 264,000 berths, supported by passenger numbers reaching about 30 million in 2019 (ibid). Cruise ship orders have been significantly reduced by the COVID-19 outbreak, particularly affecting the leading cruise shipbuilding economies Germany, Italy, France and Finland (OECD, 2018[18], SEA Europe, 2020). According to SEA Europe (2020), cruise and ferry ships together only accounted for about USD 0.5 billion in terms of global newbuilding investment value in January to April 2020, representing a decrease by 93% compared to the previous year. At the same time, uncertainty in the cruise ship delivery schedule is increasing, as well as cruise ship demolitions, with seven ships sold for scrap in 2020 (Clarkson's Research, 2020[19]).

The cruise ship industry faces a challenging short-term outlook, with a downturn in demand expected for several years and the deliveries of existing orders being postponed following customers' requests. A large share of fleet capacity is currently unused, causing enormous financial difficulties for all major cruise operators (ibid.). Given these circumstances, contracting in the short-term is expected to be dominated by small units, with the return to major 'megaships' contracts unlikely in the near future (ibid.).

Offshore Vessels

Demand for offshore vessels

Offshore oil and gas exploration, development and production activities are the main markets for offshore vessels and structures (OECD, 2015). A major demand driver is the oil price due to the link between oil prices, exploration, number of profitable fields and the need for offshore vessels and platforms (OECD, 2015). In addition to traditional offshore oil and gas, offshore renewables, such as offshore wind farms, represent an important market in other offshore sectors.

2004-2019

The demand for and deliveries of offshore vessels have been characterised by an increase of deliveries between 2000 and 2009 followed by a substantial decrease in the following decade. Between 2004 and 2009, the total number of offshore vessels deliveries more than tripled; this was mostly driven by rising oil prices and a need for fleet replacement. The rising oil prices propelled offshore petroleum investments into deeper and more complex offshore fields. As these fields required more advanced vessels, this resulted in higher newbuilding orders and contracts of offshore supply vessels. In 2014, there was a drop in the oil price and the effect on the offshore market was reflected in the decreased number of contracting for offshore vessels. Despite this, the number of offshore vessels deliveries remained elevated due to the previous high orderbooks for new offshore supply vessels. However, due to the (persisting) negative trend in the oil price

[17] Clarkson's Research (2020): „Shipping Review & Outlook".

[18] OECD (2018): „Peer Review of the Finnish Shipbuilding Industry".

[19] Clarkson's Research (2020): „Shipping Review & Outlook".

development the offshore market experienced an oversupply of offshore vessels, low rates, and lay-ups for the following 6-7 years after 2014 (Menon Economics, 2021).

2020- early 2022

Energy markets were hit hard by the impact of the pandemic in mid-2020. Demand for oil fell significantly in the second quarter, by 17 million barrels of oil per day (bpd), and Brent prices fell below USD 30 per barrel (bbl) (Clarkson's Research, 2021[20]). Brent prices averaged at about USD 41.3 per barrel in 2020, a decrease of 30% compared to the previous year (ibid.). Following a significant OPEC+ supply cut and decreasing shale output, relative stability returned across oil markets at the end of 2020. The downturn had a rapid impact on the drilling rig market, experiencing over 100 contract cancellations or revisions as of March 2021 (ibid.). Markets of offshore service vessels (OSV) saw a less rapid drop in the second quarter of 2021.

Throughout 2021, the offshore market became slowly more active, and the Clarkson Offshore Index went up by 32%, moving towards the same levels last seen in 2015 (Clarkson's Research, 2022[21]). The rig, OSV and Subsea support vessel experienced increased demand during 2021. There is an increase in offshore activity and the fleet supply has been positively impacted by factors such as consolidations, restructurings, limited newbuilding and continuing removals (ibid).

According to March 2022 Oil market report by the International Energy Agency22, ICE Brent oil futures increased to around $100/bbl from $90/bbl in early February following the invasion of Ukraine and as supply concerns mounted. The offshore market is expected to be driven in 2022 and onwards by the higher oil price environment following Russia's aggression of Ukraine.

As illustrated in Figure 5.6 below, offshore vessel deliveries and oil prices have been correlated between 1996 and 2016 (correlation coefficient 0.82). From 2017 to 2021, their correlation weakened, probably because of the high number of offshore vessels idled at ports because of weak demand and because of the development of other oil fields onshore, notably shale oil.

At this stage, it is difficult to find new oil price forecasts taking into account Russia's aggression of Ukraine. However, assuming that the oil price environment would remain for some years, for instance with an oil price averaging at USD 100/bbl, a gradual increase of offshore vessel deliveries to about 300 ships in two to three years could be expected if the current lower level of correlations between offshore vessel deliveries and oil price remain.

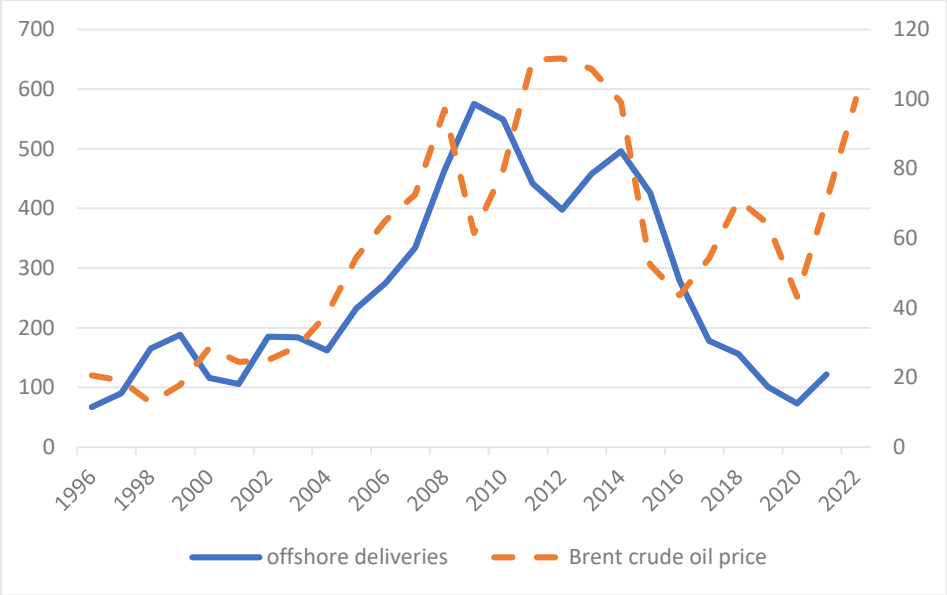
[20] Clarkson's Research (2021): "Offshore Review & Outlook: Contrasting Fortunes".

[21] Clarkson's Research (2022): «Offshore Review & Outlook: Signs of Improvement".

[22] Source : https://www.iea.org/reports/oil-market-report-march-2022

Figure 5.6. Offshore vessel deliveries and oil price

Offshore vessel deliveries (LHS, in number of ships) and oil price (in USD per barrel)



Source: OECD calculations based on Clarksons

Offshore wind

A segment of the offshore market that is expected to overtake the oil and gas sector and play an essential role in the global energy transition is offshore wind (DNV, Clarksons). In contrast to the other sectors in the offshore market, offshore wind experienced two record years in investments and start-ups. In 2020, there was an investment of $56bn and 6.7GW start-ups, whereas in 2021 the global capacity grew by 55% to 50.7 with GW 18.5 GW of start-ups (Clarkson's Research, 202223). By 2030, new investments could reach 200 GW with a CAGR of 13.5%, driving the demand for SOV and CTV vessels up (Lorentzen-Stemoco, 4C Offshore)

Estimates of shipbuilding capacity

Yard capacity

The estimation results reveal that despite reductions in shipbuilding capacity, capacity utilisation rates appear to have declined in 2020 compared to the levels observed in 2015. The negative impact of the COVID-19 crisis on new orders largely explains this development. Deliveries dropped by 14% between 2015 and 2020 as a consequence of the COVID-19 measures implemented in several shipbuilding economies. Capacity utilisation rates have however recovered in 2021 in view of increased deliveries by 13% compared to 2020-levels, which remained, however, 3% lower than 2019-levels.

Aggregate yard capacity at the global level declined from its peak in 2012 until 2020 by between 11% (15-years-interval) and 36% (3-years- interval). Estimation of yard capacity based on the maximum production approach of the 15-years interval (3-years interval) reveal that the People's

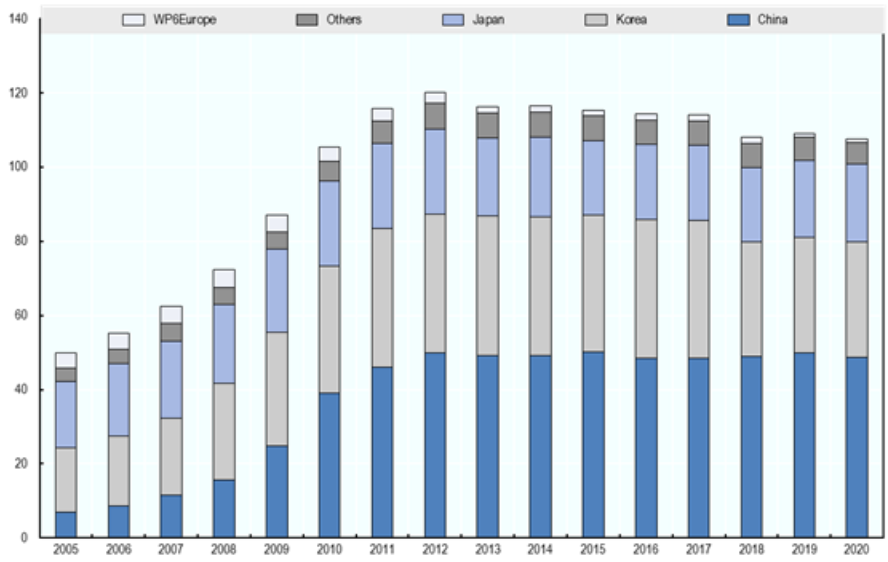
[23] Clarkson's Research (2022): «Offshore Review & Outlook: Signs Of Improvement".

republic of China (hereafter “China”)’s shipbuilding capacity is the largest one making up around 45% (41%) of global capacity in 2020, followed by Korea with a share of almost 30% (30%) and Japan accounting for around 20% (24%). As illustrated in Figure 5.7 and Figure 5.8, global yard capacity developed relatively similarly across countries with a significant drop in 2012 in the approach of a 3-year interval and only a slight decline since 2012 in the approach of a 15-year interval.

Analysing CURs as an alternative measure of yard excess capacity reveals that a larger share of yards report lower CURs in 2020 compared to 2015. This suggests an increase in yard excess capacity for a larger number of yards compared to only five years ago. Figure 5.9 shows the kernel density of CURs of yards in the sample data across years for both estimation approaches. While the kernel density for the 15-year interval is only marginally different between both years, this is less the case for the results of the 3-year interval. A large share of yards report CURs below 75% compared to 2015. Furthermore, the median of CURs for the sample yards amounts to 62% in 2015 and dropped to 53% in 2020. This result implies an increase in yard excess capacity for a larger number of yards compared to only five years ago.

Figure 5.7. Estimated global yard capacity by country: 15-years interval

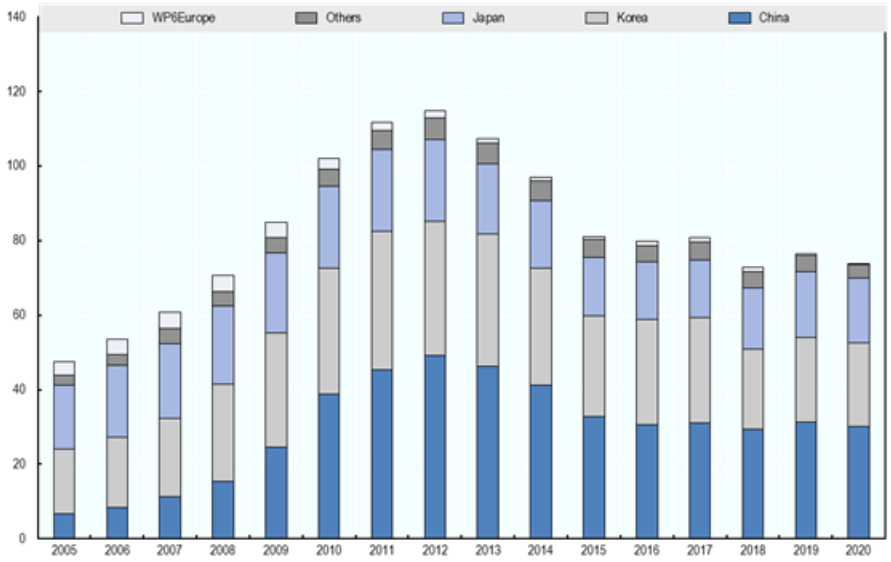
In millions of GT



Note: The region “WP6 Europe” includes the countries Croatia, Denmark, Finland, Germany, Italy, Netherlands, Norway, Poland and Romania.
Source: OECD estimation based on IHS Seaweb (2021).

Figure 5.8. Estimated global yard capacity by country: 3-years interval

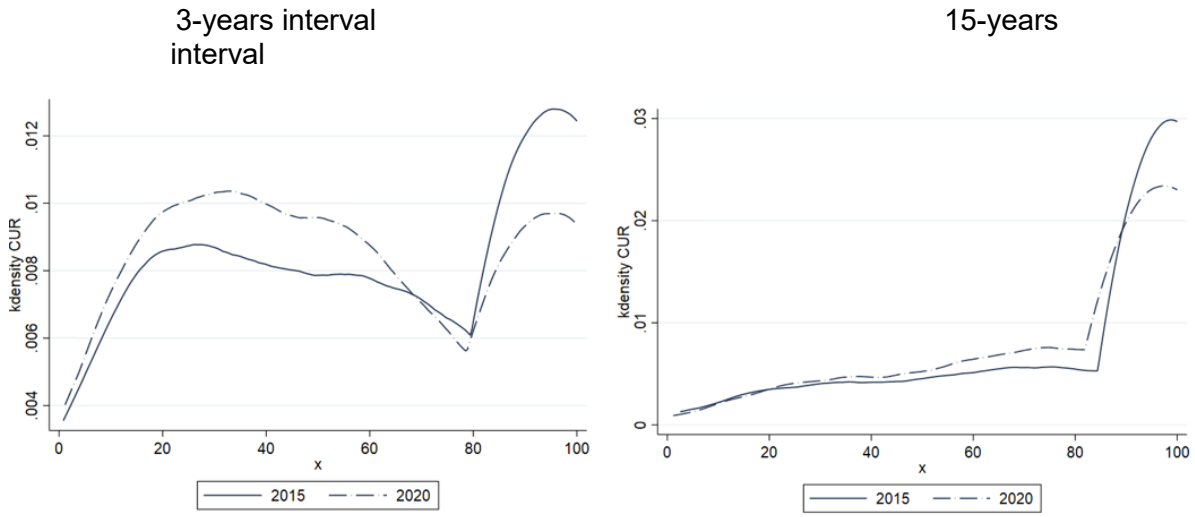
In millions of GT



Note: The region "WP6 Europe" includes the countries Croatia, Denmark, Finland, Germany, Italy, Netherlands, Norway, Poland and Romania.
Source: OECD estimation based on IHS Seaweb (2021).

Figure 5.9. Kernel density of estimates of yard-level capacity utilisation rates

Different y-axis scales



Note: The Kernel density estimate gives an approximation of the probability density function of a given distribution — up to a given point x in the horizontal axis, the area under this function provides the percentage of observations that have values that are lower or equal to x.
Source: OECD estimates based on IHS Seaweb (2021).

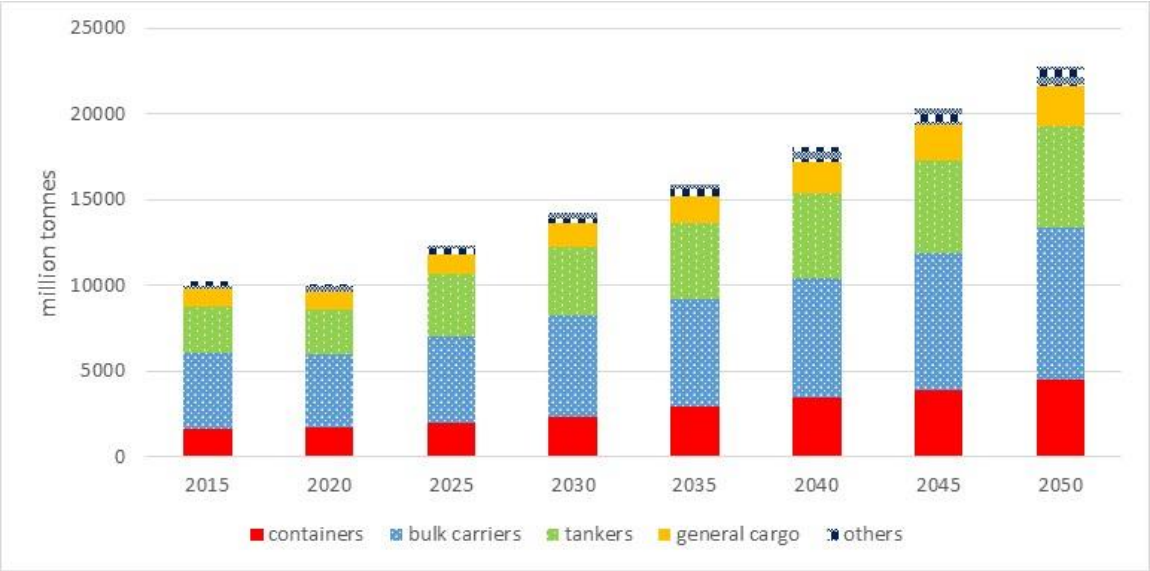
Recently released forecasts

Recently released forecasts of seaborne trade developments

Expansion or reduction in seaborne trade affects demand for transportation services and therewith ship requirements. The revised forecasts of maritime trade in tonnes for 36 commodities until 2050 provided by the ITF allows estimating the required new ship capacity to meet changes in demand for seaborne trade. These commodities are allocated to five ship types: containerships, bulkers, tankers, general cargo and others. Moreover, the latest seaborne trade forecasts only include one scenario at this moment, which do not allow fully revising at this stage the ship demand forecasts presented in the previous section.

Figure 5.10 shows the seaborne trade by ship types based on ITF's new seaborne trade forecast. In addition, Table 5.2 summarises aggregate ship demand for the period from 2021 until 2030. Total new demand for bulk carriers is estimated at 232 million GT (on average 23 million GT per year), for tankers 108 million GT (11million GT per year), for containerships at 86 million GT (9 million GT per year) and for general cargo ships 65 million GT (7 million GT per year).

Figure 5.10. Forecast of ship demand resulting from seaborne trade expansion



Source: ITF seaborne trade forecast (March 2022).

The studied scenario assumes seaborne trade of commodities such as natural gas, crude oil and petroleum carried by tankers to grow by 6.4% per year in the period 2020-2025 and 2.2% per year in the period 2025-2030. This growth is much faster than in the previous edition of the report.

Commodities transported by containerships are expected to be two times higher than in the previous forecast since those are expected to grow by 3.6% p.a. in the period 2020-2025 and 2.9% p.a. in the period 2025-2030. Electronic equipment, Electronics and Textiles are included in this category of commodities.

Newbuilding demand for bulk carriers and general cargo ships is similar than in the previous report when using the previous ITF forecast.

Table 5.2. Forecast of new ship demand by ship types

2021-30, in million GT

Baseline Scenario:	2022 forecast (period's average)		2021 forecast (period's average)	
Bulkers	232	(23)	226	(23)
Tankers	108	(11)	26	(3)
Containership	86	(9)	43	(4)
General cargo	65	(7)	68	(7)

Source: OECD estimation based on ITF seaborne trade forecast (2021, 2022).

Clarkson's forecast report (March 2022)[24]

The contracting forecast by Clarksons in the medium and long-term[25] (2022 -32) is estimated based on demand growth assumptions (aligned with macro 'energy transition' scenarios), capacity replacement requirements (derived from recycling), as well as considering the balance between sector demand and capacity in the fleet and on the orderbook at the outset of the forecast period. Potential trends in vessel productivity are also factored in.

Contracting projections are produced for three separate scenarios, described at a high level as 'base', 'high' and 'low'. These scenarios have been aligned with possible developments in the global energy transition, and with possible related developments in seaborne trade and vessel demand in non - energy related shipping sectors. 'Base case' demand assumptions are aligned with a 'gradual transition' in the global energy mix. The 'low case' represents a Paris-aligned 'Rapid Decarbonisation' scenario, with a significantly weaker demand outlook, but with potential for increased fleet renewal requirements and potentially slower speeds, helping to offset some of the impact of lower demand growth on total contracting volumes. The 'high case' scenario is also aligned with a 'gradual transition' in the global energy mix but assuming slightly firmer growth in trade volumes or average haul in some sectors (where relevant), and a potentially slightly slower pace of fleet renewal.

Contracting forecast results by Clarksons suggest that contracting would average 2,002 vessels p.a. across the whole 2022-32 forecast period (units above 2,000 dwt/GT), up 5% on expectations six months ago. In terms of tonnage, ordering would average 82.8 million GT p.a. in the period from 2022 to 2032, up 6% on expectations six months ago. This increase would largely reflect higher overall demand projections and higher expectations for fleet renewal in some sectors. Table 5.1 summarises the result on the ''base case'' over the forecast period from 2022 until 2032.

'Low case' scenario remains, suggesting more limited potential, with an average 1,599 units p.a. in 2022-32. Clear impact on contracting of significantly weaker demand growth outlook, including from efforts to accelerate global decarbonisation, although offset to some extent by a 'feedback loop' driving additional orders through accelerated fleet renewal and slower speeds

Table 5.3. Contracting forecast results (selected ship types)

2022-32, in million GT

Ship types	Period's Average
Tankers	23.0

[24] Source: The newbuilding market 2022-2032 forecast report, March 2022, Clarkson Research

[25] The forecast primarily covers global contracting of commercial ships of 2,000 DWT or GT and above up to 2032, as well as the long-term tonnage requirement growth up to 2034. The forecast is generated for the key ship types and size ranges, and total contracting demand is broken down by major geographical shipbuilding countries/areas.

Bulk Carrier	24.0
Gas Carriers	6.9
LNG Carriers	5.5
Containerships	19.1
General Cargo	0.4
Total	82.8

Source: OECD calculation based on Clarkson's forecast (March 2022).

6. Price & Cost

To better understand the shipbuilding market, this section presents:

- A literature review on factors influencing newbuilding ship prices;
- Developments of several factors affecting ship prices;
- A description of newbuilding prices of major ship types and ship size categories.

Literature review on factors influencing newbuilding ship prices

Background

The Secretariat included a description of factors impacting ship prices (and costs) in the initial report on Demand, Supply, Price and Cost Developments in 2020 [C/WP6(2020)2/REV1, pages 28-43].

The responses to the questionnaire [ONE Community site] and discussions at the 10-11 May 2021 WP6 meeting [C/WP6/M(2021)1] indicated that some delegations consider that it is necessary to further study factors (including qualitative ones) affecting ship prices.

Given these comments, the Secretariat prepared a literature review on factors influencing newbuilding ship prices in order to have a better understanding of quantitative and qualitative factors affecting ship prices.

Literature review

The shipbuilding market is a peculiar market as it answers to long-term logic and factors. It takes two to three years on average to build a new ship from its order to its delivery. By the time a new ship is built, global ship demand may have evolved dramatically. Similarly, building a new ship is a long-term investment: for instance, a tanker has an economic lifespan of between 18 to 25 years. The shipbuilding industry is also characterised by the uniqueness of ships: "*individual ships of the same category and size can be very different in terms of detailed technical specifications and quality*" (Adland, Norland and Sætrevik, 2017). The latter characteristic renders the shipbuilding market a complex and heterogeneous market. Finally, the shipbuilding market is particular for being one of the world's most competitive markets, with "*price fluctuations on a scale which few capital goods industries can match*" (Stopford, 2008).

Most of the literature on the shipbuilding market emphasised the importance of the influence of macroeconomic factors on ship prices. Stopford (2008) and Stott (2018) considered that shipbuilding prices are linked to global ship supply and demand. "*If there are more potential orders than berths, the price rises until some investors drop out, and if there are more berths than orders, prices fall until new buyers are tempted into the market*" (Stopford, 2008). Therefore, to explain the price movements of new ships, it is necessary to understand what determines the demand for building slots and the supply of berths.

Stopford (2008) underlined that "*shipbuilding demand is influenced by shipping freight rates, second-hand prices, market expectations and sentiment, and liquidity and credit availability*". It seems natural that freight rates influence the demand for new ships because higher revenues generated by ships make them more profitable and lead shipowners to increase their fleet. The second major factor influencing ship price is the situation of the second-hand ships. Potential investors want to receive ships quickly, so initially, they try to buy second-hand ships when freight rates rise, driving up price. All things equal, the rise of second-hand

prices contributes to increasing demand for new ships. The interrelationship among newbuilding prices, time charter rates and second-hand prices was also studied by Tsolakis, Cridland and Haralambides (2003). Market expectations of future ship demand also play an important role on new ship prices. As it takes two to three years to build a ship, the expectation of how the market will behave in the future affects shipowners' orders of new ships. Kalouptsidi (2017) highlights the uncertainty and volatility of seaborne trade, and due to this unpredictable ship demand: "*The ship price fluctuates over time and depends on world market conditions, such as the demand for shipping services and the total fleet in period t, which captures the competition that shipowners are facing. As shipyards build more ships, they reduce the shipowners' willingness to pay, since the latter expect lower profits*". For instance, in the early 1980s, low freight rates did not discourage shipowners to place new orders as they were confident about the market in the future. Strandenes (2010) also supported the latter thesis: "*A decision to order a vessel should reflect the expected future freight rates or correspondingly the future income level over the economic life of the new vessel*". Moreover, Jiang and Lauridsen (2012) argue that "*a higher time charter rate for dry bulk carriers leads to a higher return on investment for ships; as a result, shipowners will be more willing to invest in dry bulk carriers with higher prices*". Finally, the availability of credit allows shipowners to leverage internally generated revenues, opening up the market to many entrepreneurial shipowners who do not have significant amounts of capital.

Stopford (2008) also listed four factors influencing the supply of berths. Firstly, the number of operational shipyards and the size of the shipyards' orderbook has an impact on the supply of berths. A yard with already three years of work may be reluctant to offer longer delivery because of the inflation risks and the price variation, while a shipyard with only one building project is desperate to attract new orders. Jessen and Møller (2018) further elaborates on the impact of the size of the shipyard's orderbook on ship prices by concluding that shipyard capacity is the product traded in the shipbuilding market "*the product offered in the shipbuilding market ultimately is capacity, and that shipyards face a strategic choice in how to optimally define their product mix. As a result, newbuilding prices may be affected by the opportunity cost of available shipyard capacity, which help explain why the long-run equilibria exist*".

Secondly, the cost of building a new ship also influences the supply of berths. Stopford (2008) stated that "*shipyard unit costs depend on labour costs, labour productivity, material costs, exchange rates, and subsidies (which determine whether the shipyard is able to sell at prices which result in an acceptable return on capital)*". Similarly, Strandenes (2010) stressed that for standard vessels "*costs competition is more important than special designs or qualities that otherwise may make the ship owner willing and capable to pay higher prices*".

Thirdly, exchange rates, according to Stopford (2008), have a big influence on ship price: "*although currency movements seem far removed from the shipyard, they are the single most important factor in determining shipbuilding cost competitiveness*". Exchange rates have an impact on the amount of cash a yard receives in local currency, as most newbuilt ships are ordered in USD. Wijnolst (2009) pointed out that between 1985 and 1988, the value of the JPY almost doubled against the USD; although in Japan, the price of a newbuilt VLCC only increased from JPY 8.8 billion to JPY 9.4 billion, the price of the same VLCC went up from USD 39.5 million to USD 73 million on the global market.

Finally, production subsidies may flatten the supply curve artificially. "*Subsidisation implies that new vessels are sold at a lower than optimal price*" (Strandenes, 2010). Gourdon (2019) emphasised how preferential financing instruments and so-called de-risking instruments (insurance and guarantees as well as swaps on interest rates, currency, commodities or debt-equity) provided by governments, affects the shipbuilding industry. During market upturns, shipyards may experience over-ordering of vessels leading to future cyclical downturns. As well as during bust times excess capacity may lead to government support to failing shipyards to minimise social costs. Consequently, the government funding policies will indirectly influence ship prices as they affect the cyclical nature of the industry. Kaloupstsidi and her co-authors have also found evidence of subsidies affecting ship prices through industrial policies giving preferential

treatment to domestic firms allowing them to lower costs of production, receive low-interest loans, and benefit from favourable credit terms (Barwick, Kaloupstsidi and Zahur, 2019).

Similarly, Adland and Jia (2015) stated that the price of a newbuilt ship is correlated to the supply of berth by its delivery time: "*early delivery slots (and resales) command a premium over deliveries further into the future […] the quoted newbuilding price in the market refers to the prevailing typical time to delivery, which will necessarily vary with the size of the orderbook and developments in shipyard productivity*". This is supported by Bertram (2003) who encourage shipyards to "*quantify how much a customer is willing to pay for each day saved from order to delivery*". Gourdon (2019) explains further the relevance of freight rate and delivery time to supply berths: "*Ship buyers therefore prefer short waiting times for their orders to be able to exploit the prosperous boom phase in the form of increased freight rates. Large yard capacity shortens the delivery time of vessels as yards have more docks available. In turn, offering shorter delivery times to ship buyers strengthens the position of yards during contract negotiations, which in turn determine newbuilding prices*".

In addition, recent research papers have sought to pinpoint the microeconomic factors influencing the newbuilding ship prices using econometric tools and methods. For example, Adland, Norland and Sætrevik (2017) found that both owners and shipyard heterogeneity influences new ship prices. Heterogeneity across yards could be related to specialisation premiums, bargaining power or superior ship designs. For owners, this may reflect differences in the timing of the market, with some owners seeing the newbuilding market as a profitable source of asset plays, while others take a more strategic, long-term view of renewing their fleet. Adland, Norland and Sætrevik (2017) also demonstrated that as expected, GDP/capita (as a proxy for wages) and steel prices show a positive relationship with the price of ships in US$/CGT.

Summary

Ships, like other commodities, are priced according to the balance between supply and demand (although ship prices are characterised by a particularly high degree of volatility). Therefore, to explain the price movements of new buildings, it is necessary to understand what determines the demand for building slots and the supply of berths.

As summarised in Table 6.1, factors influencing the demand for ships include freight rates, second-hand prices, market expectations and sentiment, etc. Factors influencing the supply of ships include building capacity (which is related to orderbook), construction costs (labour and materials), exchange rates and production subsidies.

Table 6.1. Factors influencing the demand and supply of ships

Demand side	Supply side
Freight rates	Building capacity (which is related to orderbook)
Second-hand prices	Construction costs (labour and materials)
Market expectations and sentiment	Exchange rates
	Production subsidies

Developments of several factors affecting ship prices

Background

The previous section has identified the key factors on the demand and supply side that influence the price of a ship. Keeping track of how these factors develop, based on time series, would contribute to achieving the objectives of the demand, supply, price and cost project. For this reason, the Secretariat has collected data on such factors and compiled them as follows.

This data collection is also in line with the methodology for the study of cost developments agreed at the WP6 Technical Meeting on Price and Cost Developments which took place on 30 June 2021. The Secretariat made maximum use of publicly available information in this study.

The Secretariat would regularly provide these graphs to provide a sound basis for discussion of WP6.

Developments

Price index

Figure 6.1 shows the Clarksons price index. The red line shows the price of newbuildings, and the green line shows the price of second-hand ships. The price of second-hand ships has been stagnant since mid-2011, but since 2020 the price of second-hand ships has risen sharply. Following, new-build prices have increased to their highest level in a decade driven by strong demand for ships.

Freight rate

Figure 6.2, Figure 6.3 and Figure 6.4 show the respective freight rates for bulk carriers, container ships and crude oil tankers. For bulk carriers, freight rates have risen since 2020, reaching a peak in October 2021, and are now falling sharply. The reason for this may be that the turmoil for bulkers due to the Covid-19 pandemic was, to some extent, over. For containerships, freight rates have risen sharply since 2020 and, unlike for bulk carriers, are still high, notably because of solid demand for manufactured goods notably by households due to the Covid-19 pandemic. Freight rates for crude oil tankers have been cyclical, with temporary spikes and stability.

Seaborne trade

Figure 6.5 and Figure 6.6 show the evolution of seaborne trade by cargo. Compared to 2014, the trade volume of LNG has grown the most, while those of coal and crude oil has grown very little. This is partly because of shifts towards greener energy sources. In addition, Russia aggression against Ukraine might impact energy procurement worldwide, and freight rates might change significantly in the coming months. Grain, chemicals and containerised cargoes have shown an increasing trend.

Orderbook

Figure 6.7 shows a CGT-based orderbook for the world, China, Japan and Korea. This figure bottomed out during the pandemic and gradually rose as a whole driven by China and Korea. In contrast, Japan's orderbook remained stagnant.

Ship construction cost

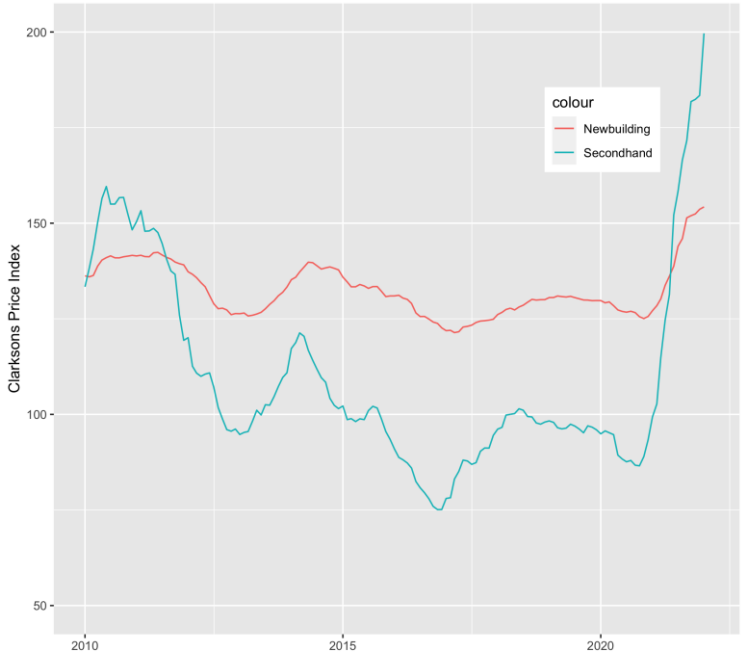
Figure 6.8 shows steel prices in each country. Steel prices began to rise in the spring of 2020 and soared in 2021, peaking at the highest level in a decade. They have then decreased compared to their peak.

Figure 6.9 displays the changes in labour costs in the manufacturing sector in selected countries. In contrast to the figures we have described so far, there have been no significant increases. Figure 6.10 shows a domestic producer price index for each country for industrial activities. The Secretariat presents this index as a proxy for the price index for marine equipment because the cost information is not available. Producer price index has followed an upward trend since 2016 and has risen sharply since 2020, during the pandemic. It should be noted, as stated above in the literature review, that material costs are one of many factors affecting ship prices.

Exchange rate

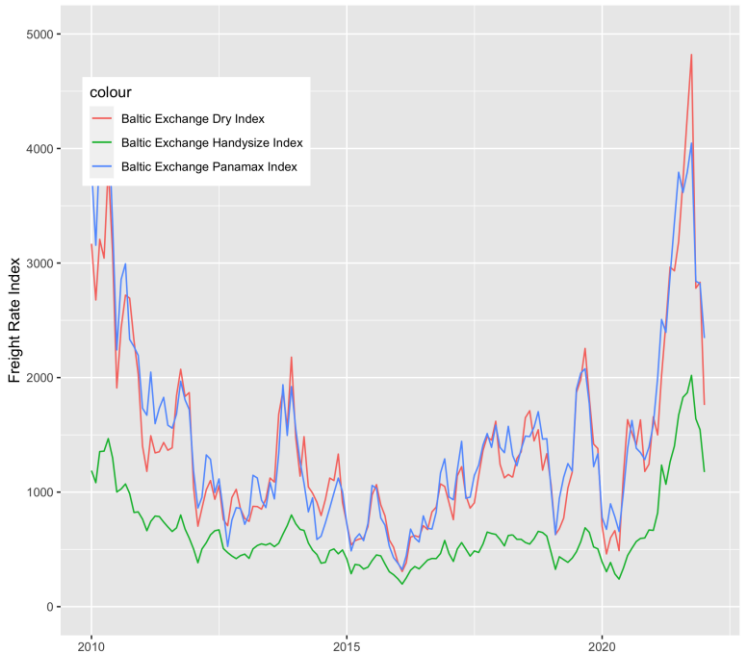
Figure 6.11 shows the exchange rate for selected countries. The exchange rate in Republic of Türkiye (hereafter “Türkiye”) has changed markedly, but the rest of the exchange rate could be considered to have remained relatively stable.

Figure 6.1. Clarksons Price Index



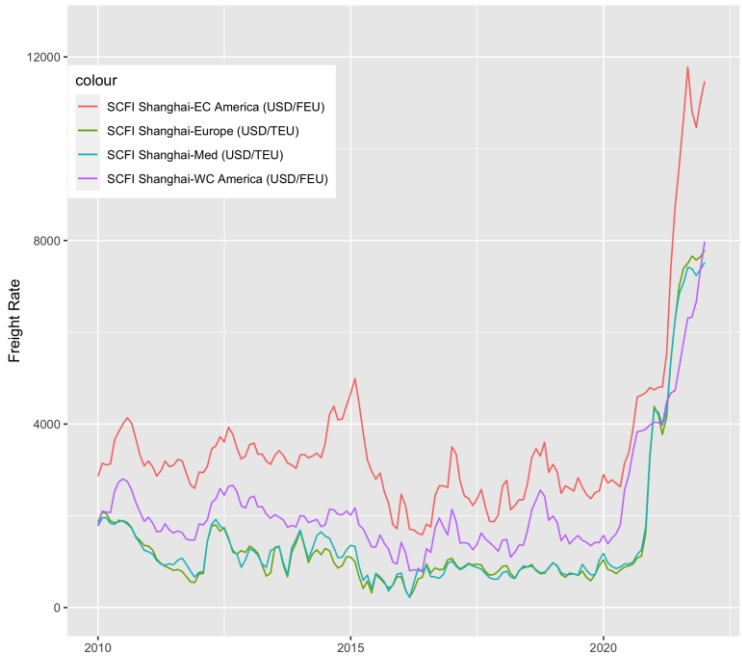
Source: Clarksons Shipping Intelligence Network

Figure 6.2. Freight rate



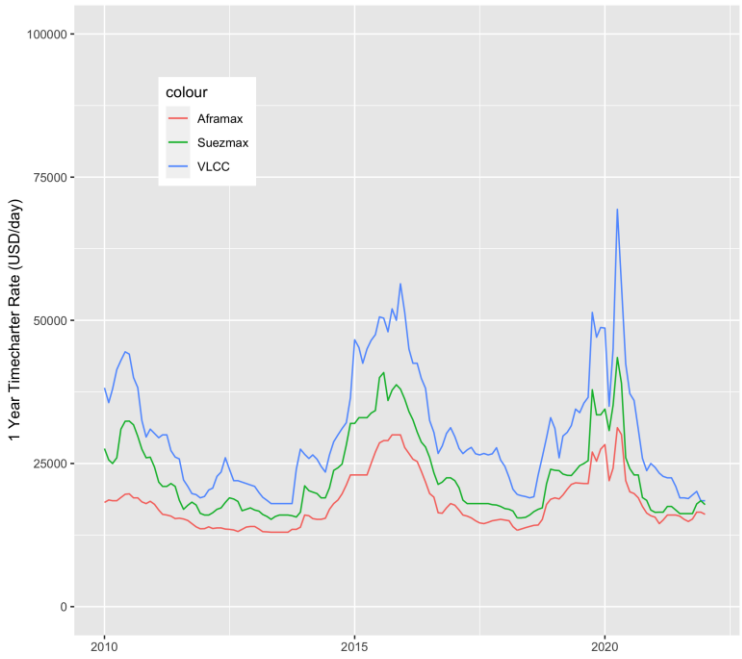
Source: Clarksons Shipping Intelligence Network

Figure 6.3. Freight rate



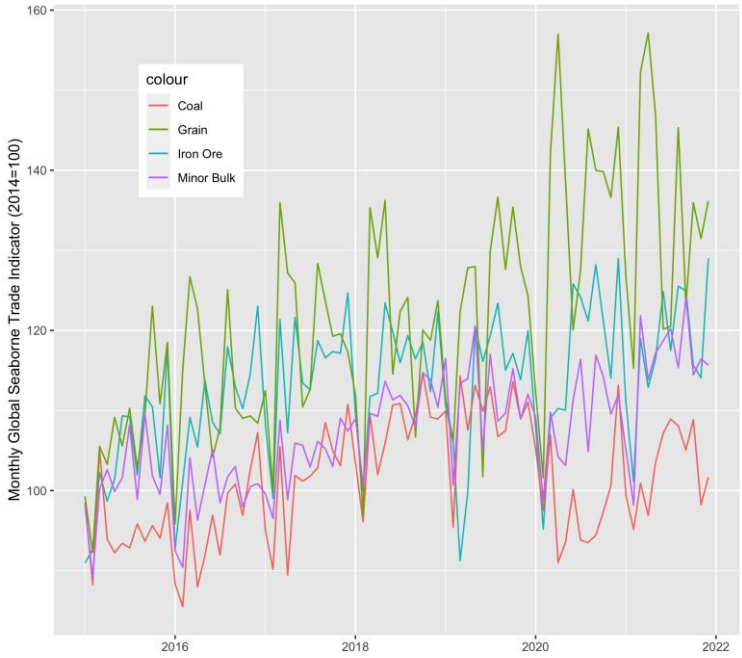
Source: Clarksons Shipping Intelligence Network

Figure 6.4. Freight rate



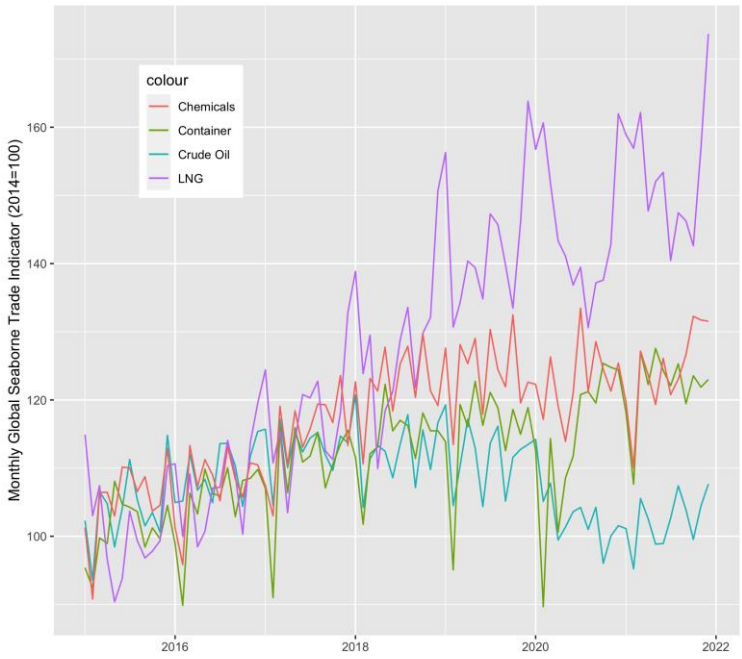
Source: Clarksons Shipping Intelligence Network

Figure 6.5. Seaborne trade



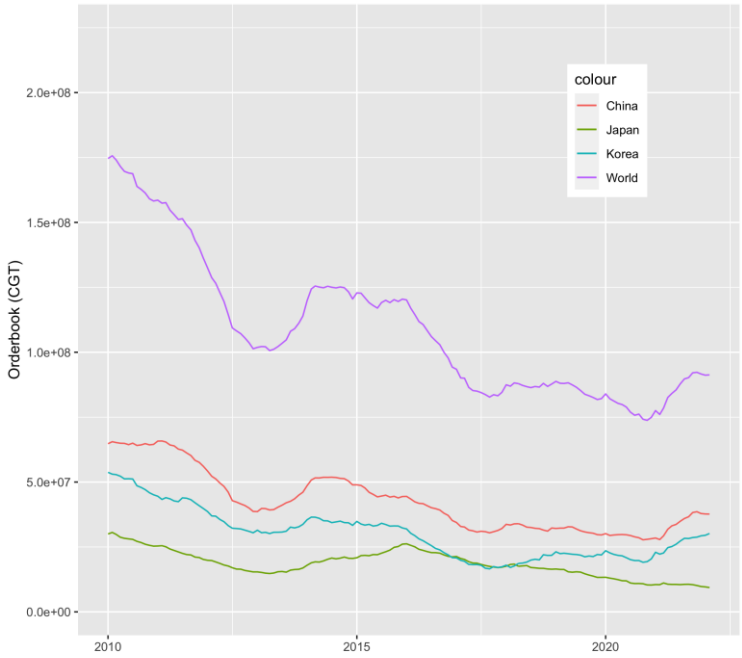
Source: Clarksons Shipping Intelligence Network

Figure 6.6. Seaborne trade



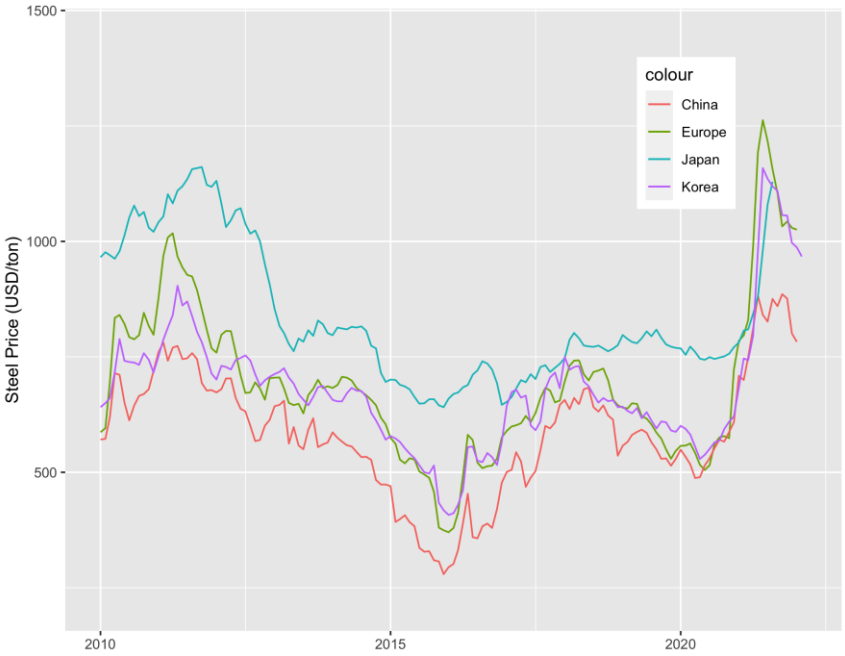
Source: Clarksons Shipping Intelligence Network

Figure 6.7. Orderbook



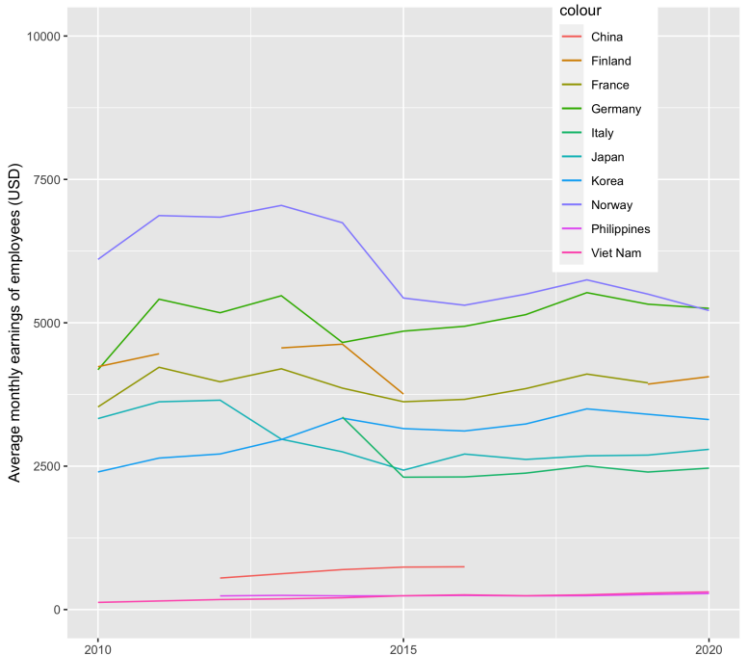
Source: Clarksons Shipping Intelligence Network

Figure 6.8. Steel price



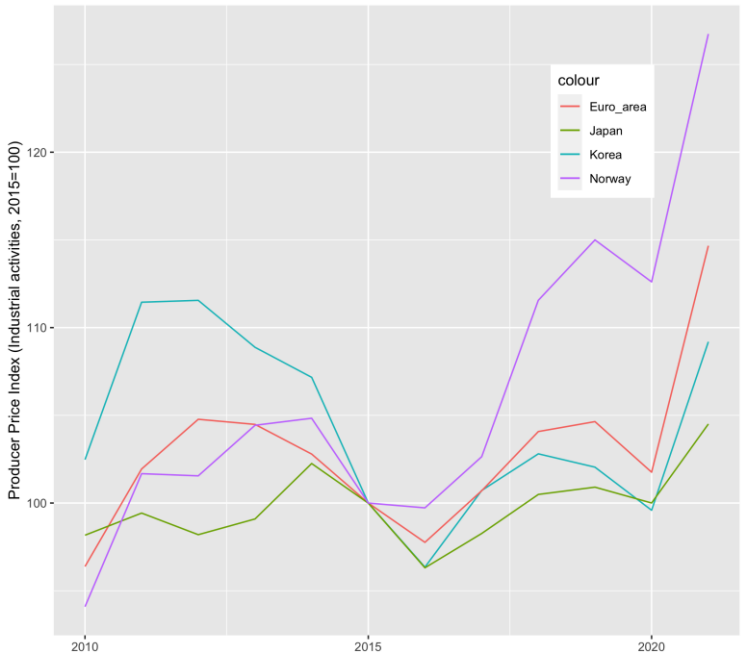
Source: OECD calculations based on SBB Steel Prices, Japan Metal Daily and Korean Steel Daily.

Figure 6.9. Labour costs



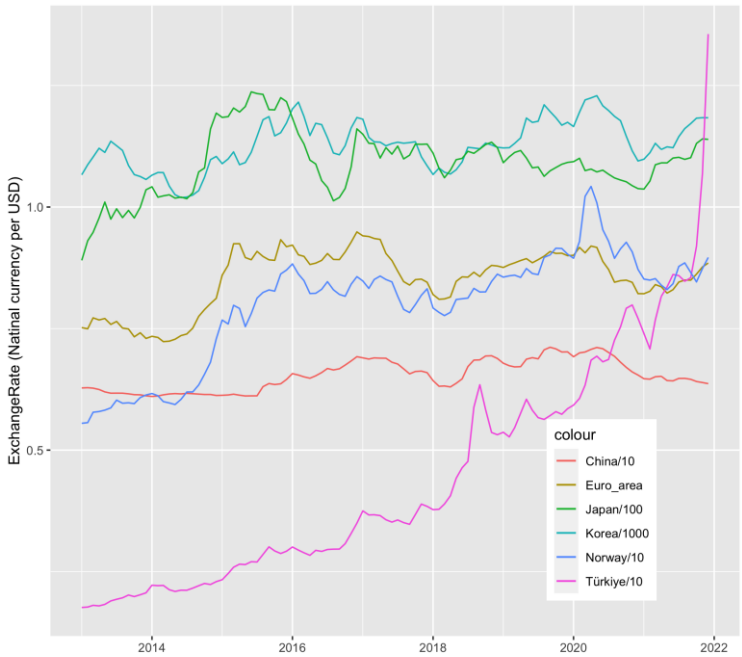
Note: This figure shows average monthly earnings of employees in the manufacturing industry as a proxy for labour costs in the shipbuilding industry which are not available.
Source: ILOSTAT

Figure 6.10. Producer Price Index (Industrial activities)



Source: OECD.Stat

Figure 6.11. Exchange rate



Note: The Secretariat has adjusted the currency units (as shown in the legend) to facilitate comparisons between currencies.
Source: OECD.Stat

Description and analysis of newbuilding prices of major ship types and ship size categories

Background

The Secretariat included a description of ship prices of UL/VLCC in the initial report on Demand, Supply, Price and Cost Developments in 2020 [C/WP6(2020)2/REV1, pages 25-27].

The response to the questionnaire indicated that some delegations prefer to focus at the beginning of the project on developing a robust methodology whereas others prefer to start with a pragmatic approach to obtain fast results [ONECommunitysite].

At the 132nd WP6 meeting on 10-11 May 2021, Japan presented a pragmatic approach to describe ship price developments based on a description of newbuilding prices of selected ship transactions for selected ship types and ship sizes.

Given that, and for a better understanding of the shipbuilding market situation, the Secretariat prepared a description and an analysis of newbuilding prices of major ship types and ship size categories for discussion, in parallel to a literature review on factors affecting ship prices.

Important caveats on the ship price analysis

Price differentials can result from the different characteristics of seemingly equivalent ships; for example, the period from order to delivery which can takes 2 years or more; customer's required specifications and equipment to be built on board; production in series which can significantly impacts ship costs and prices; yards' know-how and experience; and the volatility of the ship demand which can lead shipbuilding companies during economic downturn, to absorb fixed cost by building ships rather than idling the docks.

While at the same time, it should be noted that the previous paragraph is a note of caution in focusing on the development of price trends and does not negate this price monitoring exercise itself.

Methodology

The Secretariat has taken the following analytical approach:

- The data cover prices of new-built ships (bulkers, containerships, crude tankers, product tankers and chemical tankers), which were contracted between January 2018 and January 2022.
- The price data is derived from Clarksons World Fleet Register, complemented as far as possible by article information (TradeWinds, Lloyd's List and other sources) and company press releases;
- Scatter plots are presented with prices on the vertical axis and contract dates on the horizontal axis;
- The mean (μ) and standard deviation (σ) values for each year are calculated, and the values of μ, μ±1σ and μ±2σ for each year are indicated to observe the developments of ship prices during the periods according to market conditions. For a random sample x with a normal distribution N(μ, σ2), the probability that an observation falls within ±1σ of the mean μ is about 68% and that within ±2σ is about 95%. In other words, if the deviation from the mean μ is greater than ±1σ, the data point is in the minority, and if the deviation from the mean μ is greater than ±2σ, the data point is rare;
- Plots represent a single plot for ships with several contracts. Orange shadings cover the range where the deviation from the mean μ is less than ±1σ. Orange lines indicate the mean value and boundaries of μ ±1σ and μ ±2σ.

- Without any prejudice or conclusion, outliers, values widely separated from the mean μ, in other words, ships priced beyond the value of μ±1σ are excerpted in tables to understand what concerns outliers for the better understanding of ship price developments;
- This analysis covers ship types and sizes for which the data collection rate for ship prices exceeds a certain level (50%).

This is a highly reproducible and non-arbitrary approach that allows anyone interested in reproducing the same methodology to obtain similar results by using publicly available data or data available via specific service data providers (Clarksons, IHS).

Description and analysis

Bulkers

For bulkers, information on ship prices was more difficult to obtain than for containerships and crude tankers. The reason for this is that, compared to these two last types of ships, 1) there is a wide variety of shipowners which cannot always be identified, and 2) less information is available from charterers at the time of contracting new-built ships because there are fewer time charter contracts.

In any case, this analysis focused on the two sizes for which the Secretariat was able to collect a certain level of ship price information: (1) 179-181 k dwt (Capesize Bulk Carriers) and (2) 208-210 k dwt (Very Large Bulk Carriers). The results are shown in Figure 6.12 to Figure 6.15.

From Figure 6.12, no particular trend can be observed. If anything, it looks a little like an uptrend. Meanwhile, from Figure 6.14, it can be seen that there is a significant upward trend in the level and variability of bulker prices in the 208-210 k dwt size range.

It is also worth noting that there is a mean + 2σ plot in Figure 6.12. Of course, this could be due to several reasons, including specifications of ships and particularities of individual contracts. In any case, to understand the shipbuilding market, it would be worth discussing the fact that the prices of some ships diverge widely in today's market.

Containerships

Containerships, in contrast to bulkers, are arguably the type of ship for which the most complete ship price information is available. The reasons for this is probably the relatively limited number and mostly identified shipowners and the strong links with charterers through regular chartering. For this reason, the data collection rate of ship prices is over 75% for all containerships. For the size subdivision, the classification in Clarksons Shipping Intelligence Network was used as reference (Feeder: 0-3k TEU, Intermediate: 3-8k TEU, Neo-Panamax: 8-15k TEU, Post-Panamax: 15k + TEU).

The results are shown in Figure 6.16 to Figure 6.21 for three size classes: (1) 2.5-3.1k TEU (Feeder), (2) 11-13k TEU (Neo-Panamax), (3) 23-25k TEU (Post-Panamax). From Figure 6.16, Figure 6.18 and Figure 6.20, it appears that there is an increasing trend in prices for containerships. It is also worth noting that there is a mean - 2σ plot in Figure 6.16.

Crude tankers

Crude tankers were also analyzed for vessels for which the Secretariat was able to collect a certain level of ship price information. The size subdivision is based on the classification in Clarkson's Shipping Intelligence Network (Aframax: 85-125 k dwt, Suezmax: 125-200 k dwt, UL/VLCC: 200 k+ dwt).

The results are shown in Figure 6.22 to Figure 6.27 for three size classes: (1) 111-117k dwt (Aframax), (2) 152-160k dwt (Suezmax), (3) 298-300k dwt (UL/VLCC). Figure 6.22, Figure 6.24 and Figure 6.26 do not

show a consistent trend. Figure 6.22 appears to be going up and down, Figure 6.24 seems to be in a downward trend, and Figure 6.26 does not appear to show many changes in prices. There is a possibility that these might be due to the volatility of the crude oil market and shifts in energy policy. It is also worth noting that there are mean + 2σ plots in all the three figures, and there is a mean - 2σ plot in Figure 6.26. Thus, the price fluctuations of crude oil tankers are not as uniform as those of bulk carriers and containerships and are likely to show variations these days.

Product tankers

The Secretariat added Product tankers to the scope of the analysis. The results are shown in Figure 6.28 and Figure 6.29 for one size class: (1) 49-50 dwt (MR). From Figure 6.28, the ship price trend appears to follow a gradual increase, but if three mean + 2σ plots are excluded, it seems a series of ups and downs.

Chemical tankers

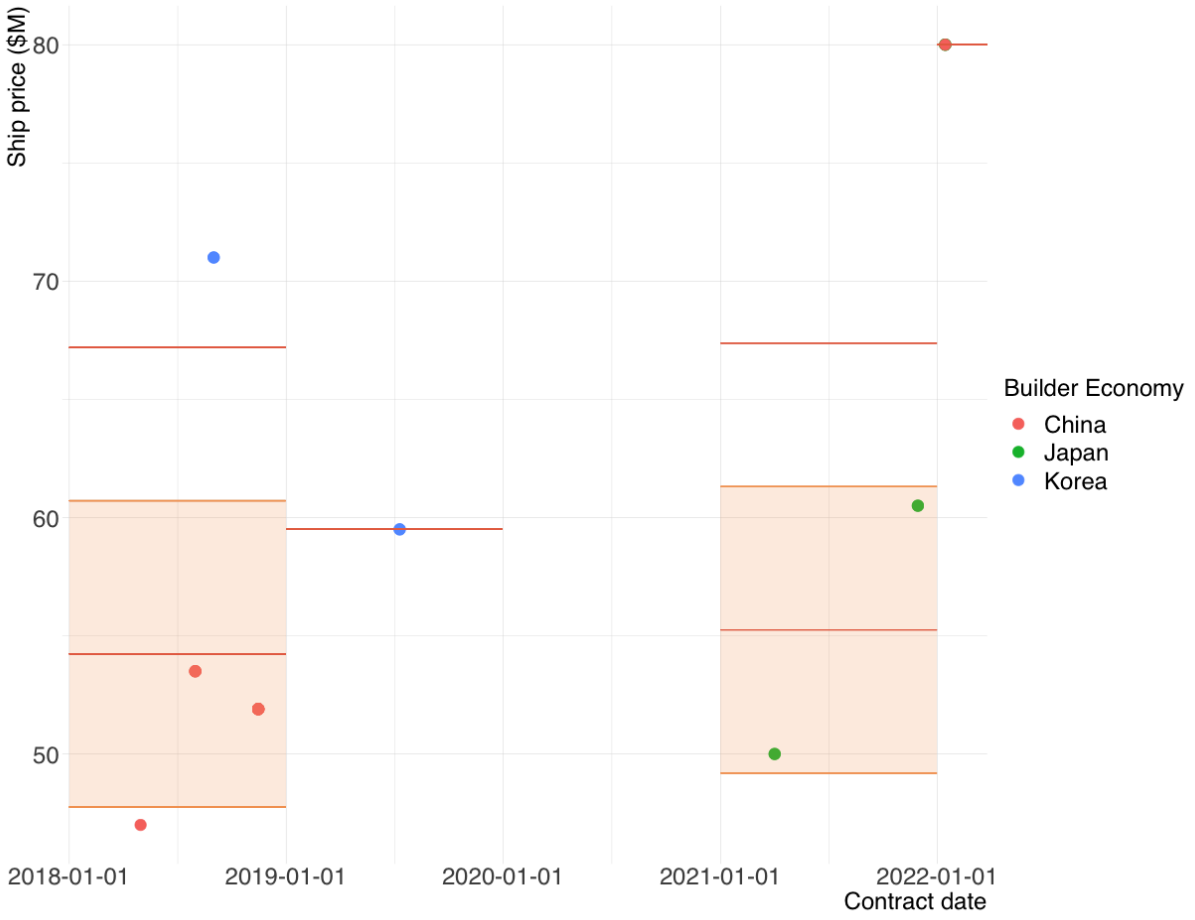
The Secretariat also tried to analyse prices of Chemical tankers. Chemical tankers were the type of ships for which it was the most difficult to collect price information among the five ship types analysed in this document. The results are shown in Figure 6.30 and Figure 6.31 for one size class: (1) 49-50 dwt (MR). From Figure 6.30, no trend is seen.

Comments from delegations on domestic shipyard contracts

In order to facilitate discussions on the developments of newbuilding prices for major ship types and ship size categories, the Secretariat invited WP6 members to give details in writing on domestic shipyard contracts before the 134th WP6 meeting taking place on 20-21 April 2022 through document C/WP6(2022)1 following the process described in paragraphs 79-80 of Document [C/WP6(2021)9]. The submitted comments are shown in **Error! Reference source not found.** to this document. This process will continue before each forthcoming WP6 meetings. At this stage, the Secretariat only received comments from the EU which are not specific to domestic shipyard contracts. The EU comments are summarised below :

- The diagrams indicates clearly that prices of bulkers and container ships have increased.
- It would be important to investigate the reasons for these price movements. In this context, the EU would importantly like to see a parallel analysis of costs evolution and also other factors that may influence price levels (to the extent that is possible). The same applies to outliers – the EU consider it importance that the OECD study in detail those cases where prices significantly deviate from the mean ("μ").
- Prices of container ships have experienced a decrease in the range of 15% to 32% in the period 2007 – 2021 so the supposed recent price increases should be put in that perspective.

Figure 6.12. Price developments for Bulkers (179-181 k dwt) during 2018-2022



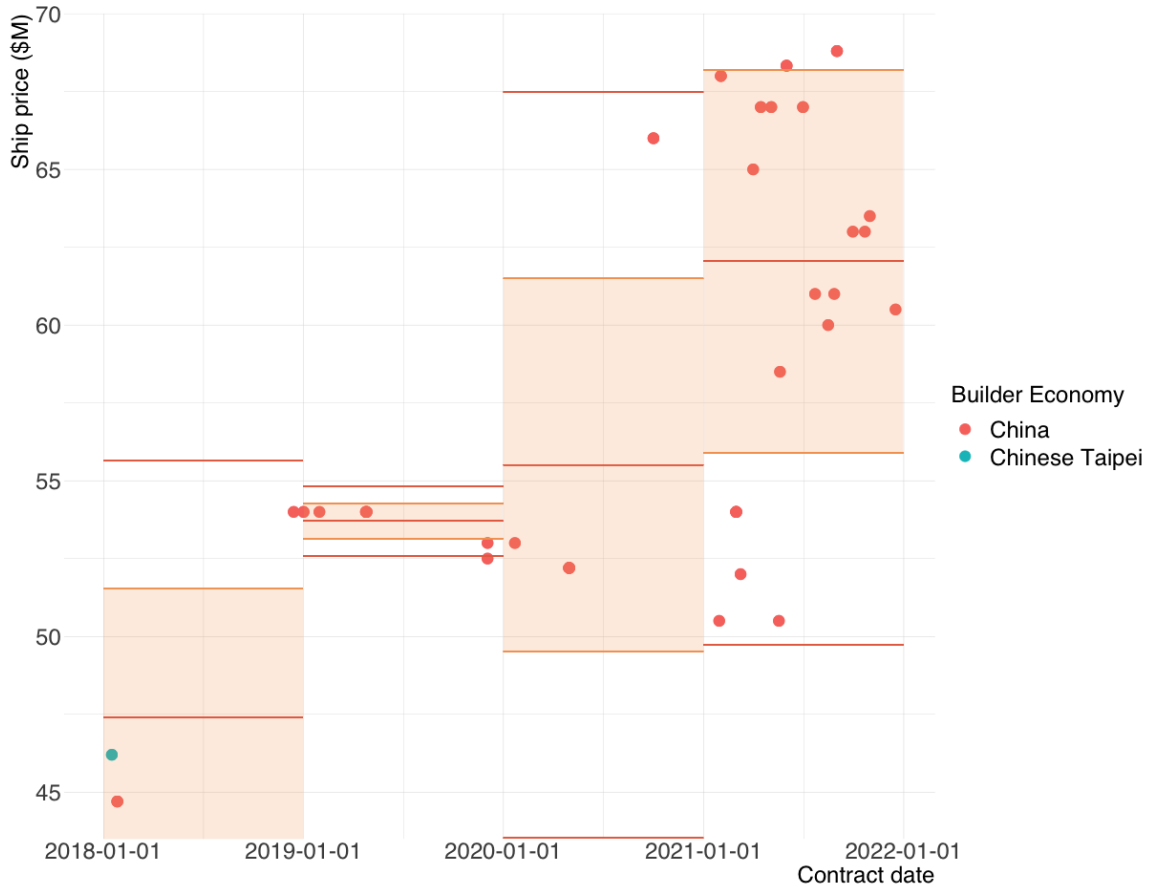
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Figure 6.13.Details of outliers for Bulkers (179-181 k dwt) during 2018-2022

IMO_Number	Name	Dwt	Contract_Date	Built_Date	Price ($m)	Builder	Builder_Group	Economy	Building_period
9869332	HL Eco	179,070	9-1-2018	11-1-2020	71	Hyundai Samho HI	Hyundai HI Group	Korea	792
9869344	HL Green	179,649	9-1-2018	12-1-2020	71	Hyundai Samho HI	Hyundai HI Group	Korea	822
9881495	Solar Majesty	180,516	5-1-2018	3-1-2020	47	Shanghai Waigaoqiao	CSSC	China	670

Source: Clarksons World Fleet Register and other sources.

Figure 6.14. Price developments for Bulkers (208-210 k dwt) during 2018-2022



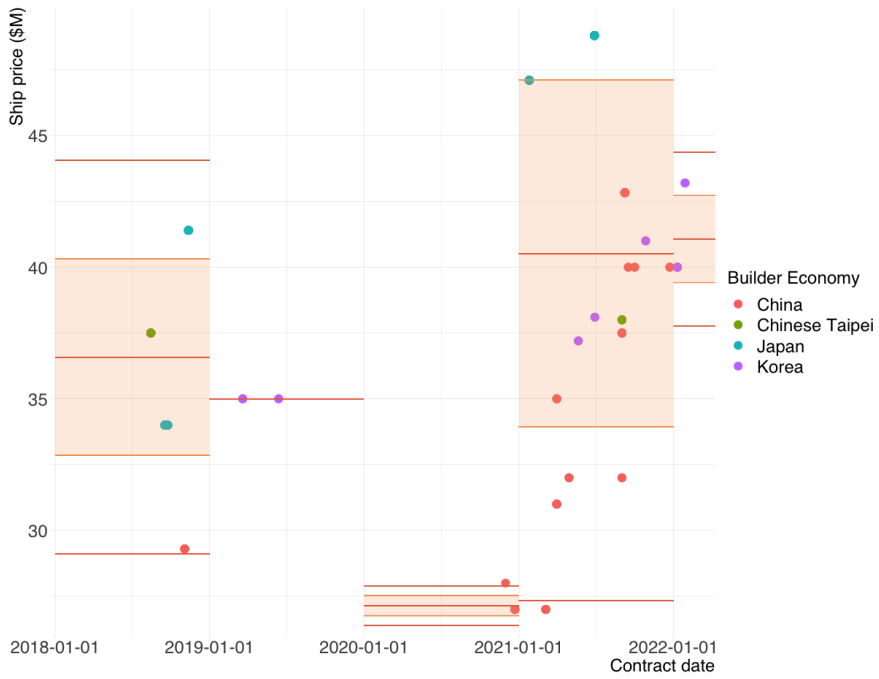
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Figure 6.15. Details of outliers for Bulkers (208-210 k dwt) during 2018-2022

IMO_Number	Name	Dwt	Contract_Date	Built_Date	Price ($m)	Builder	Builder_Group	Economy	Building_period
	N/B New Times SB	208,000	9-1-2021	8-1-2024	68.8	New Times SB	New Century SB Group	China	1065
	N/B New Times SB	208,000	9-1-2021	9-1-2024	68.8	New Times SB	New Century SB Group	China	1096
	N/B New Times SB	208,000	9-1-2021	4-1-2024	68.8	New Times SB	New Century SB Group	China	943
	N/B New Times SB	208,000	9-1-2021	7-1-2024	68.8	New Times SB	New Century SB Group	China	1034
	N/B New Times SB	208,000	6-1-2021	9-1-2023	68.33	New Times SB	New Century SB Group	China	822
	N/B New Times SB	208,000	6-1-2021	10-1-2023	68.33	New Times SB	New Century SB Group	China	852
	N/B New Times SB	208,000	6-1-2021	12-1-2023	68.33	New Times SB	New Century SB Group	China	913
	N/B New Times SB	208,000	6-1-2021	2-1-2024	68.33	New Times SB	New Century SB Group	China	975
	N/B Beihai Shipyard Qingdao BC210K-15	210,000	5-18-2021	8-1-2023	50.5	Beihai Shipyard	CSSC	China	805
	N/B Beihai Shipyard	210,000	5-18-2021	11-1-2023	50.5	Beihai Shipyard	CSSC	China	897
	N/B Shanghai Waigaoqiao Shanghai H1529	210,000	3-9-2021	9-1-2022	52	Shanghai Waigaoqiao	CSSC	China	541
	N/B Shanghai Waigaoqiao Shanghai H1530	210,000	3-9-2021	11-1-2022	52	Shanghai Waigaoqiao	CSSC	China	602
	N/B COSCO HI (Yangzhou)	210,000	3-1-2021	1-1-2023	54	COSCO HI (Yangzhou)	COSCO Shipping HI	China	671
	N/B COSCO HI (Yangzhou)	210,000	3-1-2021	1-1-2023	54	COSCO HI (Yangzhou)	COSCO Shipping HI	China	671
9939357	N/B COSCO HI (Yangzhou) Yangzhou N1051	210,000	3-1-2021	1-1-2023	54	COSCO HI (Yangzhou)	COSCO Shipping HI	China	671
9939369	N/B COSCO HI (Yangzhou) Yangzhou N1052	210,000	3-1-2021	1-1-2024	54	COSCO HI (Yangzhou)	COSCO Shipping HI	China	1036
	N/B COSCO HI (Yangzhou)	210,000	3-1-2021	1-1-2024	54	COSCO HI (Yangzhou)	COSCO Shipping HI	China	1036
	N/B COSCO HI (Yangzhou)	210,000	3-1-2021	1-1-2024	54	COSCO HI (Yangzhou)	COSCO Shipping HI	China	1036
	N/B Beihai Shipyard Qingdao BC210K-11	210,000	1-29-2021	11-1-2022	50.5	Beihai Shipyard	CSSC	China	641
	N/B Beihai Shipyard Qingdao BC210K-12	210,000	1-29-2021	2-1-2023	50.5	Beihai Shipyard	CSSC	China	733
9927976	N/B New Times SB Taizhou 0120826	208,000	10-1-2020	1-1-2022	66	New Times SB	New Century SB Group	China	457
9927988	N/B New Times SB Taizhou 0102827	208,000	10-1-2020	1-1-2022	66	New Times SB	New Century SB Group	China	457
9927990	N/B New Times SB Taizhou 0120828	208,000	10-1-2020	1-1-2023	66	New Times SB	New Century SB Group	China	822
9900772	N/B Shanghai Waigaoqiao Shanghai H1531	209,000	12-3-2019	11-1-2021	52.5	Shanghai Waigaoqiao	CSSC	China	699
	N/B Shanghai Waigaoqiao Shanghai H1532	209,000	12-3-2019	2-1-2022	52.5	Shanghai Waigaoqiao	CSSC	China	791
9906013	Trust Qingdao	210,000	12-3-2019	2-1-2021	53	Shanghai Waigaoqiao	CSSC	China	426
9906025	Trust Shanghai	210,000	12-3-2019	4-1-2021	53	Shanghai Waigaoqiao	CSSC	China	485
9881110	Solar Nova	208,892	12-14-2018	1-1-2021	54	New Times SB	New Century SB Group	China	749
9881122	Solar Oak	208,915	12-14-2018	1-1-2021	54	New Times SB	New Century SB Group	China	749

Source: Clarksons World Fleet Register and other sources.

Figure 6.16. Price developments for Containerships (2.5-3.1 k TEU) during 2018-2022



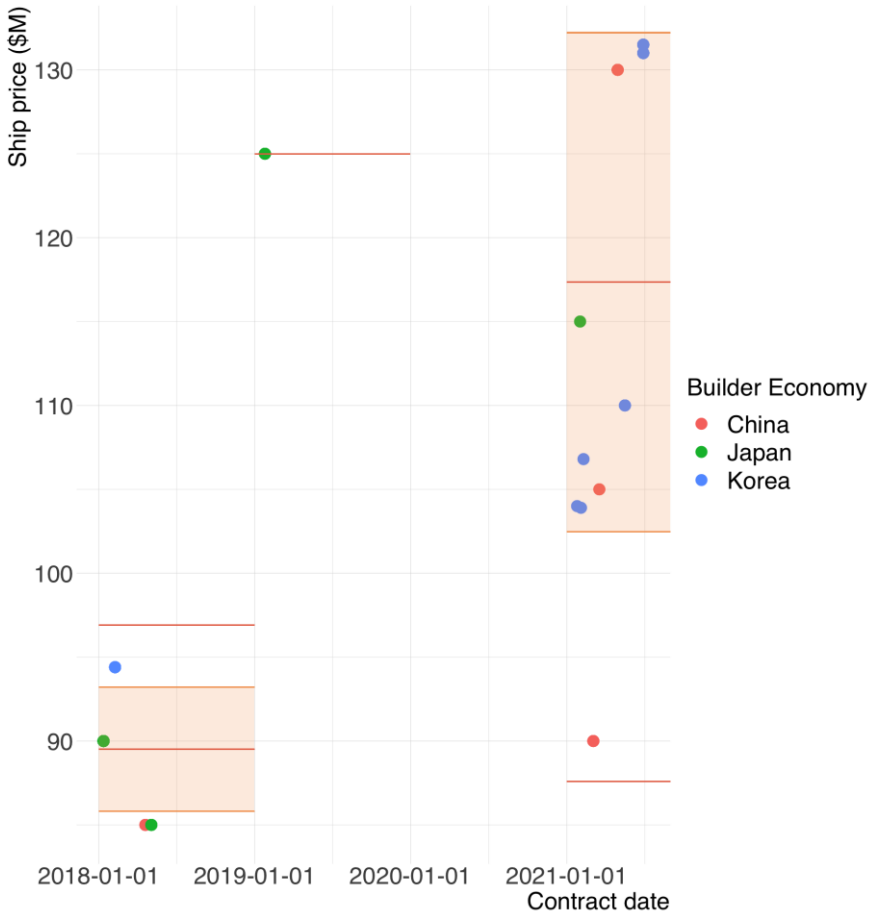
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Figure 6.17. Details of outliers for Containerships (2.5-3.1 k TEU) during 2018-2022

IMO_Number	Name	TEU	Contract_Date	Built_Date	Price ($m)	Builder	Builder_Group	Economy	Building_period
	N/B Hyundai Mipo	2,800	1-28-2022	11-1-2023	43.2	Hyundai Mipo	Hyundai HI Group	Korea	642
	N/B Hyundai Mipo	2,800	1-28-2022	2-1-2024	43.2	Hyundai Mipo	Hyundai HI Group	Korea	734
	N/B Huangpu Wenchong	2,700	9-1-2021	1-1-2023	32	Huangpu Wenchong	CSSC	China	487
	N/B Huangpu Wenchong	2,700	9-1-2021	1-1-2023	32	Huangpu Wenchong	CSSC	China	487
9954450	N/B JMU Tsu Shipyard Tsu 5505	3,055	6-28-2021	7-1-2023	48.8	JMU Tsu Shipyard	Japan Marine United	Japan	733
9954462	N/B JMU Tsu Shipyard Tsu 5506	3,055	6-28-2021	8-1-2023	48.8	JMU Tsu Shipyard	Japan Marine United	Japan	764
9954474	N/B JMU Tsu Shipyard Tsu 5507	3,055	6-28-2021	9-1-2023	48.8	JMU Tsu Shipyard	Japan Marine United	Japan	795
9954486	N/B JMU Tsu Shipyard Tsu 5508	3,055	6-28-2021	10-1-2023	48.8	JMU Tsu Shipyard	Japan Marine United	Japan	825
9954498	N/B JMU Tsu Shipyard Tsu 5509	3,055	6-28-2021	11-1-2023	48.8	JMU Tsu Shipyard	Japan Marine United	Japan	856
9954503	N/B JMU Tsu Shipyard Tsu 5510	3,055	6-28-2021	12-1-2023	48.8	JMU Tsu Shipyard	Japan Marine United	Japan	886
9958080	N/B JMU Tsu Shipyard Tsu 5511	3,055	6-28-2021	1-1-2024	48.8	JMU Tsu Shipyard	Japan Marine United	Japan	917
9958092	N/B JMU Tsu Shipyard Tsu 5512	3,055	6-28-2021	2-1-2024	48.8	JMU Tsu Shipyard	Japan Marine United	Japan	948
9958107	N/B JMU Tsu Shipyard Tsu 5513	3,055	6-28-2021	3-1-2024	48.8	JMU Tsu Shipyard	Japan Marine United	Japan	977
9958119	N/B JMU Tsu Shipyard Tsu 5515	3,055	6-28-2021	4-1-2024	48.8	JMU Tsu Shipyard	Japan Marine United	Japan	1008
9958121	N/B JMU Tsu Shipyard Tsu 5516	3,055	6-28-2021	5-1-2024	48.8	JMU Tsu Shipyard	Japan Marine United	Japan	1038
9958133	N/B JMU Tsu Shipyard Tsu 5517	3,055	6-28-2021	6-1-2024	48.8	JMU Tsu Shipyard	Japan Marine United	Japan	1069
	N/B Huangpu Wenchong	2,700	4-29-2021	1-1-2023	32	Huangpu Wenchong	CSSC	China	612
	N/B Huangpu Wenchong	2,700	4-29-2021	1-1-2023	32	Huangpu Wenchong	CSSC	China	612
9936446	N/B Zhoushan Changhong Zhoushan CHB076	2,500	3-31-2021	11-1-2022	31	Zhoushan Changhong	Zhoushan Changhong	China	580
9936458	N/B Zhoushan Changhong Zhoushan CHB077	2,500	3-31-2021	1-1-2023	31	Zhoushan Changhong	Zhoushan Changhong	China	641
9936460	N/B Zhoushan Changhong Zhoushan CHB080	2,500	3-31-2021	5-1-2023	31	Zhoushan Changhong	Zhoushan Changhong	China	761
9936472	N/B Zhoushan Changhong Zhoushan CHB081	2,500	3-31-2021	6-1-2023	31	Zhoushan Changhong	Zhoushan Changhong	China	792
9936484	N/B Zhoushan Changhong Zhoushan CHB082	2,500	3-31-2021	10-1-2023	31	Zhoushan Changhong	Zhoushan Changhong	China	914
9936496	N/B Zhoushan Changhong Zhoushan CHB083	2,500	3-31-2021	1-1-2024	31	Zhoushan Changhong	Zhoushan Changhong	China	1006
	N/B Jiangsu New YZJ	2,600	3-5-2021	3-1-2023	27	Jiangsu New YZJ	Yangzijiang Holdings	China	726
	N/B Jiangsu New YZJ	2,600	3-5-2021	4-1-2023	27	Jiangsu New YZJ	Yangzijiang Holdings	China	757
	N/B Jiangsu New YZJ	2,600	3-5-2021	4-1-2023	27	Jiangsu New YZJ	Yangzijiang Holdings	China	757
	N/B Jiangsu New YZJ	2,600	3-5-2021	5-1-2023	27	Jiangsu New YZJ	Yangzijiang Holdings	China	787
	N/B Jiangsu New YZJ Taizhou YZJ2015-2223	2,700	11-30-2020	10-1-2021	28	Jiangsu New YZJ	Yangzijiang Holdings	China	305
9871505	Wan Hai 328	3,036	11-12-2018	5-1-2021	41.4	JMU Kure Shipyard	Japan Marine United	Japan	901
9871517	Wan Hai 329	3,036	11-12-2018	5-1-2021	41.4	JMU Kure Shipyard	Japan Marine United	Japan	901
9871440	Wan Hai 321	3,036	11-12-2018	9-1-2020	41.4	JMU Kure Shipyard	Japan Marine United	Japan	659
9871452	Wan Hai 322	3,036	11-12-2018	10-1-2020	41.4	JMU Kure Shipyard	Japan Marine United	Japan	689
9871464	Wan Hai 323	3,036	11-12-2018	12-1-2020	41.4	JMU Kure Shipyard	Japan Marine United	Japan	750
9871476	Wan Hai 325	3,036	11-12-2018	12-1-2020	41.4	JMU Kure Shipyard	Japan Marine United	Japan	750
9871488	Wan Hai 326	3,036	11-12-2018	3-1-2021	41.4	JMU Kure Shipyard	Japan Marine United	Japan	840
9871490	Wan Hai 327	3,036	11-12-2018	3-1-2021	41.4	JMU Kure Shipyard	Japan Marine United	Japan	840
9870836	SITC Port Klang	2,700	11-3-2018	10-1-2020	29.3	Jiangsu New YZJ	Yangzijiang Holdings	China	698
9870848	SITC Penang	2,700	11-3-2018	12-1-2020	29.3	Jiangsu New YZJ	Yangzijiang Holdings	China	759
9870850	SITC Singapore	2,700	11-3-2018	1-1-2021	29.3	Jiangsu New YZJ	Yangzijiang Holdings	China	790

Source: Clarksons World Fleet Register and other sources.

Figure 6.18. Price developments for Containerships (11-13 k TEU) during 2018-2022



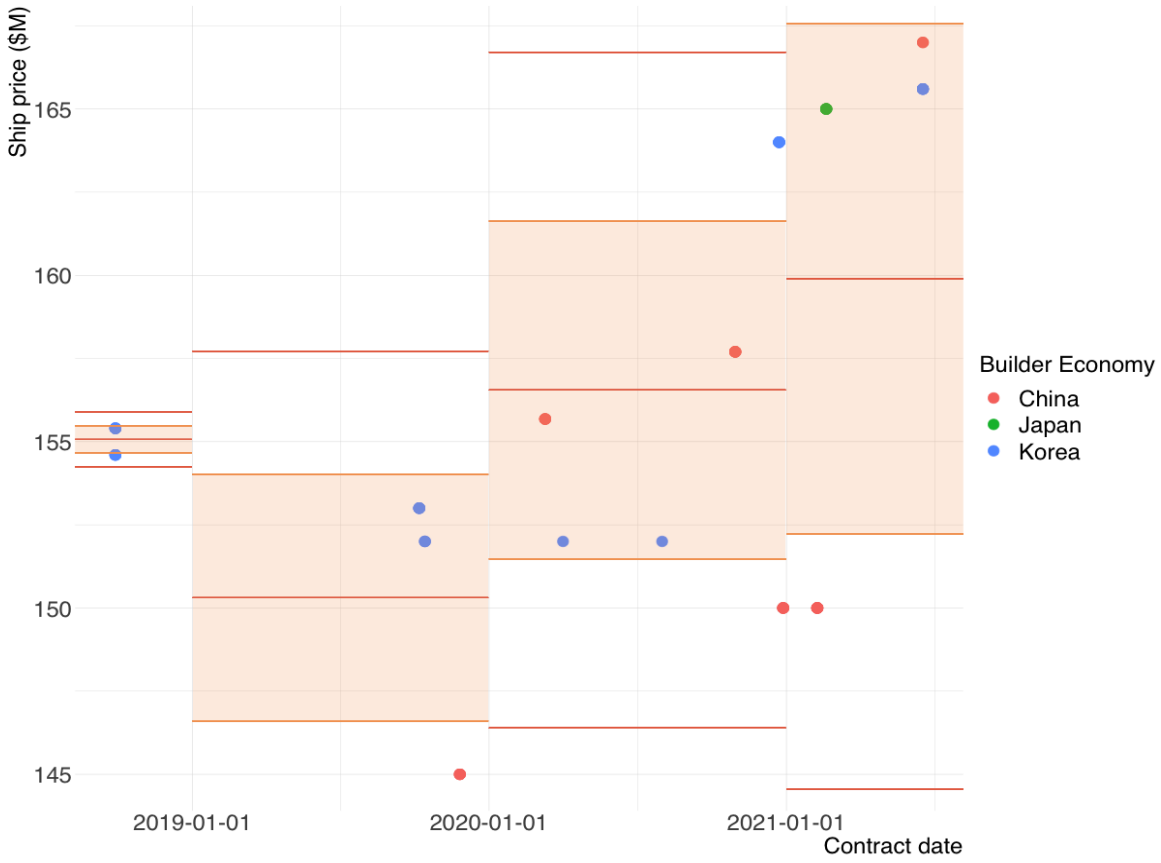
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Figure 6.19. Details of outliers for Containerships (11-13 k TEU) during 2018-2022

IMO_Number	Name	TEU	Contract_Date	Built_Date	Price ($m)	Builder	Builder_Group	Economy	Building_period
9937311	N/B Yangzi Xinfu SB Taizhou YZJ2015-2270	11,800	3-4-2021	7-1-2022	90	Yangzi Xinfu SB	Yangzijiang Holdings	China	484
9937323	N/B Yangzi Xinfu SB Taizhou YZJ2015-2271	11,800	3-4-2021	8-1-2022	90	Yangzi Xinfu SB	Yangzijiang Holdings	China	515
9937335	N/B Yangzi Xinfu SB Taizhou YZJ2015-2822	11,800	3-4-2021	9-1-2022	90	Yangzi Xinfu SB	Yangzijiang Holdings	China	546
9937347	N/B Yangzi Xinfu SB Taizhou YZJ2015-2823	11,800	3-4-2021	10-1-2022	90	Yangzi Xinfu SB	Yangzijiang Holdings	China	576
9792682	N/B Imabari SB Marugame Marugame 2682	11,714	4-27-2018	1-1-2022	85	Imabari SB Marugame	Imabari Shipbuilding	Japan	1345
9792694	N/B Imabari SB Marugame Marugame 2683	11,714	4-27-2018	4-1-2022	85	Imabari SB Marugame	Imabari Shipbuilding	Japan	1435
9792709	N/B Imabari SB Marugame Marugame 2685	11,714	4-27-2018	6-1-2022	85	Imabari SB Marugame	Imabari Shipbuilding	Japan	1496
	N/B Imabari SB Marugame	11,714	4-27-2018	1-1-2022	85	Imabari SB Marugame	Imabari Shipbuilding	Japan	1345
	N/B Imabari SB Marugame	11,714	4-27-2018	1-1-2022	85	Imabari SB Marugame	Imabari Shipbuilding	Japan	1345
9860908	YM Triumph	12,690	4-27-2018	7-1-2020	85	Yangzi Xinfu SB	Yangzijiang Holdings	China	796
9860910	YM Truth	12,690	4-27-2018	8-1-2020	85	Yangzi Xinfu SB	Yangzijiang Holdings	China	827
9860922	YM Totality	12,690	4-27-2018	9-1-2020	85	Yangzi Xinfu SB	Yangzijiang Holdings	China	858
9860934	YM Target	12,690	4-27-2018	2-1-2021	85	Yangzi Xinfu SB	Yangzijiang Holdings	China	1011
9860946	YM Tiptop	12,690	4-27-2018	5-1-2021	85	Yangzi Xinfu SB	Yangzijiang Holdings	China	1100
9850537	Ever Focus	12,118	2-8-2018	6-1-2020	94.4	Samsung HI	Samsung HI	Korea	844
9850549	Ever Front	12,118	2-8-2018	8-1-2020	94.4	Samsung HI	Samsung HI	Korea	905
9850551	Ever Forward	12,118	2-8-2018	9-1-2020	94.4	Samsung HI	Samsung HI	Korea	936
9850563	Ever Fortune	12,118	2-8-2018	10-1-2020	94.4	Samsung HI	Samsung HI	Korea	966
9850575	Ever Forever	12,118	2-8-2018	12-1-2020	94.4	Samsung HI	Samsung HI	Korea	1027
9850587	Ever Frank	12,118	2-8-2018	2-1-2021	94.4	Samsung HI	Samsung HI	Korea	1089
9850525	Ever Faith	12,118	2-8-2018	3-1-2020	94.4	Samsung HI	Samsung HI	Korea	752
9850599	Ever Future	12,118	2-8-2018	4-1-2021	94.4	Samsung HI	Samsung HI	Korea	1148

Source: Clarksons World Fleet Register and other sources.

Figure 6.20. Price developments for Containerships (23-25 k TEU) during 2018-2022



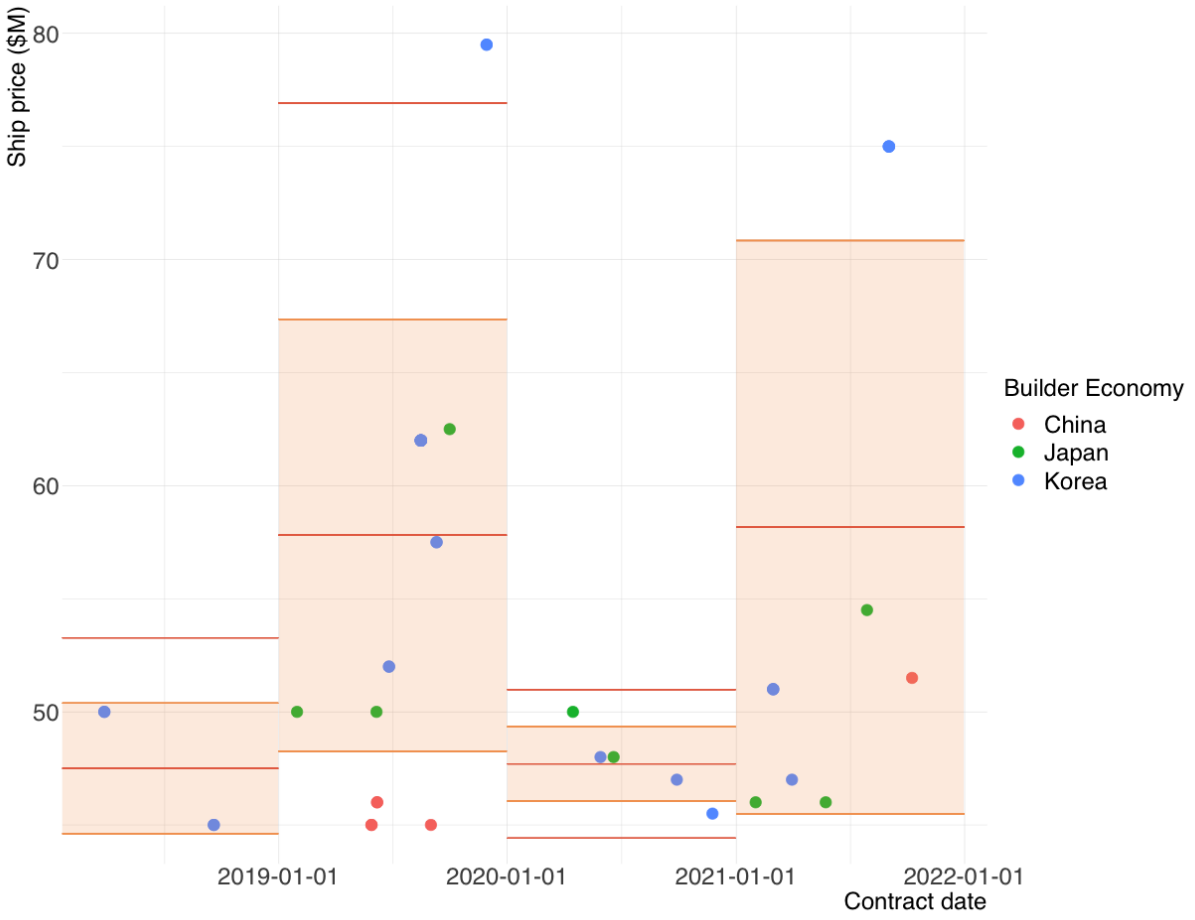
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Figure 6.21. Details of outliers for Containerships (23-25 k TEU) during 2018-2022

IMO_Number	Name	TEU	Contract_Date	Built_Date	Price ($m)	Builder	Builder_Group	Economy	Building_period
	N/B Hudong Zhonghua Shanghai H1866A	24,100	2-8-2021	1-1-2023	150	Hudong Zhonghua	CSSC	China	692
	N/B Hudong Zhonghua Shanghai H1867A	24,100	2-8-2021	1-1-2023	150	Hudong Zhonghua	CSSC	China	692
	N/B Jiangnan SY Group Shanghai H2734	24,100	2-8-2021	1-1-2023	150	Jiangnan SY Group	CSSC	China	692
	N/B Jiangnan SY Group Shanghai H2741	24,100	2-8-2021	1-1-2023	150	Jiangnan SY Group	CSSC	China	692
	N/B Yangzi Xinfu SB	24,000	2-8-2021	2-1-2023	150	Yangzi Xinfu SB	Yangzijiang Holdings	China	723
	N/B Yangzi Xinfu SB	24,000	2-8-2021	5-1-2023	150	Yangzi Xinfu SB	Yangzijiang Holdings	China	812
	N/B Yangzi Xinfu SB Taizhou YZJ2015-2335	24,000	2-8-2021	2-1-2023	150	Yangzi Xinfu SB	Yangzijiang Holdings	China	723
	N/B Yangzi Xinfu SB	24,000	2-8-2021	5-1-2023	150	Yangzi Xinfu SB	Yangzijiang Holdings	China	812
	N/B Hudong Zhonghua	24,100	12-28-2020	1-1-2023	150	Hudong Zhonghua	CSSC	China	734
	N/B Hudong Zhonghua	24,100	12-28-2020	1-1-2023	150	Hudong Zhonghua	CSSC	China	734
	N/B Jiangnan SY Group	24,100	12-28-2020	1-1-2023	150	Jiangnan SY Group	CSSC	China	734
	N/B Jiangnan SY Group	24,100	12-28-2020	1-1-2023	150	Jiangnan SY Group	CSSC	China	734
	N/B Yangzi Xinfu SB	24,232	12-28-2020	1-1-2023	150	Yangzi Xinfu SB	Yangzijiang Holdings	China	734
	N/B Yangzi Xinfu SB	24,232	12-28-2020	1-1-2023	150	Yangzi Xinfu SB	Yangzijiang Holdings	China	734
9540118	N/B Daewoo (DSME) Geoje 4360	23,500	12-23-2020	4-1-2023	164	Daewoo (DSME)	Daewoo (DSME)	Korea	829
9540120	N/B Daewoo (DSME) Geoje 4361	23,500	12-23-2020	6-1-2023	164	Daewoo (DSME)	Daewoo (DSME)	Korea	890
9540132	N/B Daewoo (DSME) Geoje 4362	23,500	12-23-2020	7-1-2023	164	Daewoo (DSME)	Daewoo (DSME)	Korea	920
9540144	N/B Daewoo (DSME) Geoje 4363	23,500	12-23-2020	9-1-2023	164	Daewoo (DSME)	Daewoo (DSME)	Korea	982
9543093	N/B Daewoo (DSME) Geoje 4364	23,500	12-23-2020	11-1-2023	164	Daewoo (DSME)	Daewoo (DSME)	Korea	1043
9543108	N/B Daewoo (DSME) Geoje 4365	23,500	12-23-2020	12-1-2023	164	Daewoo (DSME)	Daewoo (DSME)	Korea	1073
9893979	N/B Jiangnan SY Group Shanghai H2630	23,888	11-26-2019	5-1-2022	145	Jiangnan SY Group	CSSC	China	887
9893993	N/B Jiangnan SY Group	23,888	11-26-2019	8-1-2022	145	Jiangnan SY Group	CSSC	China	979
9893955	N/B SCS Shipbuilding Shanghai H1858A	23,888	11-26-2019	5-1-2022	145	SCS Shipbuilding	CSSC	China	887
9909132	N/B SCS Shipbuilding	23,888	11-26-2019	8-1-2022	145	SCS Shipbuilding	CSSC	China	979
9868326	HMM Oslo	23,792	9-28-2018	5-1-2020	154.6	Samsung HI	Samsung HI	Korea	581
9868338	HMM Rotterdam	23,792	9-28-2018	6-1-2020	154.6	Samsung HI	Samsung HI	Korea	612
9868340	HMM Southampton	23,792	9-28-2018	8-1-2020	154.6	Samsung HI	Samsung HI	Korea	673
9868352	HMM Stockholm	23,792	9-28-2018	8-1-2020	154.6	Samsung HI	Samsung HI	Korea	673
9868364	HMM St. Petersburg	23,792	9-28-2018	9-1-2020	154.6	Samsung HI	Samsung HI	Korea	704

Source: Clarksons World Fleet Register and other sources.

Figure 6.22. Price developments for Crude tankers (111-117 k dwt) during 2018-2022



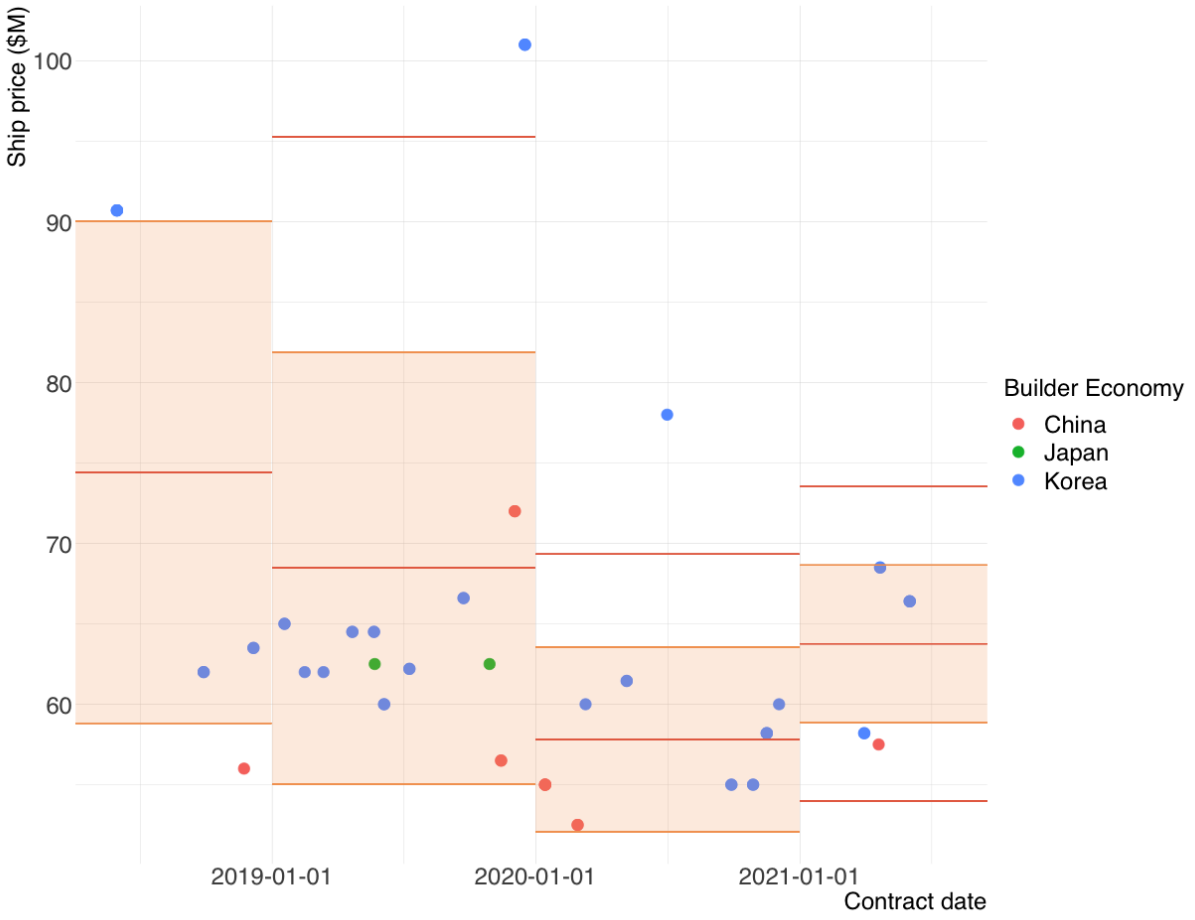
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Figure 6.23. Details of outliers for Crude tankers (111-117 k dwt) during 2018-2022

IMO_Number	Name	Dwt	Contract_Date	Built_Date	Price ($m)	Builder	Builder_Group	Economy	Building_period
	N/B Daehan Shipbuilding Haenam 5081	115,000	9-2-2021	9-1-2023	75	Daehan Shipbuilding	Daehan Shipbuilding	Korea	729
	N/B Daehan Shipbuilding Haenam 5082	115,000	9-2-2021	10-1-2023	75	Daehan Shipbuilding	Daehan Shipbuilding	Korea	759
	N/B Daehan Shipbuilding Haenam 5083	115,000	9-2-2021	11-1-2023	75	Daehan Shipbuilding	Daehan Shipbuilding	Korea	790
	N/B Daehan Shipbuilding Haenam 5084	115,000	9-2-2021	12-1-2023	75	Daehan Shipbuilding	Daehan Shipbuilding	Korea	820
	N/B Daehan Shipbuilding	115,000	11-24-2020	3-1-2022	45.5	Daehan Shipbuilding	Daehan Shipbuilding	Korea	462
9910533	N/B Sumitomo (Yokosuka) Yokosuka 1408	112,000	4-15-2020	1-1-2022	50	Sumitomo (Yokosuka)	Sumitomo HI	Japan	626
9901025	N/B Samsung HI Geoje 2367	114,000	11-29-2019	1-1-2022	79.5	Samsung HI	Samsung HI	Korea	764
9901037	N/B Samsung HI Geoje 2368	114,000	11-29-2019	3-1-2022	79.5	Samsung HI	Samsung HI	Korea	823
9903918	Sea Dragon	114,000	9-1-2019	10-1-2021	45	Shanghai Waigaoqiao	CSSC	China	761
9891660	Aigeorgis	116,092	6-7-2019	5-1-2021	46	New Times SB	New Century SB Group	China	694
9891672	Pegasus Star	115,000	6-7-2019	8-1-2021	46	New Times SB	New Century SB Group	China	786
9886718	Sea Turtle	114,085	5-29-2019	5-1-2021	45	Shanghai Waigaoqiao	CSSC	China	703
9886720	Sea Urchin	114,000	5-29-2019	7-1-2021	45	Shanghai Waigaoqiao	CSSC	China	764

Source: Clarksons World Fleet Register and other sources.

Figure 6.24. Price developments for Crude tankers (152-160 k dwt) during 2018-2022



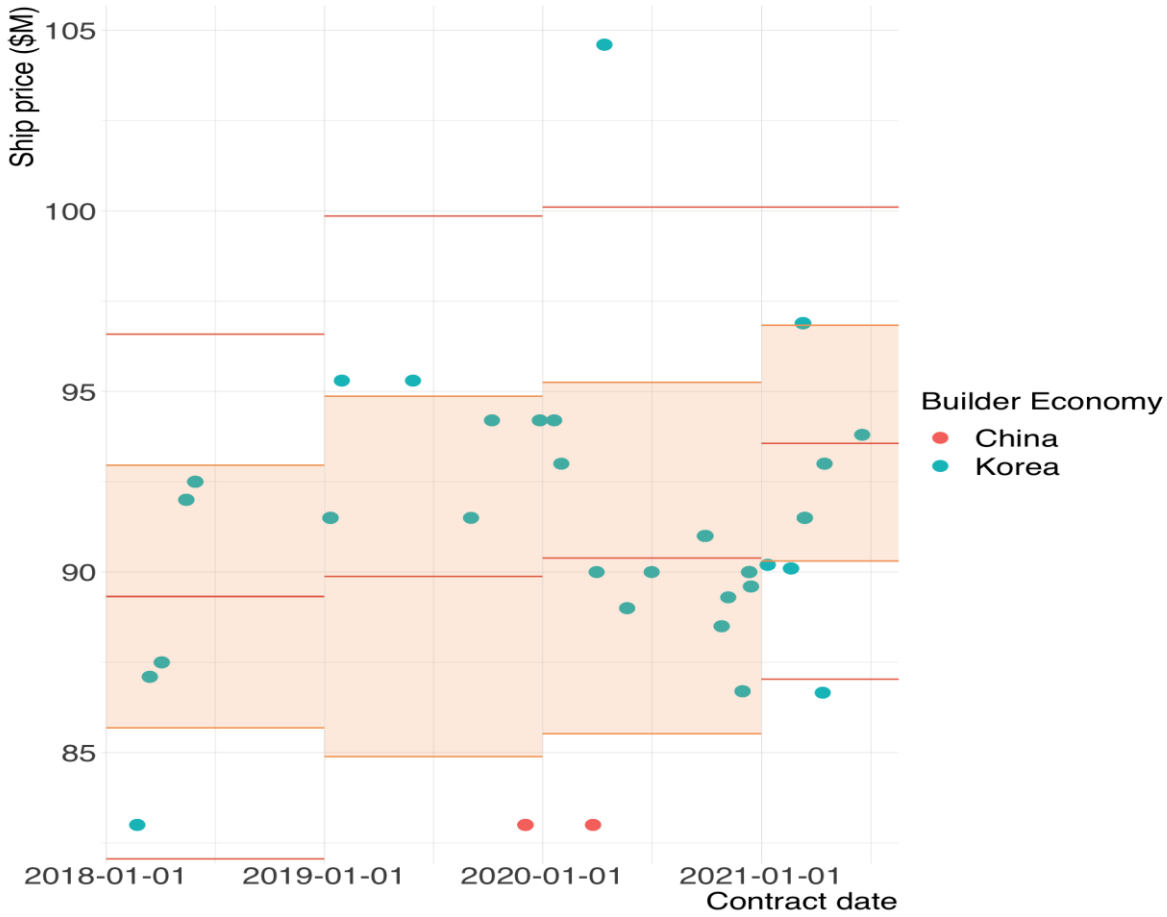
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Figure 6.25. Details of outliers for Crude tankers (152-160 k dwt) during 2018-2022

IMO_Number	Name	Dwt	Contract_Date	Built_Date	Price ($m)	Builder	Builder_Group	Economy	Building_period
	N/B New Times SB	156,500	4-20-2021	1-1-2023	57.5	New Times SB	New Century SB Group	China	621
	N/B Samsung HI	157,000	3-31-2021	1-1-2023	58.2	Samsung HI	Samsung HI	Korea	641
	N/B Samsung HI	157,000	3-31-2021	1-1-2023	58.2	Samsung HI	Samsung HI	Korea	641
	N/B Daehan Shipbuilding Haenam 5800	155,000	7-1-2020	6-1-2022	78	Daehan Shipbuilding	Daehan Shipbuilding	Korea	700
9902225	Eagle Ampos	153,000	12-17-2019	11-1-2021	101	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	685
9902237	N/B Hyundai HI (Ulsan) Ulsan 3196	153,000	12-17-2019	1-1-2022	101	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	746
9902249	N/B Hyundai HI (Ulsan) Ulsan 3197	153,000	12-17-2019	4-1-2022	101	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	836
9872688	Bella Ciao	156,586	11-23-2018	7-1-2020	56	New Times SB	New Century SB Group	China	586
9858553	Eagle Petrolina	153,227	5-31-2018	5-1-2020	90.7	Samsung HI	Samsung HI	Korea	701
9858589	Eagle Passos	153,291	5-31-2018	11-1-2020	90.7	Samsung HI	Samsung HI	Korea	885
9858565	Eagle Paulinia	152,700	5-31-2018	7-1-2020	90.7	Samsung HI	Samsung HI	Korea	762
9858577	Eagle Paraiso	152,700	5-31-2018	9-1-2020	90.7	Samsung HI	Samsung HI	Korea	824

Source: Clarksons World Fleet Register and other sources.

Figure 6.26. Price developments for Crude tankers (298-300 k dwt) during 2018-2022



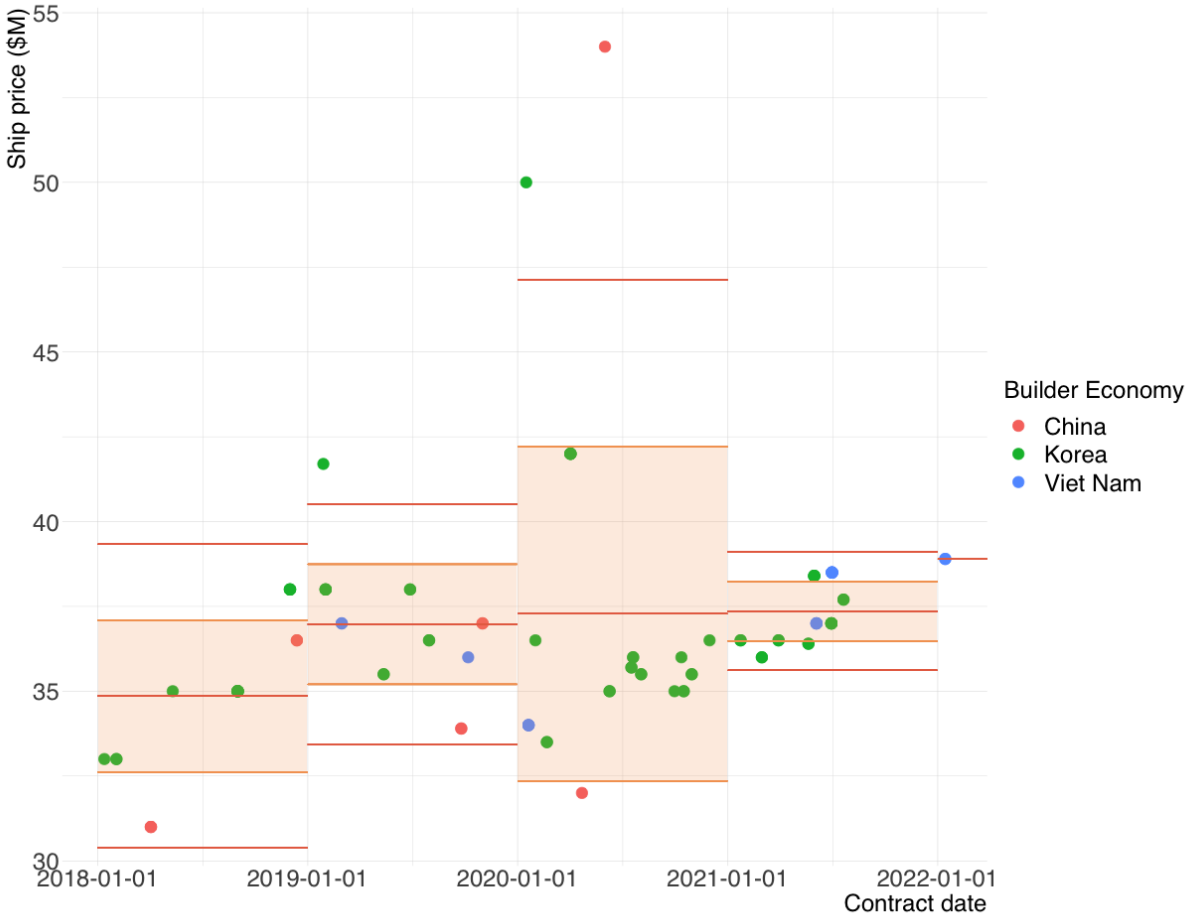
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Figure 6.27. Details of outliers for Crude tankers (298-300 k dwt) during 2018-2022

IMO_Number	Name	Dwt	Contract_Date	Built_Date	Price ($m)	Builder	Builder_Group	Economy	Building_period
9937799	N/B Daewoo (DSME) Geoje 5507	300,000	4-13-2021	2-1-2023	86.66	Daewoo (DSME)	Daewoo (DSME)	Korea	659
	N/B Hyundai Samho HI	300,000	2-19-2021	8-1-2022	90.1	Hyundai Samho HI	Hyundai HI Group	Korea	528
	N/B Hyundai Samho HI	300,000	2-19-2021	10-1-2022	90.1	Hyundai Samho HI	Hyundai HI Group	Korea	589
	N/B Hyundai Samho HI	300,000	2-19-2021	12-1-2022	90.1	Hyundai Samho HI	Hyundai HI Group	Korea	650
9928645	Hellas Fos II	299,169	1-11-2021	5-1-2022	90.2	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	475
9928657	Hellas Tiger	299,169	1-11-2021	8-1-2022	90.2	Hyundai HI (Ulsan)	Hyundai HI Group	Korea	567
9910234	N/B Samsung HI Geoje 2388	300,000	4-13-2020	1-1-2022	104.6	Samsung HI	Samsung HI	Korea	628
9910246	N/B Samsung HI Geoje 2389	300,000	4-13-2020	3-1-2022	104.6	Samsung HI	Samsung HI	Korea	687
	N/B Dalian Shipbuilding	300,000	3-25-2020	7-1-2022	83	Dalian Shipbuilding	CSSC	China	828
	N/B Dalian Shipbuilding	300,000	3-25-2020	9-1-2022	83	Dalian Shipbuilding	CSSC	China	890
9900679	N/B Dalian Shipbuilding Dalian T300K-97	300,000	12-3-2019	3-1-2022	83	Dalian Shipbuilding	CSSC	China	819
9900681	N/B Dalian Shipbuilding Dalian T300K-98	300,000	12-3-2019	5-1-2022	83	Dalian Shipbuilding	CSSC	China	880
9896414	Hunter	299,940	10-8-2019	2-1-2021	94.2	Hyundai Samho HI	Hyundai HI Group	Korea	482
9885594	Halcyon	299,942	5-29-2019	11-1-2020	95.3	Hyundai Samho HI	Hyundai HI Group	Korea	522
9878826	Babylon	299,700	1-30-2019	6-1-2020	95.3	Hyundai Samho HI	Hyundai HI Group	Korea	488
9849851	V. Glory	299,682	2-22-2018	11-1-2019	83	Hyundai Samho HI	Hyundai HI Group	Korea	617
9849863	V. Prosperity	299,682	2-22-2018	1-1-2020	83	Hyundai Samho HI	Hyundai HI Group	Korea	678

Source: Clarksons World Fleet Register and other sources.

Figure 6.28. Price developments for Product tankers (49-50 k dwt) during 2018-2022



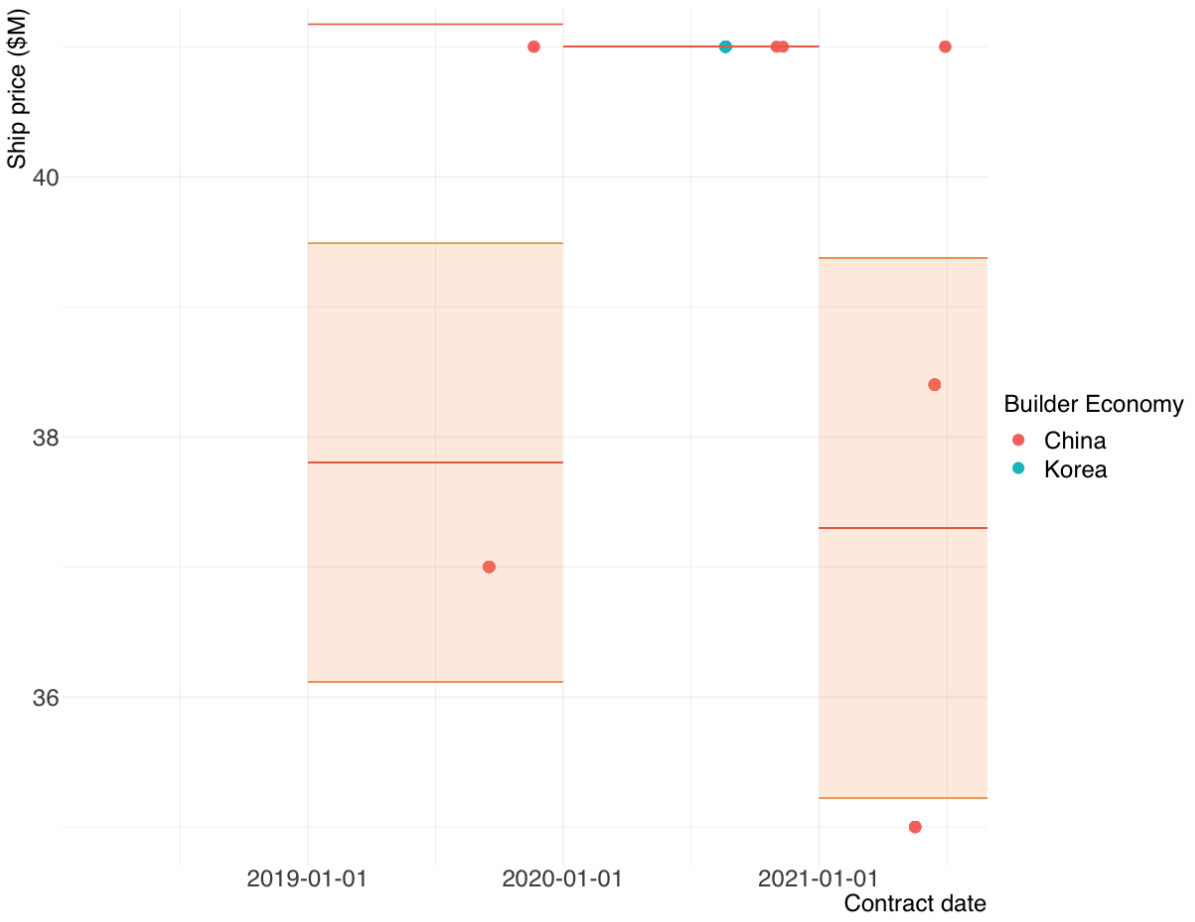
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Figure 6.29. Details of outliers for Product tankers (49-50 k dwt) during 2018-2022

IMO_Number	Name	Dwt	Contract_Date	Built_Date	Price ($m)	Builder	Builder_Group	Economy	Building_period
	N/B Hyundai Vietnam SB	50,000	7-1-2021	5-1-2023	38.5	Hyundai Vietnam SB	Hyundai HI Group	Viet Nam	669
	N/B Hyundai Vietnam SB	50,000	7-1-2021	8-1-2023	38.5	Hyundai Vietnam SB	Hyundai HI Group	Viet Nam	761
9951044	N/B Hyundai Vietnam SB Ninh Phuoc S515	50,000	7-1-2021	7-1-2023	38.5	Hyundai Vietnam SB	Hyundai HI Group	Viet Nam	730
9951056	N/B Hyundai Vietnam SB Ninh Phuoc S516	50,000	7-1-2021	9-1-2023	38.5	Hyundai Vietnam SB	Hyundai HI Group	Viet Nam	792
9951068	N/B Hyundai Vietnam SB Ninh Phuoc S517	50,000	7-1-2021	10-1-2023	38.5	Hyundai Vietnam SB	Hyundai HI Group	Viet Nam	822
9951070	N/B Hyundai Vietnam SB Ninh Phuoc S518	50,000	7-1-2021	12-1-2023	38.5	Hyundai Vietnam SB	Hyundai HI Group	Viet Nam	883
	N/B Hyundai Mipo	50,000	5-31-2021	1-1-2023	38.4	Hyundai Mipo	Hyundai HI Group	Korea	580
	N/B Hyundai Mipo	50,000	5-31-2021	2-1-2023	38.4	Hyundai Mipo	Hyundai HI Group	Korea	611
	N/B Hyundai Mipo	50,000	5-31-2021	2-1-2023	38.4	Hyundai Mipo	Hyundai HI Group	Korea	611
	N/B Hyundai Mipo	50,000	5-31-2021	3-1-2023	38.4	Hyundai Mipo	Hyundai HI Group	Korea	639
	N/B Hyundai Mipo	50,000	5-21-2021	10-1-2022	36.4	Hyundai Mipo	Hyundai HI Group	Korea	498
	N/B Hyundai Mipo	50,000	5-21-2021	12-1-2022	36.4	Hyundai Mipo	Hyundai HI Group	Korea	559
	N/B K SB (Jinhae) Jinhae 1928	49,736	3-1-2021	1-1-2022	36	K SB (Jinhae)	K Shipbuilding	Korea	306
	N/B K SB (Jinhae) Jinhae 1929	49,736	3-1-2021	2-1-2023	36	K SB (Jinhae)	K Shipbuilding	Korea	702
	N/B Chengxi Shipyard	50,000	6-1-2020	1-1-2022	54	Chengxi Shipyard	CSSC	China	579
	N/B Chengxi Shipyard	50,000	4-22-2020	5-1-2022	32	Chengxi Shipyard	CSSC	China	739
9896256	N/B COSCO HI (Dalian) Dalian N1033	49,900	9-25-2019	10-1-2021	33.9	COSCO HI (Dalian)	COSCO Shipping HI	China	737
9877810	Sunrise Glory	50,000	1-28-2019	8-1-2020	41.7	Hyundai Mipo	Hyundai HI Group	Korea	551
9882396	Solar Katherine	49,699	12-1-2018	6-1-2020	38	Hyundai Mipo	Hyundai HI Group	Korea	548
9882401	Solar Melissa	49,699	12-1-2018	7-1-2020	38	Hyundai Mipo	Hyundai HI Group	Korea	578
9882413	Solar Madelein	49,699	12-1-2018	7-1-2020	38	Hyundai Mipo	Hyundai HI Group	Korea	578
9882425	Solar Claire	49,699	12-1-2018	8-1-2020	38	Hyundai Mipo	Hyundai HI Group	Korea	609
9854789	Torm Sublime	49,974	4-3-2018	11-1-2019	31	GSI Nansha	CSSC	China	577
9854791	Torm Splendid	49,932	4-3-2018	1-1-2020	31	GSI Nansha	CSSC	China	638
9854806	Torm Stellar	49,954	4-3-2018	4-1-2020	31	GSI Nansha	CSSC	China	729

Source: Clarksons World Fleet Register and other sources.

Figure 6.30. Price developments for Chemical tankers (49-50 k dwt) during 2018-2022



Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

Figure 6.31. Details of outliers for Chemical tankers (49-50 k dwt) during 2018-2022

IMO_Number	Name	Dwt	Contract_Date	Built_Date	Price ($m)	Builder	Builder_Group	Economy	Building_period
	Provident	49,900	6-30-2021	10-1-2023	41	GSI Nansha	CSSC	China	823
	Progressive	49,900	6-30-2021	12-1-2023	41	GSI Nansha	CSSC	China	884
	N/B GSI Nansha	49,600	5-18-2021	2-1-2024	35	GSI Nansha	CSSC	China	989
	N/B GSI Nansha	49,600	5-18-2021	4-1-2024	35	GSI Nansha	CSSC	China	1049
	N/B GSI Nansha	49,600	5-18-2021	6-1-2024	35	GSI Nansha	CSSC	China	1110
	N/B GSI Nansha	49,600	5-18-2021	8-1-2024	35	GSI Nansha	CSSC	China	1171
	N/B GSI Nansha	49,600	5-18-2021	11-1-2024	35	GSI Nansha	CSSC	China	1263
	N/B GSI Nansha	49,600	5-18-2021	1-1-2025	35	GSI Nansha	CSSC	China	1324
	N/B GSI Nansha	49,600	5-18-2021	3-1-2025	35	GSI Nansha	CSSC	China	1383
	N/B GSI Nansha	49,600	5-18-2021	5-1-2025	35	GSI Nansha	CSSC	China	1444
	Stena ProPatria	49,900	11-20-2019	1-1-2022	41	GSI Nansha	CSSC	China	773
	Stena ProMare	49,900	11-20-2019	1-1-2022	41	GSI Nansha	CSSC	China	773

Source: Clarksons World Fleet Register and other sources.

7. Conclusion

This document aims to facilitate the discussions about developments of ship supply, demand, prices and costs.

The supply and demand part, provides estimates of future ship demand for six ship types until the year 2030 by taking into account economic, regulatory and technological trends. Predictions of future ship demand until the year 2030 are derived from replacement needs of obsolete ships and seaborne trade expansions. The supply and demand part furthermore present estimates of historical yard capacity, which draws on two scenarios (worst- and best-case scenario). To further develop this work, a short discussion of cruise ships and offshore services, as well as the impact of environmental regulations on vessel value and seaborne trade, are included.

The price and cost part of this document presents a literature review on factors influencing newbuilding ship prices, developments of several factors affecting ship prices, and a description of newbuilding prices of major ship types and ship size categories.

Annex A. Supporting information to the results on future ship demand

Table A.1. Classification of commodities by ship type and CAGR by scenario

Commodity	Ship type	Scenario	CAGR
Coal	Bulkers	ANN	0.5%
		Baseline	3.6%
		Reshape	0.5%
Food Products		ANN	3.4%
		Baseline	3.4%
		Reshape	3.4%
Iron and Steel		ANN	3.4%
		Baseline	3.5%
		Reshape	3.4%
Metals n.e.s.		ANN	5.8%
		Baseline	5.9%
		Reshape	5.8%
Non-metallic minerals		ANN	4.0%
		Baseline	4.0%
		Reshape	3.9%
Oil Seeds		ANN	5.2%
		Baseline	5.1%
		Reshape	5.2%
Other Crops		ANN	0.1%
		Baseline	0.0%
		Reshape	0.1%
Other Grains		ANN	3.5%
		Baseline	3.5%
		Reshape	3.5%
Other mining		ANN	4.8%
		Baseline	4.9%
		Reshape	4.8%
Paddy Rice		ANN	1.0%
		Baseline	1.0%
		Reshape	1.0%
Sugar cane and sugar beet		ANN	-0.7%
		Baseline	-0.8%
		Reshape	-0.7%
Vegetables and fruits		ANN	1.8%
		Baseline	1.8%
		Reshape	1.8%
Wheat and meslin		ANN	4.8%
		Baseline	4.8%
		Reshape	4.8%
Chemicals	Chemicals tanker	ANN	3.5%
		Baseline	3.3%
		Reshape	3.4%
Electronic Equipment	Containership	ANN	1.4%
		Baseline	1.8%
		Reshape	1.3%
Other manufacturing		ANN	1.8%
		Baseline	2.3%
		Reshape	1.8%
Textiles		ANN	0.7%
		Baseline	1.1%

		Reshape	0.7%
Fabricated metal products	General cargo ship	ANN	2.2%
		Baseline	2.7%
		Reshape	2.2%
Fisheries		ANN	0.6%
		Baseline	0.5%
		Reshape	0.5%
Forestry		ANN	-0.1%
		Baseline	-0.2%
		Reshape	-0.1%
Livestock		ANN	3.5%
		Baseline	3.4%
		Reshape	3.4%
Motor vehicles		ANN	-0.4%
		Baseline	0.0%
		Reshape	-0.4%
Paper and paper products		ANN	4.7%
		Baseline	4.9%
		Reshape	4.7%
Plant Fibres		ANN	4.2%
		Baseline	4.4%
		Reshape	4.2%
Gas extraction and distribution	Liquefied gas tanker	ANN	2.9%
		Baseline	2.9%
		Reshape	2.9%
Crude Oil	Oil tanker	ANN	-1.2%
		Baseline	0.8%
		Reshape	-1.2%
Petroleum and coal products		ANN	-1.0%
		Baseline	1.1%
		Reshape	-1.0%
Water	Others	ANN	2.9%
		Baseline	2.9%
		Reshape	2.9%

Source: Author's classification.

Annex.B. Comments from delegations following Document C/WP6(2022)1

Comments from the European Union

The EU would like to thank the OECD for preparing the document C/WP6(2022)1 "Monitoring developments of ship supply, demand, prices and costs".

The document is informative in terms of price developments in the case of bulkers and container ships for the period 2018 – 2022. It is clear from the diagrams that in the period in question, prices of bulkers and container ships have increased.

It would be important to investigate the reasons for these price movements. In this context, the EU would importantly like to see a parallel analysis of costs evolution and also other factors that may influence price levels (to the extent that is possible). The same applies to outliers – the EU consider it importance that the OECD study in detail those cases where prices significantly deviate from the mean ("μ").

Last but not least, according to data from the EU shipbuilding industry (SEA Europe), prices of container ships have experienced a decrease in the range of 15% to 32% in the period 2007 – 2021 (see presentation in annex), so the supposed recent price increases should be put in that perspective. The EU would kindly request the OECD to look into this phenomenon, also in the context of the on-going work on demand, supply, price and cost developments.

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EXHIBIT 46

CHINA BRIEF

Shipping Finance: China's New Tool in Becoming a Global Maritime Power

Publication: China Brief Volume: 18 Issue: 2

By: Virginia Marantidou (https://jamestown.org/analyst/virginia-marantidou/)

February 13, 2018 05:01 PM Age: 6 years

China began 2018 by making important strategic moves in the shipping industry. On January 10, COSCO Shipping Development, COSCO Shipping's leasing finance arm announced a plan to establish a shipping fund with state-controlled China Cinda Asset Management Co., Ltd. to finance ship assets (Splash24/7 (https://splash247.com/cosco-sets-shipping-fund-china-cinda/), January 10). COSCO Shipping, the product of a gigantic merger of Chinese shipping behemoths, China Ocean Shipping Company and China Shipping Company, last summer acquired Hong Kong's Orient Overseas International, becoming the world's third-largest container ship fleet.

These strategic moves to become dominant in the shipping industry are reflective of the industries' broader importance to China's economy. Around 90 percent of global trade travels by sea (International Chamber of Shipping (https://www.ics-shipping.org/shipping-facts/shipping-and-world-trade), 2017). The world's largest exporter of goods, China relies on seaborne imports for close to 70 percent of its energy needs. The Maritime Silk Road—one leg of the trans-Eurasian "Belt and Road Initiative" is a network of Chinese-funded infrastructure projects along global shipping routes. A less studied, but perhaps more important contributor to Chinese maritime dominance is shipping finance. While the first one has monopolized the interest of policy makers, investors, and maritime experts, China's growing shipping portfolios and its role in shipping finance is largely overlooked outside the shipping industry circles. When viewed together, they present a clearer view of China's impact on global maritime supply chains.

China's New Role in Shipping Finance

In 2009, the global financial crisis and fall off in global trade gutted the shipping market. The failure of prominent global financial institutions and the subsequent lack of trade finance and liquidity distressed the overexposed shipping portfolios of the Western banks, making shipping loans either unavailable or more expensive. The crisis offered an opportune moment for Chinese banks to step in and build new shipping portfolios or expand existing ones, allowing China to expand its fleet and build the foundations for international partnerships or even dependencies that would that would empower it on the global maritime arena.

Before the global financial crisis, Chinese shipping lending was domestically focused, providing financial support mainly to Chinese shipbuilders and shipping companies. At the time, not a single Chinese bank had a place among the top 15 global shipping lenders (OECD (https://www.oecd.org/sti/ind/Item%202.2%20HDA%20Conseil_-%20Impact%20of%20Ship%20Financing_Final.pdf), November 2015). Ten years later, the Bank of China, Export- Import Bank of China (China Eximbank) and China Development Bank (CDB) have not only made it to the top 15, but Eximbank and CDB occupy the global second and third place respectively (Petrofin (https://www.petrofin.gr/Upload/Petrofin_Global_Bank_Research_and_Petrofin_Index_of_Global_Shipend2016.pdf), July 2017).

Chinese shipping lending has undergone massive transformation, rapidly becoming outward looking and more sophisticated. Experts argue that during their initial steps in international lending Chinese banks lacked experience and had to deal with strict regulations imposed by the People's Bank of China, time-consuming internal processes, and heavy external bureaucracy. However, their appetite for doing business, prompted also by a market gap, quickly led to significant improvements and streamlining in their shipping loans structures. These improvements have made their sought-after lenders to some of the world's largest shipping companies, such as Maersk Line, BP shipping, and Mediterranean Shipping Company. **[1]** At the same time, while traditional forms of lending like bank loans still dominate the market, alternative lending such as

leasing is becoming a leading part of China's shipping finance sector. From commercial banks such as the Industrial and Commercial Bank of China (ICBC) and Bank of Communications to shipbuilders and shipowners such as China State Shipbuilding Corporation (CSSC) and COSCO Shipping, 23 financial institutions and relevant company divisions are involved in ship lease finance, with a portfolio of 989 vessels valued at $16.5 billion (Week in China (https://www.weekinchina.com/chapter/ruling-the-waves/flying-the-flag/), June, 2017).

Entry into the shipping finance industry has very much been facilitated by market factors, including the retreat of Western banks, the abundance of Chinese capital and the fact that it had not been tied to existing shipping portfolios. However, a strategic sector like shipping inevitably falls under close government supervision. With a declining domestic shipbuilding industry, Chinese banks have been given clear directions to assist and subsidize.

In January 2017, in a statement published by the Ministry of Industry and Information technology, six ministries expressed support to the shipping industry while they encouraged financial institutions to support the sector with loans and financing (miit.gov.cn (https://www.miit.gov.cn/n1146295/n1146562/n1146650/c5459940/content.html), January 2017). Additionally, the China Banking Regulatory Commission (CBRC) has encouraged financial institutions to support the domestic shipbuilding industry and the export of domestically-built ships (Splash247 (https://splash247.com/chinese-ship-finance-fore/), September 2017; Seatrade Maritime News (https://www.seatrade-maritime.com/news/asia/china-banking-regulator-voices-support-for-financial-leasing-in-shipping.html), May 2017).

For an emerging economy like China it comes as no surprise that the most prominent lenders are either in themselves export credit agencies (ECAs) such as the China Export & Credit Insurance Corporation (Sinosure) and China Eximbank or ECAs-supported banks (Marine Money (https://www.marinemoney.com/sites/all/themes/marinemoney/forums/MMWeek14/presentations/Ma [paywall], June 2014). ECAs are public institutions that facilitate financing for domestic exporters and investors who do business overseas. As Valentino Gallo, Global Head of export and agency finance at CITI has written, "ECAs operate as a tool of economic policy and have a mandate to support exports" (Citibank (https://www.citibank.com/tts/solutions/trade_finance/financing/docs/citi_ss_v2.pdf), March 2014). Chinese ECA-backed lenders prioritize lending to international firms who intend to build their ships in Chinese yards.

Similarly, as the Chinese government aspires to gain better control over how the country's trade is transported, the goal of expanding its merchant fleet is a natural outgrowth. Beijing's "national oil, nationally carried" campaign is indicative of this goal. In the early 2000's due to economic and security considerations, Beijing focused its efforts on expanding the national oil tanker fleet by encouraging Chinese shipping firms to invest more in larger tankers. In 2006, Chinese analysts expected that their country will need more than 40 large crude carriers (VLCCs) in order to be able to transport up to 50 percent of its oil imports and with the aim to further increase numbers and

carry up to 70 percent by 2020. **[2]** China is on track to surpass this goal. A newly established subsidiary of China Merchant Energy Shipping, China VLCC, possesses 42 operational VLCCs, making it the world's largest oil tanker operator. Eleven more are on order (IHS, Fairplay (https://fairplay.ihs.com/commerce/article/4291171/china-merchant-energy-shipping-acquires-four-companies-from-sinomarine) [paywall], September 2017).

Shipping finance appears to be an excellent tool to carry out these two policy goals: providing support for domestic shipyards and enlarging the Chinese merchant fleet to better control trade.

What Does this Mean for the World?

China's shipping finance has largely benefitted the global shipping industry, especially at a time when the sector experiences a dearth of funds. However, as Chinese-led shipping portfolios are further expanding, and as international shipping firms are looking more closely into China to fund their operations, ownership of the global shipping fleet seems to be shifting to Chinese hands.

This is particularly true with Chinese leasing finance, which is gaining ground over traditional bank lending because of its higher Loan to Value and longer amortization period. Leasing deals with Chinese lenders take place under two models: "the financial lease" model where the lessee is the typical manager of the assets and can take ownership at the end of the lease and the "operating lease" model where the lessor keeps ownership of the vessels at the end of the lease (Marine Money (https://www.marinemoney.com/sites/marinemoney.com/files/pdf/MMMag_2017_01_RiseofChineseFi January 2017 [paywall]). Chinese lenders frequently offer sale-and-leaseback deals which entail lessees first selling their vessels to leasing companies and then lease them back on normal loan rates. Leasing finance is fast turning Chinese banks and non-shipping firms into shipowners, enlarging China's merchant fleet and enhancing its shipping power.

The case of *Vale vs. China* from a decade ago reveals how leverage can be exerted to serve specific policy goals and economic interests. When Brazilian iron ore giant Vale, a key exporter to China began establishing its own dry bulk fleet of 14 ships, it contracted the majority of the work to Chinese shipyards with Chinese banks financing the construction. However, during their first return voyage to China loaded with ore, Valemax carriers were forbidden from docking in Chinese ports on safety grounds due to their large size. Sources claim that Vale was targeted by private Chinese shipping firms under an extension of the "national oil, nationally carried" campaign and with the blessings of the Chinese government (Week in China (https://www.weekinchina.com/advertorial/2017/07/how-vale-was-vanquished/), July 2017). In the end Vale sold the unprofitable ships to Chinese shipping firms and banks. Twelve of them were then leased back to Vale on long-term contracts, and Chinese ports opened for the now-Chinese-owned Valemax carriers (Financial Times (https://www.ft.com/content/10a4f69e-213f-11e5-ab0f-6bb9974f25d0#axzz3exNUn3XV), July 2015).

Most importantly, the Vale case demonstrates how controlling key parts of the supply chain allows a country to manipulate the entire supply chain. From the financing and building of the vessels, to controlling of the ports and the sale and lease back deal, China not only shielded its own maritime industry from strong competition but also strengthened control over one of its biggest sources of iron ore imports.

This will be no less true as China is moving forward with its Belt and Road initiative. BRI aims to create an overarching framework, which will serve these policy objectives including the direction of shipping finance to support Chinese economic interests. Therefore, looking into China's growing shipping portfolios along with the BRI infrastructure projects, it seems evident that in the near future more of the global seaborne trade will traverse via Chinese-funded ports, on Chinese-funded, Chinese-owned or Chinese-built vessels, providing China with a strong oversight over the global supply chains and a strong leverage to direct those according to its interests.

China's growing involvement in shipping is setting the foundations for future powerful partnerships in the sector. While European banks remain Greek shipping's main financiers, holding 80 percent of overall Greek loans (Petrofin (https://www.petrofin.gr/Upload/PetrofinBankResearch-Greek_end2016.pdf), May, 2017), Greek shipowners are increasingly seeking cooperation with China, especially through leasing. The Greek merchant fleet remains the largest in numbers, size and value, and with a large appetite for more funds. China's fleet is currently the third largest and growing, and China is likely to gain a larger market share in shipping finance and has an objective to have more control of the global trade routes (Hellenic Shipping News, (https://www.hellenicshippingnews.com/china-owned-ships-fleet-expansion-accelerates/) March 2016). Greek ship owners have been traditionally engaged with China and their ties go back decades. Greek ship owners were also the ones who brought Chinese investors into the Piraeus port. **[3]** It only makes sense that deepening further Sino-Greek maritime cooperation remains a shared interest. As Katerina Fitsiou from XRTC has contended "Greek ship-owners are the taxi drivers of shipping and China is a superpower increasing their fleet, controlling seaborne trade, having huge banks to finance any project." Therefore, it is important to monitor closely these synergies as they are poised to shape the future of shipping and global trade routes.

Conclusion

Despite expectations of a rebound in the price of shipping, shipping finance is expected to remain a limited business for Western financial institutions. This will allow Chinese banks to expand operations and establish themselves as global players in the shipping sector. China already possesses the third largest merchant fleet. Given its three-fold expansion in the last decade, a growth rate of seven percent for the past two consecutive years and the central government's policy, this expansion is expected to continue (Hellenic Shipping News (https://www.hellenicshippingnews.com/china-owned-fleets-brisk-growth/), March 2017). This

entails greater shipping power for China, which coupled with funding, and building of maritime infrastructure across the world will give it greater leverage and influence over the global shipping routes, and greater control over global supply chains.

Note

1. Interview with Greek Shipping Consultant, Dec 2017- Jan 2018.
2. Andrew Erickson and Gabe Collins, "Beijing's Energy Security Strategy: The Significance of a Chinese State-Owned Tanker Fleet" (https://www.andrewerickson.com/wp-content/uploads/2010/11/Chinas-New-Tanker-Fleet_Orbis_Fall-2007.pdf), *Orbis*, 2007.
3. Asteris Houliaras and Sotiris Petropoulos, "Shipowners, Ports and Diplomats: the Political Economy of Greece's relations with China" (https://www.academia.edu/5709693/Shipowners_ports_and_diplomats_the_political_economy_of *Asia Europe Journal* 2013.


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EXHIBIT 47

Chinese ship sh600150

2024-03-07 15:00:01

36.740 -0.52 (-1.40%)	Yesterday's closing: 37.260	Today's opening: 37.180	Highest price:38.190	Lowest price:36.470
	Transaction volume: 2239683208.000	Trading volume: 603287	Buying price:36.740	Selling price:36.750
	Buy one quantity: 1558	Buying price: 36.740	Amount sold: 195	Selling price: 36.750

Information and Announcements: Individual stock information | Company Announcement | annual report | midterm report | first quarter report

China Shipping: China Shipping Announcement on the Non-public Issuance of Restricted Shares to Purchase Assets (Download Announcement)

Announcement date: 2021-03-25

Securities code: 600150 Securities abbreviation: China Ship Number: Lin 2021-008

China State Shipbuilding Corporation's Announcement on the Non-Public Issuance of Restricted Shares for the Purchasing of Assets

Important content reminder:

? The number of restricted shares in circulation this time is 814,749,752 shares;

? The listing and circulation date of this restricted stock is March 30, 2021.

1. Type of listing of restricted shares this time

China State Shipbuilding Corporation (hereinafter referred to as the "Company" and "China Shipbuilding") will list some of its restricted shares in a non-public offering to purchase assets.

(1) Non-public issuance approval time

On February 25, 2020, the company received the China Securities Regulatory Commission's "Reply on Approving China Shipbuilding Industry Corporation to Issue Shares to China Shipbuilding Industry Corporation and Others to Purchase Assets and Raise Supporting Funds" (CSRC Permit [2020] 225 No.), approved the company to issue shares to purchase related assets from 20 counterparties including China State Shipbuilding Corporation, CSSC Marine and Defense Equipment Co., Ltd., CSSC Investment and Development Co., Ltd., Xinhua Life Insurance Co., Ltd., and the total number of shares issued 2,843,870,746 shares, and it was approved that the company's non-public issuance of shares to raise supporting funds shall not exceed 3,866.8 million yuan (for details, please see the "China Shipbuilding Industry Corporation's Notice on Issuing Shares to Purchase Assets and Raise Supporting Funds" disclosed by the company on February 26, 2020 Announcement that related-party transactions have been approved by the China Securities Regulatory Commission, Pro 2020-005).

(2) Share registration time and lock-up period arrangements

China Shipping: China Shipping Announcement on the Non-public Issuance of Restricted Shares to Purchase Assets (Download Announcement)

1. On March 30, 2020, the new shares involved in the company's issuance of shares to purchase assets and raise supporting funds were handled at the Shanghai Branch of China Securities Depository and Clearing Co., Ltd. (hereinafter referred to as "Zhongdeng Company") The share registration procedures were completed, and 2,843,870,746 new shares were added. The number of subscriptions for the issuance objects and the lock-up period are as follows:

serial number	counterparty	Number of shares issued (shares)	Limited sale period (months)
1	China State Shipbuilding Corporation	1,283,468,027	36
2	CSSC Marine and Defense Equipment Co., Ltd.	217,494,916	36
3	CSSC Investment and Development Co., Ltd.	23,684,058	36
4	Xinhua Life Insurance Co., Ltd.	159,386,909	12
5	Huarong Ruitong Equity Investment Management Co., Ltd.	160,846,680	12
6	China State-owned Enterprise Structural Adjustment Fund Co., Ltd.	92,641,506	12
7	China Pacific Property & Casualty Insurance Co., Ltd.	91,825,411	12
8	China Life Insurance Co., Ltd.	79,829,993	12
9	PICC Property and Casualty Co., Ltd.	79,710,537	12
10	Beijing Dongfu Tianheng Investment Center (Limited Partnership)	71,786,901	12
11	Centaline Asset Management Co., Ltd.	38,883,757	12
12	ICBC Financial Assets Investment Co., Ltd.	39,838,058	12
		39,474,613	36
13	Bank of Communications Financial Assets Investment Co., Ltd.	78,947,453	36
14	National Military-Civil Integration Industry Investment Fund Co., Ltd.	78,157,393	36
15	Guohua Military-Civilian Integration Industry Development Fund (Limited Partnership)	47,368,117	36
16	ABC Financial Assets Investment Co., Ltd.	31,579,335	36
17	Guoxin Xinxin Equity Investment Fund (Chengdu) Partnership (Limited Partnership)	94,736,235	36
18	Bank of China Financial Assets Investment Co., Ltd.	39,474,612	36
19	Beijing Dongfu Guochuang Investment Management Center (Limited Partnership)	78,947,453	36
20	Beijing Guofa Aviation Engine Industry Investment Fund Center (Limited Partnership)	15,788,782	36
total		2,843,870,746	-

The subscription quantity and sales restriction period are as follows:

serial number	Issue object name	Number of allotted shares (shares)	Lock-up period (months)
1	National Military-Civil Integration Industry Investment Fund Co., Ltd.	64,766,839	6
2	Guohua Military-Civilian Integration Industry Development Fund (Limited Partnership)	64,766,839	6

China Shipping: China Shipping Announcement on the Non-public Issuance of Restricted Shares to Purchase Assets (Download Announcement)

3	Guoxin Investment Co., Ltd.	32,383,419	6
4	Guangdong Yueke Capital Investment Co., Ltd.	19,430,051	6
5	Tibet Wanqing Investment Management Co., Ltd.	15,544,041	6
6	Ping An Securities Co., Ltd.	11,658,031	6
7	BNP Paribas	10,663,860	6
8	Shanghai Tongan Investment Management Co., Ltd.-Tongan Superstar No. 1 Securities Investment Fund	9,371,761	6
9	Xieyuan Xinhui No. 3 Private Securities Investment Fund	7,836,787	6
10	Donghai Fund Management Co., Ltd.	7,772,020	6
11	Shigatse Xinrui Infrastructure Industry Investment Fund Partnership (Limited Partnership)	6,246,766	6
total		250,440,414	-

The counterparties are Xinhua Life Insurance Co., Ltd., Huarong Ruitong Equity Investment Management Co., Ltd., China State-owned Enterprise Structural Adjustment Fund Co., Ltd., China Pacific Property & Casualty Insurance Co., Ltd., China Life Insurance Co., Ltd., and People's Insurance Company of China Co., Ltd., Beijing Dongfu Tianheng Investment Center (Limited Partnership), Centaline Asset Management Co., Ltd., etc. The shares of listed companies obtained through asset subscription in this reorganization will not be transferred within 12 months from the date of listing of the shares. In this reorganization, ICBC Financial Assets Investment Co., Ltd. subscribed to the shares of listed companies it held with the equity of Shanghai Waigaoqiao Shipbuilding Co., Ltd., the equity of Guangzhou Shipyard International Co., Ltd. and the equity of CSSC Huangpu Wenchong Shipbuilding Co., Ltd., from the shares No transfers will be made within 12 months from the date of listing. As of the date of this announcement, the above-mentioned investors have strictly fulfilled the above-mentioned commitments, and there is no situation where the failure to fulfill their commitments will affect the listing and circulation of this restricted stock.

4. Fund occupation by controlling shareholders and their related parties

The listing and circulation of restricted shares does not involve restricted shares held by the company's controlling shareholders or their related parties.

5. Verification opinions of intermediaries

The verification opinions of the independent financial advisor CITIC Securities Co., Ltd. (hereinafter referred to as "CITIC Securities") are as follows:

1. The listing and circulation of restricted shares complies with the provisions of the Company Law, the Stock Listing Rules of the Shanghai Stock Exchange and other relevant laws and regulations;

2. The number of shares with sales restrictions lifted and the time for listing and circulation comply with relevant laws, regulations and commitments on sales restrictions;

3. The listed company's information disclosure on the listing and circulation of restricted shares is true, accurate and complete;

4. CITIC Securities has no objection to the lifting of certain restricted shares in China Shipbuilding's major asset reorganization.

6. Listing and circulation of restricted shares this time

The number of restricted shares in circulation this time is 814,749,752. The number of restricted shares in circulation accounts for 18.22% of the company's total share capital, involving a total of 9 shareholders;

China Shipping: China Shipping Announcement on the Non-public Issuance of Restricted Shares to Purchase Assets (Download Announcement)

The date for the listing and circulation of the restricted shares is March 30, 2021; the detailed list of the listing and circulation of the first restricted shares (unit: share):

serial number	Shareholder name	Number of restricted shares held	Proportion of restricted shares held to the company's total share capital	The number of circulation in this listing	Number of remaining restricted shares	Proportion of circulating restricted shares to the company's total share capital
1	Huarong Ruitong Equity Investment Management Co., Ltd.	160,846,680	3.60%	160,846,680	0	3.60%
2	Xinhua Life Insurance Co., Ltd.	159,386,909	3.56%	159,386,909	0	3.56%
3	China State-owned Enterprise Structural Adjustment Fund Co., Ltd.	92,641,506	2.07%	92,641,506	0	2.07%
4	China Pacific Property & Casualty Insurance Co., Ltd.	91,825,411	2.05%	91,825,411	0	2.05%
5	China Life Insurance Co., Ltd.	79,829,993	1.78%	79,829,993	0	1.78%
6	PICC Property and Casualty Co., Ltd.	79,710,537	1.78%	79,710,537	0	1.78%
7	ICBC Financial Assets Investment Co., Ltd.	79,312,671	1.77%	39,838,058	39,474,613	0.89%
8	Beijing Dongfu Tianheng Investment Center (Limited Partnership)	71,786,901	1.61%	71,786,901	0	1.61%
9	Centaline Asset Management Co., Ltd.	38,883,757	0.87%	38,883,757	0	0.87%
total		854,224,365	19.10%	814,749,752	39,474,613	18.22%

Unit: Share		Before this listing	number of changes	After this listing
Tradable shares subject to sales restrictions	1. State-owned legal persons hold shares	2,066,536,022	-491,750,531	1,574,785,491
	2. Others	777,334,724	-322,999,221	454,335,503
	Total number of outstanding shares subject to selling restrictions	2,843,870,746	-814,749,752	2,029,120,994
tradable shares without sale conditions	A shares	1,628,558,012	+814,749,752	2,443,307,764
	The total number of outstanding shares without selling restrictions	1,628,558,012	+814,749,752	2,443,307,764
Total shares		4,472,428,758	0	4,472,428,758

8. Attachment to Internet Announcement

"CITIC Securities Co., Ltd.'s Verification Opinions on the Listing and Circulation of Non-Public Issuance of Restricted Shares of China Shipbuilding Industry Corporation".

China Shipping: China Shipping Announcement on the Non-public Issuance of Restricted Shares to Purchase Assets (Download Announcement)

Special announcement.

Board of Directors of China State Shipbuilding Corporation

March 25, 2021

Attachment: Original text of announcement

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中国船舶 sh600150 2024-03-07 15:00:01

36.740
-0.52 (-1.40%)

昨收盘:37.260	今开盘:37.180	最高价:38.190	最低价:36.470
成交额:2239683208.000	成交量:603287	买入价:36.740	卖出价:36.750
买一量:1558	买一价:36.740	卖一量:195	卖一价:36.750

资讯与公告： 个股资讯 公司公告 年度报告 中期报告 一季度报告 三季度报告

中国船舶：中国船舶关于发行股份购买资产之非公开发行限售股上市流通公告 （下载公告）

公告日期:2021-03-25

证券代码：600150 证券简称：中国船舶 编号：临2021-008

中国船舶工业股份有限公司关于发行股份购买资产之非公开发行限售股上市流通公告

重要内容提示：

? 本次限售股上市流通数量为814,749,752股；

? 本次限售股上市流通日期为2021年3月30日。

一、本次限售股上市类型

中国船舶工业股份有限公司（以下简称“公司”、“中国船舶”）本次限售股上市类型为上市公司发行股份购买资产所涉及的部分非公开发行限售股上市流通。

（一）非公开发行核准时间

公司于2020年2月25日收到中国证券监督管理委员会《关于核准中国船舶工业股份有限公司向中国船舶工业集团有限公司等发行股份购买资产并募集配套资金的批复》（证监许可〔2020〕225号），核准公司向中国船舶工业集团有限公司、中船海洋与防务装备股份有限公司、中船投资发展有限公司、新华人寿保险股份有限公司等20名交易对方发行股份购买相关资产，发行股份总数为2,843,870,746股，并核准公司非公开发行股份募集配套资金不超过386,680万元（详情请见公司于2020年2月26日披露的《中国船舶工业股份有限公司关于发行股份购买资产并募集配套资金暨关联交易事项获得中国证监会核准批复的公告》，临2020-005）。

（二）股份登记时间及锁定期安排

1、2020年3月30日，公司发行股份购买资产并募集配套资金之发行股份购买资产所涉及的新增股份在中国证券登记结算有限责任公司上海分公司（以下简称“中登公司”）办理完毕股份登记手续，新增2,843,870,746股，发行对象认购数量及限售期如下表：

序号	交易对方	发行股份数（股）	限售期（月）
1	中国船舶工业集团有限公司	1,283,468,027	36
2	中船海洋与防务装备股份有限公司	217,494,916	36
3	中船投资发展有限公司	23,684,058	36
4	新华人寿保险股份有限公司	159,386,909	12
5	华融瑞通股权投资管理有限公司	160,846,680	12
6	中国国有企业结构调整基金股份有限公司	92,641,506	12

中国船舶：中国船舶关于发行股份购买资产之非公开发行限售股上市流通公告 （下载公告）

7	中国太平洋财产保险股份有限公司	91,825,411	12
8	中国人寿保险股份有限公司	79,829,993	12
9	中国人民财产保险股份有限公司	79,710,537	12
10	北京东富天恒投资中心（有限合伙）	71,786,901	12
11	中原资产管理有限公司	38,883,757	12
12	工银金融资产投资有限公司	39,838,058	12
		39,474,613	36
13	交银金融资产投资有限公司	78,947,453	36
14	国家军民融合产业投资基金有限责任公司	78,157,393	36
15	国华军民融合产业发展基金（有限合伙）	47,368,117	36
16	农银金融资产投资有限公司	31,579,335	36
17	国新建信股权投资基金（成都）合伙企业（有限合伙）	94,736,235	36
18	中银金融资产投资有限公司	39,474,612	36
19	北京东富国创投资管理中心（有限合伙）	78,947,453	36
20	北京国发航空发动机产业投资基金中心（有限合伙）	15,788,782	36
合计		2,843,870,746	-

认购数量及限售期如下表：

序号	发行对象名称	获配股数（股）	锁定期（月）
1	国家军民融合产业投资基金有限责任公司	64,766,839	6
2	国华军民融合产业发展基金（有限合伙）	64,766,839	6
3	国新投资有限公司	32,383,419	6
4	广东粤科资本投资有限公司	19,430,051	6
5	西藏万青投资管理有限公司	15,544,041	6
6	平安证券股份有限公司	11,658,031	6
7	法国巴黎银行	10,663,860	6
8	上海同安投资管理有限公司-同安巨星1号证券投资基金	9,371,761	6
9	振源鑫汇3号私募证券投资基金	7,836,787	6
10	东海基金管理有限责任公司	7,772,020	6
11	日喀则信瑞基础设施产业投资基金合伙企业（有限合伙）	6,246,766	6
合计		250,440,414	-

的交易对方新华人寿保险股份有限公司、华融瑞通股权投资管理有限公司、中国国有企业结构调整基金股份有限公司、中国太平洋财产保险股份有限公司、中国人寿保险股份有限公司、中国人民财产保险股份有限公司、北京东富天恒投资中心（有限合伙）、中原资产管理有限公司等在本次重组中以资产认购取得的上市公司股份，自股份上市之日起12个月内不进行转让。工银金融资产投资有限公司在本次重组中以持有的上海外高桥造船有限公司股权、广船国际有限公司股权和中船黄埔文冲船舶有限公司股权认购取得的上市公司股份，自股份上市之日起12个月内不进行转让。截至本公告日，上述投资者均严格履行了上述承诺，不存在未履行承诺影响本次限售股上市流通的情况。

四、控股股东及其关联方资金占用情况

本次限售股上市流通不涉及公司控股股东或其关联方所持限售股。

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五、中介机构核查意见

独立财务顾问中信证券股份有限公司（以下简称“中信证券”）核查意见如下：

1、本次限售股份上市流通符合《公司法》、《上海证券交易所股票上市规则》等相关法律法规的规定；

2、本次限售股份解除限售的数量和上市流通的时间符合相关法律法规及限售承诺；

3、上市公司对本次限售股份上市流通事项的信息披露真实、准确、完整；

4、中信证券对本次中国船舶重大资产重组部分限售股份解禁事项无异议。

六、本次限售股上市流通情况

本次限售股上市流通数量为814,749,752股，限售股的流通数量占公司股本总额的18.22%，涉及股东共9名；

本次限售股上市流通日期为2021年3月30日；首发限售股上市流通明细清单（单位：股）：

序号	股东 名称	持有限售股数量	持有限售股占公司总股本比例	本次上市 流通数量	剩余限售股 数量	流通限售股占公司总股本的比例
1	华融瑞通股权投资管理有限公司	160,846,680	3.60%	160,846,680	0	3.60%
2	新华人寿保险股份有限公司	159,386,909	3.56%	159,386,909	0	3.56%
3	中国国有企业结构调整基金股份有限公司	92,641,506	2.07%	92,641,506	0	2.07%
4	中国太平洋财产保险股份有限公司	91,825,411	2.05%	91,825,411	0	2.05%
5	中国人寿保险股份有限公司	79,829,993	1.78%	79,829,993	0	1.78%
6	中国人民财产保险股份有限公司	79,710,537	1.78%	79,710,537	0	1.78%
7	工银金融资产投资有限公司	79,312,671	1.77%	39,838,058	39,474,613	0.89%
8	北京东富天恒投资中心（有限合伙）	71,786,901	1.61%	71,786,901	0	1.61%
9	中原资产管理有限公司	38,883,757	0.87%	38,883,757	0	0.87%
合计		854,224,365	19.10%	814,749,752	39,474,613	18.22%

单位：股		本次上市前	变动数	本次上市后
有限售条件的流通股份	1、国有法人持有股份	2,066,536,022	-491,750,531	1,574,785,491
	2、其他	777,334,724	-322,999,221	454,335,503
	有限售条件的流通股份合计	2,843,870,746	-814,749,752	2,029,120,994
无限售条件的流通股份	A股	1,628,558,012	+814,749,752	2,443,307,764
	无限售条件的流通股份合计	1,628,558,012	+814,749,752	2,443,307,764
股份总额		4,472,428,758	0	4,472,428,758

八、上网公告附件

《中信证券股份有限公司关于中国船舶工业股份有限公司非公开发行限售股上市流通的核查意见》。

特此公告。

中国船舶工业股份有限公司董事会

2021年3月25日

中国船舶：中国船舶关于发行股份购买资产之非公开发行限售股上市流通公告 （下载公告）

附件：公告原文

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EXHIBIT 48

Supporting the Belt and Road Initiative

Since President Xi Jinping proposed the Belt and Road Initiative in 2013, SINOSURE has vigorously supported the development of the Initaive. By the end of 2023,the total insured amount of SINOSURE on export and investment to the The Belt and Road countries was over $2 trillion, covering over 5700 projects, mainly in such industrial sectors as power, transportation, petroleum equipment, housing construction, communications equipment, shipping, infrastructure and telecommunications, with claims paid amounting to over USD 10.5 billion.

Fortune Times Building, 11 Fenghuiyuan, Xicheng District, Beijing100033, China TEL: (010)66582288

Email: khfw@sinosure.com.cn

EXHIBIT 49

Report to the U.S. Congress on

Global Export Credit Competition

June 2023

For the period January 1, 2022
through December 31, 2022

Competing for Jobs Through Exports

EXIM
EXPORT-IMPORT BANK
OF THE UNITED STATES

EXPORT-IMPORT BANK
OF THE UNITED STATES

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From the President and Chair

In accordance with section 8A of the agency Charter, I am pleased to submit to the U.S. Congress the Report on Global Export Credit Competition of the Export-Import Bank of the United States (EXIM) for Calendar Year 2022, the 56th edition of EXIM's "Competitiveness Report."

I want to thank the EXIM staff who contributed to the report's creation, from conducting surveys and analysis and research to writing this important body of work. And the wisdom and guidance of EXIM's Advisory Committee has been indispensable in helping us to put this report into context amidst the many opportunities and challenges facing EXIM. The Committee is comprised of experts who are world-class in their respective fields, and I especially want to thank former U.S. Senator Heidi Heitkamp of North Dakota and Lt. Governor Denny Heck of Washington State for their leadership this past year.

In reading this report, I reflect on it as a snapshot in time that provides us with a clear understanding of the status of export credit agencies (ECAs) and an indication of what could come next. The trends identified throughout the report and crystalized by the Advisory Committee and subcommittee recommendations include new developments – Italy becoming the strongest OECD Arrangement Participant and even surpassing the People's Republic of China, for example, and India's significant increase in its export and trade financing activity – but also some expected developments, particularly the welcome news that ECAs are increasingly involved in the energy transition and highly focused on sustainability.

The ECAs that stood out in 2022, following the difficult years of the pandemic, conducted business like national finance agencies, employing macro-economic policies with increasingly domestic focuses. I am excited that EXIM's Make More in America (MMIA) initiative is robust and on par with this domestic financing trend firmly taking hold among ECAs. Instead of working to reverse this current or standing still in it, EXIM can jump in with its historic know-how and a spirit of adaptive rejuvenation. We need to better spread the word about MMIA and one of my strategic goals is to help mobilize our public and private economic development partners at the federal, state, and local levels to advocate for EXIM with their constituencies and customers. It is in our strategic interest to help American manufacturers and businesses looking to start or grow their exporting capacity, to compete and win on the world stage.

The report shows there is considerable headroom for EXIM to build on its strong performance this past year and be at the front of the field in years to come. The Advisory Committee has helpfully put forward a number of key recommendations that can ensure EXIM can continue to offer globally competitive financing that levels the playing field for U.S. workers. Some would require statutory changes and we stand ready to work with Congress to advance legislation that enables the agency to unleash its full potential to support U.S. exports and jobs.

I have asked the EXIM staff, as we prepare to conduct the 2023 Competitiveness Report, to reimagine the survey and research components so that the broadened and deepened feedback we do receive will be even more granular and more attuned to the ever-shifting ECA sector and how we set up EXIM to be at the front of the pack.

I thank you for your continued support of and interest in EXIM and look forward to working with you to strengthen this agency that is integral to the economic and national security of the United States.

Sincerely,

Reta Jo Lewis, Esq.
President and Chair
EXIM Board of Directors

EXIM 2022-2023 Advisory Committee Statement on the EXIM Competitiveness Report

The Members of the 2022-23 Advisory Committee and its Subcommittees have reviewed EXIM's 2022 Report to the U.S. Congress on Global Export Credit Competition (the Competitiveness Report or Report) and present this statement reflecting the views of the Members regarding the report and the competitiveness issues raised in it. Subcommittees include the Council on China Competition, Council on Climate, and Council on Small Business and Council on Advancing Women.

First, the Committee wishes to express its profound gratitude to the leadership of the Board, Chair Reta Jo Lewis, Vice Chair Judith Pryor and Directors Spencer Bachus and Owen Herrnstadt. We are fortunate to have their depth and quality of experience in leading EXIM. Of course, they are more than ably supported in their roles by the outstanding staff. Their work, and the support of President Biden, the Biden-Harris Administration, and bipartisan leaders in Congress have assured that the agency has emerged from the global pandemic fully prepared to meet the challenges of a rapidly changing context and in so doing, help unlock capital that strengthens America's economic security and vitality. One thing the Report has made manifestly clear, however, is that in order to be successful, EXIM must adapt to the changes occurring all around it.

The Report clearly indicates that the export credit agency (ECA) sector as a whole is no longer made up of the ECAs of old. Increasingly, ECAs are becoming national security instruments of their home governments in both their foreign and domestic policy priority areas. 'What's in the national interest?' appears to be the question of the day more so than at any time in ECA history, where actions taken in pursuit of deals appear more macro-economic in nature than, say, transaction by transaction as had been the case for a long time.

We were struck by a recent 2023 survey conducted by TFX which found as much, asking numerous players in the ECA sector how things might look a decade from now: Overwhelmingly, the trend is expected to continue.

A "transition phase" is how EXIM characterizes the sector in 2022, though they leave open the question of whether this is due more to temporary or deeper, structural issues. One development that stood out to us with great interest is India's surprise showing as the third largest official tied export finance provider in 2022. India will be one to watch in the years ahead.

But there's one ECA that appears to be more set in its ways, maintaining the status quo, passively waiting for transactions, and that is our own EXIM. EXIM's stance contrasts with years of Competitiveness Report depictions of OECD and non-OECD ECAs that creatively adapt to change in the global export credit market. Meanwhile, EXIM is clinging to practices designed for a different era. EXIM will be hard pressed to fully realize its mission if it cannot, or will not, adapt to the times.

We say this fully acknowledging what a tough near-decade it has been for EXIM: almost four years without a Board quorum to conduct major business – which had myriad ripple effects throughout the organization and its business – only to receive a new authorization from Congress quite literally as a global pandemic began. EXIM is not back up to fighting weight, and yet, as we and so many other ECA sector observers and players have noted, the nature of the fight itself is changing. Moreover, the Advisory Committee recognizes that some issues are not fully within EXIM control. Specifically, that the two percent default rate cap prevents EXIM from "getting to yes" on transactions involving greater credit risk, particularly in large infrastructure projects. Congress therefore can and must help EXIM

be more competitive to help U.S. exporters win the future. As written, Congress' mandates for EXIM equate to asking the agency to run a race against its competitors, up a hill, while weights are tied around its ankles. So we are supportive of Congress opening up the hood of the 2019 reauthorization and looking at ways to not just put EXIM on par with its competitor ECAs, but help it stand out, win that race, and excel.

EXIM's Councils, which have made contributions to this year's competitiveness report in the form of policy and practice reform recommendations for both Congress and the Bank itself to consider, align with the full Advisory Committee's thinking. We support their recommendations, which are listed below, and offer reaction to some of them here as a Committee united in its belief that EXIM's core mission remains indispensable to American economic and national security.

The Council on China Competition echoes the sentiments of the Advisory Committee members regarding the two percent default rate cap, suggesting that more latitude was needed because the cap inherently and significantly reduces the Bank's ability to take on risk. Doing so could allow the Bank to really lean into some of the sectors associated with the ten areas of the China and Transformational Exports Program (CTEP), critical minerals being one concrete and important example. The People's Republic of China (PRC) is in this game for the long haul, despite a perceived levelling-off in their activity which the Council and Report get into further. In this era defined by competition, de-risking and diversification as it relates to America's global economic efforts to compete with and counter the PRC, more room for EXIM to take on risk by addressing the two percent default cap should be among the top areas where Congress makes progress for EXIM.

From the Council on Climate, we strongly echo their recommendation for a working group specifically focused on building a pipeline of clean tech and ascendant clean tech applications into the Bank. We fully understand that EXIM's Charter prevents it from discriminating against deals based solely on sector, but it isn't mutually exclusive to recognize that reality while also substantially increasing the Bank's ability to advance clean energy solutions around the world. Support for climate- and sustainability-related finance is on the rise worldwide. Addressing the climate crisis is the calling of our time and EXIM has tremendous resources to be brought to bear to maintain the world we want for future generations.

The Councils on Small Business and Advancing Women teamed up this year with their recommendations, and pried further into familiar concerns raised in years past about EXIM's support for large businesses and transactions to the detriment of medium and smaller businesses. The idea of a dedicated ambassador or 'evangelist' to spread the word about EXIM's resources for and mandate to support small businesses is a great idea to us. Because progress is being made in this area, with major room for improvement: we were heartened to see in EXIM's FY22 annual report that the Bank provided $1.5 billion in financing to small businesses – 30 percent of its total authorizations. Nearly 90 percent of its transactions that year directly benefited small business exporters, too.

Of course, EXIM has agency to make some significant reforms itself that will make it more nimble in these transitory times in the ECA sector. You hear that loud and clear in the lender and exporter roundtable surveys and feedback session documented in this Report. Because participants in this process must have experience working with EXIM and at least one other ECA, the universe is smaller, but quite knowledgeable. Almost to a T, it is widely believed that EXIM is less competitive than its counterparts. The survey respondents want EXIM to be more focused on core business, with faster processing speed and less bureaucracy. Balancing this important feedback with the Bank's mandates is a tall order, but one that must be fulfilled.

Finally, we fully embrace the range of recommendations set forth below as developed by the various councils. They are a result of intensive and extensive work. We thank the members for so freely giving of their time and considerable expertise, and thank the EXIM staff, stakeholders and customers who helped contribute to this report.

As important as the specifics of these recommendations is the thrust of all the recommendations taken together, which is that this dramatic period of transition of ECAs globally demands that we adapt. Simply put, we must change or we will be left behind.

Council Recommendations

Council on China Competition

Council on China Competition pursued five lines of effort to develop recommendations to underpin and advance EXIM's strategy to keep U.S. exports globally competitive. Those were to:

- Examine China's policies, posture, and geopolitical alignment which are causing countries to reevaluate their relationship with China.
- Assess the state of affairs in strategically important Southeast Asia and explore the needs, opportunities, and areas of possible EXIM support.
- Explore the opportunities and challenges of using EXIM to develop and enhance critical mineral projects that support U.S. objectives and adhere to Western social, governance, and environmental norms.
- Review EXIM's financial tools and processes, identify initiatives to better support transformational exports, recommend necessary risk tolerance to support transformational exports, and opportunities to optimally engage and cooperate with private banks.
- Review China's and other ECA's approach to dual use technology, the impact of perceived prohibition, and consider EXIM dual use technology policy options.

C3 recommends several consequential actions and initiatives, recognizing all cannot be undertaken simultaneously. Accordingly, this memorandum breaks out the recommendations considered most impactful and worthy of immediate action, followed by Working Group assessments and recommendations. Five working papers are attached which underpin and provide more information regarding those assessments and recommendations.

Urgency and a true whole of government approach are imperative. Meetings alone must not be the measure of inter-departmental and agency cooperation and coordination. Measurable and accountable actions paired with a targeted legislative strategy are necessary.

China will continue to strive for dominance in transformational technologies and global influence. The headwinds China faces and banking on projections of 'Peak China' must be dismissed. Accepting them will diminish the sense of urgency essential to winning the race we are in.

Priority Initiatives

PRC

- The EXIM objective must be viewed as not just about winning individual deals in developing markets. It is supporting U.S. firms in key sectors and industries, expeditiously enabling those firms, thus limiting Chinese firms in those same industries from gaining market share.
- Focus on strategic industries and drive closer alignment, in demonstrable and measurable actions, among departments and agencies of the U.S. government, including the Department of Commerce, the U.S. Trade Representative, the Department of the Treasury, the U.S. Trade and Development Agency, and the U.S. International Development Finance Corporation. EXIM will both contribute to and respond to that effort.

Southeast Asia

- The geographic focus for EXIM and competing with China must be on Southeast Asia with country prioritization of: Singapore, Vietnam, Indonesia, Malaysia, Philippines, Cambodia, Laos, Brunei.
- EXIM should host a large-scale event at the upcoming APEC Forum for US corporates and ASEAN leaders to showcase its renewed commitment to the region ideally by implementing a blanket and overall reduction in credit charges for US exports to the above select countries.

Critical Minerals

- EXIM should use its TEA authority and 402(A) designation for critical mineral projects that are eligible for the Flexible Content Policy and Flexible Rates, Terms and Conditions. Application of such content policy and financing conditions increases EXIM's competitiveness with other export credit agencies, many of which have less restrictive content policies, and helps U.S. exporters compete with China for critical mineral access.

- EXIM should prioritize locating origination teams, on the ground, where they can call directly on the miners and infrastructure developers doing critical mineral projects. Because EXIM was out of the business during the period when it could not approve significant financings, it must recreate its local profile and demonstrate to importers its value, nimbleness, and responsiveness.

Banking

- EXIM leadership, supported by the CTEP committee, the White House, and the DOD work with Congress to exclude CTEP deals from the 2% loss ratio and create a more reasonable target for CTEP approved transactions. This should include a new rating system (called cover within EXIM) approach for CTEP transactions. This will require EXIM to be innovative and look for new creative structures to protect their interest beyond the ones traditionally employed. EXIM has been creative and ingenious in filling the void in the MMIA mandate that required guaranteed banks to retain 20% of the risk in MMIA transaction, however EXIM should work with Treasury and OMB to rewrite the MMIA program so that domestic transactions have the same 100% cover as that of regular EXIM export transactions do.

- Provide additional staff and resources to Loan Officers and Engineers. EXIM is under-resourced in the number of employees who underwrite transactions and conduct technical due diligence associated with the underwriting process, causing it to be far slower and less user friendly for private banks and exporters than many other competing ECAs. EXIM should urgently focus on hiring staff in these two specific areas and consider outsourcing to third parties where necessary and appropriate.

Dual Use

- Develop an incentive strategy with an accompanying narrative to provide clarity for potential investors on direct subsidies.

- Identify areas of overlap between different U.S. government efforts to stimulate technology development and promptly optimize roles and responsibilities.

Council on Climate

1. Introduce internal policies and strengthen internal practice to ensure that EXIM's financing approaches support the US government's climate change commitments and are aligned with the Paris Agreement. This should include:

    a. Adding a section in Board approval documentation that describes how this is the case with both information submitted by the sponsor/project developer and diligence by EXIM Staff.

    b. Ensuring investments are consistent with the NDC and the transition plans of the destination country, adding a section in the application documentation and to Board approval documentation describing how this is the case and the diligence carried out by EXIM staff.

    c. Reference to how the investment supports climate objectives in press releases and public information.

    d. Accelerate the alignment of EXIM's policies and procedures with OECD guidelines for export credit agencies.

    e. Institute early project review for projects where Paris alignment is a question recognizing the extra time necessary for adequate climate and environmental review.

2. Ensure that all funding deployed integrate climate-related risk assessments, and that investments reflect (in their financial structure) incentives for low-carbon, climate resilient investment. This should include:

    a. Updating EXIM financial assessment/ modeling with climate-related stress testing (physical and transition) over (i) life of asset, and (ii) term of EXIM loan/ guarantee.

    b. Consider employing/utilizing approach presented by US Office of Management and Budget (OMB), or other asset level climate related financial risk assessment.

c. Adding climate risk assessment as an explicit component of credit review, and adding a section in the EXIM investment memo presented for Board project approval.

d. Offer opportunities for EXIM staff across all disciplines and departments to update their understanding of best practice in climate risk assessment, stress testing, pricing in investment and underwriting.

3. Increase transparency and quality of reporting by bringing EXIM's reporting into line with the standard developed by the Task Force for Climate Related Disclosures, with particular attention to TCFD guidance on (i) governance, (ii) strategy, (iii) risk management, and (iv) metrics.

4. Create a working group specifically focused on building a pipeline of potential applications across from clean tech and ascendant clean teach companies (as added to EXIM's Charter in the 2019 reauthorization). The working group, comprised of knowledgeable staff from all relevant divisions, including underwriting divisions, Office of Small Business, and Office of the Chief Risk Officer, as well as the Chair's office, should address, systematically, obstacles to clean tech firms entry into the pipeline and issues related to EXIM products that should be addressed in order for clean tech sectors to be better served by EXIM. The working group recommendations to the Chair should be shared with the Climate Council and within a specific period, the Chair produce an implementation roadmap.

5. Examine using the standard of "sufficient likelihood of repayment" referenced in EXIM's Charter to boost climate positive and clean tech applicants in the pipeline.

6. Adjust EXIM's strategy to exploit and adapt to the business environment resulting from the Inflation Reduction Act. This should include:

7. Broaden EXIM's scope to focus on new technologies and companies in the value chains of those areas benefiting from support under the IRA and to support US firms in these new and growing areas of US competitive advantage to export. Broaden the business segments which can impact quality of life improvements, which can indirectly benefit climate outcomes (More efficient air conditioning components and climate-smart technology for consumer products, for example). This could be especially beneficial especially in large countries that are focused on improving household income such as India.

a. This may include providing financing linked incentives for US manufacturing and exporters for the following areas:

- Energy efficiency & cost savings;
- Smart infrastructure;
- Net-zero Energy and net-positive water;
- Cooling technologies;
- State of the Art SAAS - based controls system and analytical platform technologies for demand management;
- Agri-tech
- Digital Energy for optimizing infrastructure plans and energy systems; and
- Carbon platform for agricultural industry with a focus on data integrity and traceability.
- Carbon credit related investments

b. Provide up to 100% EXIM coverage of contract value for climate-related exports, with an emphasis on sovereign borrowers, recognizing and appreciating that 95% coverage of contract value is a reasonable compromise.

c. Leverage EXIM's domestic investment program in by increasing domestic content requirements from 15% to 25%.

d. Apply IRA domestic manufacturing benefits to 100% of exports making export businesses more competitive until

the manufacturing economies of scale are reached.

e. Examine EXIM financing opportunities for raw materials production necessary for technologies in the energy transition, energy security and Paris alignment.

8. Engage industry experts in the development of marketing outreach and pipeline development activities and engage directly with state level teams engaged in building net zero state strategies.

9. Study the impact of a preferential pricing strategy to support climate aligned investments and guarantees and other policy approaches that would support strengthening a Paris aligned pipeline.

10. Bolster creative communications and outreach strategies to engage nationally that EXIM is open for support to business in the country's transition. Include specific information on how Continue EXIM's significant process improvement achieved during the year 2022-2023, and promote these improvements to potential partners to attract bigger climate-related projects.

COUNCIL ON SMALL BUSINESS & COUNCIL ON ADVANCING WOMEN

During its initial meeting on December 12, 2022, the Council, working across three subcommittees, identified three themes to address:

- Engaging with EXIM
    - How do small businesses learn about EXIM?
    - Easier process for small businesses to engage with EXIM.
    - Getting larger exporters engaged with smaller firms in the supply chain – "the strong supporting the weak."
- Changing the perception of EXIM for Small Business
- Banking and Alternate Lenders
    - Apathy of the banking community to address the needs of small business exporters.
    - Access to capital.

The Council then organized itself into three subcommittees to address these themes and reported their findings during a full Council meeting at EXIM on May 2, 2023. One-over arching theme concerns the length of the term served by Council members. Extending the members' terms from a one-year term to a two-year term would allow for in-depth discussions, continuity, and the ability of the Council to offer its best recommendations for improvements. Extending the members' terms would also provide the ability to advocate for adequate staffing and resources, and support the implementation of recommendations that complement the agency's professional teams' current work, and maximize the positive impact on small and minority businesses.

The Council would like to recognize the hard work and contributions made by EXIM staff. The recommendations are made in the spirit of independent analysis and continuous improvement. The Council would further like to emphasize that adopting some or all of the recommendations below will require additional resources, including staff, training, and tools (e.g. analytics software) to implement change and measure success.

Recommendations from the subcommittees have been consolidated by the following common themes that emerged in the subcommittees' reports:

- Ease of Access and Engagement with EXIM.
- New export financing and products/product improvement.
- Expanded small and minority business outreach.

Ease of Access and Engagement with EXIM

There are beliefs and (mis)perceptions in the marketplace that EXIM only supports large corporations and/or large dollar transactions, is slow, bureaucratic, and has an administrative overhead burden that is difficult for small businesses to bear. In addition, there is a gap in EXIM services to assist

small businesses that are not yet export ready. Changing these perceptions and filling gaps in EXIM services will significantly improve the agency's ability to meet the needs of small and minority medium-sized enterprises.

- Coordinate across all federal agencies that support exporting by small and minority businesses (SBA, MBDA, ITA etc.) to create an integrated eco-system to leverage impact.
- Establish an inside sales team and "service desk" to help early-stage companies achieve export readiness and resolve issues for existing and new customers.
- Expand focus on encouraging early-stage small and minority owned businesses to consider exporting.
- Offer export financial education and guidance to small businesses.
- Dedicate resources (e.g. relationship managers) to guide companies through the process from start to finish.
- Establish metrics and KPI's to measure relationship managers' success.
- Provide grant funding to organizations to provide technical assistance.
- Create more user-friendly communications specifically for small businesses to drive applications.
- Develop an on-line exporter's checklist/pre-qualification process to determine a company's point on the export readiness roadmap. Empower authorized regional partners to prequalify companies.
- Establish a mentorship program to connect new and experienced exporters.
- Lead an interagency task force to create a referral process to leverage resources of federal agencies that assist small and minority businesses.
- Offer incentives to corporations that prioritize small/diverse businesses in their supply chains.
- Document and provide access to lenders and the services they provide.

New Export Financing Products/Product Improvements

Small businesses, particularly underserved businesses, have unique financing needs that may not be met by traditional financing. Credit insurance policies and working capital facilities that are customized to the specific needs of small businesses will help improve access to financing for small businesses across the board.

- Expand Export Credit products to provide a comprehensive solution for small and minority-owned businesses
- Develop streamlined, expedited, and transparent application processes for small businesses
- Create EXIM-funded outsourcing of accounts receivable factoring to provide export related accounts receivable financing direct to borrowers
- Leverage existing EXIM customers' supply chains to identify new borrowers
- Amend the Export Credit Insurance claims procedure to allow lenders to file and manage the claims process
- Allow non-delegated authority banks to consult/work with their correspondent bank (DA)

Expanded Small and Minority Business Outreach

In reviewing EXIM's current digital marketing content, the subcommittee found it to be well done and appropriate for target audiences. In addition, the subcommittee feels that there are ample opportunities to expand outreach opportunities, particularly for underserved communities.

- Provide and devote additional financial resources and manpower to outreach efforts.
- Establish separate social media channels for the Office of Small Business. Small and minority businesses have very specific concerns and messages to small business owners need to

focus on solving problems and providing access to resources and opportunities that are actionable, rather than on general brand awareness.

- Create an "ambassador/evangelist" program providing opportunities for existing EXIM small and minority businesses to publicly express and promote their support for the role EXIM played in their success.
- Create a series of 2-minute videos featuring diverse small and minority business "ambassadors/evangelists" that address the opportunities and challenges of exporting, how to take advantage of them, and how to overcome them.
- Develop a mentorship program to connect new and early-stage exporters with more established exporters. Leverage existing program in Texas that focuses on underutilized businesses as a model.
- Expand the library of customer testimonials to include messages encouraging the non-exporting businesses to get involved.
- Create a "Small Business Toolkit," that organizes the relevant content in one place and display it prominently on the EXIM.gov website.
- EXIM needs to create a product for the underserved business community
- Outreach through partners.
    - Expand and develop relationships with state and local Community Development Finance Agencies (CDFAs) that work closely with small and minority-owned businesses.
    - Align with support services needed by exporters: legal, accounting, finance, HR, banking, compliance, IT, etc.
    - Be included in the curricula of academic institutions.
    - Conduct webinars through partner organizations.
    - Define what it means to be an EXIM partner and the opportunities/benefits to becoming a partner. Explore signing MOU's with partner organizations that identify the nature of the partnership (webinars, referrals, etc.) and contain quantifiable metrics.
    - Provide quarterly reporting on partner activities.
    - Expand the directory of partners to identify service areas, targeted constituents, and partnership areas of interest. Create multi-lingual MWOB focused-training materials for exporters and partners, including 2-minute videos that can be multi-purposed.
    - Leverage Small Business Council members' relationships to expand regional and local partnerships with small and minority businesses, non-profit organizations, chambers of commerce, and trade associations. Leverage these relationships to expand connections, extend outreach, and have a significant impact on small, minority, women, veteran, LBGTQ+ and businesses owned by persons with disabilities.
    - Engage with private sector CMOs to assist with direction on brand positioning, creation of marketing assets, and messaging.
    - Lead the whole-of-government approach by instituting a "U.S. Government Export Resources for Small Businesses" webinar series.

In conclusion, EXIM staff can build upon the existing foundation by addressing many of the challenges/opportunities outlined above and continue to better meet the needs of U.S.-based small businesses.

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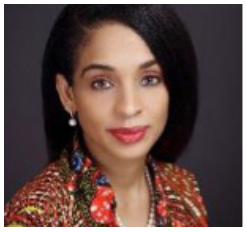

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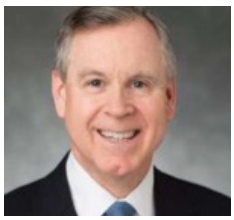

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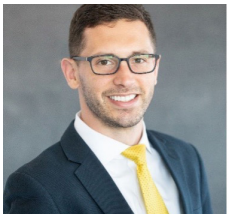

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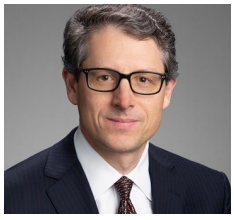

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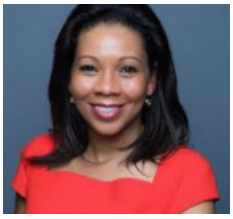

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Executive Summary

Per the Export-Import Bank of the United States' (EXIM or the Bank) statutory mandate, the 2022 Competitiveness Report evaluates the impact of calendar year 2022 official medium- and long-term (MLT) export and trade financing activity and trends on EXIM's competitiveness. During 2022, the definition of a "competitive" export credit agency (ECA) continued to evolve. That is, the characteristics of a competitive ECA are morphing from an ECA winning specific, one-off deals with standard terms, based on the Organisation for Economic Co-operation and Development (OECD) Arrangement on Officially Supported Export Credits (the Arrangement), to an ECA that meets multiple national objectives by offering: 1) case-by-case cover that meets the specific needs of an export transaction, 2) a spectrum of support in order to develop and expand national export capacity, and 3) support that facilitates financial access in priority areas (e.g., climate, sustainability).

For 2022 it appears that, due to a variety of factors (e.g., the variable phasedown of the economic effects associated with the COVID-19 pandemic, emerging market debt problems), many of the world's MLT export and trade finance institutions are in a *transition* phase. That is, 2022 data indicates a shift in a variety of directions, both in terms of activity and programs, but it is not yet clear for each situation whether the factors driving these shifts are structural (and, therefore, long-term) or temporary (causing spikes, but not permanent change).

Highlights from 2022 include:

1. One noteworthy insight that may have been "hiding" in previous years' data is that India may have been a major (and growing) player among the set of suppliers of official MLT tied export financing (i.e., the set of most direct actual or potential competitors for EXIM). Due to a combination of reporting changes and an apparent increase in India's MLT support, India rose to the third position among all MLT official tied export finance providers in 2022.[1]

2. The combination of a major decline in traditional trade-related investment insurance from Japan and a surge in OECD Arrangement compliant MLT tied export financing has reversed the long-term trend of a declining share of official support falling under the OECD Arrangement. Given the multiplicity of factors driving this shift, it is not clear whether this shift is driven by structural or temporary factors.

3. The leveling off in China's estimated MLT official tied support. This could indicate a new plateau of activity given the indebtedness of many of its obligors or could represent the bottom in a rebound cycle as the level of foreign currency assets available for China's deployment once again nears record levels.

4. The continued emphasis across the ECA world on climate- and sustainability-related finance. The factors driving this trend appear structural and global.

5. The continued expansion in the use of ECAs to build export capacity domestically. This is the latest indication that ECAs are increasingly becoming a valued national strategic tool.

1 EXIM will look into this data further and confirm or correct India's volume in next year's edition.

Introduction

Background

EXIM is the official ECA of the United States. EXIM's Charter (codified at 12 U.S.C. §635 et seq) mandates that EXIM provide financing that is "fully competitive with the Government-supported rates and terms and other conditions" offered by foreign providers of official export finance.[2] EXIM's Charter also requires the Bank to submit to Congress an annual assessment of its competitiveness in the previous calendar year.[3] The Charter requires that, in this report, EXIM "indicate in specific terms the ways in which the Bank's rates, terms, and other conditions compare with those offered from such other governments directly or indirectly."[4] As such, EXIM annually submits this Report to the U.S. Congress on Global Export Credit Competition (the Competitiveness Report).

This year's Competitiveness Report will focus on MLT officially supported export credits, the area where U.S. exporters report acute competition against foreign exporters (supported by their respective ECAs and other parts of their governments).

Report Structure

- Chapter 1 offers a detailed look at 2022 export and trade-related finance activity levels from various institutions.
- Chapter 2 provides a readout of Chinese ECA activity in 2022.
- Chapter 3 highlights new initiatives and programs offered by ECAs in 2022.
- Chapter 4 summarizes exporter and lender feedback on EXIM's competitiveness in 2022.
- Chapter 5 provides an estimate of EXIM's relative market share in Congressionally mandated areas of focus.
- Section C includes all additional Charter mandated reporting requirements as well as general information on official export and trade-related finance for new readers.

Methodological Note – Foreign Official Export and Trade-Related Finance Data

The Charter requires EXIM to provide Congress with "a survey of all other major export-financing facilities available from other governments and government-related agencies through which foreign exporters compete with United States exporters."[5] The Charter requires that where data is not available, "the Bank shall use all available information to estimate the annual amount of export financing available from each such government and government-related agency."[6] EXIM undergoes an extensive process for data compilation, collection, and verification, as detailed below.

EXIM's "bilateral template" is the primary source for most of the quantitative data presented in this report. Acknowledging that, in the past decade, many OECD Arrangement Participants have shifted to providing more MLT trade-related support outside the scope of the Arrangement while many non-participants to the OECD Arrangement have ramped up MLT export credit support (also outside the scope of the Arrangement), EXIM modified the bilateral template in 2022 to better delineate between MLT export credit and MLT trade-related support.[7] While providing more clarity, the modified template shifted how some ECAs characterized their volumes. For

2 12 U.S.C. §635(b)(1)(A).
3 12 U.S.C. §635g-1(a)(1).
4 12 U.S.C. §635g-1(a)(1).
5 12 U.S.C. §635g-1(a)(1).
6 12 U.S.C. §635g-1(a)(1).
7 EXIM defined tied MLT export credits as loans, guarantees, and insurance commitments in calendar year 2022 with tenors of two or more years that are contingent upon (tied to) an export sale from that government's country.
EXIM defined MLT trade-related support as loans, guarantees, and insurance commitments in calendar year 2022 with tenors of two or more years that support a cross-border transaction, but are not contingent upon (tied to) an export sale from that government's country.

example, some ECAs historically reported their MLT export credit volumes as untied support because this support was not covered by the OECD Arrangement Terms, a prerequisite for reporting the volume as MLT export credits in the old bilateral template. EXIM worked bilaterally with ECAs to understand significant year-over-year changes in reporting. This report will note these instances when they resulted in significant year-over-year shifts as compared to those reported in 2021.

The data that EXIM relies upon for export and trade-related program activity is largely reported directly to EXIM bilaterally by almost every major ECA in the bilateral template. EXIM's request for commitment data in this template is intentional as it provides a sense of the volume and types of export credit support that providers were willing to authorize in support of their exporters. EXIM acknowledges that this approach does not track whether funds were ultimately disbursed, whether exports were ultimately shipped, or whether institutional commitments led to measurable outcomes. Importantly, this approach provides an indication of whether the official export credit provider fulfilled its mission to provide competitive financing to level the playing field for their exporter at the time of bid.

With respect to ECA outreach, EXIM requested 2022 commitment data from most of the ECAs whose data is presented in this report. Virtually all ECAs mentioned in this report responded to EXIM's requests for 2022 data,[8] including China Export and Credit Insurance Corporation (Sinosure), a noteworthy and positive development for ECA transparency. The Export-Import Bank of China (China EXIM or CEXIM) was the only ECA to not respond to our data request this year.[9]

EXIM is grateful to other ECAs for sharing their commitment data with us, confirming their data when EXIM had questions, providing EXIM with information on their institution's activity and/or programs, and otherwise clarifying comments where necessary. This verification process helps EXIM provide a more accurate portrayal of foreign ECA activity and intent, which contextualizes the individual views of export credit practitioners.[10] EXIM's Competitiveness Report would not be possible without fulsome, transparent, and prompt input from colleagues across the global ECA community.

Methodological Note – Stakeholder Views

EXIM also conducts several methods of outreach to solicit qualitative and quantitative feedback from the Bank's stakeholders throughout the year. Included in this work is a congressionally mandated survey of exporters and lenders about their experiences regarding EXIM's role in meeting competition from other countries whose exporters compete with those from the United States. EXIM supplements the EXIM exporter and lender survey results with a variety of other engagements. Information on EXIM's efforts to understand the experiences of exporters and lenders and on the survey results can be found in Chapter 4.

8 Note, EXIM did not submit a request for data from Russia's ECAs, similar to last year.
9 Refer to the Methodological Note in Chapter 2 for our China EXIM methodology.
10 EXIM also draws upon data from public sources, such as institutions' websites and annual reports, to better contextualize ECA activities.

SECTION A

Trends in Official Export and Trade-related Activity

- Chapter 1: Official MLT Export and Trade-related Activity
- Chapter 2: Chinese Official Export and Trade-related Activity
- Chapter 3: New Initiatives and Products from Other Export Credit Agencies

23

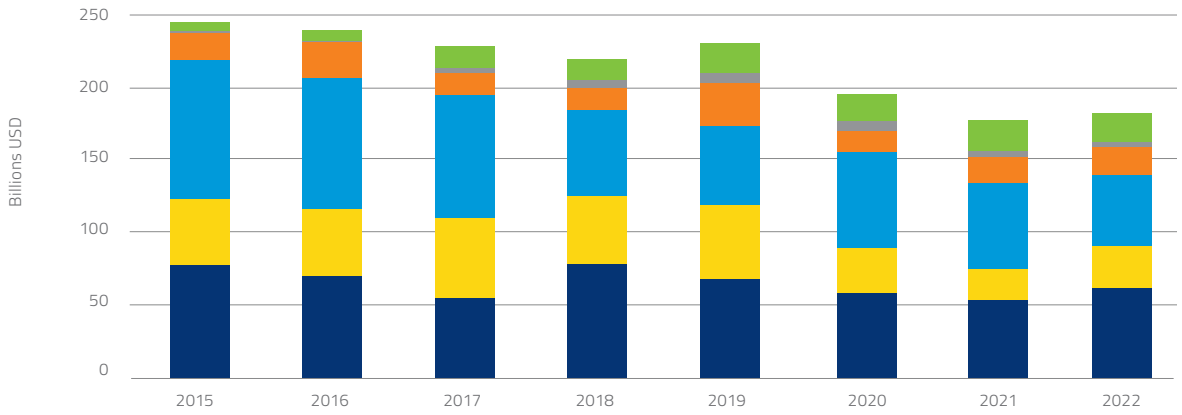
CHAPTER 1

Official MLT Export and Trade-related Activity

Introduction

This chapter of the Competitiveness Report describes the full range of official MLT export and trade-related support available in 2022. This combination of export and trade-related support represents the estimated volume of official MLT financing that supported competitors of U.S. exporters (including potential exporters). In order to measure more accurately the marketplace in which U.S. exporters operate, and to more appropriately assess EXIM's competitiveness, this chapter measures both officially supported export credit activity and the scope and scale of support for exports through trade-related programs, including investment, untied, market windows, and development finance institution (DFI) programs.

Figure 1: Grand Total of Official MLT Export and Trade-related MLT Activity from Participants and non-participants to the OECD Arrangement



	2015	2016	2017	2018	2019	2020	2021	2022
DFI Activity	11.1	11.2	11.9	12.8	16.4	13.9	16.1	16.7
Market Windows	1.7	0.3	2.7	4.2	4.1	3.9	3.2	2.6
Untied Support	15.5	19.5	13.7	11.9	23.2	14.9	17.6	19.3
Investment Support	93.0	92.2	82.0	60.3	62.8	73.8	62.4	52.3
Non-Arrangement MLT Export Credits	45.3	49.0	50.6	50.3	41.8	20.8	15.3	21.9
Arrangement MLT Export Credits	78.1	66.9	58.9	78.1	74.3	62.3	55.8	67.4

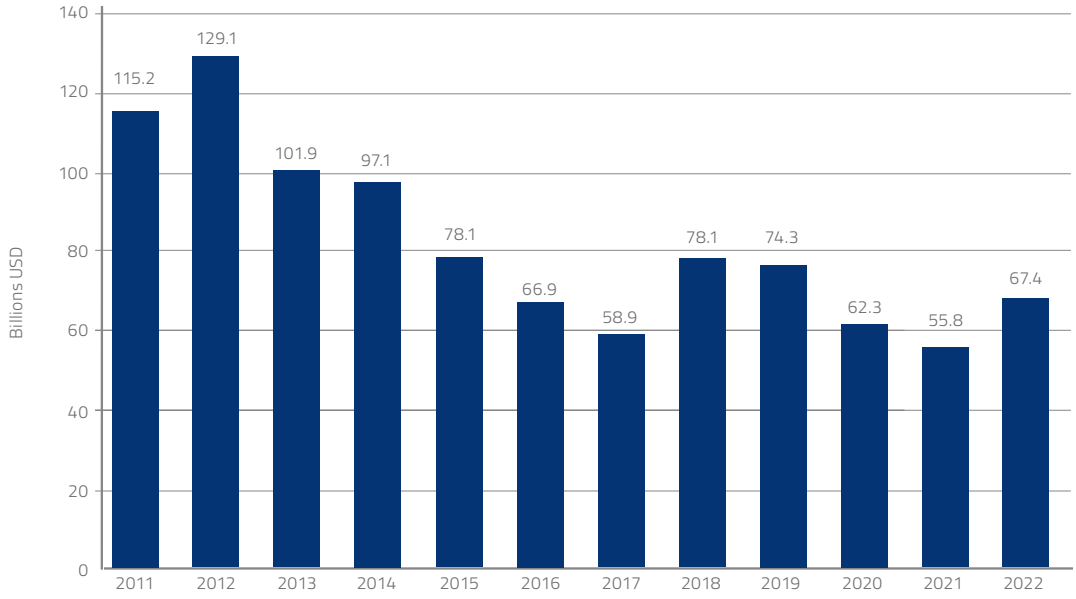
Sources: EXIM, bilateral engagement, annual reports.

Despite the COVID-19 restrictions, supply chain disruptions, and geopolitical tensions experienced in 2022, total official export credit and trade-related financing volumes provided by OECD Arrangement Participants and non-participants to the OECD Arrangement increased by $10 billion, 6% higher than 2021 volumes and the first year-over-year increase since 2019 (see Figure 1). In total, combined official MLT export and trade-related finance increased to approximately $180 billion in 2022 compared to approximately $170 billion in 2021. However, even with this increase, total MLT export and trade-related finance activity in 2022 remains substantially lower than pre-pandemic levels.

Trade-related support, comprised of investment support, untied support, market windows, and DFI activity, experienced an approximate $8 billion decline in 2022. This decline in trade-related support was caused by a decrease in investment support, which fell by around 16% to a low of $52.3 billion due to a significant, demand-related drop in Japanese activity. Meanwhile, DFI activity slightly increased in 2022 to $16.7 billion.[11]

MLT Export Credit Activity Provided by OECD Arrangement Participants

Figure 2: OECD Arrangement Compliant Official MLT Export Credits Provided by OECD Arrangement Participants



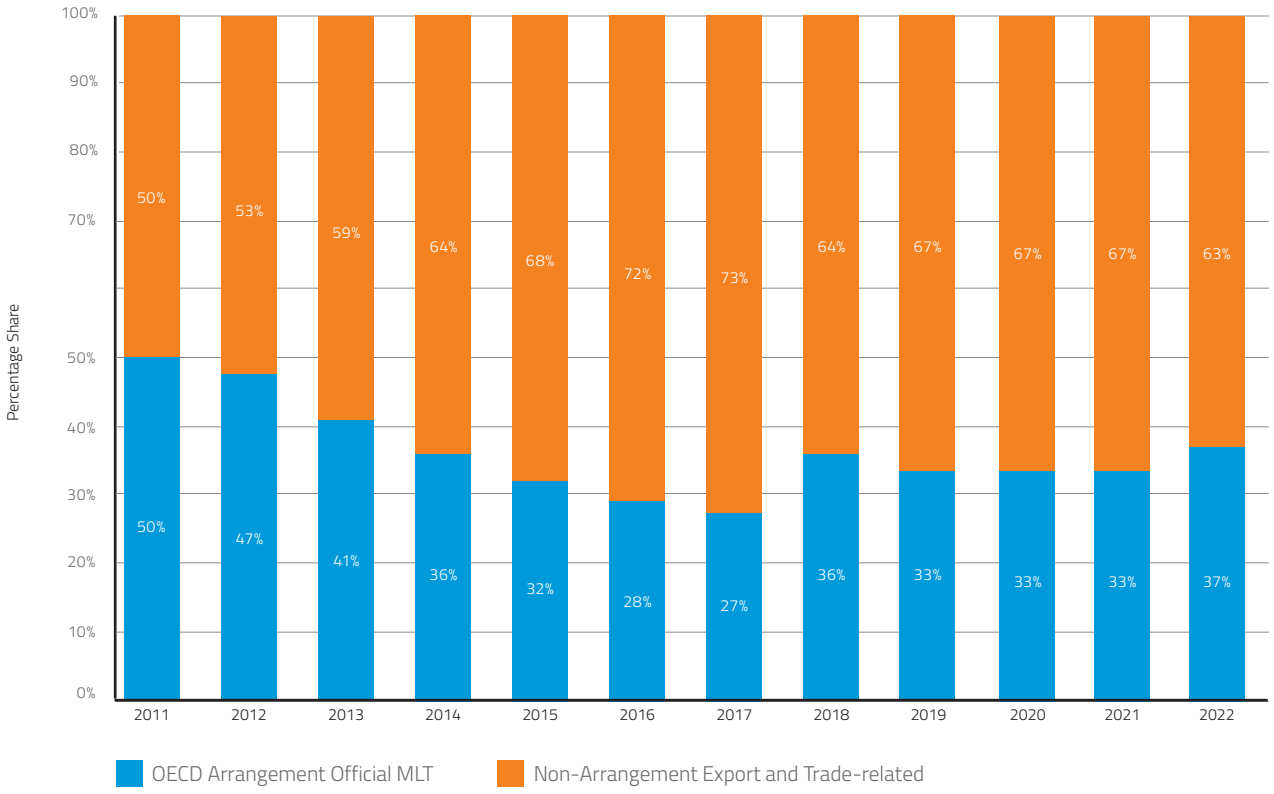
Sources: EXIM, bilateral engagement.

11 DFI volume represents reported volume from U.S. International Development Finance Corporation, European Development Financial Institutions, and Development Finance Institute Canada. Volume is taken from annual reports (when available) and is otherwise estimated. When estimates were used in the previous year, as was the case in the 2021 Competitiveness Report, EXIM revises the DFI figure with the actual volume reported in annual reports in the next year's report. This drove the change in 2021 volume reported in this year's report. DFI volume does not include DFI activity from official financing institutions in Asia due to a lack of data.

In 2022, Arrangement-compliant MLT export credit activity provided by Arrangement Participants increased (as seen in Figure 2), reversing a three-year downward trend that began in 2019. The 2022 volume was driven by significantly increased support from Italy and Korea. Italy reported $14.8 billion in MLT export credit volume in 2022, the highest among OECD Arrangement Participants, primarily driven by several large transactions in the cruise ship sector and the expansion of an existing petrochemical complex. Most other countries, including the United States, experienced modest growth.

OECD Arrangement-compliant activity comprised approximately 37% of total export and trade-related financing in 2022 (see Figure 3)— an increase of four percentage points from 2021 levels and the highest seen since 2013.

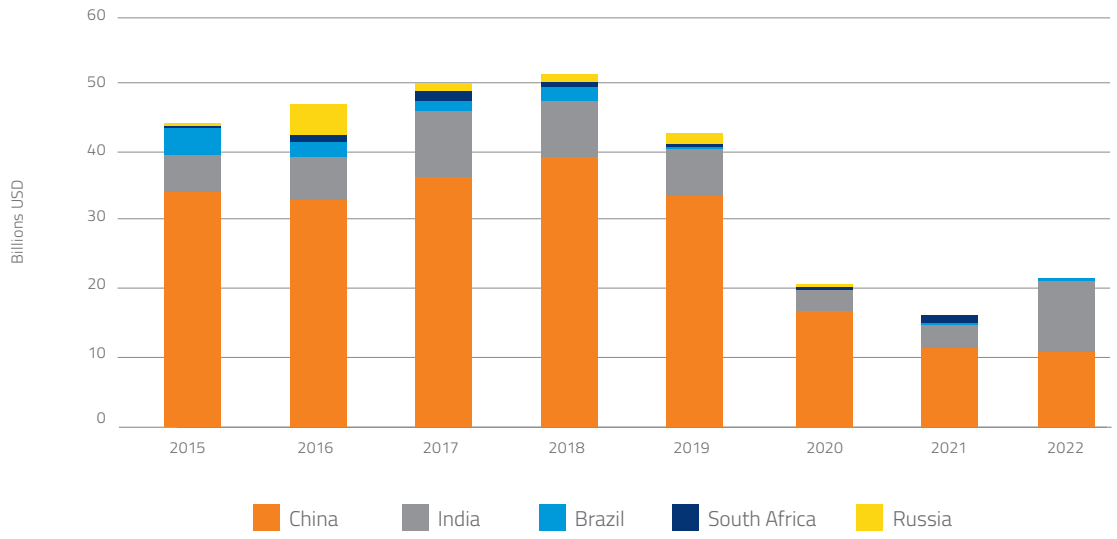
Figure 3: OECD Arrangement Official MLT Export Credits vs. Non-Arrangement Export and Trade-related Support



Sources: EXIM, bilateral engagement, annual reports.

BRICS Countries' MLT Export Credit Activity[12]

Figure 4: BRICS Official MLT Export Credit Activity



Sources: EXIM, bilateral engagement, annual reports

As in past years, China was the largest provider of official MLT export credits from the BRICS countries in 2022 (Brazil, Russia, India, China, South Africa).[13] EXIM research indicates that China's MLT official export credit reached approximately $11 billion in 2022, similar to 2021 levels.[14] For the first time since 2012, China was not the largest provider of official MLT export credits in the world, with Italy reporting nearly $14.8 billion in MLT export credit support.

China's decades-long dominance in MLT export credit financing among BRICS countries appears to be waning due not only to its lower levels of support when compared to historical standards, but also due to the steady and significant rise of India. In 2022, India reported volume nearly on par with China, rising to $10.4 billion.[15] Given India's high levels of support, total support among BRICS countries increased to approximately $22 billion, its highest level since 2019. Brazil and South Africa recorded more muted figures.

12 EXIM did not request bilateral information from Russia, therefore the activity of Russia's ECAs will not be covered in this year's report.

13 The BRICS (Brazil, Russia, India, China, South Africa) countries are significant emerging market economies that are not Participants to the OECD Arrangement, with the exception of Brazil as a Participant to the OECD Arrangement's Aircraft Sector Understanding (ASU). Therefore, their official export credit support is not subject to Arrangement rules.

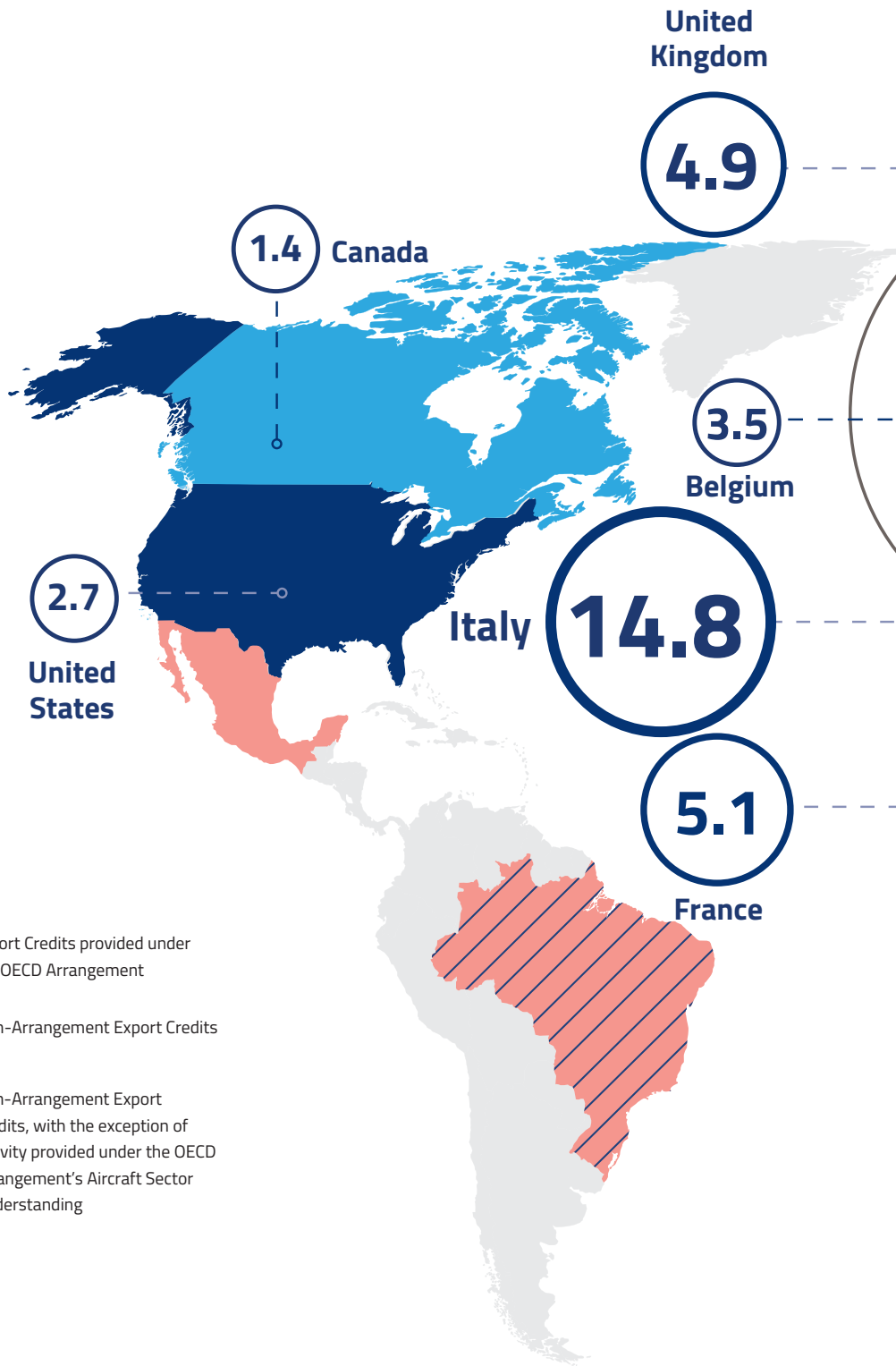
14 EXIM conducts research on Chinese official export credit volumes through open-source research, and therefore these volumes are considered estimates. They may not fully reflect the actual trend in Chinese official export credit volumes.

15 Note that changes to the EXIM reporting template appear to have clarified to India that its standard MLT financing belonged in the tied category rather than the untied category. This amended reporting accounted for a significant amount of the growth in India's tied volume in 2022. EXIM is looking into India's data further and may adjust India's 2020 and 2021 volume in next year's report.

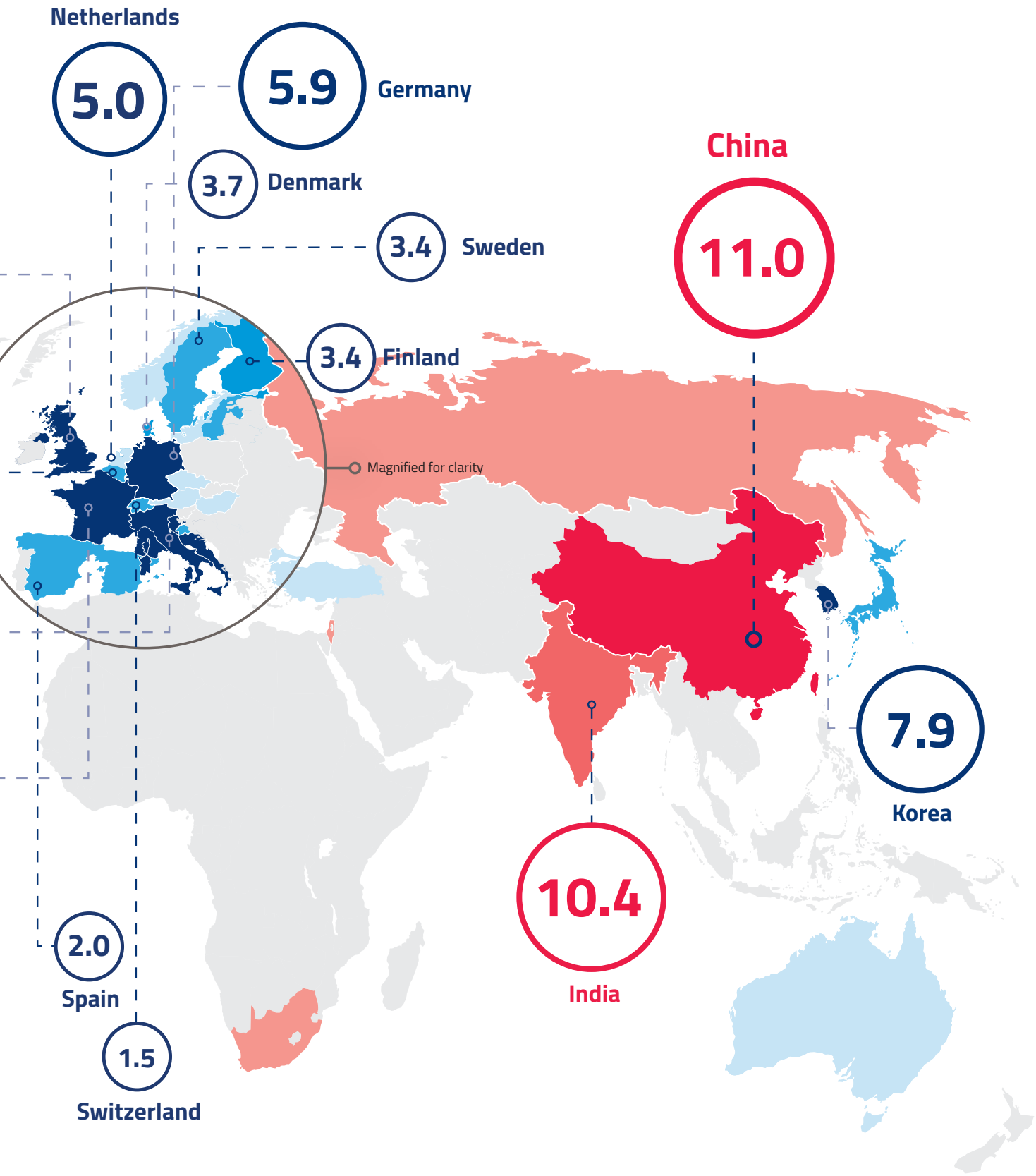
New Major Official Medium- and Long-Term Export Credit Volumes

Billions USD

1	Italy	14.8
2	China[16]	11.0
3	India	10.4
4	Korea	7.9
5	Germany	5.9
6	France	5.1
7	Netherlands	5.0
6	United Kingdom	4.9
9	Denmark	3.7
10	Belgium	3.5
11	Finland	3.4
12	Sweden	3.4
13	United States	2.7
14	Spain	2.0
15	Switzerland	1.5
16	Canada	1.4
17	Austria	0.8
18	Israel	0.5
19	Japan	0.5
20	Brazil	0.5
21	Norway	0.4
22	Other OECD	0.2
23	Mexico	0.1
24	South Africa	0.0
25	Turkey	0.0
26	Czech Republic	0.0
27	Australia	0.0
28	Hungary	0.0
29	Russia[17]	NA



16 EXIM estimate based on open-source research and bilateral engagement. See methodology section in Chapter 2 for more details.
17 Similar to 2021, EXIM did not request bilateral information from Russia's ECAs. As such, their activity will not be covered in this year's report.

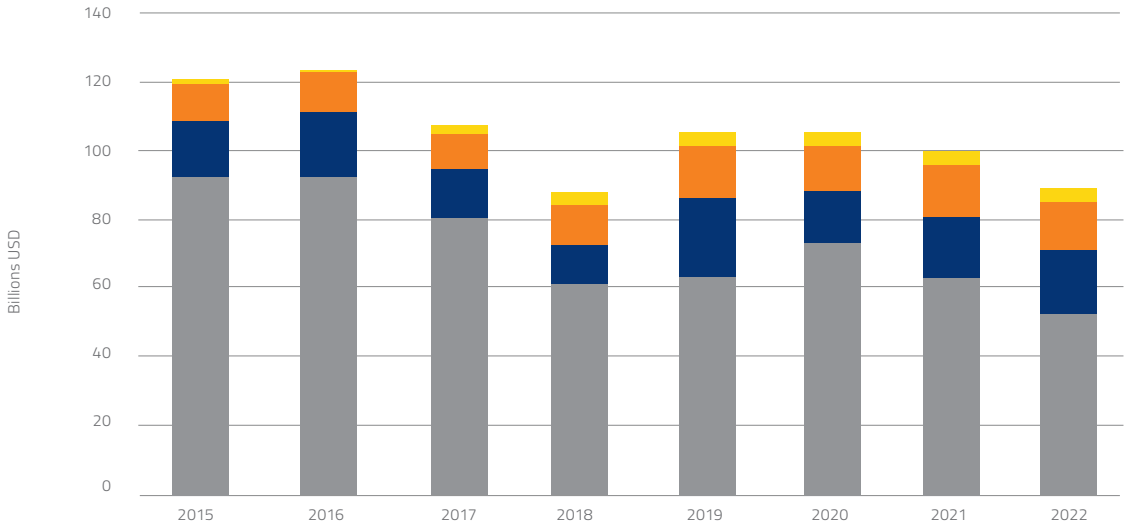


Sources: EXIM, bilateral engagement

Disclaimer: Bubbles are not to scale and do not correlate with export credit volumes listed.

Trade-related Activity (Not Covered by the OECD Arrangement)

Figure 5: Trade-related Activity (non-Export Credit) from OECD and non-OECD Countries



	2015	2016	2017	2018	2019	2020	2021	2022
Market Windows	1.7	0.3	2.7	4.2	4.1	3.9	3.2	2.6
DFI Activity	11.1	11.2	11.9	12.8	16.4	13.9	16.1	16.7
Untied Support	15.5	19.5	13.7	11.9	23.2	14.9	17.6	19.3
Investment Support	93.0	92.2	82.0	60.3	62.8	73.8	62.4	52.3

Official trade-related finance is government-backed MLT financing that is generally associated with some degree of trade between nations, but generally provided for a primary purpose other than financing an export sale; it does not normally require a minimum amount of exports from the providing country.[18] As such, this activity is not within the scope of the OECD Arrangement because it is not considered official support for exports. As U.S. exporters have reported facing global competitors backed by these types of financing, they are again included in this year's analysis.

Official trade-related finance includes investment support, untied support, market window activity, and DFI activity (shown in Figure 5). Each of these types of support (excluding DFIs) are typically dominated by a subset of ECAs.

18 See Glossary for a more detailed explanation.

Investment Support

Figure 6: Investment Support by Select ECAs (Billions USD)

Year	China	Japan	Korea	Canada	Other OECD ECAs	All Other ECAs
2015	48.6	31.6	2.1	5.7	5.0	0.0
2016	51.4	23.2	5.5	3.8	7.0	1.3
2017	44.7	21.0	7.3	4.7	2.9	1.3
2018	22.0	18.2	9.4	5.5	4.6	0.7
2019	23.1	19.4	6.9	5.5	7.8	0.2
2020	18.2	36.9	7.5	6.4	4.4	0.4
2021	13.2	29.9	8.6	4.9	5.7	0.2
2022	13.0	13.6	11.0	7.9	6.2	0.7

Investment support is historically the largest component of trade-related activity and is most often the source of competition alleged by U.S. exporters. When providing investment support, an official government entity, such as an ECA, provides support to a domestic investor from that government's country looking to acquire an equity stake in a foreign company or project overseas. That support includes insurance or a guarantee that covers political risks for an equity investor. In addition, this support includes debt to a foreign subsidiary to undertake purchases that frequently involve acquiring goods or services in international markets.[19]

Major providers of official investment support decreased their new commitments from approximately $62 billion in 2021 to $52 billion in 2022. This type of support is often used for major large-ticket projects, and therefore ebbs and flows from year to year depending on the timing of a relatively small number of projects. Japan provided the most investment support of all ECAs with $13.6 billion, followed by China with $13 billion, Korea with $11 billion, and Canada with $7.9 billion. Japan, which dominated in the investment support category over the past few years, experienced a significant drop off in support, falling from $29.9 billion in 2021 to $13.6 billion in 2022.[20]

Untied Support

Figure 7: Untied Support by Select ECAs (Billions USD)

Year	Germany	Canada	Italy	Japan	Korea	All Other ECAs
2015	0.1	1.1	0.0	1.3	7.7	5.3
2016	0.5	6.6	0.0	1.5	6.8	4.1
2017	0.0	6.5	1.5	0.6	1.0	4.1
2018	0.5	4.6	1.2	1.1	0.4	4.1
2019	0.7	4.7	0.7	2.0	5.2	9.8
2020	0.5	2.2	0.6	1.6	4.0	6.0
2021	0.0	2.3	1.2	1.8	3.1	9.1
2022	4.5	4.1	3.9	2.0	4.3	0.6

19 See Glossary for a more detailed explanation.
20 Japan indicated the decline was driven by cyclical demand, which impacted the size and number of projects in 2022.

Untied financing is generally provided to a company to promote the provider country's "national interests" rather than directly financing a specific export sale. Recently, instead of this support being used primarily for a discrete transaction, ECAs are now using it more as a lever to achieve specific, non-transactional and strategic goals—sometimes even including domestic activity. Exporters and lenders have touted the untied programs offered by foreign ECAs as competitive offerings that give buyers sourcing flexibility and allow buyers to diversify the ECAs that they work with, influencing sourcing decisions in the medium- to long-term.

Untied support increased by around 10% from 2021 to 2022. Germany was the largest provider of untied support in 2022 with $4.5 billion. Canada, Korea, and Italy also provided high levels of untied support.[21]

Market Windows

Figure 8: Market Window Activity by ECA (Billions USD)

Year	Belgium	Canada
2015	0.0	1.7
2016	0.0	0.3
2017	0.0	2.7
2018	2.8	1.4
2019	2.8	1.3
2020	2.7	1.2
2021	2.6	0.6
2022	2.6	0.0

Source: Bilateral engagement.

EXIM is required to include market window activity as part of this report.[22] A market window program is an officially backed financing program with pricing on exclusively commercial market terms and is, as such, not subject to Arrangement disciplines. The market window activity of OECD Arrangement Participants has historically raised competitive issues for U.S. exporters, although use everywhere (except Belgium) has declined to minimal levels. Belgium's market window support was stable year-over-year (see Figure 8).

Development Finance

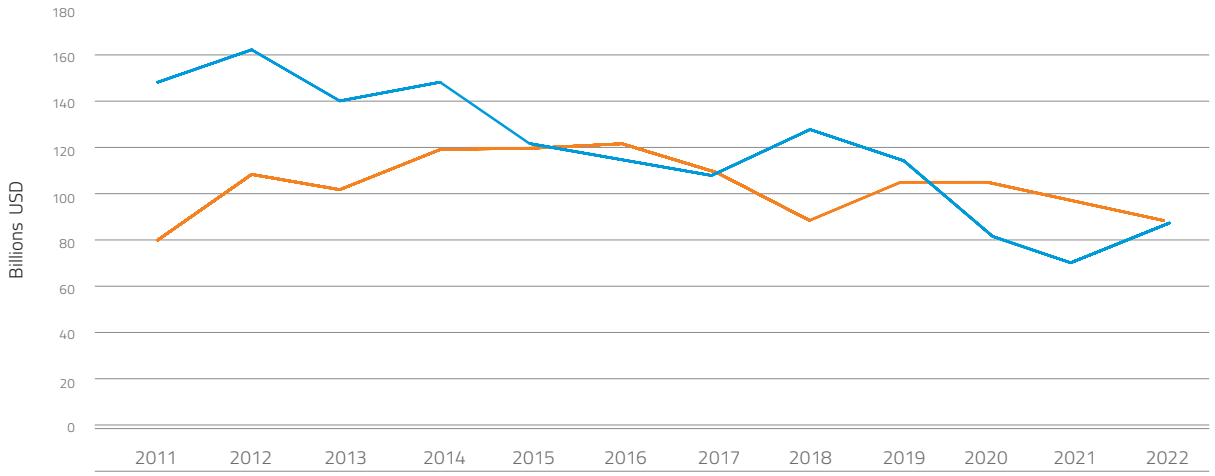
Development finance, provided by bilateral DFIs, encourages private sector entities to do business in foreign developing markets for developmental purposes. While development finance is untied, many DFIs have "national interest" mandates similar to those of many ECAs, or initiatives aimed at supporting domestic exporters. The U.S. International Development Finance Corporation (DFC), which is the DFI of the United States, continues to provide development finance only of an untied nature. DFI activity is included in trade-related financing as U.S. exporters continue to report foreign exporters have DFI support in their financing packages.

Based on EXIM estimates of U.S., EU, and Canadian DFI activity,[23] DFI support was slightly up in 2022 compared with 2021, increasing from approximately $16.1 billion to $16.7 billion. This is the highest level of DFI activity reported since EXIM began tracking these statistics, eclipsing the previous record of $16.4 billion occurring in 2019. DFI support has been trending steadily upwards over the past decade, broadly demonstrating the strategic value that governments continue to find in this tool.

21 Note that the significant decline in untied support from "All Other ECAs" seems to have been driven by the shift in India's classification of its MLT support as tied in 2022.
22 12 U.S.C. §635g-1(a)(1).
23 Asian countries, especially Japan and Korea, are consistently the largest providers of development support, but there is limited data or reporting on their activity.

Conclusion

Figure 9: Official MLT Export Credits vs. Other Trade-Related Support from OECD and non-OECD Countries



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Total Official MLT Export Credit	149.7	163.8	141.7	148.6	123.4	115.9	109.5	128.3	116.1	83.2	71.0	89.3
Total Official MLT Trade-Related Support	82.6	110.9	104.4	119.9	121.3	123.2	110.4	89.2	106.4	106.5	99.3	90.9

Sources: EXIM, bilateral engagement, annual reports.

Combined export credit and trade-related activity ticked upwards in 2022 from its 2021 lows. Led by the increase in India's MLT support, official MLT export credit volumes increased by over $18 billion in 2022. Conversely, official trade-related activity decreased by 8% to $91 billion (as seen in Figure 11) due to a fall in Japan's investment support and a reclassification of India's support as export credit.

Together, these changes resulted in a total increase in export and trade-related activity of $10 billion. This represents the first increase in overall export and trade-related activity since 2019. It is not yet clear whether the dramatic uptick in MLT export credits is the start of a new trend or only a blip in the longer-term level of declining activity.

CHAPTER 2

Chinese Official Export and Trade-related Activity

China, like some other (particularly Asian) countries, has two official export credit agencies. The Export Import Bank of China (China EXIM or CEXIM) offers loan, guarantee, and bond products that support in-bound and out-bound trade and investment.[24] China Export and Credit Insurance Corporation (Sinosure) offers trade and export credit insurance products that are comparable to standard ECA credit insurer support. While many other Chinese financial institutions provide similar trade and export-related support and are state or quasi-state owned, such as China Development Bank (CDB), China does not deem these institutions official export credit agencies, so their support is not included in this analysis.

China EXIM and Sinosure are typically less transparent about their lending products and volumes than OECD ECAs.[25] Their annual reports come with a significant time lag and, though audited by an independent third party in a manner consistent with Chinese accounting standards, do not include comparable commitment figures nor the level of detail typical of other ECA financial statements.[26] Furthermore, on a transactional basis, Chinese export credit agencies frequently include non-disclosure covenants in their credit agreements that allow the Chinese agencies to nullify the loan agreement should the terms and conditions of the loan be made public by the borrower.[27] In effect, this keeps a tight lid on the terms and conditions of these institutions' products, even though many of the borrowers are sovereigns or borrowers that carry a sovereign guarantee.

On a macro level, the value of Chinese ECA support has significantly decreased since peaking in 2018 at an estimated $39 billion. While this downward trend pre-dated the pandemic, it accelerated significantly in 2020 and 2021, before plateauing at $11 billion in 2022. A myriad of factors appears to have contributed to this decline, including tighter credit metrics, enhanced environmental, social, and governance requirements, more competition from other financial institutions, and other domestic policy shifts.[28]

Readout of China's 2022 MLT Activity

China EXIM and Sinosure authorized approximately $11 billion in MLT support in 2022, roughly equivalent to 2021. EXIM continues to see fewer large infrastructure projects in low-income countries that once typified official ECA support from China. Overall, China EXIM and Sinosure appear to have become more selective and strategic in their programs, doing fewer high-value transactions in high-risk markets.

Official support continues to be geographically dispersed, although the Caribbean and Oceania regions did garner more support than their bilateral trade relationships with China would suggest.[29] Also noteworthy, and potentially a function of worsening risk profiles and debt restructuring efforts, was the absence of any China EXIM commitments to sub-Saharan Africa in 2022, once a driver of CEXIM volumes.

On a more granular level, CEXIM maintained support for telecommunications projects in 2022. One project in the Solomon Islands was to build mobile

24 Unlike EXIM but similar to other Asian ECAs, CEXIM is effectively both an ECA and DFI. Since it has a development focus, some of CEXIM's products are not tied to Chinese exports and are provided on concessional terms. EXIM does not provide untied support or concessional loans.

25 This year, Sinosure bilaterally shared 2022 data with EXIM for use in the report, a welcome development with respect to transparency. See methodological note later in this section for more detail.

26 Neither CEXIM nor Sinosure's 2022 annual report is currently available. CEXIM's 2021 annual report was released in February of 2023. Sinosure's 2021 annual report was released in July 2022.

27 "China's Lending Strategy in Emerging Markets Risks Prolonging Borrowers' Pain," Wall Street Journal, September 10, 2022, https://www.wsj.com/articles/chinas-lending-strategy-in-emerging-markets-risks-prolonging-borrowers-pain-11662629962?st=2i444rg7385wp1j&reflink=desktopwebshare_permalink.

28 "'Small is Beautiful': A New Era in China's Overseas Development Finance," Boston University Global Development Policy Center, January 19, 2023, https://www.bu.edu/gdp/2023/01/19/small-is-beautiful-a-new-era-in-chinas-overseas-development-finance/.

29 EXIM Research.

communication towers. Huawei was reportedly the supplier and project sponsor, benefiting from a concessional financing package from CEXIM, who financed 100% of the $66 million project with a concessional loan that had a 1% interest rate and a 20-year repayment term. China EXIM's sustained support for telecommunication projects was also present in Turkey (see Box 2) and Bangladesh in 2022.[30]

Chinese ECAs also either walked away from or otherwise withheld support for a few significant transactions in 2022. In the power sector, this included power plant development in Pakistan[31] and a high-profile nuclear project in Argentina.[32] In the infrastructure sector, this included port expansion projects in Gambia[33] and Tanzania[34] and a rail project in Uganda.[35]

Box 1: CEXIM's Environmental and Social Policy

Chinese ECAs have traditionally had opaque environmental and social policies. This lack of transparency in combination with many project locations in sensitive environmental and social contexts has led to allegations that Chinese ECAs do not follow international best practices on environmental and social due diligence. Over the years, exporters have indicated that this perceived subordination of environmental and social risks to other factors in their credit decisions permits the expeditious approval of high-impact projects without full consideration of environmental and social consequences. In other words, lax environmental and social policies give Chinese ECAs a competitive advantage over EXIM and other OECD ECAs, which adhere to the Common Approaches for Officially Supported Export Credits and Environmental and Social Due Diligence and have transparent environmental and social guidelines.[36]

In an effort to improve CEXIM's Environmental and Social Management System, the Asian Infrastructure Investment Bank (AIIB), a large multilateral development bank (MDB), signed a $200 million facility with CEXIM in 2022 to fund green projects in China.[37] AIIB co-administers the program with CEXIM to ensure that projects meet CEXIM's new Green Financing Framework.[38] If robustly implemented, projects approved under this framework would better align with international environmental and social best practices. CEXIM has made clear that its new Environmental and Social Framework will only be applied to projects funded through the $200 million facility.[39] This targeted application of international best practices to a portion of its projects stands in contrast to OECD ECAs, which adhere to the Common Approaches on most projects.[40]

30 Unfortunately, details on the terms of CEXIM's $368 million loan to Bangladesh are unknown.

31 "Financial Closure of Three Power Projects: Govt Seeks Sinosure's Support," October 27, 2022, https://www.energyupdate.com.pk/2022/10/27/financial-closure-of-3-power-projects-govt-seeks-sinosures-support/#:~:text=Prime%20Minister%20Shehbaz%20Sharif%2C%20sources%20said%2C%20had%20directed,Kohala%20hydropower%20project%20and%20Thar%20Block-I%20power%20projects.

32 Argentina Wants China to Fully Fund $8.3 bln Nuclear Plant Amid Cash Shortfall," April 5, 2022, https://www.reuters.com/business/energy/argentina-wants-china-fully-fund-83-bln-nuclear-plant-amid-cash-shortfall-2022-04-05/.
"Argentina Is Wasting the Vast Opportunities China Offers it," March 7, 2023, https://www.economist.com/the-americas/2023/03/07/argentina-is-wasting-the-vast-opportunities-china-offers-it.

33 AidData.org

34 "Tanzania's China-backed $10 billion Port Plan Stalls Over Terms," https://www.reuters.com/article/us-tanzania-port-idUSKCN1ST084. "Bagamoyo SEZ negotiations all set to commence afresh," https://thecitizen.co.tz/tanzania/news/national/bagamoyo-sez-negotiations-all-set-to-commence-afresh-3607784.

35 "Uganda Cancels $2.3 billion Railway Deal with China," January 13, 2023, https://www.globalconstructionreview.com/uganda-cancels-2-3bn-ra way-deal-with-china/.

36 The alleged lax policies may have also caused a number of political challenges for China in developing markets. Government turnover and deteriorating public finances in recipient countries have further exacerbated these problems and cast some Belt and Road Initiative (BRI) projects in a negative light.
"China's Global Mega-Projects Are Falling Apart," Wall Street Journal, January 20, 2023, 30 https://www.wsj.com/articles/china-global-mega-projects-infrastructure-falling-apart-11674166180?mod=hp_lead_pos6.
"China's Huge Asian Investments Fail to Buy It Soft Power," Economist, April 5, 2023, https://www.economist.com/asia/2023/04/05/chinas-huge-asian-investments-fail-to-buy-it-soft-power.

37 China: China EXIM Bank Green On-lending Facility, Asian Infrastructure Investment Bank, https://www.aiib.org/en/projects/details/2022/approved/China-EXIM-Bank-Green-On-lending-Facility.html.

38 "Green Financing Framework: The Export-Import Bank of China, Version 1.0," September 2022, http://english.eximbank.gov.cn/News/highlights/CEXIMAIIB/202302/P020230217598004551759.pdf.

39 "Environmental and Social Framework: The Export-Import Bank of China, Version 1.0," September 2022, http://english.eximbank.gov.cn/News/highlights/CEXIMAIIB/202302/P020230216616190520326.pdf.

40 The Common Approaches applies to all types of officially supported export credits for exports of capital goods and/or services, except exports of miliary equipment or agricultural commodities, with a repayment term of two years or more.

Box 2: Turk Telecom Case Study

The OECD Arrangement contains rules regarding the minimum pricing level that Participants must offer a borrower or project. Specifically, the OECD Arrangement requires Participants providing funding at a fixed rate to charge at least the relevant minimum interest rate, known as the Commercial Interest Reference Rate.[41] *Moreover, all Arrangement-compliant deals must charge at least the applicable Minimum Premium Rate (MPR) for medium- and long-term transactions. The MPR accounts for the credit risk component of the transaction, which includes both buyer and country risk, time at risk, and type of cover (e.g., conditional versus unconditional support). The MPR is charged in addition to the interest rate, as it is meant to cover the risk of non-repayment for a given export credit.*

While the OECD Arrangement endeavors to create a level playing field for financing—particularly pricing—among OECD Arrangement Participants, non-participants to the Arrangement are not subject to these requirements. For years, observers have believed that China intentionally structured its rates, fees, and terms to provide their exporters a competitive edge over Arrangement-compliant offers. However, as outlined in the example below, this flexibility may not always mean non-participants to the Arrangement offer more affordable pricing than their Arrangement-compliant counterparts.

In 2022, the Bank of China and China EXIM provided a EUR 200 million loan, which was insured by Sinosure, to a Turkish telecommunications provider.[42] *The five-year loan was priced at Euribor plus 1.40% and, after factoring in the insurance premium and other upfront costs, Turk Telekom indicated the total all-in financing cost would be Euribor plus 2.76%. To demonstrate how this pricing would compare with a hypothetical loan guaranteed by an Arrangement Participant, see Figure 10 for a summary comparison.*

Figure 10: Sample Pricing Comparison of Chinese-backed Financing with Hypothetical EXIM Guarantee

Financing Product	Funding Cost	Risk Fee and Other Upfront Costs	All-in Pricing
Chinese Financing	Euribor + 1.40%	1.36%	Euribor + 2.76%
OECD Guaranteed Financing	Euribor + 0.30% to Euribor + 0.70%[43]	1.79%[44]	Euribor + 2.09% to Euribor + 2.49%

While EXIM had to make several assumptions in calculating the interest rate and exposure fee to estimate an Arrangement-equivalent financing package, this example demonstrates that in certain situations financing on OECD Arrangement terms can be cheaper, or at least comparable, to what is offered by countries that are not Participants to the OECD Arrangement. In this particular example, the estimation above shows that an OECD Arrangement Participant's funding cost for a Euro-guaranteed note could be cheaper than a similarly structured Chinese-backed loan, while the associated risk fee for an OECD Arrangement Participant is roughly 25% higher.

41 The OECD Arrangement has no minimum interest rate requirements for floating rates; minimum fixed rate interest to be charged is determined by the currency and repayment profile of the transaction.

42 "Special Condition Disclosure dated 18.11.2022 – Long-term Loan Agreement," Turk Telekom, https://www.ttyatirimciiliskileri.com.tr/en-us/announcements-disclosures/pages/regulatory-disclosures?id=23777.

43 As the OECD Arrangement does not stipulate the interest rate charged for ECA-guaranteed loans, this figure was estimated using interest rate data for comparable, ECA-backed Euro-denominated guarantees.

44 EXIM does not have the exact details of the Chinese financial offering, so assumptions were made regarding MPR inputs (e.g., drawdown period, buyer risk classification, amortization schedule).

EXIM's Response to China Competition

In EXIM's 2019 Reauthorization, Congress mandated that the Bank establish the China and Transformational Exports Program (CTEP) to focus on competing with China, particularly in transformational export areas. Importantly, CTEP provides enhanced support for eligible transactions, allowing EXIM to support 85% of the net contract price so long as more than half of that contract price is eligible U.S. content. In certain sectors like wireless communication, EXIM can support 85% of the net contract price even if less than half of the content is eligible U.S. content, so long as certain measures are met. EXIM supported six MLT transactions totaling approximately $630 million in authorizations under the CTEP program in 2022, up from four transactions totaling approximately $90 million in 2021.

Methodological Note

Typically, neither CEXIM nor Sinosure respond to EXIM's bilateral data request. As such, EXIM uses aggregators (LexisNexis) and analytic tools (Janes IntelTrak, Emerging Market Information Service), monitors news alerts, and performs open-source research to build a database of transactions that CEXIM and/or Sinosure authorized in 2022 to inform this report.[45] China's 2022 MLT volume represents the following:

- CEXIM's non-concessional support per EXIM research, plus[46]
- Sinosure's support per bilateral input, less
- Sinosure's overlapping support of CEXIM's support per EXIM research[47]

45 Sinosure bilaterally provided EXIM with its 2022 volume of MLT and overseas investment support. Unsurprisingly, Sinosure's bilaterally reported volumes are higher than what EXIM's internal research suggested. This variance may be attributed to different definitions of MLT. EXIM defines MLT as loans, guarantees, and insurance commitments with tenors of two or more years. Sinosure classifies its guarantees and insurance commitments as MLT if it has a tenor of more than one year. So, if half of Sinosure's reported volume had a tenor between one and two years, then their reported volume would be two times higher than what EXIM would report.

46 CEXIM can provide concessional loans with below market interest rates, long terms, low fees, etc. When EXIM has enough information to assess the concessionality of CEXIM support, it excludes concessional support that meets minimum OECD Arrangement concessionality levels from China's MLT figure to be consistent with our treatment of tied aid from other OECD Arrangement Participants.

47 Sinosure can insure CEXIM loans. In order to avoid double counting these commitments, EXIM deducts this overlapping exposure.

CHAPTER 3

New Initiatives and Products from Other Export Credit Agencies

In 2022, many ECAs introduced new products and programs to advance non-export related interests. Of particular interest to many ECAs in 2022 was advancing green/sustainable agendas, securing critical input supplies, and developing strategic industries and small and medium-sized enterprises (SMEs). Generally, most ECAs have a more flexible approach to domestic content requirements and a more holistic view of their exporters' supply chains when advancing these interests. While export development remains a core consideration in some of these programs, domestic content is rarely the primary focus. ECAs may use untied products (loans, guarantees, insurance with 0% domestic content requirements), including concessional products (products with below market terms and conditions), and minimally tied products (less than 25% domestic content) to advance these interests.

Sustainability

Similar to 2021, sustainable finance remained a priority area for many OECD ECAs in 2022. Some ECAs have development goals and have created sustainability-linked products to deliver on those objectives. For purposes of this report, sustainability means programs that promote environmental, social, and governance goals. These programs range from advancing the UN's Sustainable Development Goals (SDGs), promoting climate-positive investment, and increasing women and minority representation in governance mechanisms. They are frequently crafted to align with government-wide initiatives and commitments and occasionally involve collaboration with DFIs or MDBs.

As an example of the latter, the European Investment Bank (EIB) provided a EUR 600 million lending facility to Italian energy giant Enel, backed by a SACE guarantee, to support the development of renewable power generation and distribution in Peru, Colombia, and Brazil. The facility is linked to the emission intensity of the underlying projects and includes margin adjustments should targets not be met.[48] Enel also inked an $800 million sustainability-linked direct loan with Denmark's EKF in 2022. The multi-tranche loan will support a 1.5 GW buildout of Enel's global wind portfolio.[49] The loan is tied to supply contracts with Danish exporters.

Late in 2022, UK Export Finance (UKEF) provided a sustainability-linked loan to Pegasus Airlines to finance the airline's acquisition of ten Airbus aircraft. The loan was indexed to the airline's ability to meet carbon intensity and gender diversity targets.[50] UKEF is developing a track record for sustainability-linked support in the aviation sector, providing cover on a GBP 1 billion facility to British Airways in 2021 that included a "sustainability-related performance clause."[51]

Credendo, the Belgian ECA, introduced its Green Package in 2022, with new sustainability-linked incentives for insurance, buyer credit, and guarantee products. For sustainable export credit insurance,

48 "Enel Agrees on 600 Million Euro Facility with the European Investment Bank and SACE for Sustainability-Linked Financing in Latin America," April 11, 2022, https://www.sace.it/en/media/press-releases-and-news/press-releases-details/enel-agrees-on-600-million-euro-facility-with-the-european-investment-bank-and-sace-for-sustainability-linked-financing-in-latin-america. "Enel Agrees on EUR 600 Million Facility with the EIB and SACE," April 11, 2022, https://www.eib.org/en/press/all/2022-195-enel-agrees-on-eur600-million-facility-with-the-eib-and-sace-for-sustainability-linked-financing-in-latin-america.

49 "Enel Agrees on an 5,8 Billion KR Sustainability-Linked General Purpose Financing with EKF and Citi," https://www.ekf.dk/en/about-ekf/ekf-s-organisation/news/2022/enel-agrees-on-an-5-8-billion-kr-sustainability-linked-general-purpose-financing-with-ekf-and-citi.

50 "Sustainable Finance: AF Rethinks SPTs, Wizz Air and Pegasus debut Sust-linked Deals," February 1, 2023, https://www.ishkaglobal.com/News/Article/6872/Sustainable-Finance-AF-rethinks-SPTs-Wizz-Air-and-Pegasus-debut-sust-linked-dea.

51 "UK Agency Has Backed Billions' Worth of Aviation Deals since Paris Agreement," April 6, 2023, https://www.theguardian.com/environment/2023/apr/06/uk-agency-has-backed-billions-worth-of-of-aviation-deals-since-paris-agreement.

Credendo lowered its minimum domestic content to 20% and increased its cover from 90% to 98%.[52] Additionally, this product is open for domestic green projects so long as the good or service has export potential. In its buyer credit programs, it increased the maximum amount of funding per transaction from EUR 8 million to EUR 15 million and increased the maximum tenor from five to ten years. Finally, it increased the cover on its domestic guarantee product from 50% to 80%, where it provides cover on loans (e.g., working capital, investment loans) to Belgian companies with international operations.

In a similar vein, Cesce (Spain) rolled out a new Green Export Policy to advance climate-friendly exports. The Green Export Policy lowers minimum domestic content from 50% to 30%, provides premia discounts (within Arrangement limits), and allows for the refund of study expenses upon signing of the policy.[53] In 2022, Cesce used the Green Export Policy to provide cover on a EUR 500 million syndicated loan to support renewable energy and transmission projects in the UK, Ireland, Portugal, and Poland.[54] This policy also led to a EUR 500 million strategic agreement to promote green exports with Alstom, a rail heavyweight with a significant industrial footprint in Spain. The agreement indicates that Cesce can guarantee up to EUR 500 million of Alstom's green projects on an annual basis through its buyer credit insurance policy.[55]

Strategic Interests

Many ECAs have designed programs to promote core national interests. The most common themes of these initiatives in 2022 were strategic industry development, energy and supply chain security, and SME development. Targeting these national interests involved boosting domestic industries.

Many of the new products that ECAs rolled out in 2022 targeting strategic interests were untied. For example, Sweden's EKN introduced a new raw material guarantee in which it provides untied cover so long as the offtake contract is with a Swedish exporter. This new program, effectively an import support program, required a new ordinance that expanded EKN's mission.[56] Euler Hermes (Germany) also has a similar untied program associated with German offtake. Euler Hermes supported two large commodity transactions with Trafigura in 2022 using this program: an $800 million syndicated loan for the inbound supply of non-ferrous metals,[57] and a $3 billion syndicated loan for the inbound supply of natural gas.[58] These commodities are critical for Germany's strategic chemical and manufacturing industries. On a slightly different track, Atradius (Netherlands) rolled out an untied insurance product, the Green Cover Investment Loan, to expand domestic production capacity for green capital goods or projects. Atradius can cover up to 80% of the loan and charges market terms on the insurance product.[59]

Innovative solutions to promote strategic industries were not restricted to traditional high-volume ECAs. KUKE, the Polish ECA, developed a new tool to boost investment from large foreign companies that export from Poland. In March 2022, KUKE signed a EUR 1 billion strategic cooperation agreement with Alstom to expand export-related projects in Poland.[60] While specifics aren't public, the agreement reportedly facilitates contract execution with international

52 "Credendo Green Package," https://credendo.com/sites/default/files/media/files/2023-02/2022-07%20Credendo_Brochure_The%20Credendo%20Green%20Package_AG_v05.pdf.
53 "New Green Policies on Behalf of the State," https://www.cesce.es/en/cuenta-del-estado/polizas-verdes.
54 "Cesce Green Investment Policies," https://comercio.gob.es/en-us/NotasPrensa/2022/Paginas/221107_firmapolizaverdecesce.aspx.
55 "Cesce and Alstom Sign a Strategic Agreement to Promote Green Exports," October 11, 2022, https://www.alstom.com/press-releases-news/2022/10/cesce-and-alstom-sign-strategic-agreement-promote-green-exports.
56 "New Credit Guarantee to Secure Sweden's Access to Raw Materials," October 14, 2022, https://www.ekn.se/en/about-ekn/newsroom/archive/2022/press-releases/new-credit-guarantee-to-secure-swedens-access-to-raw-materials/#:~:text=The%20raw%20materials%20guarantee%20means%20EKN%20can%20now,of%20securing%20the%20production%20of%20raw%20materials%20abroad.
57 "Trafigura Signs USD800 Million Loan Agreement Guaranteed by the Federal Republic of Germany," October 21, 2022, https://www.trafigura.com/press-releases/trafigura-signs-usd800-million-loan-agreement-guaranteed-by-the-federal-republic-of-germany/.
58 "Trafigura Signs USD3 Billion Loan Agreement Guaranteed by the Federal Republic of Germany to Secure Gas Supply," December 5, 2022, https://www.trafigura.com/press-releases/trafigura-signs-usd3-billion-loan-agreement-guaranteed-by-the-federal-republic-of-germany-to-secure-gas-supply/.
59 "Green Cover," Accessed April 12, 2023, https://atradiusdutchstatebusiness.nl/en/products/green-cover.html. Atradius has also developed a "green label" methodology for transactions that benefit from its various green initiatives. "The Green Label," Atradius Dutch State Business, Version December 2020.
60 KUKE and Alstom Sign Billion-Euro Strategic Cooperation Agreement," March 4, 2022, https://kuke.com.pl/en/news-and-insights/kuke-and-alstom-sign-billion-euro-strategic-cooperation-agreement-to-increase-export-projects-in-poland.

buyers and appears to be tied to future Alstom export contracts. KUKE's President and CEO Janusz Wladyczak, speaking about the Alstom agreement, pledged "KUKE is ready to support the foreign expansion of companies operating in Poland."

Domestic Programs

While some of the programs mentioned previously could serve domestic purposes, others are exclusively designed to benefit domestic borrowers. ECAs established some of these programs to provide liquidity during the pandemic. More recently, ECAs have designed domestic programs to mitigate other vulnerabilities.

In 2022, Cesce rolled out a new Strategic Investment Policy to promote inbound investment in Spain.[61] Cesce will provide up to 80% cover for projects in Spain in innovative sectors like renewable energy, energy storage, and green hydrogen. Cesce charges a 5% surcharge on top of the interest rate charged by the bank net of the bank's funding cost. This product does not need to be linked to an export contract, although there are export performance related eligibility requirements.

Also in 2022, EFA (Australia) approved its first loans under its Critical Minerals Facility, an AUD 2 billion facility established in 2021 to support critical mineral projects in Australia. The first two projects involved graphite, a key ingredient in rechargeable batteries.[62] One loan will fund construction of a battery anode material facility. The other will fund the mining, processing, and manufacturing of purified graphite. The third and by far the largest was an AUD 1.25 billion loan to Iluka Resources to develop Australia's first integrated rare earths refinery in Western Australia.[63] Australia, a mineral-rich country, sees this program as a means to boost its economy by capturing more upstream value, creating regional jobs, and ensuring supply of critical inputs for domestic industries while simultaneously boosting exports.

On April 14th, 2022, EXIM's Board of Directors approved the Make More in America Initiative (MMIA), which extends EXIM's MLT financing to eligible domestic projects with an export connection. Eligible projects are expected to export 25% of production associated with EXIM financing, or 15% for priority areas such as small business, transformational export areas, and environmental beneficial projects, among others. Borrowers must report annually on how their financing is supporting exports. Additionally, EXIM's financing does not have a content requirement but is directly tied to the jobs supported by the financing, including both jobs to construct and operate facilities. This reflects EXIM's core mission of supporting U.S. jobs via exports.

As this domestic financing is not an export credit, MMIA is not subject to the OECD Arrangement. However, EXIM will still price such transactions using the OECD methodologies allowed for high-income (Category 0) countries, as these methodologies are appropriately "market-reflective." EXIM is not bound by the maximum tenors of the Arrangement for MMIA transactions but will continue to follow the Arrangement's underlying spirit (and prudent underwriting) by not lending beyond the useful life of an asset. EXIM's MMIA loans are generally subject to the same requirements as any other MLT loan, including reasonable assurance of repayment and additionality. Finally, EXIM's MMIA loan guarantees will only provide an 80% guarantee, consistent with general U.S. government credit policy, which is less than the 100% guarantee provided under its MLT export financing.

61 "Strategic Investments Financing," https://www.cesce.es/en/w/cuenta-del-estado/entidades-financieras/financiacion-inversiones-estrategicas.
62 "First Loans Approved under A$2bn Critical Minerals Facility," February 2, 2022, https://www.miningweekly.com/article/first-loans-approved-under-a2bn-critical-minerals-facility-2022-02-02/rep_id:3650.
63 "Transforming Australia's Critical Minerals Sector," April 4, 2022, https://www.exportfinance.gov.au/newsroom/transforming-australia-s-critical-minerals-sector/.

SECTION B

Stakeholder Views and EXIM's Performance in Mandated Areas

- Chapter 4: Exporter and Lender Views
- Chapter 5: Review of EXIM's Performance in Mandated Areas

CHAPTER 4

Exporter and Lender Views

Overview

Each year, EXIM conducts outreach and solicits feedback from exporters, lenders, and other export credit practitioners through a variety of avenues. Notably, EXIM conducts a survey of exporters and lenders, as required by its Charter.[64] To provide a more fulsome picture of the impact that EXIM's years of inactivity had on U.S. exporter competitiveness and to better inform the report's findings on the changes occurring at other ECAs during these years, EXIM supplemented its own survey findings with information collected through third-party surveys of export credit practitioners.

This year, EXIM expanded its survey pool to include many more companies and stakeholders that engaged with EXIM to ensure that the feedback was as diverse and robust as possible. The result was an experienced set of stakeholder respondents that included lenders and exporters as well as advisors and consultants who specialize in export credit support.

Additionally, EXIM, in collaboration with two industry groups (the National Association of Manufacturers and the Bankers Association for Finance and Trade), held focus groups with U.S. exporters and lenders. Industry association representatives explained that their comments regarding EXIM's competitiveness reflected the views of their members involved in MLT export finance, and this year also included comments on EXIM's MMIA program.

The purpose of the focus groups and outreach efforts is to supplement survey findings with more detailed commentary from the lender and U.S. export communities. Many of the same points and issues identified in the survey were also emphasized during the in-person group discussions.

As a means of validating its survey findings, EXIM has an independent third party conduct an Export Finance Survey[65] and a Global Borrowers Survey[66] to round out the market views collected from EXIM stakeholders.

It is important to note that these are qualified surveys, which means the respondents must have had some experience dealing with at least two ECAs in order to have a point of comparison from which to respond. The quotes selected for inclusion in this report best represent the overriding sentiment expressed by the stakeholders on a given aspect of EXIM competitiveness. EXIM has anonymized quotes from the survey and focus groups to ensure exporters and lenders are comfortable providing honest, fulsome feedback.

Finally, EXIM gathers information from industry conferences, meetings with experts, and market reports to contextualize all of the input provided by the range of stakeholders contributing to this section.

Key EXIM Survey and Focus Group Trends

Respondent Profile

This year, the survey was sent to an expanded pool of stakeholders familiar with EXIM[67] and covered roughly 90 questions.[68] EXIM received 45 responses of which, 51% (23) were exporters, 40% (18) were lenders, and the remaining approximately 9% (4) were "other" stakeholders familiar with EXIM. This number of responses was one more than 2021 (44). The number of responses continues to reflect the shrinking number of respondents knowledgeable—and willing to opine on—EXIM's policies and practices relative to foreign ECAs.[69]

64 12 U.S.C. §635g-1(a)(1).
65 EXIM contracted TXF and they conducted an online industry survey that attracted 413 responses, slightly up on a year before, and supplemented those finding with 19 follow-up interviews, split equally between banks, ECAs, and exporters.
66 TXF sub-sample of borrowers and importers comprised 48 individuals from 40 companies with experience dealing with at least two of these ECAs over the past two years.
67 The survey was sent to 391 stakeholders, meaning the overall response rate was approximately 12%. However, many SMEs would not be able to respond to the survey, as it requires experience with more than one ECA for comparison.
68 Most stakeholder only had to respond to a subset of those questions based on their experience with EXIM.
69 It is important to note that EXIM conducts a qualified survey which means respondents must be familiar with the programs and practices of at least one other ECA in addition to EXIM to be able to rate EXIM's relative competitiveness.

The focus groups consisted of 11 exporters and 17 banks. One exporter and one lender also requested separate bilateral meetings.

EXIM is viewed as less competitive than other ECAs but improving.

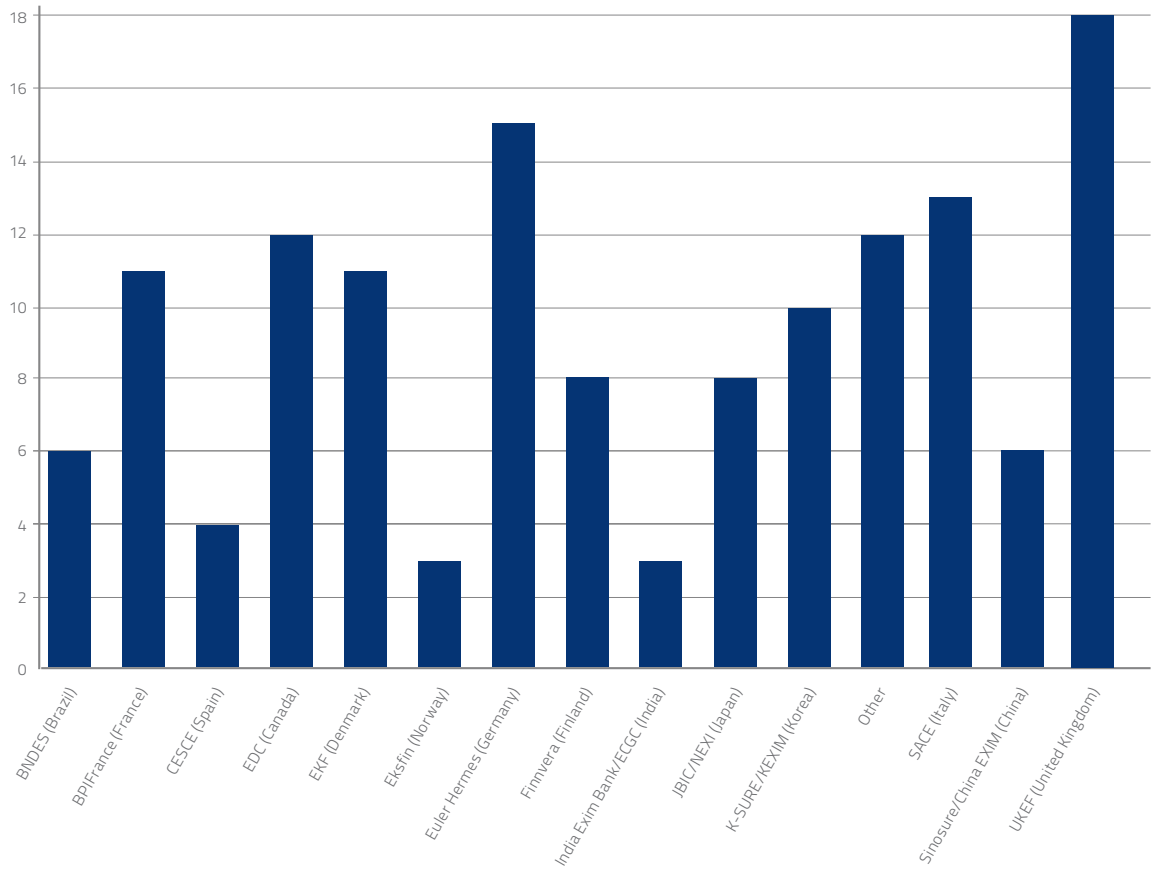
While the majority of stakeholders continued to regard EXIM as less competitive compared to other ECAs, the percentage of stakeholders with an improved opinion of EXIM competitiveness increased, with approximately 60% (25 of 42) of who responded indicating that EXIM was "far" or "slightly" less competitive than foreign ECAs. Although an improvement from last year, when 85 percent of respondents rated EXIM as "far" or "slightly" less competitive, this rating stands in stark contrast to the "A/A+" ratings that EXIM had reported in previous editions of this report a decade ago.

In terms of relative importance of financing, approximately 89% (39 of 44) of respondents stated that availability and/or terms and conditions of MLT export financing influenced a buyer's procurement decisions. In the focus group discussions, lenders and exporters further emphasized their assessment of EXIM competitiveness stating that EXIM was too passive, waiting for deals to be brought to EXIM. The group acknowledged EXIM's efforts to educate and increase opportunities for small and medium businesses, but the group felt that EXIM was reactive on large infrastructure deals. For instance, lenders stated that other ECAs act as financing advocates for their suppliers, but EXIM does not provide lists of U.S. exporters to potential borrowers, nor does EXIM offer lines of credit to "pull" supply chains into the U.S. As one lender noted: "During EXIM's shutdown, other ECAs developed programs with additional flexibility regarding content/untied schemes. U.S. firms learnt how to access those by routing sourcing away from the U.S."

Respondents were savvy and generally experienced with many foreign ECA and EXIM programs, particularly MLT programs.

Approximately 59% (26 of 44) of survey respondents answered that they have worked with other ECAs, with most having reached out to the foreign ECA themselves. They worked with an average of approximately five ECAs across at least 14 countries.

Figure 11: Other ECAs that Survey Respondents Worked With



Content requirements, interest rates/prices, and prioritization are the main competitiveness concerns.

When asked to rank the most important aspects of export credit financing, nearly 53% (19 of 36) of the survey respondents indicated that content requirements were the most important, noting that EXIM's U.S. content policy is a deterrent to doing business with EXIM. The focus group participants stated that they believed the content policy changes under the China Transformational Export Program (CTEP) were positive, but that the exclusion of Chinese content was uncompetitive as this exclusion was not required by any other ECA. According to a lender, "EXIM's restrictive content policy has led to not considering EXIM support when the level of U.S. content is not substantially high."

Another area of competitive imbalance between EXIM and foreign ECAs that approximately 28% (10 of 36) of survey respondents mentioned were EXIM's pricing and interest rate conditions. As one lender noted: "Holding rates during the pre-contract period and during disbursement are valuable factors for project finance sponsors." As EXIM typically does not hold an interest rate and instead sets the rate at first disbursement, respondents noted that EXIM support is less competitive with that of foreign ECAs who can lock in rates, a feature that is particularly important in a rising interest rate environment.

During the focus groups, lenders and exporters expressed concern at a lack of policy prioritization. They raised a number of topics that EXIM is engaged on, arguing that EXIM was creating uncertainty and inaction by making everything a priority. Topics included balancing climate change mitigation and energy transition projects and supporting projects in higher risk sectors and geographies, such as the Partnership for Global Infrastructure and Investment (PGII), Ukraine, and Sub-Saharan Africa, within the 2% default rate cap.

Focus group members flagged disappointment with these and other "policy factors" that created uncertainty around support for their transaction and delays resulting from "analysis paralysis" that impair their ability to compete.

Both survey respondents and focus group participants mentioned the negative impact of U.S. flag shipping requirements but indicated their understanding that a policy change is unlikely. Focus group participants believed that waivers were insufficient, as waivers address availability issues but not cost concerns.

Customers would like to see more business orientation and faster processing speed.

> ***"EXIM is too policy-focused and not business transaction-focused."*** -Exporter

When asked what would make EXIM more competitive compared to other ECAs, the greatest number of survey responses were focused on processing speed and flexibility. Eight of the 25 (32%) respondents to the question wrote that they want faster processing time, and five of the 25 (20%) wrote that they want greater flexibility, especially in product and financing structures. As one exporter shared, "In addition, EXIM approved [the] facility with additional conditions, which brought us to work with other ECA[s]."

Focus group participants tempered concerns regarding EXIM documentary burden and turn-around time with appreciation for EXIM's guarantee support and the quality of cover EXIM provides relative to insurance support more widely available from most foreign ECAs. Nevertheless, stakeholders did emphasize that foreign ECAs provided offers of cover more quickly than EXIM and that the documentary burden of dealing with EXIM far surpasses that of foreign ECAs, maintaining that EXIM is overly focused on legal considerations.

During the focus groups, the lenders appreciated that EXIM was now better aligned with OECD-approved 40-50% local cost support and 5% cash payment policy, while an exporter noted that the delay in the policy change may have cost U.S. exporters four water project transactions in Sub-Saharan Africa to another ECA that was able to readily offer local cost support. Additionally, lenders flagged that such flexibility should be applied to all transactions, since other OECD ECAs already offer maximum OECD-compliant flexibility. The focus group members also expressed appreciation for EXIM's Make More in America Initiative but stated that its utility will be limited due to EXIM's guarantee only offering coverage for 80% of the loan.

Third Party Survey Results

EXIM began supplementing its exporter and lender survey results and focus group findings with a third-party survey in 2016 given EXIM's restricted capabilities that limited the potential survey pool. Since then, EXIM has included a 'heatmap' that reflects inputs from a global sample of export credit practitioners as well as buyers and borrowers.

In 2022, EXIM was ranked lowest among the 18 major ECAs represented on the heatmap – in particular with respect to "Understanding the client's business" where EXIM scored a 2.9, reflecting similar sentiments expressed during the focus group meetings and the surveys that the lack of staff resources is most decidedly impacting EXIM's competitiveness.

Figure 12: 2022 TXF Export Credit Agency Heatmap (Adjusted)[70]

ECA	Speed Of Deal Execution	Product Offering	Understanding Of Clients' Business	Customer Service	Industry Expertise	Appetite For Sustainable Deals	*Final Score*
KSURE	4.02	4.46	4.25	4.17	4.19	4.27	4.23
KEXIM	4.08	4.37	4.10	4.15	4.16	4.14	4.17
OeKB	3.84	4.06	4.12	4.36	4.18	3.94	4.08
Euler Hermes	3.69	3.87	3.95	4.10	4.04	4.06	3.95
EDC	3.70	4.00	4.00	3.73	3.91	4.30	3.94
SERV	4.15	3.83	3.93	4.03	3.53	3.90	3.89
SACE	3.59	3.89	3.89	3.73	3.93	3.83	3.81
JBIC	3.20	4.00	4.10	3.64	4.10	3.82	3.81
Atradius	3.54	3.92	3.87	3.91	3.77	3.71	3.79
UKEF	3.40	3.78	3.84	3.90	3.83	3.91	3.78
EKN	3.21	3.75	3.93	3.67	4.00	4.00	3.76
EKF	3.48	3.55	3.76	3.77	3.81	4.00	3.73
CESCE	3.34	3.69	3.80	3.62	3.70	3.80	3.66
Credendo	3.31	3.53	3.69	3.72	3.53	3.40	3.53
Bpifrance	3.12	3.41	3.76	3.58	3.74	3.53	3.52
Sinosure	3.35	3.61	3.54	3.39	3.71	3.46	3.51
US EXIM	3.90	3.20	2.90	3.56	3.60	3.60	3.46
Avg. Attribute score	3.56	3.86	3.91	3.84	3.88	3.88	

Source: Export Finance Research Report 2022, Borrowers and Buyers in Focus, TXF.

70 EXIM simplified the color scheme in the heatmap for clarity and consistency. Scores of 2.5-3.25 are highlighted in red. Scores of 3.26-4.0 are highlighted in yellow. Scores above 4.0 are highlighted in green.

CHAPTER 5

Review of EXIM's Performance in Mandated Areas

EXIM's Charter mandates specific areas of focus for export development. This report focuses on the three mandated areas with significant MLT competition: environmentally beneficial exports, transformational exports, and exports to sub-Saharan Africa. This report will not cover the small business export development mandate due to a lack of data (see methodological note below).[71]

Methodological Note

EXIM's bilateral outreach does not include a request for MLT volumes in the below mandated areas. This would be administratively burdensome for the reporting ECAs given the subjective nature of the classifications (e.g., what constitutes an environmentally beneficial or transformational export). Instead, EXIM has mapped OECD purpose codes to the agency's environmentally beneficial and transformational definitions and used aggregated OECD data to approximate EXIM's relative market share in these important areas.[72] Note, this market share should be read as EXIM's market share within the OECD, not EXIM's market share globally. The OECD dataset does not include volumes from non-OECD Arrangement Participants (e.g., Chinese ECAs, Indian ECAs).

As this is the first year for this section, EXIM has calculated its market share for both 2021 and part of 2022 to provide a point of reference. Note, due to a time lag in OECD reporting, the 2022 data only represents three-quarters of calendar year 2022 authorizations. EXIM's 2022 market share will be revised in next year's report, when its preliminary 2023 market share will also be presented.[73]

Environmentally Beneficial Transactions

The Charter states that EXIM "shall encourage the use of its programs to support the export of goods and services that have beneficial effects on the environment or mitigate potential adverse environmental effects."[74] It further states that EXIM "shall promote the export of goods and services related to renewable-energy sources."[75]

EXIM has an active portfolio that includes financing for U.S. exports of renewable energy equipment, wastewater-treatment and waste management equipment, and air-pollution remediation equipment, among other technologies. In 2021, EXIM authorized four environmentally beneficial transactions totaling $15.9 million.[76] This included two solar projects, a water treatment project, and a recycling project. This represented an approximate market share of 0.3%. Through Q3 2022, EXIM authorized another four environmentally beneficial transactions totaling $82.5 million, representing an OECD market share of 2.4% over the same time span. This included a rural water supply project with a solar component, a grid-scale energy storage project, a solar power plant, and engineering services related to a nuclear project.

EXIM's small market share is partially driven by current differences between U.S. and European industrial bases. Large renewable energy projects, typically related to offshore wind, drive OECD Arrangement Participant volume in this environmentally beneficial segment; several European economies have been developing industrial wind energy expertise for decades (see Appendix G for more detail on foreign competition in the renewable

71 Most small business support is short-term support with limited competitive implications.
72 The OECD dataset does not indicate whether the transaction supported a small business export. For this reason, EXIM cannot calculate EXIM's relative market share in this mandate area.
73 EXIM's market share means EXIM's commitment volume relative to OECD Arrangement Participants commitment volume in that specific export area over the same time period.
74 12 U.S.C. §635i-5(b)(1).
75 12 U.S.C. §635(b)(1)(K).
76 Note, this volume includes medium and long-term transactions only, the focus of this report. This volume differs from the volume reported in the annual management report because it consists of calendar year rather than fiscal year transactions and because it excludes short-term volume.

energy space). While there is some U.S. production capacity in environmentally beneficial sectors like wind energy, much of this production is for domestic consumption.

Transformational Exports

The Charter directed EXIM to establish a program that supports transactions on terms that are fully competitive with offerings from the People's Republic of China (402A) or that otherwise advances the comparative leadership of the U.S. with respect to China in ten transformational export areas (402B).[77] EXIM implemented this mandate with CTEP.

The ten transformational export areas identified by EXIM's Charter are as follows:[78]

- Artificial intelligence
- Biotechnology
- Biomedical sciences
- Wireless communications equipment
- Quantum computing
- Renewable energy, energy efficiency, and energy storage
- Semiconductor and semiconductor machinery manufacturing
- Emerging financial technologies
- Water treatment and sanitation
- High-performance computing

In 2021, EXIM authorized three transactions under 402B totaling $78.7 million.[79] This included two wireless communications projects and a water treatment project. This represented an approximate market share of 1%. Through Q3 2022, EXIM authorized two transactions under 402B totaling $59.4 million, representing a market share of 1%. This included the solar plant and grid scale energy storage projects also identified as environmentally beneficial. Overall, renewable energy and telecommunications dominated this sector in the OECD. As the world's ten largest telecom producers are all foreign, EXIM's market share is significantly limited in this segment.

Exports to Sub-Saharan Africa

The Charter directs the EXIM Board of Directors to take measures to promote the expansion of EXIM's financial commitments in sub-Saharan Africa.[80] In 2021, EXIM authorized four transactions to obligors in sub-Saharan Africa totaling $21.5 million, which represented a market share of approximately 0.45%. Support consisted of a solar/rural electrification project in Senegal, cotton processing equipment in Cote D'Ivoire, feasibility study associated with a water treatment project in Cameroon, and an aircraft transaction in Kenya. Through Q3 2022, EXIM authorized two transactions to obligors in SSA totaling $81.1 million, which represented a market share of 2.7%. Support consisted of an energy storage project in Nigeria and construction equipment sales to Cameroon.

77 12 U.S.C. §635(l)(1)(A).
78 12 U.S.C. §635(l)(1)(B).
79 EXIM's market share calculation only looked at 402B because the OECD data set does not include information on whether the ECA faced direct competition from China on the transaction.
80 12 U.S.C. §635(b)(9)(A).

SECTION C

Required Charter Reporting and Further Reading

In conformance with statutory requirements,[81] the following appendices provide additional reports on select topics. The appendices also provide additional background on key policies or topics that impact EXIM's competitiveness vis-à-vis foreign ECAs and useful references for those who want to learn more about official export financing.

81 12 U.S.C. §635g 1.

APPENDIX A

Primer on EXIM and Official MLT Export and Trade-related Finance

Introduction

Historically, the Competitiveness Report focused on the official export credit activity of the Group of Seven (G7) countries (Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States) as the G7 represented the majority of the export credit support—and therefore financing competition—offered globally. However, over the past decade, EXIM has expanded its analysis to better capture the growing number of export-credit providers and multiplicity of export and trade-related products offered by other governments to understand the competitive implications of such programs on U.S. exporter competitiveness. The evolving picture is a complex export-finance ecosystem involving a range of agencies and programs aimed at defending or expanding export-related benefits to the ECA's country. Moreover, a growing number of ECAs are taking up new initiatives and working together with other official institutions that offer export and trade-related financing.

What is Official Export Credit?

An official export credit is a financing commitment to a foreign entity that is provided or supported by an official government source that is aimed at facilitating the cross-border purchases of goods or services, thereby deriving domestic economic benefits from increased exports. Official export credits are contingent upon an export sale from that government's country. In other words, they require a formal— even if minimal—amount of domestic sourcing and overseas sales.

EXIM's programs follow the rules set out by the OECD Arrangement on Officially Supported Export Credits. Originally agreed to in 1978 among a group of governments referred to as the Participants to the Arrangement (the Participants), the Arrangement outlines specific terms and conditions to provide for the orderly provision of export credits. Today, the Participants include Australia, Canada, the European Union, Japan, Korea, New Zealand, Norway, Switzerland, Turkey, the United Kingdom, and the United States. Non-Participant governments, such as China and India, are not covered by these rules.

The OECD Arrangement MLT export credit activity reflected in this report consists of support from OECD Arrangement Participants that is within the scope and complies with the terms of the OECD Arrangement. This includes official support in the form of MLT insurance, guarantees, and direct loans. All transactions follow the transparency, pricing, and eligible flexibilities outlined in the OECD Arrangement. Non-OECD Arrangement official MLT export credit activity, as reflected in this report, consists of the major ECAs whose states are not Participants to the Arrangement.[82] As a result, these ECAs provide official MLT export credits outside the scope of the OECD Arrangement, and, while some of these ECAs aim to mirror Arrangement terms, they have the ability to be more flexible in the terms they offer.

What is Official Trade-related Finance?

Official trade-related finance is government-backed MLT financing of trade between nations but is generally provided for purposes other than promoting exports and does not formally require a minimum amount of exports from a certain country.[83] Similar to export credits, trade-related finance can take the form of loans, guarantees, or insurance, among other products. Export-credit support is subject to rigorous disciplines that afford it special protection within the

82 This includes Brazil, Russia, India, China, and South Africa (the BRICS countries). Brazil is a Participant to the Aircraft Sector Understanding.
83 Trade-related finance is not to be confused with trade finance, which typically refers to short-term financing.

World Trade Organization's rules framework. Other forms of trade-related programs, such as support for foreign investment, untied credits, market window, and DFI support, are not subject to export-credit disciplines, given that such support falls outside the scope of the OECD Arrangement. However, as U.S. exporters have reported facing competitors backed by these types of financing, they are included in this year's analysis. A description of each kind of trade-related support is outlined below.

Investment Support: When providing investment support, an official government entity such as an ECA provides support to an investor (usually from that government's country) looking to acquire an equity stake in a foreign company or project overseas. This typically occurs in one of two forms: political-risk insurance provided to an investor's cross-border equity investment, or debt financing provided to an investor to use for a cross-border investment. ECAs are one of many providers of this type of support. Asian ECAs provided the largest volume of investment support in the last few years.

Untied Financing: Untied financing is generally provided to support "national interests" and thus may or may not result in direct export support from the providers' country. To provide such support, the ECA requires some national interest components (e.g., offtake contracts; operation and maintenance contracts; taxes paid in the ECA's country or promises of future procurement from the ECA's country) rather than exports. This does not mean, however, that host country exports are not supported by such financing—only that there is no formal requirement for a minimum amount of domestic content that must be purchased with the financing provided. For example, a steadily increasing number of ECAs attempt to use untied programs to incentivize major companies to move their supply chains to their country to support future procurement rather than current export sales. Given the diverging approaches in using untied financing, its competitive implications vary widely.

Market Windows: In a market window program, an ECA offers pricing on the same terms as the commercial market. A market window does not necessarily result in lower financing costs compared with financing provided under the OECD Arrangement. However, market windows allow ECAs to have more flexibility on tenor, down payments, and risk premia because these programs are not covered by the Arrangement. While EXIM monitors market window activity of OECD Arrangement Participants pursuant to statutory requirements,[84] they appear to have limited impact on the competitive landscape.

Development Finance: Development finance, provided by bilateral DFIs, encourages private-sector entities to do business in foreign developing markets for developmental purposes. While development finance is untied, many DFIs have "national interest" mandates or related initiatives aimed at supporting domestic exporters, although this does not mean that DFI support is limited to national exporters. In the 2018 Competitiveness Report, EXIM outlined the changes in development finance activity over the past decade, including how some European DFIs now provide tied export finance to support their countries' exporters. In subsequent editions of the Competitiveness Report, EXIM has noted changes in DFI activity. However, because DFI activity is not as transparent as ECA activity, it is difficult to adequately describe and quantify DFI activity and relevant trends in this product.

Note: The majority of all export and trade related finance is either provided by non-Arrangement Participants or is not formally tied to national exports and therefore is not part of the OECD Arrangement's transparency provisions. This creates a particularly opaque landscape when gathering and analyzing data.

84 12 U.S.C. §635g-1(a)(1).

APPENDIX B

EXIM Actions to Provide Competitive Financing and to Minimize Competition in Government-supported Export Financing

Providing Competitive Financing

EXIM's Charter directs EXIM to "provide guarantees, insurance, and extensions of credit at rates and on terms and other conditions which are fully competitive with the Government-supported rates and terms and other conditions available for the financing of exports of goods and services from the principal countries whose exporters compete with United States exporters, including countries the governments of which are not members of the Arrangement."[85] Section 8A(a) of the Charter requires EXIM to provide a description of the actions of the Bank in complying with these mandates.[86]

As described in the Introduction, EXIM follows the terms outlined in the OECD Arrangement. Under the Arrangement, EXIM generally meets its mandate to provide competitive financing. EXIM is able to offer the maximum repayment terms, minimum interest rates, and minimum premium rates the Arrangement allows. These factors vary depending on, among other things, country risk, the obligor's risk profile, the project's sector, etc.

Maximum repayment terms vary depending on the income level of the borrower's country and the nature of the goods being exported. General transactions (i.e., those not covered by one of the Arrangement's Sector Understandings) qualify for a maximum repayment term of 8.5 to 10 years, with the lower bound being the maximum term for transactions in high income markets. Exceptions to the standard include: project finance (10 to 14 years); renewable energy and nuclear power plants (18 years); commercial aircraft (12 years); and rail infrastructure (12 to 14 years).

The Arrangement also sets rules for the minimum fixed interest rate that Participants can offer when providing direct loans. The minimum rate, referred to as the Commercial Interest Reference Rate (CIRR), is based on the currency and tenor of the loan. The U.S. Dollar CIRR that EXIM offers for most direct loans is calculated by adding a fixed margin of 100 basis points to one of the following three yields (the base rates):

1. Three-year U.S. Treasury bond yields for a repayment term up to and including five years,
2. Five-year U.S. Treasury bond yields for terms over five years and up to and including 8.5 years, or
3. Seven-year U.S. Treasury bond yields for terms over 8.5 years.

In 2021, Participants agreed to a new CIRR construction that will come into effect in mid-2023. The CIRR calculation was changed to become more market reflective, including by incorporating the disbursement period into the base rate and by adding a margin that varies based on the five-year swap spread.

In April 2021, the Participants agreed to increase the amount of local cost financing to 40% for high-income OECD countries and 50% for all other countries. As of the end of 2022, EXIM's Board had yet to consider the local cost increase for approval but was on track to do so in early 2023.

85 12 U.S.C. §635(b)(1)(A).
86 12 U.S.C. §635g-1(a)(1).

In November 2021, the Participants also agreed to a temporary amendment to the cash payment rules in which OECD Arrangement Participants can offer a reduced minimum cash payment of 5% (the standard is 15%) to sovereign or public borrowers with a Ministry of Finance guarantee. This flexibility was extended in November 2022. Given EXIM's content policy is tied to the 15% cash payment, in 2022, EXIM's offering of the 5% cash payment flexibility was limited to CTEP transactions, for which EXIM can finance eligible foreign content.

In 2022, there were differences in the terms and conditions available under the Arrangement and what EXIM could offer as it related to local costs and the 5% cash payment flexibility. The lack of Board approval of these two financing options put EXIM at a competitive disadvantage.

As reported in previous years, the increase in volume of official financing not covered by the Arrangement poses considerable challenges to EXIM's efforts to facilitate a level playing field for U.S. exports. EXIM cannot directly compare the terms and conditions it offers to the terms and conditions offered under these trade-related finance programs because information on these terms is not available. EXIM continues to receive anecdotal evidence that indicates the terms offered under these programs are more generous than those allowed under the Arrangement (e.g., longer repayment terms, lower interest rates, 100 percent financing).

Moreover, exporters and lenders report that while EXIM's financing terms may be competitive, EXIM policies, such as content, put it at a competitive disadvantage particularly as other ECAs continue to offer more flexible domestic content requirements.

Minimizing Competition in Government-supported Export Financing

The Charter also states that "The Bank shall, in cooperation with the export financing instrumentalities of other governments, seek to minimize competition in Government-supported export financing and shall, in cooperation with other appropriate United States Government agencies, seek to reach international agreements to reduce government subsidized export financing."[87]

In 2022, EXIM was focused on negotiations at the OECD to update the Arrangement to better reflect current market trends.

87 12 U.S.C. §635(b)(1)(A).

APPENDIX C

Purpose of EXIM Transactions

Pursuant to Section 8A(a)(4) of EXIM's Charter, EXIM gathers "a description of all Bank transactions which shall be classified according to their principal purpose, such as to correct a market failure or to provide matching support."[88] Applicants indicate the reason for seeking EXIM support on their financing application. EXIM aggregates applicant responses into three main categories for reporting purposes: (1) to counter potential ECA competition, (2) to address private sector financing limitations, and (3) to address when the private sector is unwilling to take risks. Figure 13 below reports the listed primary purpose per transaction by program in 2022. Although only the primary purpose is reported here, applicants may cite multiple purposes. For MLT transactions, EXIM has reported both Investment Grade and non-Investment Grade markets. Short-term (ST) transactions generally involve multiple buyers, so it is not possible to make a similar distinction for the ST table.

Consistent with the Board's 2020 approval of additionality reforms, EXIM will be reviewing its additionality compliance procedures through 2023 and expects to bring proposed updated procedures to the Board in 2023. In addition, EXIM will seek to ensure that the updated procedures address recommendations made by the Office of Inspector General regarding documentation and monitoring of additionality factors.

Figure 13: EXIM Transactions by Purpose, 2022

Short-Term (Millions USD)

	Potential Competition		Private Sector Limitations		Private Sector Unwilling to Take Risk		Total	
	Volume	Count	Volume	Count	Volume	Count	Volume	Count
ST Insurance	$0	-	$2,129	1,259	$227	344	$ 2,355	1,603
Working Capital	$0	-	$453	3	$623	114	$ 1,075	117
TOTAL	**$0**	**0**	**$2,581**	**1,262**	**$850**	**458**	**$3,431**	**1,720**

Medium/Long-Term (Millions USD)

	Potential Competition				Private Sector Limitation				Private Sector Unwilling to Take Risk				Total			
	Investment Grade		Non-Investment Grade		Investment Grade		Non-Investment Grade		Investment Grade		Non-Investment Grade		Investment Grade		Non-Investment Grade	
	Volume	Count	Volume	Count	Volume	Count	Volume	Count	Volume	Count	Volume	Count	Volume	Count	Volume	Count
Long-Term Loan	$0	-	$407	1	$0	-	$0	-	$0	-	$0	-	$-	-	$407	1
Long-Term Guarantee	$586	2	$1,149	10	$0	-	$45	3	$0	-	$78	2	$586	2	$1,271	15
Medium-Term Loan	$0	-	$0	-	$0	-	$0	-	$0	-	$0	-	$-	0	$-	0
Medium-Term Guarantee	$2	2	$68	55	$0	-	$0	-	$1	1	$269	13	$3	3	$336	68
Medium-Term Insurance	$0	-	$50	9	$0	-	$0	-	$3	1	$41	10	$3	1	$91	19
TOTAL	**$588**	**4**	**$1,674**	**75**	**$-**	**0**	**$45**	**3**	**$4**	**2**	**$387**	**25**	**$592**	**6**	**$2,106**	**103**

88 12 U.S.C. §635g-1(a)(4).

APPENDIX D

Equal Access for U.S. Insurance

Section 2(d)(4) of EXIM's Charter requires the Bank to report in the annual Competitiveness Report those transactions for which the Bank had information that an opportunity to compete was not available to U.S. insurance companies.[89] Section 2(d)(2) of the EXIM Charter states that "the Bank shall seek to ensure that United States insurance companies are accorded a fair and open competitive opportunity to provide insurance against risk of loss"[90] in connection with long-term transactions valued $25 million or more.

At the time the legislation was enacted, EXIM had neither encountered nor been informed about any long-term transaction for which equal access for U.S. insurance companies was not accorded. Consequently, EXIM, the Department of Commerce, and the Office of the United States Trade Representative agreed that the establishment of a formal reporting mechanism was not necessary. It was also agreed that should EXIM identify any long-term transaction in which U.S. insurance companies are not allowed equal access, a more formalized procedure would be created. As of December 2022, EXIM had not identified any long-term transactions greater than $25 million in which U.S. insurance companies were not allowed equal access.

89 12 U.S.C. §635(d)(4).
90 12 U.S.C. §635(d)(2).

APPENDIX E

Tied Aid Credit Program and Fund

Overview and Background

Section 10(g) of EXIM's Charter requires EXIM to provide an annual report on several aspects of EXIM and foreign ECA use of tied aid.[91] This appendix addresses:

1. The tied aid reporting requirements of EXIM's Charter; and
2. The competitiveness issues pertaining to the use of tied and untied aid because, in creating EXIM's Tied Aid Credit Program and Fund, Congress recognized in EXIM's Charter that tied and untied aid can be "predatory" methods of financing that can distort trade to the detriment of U.S. exporters.[92]

Tied aid is concessional funding provided by a donor government that finances the procurement of goods or services from the donor country. Unlike export credits, tied aid is subsidized support and its terms are more generous than standard export credits. Therefore, tied aid can distort trade flows by inducing a buyer in the recipient country to make its purchasing decisions based on financial terms rather than the price and/or quality of the good/service. Tied aid providers pursue developmental and strategic objectives with the provision of tied aid.

In some countries, ECAs are responsible for tied aid programs. In other countries, aid agencies or other ministries are responsible for administering tied aid programs. Tied aid offers can take various forms, including:

- Grants
- Concessional loans: loans bearing a low interest rate, extended grace period, and/or a long repayment term
- Mixed credits: a grant provided alongside a standard export credit where the concessional funds are available only if the linked non-concessional component is accepted by the recipient

The OECD Arrangement takes into account the various forms of support. That is, Participants use standard calculators to determine the Overall Concessionality Level (OCL) to ensure that tied aid offers meet the minimum concessionality levels.

Description of the Implementation of the Arrangement

Section 10(g)(2)(A) of EXIM's Charter requires EXIM to report on the implementation of the Arrangement rules on tied aid, including a description of the notification and consultation procedures.[93]

Competitive concerns and level playing field considerations led Participants to the OECD Arrangement to require tied aid providers submit notifications of tied aid offers to the Participants to the Arrangement 30 days in advance of the bid closing or commitment date. This prior notification allows OECD ECAs to review and, if needed, match foreign tied aid offers that are either noncompliant with OECD rules and/or compete with standard export credit support. Additionally, the OECD Participants have agreed to rules known as the "Helsinki Rules" or "Helsinki Disciplines" that govern a subset of tied aid actions with the most trade-distorting potential. These rules, agreed to in 1991, can be summarized as follows:

1. no tied aid for commercially viable projects;
2. no tied aid for upper-middle income and high-income countries; and
3. no tied aid offers with less than 35% concessionality.

These disciplines and levels of transparency have worked well to reduce trade-distorting aid and redirect tied aid from commercially viable sectors to less viable, development-oriented sectors. As such, no tied aid offers have been challenged since 2009. Regarding consultation procedures, no tied

91 12 U.S.C. §635i-3(g).
92 12 U.S.C. §635i-3(a)(1).
93 12 U.S.C. §635i-3(g)(2)(A)

aid projects have been examined by the Consultation Group on Tied Aid since the 2009 challenge. No tied aid matching offers were made in 2022.

EXIM Tied Aid Activity

Section 10(g)(2)(C) of EXIM's Charter requires a description of EXIM's use of the Tied Aid Credit Fund.[94] To use the Tied Aid Credit Fund, EXIM must follow the "Reed-McIntosh Procedures" which were developed jointly by EXIM and the U.S. Department of Treasury and implemented in October 2020. The updated procedures reflect legislative changes to the tied aid provisions in EXIM's Charter and bring the procedures up to date with the letter and spirit of those changes. EXIM did not use its Tied Aid Credit Fund in 2022.

Foreign ECA Tied Aid Activity

Section 10(g)(2)(B) of EXIM's Charter requires EXIM to provide a description of foreign tied aid activity.[95]

OECD ECA Activity

The tied aid rules of the OECD Arrangement define four types of tied aid, described below with the related activity levels in 2022. Taken together, OECD Arrangement Participants' tied aid support reached a total of approximately $8.9 billion in 2022, broken out as follows:

- Tied aid that has a concessionality level of greater than or equal to 80 percent is considered highly concessional. This type of tied aid is more costly to the donor country and more closely resembles a grant than tied aid with a lower level of concessionality. As such, highly concessional tied aid is more developmental in nature and less likely to be trade-distorting. In 2022, highly concessional tied aid totaled $2.2 billion, representing a 26% decrease in volume from 2021 levels. The United States, through support from U.S. Agency for International Development (USAID), provided all highly concessional aid recorded at the OECD in 2022, as has been the case since 2016.
- De minimis tied aid is an offer of tied aid that has a value of less than 2 million SDR. Given the small transaction size, competitive concerns are nominal. In 2022, there was one de minimis tied aid notification for $2.2 million. In general, these transactions are rare; none were reported in 2021.
- Least Developed Countries (LDCs), as defined by the United Nations, are not a typical market for export credits, and, as such, are considered less likely to pose competitiveness implications. In 2022, tied aid to LDCs totaled $2.2 billion, nearly a 50% increase from 2022.
- Helsinki tied aid is the core type of tied aid and captures all other tied aid activity. Because Helsinki tied aid has the highest potential for competitiveness concerns and potentially negative implications for a level playing field, the Arrangement requires 35% concessionality and directs this type of tied aid to commercially non-viable projects. Helsinki-type tied aid increased by 21% to approximately $4.7 billion in 2022, approaching historic levels, albeit with significantly fewer transactions.

The OECD tied aid disciplines have helped diminish the degree and scope of competitiveness concerns by redirecting tied aid away from commercial projects in high-income markets to developmental projects in lower-income markets. Overall, tied aid volumes, including Helsinki tied aid, continued to rebound from their pandemic nadir but remain below pre-pandemic volumes.

Tied aid trends in 2021 include:

- **Providers:** Japan ($1.8 billion), Korea ($1.2 billion), and France ($1.2 billion) provided the most Helsinki-type tied aid in 2022. All three have consistently been prominent suppliers of Helsinki aid.
- **Recipients:** Egypt was the top destination for Helsinki-type tied aid in 2022, accounting for $3.5 billion (74%) of Helsinki aid. Outside of Egypt, no other destination country accounted for more than 5% of the total.
- **Sector:** Approximately $4 billion (85% of all Helsinki type aid) went to the Transport and Storage sector, as has consistently been the case.

94 12 U.S.C. §635i-3(g)(2)(C)
95 12 U.S.C. §635i-3(g)(2)(B)

Non-OECD Tied Aid Activity

OECD Arrangement tied aid rules and transparency requirements do not apply to tied aid offers from non-participants to the OECD Arrangement. U.S. exporters have expressed competitiveness concerns regarding concessional offers from these countries, particularly China. China is likely one of the largest providers of tied aid. However, China's tied aid programs are poorly understood due to reporting opacity and other access barriers. Other non-participants to the Arrangement also provide tied aid financing that may pose a threat to the competitiveness of U.S. exporters. However, they have not been reported as posing a significant competitive threat in 2022. Finally, EXIM did not receive any applications for EXIM tied aid support in 2022.

OECD Untied Aid

In light of historical concerns regarding the de facto tying of aid, the Arrangement requires that governments report trade-related untied aid to the Participants to the Arrangement 30 days prior to the opening of the bidding period. Furthermore, due to competitiveness concerns, Participant countries have committed to reporting untied aid credits prior to and following commitment in their Agreement on Untied Official Development Assistance Credits Transparency. This was first put in place in 2005.

Trade-related untied aid fell for the second consecutive year to $7.8 billion, falling below tied aid volumes ($8.9 billion) for the first time since 2019. Japan provided the highest volume of trade-related untied aid in 2022, followed by France and the Netherlands; Japan and France have historically provided the highest levels of trade-related untied aid.

APPENDIX F

Co-financing

Section 8A(a)(7) requires that EXIM provide a description of the co-financing programs of the Bank and of the other major export-financing facilities.[96] Co-financing is a financing arrangement that allows EXIM to address some of the challenges that U.S. exporters face when an export contains content from multiple countries. Specifically, co-financing is a tool that streamlines official export credit support into a one-stop financing package (a financial guarantee or insurance policy) to support transactions that include content from the U.S. and one or more other countries. With co-financing, the lead ECA provides the applicant (buyer, bank, or exporter) with full export credit support for a single transaction. Behind the scenes, the follower ECA provides reinsurance (or a counter-guarantee) to the lead ECA for the follower ECA's share of the export transaction.

EXIM currently has bilateral co-financing framework agreements with 17 ECAs (see Figure 14); these agreements allow EXIM to enter into co-financed transactions more readily with those ECAs. Additionally, EXIM can enter into one-off, case-specific co-financing agreements with other ECAs if no bilateral framework agreement is in place. While EXIM uses co-financing to accommodate U.S. exporters whose goods and services have less than 85 percent U.S. content, most foreign ECAs use co-financing to manage their country-specific exposure limits.[97] With limited exceptions, all G7 ECAs have co-financing framework agreements with each other, and increasingly with a wider scope of ECAs that includes non-participants to the OECD Arrangement.

EXIM continuously explores opportunities to sign framework co-financing agreements with foreign ECAs to support U.S. exports, especially in strategic sectors that may contain lower amounts of U.S. content (e.g., telecommunications). In 2022, EXIM signed two different co-financing framework agreements with foreign ECAs. Specifically, EXIM updated its existing agreement with the former French ECA, Coface (now BPIFrance), and signed a new framework agreement with K-SURE.

Figure 14: List of ECAs with which EXIM has Bilateral Framework Agreements

	Country	ECA
1	Australia	EFA
2	Canada	EDC
3	Czech Republic	EGAP*
4	Denmark	EKF
5	France	BPIFrance
6	Germany	Euler Hermes
7	Israel	ASHRA
8	Italy	SACE
9	Japan	JBIC
10	Japan	NEXI
11	Korea	KEXIM**
12	Korea	K-SURE
13	Netherlands	Atradius
14	Spain	CESCE
15	Switzerland	SERV
16	Turkey	Turk EXIM*
17	United Kingdom	UKEF

Source: EXIM

**EXIM always leads under the bilateral framework agreements*
***EXIM's bilateral framework agreement with KEXIM is limited to cargo aircraft*

96 12 U.S.C. §635g-1(a)(7).
97 EXIM does not have exposure limits by country or geographic region.

In 2022, EXIM provided approximately $879 million in financing towards transactions involving a reinsuring ECA. This figure represents EXIM's highest reported level of co-financing activity since 2015 and an approximate 58% increase from its 2021 amount ($555 million). In 2022, aircraft, including agricultural aircraft, commercial jets and helicopters, constituted a majority of the overall number and volume of activity in 2022. As such, 99% of the volume, approximately $878 million, of all 51 co-financed transactions authorized in 2022 involved some type of aircraft, with the exception of one transaction supporting agricultural machinery.

APPENDIX G

Renewable Energy Exports/ Environmental Policy

Background

Since 1992, EXIM's Charter has mandated that EXIM promote and increase the Bank's support for environmentally beneficial U.S. exports, including renewable energy exports.[98] In EXIM's December 2019 reauthorization, Congress expanded this mandate to include energy efficiency and energy-storage exports and set a goal for the Bank to make available not less than 5% of its total financing authority each fiscal year for the financing of these exports.[99] EXIM is making it a high priority to substantially increase its annual financing for these exports and aims to expand and diversify its portfolio.

Export Promotion

Section 8A(a)(5) of EXIM's Charter requires that this report contain a description of the activities of the Bank with respect to promoting and financing these exports.[100] Although EXIM support is demand-driven, the Bank has long sought to increase the probability that foreign buyers would seek EXIM financing over that of foreign ECAs, boosting the chances that they source from U.S. exporters and that overseas renewable energy projects support U.S. jobs.

EXIM has continued to maintain and expand relationships with existing U.S. exporters of renewable energy technologies and has expanded its outreach to U.S. manufacturers of energy efficiency and energy storage exports. Renewable energy business development staff, in collaboration with senior leadership, lead these outreach efforts. Some examples of EXIM engagement with prospective U.S. exporters, financial institutions, U.S. Government counterparts, and other partners follows:

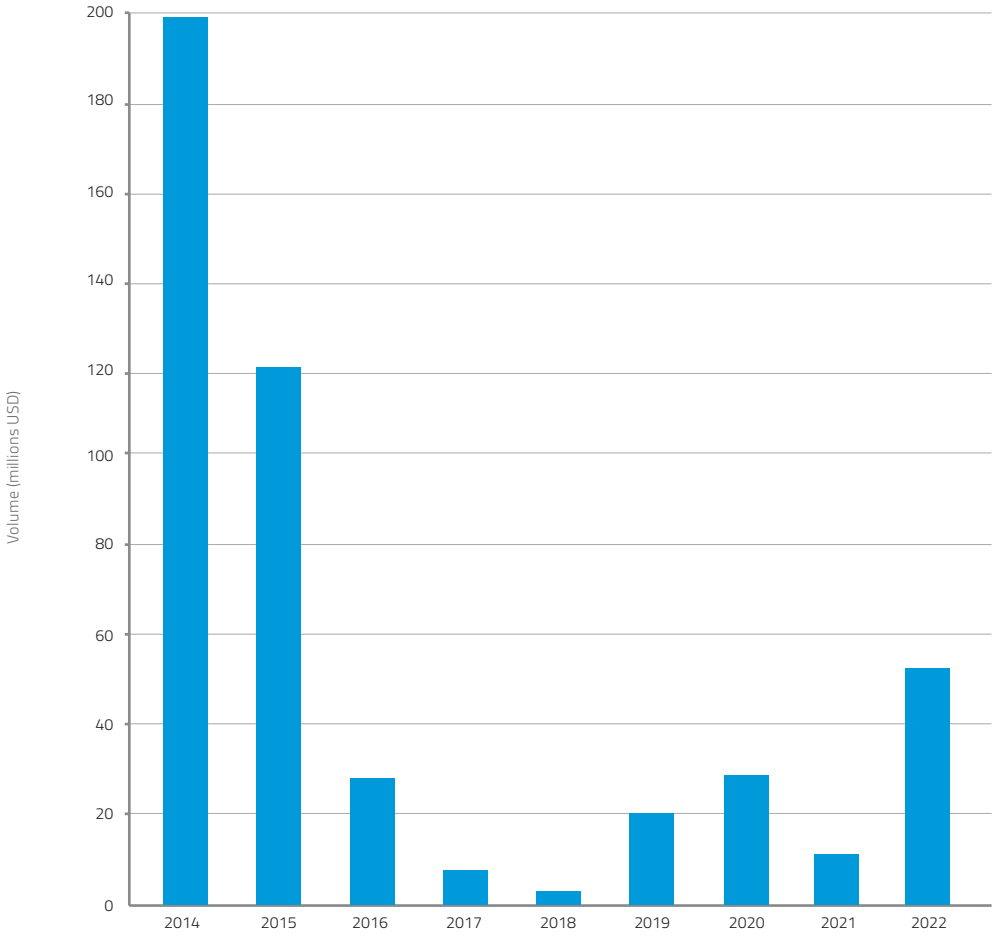
- Represented by a panelist at the Latin America Energy Forum in March 2022
- Represented by a panelist at the U.S.-Africa Trade and Investment Virtual Roundtable
- Participated in the Clean Power 2022 Conference and Trade Show in San Antonio, TX in May 2022
- Participated in the Virtual Roundtable on Cleantech and Economic Growth with TPCC Agencies
- Participated in State Department Investment Pillar meetings for renewable energy projects in the Caribbean
- Met with Ministry of Finance, renewable energy executives, and local American Chamber of Commerce on delegation trips to Bahrain and Oman
- Participated in the U.S. delegation to the United Nations Framework Convention on Climate Change Conference of the Parties in 2022 (COP27)

EXIM Activity in 2022

Although the annual Competitiveness Report covers calendar year 2022 activity, Section 8A(a)(5) of EXIM's Charter requires reporting total renewable energy authorizations on a fiscal year (FY) basis.[101] In FY2022, EXIM authorized $54.3 million to support U.S. renewable energy exports related to renewable energy. EXIM's renewable energy volume was driven by a 53MW solar project in Honduras, the largest solar project EXIM has ever financed in the Americas.[102] This represented a significant increase from FY2021 levels of almost $12 million but remains well below authorization levels from the years preceding the agency's lapse in authority and lack of Board quorum, which occurred in July 2015-May 2019 (see Figure 15).

98 12 U.S.C. §635(b)(1)(C), 635(b)(1)(K).
99 12 U.S.C. §635(b)(1)(K)
100 12 U.S.C. §635g-1(a)(5).
101 12 U.S.C. §635g-1(a)(5).
102 "2022 Renewable Energy Deal of the Year," December 13, 2022, https://www.exim.gov/news/2022-renewable-energy-deal-year-awarded-stakeholders-honduran-solar-project-export-import-bank.

Figure 15: EXIM Renewable Energy Authorizations by Fiscal Year



Source: EXIM.

Foreign Competition

Based on preliminary OECD data, wind energy projects continued to dominate renewable energy volumes in 2022, as they have for the past decade. EKF (Denmark) was once again a significant actor in this segment. As a good example, EKF authorized a EUR 1 billion loan to Iberdrola in 2022 for the purchase of turbines from Danish-based exporters Vestas and Siemens Gamesa.[103] Iberdrola, a Spain-based multinational utility company, will use proceeds to build out its wind portfolio in Europe. EKF also directly provided a EUR 194 million loan to Australian wind farm operator Golden Plains as part of a consortium to develop a large onshore wind farm.[104] Notably, the deal was structured in such a way that EKF was comfortable taking on merchant risk (i.e., EKF authorized the transaction without a Power Purchase Agreement in place), a departure from their standard underwriting approach and typical ECA practice.

103 "EKF Grants a Record-breaking EUR 1bn Loan to Spanish Energy Giant," June 24, 2022, https://ekf.dk/en/about-ekf/ekf-s-organisation/news/2022/ekf-grants-a-record-breaking-eur-1bn-loan-to-spanish-energy-giant.

104 "One of the World's Biggest Onshore Wind Farms Will Be Built with an Export Loan from EKF," https://ekf.dk/en/about-ekf/ekf-s-organisation/news/2022/one-of-the-world-s-biggest-onshore-wind-farms-will-be-built-with-an-export-loan-from-ekf.

Solar and hydropower, at least on a preliminary basis, were well off wind energy volumes in 2022. Hydropower volumes in 2022 appear to be driven by the construction of the Sambangalou hydro plant in Senegal, a multiphase project awarded late in 2020. Sources at the time of the awarding of the approximately $450 million contract indicate ECA, MDB, and DFI involvement through a mixture of loans and grants, including from China EXIM, the World Bank Group, European Investment Bank, African Development Bank Group, and the French (AFD) and German (KFW) development agencies.[105] After reviewing public disclosures for high-impact projects required by the OECD Common Approaches, it appears at least one OECD ECA, OEKB (Austria), also joined the consortium to support this project in 2022.[106] Dam construction, likely delayed by the pandemic, commenced in 2023.[107] One of the larger solar projects awarded in 2022, a solar streetlight project, was also located in Senegal. BPI France provided support for this EUR 121 million project.[108]

Outside of the OECD, China continues to provide high levels of support to renewable energy projects. As an example, from 2022, both CEXIM (EUR 190 million direct loan) and Sinosure (insurance) provided support for construction of the 159.9 MW Dabar Hydroelectric Power Plant in Bosnia and Herzegovina.[109] According to Milbank, who advised on the project, the 20-year tenor on the insurance cover provided by Sinosure was the longest it had ever provided.

India is also becoming more active in the renewable energy space, particularly in solar and transmission. Like many nations, India is keen to develop its solar industry given its aggressive decarbonization goals and supply chain exposure to China.[110] India EXIM provides term loans to export-oriented companies (so-called export-oriented units) to boost production capacity.[111] According to India EXIM's Annual Report 2021-22, India EXIM also issued letters of credit for the purchase of capital goods to stand up a 2,000 MWp solar PV module and cell manufacturing facility at the Mundra Industrial Park. India EXIM parlays these domestic-facing programs with lines of credit to sovereign governments that are tied to the export of Indian goods. According to their annual report, India EXIM extended six of these LOCs aggregating $1.13 billion in their last fiscal year to "catalyse exports by way of financing projects such as renewable energy like solar power." While India EXIM does not provide precise volumes for its renewable energy support, India EXIM's increasing MLT volumes are noteworthy.

105 "Senegal: Contract for Sambangalou Multi-purpose Dam Project Awarded," January 8, 2021, https://africa-energy-portal.org/news/senegal-contract-sambangalou-multi-purpose-dam-project-awarded. See also www.AidData.org.99

106 "Projects in Categories A and B after Final Commitment," https://www.oekb.at/en/export-services/about-oekb-export-services/environmental-and-social-aspects/projects-after-commitment.html.

107 "Construction of Senegal's Sambangalou Hydropower Plant Kicks Off," January 16, 2023, https://energycapitalpower.com/sambangalou-hydroelectric-power-senegal/.

108 "Senegal: Fonroche Wins EUR 121 Million Contract for 67,000 Solar Streetlights," March 17, 2022, https://www.afrik21.africa/en/senegal-fonroche-wins-e121-million-contract-for-67000-solar-streetlights/.

109 "Milbank Advises Export-Import Bank of China on Financing of Central and Eastern Europe's Largest Hydro IPP," January 12, 2022, https://www.milbank.com/en/news/milbank-advises-export-import-bank-of-china-on-financing-of-central-and-eastern-europes-largest-hydro-ipp.html.

110 "Indian Solar Sector: Fostering Growth and Sustainable Development," January 2022, https://www.eximbankindia.in/research-papers#.

111 "Annual Report 2021-22," https://www.eximbankindia.in/investor-relations.

APPENDIX H

Services Exports

According to Section 8A(a)(8) of EXIM's Charter, EXIM must report on the participation of the agency in providing financing for services exports. EXIM supports U.S. services exports through all its programs.[112]

EXIM authorized $535 million in support of services exports in 2022, a decrease from the $725 million supported in 2021. For services exports, EXIM authorized $471 million in four LT transactions, $24 million in three MT transactions, and $40 million in 57 ST transactions.

Associated services are services that are included with the sale of goods. In 2022, stand-alone services made-up 78.9 percent of EXIM's services authorizations volume. Associated services made up 20.9 percent of the authorizations. Therefore, the majority of all services transactions supported stand-alone services where the services were the primary export. About half of the short-term services transactions, however, were supporting associated services as a portion of a larger project or capital goods export contract.

Top service sectors that received EXIM support in 2022 included IT and telecommunications ($413 million), transportation ($70 million), engineering and consulting ($36 million), and administrative and support services ($6 million).

During 2022, based on available information, the top three services exports supported by OECD Arrangement Participants in 2022 were construction, engineering and consulting, and IT and telecommunications. However, since services can be embedded within contracts that primarily involve goods, EXIM does not have clear visibility into all the services supported by OECD Arrangement Participants. With that caveat, the best available information indicates that in 2022, Finland, France, and Germany were the top three finance providers for contracts that included a services component. There were 16 OECD Arrangement Participants that financed over $9 billion in contracts that included a services component, a decrease from the 18 Participants that financed over $13 billion in 2021.

112 12 U.S.C. §635g-1(a)(8).

Figure 16: Services Exports

Term and Sector	Authorized Amount	Percentage of Total	Percentage of Term and Sector
Long-Term	**$471,104,670.00**	**88.03%**	**100.00%**
Rental and Leasing	0	0.00%	0.00%
Engineering and Consulting	0	0.00%	0.00%
Legal and Banking	0	0.00%	0.00%
Oil and Gas and Mining	0	0.00%	0.00%
Transportation	$63,694,340.00	11.90%	13.52%
Construction	0	0.00%	0.00%
Admin and Support Services	0	0.00%	0.00%
IT and Telecommunications	$407,410,330.00	76.13%	86.48%
Medical	0	0.00%	0.00%
Management Services	0	0.00%	0.00%
Other Services	0	0.00%	0.00%
Medium-Term	**$24,053,149.05**	**4.49%**	**100.00%**
Rental and Leasing	0	0.00%	0.00%
Engineering and Consulting	$22,262,331.00	4.16%	92.55%
Legal and Banking	0	0.00%	0.00%
Oil and Gas and Mining	$934,132.13	0.17%	3.88%
Transportation	0	0.00%	0.00%
Construction	$856,685.92	0.16%	3.56%
Admin and Support Services	0	0.00%	0.00%
IT and Telecommunications	0	0.00%	0.00%
Medical	0	0.00%	0.00%
Management Services	0	0.00%	0.00%
Other Services	0	0.00%	0.00%
Short-Term	**$39,998,000.00**	**7.47%**	**100.00%**
Rental and Leasing	$200,000.00	0.04%	0.50%
Engineering and Consulting	$14,300,000.00	2.67%	35.75%
Legal and Banking	0	0.00%	0.00%
Oil and Gas and Mining	$250,000.00	0.05%	0.63%
Transportation	$6,374,000.00	1.19%	15.94%
Construction	$3,200,000.00	0.60%	8.00%
Admin and Support Services	$6,375,000.00	1.19%	15.94%
IT and Telecommunications	$6,324,000.00	1.18%	15.81%
Medical	0	0.00%	0.00%
Management Services	$625,000.00	0.12%	1.56%
Other Services	$2,350,000.00	0.44%	5.88%
Total	**$535,155,819.05**	**100.00%**	**100.00%**
Rental and Leasing	$200,000.00	0.04%	0.04%
Engineering and Consulting	$36,562,331.00	6.83%	6.83%
Legal and Banking	0	0.00%	0.00%
Oil and Gas and Mining	$1,184,132.13	0.22%	0.22%
Transportation	$70,068,340.00	13.09%	13.09%
Construction	$4,056,685.92	0.76%	0.76%
Admin and Support Services	$6,375,000.00	1.19%	1.19%
IT and Telecommunications	$413,734,330.00	77.31%	77.31%
Medical	0	0.00%	0.00%
Management Services	$625,000.00	0.12%	0.12%
Other Services	$2,350,000.00	0.44%	0.44%

APPENDIX I

Size of EXIM Program Account

Charter Section 8A(a)(6) requires that EXIM report on its program account and compare it to that of the size of the program accounts of the other major export financing facilities.[113]

When expected cash disbursements exceed expected cash receipts, there is an expected net outflow of funds, resulting in a cost to the Bank. This cost is sometimes referred to as subsidy or program cost. EXIM is required to estimate this cost annually and to seek budget authority from Congress to cover that cost. New loans and guarantees with a program cost cannot be committed unless sufficient program budget authority is available to cover the calculated credit cost.

In FY 2022, EXIM received a $5.0 million program budget appropriation for the cost of direct loans, loan guarantees, and insurance, which is available for obligation until September 30, 2025. As of September 30, 2022, of the $5.0 million program budget appropriation, EXIM obligated $2.1 million. These appropriations were requested, in part, to support the agency's effort to fulfill the mandate of EXIM's China and Transformational Exports Program to provide "fully competitive" financing that "directly neutralize[s] export subsidies" by China. Congress restarted program budget appropriations for EXIM in FY 2022.

Information on the program accounts of other countries' major export-financing programs is unavailable. Between FY2022 and FY2023, Congress appropriated $20 million in program budget and the President's FY 2024 Budget Request included recommendations for the agency's program account to enable the agency to provide globally competitive financing for U.S. exports.

113 12 U.S.C. §635g-1(a)(6).

APPENDIX J

Export Finance Cases not in Compliance with the Arrangement

Section 8A(a)(9) requires EXIM to provide detailed information on cases reported to EXIM of export financing that appear not to comply with the Arrangement or that appear to exploit loopholes in the Arrangement for the purpose of obtaining a commercial competitive advantage.[114]

EXIM was not aware of any official export credit financing provided in 2022 that was not in compliance with the Arrangement or that exploited "loopholes" in the Arrangement.

114 12 U.S.C. §635g-1(a)(9).

APPENDIX K

Activities not Consistent with the WTO Agreement on Subsidies and Countervailing Measures

Section 8A(a)(10) requires EXIM to provide a description of the extent to which the activities of foreign export credit agencies and other entities sponsored by a foreign government, particularly those that are not members of the Arrangement appear not to comply with the Arrangement and appear to be inconsistent with the terms of the Agreement on Subsidies and Countervailing Measures (ASCM) of the World Trade Organization (WTO), and a description of the actions taken by the U.S. government to address the activities.[115]

The Office of the United States Trade Representative (USTR) leads negotiations for the U.S. government at the WTO and EXIM defers to USTR on any determination regarding compliance with WTO agreements. EXIM is not aware of any U.S. government determination regarding non-compliance with the ASCM.

115 12 U.S.C. §635g-1(a)(10).

APPENDIX L

U.S.-Flag Shipping Requirement

Public Resolution 17 (PR-17), enacted March 26, 1934, and codified in Public Law (PL) 109-304,[116] expresses the sense of Congress that ocean-borne exports financed by instrumentalities of the U.S. Government should be transported on U.S.-flag vessels. Shipping on U.S.-flag vessels is required for U.S. ocean-borne exports supported by (1) EXIM loans (of any size); (2) EXIM loan guarantees that are over $20 million (excluding the exposure fee), including any disbursement over $20 million (excluding the exposure fee) made under a credit guarantee facility; or (3) transactions that have a greater than seven-year repayment term (unless the export qualifies for a longer repayment term under EXIM's special initiatives for transportation security or environmentally-beneficial exports).[117,118] This U.S.-flag shipping requirement seeks to increase revenue for U.S.-flag carriers and experience for crews to help sustain an effective merchant marine industry able to maintain the flow of waterborne domestic and foreign commerce during peace, wartime, or national emergency and is important to economic and national security.

EXIM was unable to authorize transactions greater than $10 million for nearly four years from July 2015 until May 2019, when EXIM's Board quorum was restored.[119] In September 2019, the Board of Directors authorized a loan for Mozambique and another for Senegal in 2020, both subject to PR-17. Soon after the loan for the Mozambique LNG project was made operative in 2021, insurgency violence led the project operator to declare force majeure, which paused the EXIM loan's operative status before any disbursements were made. With regard to the Senegal transactions, EXIM's loan in support of $66.4 million of U.S. exports for Senegal's National Electricity Authority's rural electrification project was made operative in September 2022.[120]

In 2022, there were no shipments of PR-17-impelled cargo under either of these two transactions. Some shipments are expected in 2023. Additionally, besides finalizing the Senegal transaction following amendments that increased the amount of U.S. exports, EXIM authorized four new transactions in 2022 aggregating over $215 million to support sales to Honduras, Angola, Cameroon, and Sri Lanka that are subject to PR-17.

116 46 U.S.C. §55304 . PL109-304 enacted October 6, 2006, combined and updated U.S. shipping code into one document.

117 When PR-17 was enacted, EXIM Bank only offered direct loans. Subsequently, EXIM and MARAD agreed that PR-17 would apply to EXIM-guaranteed transactions that were equivalent to direct loans. A 2004 Memorandum of Understanding (MOU) signed by EXIM Bank and MARAD set the threshold for applying PR-7 to financial guarantees at a value exceeding $20 million and a repayment term exceeding 7 years. This MOU remains in force to date.

118 Credit guarantee facilities are lines of credit between a funding bank and a foreign obligor and usually support an aggregation of medium-term sales to unrelated buyers. In December 2015, Congress reauthorized EXIM and raised the cap on medium term sales from $10 million to $25 million, opening the possibility that there could be a sale under a CGF that is over $20 million, and that single transaction under a larger CGF could be subject to PR-17.

119 EXIM only authorized one transaction subject to PR-17 during this period, a medium-term transaction that qualified for longer repayment terms under a China Framework Agreement, in force at the time.

120 The actual authorized amount was higher, as it included financing for the exposure fee and local costs.

APPENDIX M

Trade Promotion Coordinating Committee

Section 8A(a)(2) of EXIM Bank's Charter requires EXIM to report on its role in the Trade Promotion Coordinating Committee (TPCC), an interagency group mandated by the Export Enhancement Act of 1992 to provide a unifying framework to coordinate export promotion and export financing activities of the U.S. Government and to develop a government-wide strategic plan for carrying out such programs.[121] The TPCC serves as the coordinating body designed to ensure that U.S. federal trade agencies act together and in coordination to establish priorities, coordinate new programs and initiatives, improve customer service, leverage resources, and eliminate duplication.

A goal of the TPCC is to drive equitable local and regional growth by expanding the number and diversity of U.S. companies that export. TPCC agencies achieve this by providing actionable information, training, and counseling to U.S. businesses, especially SMEs, to begin exporting or expand international sales. EXIM is primarily involved with the TPCC's priorities related to the following areas:

1. Expanding access to export financing by educating more financial institutions and corporations about U.S. Government financing options and streamlining access;
2. Supporting state and local entities seeking to expand regional exports;
3. Connecting exporters and potential foreign buyers by providing tailored assistance and information, and
4. Providing support to U.S. companies already pursuing international deals and identifying export opportunities for them.

Advancing diversity, equity, and inclusion has been at the forefront of EXIM's activities, notably through greater outreach and collaboration geared at assisting minority and women-owned businesses (MWOBs) expand their international footprints. To this end, EXIM established a Council on Advancing Women in Business in 2022.[122] The Council provides recommendations on ways EXIM can reach more women in business and enhance equity goals in the Bank's strategic planning. EXIM provided over $350 million in support for MWOBs in 2022.

As part of EXIM's efforts to educate more small businesses about exporting opportunities, staff from the Office of Small Business and the regional offices located across the country participated in over 660 outreach events (in-person and virtual) and capitalized on digital innovations that were put in place in recent years.[123] EXIM also continued its engagement with the Department of Commerce to formally establish a new Commerce Accounts Channel, which will increase collaboration by providing training to new international trade specialists, conducting joint counseling for exporters, and working together to reach MWOBs and businesses in underserved communities. Additionally, the Commerce Accounts Channel will facilitate EXIM engagement with District Export Councils (DEC), organizations of business leaders from local communities appointed by the

121 12 U.S.C. §635g-1(a)(2). Members of the TPCC are: U.S. Departments of Commerce (Chair), State, Treasury, Agriculture, Defense, Energy, Transportation, Interior, and Labor, U.S. International Development Finance Corporation (DFC), Export-Import Bank of the United States (EXIM), U.S. Agency for International Development (USAID), Small Business Administration (SBA), U.S. Trade and Development Agency (USTDA), Office of the U.S. Trade Representative (USTR), Environmental Protection Agency (EPA), the Council of Economic Advisors (CEA), National Security Council (NSC), National Economic Council (NEC), and the Office of Management and Budget (OMB).

122 Council is a subcommittee of the longstanding, Congressionally-mandated Advisory Committee, whose 17 members represent a broad cross sector of the economy, including production, commerce, finance, agriculture, labor, services, state government, the textile industry, and the environment.

123 EXIM's regional offices are located in Chicago, Illinois; Houston, Texas; Minneapolis, Minnesota; Detroit, Michigan; Miami, Florida; Atlanta, Georgia; New York, New York; Irvine, Los Angeles, San Diego, and San Francisco, California; and Seattle, Washington. Owing to their understanding of regional needs, economies, and centers of export information, the on-the-ground customer engagement is a critical component of EXIM's efforts to increase small business authorizations.

Secretary of Commerce who work to increase awareness of exporting, including export assistance and export financing tools provided by EXIM. Similarly, EXIM works in close collaboration with the U.S. Small Business Administration (SBA) and their resource partners, including the national network of Small Business Development Centers, to provide export finance training to business-facing international trade counselors and to conduct joint education and outreach events for small businesses in local communities. EXIM invited SBA officials to participate on a panel at EXIM's annual conference to highlight the State Trade Expansion Program (STEP). This panel explained that small businesses can leverage STEP to offset costs incurred in exporting, such as EXIM's insurance premiums. Used in this way, STEP reduces impediments that discourage some small businesses from pursuing export sales.

Many small businesses also need pre-export finance, and EXIM is continuing to expand the reach of its Working Capital Guarantee Program (WCGP) to meet this need. In 2022, EXIM approved three new Delegated Authority (DA) lenders: Rosenthal & Rosenthal Inc., New York, New York; Commerce Bank, Kansas City, Missouri, and Amerisource Business Capital, Houston, Texas. Additionally, East-West Bank, Pasadena, California was approved for an increased level of delegated authority from $7.5 million to $10 million, improving its ability to respond to customers' requests for support under EXIM's WCGP. Huntington National Bank, headquartered in Columbus, Ohio, was authorized for Fast Track lender status, which increases its delegated authority to commit EXIM's guarantee on working capital loans from $10 million to $25 million. Huntington Bank, an experienced user of EXIM's working capital program and supporter of women and minority owned businesses, will be able to expedite coverage for loans that meet EXIM's standard underwriting criteria. Established in 2006, eight other financial institutions also have Fast Track status: Bank of America; Citibank; Comerica Bank; HSBC; JPMorgan Chase Bank; PNC Bank; Wells Fargo Bank; and Zions Bancorporation.

"A Brighter Future through Exporting" was the theme of EXIM's 2022 annual conference held on December 13. The one-day hybrid (in-person and virtual) event drew nearly 1,300 attendees and featured high-level leaders in business, finance, government, and media discussing the critical role EXIM plays in supporting U.S. jobs and economic security. The conference coincided with President Biden's 3-day U.S.-African Leaders Summit, and President H.E. João Lourenço of Angola and the President H.E. Filipe Nyusi of Mozambique kicked off the conference with presentations on Enhancing Strategic Relationships Between the U.S. and Africa. Senior officials from TPCC agencies also headlined the event, including leaders from the DFC, USTDA, the Departments of Commerce, Energy, Treasury, and State, as well as SBA and USTR. In addition to a small business track, the conference also delved into important global issues related to the environment, technology, and overseas infrastructure. Secretary of Energy Jennifer Granholm discussed Energy Security and Global Energy Transition. Amos Hochstein, Special Presidential Coordinator for the Partnership for Global Infrastructure and Investment (PGII), the framework guiding the efforts of the U.S. and G-7 and other like-minded partners to catalyze international infrastructure financing and development that is sustainable, clean, resilient, inclusive, and transparent, and that adheres to high standards. State Department Under Secretary for Economic Growth, Energy and the Environment Jose W. Fernandez and representatives from banking and academia provided their insights on "Shaping the Future: New Technologies, Critical Minerals, and Transformational Exports."

The small business and global issues discussed at the annual conference permeate EXIM's efforts throughout the year, including expanding U.S.-Africa trade. In 2022, EXIM supported a $281 million loan guarantee for aircraft to Ethiopian Airways and over $120 million in capital goods exports to Cameroon, Angola, and Nigeria. A $73.7 million long-term loan guarantee was authorized to support sales of construction equipment to FEICOM, an independent agency of the Government of Cameroon established in 1974 with the mandate to enable regional infrastructure development. FEICOM will use the equipment to improve access to drinking water and education and undertake other socially beneficial projects across the country. A $41.8 million long-term loan guarantee for FM radio equipment exports

to the Government of Angola will expand the reach of radio transmission across the country, giving the entire population access to timely information about natural disasters, as well as updates on general weather, health, and education issues. A $7.4 million medium-term guarantee for an energy storage system will support Nigeria's clean energy transition. EXIM's short term insurance program also actively supported U.S. exporters' sales to African buyers. Additionally, shipments under EXIM's short-term insurance program to African buyers exceeded $51 million. EXIM is proud of the strides made to increase its total activity in Africa, providing evidence of our commitment to support U.S. exports that facilitate U.S. jobs and will help African buyers expand output necessary to support strong, diversified, sustainable economies.

An important tool for promoting U.S. exports across the globe is the Deal Team Initiative. This initiative, jointly coordinated by the Departments of State and Commerce, maximizes success through a whole-of-government approach and promotes greater connectivity and collaboration among on-the-ground commercial and economic diplomats and TPCC agencies. EXIM participated in Deal Team-arranged "call-ins" to provide training on EXIM programs and policies to embassy staff worldwide, and EXIM consulted virtually one-on-one with individual posts to address particular issues or requests for EXIM to present to a particular buyer or market sector.

In addition to working with embassy-based Deal Teams, EXIM supported other TPCC undertakings. For example, EXIM briefed the Department of Commerce's Environmental Technologies Trade and Advisory Committee (ETTAC). The ETTAC is comprised of 35-40 private sector executives who provide consensus-based advice to the interagency Environmental Trade Working Group of the TPCC, through the Secretary of Commerce, on U.S. Government policies and activities to advance U.S. environmental goods and services exports. The ETTAC is an important voice guiding the U.S. interagency on environmental trade policy and represents the $360 billion U.S. environmental technologies, goods, and services industry, which exports roughly $46 billion annually and employs 1.6 million Americans.

Finally, EXIM also participated with other TPCC agencies in a Virtual Roundtable on Clean Tech and Economic Growth with McKinsey Consulting. EXIM further advanced the TPCC's clean tech objectives as a panelist at the Latin America Energy Forum and by participating in the Cleanpower 2022 Conference and Trade Show (formerly Windpower) in San Antonio, Texas. In 2022, EXIM re-established its Office of Global Business Development, positioning the Bank to continue to expand virtual and in-person outreach to potential foreign buyers.

APPENDIX N

List of Known Official Export Credit Providers

No.	Country	Name	Acronym
1	Algeria	Compagnie Algérienne d'Assurance et de Garantie des Exportations	CAGEX
2	Armenia	Export Insurance Agency of Armenia	EIAA
3	Argentina	Banco de Inversion y Comercio Exterior	BICE
4	Australia	Export Finance Australia	EFA
5	Austria	Oesterreichische Kontrollbank AG	OeKB
6	Austria	Austria Wirtschaftsservice	AWS
7	Bahrain	Export Bahrain	Export Bahrain
8	Bangladesh	Sadharan Bima Corporation	SBCE
9	Barbados	Central Bank of Barbados: Export Credit Insurance Scheme	N/A
10	Belarus	EXIMGARANT of Belarus	EXIMGARANT
11	Belgium	Credendo Group	Credendo
12	Belgium	The Brussels Guarantee Fund (Fonds Bruxellois de Garantie)	FBG
13	Bosnia and Herzegovina	Export Credit Agency of Bosnia and Herzegovina	IGA
14	Botswana	Export Credit Insurance & Guarantee Company	BECI
15	Brazil	Brazilian Development Bank	BNDES
16	Bulgaria	Bulgarian Export Insurance Agency	BAEZ
17	Cameroon	Fonds d'Aide et de Garantie des Crédits aux Petites et Moyennes Enterprises	FOGAPME
18	Canada	Export Development Canada	EDC
19	Chile	La Corporación de Fomento de la Producción	CORFO
20	China	Export-Import Bank of China	China EXIM
21	China	China Export and Credit Insurance Corporation	Sinosure
22	China - Hong Kong	Hong Kong Export Credit Insurance Corporation	HKECIC
23	Colombia	Banco de Comercio Exterior de Colombia	Bancoldex
24	Colombia	Fondo Nacional de Garantias S.A.	FNG
25	Croatia	Croatian Bank for Reconstruction and Development	HBOR
26	Czech Republic	Česká exportní banka, a.s.	CEB
27	Czech Republic	Export Guarantee and Insurance Corporation	EGAP
28	Dominican Republic	National Bank for Exports	BANDEX
29	Denmark	Export Kredit Fonden	EKF
30	Ecuador	Corporacion Financiera Nacional Fondo de Promocion de Exportaciones	CFN
31	Egypt	Export Credit Guarantee Company of Egypt	EGE
32	Estonia	Kredex Krediidikindlustus	KredEx
33	Ethiopia	Development Bank of Ethiopia, Export Credit Guarantee and Special Fund Administration Bureau	DBE
34	Finland	Finnvera	Finnvera
35	Finland	Finnish Export Credit Ltd.	FEC
36	France	BPIFrance Assurance Export	BPIFrance
37	France	Société de Financement Local	SFIL
38	Germany	Euler Hermes Aktiengesellschaft	Euler Hermes
39	Germany	KfW IPEX Bank	KfW
40	Ghana	Eximbank of Ghana	GEXIM
41	Greece	Export Credit Insurance Organisation	ECIO
42	Hungary	Hungarian Export Credit Insurance Ltd.	MEHIB
43	Hungary	Hungarian Export-Import Bank Plc.	EXIM HU
44	India	Export Credit Guarantee Corporation of India	ECGC
45	India	Export-Import Bank of India	I-Eximbank

No.	Country	Name	Acronym
49	Iran	Export Guarantee Fund of Iran	EGFI
50	Israel	The Israel Foreign Trade Risks Insurance Corporation	ASHRA
51	Italy	Servizi Assicurativi del Commercio Estero S.p.A.	SACE
52	Italy	Cassa Depositi e Prestiti	CDP
53	Jamaica	National Export Import Bank of Jamaica	EXIM J
54	Japan	Japan Bank for International Cooperation	JBIC
55	Japan	Nippon Export and Investment Insurance	NEXI
56	Jordan	Jordan Loan Guarantee Cooperation	JLGC
57	Kazakhstan	Kazakh Export Credit Insurance Corporation	KAZAKHEXPORT
58	Latvia	Development Finance Institution Altum (JSC)	LGA ALTUM
59	Lithuania	Investiciju ir Verslo Garantijos	INVEGA
60	Luxembourg	Luxembourg Export Credit Agency	ODL
61	North Macedonia	Development Bank of North Macedonia	DBNM
62	Malaysia	Export-Import Bank of Malaysia Berhad	MEXIM
63	Mexico	Banco Nacional de Comercio Exterior, SNC	Bancomext
64	Morocco	Société Marocaine d'Assurance à l'Exportation	SMAEX
65	Namibia	Development Bank of Namibia	DBN
66	Netherlands	Atradius Dutch State Business	Atradius
67	Netherlands	Netherlands Enterprise Agency	NEA
68	New Zealand	New Zealand Export Credit Office	NZEC
69	Nigeria	Nigerian Export-Import Bank	NEXIM
70	Norway	Export Finance Norway	Eksfin
71	Oman	Export Credit Guarantee Agency of Oman (S.A.O.C)	ECGA Oman
72	Pakistan	EXIM Bank of Pakistan	EXIM Bank
73	Peru	Corporacion Financiera de Desarrollo	COFIDE
74	Philippines	Philippine Export-Import Credit Agency	PhilEXIM
75	Poland	Korporacja Ubezpieczén Kredytów Eksportowych	KUKE
76	Poland	Bank Gospodarstwa Krajowego	BGK
77	Portugal	Companhia de Seguro de Créditos	COSEC
78	Qatar	TASDEER (managed by the Qatar Development Bank)	TASDEER/QDB
79	Republic of Korea	Export-Import Bank of Korea	KEXIM
80	Republic of Korea	Korea Trade Insurance Corporation	K-SURE
81	Romania	Eximbank of Romania	EXIM R
82	Russia	Export Insurance Agency of Russia	EXIAR
83	Russia	Export Import Bank of Russia	Russia EXIM
84	Russia	Bank for Development and Foreign Economic Affairs (Vnesheconombank)	VEB
85	Saudi Arabia	Saudi Export Program	SEP
86	Saudi Arabia	Saudi Export-Import Bank	Saudi EXIM
87	Senegal	Société Nationale d'Assurances du Crédit et du Cautionnement	SONAC
88	Serbia	Serbian Export Credit and Insurance Agency	AOFI
89	Singapore	Enterprise Singapore	ES
90	Slovakia	Export-Import Bank of the Slovak Republic	EXIMBANKA SR
91	Slovenia	Slovenska izvozna in razvojna banka	SID
92	South Africa	Export Credit Insurance Corporation SOC LTD	ECIC SA
93	Spain	Compañía Española de Seguros de Crédito a la Exportación (CESCE)	CESCE
94	Spain	Fondo para la Internationalización de la Empresa	FIEM
95	Sri Lanka	Sri Lanka Export Credit Insurance Corporation	SLECIC
96	Sudan	National Agency for Insurance and Finance of Export	NAIFE
97	Swaziland	Central Bank of Swaziland: Export Credit Guarantee Scheme	N/A
98	Sweden	Exportkreditnämnden	EKN
99	Sweden	Svensk Exportkredit	SEK

No.	Country	Name	Acronym
101	Taiwan	Taipei Export-Import Bank of China	TEBC
102	Tanzania	Export Credit Guarantee Scheme	ECGS
103	Thailand	Export-Import Bank of Thailand	Thai EXIMBANK
104	Trinidad and Tobago	Export-Import Bank of Trinidad & Tobago	Eximbank TT
105	Tunisia	Compagnie Tunisienne pour l'Assurance du Commerce Exteriueur	COTUNACE
106	Turkey	Export Credit Bank of Turkey	Türk Exim
107	U.A.E	Etihad Credit Insurance	ECI
108	U.A.E	Export Credit Insurance Company of the Emirates	ECIE
109	Ukraine	The State Export-Import Bank of Ukraine	Ukreximbank
110	United Kingdom	UK Export Finance (Export Credit Guarantees Deparment)	UKEF
111	United States	The Export Import Bank of the United States	EXIM
112	Uruguay	Banco de Seguros del Estado	BSE
113	Uzbekistan	National Export-Import Insurance Company	Uzbekinvest
114	Vietnam	The Vietnam Development Bank	VDB
115	Zambia	Development Bank of Zambia	DBZ
116	Zimbabwe	Export Credit Guarantee Company of Zimbabwe	ECGC Z

Glossary

Associated Service: A service export that is related to the export of a good (e.g., transportation/logistical services related to the export of construction equipment).

Authorization: The approval of a transaction.

Concessional Financing: Financing that is extended on terms that result in a negative net present value relative to an applied discount rate. The concessionality is achieved through interest rates below a reference discount rate, extended repayment terms, grace periods, or a combination of these.

Credit: An agreement by which one party is permitted to defer repayment of a financial obligation to another party over time (thus creating a debt obligation).

Development Finance: Development finance, provided by bilateral development finance institutions (DFIs), encourages private sector entities to do business in foreign developing markets for developmental purposes.

Direct Lending: Financing provided directly by an ECA to a borrower (in contrast to pure cover).

Domestic Content: The value of the export(s) under an export contract that were produced in the ECA's country.

Export Credit: A financial instrument which allows the buyer of a cross-border good or service to defer payment of that good or service through the creation of a debt obligation.

Export Credit Agency (ECA): An agency of or on behalf of a creditor country that provides export credit (or export credit cover), in the form of insurance, guarantees, loans, or interest-rate support, for the export of goods and services.

Foreign Content: Any value of export(s) in an export contract (including both for goods or services) which is produced within any country other than the either the ECA's or the foreign buyer's country.

Investment Support: Insurance or guarantee that indemnifies an equity investor or a bank financing the equity investment for losses incurred to a cross-border investment as a result of political risks. Insurance or guarantee that indemnifies the counterparty to a cross-border debt obligation for losses incurred by nonpayment by the debt obligor. The debt obligation is provided without any requirement that the capital be used to finance an export or international trade.

Long-term Finance: Export-financing transactions with repayment terms greater than seven years or for amounts greater than $10 million.

Market Window: Official export financing that is commercially priced by setting all financing terms to market terms and conditions. This type of export finance falls outside the OECD Arrangement.

Medium-term Finance: Export-financing transactions with repayment terms of up to seven years and for amounts up to $10 million.

Non-OECD Export Credit Agencies: ECAs that are not Participants to the OECD Arrangement on Officially Supported Export Credits.

OECD Arrangement: An agreement that establishes transparency provisions and guidelines governing the financing terms and conditions of export credits provided by participating ECAs.

OECD Common Line: An exceptional agreement of the Participants to apply alternative terms and conditions – rather than those in the OECD Arrangement – for a specific transaction or multiple transactions with certain characteristics.

OECD Notification: Part of the transparency provisions under the OECD Arrangement that requires participants to inform the OECD Secretariat and other Participants of an offer under the OECD Arrangement.

Offer: ECA support extended in relation to an export contract prior to commitment, which may not materialize into a transaction.

Official Trade-related Finance: Government-backed MLT financing of trade between nations that is generally provided for purposes other than promoting exports and does not formally require a minimum amount of exports from a certain country. Similar to export credits, trade-related finance can take the form of loans, guarantees, or insurance, among other products.

Premia (also known as exposure fee): The amounts an ECA charges to cover the liabilities associated with expected losses (i.e., claims) resulting from the risk of nonpayment. It is a form of compensation for taking risk above risk-free investments such as government bonds.

Project Finance: The financing of an asset (or "project") based on a non-recourse or limited recourse financial structure whereby the lender relies on the underlying cash flows being generated by the asset as the source of repayment for the loan.

Pure Cover: Official support provided for an export credit in the form of guarantee or insurance only.

Short-term Finance: Export financing with a repayment term less than two years. The OECD Arrangement rules do not apply to transactions with a repayment term of less than two years.

Special Drawing Right (SDR): The SDR is an international reserve asset created by the IMF in 1969 to supplement its member countries' official reserves. SDRs can be exchanged for freely usable currencies. The value of the SDR is based on a basket of five major currencies: the U.S. dollar, the euro, the Chinese renminbi, the Japanese yen, and the British pound sterling.

Stand-alone Service: A service export that is an export in and of itself (e.g., architectural or design services).

Structured Finance: The financing of a project that relies on the underlying project's revenues to ensure against the risk of nonpayment but is not the sole source of repayment. The lender typically has recourse to the borrower in the case of nonpayment.

Tenor: The term or length of time from initial loan repayment to maturity.

Tied Aid: Aid which is in effect (in law or in fact) tied to the procurement of goods and/or services from the donor country and/or a restricted number of countries, including loans, grants, or associated financing packages with a concessionality level greater than zero percent.

Tied Export Support: Financing support for which the offer of support is predicated on the condition of procurement from one country or a limited number of countries.

Transaction: Confirmed ECA support for an export credit signified by issuing a final commitment.

Untied Aid: Financing with a concessionality level greater than zero of which the proceeds can be used freely to procure goods or services from any country.

Untied Export Support: Official export financing on non-concessional terms for which the offer of support is not predicated on the condition of procurement restrictions but is provided to support "national interests" and thus may or may not result in direct export support from the providers' country. This type of finance falls outside of the scope of the OECD Arrangement.

Acronyms and Abbreviations

ASCM	WTO Agreement on Subsidies and Countervailing Measures
ASU	Aircraft Sector Understanding
BRICS	Brazil, Russia, India, China, and South Africa
COP27	27th Conference of the Parties; refers to the 2022 United Nations Climate Change Conference
CTEP	China and Transformational Export Program
DOC	Department of Commerce
DFC	U.S. International Development Finance Corporation
DFI	Development Finance Institution
ECA	Export Credit Agency
EDFI	Association of European Development Finance Institutions
EDG	Export Development Guarantee (UKEF product)
EPC	Engineering, Procurement, and Construction
ESG	Environmental, Social, and Governance
G7	Group of Seven Countries (Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States)
G12	Group of Twelve Countries (Brazil, Canada, China, France, Germany, India, Italy, Japan, Korea, Russia, the United Kingdom, and the United States)
IMF	International Monetary Fund
MMIA	Make More in America Initiative
MARAD	U.S. Department of Transportation's U.S. Maritime Administration
MLT	Medium- and Long-term
MOU	Memorandum of Understanding
O&M	Operation and Maintenance
OECD	Organisation for Economic Co-operation and Development
OIG	EXIM Office of Inspector General
PR-17	Public Resolution 17
SBA	Small Business Administration
SDR	Special Drawing Rights
SME	Small- and Medium-Sized Enterprises
SOE	State-owned Enterprise
TPCC	Trade Promotion Coordinating Committee
USTR	United States Trade Representative
WTO	World Trade Organization

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EXHIBIT 50

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Ship Finance in Asia

Kevin Oates
Managing Director
Marine Money Asia Pte. Ltd

27th Marine Money Week
June 2014

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Today's Topics

1. The Growth of Ship Finance in Asia
2. What caused Asian Ship Finance to Expand?
3. The Rise of Export Credit Finance
4. Leasing: the next big thing in Asian Ship Finance
5. Some words of Warning

1. The Growth of Ship Finance in Asia

Typically Asian banks supported local owners. This is still predominant in Singapore, Japan and Taiwan and common in China. Terms offered cannot be matched by international shipping finance.

But Asian banks were not active on the global scene - until after 2009.

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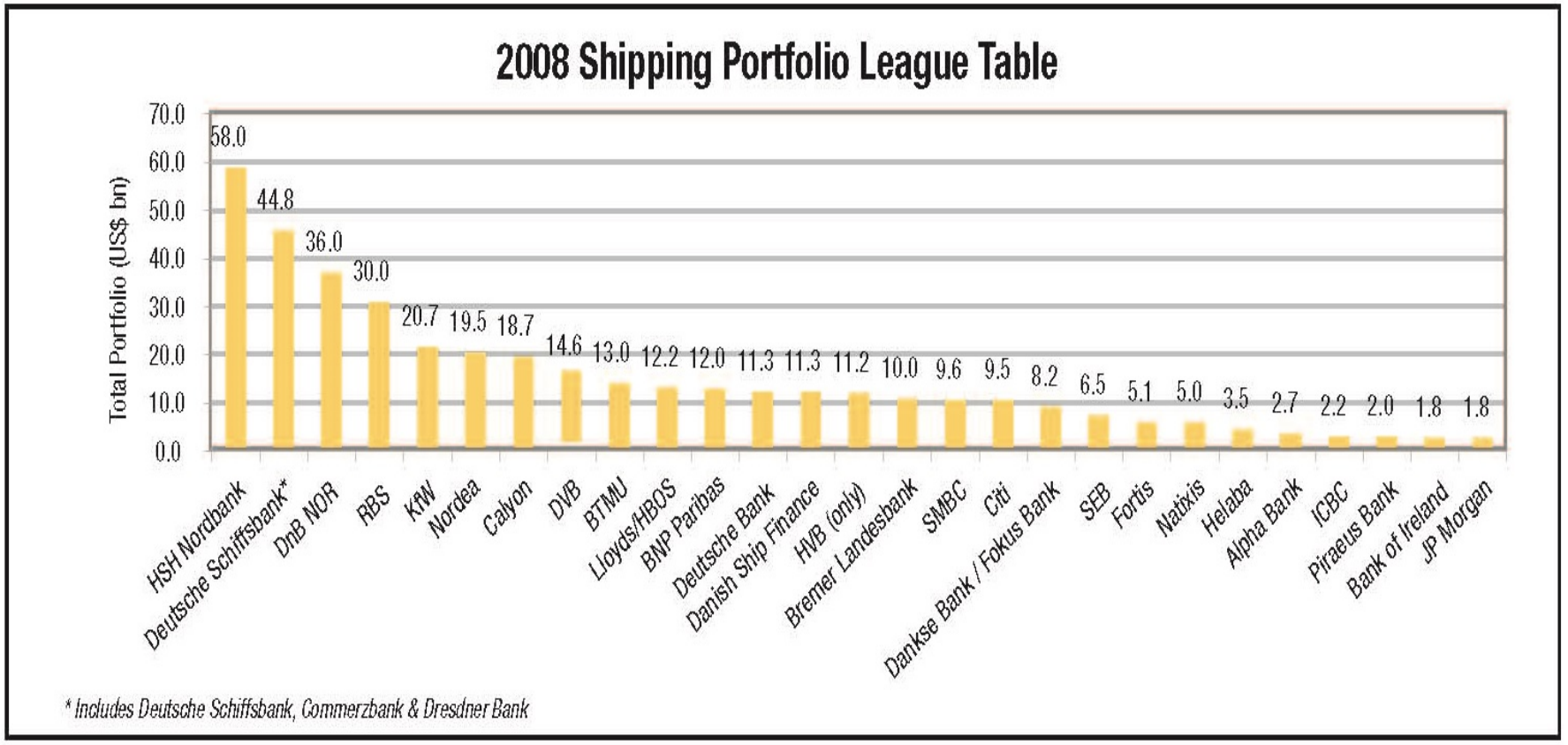

Source: Marine Money International

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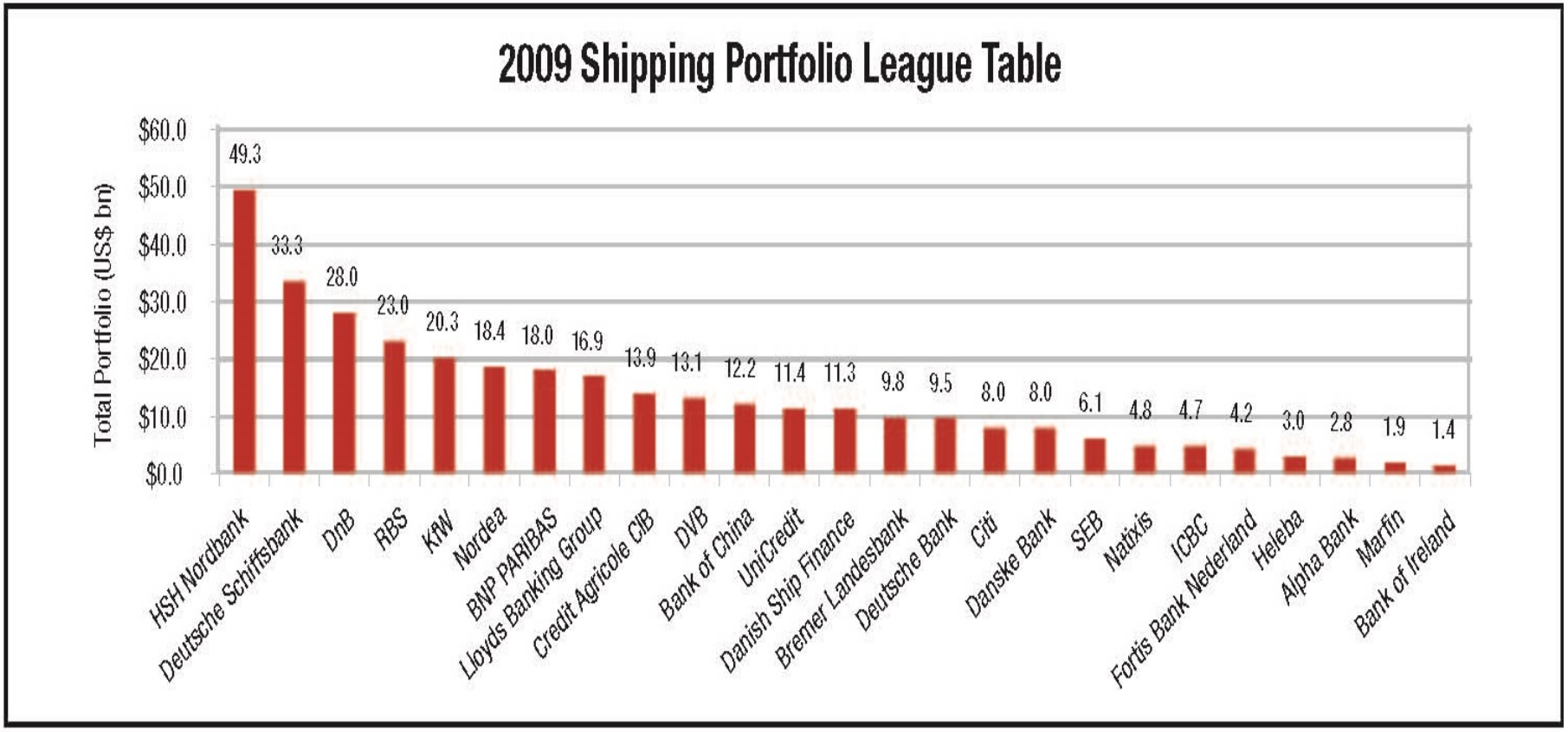

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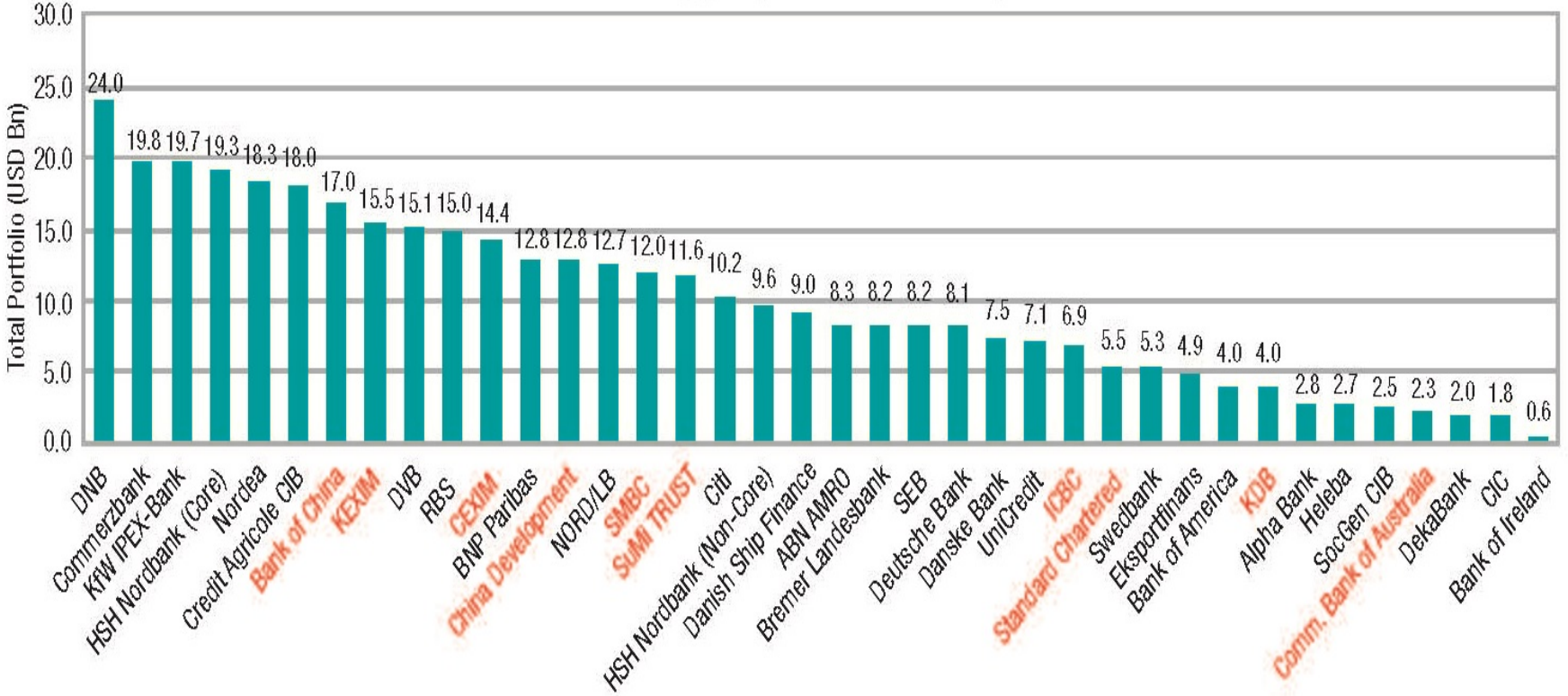
2013 Shipping Portfolio League Table



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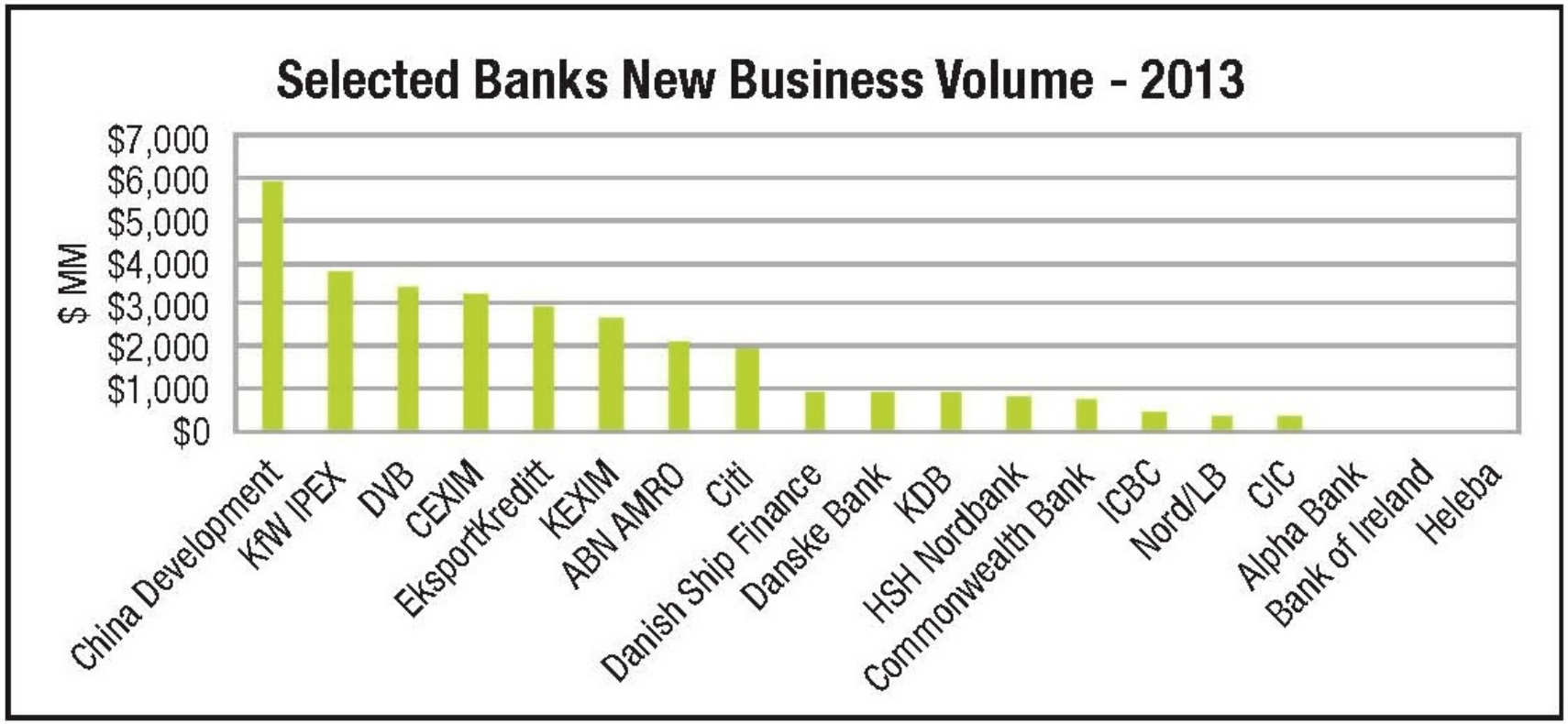

Source: Marine Money International

FIGURES 2 & 3

2. What caused Asian Ship Finance to Expand?

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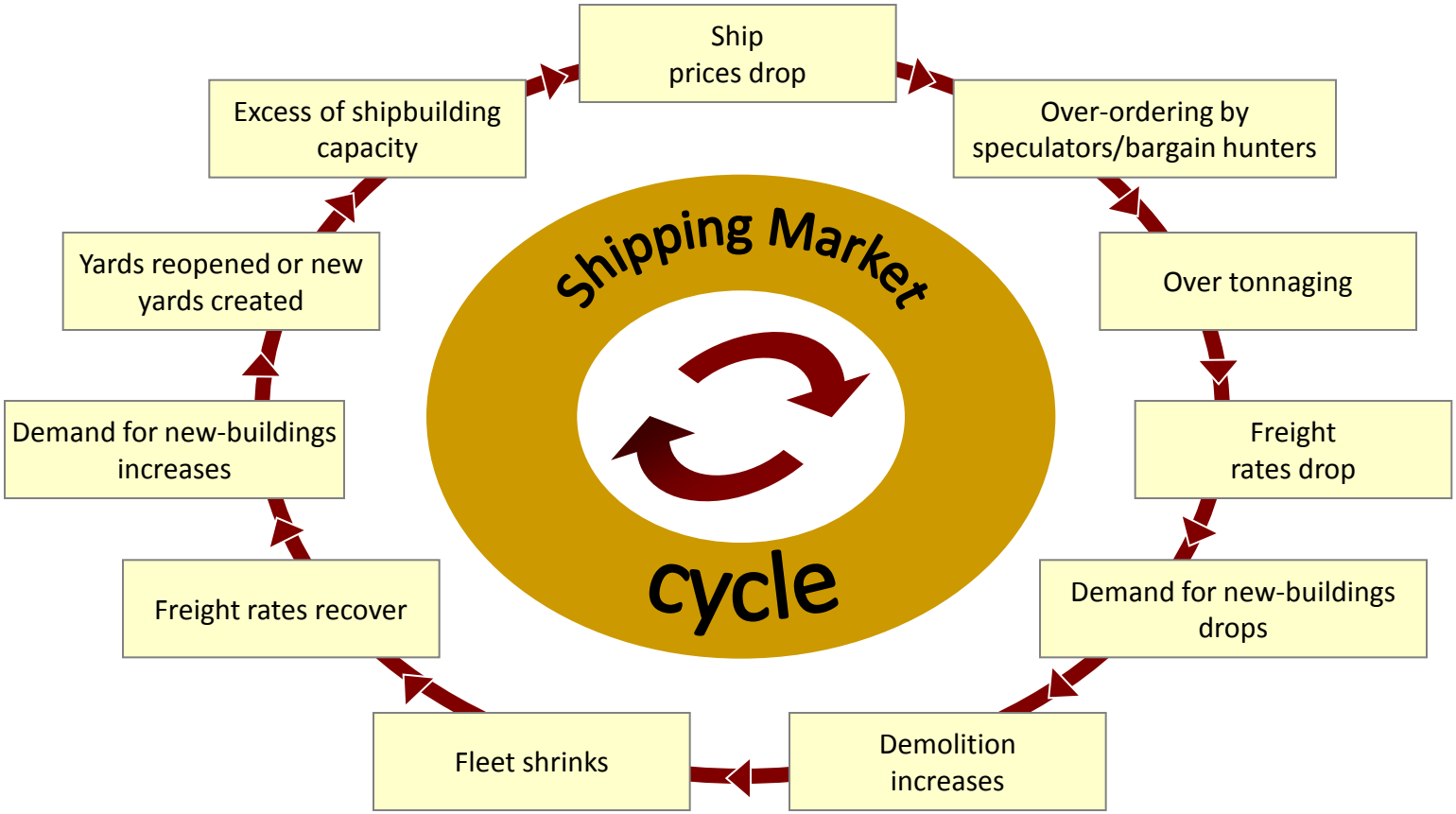
The Shipping Market Cycle



Source: DVB

A normal shipping cycle has one or two high years and six or seven year lows.

But the 2003/4 – 2007/8 boom cycle was different.

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Prolonged Shipping Cycle led to Irrational Exuberance and Escalated Asset Values

The 2003 to 2008 shipping cycle had a peak of four years for the following reasons:

1. Inadequate shipbuilding capacity .

• The upswing started with too little yard capacity needed for normal fleet renewal process

• Then the LNG wave came where people started to build ships for projects and the offshore boom came

• The yards found themselves lacking capacity a longer period of time

2. The rise of China after entry to the WTO in 2001 and massive investment in infrastruture in the years to follow3

3. Abundance of liquidity in the financial markets

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Prolonged Shipping Cycle led to Irrational Exuberance and Escalated Asset Values

But over the four year boom

Global shipyard capacity increased tremendously, especially in China

The fleet of ships in all sectors more than doubled because of low scrapping and massive newbuilding

Huge orders were placed even in 2009

Owners and bankers alike were behaving as if the good times were here forever.

And then the Global Financial Crisis Struck…

(unavailability of trade finance accelerated the shipping crisis)

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Financial Institutions failed or were bailed out by governments

Source: BBC

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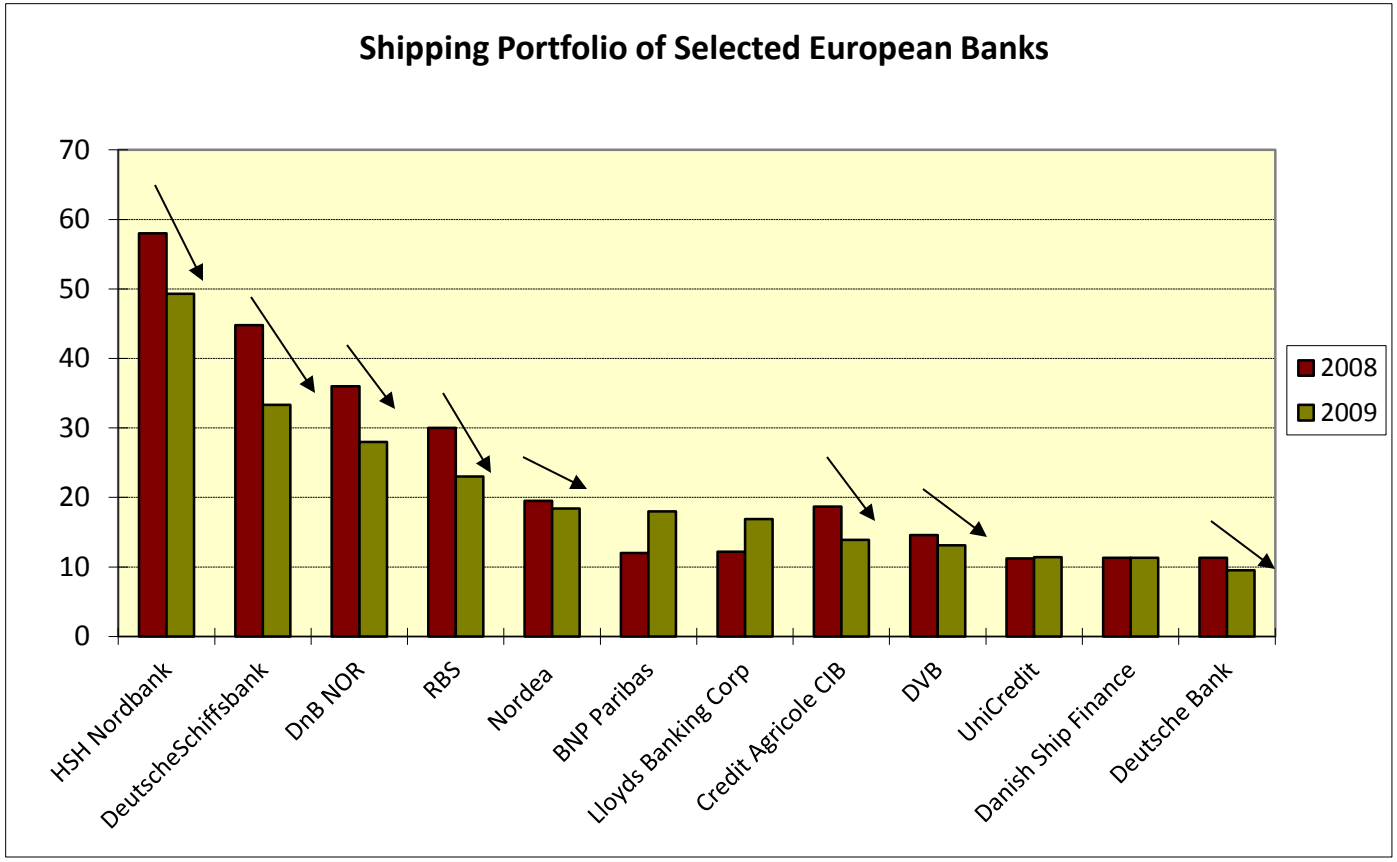

Source: Marine Money

Material Contraction in Ship lending capacity among major shipping banks

Distressed exposures to non-core names and excessive lending at the cycle peak caused a retreat to narrower target market and greater focus on existing clients

Some prominent shipping banks were nationalized and some faced over-exposure to unique ship finance conditions in home markets

Those banks which WERE lending increased pricing and severely tightened covenants

And the Shipping Markets

Plunged into Crisis

Unprecedented collapses in both shipping and financial markets

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Pain Across The Entire Shipping Value Chain

Key Shipping Value Chain Participants

Asset Financiers

- Overextended balance sheets
- Challenging overall liquidity situation
- Loans secured through insufficient collaterals
  - Loan-to-value covenants inadequate
- Challenging operating environment is enhancing the execution risk of repossessions

Asset Owners

- Material decline in asset values
  - Breach of loan-to–value covenants
- Declining rate environment
  - Potential charter renegotiations
- Substantial orderbook
  - Material outstanding finance commitments
- New funding, if at all possible, prohibitively expensive

Asset Operators

- Rapidly deteriorating macro-economic environment
  - Pronounced decline in demand
- Potential long-term contractual commitment to use assets
  - High cost assets in declining rate environment puts margins under pressure
- New funding, if at all possible, prohibitively expensive

Source: Citibank

Who was to become the white knight?

3. The Rise of Export Credit Finance

China Exim. Sinosure. JBIC. NEXI. KEXIM. KEIC

Q: What is an Export Finance Agency?

A: Export Credit Agencies (ECAs) are public institutions that facilitate financing for home country exporters and investors doing business overseas, particularly in developing countries and emerging market economies.

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Advantages of ECAs

- Availability – When commercial financing is limited/not available

- Long-term – The total loan horizons are longer than those available on a purely commercial basis

- High loan amounts – can be 70/80% of value

- As the Seller's Credit is a loan, the Seller may even receive interest accrued on the principal

Source: Marine Money, HSBC

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Types of ECA Products

• Buyer's Credit – A financial arrangement in which a bank or an export credit agency extends a loan directly to a foreign buyer in the importing country to pay for the purchase of goods and services from the exporting country

• Seller's Credit – A financial arrangement in which the seller provides credit to the buyer in respect of part of the purchase price of the good

• Export Credit Insurance – An insurance policy provided by an ECA that protects an exporter of products and services against the risk of non-payment by a foreign buyer

Source: Marine Money, HSBC

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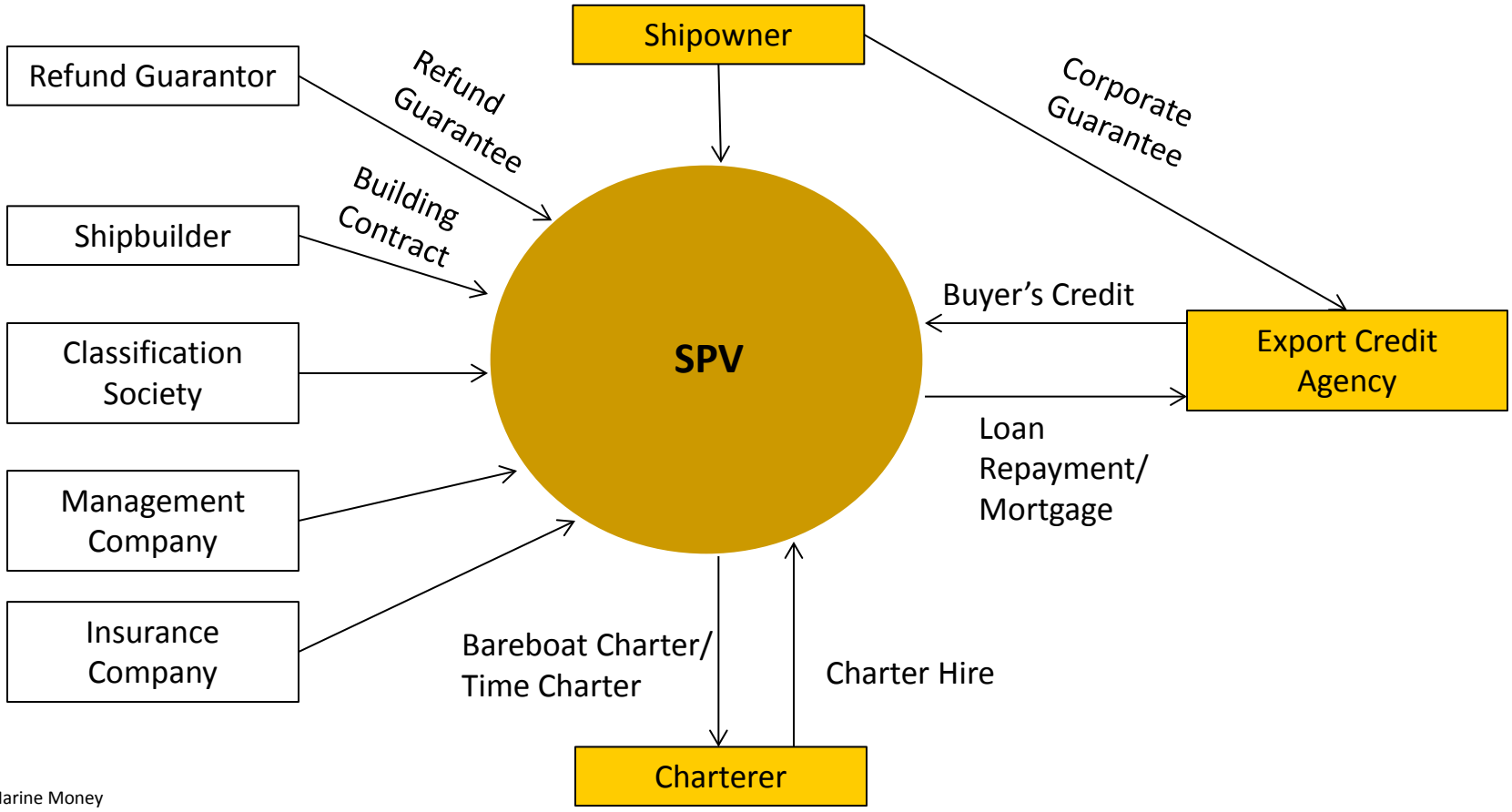
Typical Buyer's Credit Structure



Source: Marine Money

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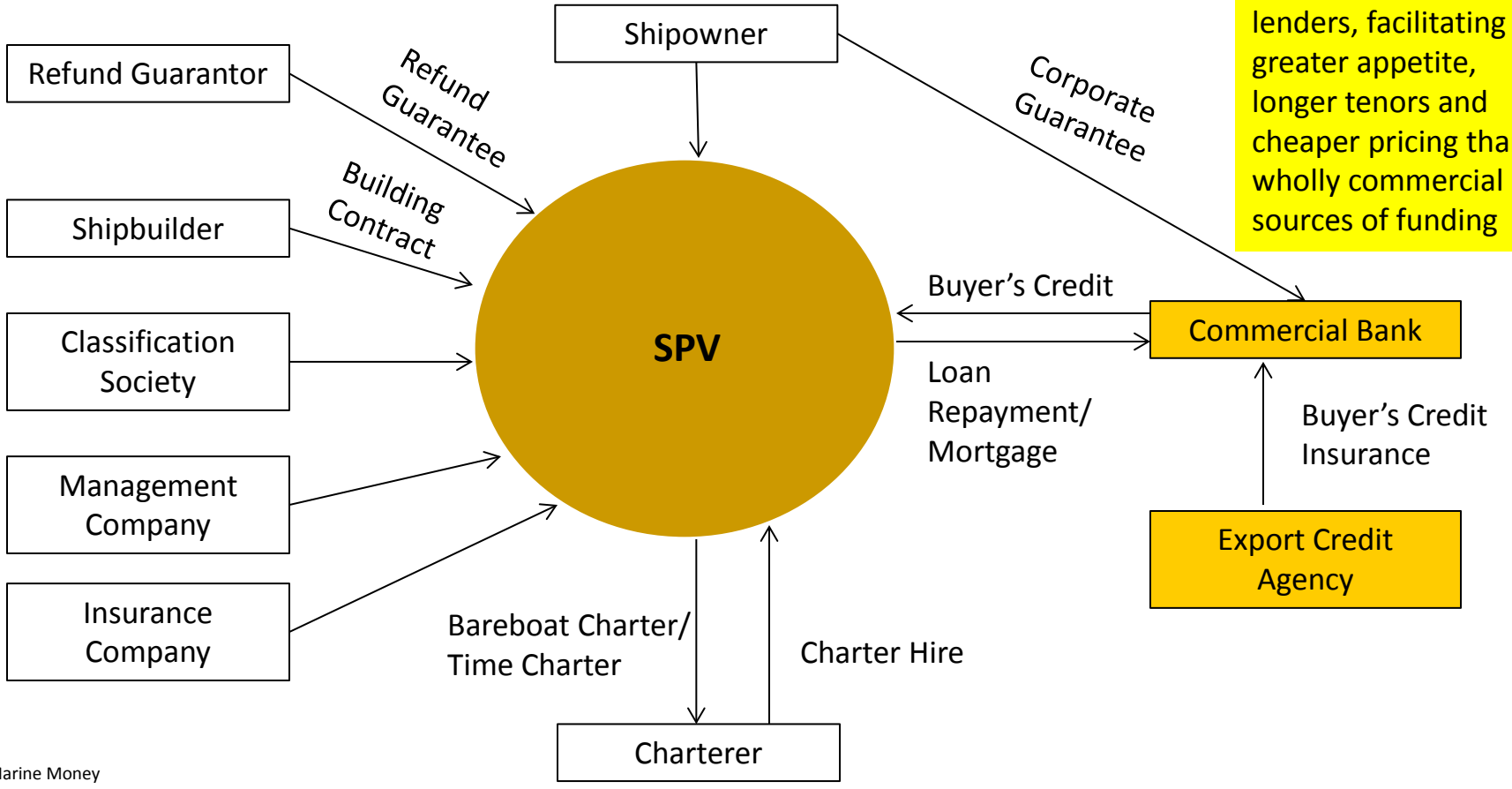
Typical Buyer's Credit Structure - II

ECA financing provides credit enhancement to lenders, facilitating greater appetite, longer tenors and cheaper pricing than wholly commercial sources of funding



Source: Marine Money

Important ECAs in Shipbuilding Nations in Asia

China:
The Export-Import Bank of China (China Eximbank)
China Export & Credit Insurance Corporation (Sino-sure)
China Development Bank (CDB)

Japan:
Japan Bank for International Cooperation (JBIC)
Nippon Export and Investment Insurance (NEXI)

Korea:
The Export-Import Bank of Korea (KEXIM)
Korea Trade Insurance Corporation (K-sure)

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The Rise of Export Credit Finance

中国出口信用保险公司
China Export & Credit Insurance Corporation

CHINA EXIM BANK
THE EXPORT-IMPORT BANK OF CHINA

China Exim Flexes Financial Muscle

• Since its establishment in 1994, China Exim Bank has played an instrumental role in supporting China's maritime industry, having granted shipping/shipbuilding related loans of over RMB 116.8 billion (USD 17.1 billion) in the domestic currency and USD 8.5 billion in greenback at the end of 2009

• Financed over 3,700 Chinese built vessels of over 120 million dwt

• Adopts a two-pronged strategy to support Chinese Shipbuilders by:

a) Encouraging foreign ship owners to build ships in China through attractive financing packages.
b) Providing shipbuilders bank guarantees required in their business which include refund guarantees, tender bonds, performance bonds, payment guarantees and seller's credit

• The objective is to nurture and provide financial support to a selected group of Chinese shipbuilders including state-owned CSSC and CSIC, as well as privately held Jiangsu Rongsheng Heavy Industries, Sino-Pacific Shipbuilding and Jiangsu New Century

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China Exim Takes Bold Steps to Help Greek and Italian Owners

中国出口信用保险公司
China Export & Credit Insurance Corporation

CHINA EXIM BANK
THE EXPORT-IMPORT BANK OF CHINA

In October 2010 during his visit to Athens Chinese Premier Wen Jiabao gave his backing to Greek shipowners with the establishment of a massive USD 5 billion shipping fund to facilitate the sale of Chinese built ships to Greek shipping companies. This amount is reportedly said to have doubled to USD 10 billion

In the same month, China Exim signed an agreement with Confitarma (the Italian Shipowner's Association) to promote the availability of Chinese finance for Italian shipowners placing orders at Chinese shipyards

Source: Marine Money, Lloyd's List

Some CEXIM transactions

MÆRSK

Sole Arranger and Lender Master Facility Agreement

$1.5billion

CMA CGM

Lead Arranger and Lender

$400million

msc

Sole Arranger and Lender

$150million

ZIM

Lead Arranger and Lender

$57million

MOL 商船三井

中国海运（集团）总公司 CHINA SHIPPING (GROUP) COMPANY

Mandated Lead Arranger and Lender for 4LNG Tankers

$440million

COSTAMARE Inc.

Lead Arranger and Lender for 3X Containerships

$200million

FRONTLINE

Sole Arranger and Lender for 2X VLCC Tankers

$150million

CMB BOCIMAR INTERNATIONAL

Mandated Lead Arranger and Lender for 2 Bulk Carriers

$90million

More CEXIM transactions

BERNHARD SCHULTE

Lead Arranger and Lender for 3X Containerships

$200million

BOURBON

Sole Arranger and Lender for 62X Offshore Vessels

$400million

Ofer Shipping

Lead Arranger and Lender for 6X Bulkers and 6X Containerships

$250million

NAKILAT ناقلات

Tranche III Lender for 25 X LNG Carriers

$200million

FRONTIER DRILLING

Lender for Ultra-deepwater drill ship

$100million

VALE

Lead Arranger and Lender for 12X VLOC

$1.28 billion

CLIPPER

Mandated Lead Arranger and Joint Lender for 4 VLCCs

$200million

Mandated Lead Arranger and Joint Lender for 10X AHTS

$170million

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Korea EXIM Bank

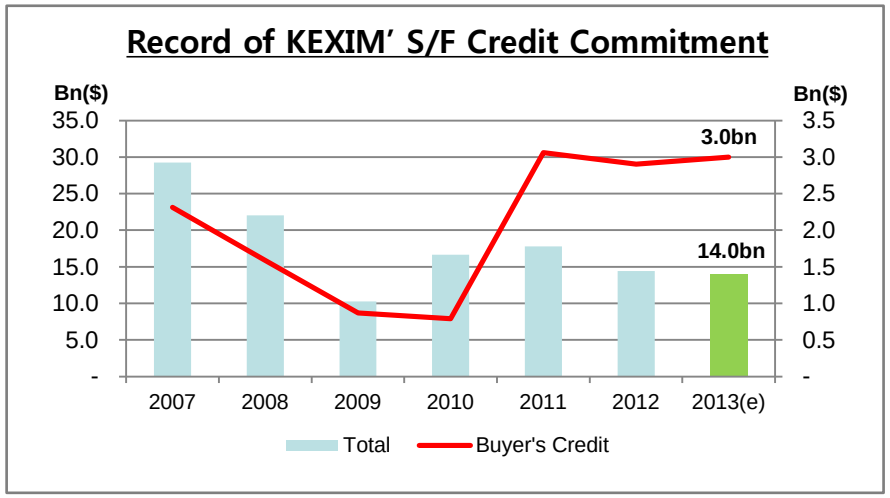
Korea Eximbank

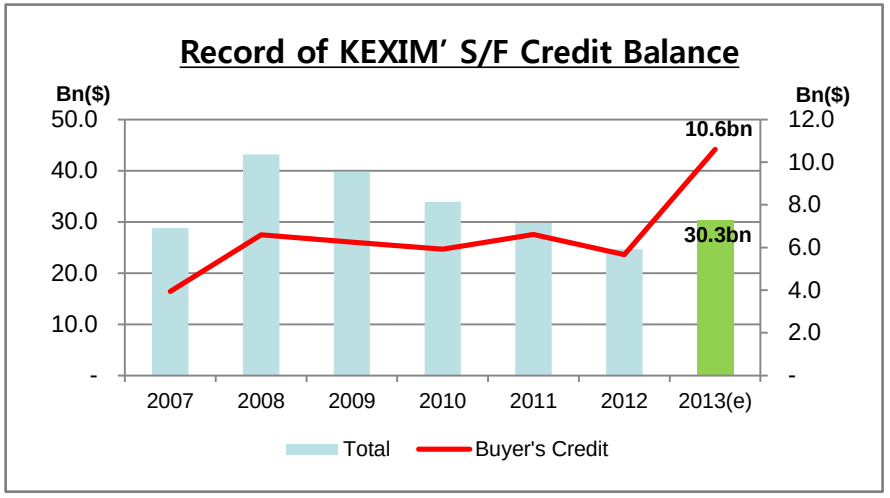
The Export-Import Bank of Korea (Korea Eximbank) is an official export credit agency providing comprehensive export credit and guarantee programs to support Korean enterprises in conducting overseas business. Established in 1976, the bank actively supports Korea's export-led economy and facilitated economic cooperation with foreign countries. Korea Eximbank's primary services include export loans, trade finance, and guarantee programs structured to meet the needs of clients in a direct effort to both complement and strengthen the clients' competitiveness in global markets

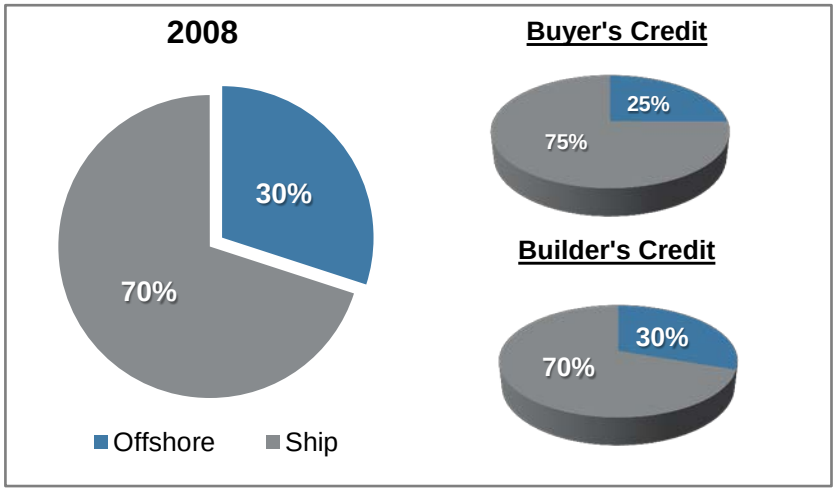
SHIPPING LOANS AND FACILITIES TOTAL OVER USD 30 BILLION

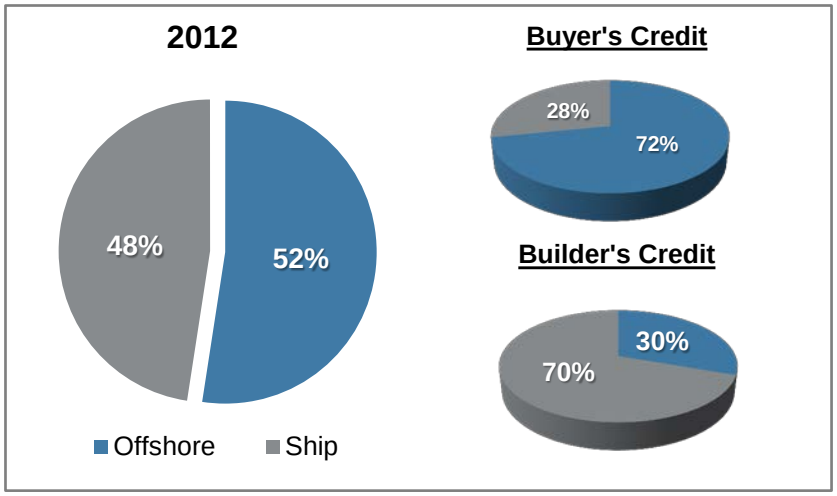
Korea Eximbank

KEXIM's ship financing feature





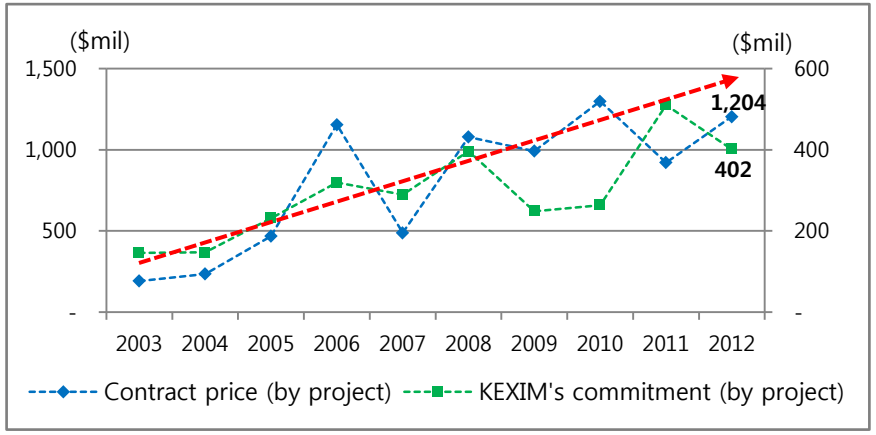




Filling gap of liquidity

- Deals going bigger

Vessel Type	Contract Price (1 vessel, million)	Deal Value* (million)
Bulker	~ 50	300 ~ 800
Container	~ 150	
Tanker	~ 100	
LNGC	~ 200	400 ~ ...???
Drillship	500 ~ 800	
FPSO/CPF...	600 ~ 2000	



* KEXIM's previous deals

MAERSK
A.P. Moller
18 Containers
3,663mil

Ichthys PROJECT
Ichthys LNG
CPF, FPSO
4,590mil

Seadrill
Seadrill
3 Drillships
1,573mil

OCEAN RIG
Ocean Rig
3 Drillships
1,864mil

Nigeria LNG Limited
BGT
6 LNGCs
1,337mil

Golar LNG
Golar LNG
2 FSRUs, 6 LNGCs
1,730mil

4. Leasing

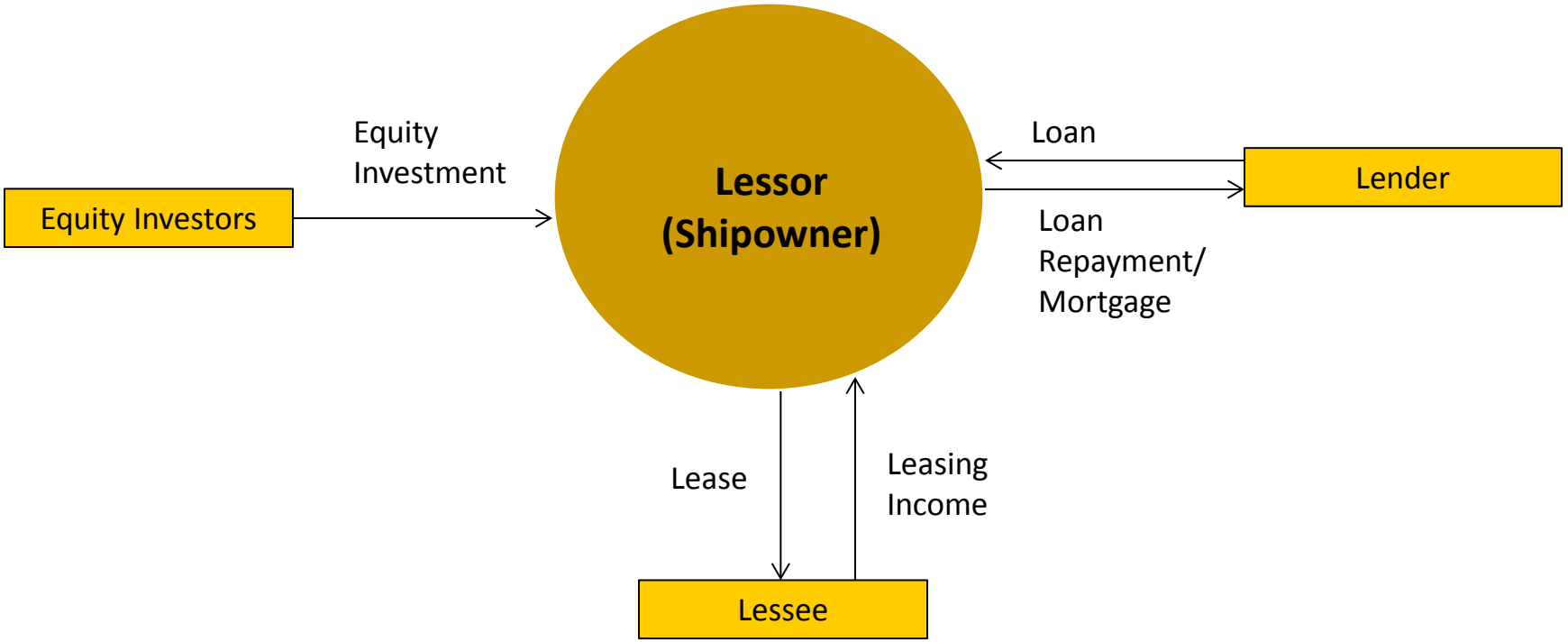
The next big thing in Asian Ship Finance

Q: What is Leasing?

A: Leasing is a process by which a firm can obtain the use of a certain fixed assets for which it must pay a series of contractual, periodic, tax deductible payments.

Source: Wikipedia

Typical Leasing Structure



Source: Marine Money

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When Banks Become Ship Owners…

• Chinese banks moves into owning vessels through the establishment of ship leasing divisions

ICBC Leasing
Minsheng Financial Leasing
China Construction Bank ("CCB") Leasing
Agricultural Bank of China
Bank of Communications Financial Leasing
China Development Bank ("CDB") Leasing
China Everbright Bank

And more to come, as other Chinese banks are applying to set up leasing their own subsidiaries

• State-owned chemical group Sinochem has its own ship-leasing division, that targets small and medium size Chinese shipowners – International Far Eastern Leasing

• Standard Chartered Bank has a ship leasing division to provide clients bareboat charters, on long term lease tenors of 5 to 12 years

工银租赁 ICBC LEASING
民生金融租赁 MINSHENG FINANCIAL LEASING CO.,LTD.
Standard Chartered
交银金融租赁有限责任公司 Bank of Communions Finance Leasing CO.,Ltd.
CLC 国银租赁 CDB Leasing
招商银行 CHINA MERCHANTS BANK 招银金融租赁有限公司 CMB Financial Leasing Co.,LTD.

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Ship Leasing in China

- In 2007 the China Banking Regulatory Commission ("CBRC") launched its pilot project and granted the first batch of twelve licenses for financial institutions to venture into leasing – including Industrial and Commercial Bank of China ("ICBC"), Bank of Construction, Bank of Communications, Minsheng Bank, China Development Bank and China Merchants Bank

- Among the real pioneers was ICBC Leasing which has become a powerhouse since the landmark RMB 5.3 billion (USD 780 million) leasing facility for Chinese state owned power generation enterprise China Huaneng for 12 supramax dry bulkers constructed by China State Shipbuilding Corp (CSSC) and other yards

- In 2013 ICBC Leasing supported a excess USD1 billion deal sale and leaseback deal with French offshore group Bourbon

Chinese leasing companies are well supported by local banks who have

- Liquidity
- Encouragement from central authorities (Government) to support shipping
- Leasing expertise
- Ability to do massive deals – even excess $1 billion
- But have not YET attracted many foreign clients

Finally,

5. Some words of warning

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Traditional shipping banks

- Are mending their balance sheets and are lending again
- For top clients competition amongst the banks is fierce with pricing down 100 bps in 12 months and covenants weakening
- This may price the ECAs out of the market or render the ECAs less desirable in a transaction

Source: Marine Money, HSBC

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The Asian banks have had their own distress situations – even the ECAs

BLT

Torm

Korea Lines

TMT

STX

Nanjing Tankers.

Source: Marine Money, HSBC

Final Point

Will Asian banks (ECA and non-ECA) continue to play the role they have played in the past five years in shipping?

Or will the European and US shipping banks take the lion's share once again?

Will leasing be the next big thing in ship finance in Asia?

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