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Shipbuilding market developments First semester 2022

Monitoring developments in ship supply, demand, prices and costs

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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

Table of contents

FIGURES

TABLES

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Around 60% of newbuilding demand arises from the need to replace outdated ships rather than new demand resulting from seaborne trade expansion.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

$$\textit{Yard capacity imbalance}_{t_{forecast}} = \textit{Yard capacity}_{T=2020} - \sum_{s}^{k} \textit{Newbuilding demand}_{s,t_{forecast}}$$

If <0: under-capacity
If >0: excess-capacity
If =0: equilibrium

Maximum production approach:
i. moving 3 years-interval
ii. moving 15 years-interval
Source: IHS Seaweb.

→ $\textit{Replacement demand}_{s,t_{forecast}}$

Survival analysis:
- Kaplan-Meier estimator

Source: IHS Seaweb.

→ $\textit{Seaborne trade expansion}_{s,\; t+1_{forecast};\; t_{forecast}}$

ITF International freight model:
- Forecast of maritime trade of 28 commodities.
- 2020-30
- Scenarios: *Baseline* or *Reshape*

Source: ITF (2021).

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: $\widehat{S(t)} = \prod_{i:\, t_i \leq t}(1 - \frac{d_i}{n_i})$ 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.

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[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.

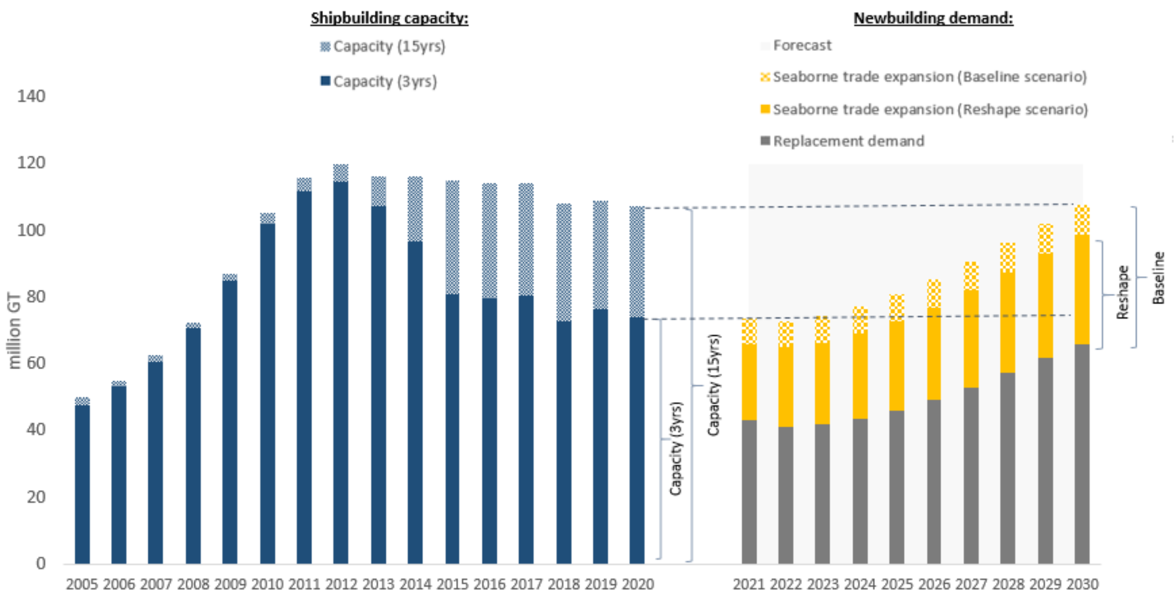
Predictions about newbuilding demand for the period 2021-30 amount to a total of between 861 and 777 million gross tonnes (GT) depending on the scenario considered. The results cover six ship groups that are bulk carriers, containerships, oil tankers, chemical tankers, liquefied gas tankers ad general 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

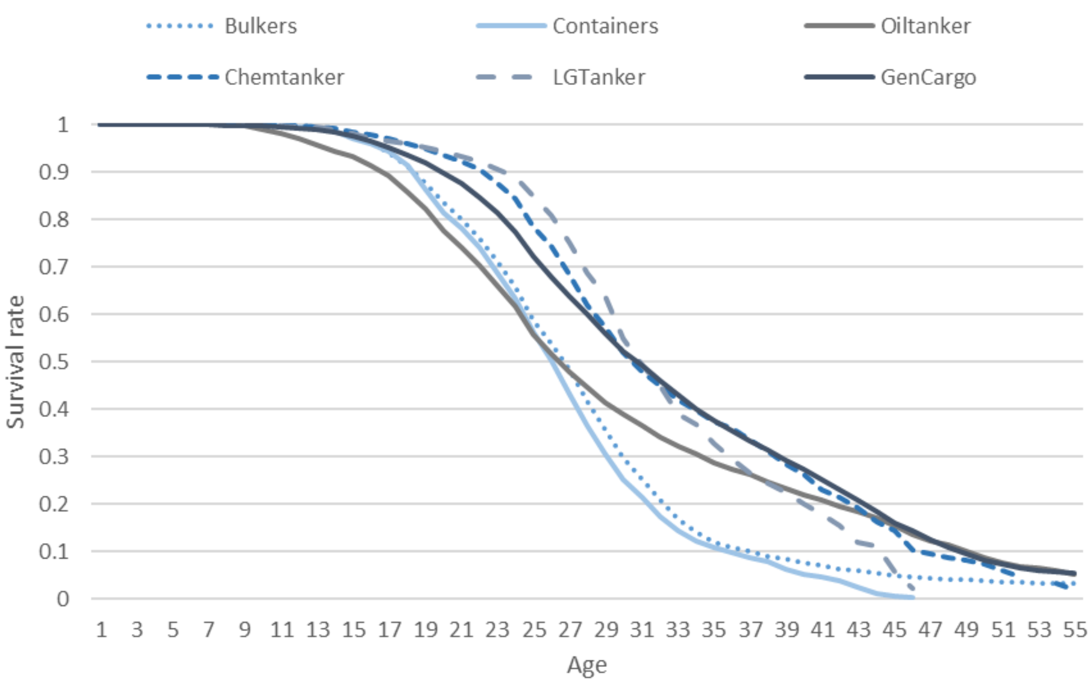
Predictions of newbuilding demand are aggregations of new orders arising from the need to replace obsolete ships and from demand for seaborne trade.

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

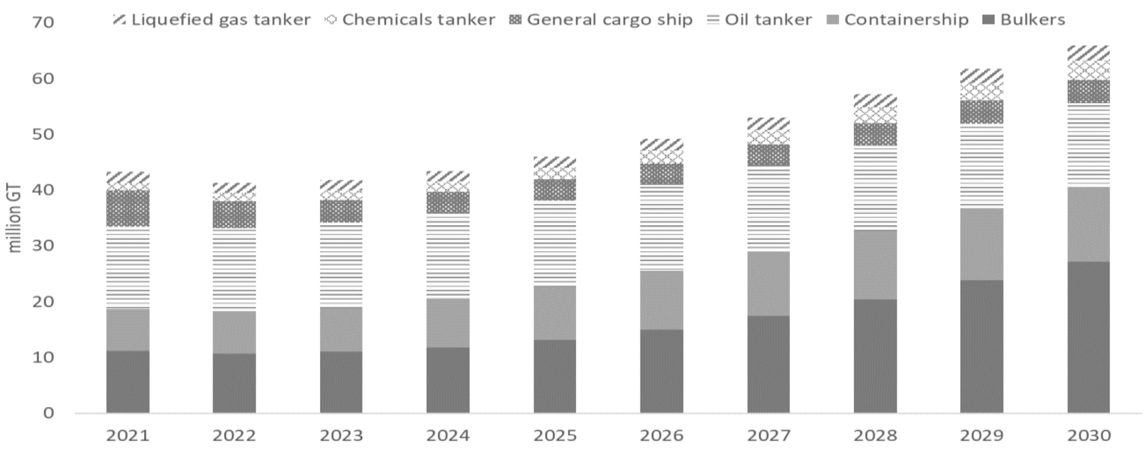


Note: Estimates of survival rates are based on ship demolitions and age that are observed in the fleet, excluding ships in service beyond the age of 45 to smooth the survival rates.
Source: OECD estimation based on IHS Seaweb (2021).

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



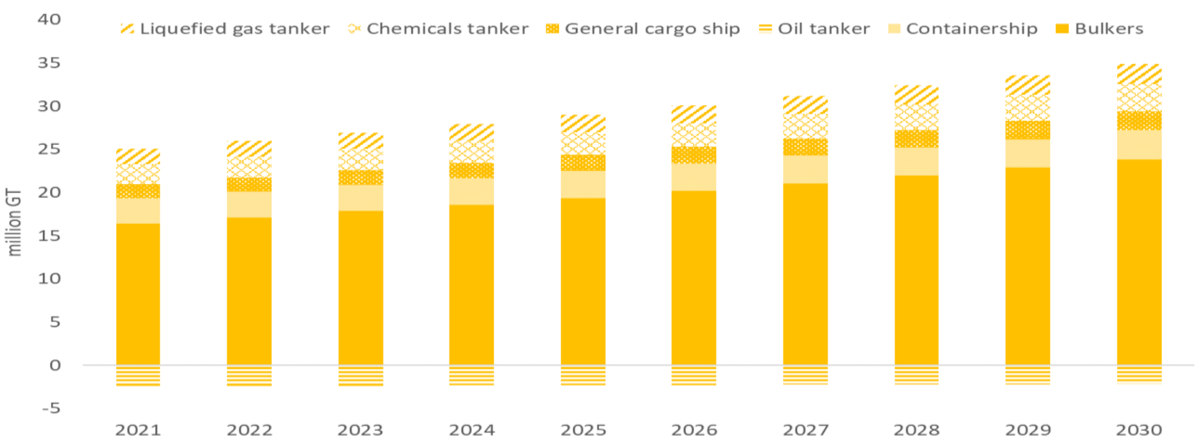
Source: OECD estimation based on IHS Seaweb data (2021).

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.

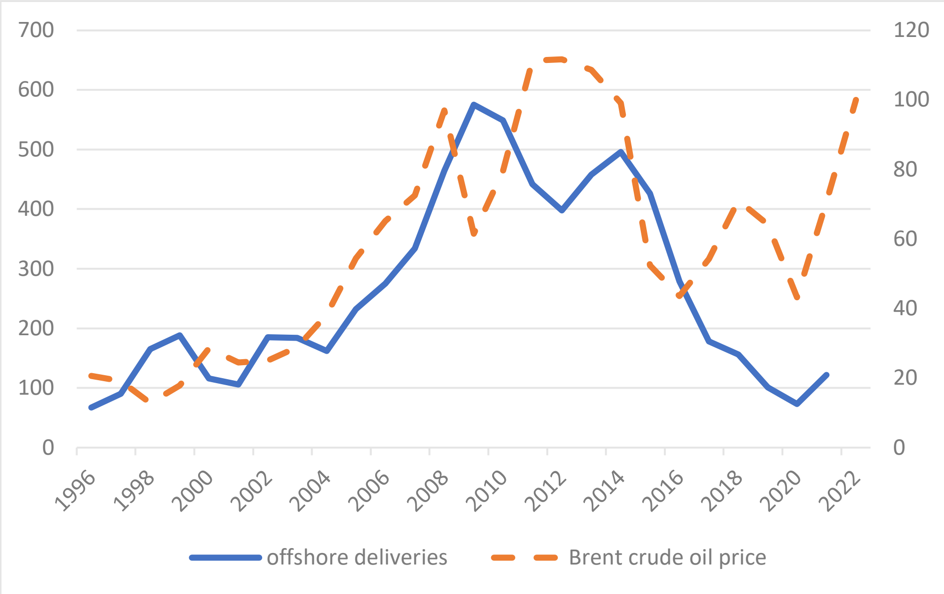
[20] Clarkson's Research (2021): "Offshore Review & Outlook: Contrasting Fortunes".

[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, 2022[23]). 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

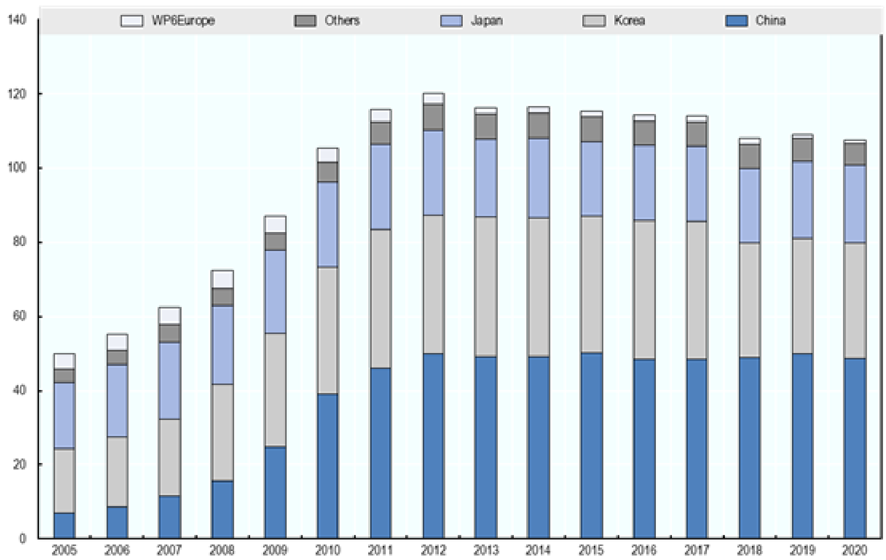
[23] Clarkson's Research (2022): «Offshore Review & Outlook: Signs Of Improvement".

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

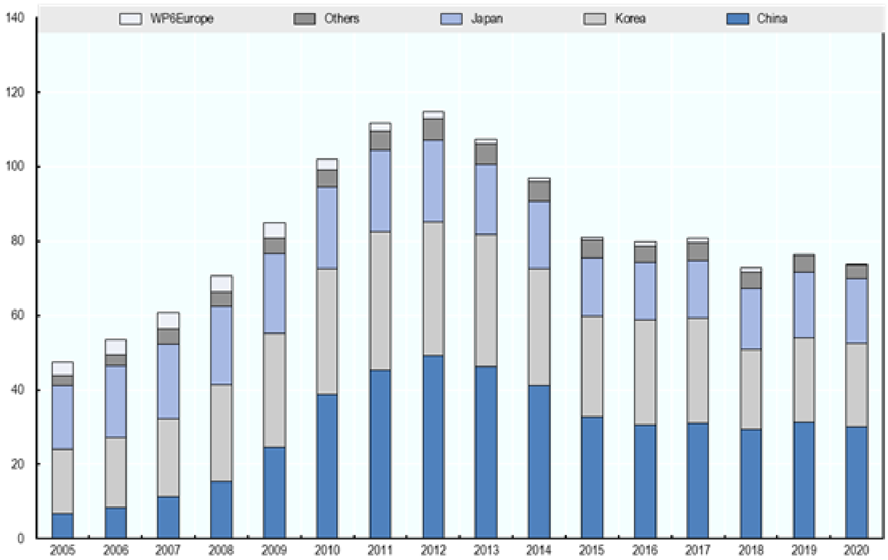
In millions of GT



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



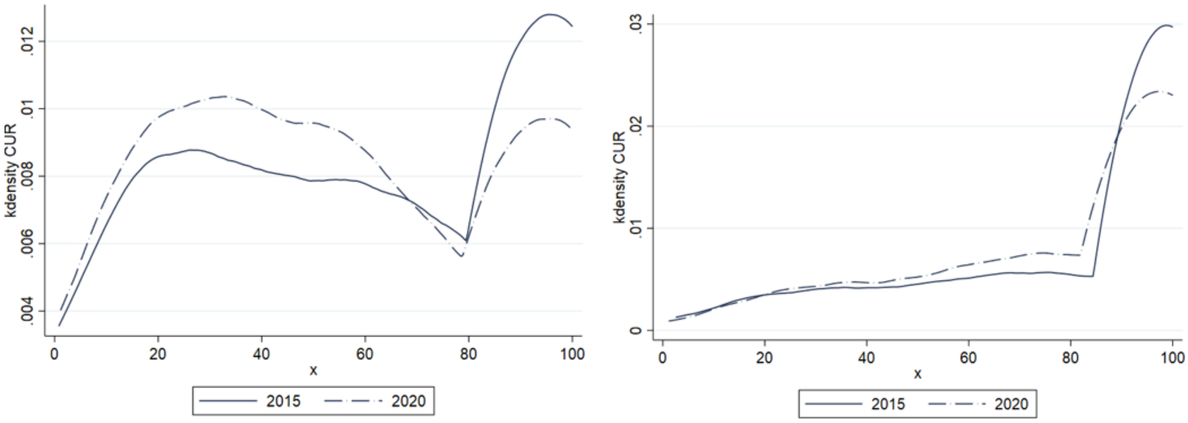
Note: The region "WP6 Europe" includes the countries Croatia, Denmark, Finland, Germany, Italy, Netherlands, Norway, Poland and Romania.
Source: OECD estimation based on IHS Seaweb (2021).

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

Different y-axis scales

3-years interval
interval

15-years



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).

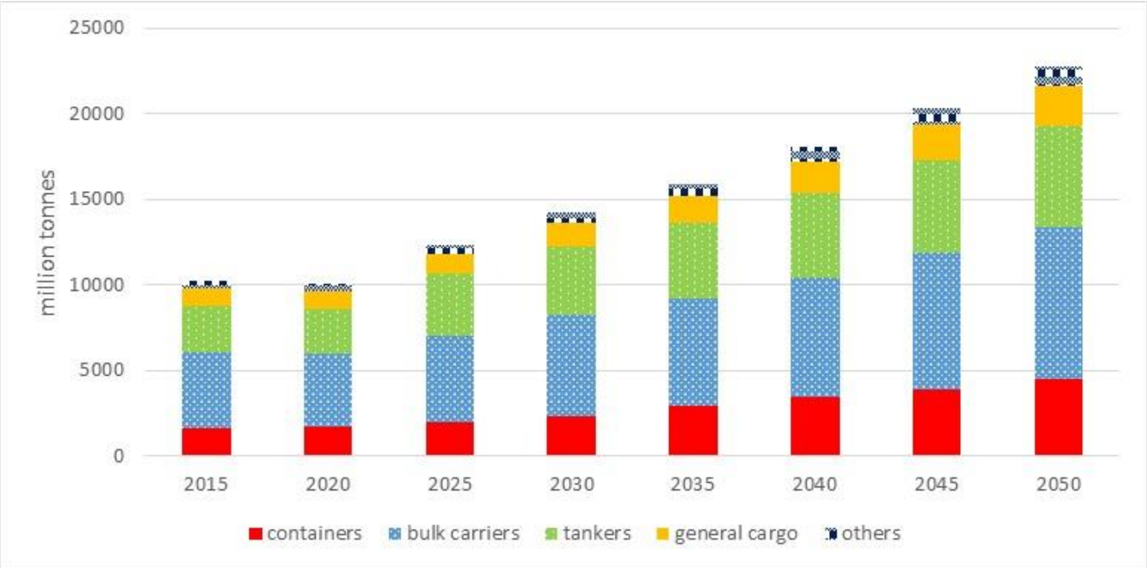
Recently released forecasts

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).

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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.

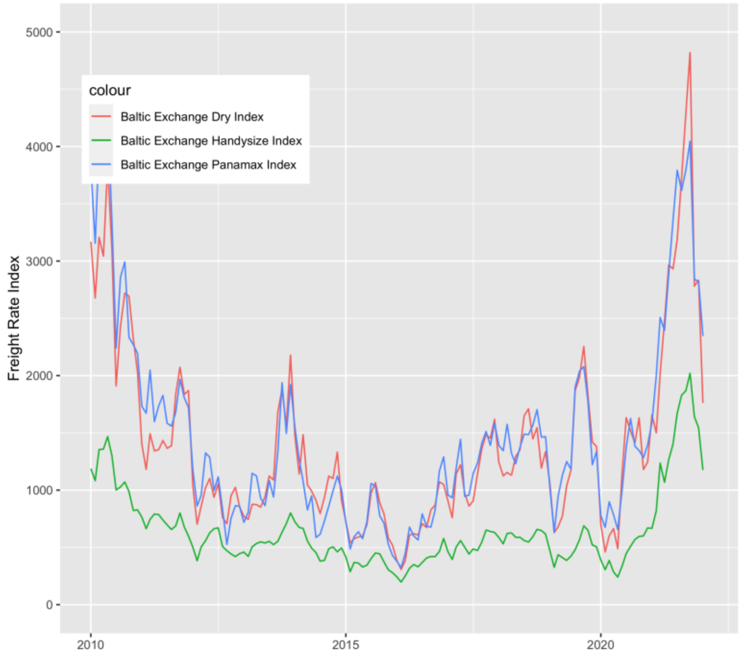
Exchange rate

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

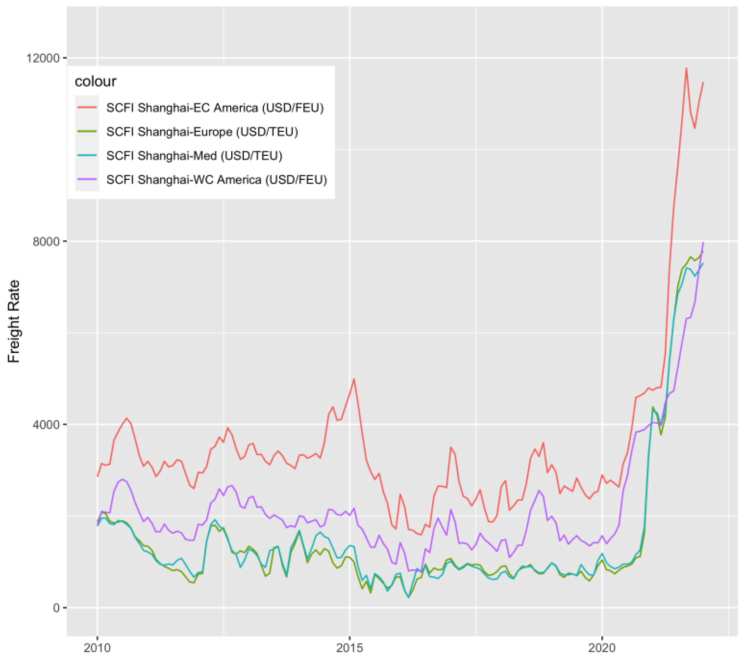
Source: Clarksons Shipping Intelligence Network

Figure 6.2. Freight rate



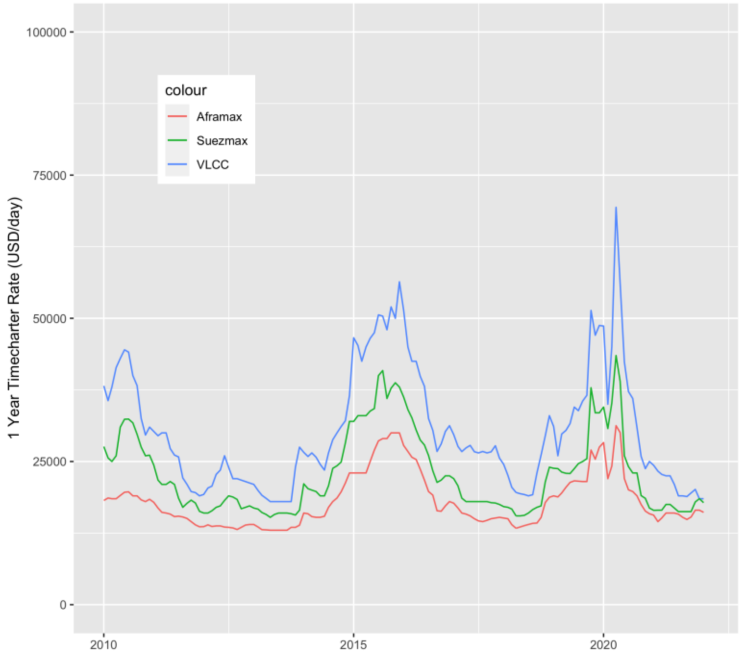
Source: Clarksons Shipping Intelligence Network

Figure 6.3. Freight rate



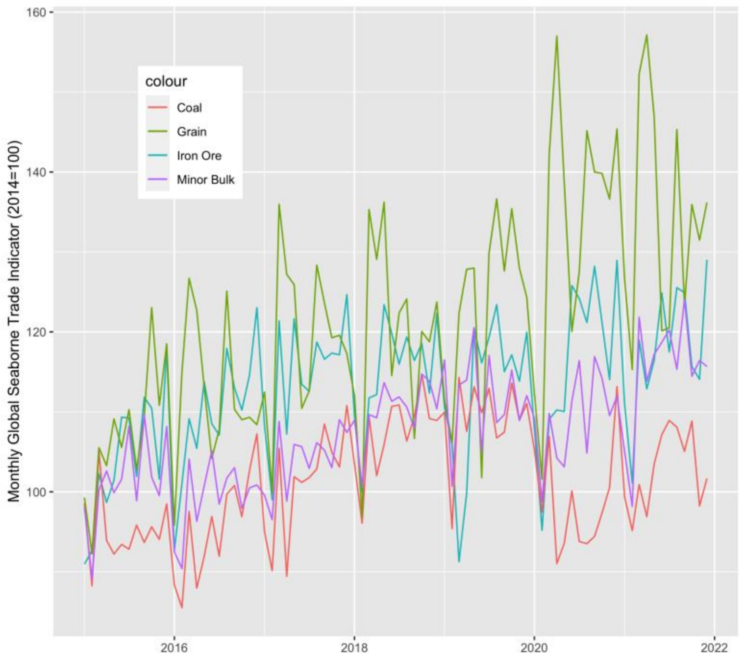
Source: Clarksons Shipping Intelligence Network

Figure 6.4. Freight rate



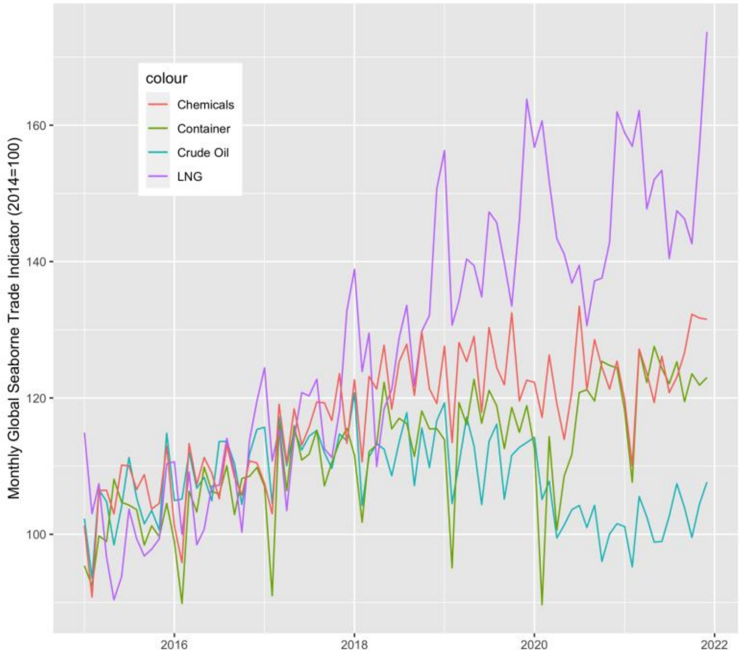
Source: Clarksons Shipping Intelligence Network

Figure 6.5. Seaborne trade



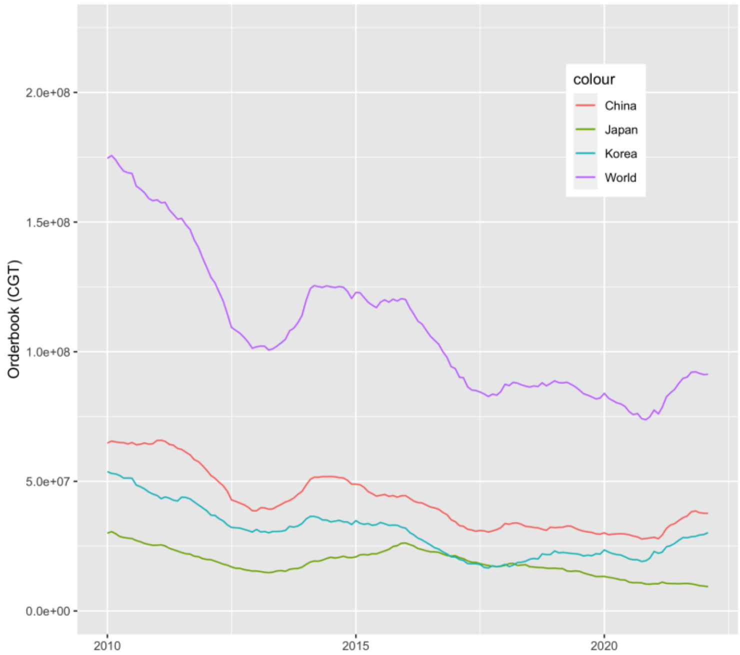
Source: Clarksons Shipping Intelligence Network

Figure 6.6. Seaborne trade



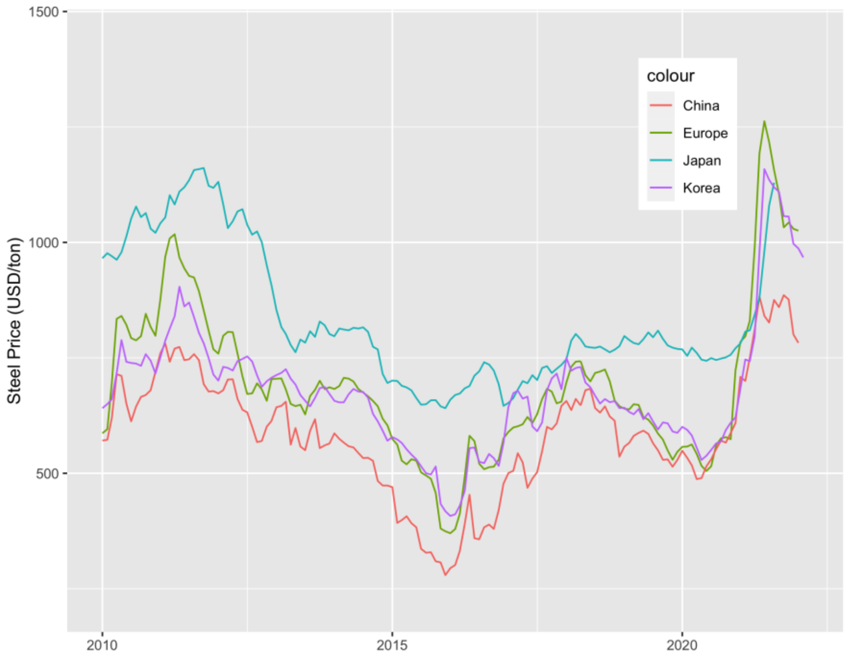
Source: Clarksons Shipping Intelligence Network

Figure 6.7. Orderbook



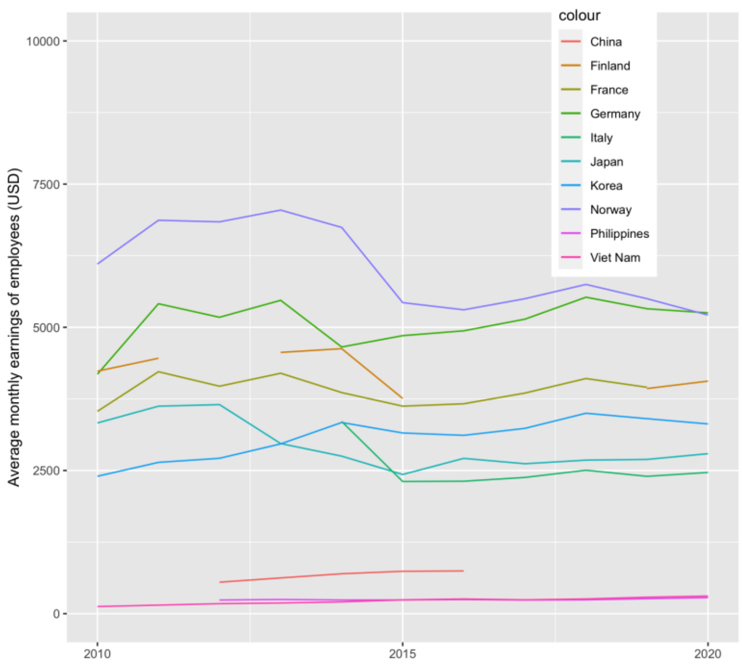
Source: Clarksons Shipping Intelligence Network

Figure 6.8. Steel price



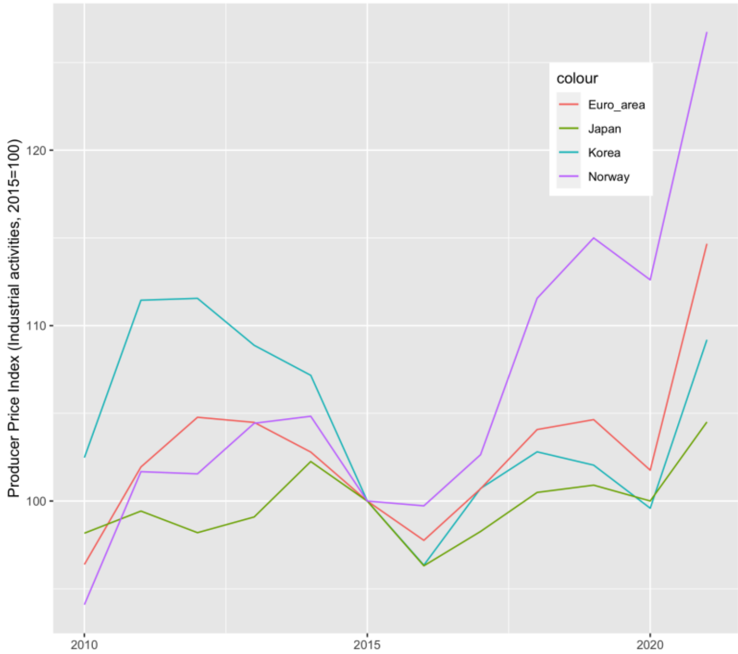
Source: OECD calculations based on SBB Steel Prices, Japan Metal Daily and Korean Steel Daily.

Figure 6.9. Labour costs



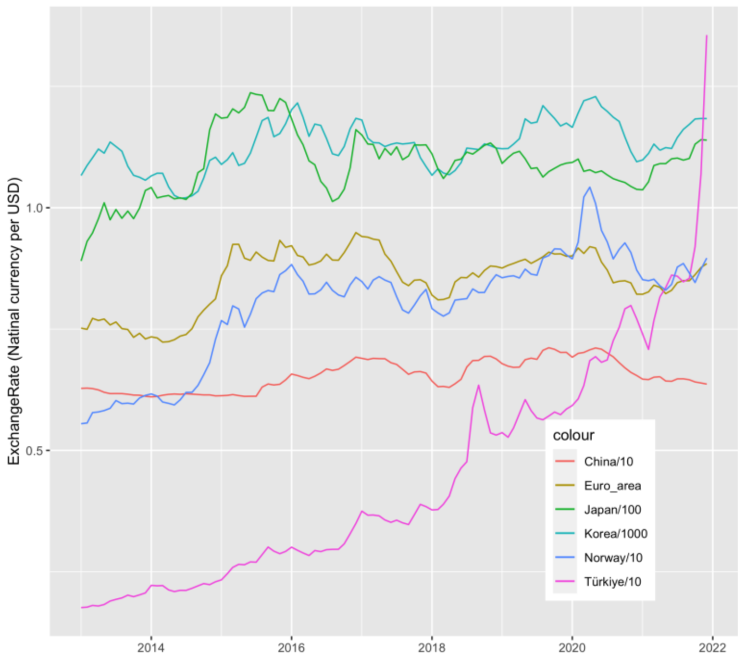
Note: This figure shows average monthly earnings of employees in the manufacturing industry as a proxy for labour costs in the shipbuilding industry which are not available.
Source: ILOSTAT

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 $\mu \pm 1\sigma$ 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

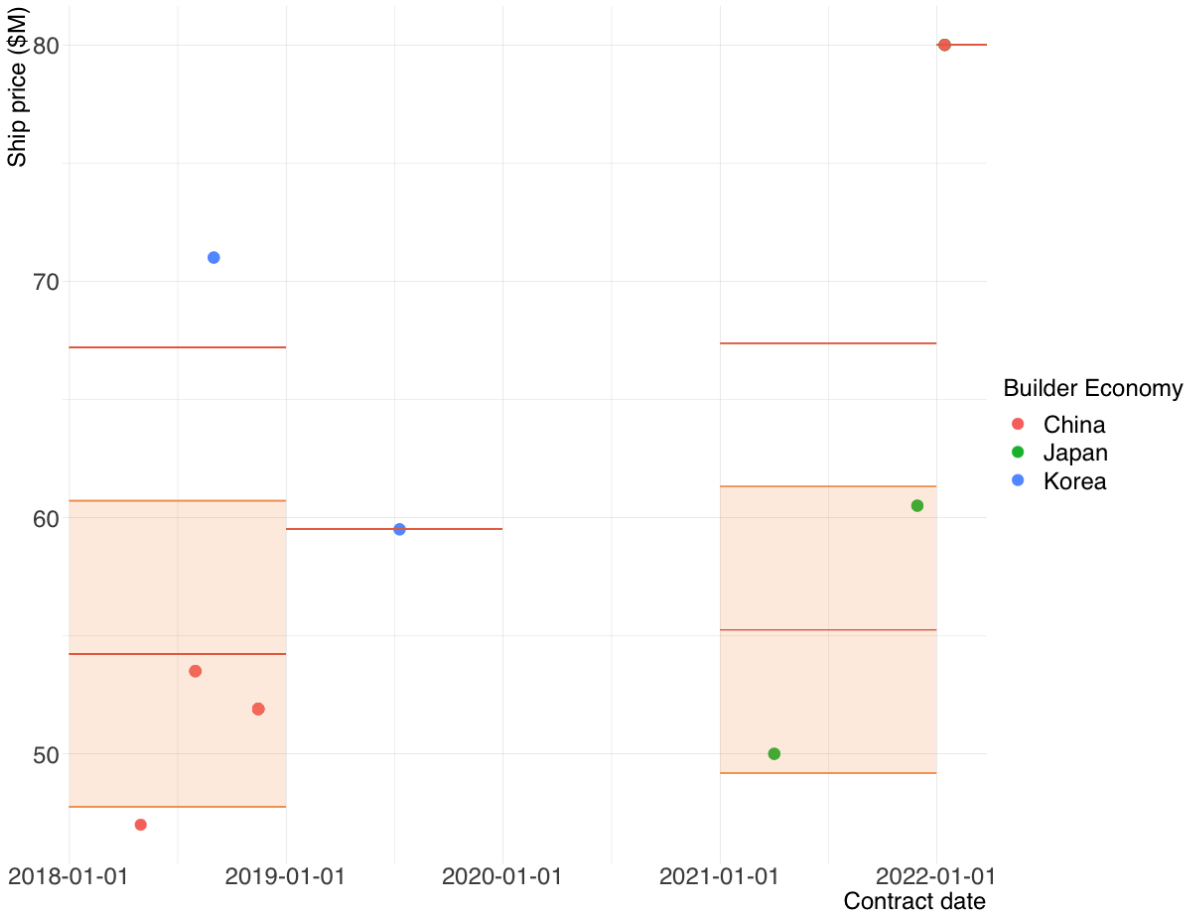
The Secretariat also tried to analyse prices of Chemical tankers. Chemical tankers were the type of ships for which it was the most difficult to collect price information among the five ship types analysed in this document. The results are shown in Figure 6.30 and Figure 6.31 for one size class: (1) 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



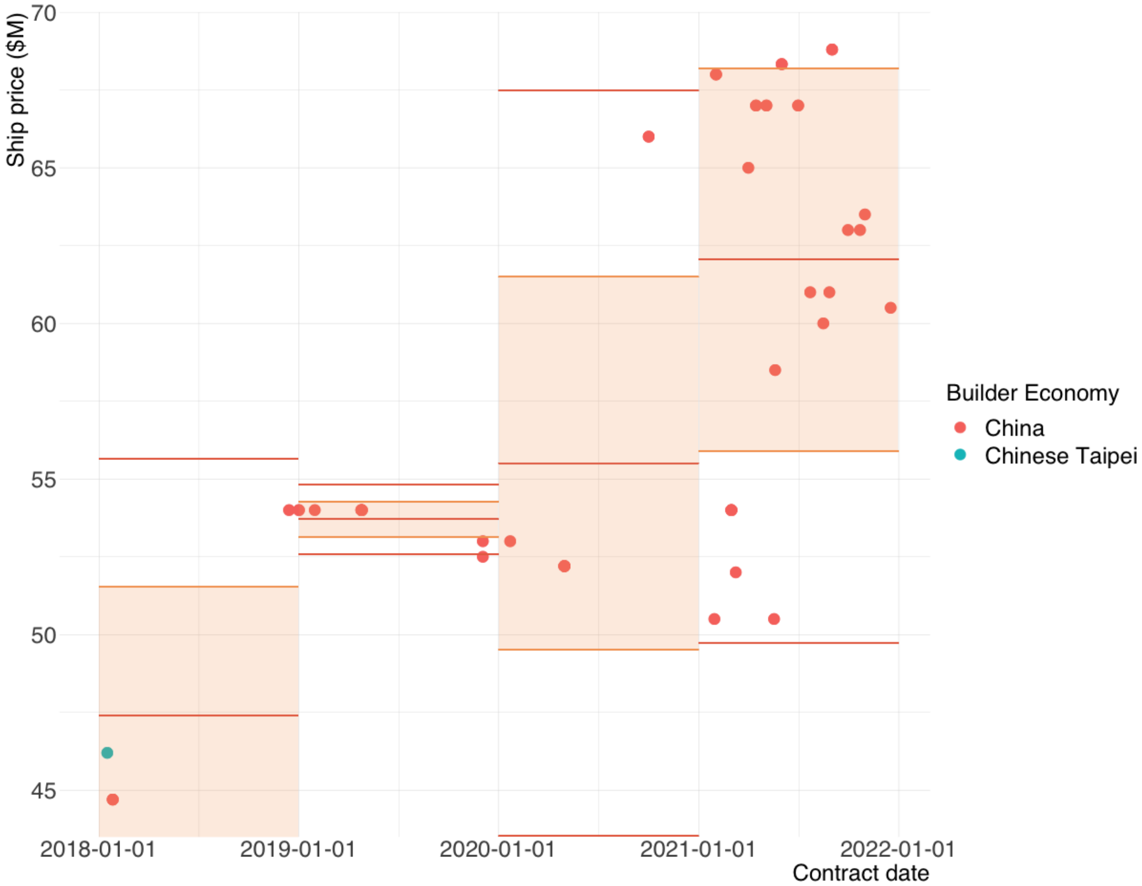
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

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



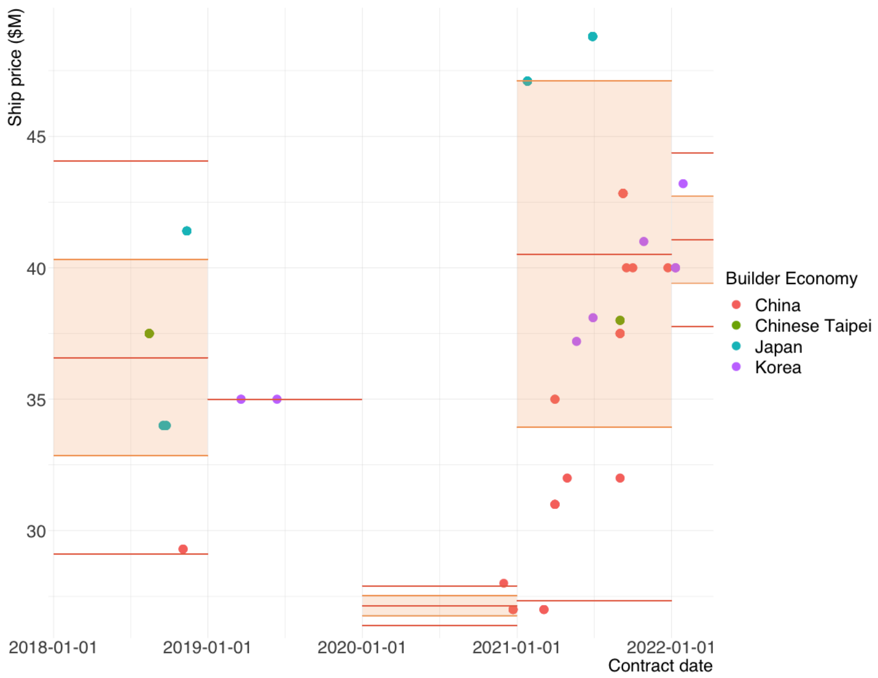
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

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



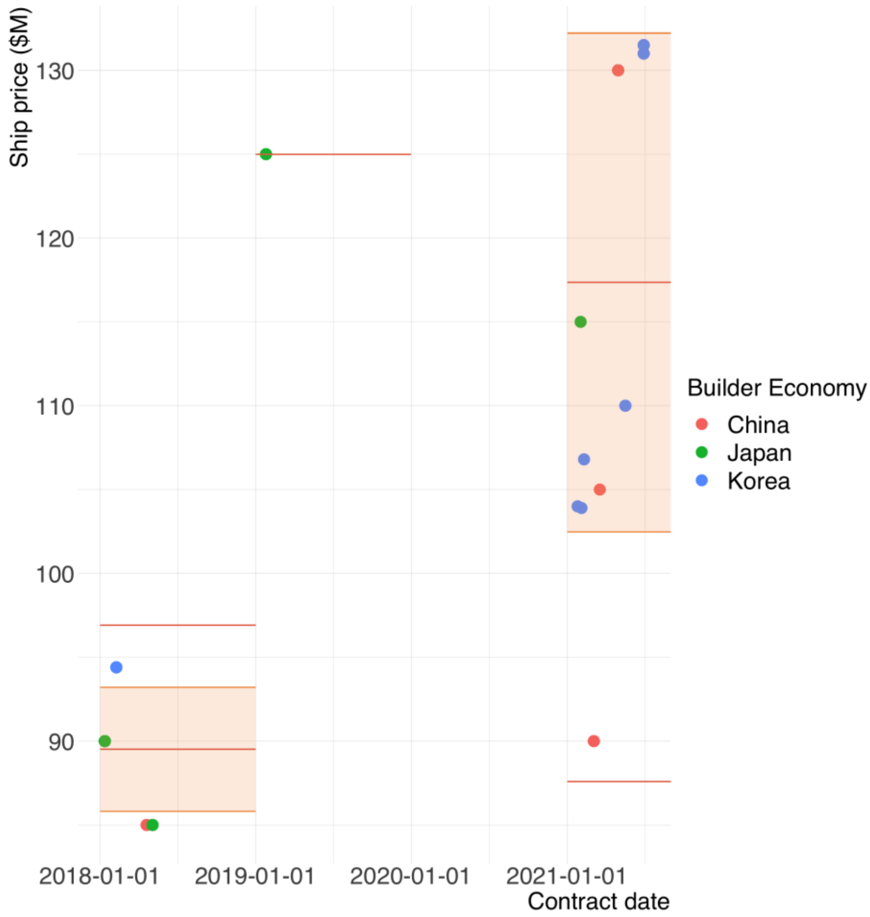
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

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



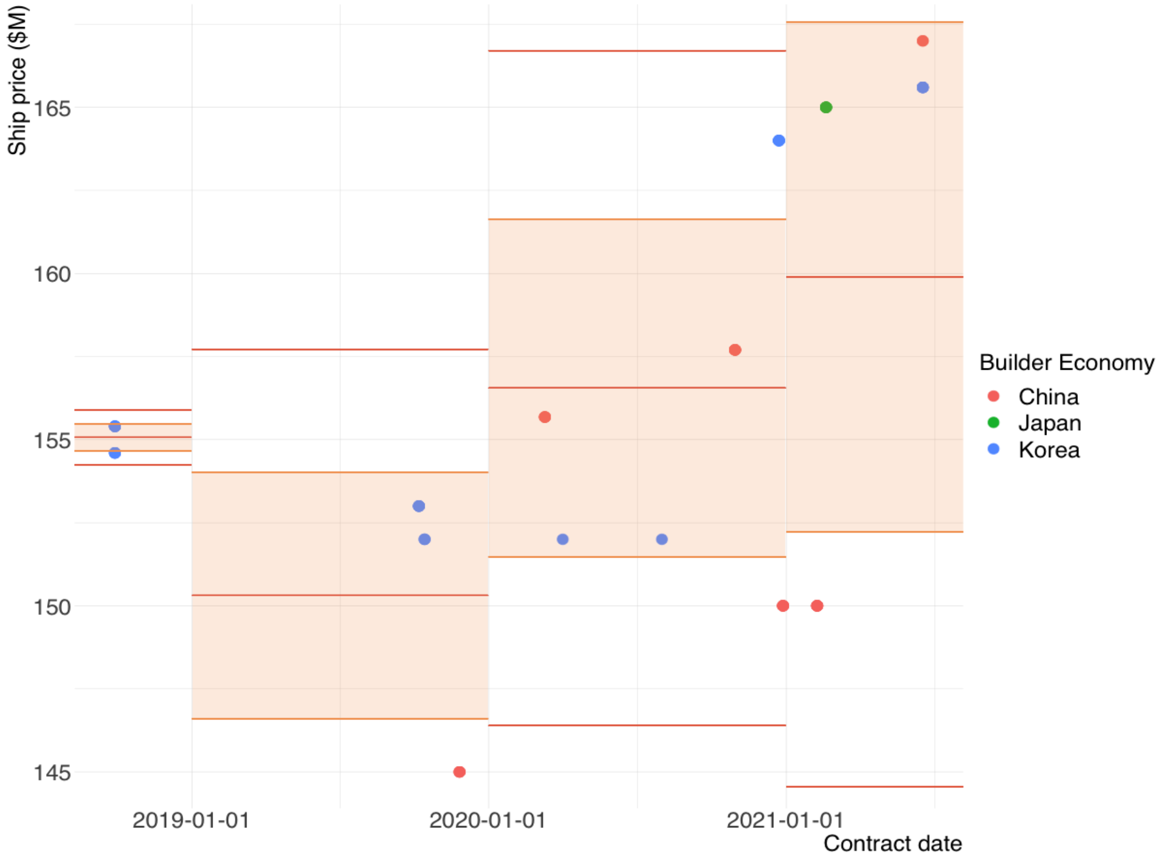
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

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



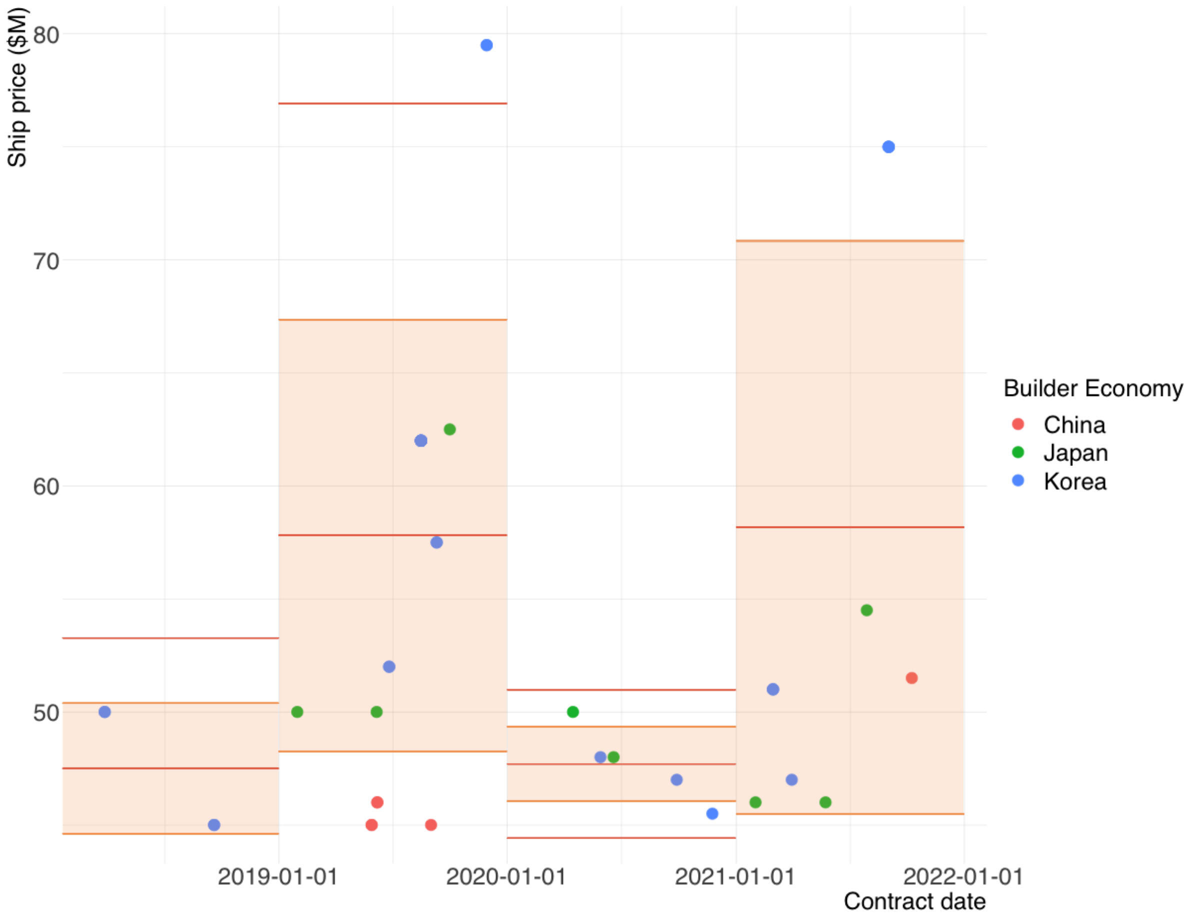
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

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



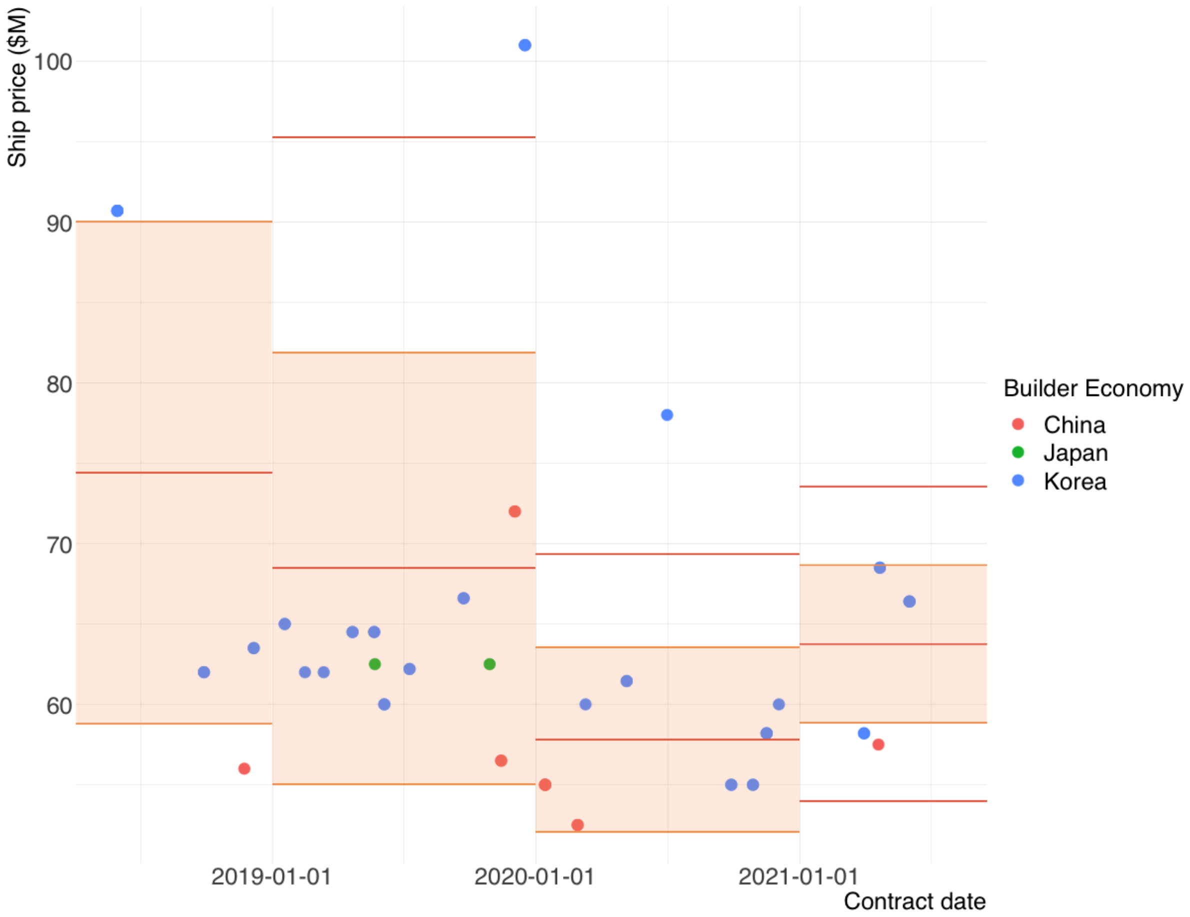
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

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



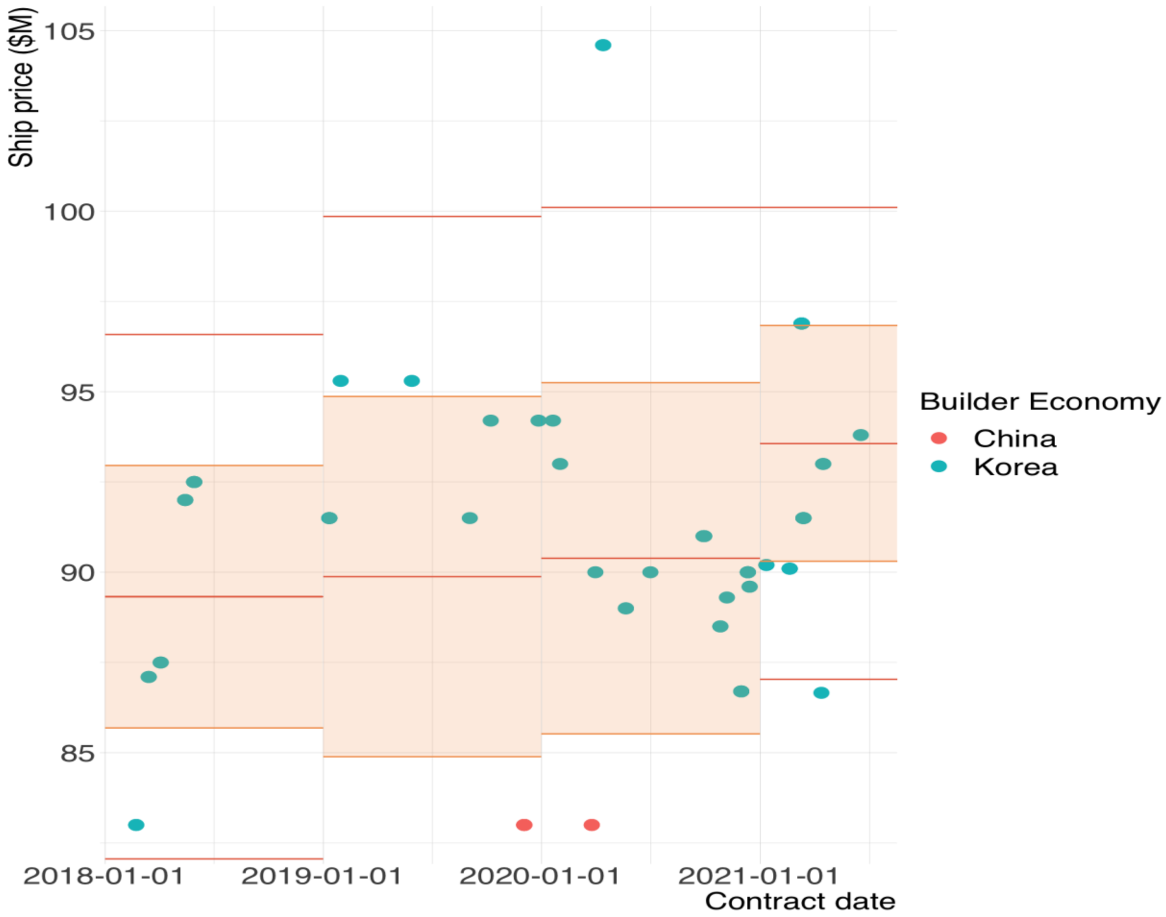
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

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



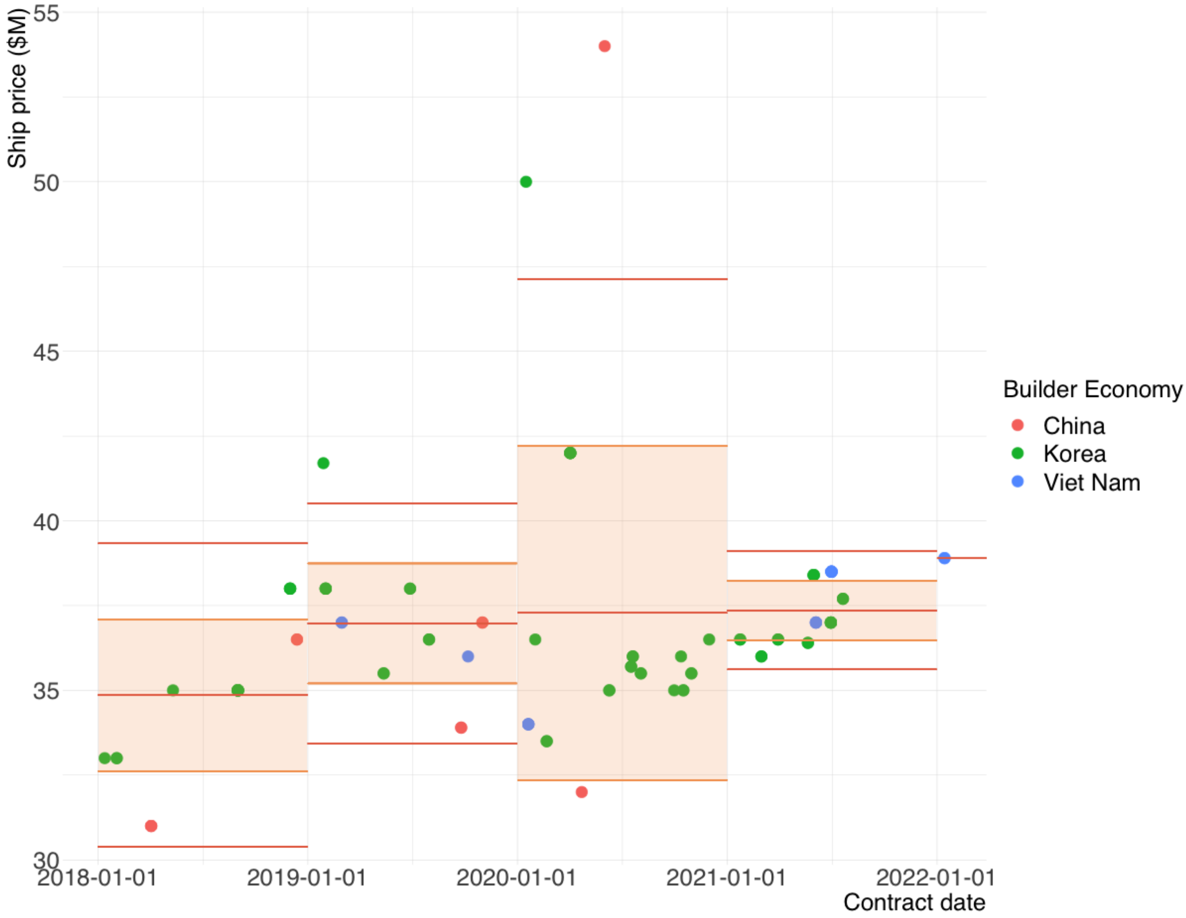
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

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



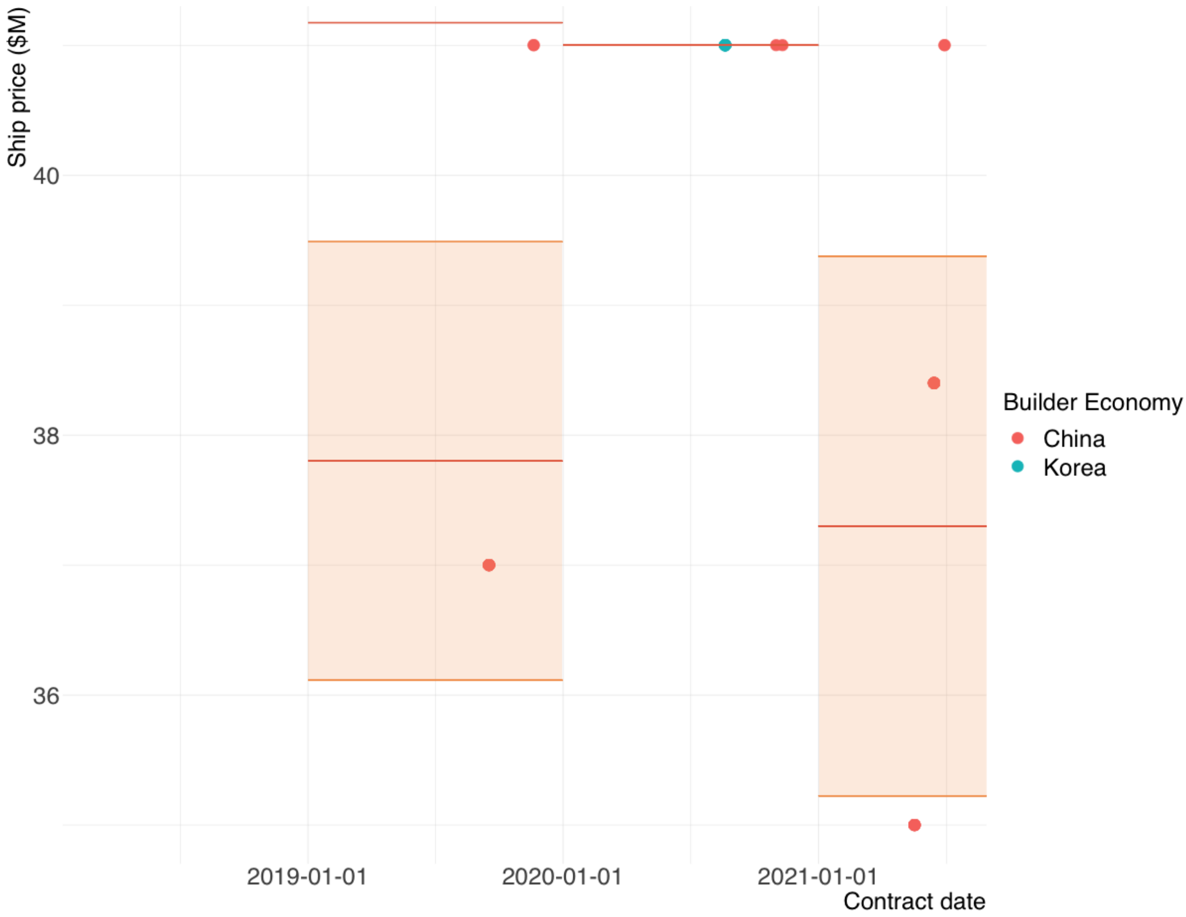
Source: OECD calculations based on the Clarksons World Fleet Register and other sources.

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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