ITEM 1.1.2: IMBALANCES IN THE SHIPBUILDING INDUSTRY: MAGNITUDE, CAUSES & POTENTIAL POLICY IMPLICATIONS

WP6 workshop on supply and demand
Paris, 09 November 2015

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Outline of the presentation

1. Background
2. Magnitude of market imbalances in shipbuilding
   a. Revised future vessel requirements
   b. Shipyard capacity
3. Characteristics, structure & performance of the shipbuilding market
4. Potential causes for market imbalances
5. Policy measures addressing imbalances
6. Implications and future work
1. Background

The 11-12 June 2015 WP6 meeting showed that there was scope for **improvement of the analytical work on future vessel requirements.**

Moreover, **new work** was requested:
- To assess shipyard (excess) capacity.
- To study the causes of excess vessel supply, shipyard capacity and potential policy remedies.
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2a. Revised future vessel requirements

Methodology

Future new-building requirements

- Seaborne trade expansion
  - Based on seaborne trade forecasts of OECD ITF (Network model), Sea Europe, and SAJ.
- Replacement demand
  - Based on Sea Europe's deletion model.
2a. Revised future vessel requirements

**Forecasts of seaborne trade**

Seaborne trade projections (2010 - 2035)

![Chart showing seaborne trade projections from 2010 to 2035 for different entities: ITF, Sea Europe, and SAJ. The chart illustrates the forecasted growth in seaborne trade in million tonnes over time, with a significant increase projected by 2035.](chart1.png)

Source: ITF (2015); Sea Europe (2015); SAJ (June 2015).

2a. Revised future vessel requirements

**Future seaborne trade by ship types**

Seaborne trade projections for good categories by ship types

![Chart depicting seaborne trade projections for various good categories by ship types for the years 2010 to 2035. The chart shows the growth in tonnes for different categories such as total, containers, bulkers, and tankers, with a focus on projected growth rates for each category.](chart2.png)

Note: ITF’s predictions of seaborne trade by commodities have been grouped by cargo category for each of the three ship types studied. Tankers including chemicals, rubber and plastic, crude oil, gas, refined oil products and coke; containers include electronic devices, livestock, other agriculture / fishing, other manufacturing, textile, transport equipment; bulkers including coal, food, iron and steel, metal products, other manufactures, ores, other minerals / non-metallic, other mining, paper and wood, pulp, paper, rice, and crops.

Source: OECD calculations based on ITF’s seaborne trade forecast (2015).
2a. Revised future vessel requirements … from seaborne trade expansion

Future vessel requirements linked to seaborne trade by ship type (2010 - 2035)

- **Total** vessel requirements: around 835 m. gt.
- **Tanker** requirements: about 261 m. gt
- **Bulkers** ca. 400 m. gt.
- **Containers** 170 m. gt.

Note: OECD calculations based on ITF’s seaborne trade forecast (2015).

2a. Survival probability by age

- **Low probability** on average for vessels age of 23 years.
- **Significant decrease in the likelihood** of staying in operation between an average age of 24 and 30.

Source: Sea Europe (2015)
2a. Revised future vessel requirements

... from vessel disposal

Future vessel requirements linked to disposals by ship type (2015 – 2035)

- Until 2035 expectations of a total of around 398 m gt.
- Tankers about 156 m gt.
- Bulkers roughly 148 m gt.
- Containers about 94 m gt.

Note: IHS Maritime & Trade.

2a. Revised future vessel requirements

Total requirements


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2b. Shipyard capacity

Capacity utilization rate

Global average capacity utilization rate (2010 – 2014)

Note: Capacity is defined as the maximum annual output for each of the 131 yards in cgt since 2000.
2b. Shipyard capacity
Capacity utilization rate

Capacity utilization rates of 131 large shipyards (2014)

Note: Capacity is defined as the maximum annual output for each yard in cgt since 2000. Firm-level data is based on a total of 131 yards in 2014.

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3. Characteristics

Selected structural characteristics of the shipbuilding industry

<table>
<thead>
<tr>
<th>Industry Characteristics</th>
<th>Situation of the shipbuilding industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivery time</td>
<td>Long (2-3 years)</td>
</tr>
<tr>
<td>Production factor intensity</td>
<td>Labour for low value-added ships</td>
</tr>
<tr>
<td></td>
<td>Balanced for high value-added ships</td>
</tr>
<tr>
<td>Tradability</td>
<td>Strong role of ship finance in ship</td>
</tr>
<tr>
<td></td>
<td>exports</td>
</tr>
<tr>
<td>Substitutability</td>
<td>Low</td>
</tr>
<tr>
<td>Possible reorientation areas</td>
<td>Notably offshore, but involves large</td>
</tr>
<tr>
<td></td>
<td>risks: ship repair and maintenance</td>
</tr>
<tr>
<td>Heterogeneity of products</td>
<td>High between vessel types</td>
</tr>
<tr>
<td>Demand drivers</td>
<td>Seaborne trade expansion, vessel</td>
</tr>
<tr>
<td></td>
<td>replacement, newbuilding</td>
</tr>
<tr>
<td></td>
<td>prices, regulations</td>
</tr>
<tr>
<td>Capacity to inventory vessels</td>
<td>Limited</td>
</tr>
</tbody>
</table>

Source: OECD.

3. Market structure: concentrated

- China, Korea and Japan accounted jointly for **83% of global ship completions** in compensated gross tonnes (cgt) in 2014.
- **Largest shipbuilder** in the world (Hyundai Heavy Industry incl. subsidiaries) accounted for **16.0% of world ship completions**.
- **Top five** shipbuilding companies represented **34.2%** of world ship completions in 2014.

Source: OECD.
3. Performance

Productivity and competitiveness

Production of the shipbuilding sector by employee in selected economies
in cgt per employee per year

Note: Due to data limitations productivity levels were calculated for 2012 for Japan and Korea, for 2010 for China.

Source: OECD.

3. Performance

Financial aspects: Sales

Sales of the global shipbuilding industry
in nominal terms, in billions of USD

Source: IHS World Industry Service.
3. Performance

**Financial aspects: Operating margins**

Operating margins of the global shipbuilding industry (in per cent)

Source: IHS World Industry Service.

3. Performance

**Financial aspects: Capital expenditures**

Capital expenditures of the global shipbuilding industry
in nominal terms (lhs); in billions of USD in per cent of nominal sales (rhs)

Source: IHS World Industry Service.
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4. Potential causes for market imbalances

Structural sources

<table>
<thead>
<tr>
<th>Category</th>
<th>Factor</th>
<th>Affected in the first instance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long delivery times of vessel</td>
<td>Supply</td>
<td></td>
</tr>
<tr>
<td>Long lead times in adding shipyard capacity</td>
<td>Capacity</td>
<td></td>
</tr>
<tr>
<td>Capacity expansion problem</td>
<td>Capacity</td>
<td></td>
</tr>
<tr>
<td>Role of ship finance</td>
<td>Supply/Capacity</td>
<td></td>
</tr>
<tr>
<td>Capacity to inventory vessels</td>
<td>Supply/Capacity</td>
<td></td>
</tr>
<tr>
<td>Limited opportunities to re-orientate into other markets</td>
<td>Capacity</td>
<td></td>
</tr>
<tr>
<td>Technological shocks</td>
<td>Supply/Capacity</td>
<td></td>
</tr>
<tr>
<td>Economies of scale</td>
<td>Supply/Capacity</td>
<td></td>
</tr>
<tr>
<td>Low to medium entry barriers and high exit barriers</td>
<td>Capacity</td>
<td></td>
</tr>
<tr>
<td>Push from the buyers’ side</td>
<td>Capacity</td>
<td></td>
</tr>
<tr>
<td>Overbuilding of capacity in customers’ industries</td>
<td>Supply</td>
<td></td>
</tr>
</tbody>
</table>

Source: OECD.
4. Potential causes for market imbalances

**Cyclical sources**

<table>
<thead>
<tr>
<th>Category</th>
<th>Factor</th>
<th>Affected in the first instance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyclical sources</td>
<td>Vicious circle in the shipbuilding and shipping</td>
<td>Supply/Capacity</td>
</tr>
<tr>
<td></td>
<td>markets</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Negative economic shocks</td>
<td>Supply</td>
</tr>
<tr>
<td></td>
<td>Overly optimistic expectation of future demand</td>
<td>Capacity</td>
</tr>
<tr>
<td></td>
<td>New entrants</td>
<td>Capacity</td>
</tr>
<tr>
<td></td>
<td>Divergence between good and bad performing firms</td>
<td>Capacity</td>
</tr>
</tbody>
</table>

Source: OECD.

**Cyclical sources: Vicious circle**

Global shipbuilding new orders, completions and freight rates
New orders and completions in gt; 1996 – 2015

Source: Clarkson, HGS.
4. Potential causes for market imbalances
*Non-market related sources*

<table>
<thead>
<tr>
<th>Category</th>
<th>Factor</th>
<th>Affected in the first instance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-market factors</td>
<td>Protectionist policies</td>
<td>Supply/Capacity</td>
</tr>
<tr>
<td></td>
<td>Policies favouring new capacity investments or curbing restructuring</td>
<td>Capacity</td>
</tr>
<tr>
<td></td>
<td>Strategic capacity expansion to discourage new entry</td>
<td>Capacity</td>
</tr>
</tbody>
</table>

Source: OECD.

4. Factors contributing to market imbalances

<table>
<thead>
<tr>
<th>Capacity expending phase</th>
<th>Capacity maintaining phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market background</td>
<td>Government financial support for maintaining the capacity such as subsidies, capital participation, tax benefits, regulation on the use of land and facilities.</td>
</tr>
<tr>
<td>Policy-driven factors</td>
<td>Policy-driven factors</td>
</tr>
<tr>
<td>Supply side</td>
<td>Demand side</td>
</tr>
<tr>
<td>Government financial support for creating capacity such as subsidies, capital participation, excessive investment by firms supported by the government or public financial institution, tax benefits.</td>
<td>Export credits, local content requirements</td>
</tr>
<tr>
<td>Demand side</td>
<td>Supply side</td>
</tr>
<tr>
<td>Aggressive expansion to increase market share</td>
<td>Government financial support for maintaining the capacity such as subsidies, capital participation, tax benefits, regulation on the use of land and facilities.</td>
</tr>
<tr>
<td>Demand side</td>
<td>Demand side</td>
</tr>
<tr>
<td>Speculative investment, low optimistic perspective, abundant finance</td>
<td>Excessive ordering because of low vessel prices</td>
</tr>
</tbody>
</table>

Source: OECD (2015a).
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6. Implications and future work

5. **Policy measures addressing imbalances**

<table>
<thead>
<tr>
<th>Categories</th>
<th>Examples of measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output-related measures</td>
<td>Limitation of ship construction</td>
</tr>
<tr>
<td>(to reduce excess vessel supply)</td>
<td>Limitation of the workforce</td>
</tr>
<tr>
<td>Capacity-related measures</td>
<td>Permission for capacity expansion</td>
</tr>
<tr>
<td>(to reduce excess shipyard capacity)</td>
<td>Promotion of restructurings</td>
</tr>
<tr>
<td>Structural change support</td>
<td>Policies promoting the elimination of outdated industrial capacity</td>
</tr>
<tr>
<td>(to reduce excess vessel supply and shipyard capacity)</td>
<td>Entering higher value-added shipbuilding market segments</td>
</tr>
<tr>
<td></td>
<td>Promoting the reorientation of shipyards outside shipbuilding</td>
</tr>
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6. Implications and future work

10-Nov-2015

6. Implications and future work

- Without strong actions or positive economic developments, the shipbuilding industry is expected to remain in severe excess supply and excess capacity for the foreseeable future.
- Various aspects and characteristics of the shipbuilding industry help explain these imbalances and why in particular this industry experiences vicious circles that weigh on its economic health.
6. Implications and future work

- **Various causes (structural, cyclical, non-market)** have led to persistent imbalances in vessel supply and yard capacity.

- **Some policy measures (Output-related, Capacity-related, Structural change support)** could help to reduce excess supply and excess capacity.

6. Implications and future work

1. Necessary access to ship-by-ship databases (incl. construction and disposal date, technical details of vessels) to expand analysis.

2. Future work on a quantitative assessment of supply and demand:
   a. **Developing a network model** similar to ITF to derive future seaborne trade expansion
   b. Dynamic statistical model that shows the **impact of each factor on oversupply or overcapacity**
   c. Understanding the **reasons for firm exit** by drawing on work recently published by the OECD (Calvino, Criscuolo and Menon, 2015).
3. **Cooperation with experts** for deepening the work.
4. Spill-overs from **joint-project with China’s Development Research Center**.
5. **Assessment of the efficiency of the various policy measures.**
References

- Clarkson (2015a), Shipping Review and Outlook Spring 2015
- Clarkson (2015b), World Shipyard Monitor, April 2015
- IHS Maritime & Trade (2014), World Fleet Statistics
- IHS Maritime & Trade (2013), World Fleet Statistics
- OECD (2012b), Worldyards shipbuilding market distortion framework: a supply-demand & macro-micro analysis
- OECD (2014a), Short summary of recent work by the WP6 on the measurement of capacity in the shipbuilding industry
- Shipbuilders’ Association of Japan (2011), Table of conversion coefficients

Backup: Disposal age by ship type

Average age of scrapped vessels by year and ship type

Source: IHS Maritime & Trade various publications.
Backup: Disposal rate relative to fleet by country

Disposals of vessels as a percentage of fleet by country (2006 – 2014)

Source: IHS Maritime & Trade various publications.

Backup: Conversion factor t/dwt and dwt/gt

tonnes/dwt

- 0.71 dwt/gt as historical average for 1996 – 2013.
- Variation among ship types: 0.56 dwt/gt for tankers, 0.90 dwt/gt for bulkers and 0.89 dwt/gt for containers (SAJ, 2011).

Source: Clarkson Research (2015a).
Backup: Future vessel requirements

**Tankers**


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Backup: Future vessel requirements

**Bulkers**


**Backup: Future vessel requirements**

*Containerships*

**Containership market – Completions and future vessel requirements**


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**Backup: Granger Causality tests**

**Granger (1969) test:** Analyse causal relationships of time series observations.

A cause occurs prior to its effect, therefore, given a dataset with two time-series X and Y data X Granger causes Y if X’s (e.g. BDI’s) past values (or lags) can better predict Y’s future values than when X is excluded.

Null hypothesis: lagged excluded variable (IV, independent variable) does not cause equation variable (DV, dependent variable).
Null hypothesis: lagged excluded variable (IV, independent variable) does not cause equation variable (DV, dependent variable).

Note: The test with two lags shows statistically significant results for both, new orders and BDI, implying that both variables Granger cause each other.

Source: OECD.
Backup: Granger Causality tests

New orders and capital expenditures

Logarithm of first-differenced new orders and capital expenditures (1994 to 2015)

Null hypothesis: lagged excluded variable (IV, independent variable) does not cause equation variable (DV, dependent variable).

Granger causality test:

<table>
<thead>
<tr>
<th>Equation</th>
<th>Included</th>
<th>chf</th>
<th>df</th>
<th>Prob &gt; chf</th>
</tr>
</thead>
<tbody>
<tr>
<td>d_in_orders d_in_CapEx</td>
<td>3.2561</td>
<td>3</td>
<td>0.041</td>
<td></td>
</tr>
<tr>
<td>d_in_orders ALL</td>
<td>3.2561</td>
<td>3</td>
<td>0.041</td>
<td></td>
</tr>
<tr>
<td>d_in_CapEx d_in_orders</td>
<td>2.4014</td>
<td>3</td>
<td>0.493</td>
<td></td>
</tr>
<tr>
<td>d_in_CapEx ALL</td>
<td>2.4014</td>
<td>3</td>
<td>0.493</td>
<td></td>
</tr>
</tbody>
</table>

Note: The test with two lags shows no statistically significant results.
Source: OECD Secretariat.

Granger causality test:

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<td>2.4014</td>
<td>3</td>
<td>0.493</td>
<td></td>
</tr>
</tbody>
</table>

Note: The test with four lags shows statistically significant results for new orders Granger causing changes in capital expenditures at a 5% significance level.
Source: OECD Secretariat.

Null hypothesis: lagged excluded variable (IV, independent variable) does not cause equation variable (DV, dependent variable).

Source: IHS World Fleet Register; IHS World Industry Services.