ECONOMIES OF SCALE IN CONTAINER SHIP COSTS

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Economies of Scale in the Container Fleet

• How has the fleet changed in the past decade?
• What does the fleet look like today?
• How are capital, voyage, and operational costs influenced by ship size?
Changes in Ship Size

- Trend is towards larger vessels
- Mega ships have arisen in the past decade
- Records continually being broken
- Cost categories

<table>
<thead>
<tr>
<th>Size (TEU)</th>
<th>Percentage of Fleet</th>
<th>% 2015 Newbuilds</th>
<th>% of 2016 Newbuilds</th>
</tr>
</thead>
<tbody>
<tr>
<td>13300+</td>
<td>4.2%</td>
<td>19%</td>
<td>22%</td>
</tr>
<tr>
<td>10000-13299</td>
<td>3.8%</td>
<td>8%</td>
<td>10%</td>
</tr>
<tr>
<td>7500-9999</td>
<td>9.1%</td>
<td>26%</td>
<td>17%</td>
</tr>
<tr>
<td>5100-7499</td>
<td>9.1%</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>4000-5099</td>
<td>13.5%</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>3000-3999</td>
<td>5.3%</td>
<td>4%</td>
<td>2%</td>
</tr>
<tr>
<td>2000-2999</td>
<td>13.2%</td>
<td>11%</td>
<td>20%</td>
</tr>
<tr>
<td>1500-1999</td>
<td>10.8%</td>
<td>11%</td>
<td>15%</td>
</tr>
<tr>
<td>1000-1499</td>
<td>13.4%</td>
<td>8%</td>
<td>9%</td>
</tr>
<tr>
<td>0-999</td>
<td>17.7%</td>
<td>5%</td>
<td>2%</td>
</tr>
</tbody>
</table>
Capital Costs

- Trend in nominal costs (larger ships cost more)
- Cost per TEU decrease as vessel size increases
- Diminishing returns
Capital Costs

- Trend has flattened out
- Cost per TEU decrease as vessel size increases
- Diminishing returns

<table>
<thead>
<tr>
<th>Size</th>
<th>Cost/TEU</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-999</td>
<td>$23,065.11</td>
</tr>
<tr>
<td>1000-1499</td>
<td>$20,606.62</td>
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<tr>
<td>1500-1999</td>
<td>$19,215.59</td>
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<tr>
<td>2000-2999</td>
<td>$16,436.43</td>
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<tr>
<td>3000-3999</td>
<td>$16,255.45</td>
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<tr>
<td>4000-5099</td>
<td>$14,672.54</td>
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<tr>
<td>5100-7499</td>
<td>$13,912.16</td>
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<tr>
<td>7500-9999</td>
<td>$11,491.36</td>
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<tr>
<td>10000-13299</td>
<td>$11,234.63</td>
</tr>
<tr>
<td>13300+</td>
<td>$9,298.82</td>
</tr>
</tbody>
</table>
Voyage Costs

- Fuel consumption
- Corresponding drops in average design speed and horsepower
- Impact of bunker prices and capacity utilization ratio
Voyage Costs

- Linear relationship between horsepower and fuel consumption
Voyage Costs

- Speed-adjusted fuel consumption comparison
- Recent trend?

Tons of Fuel Burned per TEU per day @ 23 knots

Fuel Consumption (metric tons) Per TEU @ 23 knots

Year of Construction

Marginal Adjusted Fuel Consumption

Vessel Capacity (TEU)

Tons of Fuel per TEU @ 23 knots

Marginal Adjusted Fuel Consumption

- 13300+
- 10000-13299
- 7500-9999
- 5100-7499
- Average
Operating Costs

- Main categories are crewing, manning, insurance, stores and lubes, repairs and maintenance

![Distribution of Operating Costs](chart.png)
Operating Costs

- Larger vessels have lower marginal operating costs
- Costs have increased over time

![Graph showing daily operating cost per TEU over time for different vessel capacities.](image-url)
Conclusion

- Economies of scale exist in all categories, although there may be a point of diminishing returns
- Greater economic conditions play a large role
- Consider externalities, particularly in regards to routes, infrastructure, and turnaround time
- Trends have persisted over time, but there has been variability in recent years
- Overcapacity?

From ITF Report “The Impact of Mega-Ships”
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