2 The maritime industry: key developments in seaborne trade, maritime business and markets

Hassiba Benamara, Jan Hoffmann and Vincent Valentine

2.1 Demand

2.1.1 International trade
Demand for transport services naturally grows in tandem with world trade, and receives a boost from the fragmentation and globalization of international production. As ‘derived demand’, it is generated by trade whereby goods are delivered from sellers to buyers, who today, more than ever, are scattered around the world.

Since 1950, world exports have grown on average 2.4 times faster than world gross domestic product (GDP). While GDP tends to grow more or less in line with industrial production, trade grows significantly faster (Figure 2.1). Trade liberalization, increasingly globalized production processes and continuously improving transport services all contribute to this trend.

Developing and transition economies are ever driving the growth in world merchandise trade. Their contribution to global merchandise exports by value increased from 34 per cent in 1997 to over 40 per cent in 2007. In 2007, 12 countries from transition economies and developing regions featured among the world’s 30 leading traders. China, Brazil, India, Mexico, South Africa, the Republic of Korea and the Russian Federation in particular are propelling trade growth. The share of these seven countries in world exports was 17 per cent in 1997 and 23 per cent in 2007. The contribution of South–South trade to the total value of world exports more than doubled from 7.7 per cent in 1990 to 16.7 per cent in 2006. The share of intra-developing countries’ exports in terms of their total exports increased from 39.5 per cent in 2000 to almost 46 per cent in 2006.

2.1.2 Logistics and transport services
Transport is a key component of logistics, together with inventory holding and planning. Decisions on transport routes and modes, storage
International handbook of maritime economics

and value-added services are increasingly taken simultaneously. Clients demand ever faster deliveries of goods, be they for consumption or as components within a globalized production process that requires just-in-time (JIT) deliveries.

Suppliers of logistics services aim above all at reducing inventory holding, that is, capital holding, warehousing, depreciation, obsolescence and insurance. Consequently, over recent years the demand for transport services within logistics has surged. For example, the 1980 US expenditure on inventory holding still exceeded transport-related expenditure, while today the latter is almost twice the former (Figure 2.2). The growth in transport expenditure as a percentage share of total logistics expenditure can also partly be explained by the growth in sourcing raw materials from places ever more distant from the point of final consumption, improved logistics planning and, possibly, rising transport costs.

2.1.3 Seaborne trade

The modal split of international trade The proportion of maritime transport within global trade volumes (tons) is estimated at 80 per cent globally, and at 90 per cent if intra-EU trade is excluded. As shipping is used especially for longer distances, in terms of ton-miles the share of maritime transport is above 90 per cent. Figure 2.3 illustrates the share of seaborne

Sources: UNCTAD secretariat on the basis of OECD Main Economic Indicators, April 2008; UNCTAD (2008) and UNCTAD Review of Maritime Transport (various years).

Figure 2.1 Indices for world GDP, OECD industrial production, and world seaborne trade (volume), 1994–2007

and value-added services are increasingly taken simultaneously. Clients demand ever faster deliveries of goods, be they for consumption or as components within a globalized production process that requires just-in-time (JIT) deliveries.

Suppliers of logistics services aim above all at reducing inventory holding, that is, capital holding, warehousing, depreciation, obsolescence and insurance. Consequently, over recent years the demand for transport services within logistics has surged. For example, the 1980 US expenditure on inventory holding still exceeded transport-related expenditure, while today the latter is almost twice the former (Figure 2.2). The growth in transport expenditure as a percentage share of total logistics expenditure can also partly be explained by the growth in sourcing raw materials from places ever more distant from the point of final consumption, improved logistics planning and, possibly, rising transport costs.

2.1.3 Seaborne trade

The modal split of international trade The proportion of maritime transport within global trade volumes (tons) is estimated at 80 per cent globally, and at 90 per cent if intra-EU trade is excluded. As shipping is used especially for longer distances, in terms of ton-miles the share of maritime transport is above 90 per cent. Figure 2.3 illustrates the share of seaborne
The maritime industry: key developments

Trade in terms of volume and value (excluding intra-EU trade). Given that higher-valued goods are more likely to be moved by air or land transport, the maritime share is lower when looking at the value of trade than when looking at its volume.


Figure 2.2 Logistics expenditures in the United States, billion US$

Note: Excluding intra-EU trade.

Source: UNCTAD, based on data provided by GlobalInsight.

Figure 2.3 Share of seaborne trade within global trade, 2000–2006

trade in terms of volume and value (excluding intra-EU trade). Given that higher-valued goods are more likely to be moved by air or land transport, the maritime share is lower when looking at the value of trade than when looking at its volume.
It is interesting to note that the share in terms of value fluctuates more than the share in terms of volume. Between 2000 and 2006 inclusive, the share of seaborne trade volume fluctuated only between 89.04 and 89.82 per cent (a range of 0.78 points), whilst its share in trade value fluctuated seven times more – between 64.48 and 70.07 per cent (a range of 5.59 points). During the same period, the airborne share fluctuated by only 0.02 points in terms of volume, and by 3.29 points in terms of value. The underlying reason for this difference is the fact that the value share also includes variations in the price of the traded commodities, and the prices of the commodities traded by sea (for example oil) may not move in tandem with the prices of goods traded by air (for example computer chips).

An underlying trend that contributes to the increase in the share of maritime trade value is the changing composition of global seaborne trade, which increasingly includes manufactured and intermediate goods.

In 2006, seaborne trade accounted for 89.6 per cent of global trade in terms of volume (tons) and 70.1 per cent in terms of value (USD) (excluding intra-EU trade). During the same year, airborne cargo had a share of just 0.27 per cent of trade volume and 14.1 per cent of trade value, whilst overland and other modes (including pipelines) accounted for the remaining 10.2 per cent of trade volume and 15.8 per cent of trade value.

The average value per tonne of cargo of seaborne trade in 2006 was US$ 943, versus US$ 63,184 per tonne of airborne trade and 1,878 US$ per tonne of trade transported overland or by other modes such as pipelines. In other words, airborne cargo was, on average, 67 times more valuable per ton than seaborne cargo.\(^2\)

*The commodities of seaborne trade*  In 2007, international seaborne trade was estimated at 8.02 billion tons of goods loaded, a volume increase of 4.8 per cent over the previous year. Two-thirds of seaborne trade is dry cargoes and one-third liquid bulk (Figure 2.4).

Although maritime transport has generally been associated with the carriage of high-volume, low-value goods (for example iron ore and coal), over recent years the share of low-volume, high-value goods (for example manufactures) has been growing. Today, manufactured goods account for over 70 per cent of world merchandise trade by value. They include consumption goods as well as intermediate goods, parts and semi-finished products, that have expanded in tandem with intra-company trade, international outsourcing and globalization.

Major loading areas for crude oil are mainly located in developing regions, with Western Asia topping the list in 2007 (727 million tons). Other loading areas include Western Africa (239 million tons), Northern Africa (140 million tons), the Caribbean and Central America (120 million...
The maritime industry: key developments

17

World shipments of petroleum products are estimated at 815 million tons. In general, shipments of products are affected by global refinery capacity, the driving season in the United States (that is, an increase in motor vehicle use between May and September) as well as the weather conditions, which impact on seasonal fuel consumption. Liquefied natural gas shipments amount to 226 billion cubic metres (bcm) largely as a result of additional capacity provided by liquefaction and purification facilities (for example Nigeria and Equatorial Guinea).

Dry cargo shipments reached 5.34 billion tons. Trade in the major dry bulks (iron ore, coal, grains, bauxite/alumina and rock phosphate) was estimated at 2 billion tons. The difference was made up of minor bulks and liner cargoes, which together were estimated at 3.34 billion tons.

Dry cargoes, such as agricultural bulk cargoes, are increasingly being carried in containers. The majority of containerized cargo is made up of
manufactured goods and high-value bulk commodities, such as time- and temperature-sensitive agricultural products. Since 1990, containerized trade has increased by a factor of five – an average annual growth rate of almost 10 per cent. In 2007, global container trade was estimated at 143 million twenty-foot equivalent units (TEUs), or 1.24 billion tons, corresponding to an average of 8.7 tons per TEU. The largest containerized shipments correspond to intra-Asia trade flows and the three major sea lanes along the East–West axis. In 2007, the Asia–Europe route overtook the transpacific route as the largest containerized trading lane.

The geography of seaborne trade The major loading areas for seaborne trade are developing regions, which account for 63.2 per cent in terms of volume (tons), followed by developed economies (33.3 per cent) and transition economies (3.5 per cent). A geographical breakdown of total goods loaded by region underscores Asia’s continued predominance, with a share of 40 per cent, followed by the Americas, Europe, Africa and Oceania.

The majority of developing and transition economies are still dependent on the commodity sector, including fuels, as their largest source of revenue. Over 100 developing and transition economies derive more than 40 per cent of their export earnings from the export of primary commodities. This reliance on the commodity sector is reflected in the composition of their seaborne trade. In 2007, 63.2 per cent of goods loaded (tons) originated in developing regions, while a smaller share (46.2 per cent) of shipments were unloaded at ports in developing countries (Figure 2.5).

Figure 2.5 reflects the evolving participation of developing countries in global imports and exports. In 1970, developing countries still imported mostly high-value, low-volume manufactured goods and exported above all low-value raw materials; as a result, they exported almost four times as many tons of seaborne cargo than they imported. Today, developing countries participate much more in globalized production processes; in particular China, India and other Asian countries have become important importers of commodities such as iron ore, bauxite and grains, while at the same time increasing their share in manufactured exports.

The structure of developing economies’ seaborne imports also reflects their growing energy needs and the expansion of South–South trade. Africa and Latin America are increasingly becoming suppliers of China’s primary commodity needs, while China’s consumer goods are increasingly exported to Africa and Latin America. In 2006, over 70 per cent of China’s exports to Africa were manufactured goods, while around 60 per cent of Africa’s exports to China consisted of fuels. During the same year, fuels and other minerals made up 40 per cent of Latin America’s exports.
The maritime industry: key developments

Oil prices and seaborne trade  The energy mix used in transportation is dominated by oil. As a result, the 2008 rise in oil prices was raising concerns about the potential implications for transport costs and trade. Some trade observers were calling into question the sustainability of current trade patterns, global production networks and related transportation strategies. It was argued that increased transport costs may reverse globalization and bring to an end the comparative advantage of low-cost remote production locations such as China. Others observed that rising energy prices have yet to affect demand for logistics services.

It should be noted that transport costs tend to be of more relevance for low-value commodities than for manufactured goods. To minimize the incidence of transport costs on low-value, high-volume goods, importers of bulk cargo are more likely to source from nearby providers. For example, oil requirements in the Americas are more likely to be sourced from locations such as South America or Mexico or, in Asia, from neighbouring Asian oil-exporting countries.

Nevertheless, some changes in global production patterns for manufactured goods are also being reported. For example, the Swedish manufacturer IKEA opened its first factory in the United States in May 2008 to avoid transportation costs. However, some of the reported decisions...
to relocate to neighbouring locations such as in the textile sector appear not to be motivated entirely by transport cost considerations. In many cases, the decision to move production plants to neighbouring locations was rather the result of more favourable duty treatment or retailers’ need to cut inventories in view of uncertain economic times (Flanagan, 2008). Labour and production cost differentials, differences in tariff regimes and supply chain responsiveness and agility appear to play a more important role in outsourcing decisions than do transport costs (Drewry, 2007). Short production cycles requiring rapid delivery times and agile supply chains are particularly relevant in the context of the growing luxury apparel segment (Pendle and Stiles, 2008).

The environment and seaborne trade  Given its economic importance and in view of its projected growth, maritime transport will likely be included in future discussions on global concerns such as security, air pollution and climate change. Shipping is already at the centre of attention given the flurry of adopted or planned national as well as international supply chain security initiatives. Environmental considerations are also gaining momentum in view of sustainable development objectives, the climate change challenge and concerns over growing air pollution. Heavy oil burned in ships’ bunkers contains a high level of sulphur. As a result, and fuelled by growth in seaborne trade, shipping is responsible for high levels of sulphur oxide and nitrogen oxide emissions.

The International Maritime Organization (IMO) has recently estimated the total fuel consumption by ships at 369 million tons in 2007 and has projected that by 2020 consumption will grow by over 30 per cent to reach 486 million tons. These consumption levels result in carbon dioxide (CO₂) emissions from ships totalling 1120 million tons in 2007 and 1475 million tons in 2020.

Economies of scale derived from the deployment of larger and more fuel-efficient ships on longer trade routes contribute to achieving greater fuel efficiency and related fuel cost savings as well as CO₂ emissions reduction. A cargo ship over 8000 deadweight tons (dwt) is estimated to emit 40 per cent less CO₂ per ton of cargo than smaller ships (2000–8000 dwt) (ECSA and ICS, 2008). In addition to differences in fuel efficiencies within the shipping sector, there are significant differences between shipping and other modes of transport. Sending, for example, ‘a container load of shirts 10 000 miles around the world on a ship with 8000 other containers uses a great deal less fuel than trucking the same container by road the 2000 miles from Istanbul to London’ (Flanagan, 2008).

On a per ton-kilometre basis, shipping remains the most energy efficient and least environmentally damaging mode of transport. For example, on
average, a container ship of 3700 TEU consumes 77 times less energy per ton of cargo than a freight aircraft (Boeing 747-400), about seven times less than a heavy truck and about three times less than rail. Equally, a container ship is reported to emit over 40 times less CO₂ than a freight aircraft and about four times and 31 per cent less CO₂ than a heavy truck and rail, respectively (Network for Transport and the Environment, 2008). Shipping’s fuel and carbon efficiency means that any increase in fuel costs and any cost pressure resulting from climate-led initiatives will likely have less impact on the cost of moving trade by sea compared to other modes of transport.

2.2 Supply

2.2.1 Maritime businesses
As the backbone of globalized merchandise trade, maritime transport is itself probably the most globalized of industries. A typical seaborne trade transaction may easily involve providers of goods and services from 20 different countries. As an example of this, a container, made in China and filled with goods from Nepal, is exported through a port in India; the port is operated by a concessionaire from Dubai, using cranes built in Malaysia and software developed in Belgium; the Korean-built container ship is owned by a German investment fund, managed by a company head-quartered in Cyprus, operated by a Danish carrier, flagged in Panama, certified by a classification society from the United States and crewed with Philippine nationals, applying global employment conventions from the International Labour Organization; the shipping agent in the port belongs to a Norwegian network while the freight forwarder is Swiss and the ship’s Protection and Indemnity Club is from the United Kingdom; en route to the Netherlands, the ship fights pirates off the coasts of Somalia, pays canal dues in Egypt, and bunkers fuel in Spain; it implements global IMO rules to avoid an oil spill, for example in France.

Liner shipping companies Together, the 20 leading operators account for about 70 per cent of the total container capacity deployed (Table 2.1). The three largest companies are based in Europe, while six of the remaining top ten are based in Asia.

The ownership of container ships The ownership of container ships is less concentrated than their operation. Operators tend to charter a large proportion of their vessels, which are often owned by ‘non-operating’ owners. The three largest owners of container ships are ‘operating’ owners, notably Maersk, MSC and Evergreen, followed by two non-operating owners
<table>
<thead>
<tr>
<th>Rank</th>
<th>Company</th>
<th>Ships</th>
<th>TEU</th>
<th>Market share TEU (%)</th>
<th>Combined market share TEU (%)</th>
<th>Order book TEU</th>
<th>Order book TEU as % of fleet</th>
<th>Order book ships</th>
<th>Average vessel size fleet</th>
<th>Average vessel size order book</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Maersk Line</td>
<td>440</td>
<td>1772545</td>
<td>12.4</td>
<td>12.4</td>
<td>304489</td>
<td>17</td>
<td>56</td>
<td>4029</td>
<td>5437</td>
</tr>
<tr>
<td>2</td>
<td>Mediterranean Shipping Co SA</td>
<td>423</td>
<td>1463162</td>
<td>10.3</td>
<td>22.7</td>
<td>490766</td>
<td>34</td>
<td>47</td>
<td>3459</td>
<td>10442</td>
</tr>
<tr>
<td>3</td>
<td>CMA CGM SA</td>
<td>290</td>
<td>883818</td>
<td>6.2</td>
<td>28.9</td>
<td>600904</td>
<td>68</td>
<td>69</td>
<td>3048</td>
<td>8709</td>
</tr>
<tr>
<td>4</td>
<td>Evergreen Line</td>
<td>182</td>
<td>630229</td>
<td>4.4</td>
<td>33.3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3463</td>
<td>na</td>
</tr>
<tr>
<td>5</td>
<td>Hapag-Lloyd AG</td>
<td>132</td>
<td>496724</td>
<td>3.5</td>
<td>36.8</td>
<td>122500</td>
<td>25</td>
<td>14</td>
<td>3763</td>
<td>8750</td>
</tr>
<tr>
<td>6</td>
<td>Cosco Container Lines Ltd</td>
<td>154</td>
<td>491481</td>
<td>3.4</td>
<td>40.2</td>
<td>444752</td>
<td>90</td>
<td>59</td>
<td>3191</td>
<td>7538</td>
</tr>
<tr>
<td>7</td>
<td>APL Ltd</td>
<td>129</td>
<td>474453</td>
<td>3.3</td>
<td>43.5</td>
<td>132232</td>
<td>28</td>
<td>17</td>
<td>3678</td>
<td>7778</td>
</tr>
<tr>
<td>8</td>
<td>China Shipping Container Lines Co Ltd</td>
<td>119</td>
<td>420562</td>
<td>2.9</td>
<td>46.5</td>
<td>167596</td>
<td>40</td>
<td>23</td>
<td>3534</td>
<td>7287</td>
</tr>
<tr>
<td>9</td>
<td>Mitsui OSK Lines Ltd</td>
<td>107</td>
<td>376501</td>
<td>2.6</td>
<td>49.1</td>
<td>109410</td>
<td>29</td>
<td>19</td>
<td>3519</td>
<td>5758</td>
</tr>
<tr>
<td>10</td>
<td>Orient Overseas Container Line Ltd</td>
<td>93</td>
<td>365240</td>
<td>2.6</td>
<td>51.7</td>
<td>128912</td>
<td>35</td>
<td>20</td>
<td>3927</td>
<td>6446</td>
</tr>
<tr>
<td>11</td>
<td>NYK Line</td>
<td>82</td>
<td>356512</td>
<td>2.5</td>
<td>54.2</td>
<td>84600</td>
<td>24</td>
<td>16</td>
<td>4348</td>
<td>5288</td>
</tr>
<tr>
<td>12</td>
<td>Hanjin Shipping Co Ltd</td>
<td>78</td>
<td>350274</td>
<td>2.5</td>
<td>56.6</td>
<td>240495</td>
<td>69</td>
<td>26</td>
<td>4491</td>
<td>9250</td>
</tr>
<tr>
<td>13</td>
<td>Kawasaki Kisen Kaisha Ltd</td>
<td>99</td>
<td>310251</td>
<td>2.2</td>
<td>58.8</td>
<td>167356</td>
<td>54</td>
<td>35</td>
<td>3134</td>
<td>4782</td>
</tr>
<tr>
<td>14</td>
<td>Yang Ming Marine Transport Corp</td>
<td>84</td>
<td>304564</td>
<td>2.1</td>
<td>61.0</td>
<td>178809</td>
<td>59</td>
<td>29</td>
<td>3626</td>
<td>6166</td>
</tr>
<tr>
<td>Rank</td>
<td>Name</td>
<td>VES (Q'ty)</td>
<td>VES (% of World Total)</td>
<td>VES (Units)</td>
<td>VES (% of World Total)</td>
<td>VES (CGR)</td>
<td>VES (% of World Total)</td>
<td>VES (Total)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>----------------------------------------------------</td>
<td>------------</td>
<td>------------------------</td>
<td>-------------</td>
<td>------------------------</td>
<td>-----------</td>
<td>------------------------</td>
<td>-------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Zim Integrated Shipping Services Ltd</td>
<td>82</td>
<td>1.8</td>
<td>289,010</td>
<td>115</td>
<td>40</td>
<td>3070</td>
<td>7225</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Hyundai Merchant Marine Co Ltd</td>
<td>58</td>
<td>1.7</td>
<td>34,400</td>
<td>14</td>
<td>4</td>
<td>4230</td>
<td>8600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Hamburg Sud. Dampfschifahrts-Ges. KG</td>
<td>78</td>
<td>1.7</td>
<td>100,470</td>
<td>42</td>
<td>18</td>
<td>3072</td>
<td>5582</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Pacific International Lines Pte Ltd</td>
<td>80</td>
<td>1.1</td>
<td>69,308</td>
<td>43</td>
<td>22</td>
<td>1992</td>
<td>3150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>United Arab Shipping Co (SAG)</td>
<td>47</td>
<td>1.1</td>
<td>145,728</td>
<td>95</td>
<td>15</td>
<td>3252</td>
<td>9715</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Compania Sud Americana de Vapores</td>
<td>57</td>
<td>1.0</td>
<td>131,739</td>
<td>91</td>
<td>21</td>
<td>2535</td>
<td>6273</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Wan Hai Lines Ltd</td>
<td>72</td>
<td>0.9</td>
<td>51,324</td>
<td>40</td>
<td>18</td>
<td>1771</td>
<td>2851</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>CSAV NORASIA</td>
<td>31</td>
<td>0.9</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4087</td>
<td>na</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Islamic Republic of Iran Shipping Lines</td>
<td>45</td>
<td>0.6</td>
<td>47,080</td>
<td>51</td>
<td>16</td>
<td>2049</td>
<td>2943</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>MISC Berhad</td>
<td>27</td>
<td>0.6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3323</td>
<td>na</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Safmarine Container Lines NV</td>
<td>51</td>
<td>0.6</td>
<td>9634</td>
<td>11</td>
<td>6</td>
<td>1717</td>
<td>1606</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Subtotal top 25 carriers: 3040, 10413395, 73.0, 73.0, 4051, 514, 39, 590, 3425, 6867

All others: 6384, 3853368, 27.0, 27.0, 21722727, 56, 770, 704, 2822

World total: 9424, 14266763, 100.0, 100.0, 6224241, 44, 1360, 1514, 4577

*Source:* UNCTAD secretariat, based on *Containerisation International Online*, Fleet Statistics, www.ci-online.co.uk.
from Germany. The largest non-operating owner is NSB Nordelbe, controlling 85 ships with a total capacity of 351,000 TEU as at the end of 2008 (Clarkson Research Studies, 2008). In Europe, the ownership and operation of vessels tends to be more split between different companies than in Asia, where companies own a relatively larger proportion of their fleet than the major European carriers.

The construction of container ships Nine of the top ten container shipyards are located in Asia, the tenth being Daewoo Mangalia in Romania (Clarkson Research Studies, 2008). The world’s four largest shipyards are located in the Republic of Korea and almost two-thirds of container ships are being built in this country.

Seafaring By far the largest provider of seafarers is the Philippines, with 28 per cent of the world’s crew, followed by Russia, Ukraine, China, India, Indonesia and Poland (BIMCO/ISF, 2005).

Classification societies The ten largest classification societies are also the ten members of the International Association of Classification Societies (IACS). Together, they have a market share of approximately 85 per cent. The companies are from China, France, Germany, Italy, Japan, Norway, the Republic of Korea, the Russian Federation, the United Kingdom and the United States.

P&I clubs Most of the major Protection and Indemnity (P&I) clubs are based in the United Kingdom; others are located in Scandinavia, Asia and North America. Together the major P&I Clubs form the International Group of P&I Clubs which has a market share of around 95 per cent of the world’s fleet.

Ship scrapping Effectively, 99 per cent of world ship scrapping takes place in Asia. The largest market share is that of Bangladesh, followed by India, China, Pakistan and Turkey (Mikelis, 2007).

2.2.2 Ships

World fleet growth and principal vessel types At the beginning of 2008, the world merchant fleet reached 1.12 billion dwt. Oil tankers and dry bulk carriers together represent 71.5 per cent of total tonnage. The share of general cargo continued to decline to 9.4 per cent. The fleet of container ships represents almost 13 per cent of the total world fleet (Figure 2.6).

As regards container ships, during the last 20 years, the fleet’s total
The maritime industry: key developments

TEU capacity has multiplied by eight and the number of ships by four. Ship sizes continue to increase, with average carrying capacity per ship on the current order book standing at 4577 TEU, three times bigger than the average vessel size of the existing fleet.

Currently, the largest container ships are gearless, that is, without their own cranes and thus dependent upon the container cranes in ports for loading and discharge. Many smaller ports, especially in developing countries with port infrastructure constraints, cannot accommodate large or gearless container ships. Ship operating costs for geared container ships are higher than on gearless ships, while loading and unloading speeds in the ports are lower.

Of the fully cellular container ships that entered into service in 2007, 23 per cent were geared. The average vessel size of those geared ships was 1473 TEUs, versus 3843 TEUs for the gearless ships that entered into service during the same year. The total TEU carrying capacity on the gearless ships built in 2007 amounted to 1.18 million TEUs, 8.5 times larger than the combined geared capacity of 0.14 million TEUs that entered the market during the same period. Larger ships are far more likely to be gearless. On ships built after 2000, 87 per cent of the container carrying capacity is gearless, as is 94 per cent of the capacity on existing ships of 2500

Note: Cargo carrying vessels of 100 GT and above.

Source: Compiled by the UNCTAD secretariat on the basis of data supplied by Lloyd’s Register – Fairplay.

Figure 2.6 World fleet by principal vessel types, selected years (beginning of year figures, millions of dwt)
Among container ships built since 2001, the number of gearless vessels is three times higher than that of geared ships, indicating that geared ships are losing ground.

**Age distribution of the world merchant fleet**  By vessel type, the youngest fleet is that of container ships, with an average age of nine years (at the beginning of 2008); 37.3 per cent of container ship tonnage is younger than five years and only 12.4 per cent is 20 years and older. The average age of tankers is 10.1 years, the average age of bulk carriers 12.7 years, and general cargo vessels continue to be the oldest vessel type, with an average of 17.1 years and representing 55.9 per cent of tonnage 20 years and older. Only 12 per cent of general cargo tonnage is younger than five years, reflecting the trend that general cargo is increasingly containerized (Figure 2.7).

**Ownership of the world fleet**  Figure 2.8 features the ranking by ship carrying capacity (dwt) of the 35 economies with the largest fleets owned by nationals (based on data on vessels of 1000 gross tonnage (GT) and above, as the country of ownership of smaller ships is not always available; vessels of 1000 GT and above account for 92.8 per cent of the world total).
National flag ⊗Foreign flag

Note: Vessels of 1000 GT and above.

Source: Compiled by the UNCTAD secretariat on the basis of data supplied by Lloyd’s Register – Fairplay.

Figure 2.8 Ownership of the world fleet, 1000 dwt tons, 1 January 2008

Nationals of these countries control 95.35 per cent of the world fleet. Greece is the country with the largest controlled fleet, totalling 175 million dwt and 3115 ships, followed by Japan (162 million dwt and 3515 ships), Germany (94 million dwt, 3208 ships), China (85 million dwt, 3303 ships)
and Norway (47 million dwt, 1827 ships). Together, those five countries hold a market share of 54.2 per cent.

Thirty-two per cent of the Greek-controlled fleet use the national flag, versus 68 per cent using foreign flags. As regards vessel types, the Greek-controlled fleet includes 82.7 million tons of dry bulk carriers, 76.3 million dwt of oil tankers, 8.3 million dwt of containerships, 4.3 million dwt of general cargo vessels and 3 million dwt of other vessels. The share of foreign flagged tonnage is highest among general cargo ships (93 per cent) and lowest among oil tankers (56 per cent).

The Japanese-controlled fleet is 93 per cent foreign flagged. Japanese-controlled ships include 86.5 million dwt of dry bulk carriers, 44.1 million dwt of oil tankers, 12.7 million dwt of containerships, 9.4 million dwt of general cargo vessels and 9 million dwt of other vessels. An impressive total of 880 Japanese-controlled dry bulk carriers with a combined tonnage of 70 million dwt fly the flag of Panama.

The German-controlled fleet uses a foreign flag for 85 per cent of its tonnage. More than half of the German-controlled fleet comprises container ships (50.7 million dwt), followed by 20.7 million dwt of oil tankers, 14.1 million dwt of dry bulk carriers, 7.4 million dwt of general cargo vessels and 1.3 million dwt of other vessels. The share of foreign-flagged tonnage is highest among dry bulk carriers (98 per cent) and lowest among container ships (74 per cent).

The Chinese-controlled fleet is 40 per cent registered in China, versus 60 per cent that uses a foreign flag. More than half of the Chinese-controlled fleet are dry bulk carriers (43 million dwt), followed by 19.4 million dwt of oil tankers, 10.1 million dwt of general cargo vessels, 7.7 million dwt of container ships and 4.6 million dwt of other vessels. The share of foreign-flagged tonnage is highest among other vessel types (78 per cent) and lowest among general cargo ships (74 per cent); 62 per cent of the Chinese-controlled dry bulk fleet uses foreign flags.

The Norwegian-controlled fleet declined slightly during 2007, still maintaining its fifth-place ranking with 46.9 million dwt. Of this tonnage, 69.7 per cent is registered under a foreign flag, and the remaining 30.3 per cent mostly under the Norwegian International Ship Register (NIS). Half of the Norwegian-controlled tonnage consists of oil tankers (23.5 million dwt), followed by 10 million dwt of general cargo vessels, 7.4 million dwt of dry bulk carriers, 5.2 million dwt of other types and 0.7 million dwt of container ships.

Countries of registration Since the United Nations Conference on Trade and Development (UNCTAD) began recording the share of foreign-flagged ship capacity (dwt) in 1989, every year until 2006 this share has
increased. Between January 2006 and 2007, however, for the first time, the foreign flagged share decreased slightly, from 66.5 to 66.35 per cent. Further growth in the use of foreign flags is limited by market restrictions in many countries with important cabotage traffic, as well as government-controlled trade, both of which may be reserved to nationally flagged vessels. At the same time, several European countries have reduced the tax burden on nationally flagged vessels, thus achieving in some cases a return of previously foreign flagged dwt to the national flag.

The top 35 flags of registration together account for 1033 million dwt, corresponding to 92.42 per cent of the world fleet. The top five registries together account for 49.3 per cent, and the top ten registries account for 69.5 per cent of the world’s dwt (January 2008 data). Information in this chapter is based on data on vessels of 100 GT and above, except where the vessel owner’s nationality is considered. For the latter case, data are for vessels of 1000 GT and above.

The largest flag of registration is Panama, with 252.6 million dwt (22.6 per cent of the world), followed by Liberia (117.5 million dwt, 10.5 per cent). These two leading registries are followed by five flags with between 55 and 61 million dwt (close to 5 per cent of the world fleet) each; they are Greece, the Bahamas, the Marshall Islands, Hong Kong (China) and Singapore. As regards the nationally flagged number of ships, the largest fleets belong to Japan (6447 ships), the United States (6419), Indonesia (4477), China (3816) and the Russian Federation (3461). These include a large number of general cargo and other smaller vessels employed in coastal shipping. See Figure 2.9.

The ten largest open and international registries that cater almost exclusively to foreign-controlled ships are Panama, Liberia, the Bahamas, the Marshall Islands, Malta, Cyprus, the Isle of Man, Antigua and Barbuda, Bermuda, and Saint Vincent and the Grenadines. Although in principle they are open to vessels from practically any country, most of them in fact specialize in some countries of ownership, or in certain vessel types. More than half the tonnage registered in Antigua and Barbuda, for example, is container ships. The registries that cater mostly for dry bulk carriers are Bermuda, Cyprus, Malta, Panama and Saint Vincent and the Grenadines; Panama alone accounts for one-third of the world’s dry bulk tonnage. Oil tankers account for the largest tonnage in the registries of the Bahamas, the Isle of Man, Liberia and the Marshall Islands.

The flag of the world’s largest registry, Panama, is predominantly used by vessel owners of Japan, who account for more than half of the registry’s tonnage, followed by China, Greece and the Republic of Korea. The world’s second-largest registry, Liberia, is predominantly used by owners from Germany as well as from Greece, the Russian Federation and Saudi
Arabia. Saudi Arabia relies on Liberia to provide the flag for more than half of its nationally controlled fleet. Three-quarters of the dwt registered in Malta is owned by Greek nationals, more than 90 per cent of the fleet of Antigua and Barbuda is owned by German nationals, and around 60 per cent of the dwt of Saint Vincent and the Grenadines belongs to nationals of Greece and China.

Some countries provide their flag to both their own nationals and a significant share of foreigners. The largest such registries are Hong Kong (China) and Singapore; for both registries, about two-thirds of the registered tonnage are foreign-controlled. In Cyprus, about 90 per cent of registered tonnage is foreign-controlled. About half of the tonnage that is registered under the flag of the United Kingdom belongs to foreign owners, as does about 40 per cent of the tonnage registered in the Netherlands.

Among the top 35 registries, 15 cater almost exclusively for nationals of their own country. They are Greece, China, the Republic of Korea, India, Germany, Japan, Italy, the United States, Malaysia, Turkey, the Russian Federation, Indonesia, Belgium, the Islamic Republic of Iran, Taiwan Province of China, and Thailand. A low participation of foreign-controlled tonnage may be due to two reasons. First, the country’s laws may not allow for the use of its national flag if there is no adequate ‘genuine link’ between flag and ownership. Second, although in theory

Note: Cargo carrying vessels of 1000 GT and above.

Source: Compiled by the UNCTAD secretariat on the basis of data supplied by Lloyd’s Register – Fairplay.

Figure 2.9 Share of foreign flagged deadweight tonnage, 1989–2007
The maritime industry: key developments

the country’s registry might be open to foreigners, its tax or employment regime or other regulations may make the registry unattractive to foreign ship owners.

Finally, among the top 35 flags of registration, there are three ‘second’ or ‘international’ registries, that is, registries that allow for the use of the national flag, albeit under conditions that are different from those applicable for the first national registry. They include notably the Norwegian International Ship Register (NIS), the Danish International Register of Shipping (DIS), and the French International Register (RIF). While the DIS is almost only used by Danish-controlled ships, both the NIS and the RIF also cater to some foreign-controlled tonnage.

Ship building Since 1990, annual newbuilding deliveries approximately doubled every ten years. The share of oil tankers decreased, while that of container ships and other dry cargo ships increased (Figure 2.10). As regards container ships, in May 2008, the global container ship newbuildings order book reached its highest level ever, with 1528 ships on order with a total container carrying capacity of 6.7 million TEUs. In early 2009, the numbers started to decline somewhat, as hardly any new orders are being placed after the financial crisis; the January 2009 order book amounts to 1360 ships with a carrying capacity of 6.2 million TEUs, still

Note: Dry bulk carriers and oil tankers of 10 000 dwt and above.

Source: Compiled by the UNCTAD secretariat on the basis of data from Fearnleys Review (various issues) and Lloyd’s Register – Fairplay.

Figure 2.10 Deliveries of newbuildings, million dwt

<table>
<thead>
<tr>
<th>Year</th>
<th>Container ships and others</th>
<th>Dry bulk carriers</th>
<th>Oil tankers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>4.4</td>
<td>4.0</td>
<td>7.0</td>
</tr>
<tr>
<td>1990</td>
<td>4.0</td>
<td>9.6</td>
<td>8.7</td>
</tr>
<tr>
<td>2000</td>
<td>10.5</td>
<td>13.1</td>
<td>20.8</td>
</tr>
<tr>
<td>2001</td>
<td>9.8</td>
<td>21.0</td>
<td>14.4</td>
</tr>
<tr>
<td>2002</td>
<td>11.5</td>
<td>14.1</td>
<td>23.4</td>
</tr>
<tr>
<td>2003</td>
<td>8.6</td>
<td>19.8</td>
<td>29.4</td>
</tr>
<tr>
<td>2004</td>
<td>7.9</td>
<td>11.2</td>
<td>27.0</td>
</tr>
<tr>
<td>2005</td>
<td>16.8</td>
<td>19.8</td>
<td>29.0</td>
</tr>
<tr>
<td>2006</td>
<td>21.3</td>
<td>29.0</td>
<td>24.7</td>
</tr>
<tr>
<td>2007</td>
<td>27.7</td>
<td>29.5</td>
<td>29.5</td>
</tr>
</tbody>
</table>
corresponding to 44 per cent of the existing capacity (see above, Table 2.1).

The record order book has raised concerns over whether the supply of qualified seafarers will grow sufficiently quickly to sustain the fleet that will enter into service in coming years. Carriers report an acute shortage of officers, and the shortage is expected to escalate. Some of the recent maritime accidents are thought to be the consequence of the employment of insufficiently experienced on-board personnel. In past decades, traditional ‘maritime nations’ would have their own national shipping companies, vessel registrations and seafarers, and if there was a shortage of the latter, there would have been a need for a national solution, possibly involving support to nautical schools and more attractive working conditions. Today, the global shortage of seafarers requires a global solution, where carriers and trading nations need to provide a framework that makes maritime training and education a worthwhile investment.

2.2.3 Containers

The global container fleet reached a total of more than 25 million TEUs by the end of 2007. This is more than a 50 per cent increase since the end of 2002. While the main growth was largely led by the ocean carriers, lessors have recently retaken the lead. Ocean carriers’ share of the world container fleet stood at 59 per cent in 2007. During the same year, the lessors purchased 1.5 million TEUs, 36 per cent more than the previous year, making it the largest purchase made by lessors over the previous four years (Figure 2.11). The global production of new containers reached 3.9 million TEUs in 2007.

Almost nine out of ten containers built were standard dry freight boxes; 5 per cent are integral reefer boxes, 3.1 per cent are regional sizes, 2.3 per cent are dry freight specials and 0.4 per cent are tank containers.

2.2.4 Ports

Spurred by growth in container trade, port container handling activity has also expanded. A given trade movement (import or export) involves two or more port moves. The share of transhipments in total port throughput has grown from 10 per cent in 1980 to 27 per cent in 2007. As a result, container port throughput is more than threefold the volume of trade.

Container throughput in the top 20 ports reached 236 million TEUs in 2007, a rise of 13.1 per cent over 2006. The list includes 13 ports from developing economies, all from Asia, with the remaining from developed countries located in Europe (4) and the United States (3).

Singapore retains its lead as the world’s busiest port in terms of the total number of TEU moves by achieving an impressive 12.7 per cent growth
The maritime industry: key developments

over 2006. The port of Hong Kong lost second position to the rapidly growing port of Shanghai. Shanghai matched its impressive growth of just over 20 per cent achieved in 2006 again in 2007, to bring its total to just over 26 million TEUs and narrowing the gap with Singapore to just 1.7 million TEUs. See Figures 2.12 and 2.13.

2.3 Markets

2.3.1 Comparison of national trade and fleets

Do trading nations require ‘national’ fleets for their national trade? In theory, they do not. In practice, however, there still exists a positive correlation between a country’s trading profile and the tonnage and type of vessels it controls. Overall, the statistical correlation coefficient between the shares of world trade and the shares in fleet ownership is +0.57 (see Table 2.2). Looking at specific trading and fleet profiles, we observe a linkage between the controlled fleet and a country’s exports and imports, especially as regards oil and dry bulk trades and the ownership of oil tankers and dry bulk carriers, respectively.

In 2007 the United States generated 11.4 per cent of world trade value (imports plus exports in USD) while owning only 3.8 per cent of world tonnage; 1.1 per cent of the world’s cargo carrying tonnage used the flag of the United States. Germany, China and Japan are among the top four trading nations, accounting for 8.5, 7.8 and 4.8 per cent of world trade,
Source: UNCTAD based on data provided by Drewry Shipping Consultants (Drewry, 2006).

**Figure 2.12** International container port traffic, 1980–2008

Source: UNCTAD secretariat based on Containerisation International.

**Figure 2.13** Top 20 container ports and their throughput for 2005, 2006 and 2007 (million TEUs)
Table 2.2  Maritime engagement of 25 major trading nations

<table>
<thead>
<tr>
<th>Country / territory</th>
<th>% share of world trade generated, in terms of value</th>
<th>% share of world fleet (flag) in terms of dwt</th>
<th>% share of world fleet (ownership) in terms of dwt</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>11.38</td>
<td>1.09</td>
<td>3.84</td>
</tr>
<tr>
<td>Germany</td>
<td>8.51</td>
<td>1.34</td>
<td>9.07</td>
</tr>
<tr>
<td>China</td>
<td>7.81</td>
<td>3.32</td>
<td>8.18</td>
</tr>
<tr>
<td>Japan</td>
<td>4.77</td>
<td>1.32</td>
<td>15.58</td>
</tr>
<tr>
<td>France</td>
<td>4.16</td>
<td>0.71</td>
<td>0.63</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>3.76</td>
<td>1.42</td>
<td>2.50</td>
</tr>
<tr>
<td>Netherlands</td>
<td>3.72</td>
<td>0.56</td>
<td>0.83</td>
</tr>
<tr>
<td>Italy</td>
<td>3.55</td>
<td>1.19</td>
<td>1.71</td>
</tr>
<tr>
<td>Belgium</td>
<td>3.01</td>
<td>0.58</td>
<td>1.17</td>
</tr>
<tr>
<td>Canada</td>
<td>2.88</td>
<td>0.28</td>
<td>1.81</td>
</tr>
<tr>
<td>Republic of Korea</td>
<td>2.62</td>
<td>1.89</td>
<td>3.63</td>
</tr>
<tr>
<td>Hong Kong (China)</td>
<td>2.56</td>
<td>5.30</td>
<td>3.22</td>
</tr>
<tr>
<td>Spain</td>
<td>2.18</td>
<td>0.25</td>
<td>0.43</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>2.16</td>
<td>0.64</td>
<td>1.74</td>
</tr>
<tr>
<td>Mexico</td>
<td>2.04</td>
<td>0.14</td>
<td>n.a.</td>
</tr>
<tr>
<td>Singapore</td>
<td>2.02</td>
<td>4.97</td>
<td>2.76</td>
</tr>
<tr>
<td>Taiwan Province of China</td>
<td>1.67</td>
<td>0.39</td>
<td>2.52</td>
</tr>
<tr>
<td>India</td>
<td>1.29</td>
<td>1.35</td>
<td>1.55</td>
</tr>
<tr>
<td>Switzerland</td>
<td>1.19</td>
<td>0.08</td>
<td>0.34</td>
</tr>
<tr>
<td>Austria</td>
<td>1.16</td>
<td>0.00</td>
<td>n.a.</td>
</tr>
<tr>
<td>Malaysia</td>
<td>1.16</td>
<td>0.85</td>
<td>1.08</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>1.15</td>
<td>0.10</td>
<td>1.25</td>
</tr>
<tr>
<td>Sweden</td>
<td>1.14</td>
<td>0.22</td>
<td>0.67</td>
</tr>
<tr>
<td>Australia</td>
<td>1.10</td>
<td>0.19</td>
<td>n.a.</td>
</tr>
<tr>
<td>Poland</td>
<td>1.08</td>
<td>0.01</td>
<td>n.a.</td>
</tr>
<tr>
<td>Total</td>
<td>78.02</td>
<td>28.16</td>
<td>64.93</td>
</tr>
</tbody>
</table>

Note: 2007 data (trade) and beginning of 2008 data (fleet).

Source: Compiled by the UNCTAD secretariat on the basis of data supplied by UNCTAD Handbook of Statistics (trade) and Lloyds Register - Fairplay (fleet registration and ownership).

respectively; all three countries also have important shares in the controlled fleet, while only a minor proportion of its controlled fleet flies the national flag. France and the United Kingdom account for 4.2 and 3.8 per cent of world trade, respectively, and while the United Kingdom has a 2.5 per cent share in the nationally controlled fleet, France, with a similar
share in world trade, only controls 0.6 per cent of the world’s fleet. Some of the largest ship owners, notably Greece, which controls the world’s largest tonnage, are not among the top 25 trading countries. Together with China, the Republic of Korea, Hong Kong (China) and Singapore are among the Asian developing economies with the highest share in world trade, accounting for 2.6, 2.6 and 2 per cent, respectively. The Republic of Korea controls 3.6 per cent of the fleet as regards ownership, Hong Kong (China) 3.2 per cent and Singapore 2.8 per cent. The only Latin American country among the 25 major trading nations is Mexico, with a 2 per cent share of world trade, albeit with only a very minor interest in vessel owning or registration.

For many countries, the fleet structure reflects the composition of their trade. The countries with the largest shares of crude oil exports, such as Kuwait, Saudi Arabia, the Islamic Republic of Iran, the Russian Federation, the United Arab Emirates and Indonesia, also have the highest share of their nationally controlled fleets in oil tankers.

The countries with the highest shares of agricultural exports, such as Brazil, Vietnam, Indonesia, Thailand, India and Turkey, also have important dry bulk fleets. In China, Hong Kong (China), the Republic of Korea and Taiwan Province of China, the dry bulk fleet has the highest share, reflecting the large import demand for iron ore, grains and other dry bulk products.

A different picture emerges if we look at manufactured goods, which are mostly traded in containerized liner shipping services. These services call in numerous countries’ ports, unlike oil tankers and bulk carriers, which are usually employed on direct port-to-port voyages. Container ships are often operated by companies different from the vessel owner (the latter charters the ship to the company that provides the actual liner shipping service). These aspects may explain why there does not appear to be a correlation between a country’s trade in manufactured goods and its nationally controlled container ship fleet. Even China, which accounts for about 25 per cent of the world’s containerized exports, has only a very small share of container ships among its nationally controlled fleet.

As regards the relationship between national trade and a nationally flagged fleet, the correlation is much weaker (+0.23), since the majority of the world fleet is registered in open and international registries, most of which do not belong to any of the top 25 trading nations. Only France, Hong Kong (China) and Singapore have a higher share of the nationally flagged fleet than of the controlled tonnage, reflecting a high proportion of foreign-controlled tonnage among the nationally flagged fleet. In addition to Hong Kong (China) and Singapore, India also has a slightly higher share of the nationally flagged fleet than of the world merchandise trade,
The maritime industry: key developments

the reason being that part of the nationally flagged fleet is employed in cabotage traffic.

2.3.2 Freight markets

Crude oil and petroleum products  In 2007 Petrobras, Brazil’s partly state-owned oil firm, announced the world’s biggest oil discovery since 2000, the Tupi field, believed to hold between 5 billion and 8 billion barrels. There are possibilities of other big discoveries as analysts assess finds at two nearby fields named Carioca–Sugar Loaf and Jupiter. All three fields are in an area far below the seabed and beneath a thick layer of salt, making extraction costly. The cost of operating an oil rig has risen from around US$200,000 per day in 2003 to US$600,000 in 2008. While most analysts agree that the cost of extracting oil is rising, the estimates vary. Some put the cost of extraction in many developing countries at below US$10 per barrel, others in the range US$10–US$30, with offshore production at US$64.

Representing some of the world’s largest ships, very large crude carriers (VLCCs) and ultra large crude carriers (ULCCs) offer the best economies of scale for oil transportation when pipelines are not available. Suezmax ships offer economies of scale combined with flexibility. Suezmax ships require less lightering than VLCCs and are able to attract more cargo when ship size may be a constraining factor. A fully loaded Suezmax must be capable of transiting the Suez Canal, which is presently 16m deep, although they do not necessarily only operate on this route.

The Baltic Dirty Tanker Index, which captures the costs of chartering crude oil tankers, reached values below 700 points in early 2009, a dramatic decline compared to values above 3200 achieved at the end of 2004.

Dry bulk  The dry bulk shipping market represents around 40 per cent of the total volume of cargo transported by sea. From the iron ore that is smelted and refined into consumer goods to the phosphates that are used to fertilize crops, this sector covers the five main bulks (iron ore, coal, grain, bauxite/alumina and phosphates).

The Baltic Dry Index (BDI) is a compendium of spot rates for bulk carriers that transport raw materials. The BDI is both a useful economic indicator as to which way end prices of manufactured goods are moving, and an indicator of the earning potential for owners of bulk carriers. In May 2008, the BDI reached a historical record of 11,793 points. The daily earning rate for capesize vessels, for example, climbed to US$230,000. By early December 2008, the BDI had declined more than 17-fold to 663, and a Capesize vessel could be chartered for below US$5000.
Figure 2.14 provides an overview of selected container-ship time-charter rates, per 14-ton TEU slot. The costs to charter TEU carrying capacity vary significantly over time, with record highs in 2005, and a record downturn towards the end of 2008. The chart also nicely illustrates the existence of economies of scale, as the unit costs on larger ships tend to be below those on smaller ones. Geared slots are more costly than TEU capacity on gearless vessels.

<table>
<thead>
<tr>
<th>Year</th>
<th>200–299 TEU geared</th>
<th>200–299 TEU gearless</th>
<th>2000–2299 TEU</th>
<th>2300–3400 TEU</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>17.2</td>
<td>16.7</td>
<td>6.9</td>
<td>6.0</td>
</tr>
<tr>
<td>2000</td>
<td>17.8</td>
<td>15.7</td>
<td>8.0</td>
<td>9.3</td>
</tr>
<tr>
<td>2001</td>
<td>17.0</td>
<td>15.7</td>
<td>4.9</td>
<td>13.2</td>
</tr>
<tr>
<td>2002</td>
<td>18.9</td>
<td>16.9</td>
<td>9.8</td>
<td>13.0</td>
</tr>
<tr>
<td>2003</td>
<td>27.0</td>
<td>25.0</td>
<td>13.8</td>
<td>13.0</td>
</tr>
<tr>
<td>2004</td>
<td>35.4</td>
<td>31.7</td>
<td>16.4</td>
<td>10.2</td>
</tr>
<tr>
<td>2005</td>
<td>28.0</td>
<td>26.7</td>
<td>10.5</td>
<td>10.7</td>
</tr>
<tr>
<td>2006</td>
<td>29.8</td>
<td>27.2</td>
<td>11.7</td>
<td>10.7</td>
</tr>
<tr>
<td>2007</td>
<td>32.1</td>
<td>26.0</td>
<td>10.0</td>
<td>9.5</td>
</tr>
<tr>
<td>2008</td>
<td>25.7</td>
<td>16.5</td>
<td>4.6</td>
<td>9.5</td>
</tr>
</tbody>
</table>


**Figure 2.14 Container ship time-charter rates, US$ per 14-ton TEU slot per day**

**Liner shipping** Figure 2.14 provides an overview of selected container-ship time charter rates, per 14-ton TEU slot. The costs to charter TEU carrying capacity vary significantly over time, with record highs in 2005, and a record downturn towards the end of 2008. The chart also nicely illustrates the existence of economies of scale, as the unit costs on larger ships tend to be below those on smaller ones. Geared slots are more costly than TEU capacity on gearless vessels.

Figure 2.15 provides data on liner service freight rates as a percentage of market prices for selected commodity exports to Europe and trade routes between 1970 and 2007. These shares vary with variations in freight rates, as well as fluctuations in commodity prices; the lower the commodity’s market value, the more relevant the freight rate becomes. The ratios vary between just 2.4 per cent for a low freight rate for high-value cocoa beans from West Africa, and over 44 per cent for a high freight rate for lower-value jute from Bangladesh.

In addition to variations over time, differences in freight rates depend on numerous factors, including the following:

1. Higher-value goods and commodities requiring special containers, such as reefer cargo, will command higher freight rates than low-value commodities with a higher price elasticity of demand.
2. Freight rates will be significantly higher on the dominant leg on trade routes with large trade imbalances.

3. Economies of scale as regards ship sizes, shipment volumes and port traffic help to reduce unit costs for the carriers and tend to translate into lower freight rates.

4. Competition levels among carriers, for example through a larger number of service providers on a given route, also lead to lower freight rates.

5. Numerous aspects related to port characteristics have been shown to impact on port-to-port freight rates, including port infrastructure, private sector operation and investment, and trade facilitation measures at Customs.

6. Finally, a longer distance will – ceteris paribus – lead to higher freight costs, especially in times of high fuel prices.

**Fluctuations of freight costs over time** As demand fluctuates, so do freight costs, as it takes time for capacity to adjust. However, as seen above, vessel charter rates and freight costs have become more volatile in recent years. As regards the end of 2008 slump, ‘the shipping industry is now attempting to undo the self-inflicted damage of a bloated new building order book, the growth of which has encouraged a near doubling of shipbuilding capacity in the past ten years’ (Sommerseth Jaer, 2008).
Over the longer term, an important underlying cause of the higher fluctuations appears to be the trend that the share of fixed costs within the overall costs of supplying transport services has been increasing, in line with technological advances and economies of scale. The price will only need to cover variable costs in the short term, while in the longer term shipping companies will only survive if their freight rates cover their total average unit costs. In the short term, however, they may choose to supply shipping services even if their average unit costs are not covered by the freight rate, as long as the short-term marginal costs are covered. As a result, a small surplus or shortage of supply will lead to larger fluctuations in the price.

Another reason for the increasing volatility may lie in growing speculation. In recent years, more traders are participating in the market that are not themselves users or providers of transport services, but instead purchase future positions aiming at speculative capital gains. As has been seen in other markets, such as shares, crude oil and food commodities in early 2008, the expectation of future gains encourages traders to hold on to positions, thus further worsening the shortage of supply and increasing the prices – until the bubble bursts.

2.3.3 Vessel capacities, services and prices

Productivity of the world fleet  The global average of tons of cargo carried per dwt of cargo carrying capacity is around 7.7; that is, the average ship is fully loaded around 7.7 times during the year (2007 data). World seaborne trade is estimated at 32932 billion ton-miles (2007). The ton-miles performed per deadweight ton reached 31.6; that is, the average dwt of cargo carrying capacity transported 1 ton of cargo over a distance of 31600 nautical miles (60375 km), that is, 87 miles per day.

Container shipping capacity  As regards the growth of supply and demand in container shipping, Figure 2.16 provides a comparison of the annual change of containerized trade (TEU) and the year-on-year growth of the container carrying capacity of the world fleet (TEU). Since 2006, the growth of the fleet has outstripped growth of containerized trade.

Access to liner shipping services  A country’s access to world markets strongly depends on the availability of regular and efficient transport connectivity, especially as regards regular shipping services. UNCTAD’s Liner Shipping Connectivity Index (LSCI) aims at capturing a country’s level of integration into the existing liner shipping network through measuring its liner shipping connectivity. The ships which are deployed to
provide liner shipping services to a country’s port(s) form the basis of the five components which constitute the index: (1) number of ships; (2) the container carrying capacity in TEU of those ships; (3) maximum ship size; (4) number of services; and (5) number of companies. The data are derived from Containerisation International Online.

China leads the overall LSCI ranking, followed by Hong Kong (China), Singapore, Germany and the Netherlands. The best-connected countries in Africa are Egypt (ranked 17th) and South Africa (ranked 35th), while the best-connected countries in Latin America are Mexico, Brazil and Panama (ranked 26th, 27th and 28th, respectively). Only 17 per cent of the pairs of countries are linked through direct liner services. For all other routes, a containerized trade transaction requires at least one transhipment.

As regards the five components of the LSCI, it can be observed that the total number of ships per country, their TEU capacity deployed and the average maximum ship size per country have all increased since 2004. In comparison, liner services and companies have decreased. The number of liner shipping companies per country has contracted by 7.7 per cent. This trend raises concerns about the impact of the continuing process of concentration in liner shipping, especially for countries with a low

Figure 2.16  Growth of demand and supply in container shipping, 2000–2009

![Diagram showing growth rates of demand (Trade), supply (TEU capacity), and balance (Demand - Supply) from 2000 to 2009.]

Source: Compiled by the UNCTAD secretariat on the basis of data from Clarkson Container Intelligence Monthly, (various issues). Total container carrying fleet, including multi-purpose and other vessels with some container carrying capacity. 2009 data: forecast.
connectivity, where a further decline in the number of service providers may give rise to oligopolistic market structures.

**Prices of newbuildings and second-hand tonnage** The most expensive new ships are liquefied natural gas (LNG) carriers, which in 2007 cost US$220 million, about the same price as in the late 1980s (see Figure 2.17) and equivalent to almost US$1500 per m³. Prices per dwt depend heavily on ship sizes, implying significant economies of scale. At US$483, the price per dwt of a 300 000 dwt tanker was only 42 per cent of the price per dwt of a 45 000 dwt tanker, and was in fact the lowest price per dwt of all ship types. In the case of dry bulk carriers, the price per dwt on a 170 000 dwt vessel was US$571, two-thirds of the price per dwt of a 45 000 dwt vessel. An 8000 TEU container ship in 2007 cost US$20 000 per TEU, less than two-thirds of the TEU price of a 4000 TEU ship.

Prices for second-hand tonnage fluctuate more than prices for newbuildings. Prices for five-year-old dry bulk carriers grew more than sixfold between 2001 and 2007, reaching levels that were in fact significantly higher than the corresponding newbuilding prices. A five-year-old 170 000 dwt dry bulk carrier in 2007 cost US$152 million, compared to just US$97 million for a newbuilding contract for a vessel of the same type.
2.3.4 Port operations and performance

Ports are facing increasing demands for a quick turnaround of vessels from customers with ever-increasing sizes of ships. Improving turnaround time by increasing port performance is, however, no easy task, for the main bottleneck is often in crane handling. Ports have not made any significant breakthroughs in container handling, even with the arrival of tandem lift and triple lift cranes. These cranes do not bring double or triple levels of productivity, merely marginal increases, for they cannot complete every move with the optimum carrying capacity. Neither do there appear to be any new radical solutions on the horizon, which would have to be in terms of a new approach to either container handling or box design.

In 1993, 42 per cent of world container throughput passed through state-owned terminals, but by 2006 this figure was down to 19 per cent. The share of state throughput varies by region: in Northern Europe it is 6 per cent; in South-East Asia, 42 per cent; Eastern Europe, 24 per cent; and Africa, 68 per cent (Drewry, 2006). Today, the majority of the top 100 container ports, which represent over 80 per cent of total world container port throughput, have some form of private participation.

The plethora of port concessions worldwide has created many individual terminal operating companies. Some companies have expanded through winning new concessions in other countries or, more recently, through a spate of mergers and acquisitions which have transformed some terminal operators into transnational corporations, so that some control more than 50 terminals and others are present in more than 30 countries. At the other end of the scale are small individual port operators which, having matured in their own market, have sought out new opportunities abroad.

The global port industry remains relatively fragmented. From Table 2.3, it can be seen that the Herfindahl–Hirschmann Index, an indicator of market concentration, globally is at 548, where 1000 is considered concentrated and 1800 highly concentrated. Note, however, that ports operate in local or regional markets, where levels of market concentration may be much higher.

Drewry (2008) placed PSA in the lead over Hutchison by virtue of its 20 per cent stake in the latter. Drewry puts the top five port operators and their 2007 TEU throughput as follows: PSA (47.5 million TEUs), Hutchison (33.6 million), APM Terminals (31.6 million), DP World (28.9 million) and Cosco (9.8 million). The top 20 global terminal operators handled some 349 million TEU, an increase of 13 per cent over the previous year.

The world's major ports are all located on the main shipping routes on an East–West axis. This axis has historically been where ports have sought
to expand internationally. Along this route there are numerous countries where global port operators are not (yet) located (that is, from east to west, Cambodia, Myanmar, Bangladesh, Yemen, Somali, Eritrea, Sudan, Libyan Arab Jamahiriya and Tunisia). In principle, these countries’ geographical position makes them candidates that global port operators may wish to investigate further. Obviously, factors other than location on shipping routes need to be considered, for example water depth, and existing facilities, social, political, legal and economic constraints (see Box 2.1).

Historically, the hardest change for many governments to implement is that of the labour reforms, such as the abolition of controls originally established to protect the employment rights of port workers. Baird and Valentine (2007) state that, in the United Kingdom, it was not until the abolition of the National Dock Labour Scheme in 1989 that port privatization really received momentum, despite the first port privatizations six years previously. Juhel and Pollock (1999) quote from an unnamed study which states that 79 per cent of the former registered dockworkers became redundant, of whom 19 per cent wished to remain active but could not find work. While 55 per cent found employment elsewhere, 25 per cent re-entered the port industry.

Labour reforms can be a thorny issue for governments, as traditionally ports tend to overemploy. For example, in the port of Buenos Aires, Argentina, the suspension of labour agreements led to a 50 per cent

Table 2.3  Global terminal operators’ percentage share of world container throughput (%)

<table>
<thead>
<tr>
<th>Global terminal operators</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>HHI</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPH</td>
<td>13</td>
<td>13</td>
<td>14</td>
<td>187.69</td>
</tr>
<tr>
<td>PSA International</td>
<td>11</td>
<td>12</td>
<td>11</td>
<td>127.69</td>
</tr>
<tr>
<td>APM Terminals</td>
<td>10</td>
<td>10</td>
<td>12</td>
<td>153.76</td>
</tr>
<tr>
<td>DP World</td>
<td>9</td>
<td>10</td>
<td>9</td>
<td>79.21</td>
</tr>
<tr>
<td>Cosco Pacific</td>
<td>7</td>
<td>7</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Eurogate</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>SSA Marine</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Total share of world throughput 56 58 60
World throughput (in millions of TEUs) 387.7 434.3 485.0 548.35

Note: DP World includes CSX World Terminals and P&O Ports for all three years.

Source: Adapted by the UNCTAD secretariat from information obtained by Dynamar B.V.
reduction of the number of workers. Port reforms in Australia, France and the United Kingdom cut employment levels by 40 to 60 per cent (International Labour Organization, 1996). Finding other jobs for these people will initially be a challenge. However, in the long run, as the economies develop, more jobs will be created. The time lag in returning workers to the labour market and retraining costs will remain an issue. Often new port concessions are awarded with gradual reduction in workforce limits set over a defined period.

The approach taken towards port operation depends also on whether the global terminal operator is derived from an ocean carrier (such as APM Terminals, which belongs to the same group as Maersk) or a specialized international terminal operator (an ITO, such as HPH, PSA International or DP World), as the drivers and motives tend to be different. Ocean carriers are largely driven by the need to control supply chains. This includes the whole process – from the initial stages of a product’s formation, its transportation to the market for sale, to its final point of consumption by the consumer. This chain is complicated but, once created, is difficult for new entrants to compete against. The motivation here is guaranteed income through managing the logistics processes. On the other hand, an ITO will be motivated by guaranteeing income through market share of the terminal operating business. The ITO will be looking to replicate the efficiencies achieved in one port in other locations, and its business will be highly focused but diversified globally to offset any regional imbalances in trade. It will thus look for a globally diversified portfolio. An ocean carrier port operator will conversely look for terminal management where
its shipping line has the best advantage (that is, fewer competitors and larger market share). As ocean carrier port operators tend increasingly to distance themselves from their parent shipping line, their approach will more and more resemble that of ITOs.

Notes
1. The views expressed in this chapter are those of the authors and do not necessarily represent the point of view of UNCTAD.
2. The mode of transport reported in these figures records the mode at which the imports arrive at the country’s border, seaport or airport. In practice, the majority of international trade transactions involve more than one mode of transport.

References
ECSC and ICS (2008), ‘Climate change and shipping’, European Community Shipowners’ Associations (ECSC) and the International Chamber of Shipping (ICS), ECSA Position Paper, 10 January.
Sommerseth Jæger, M. (2008), shipping analyst at Arctic Securities in Oslo, as quoted in Fairplay on-line, October.
UNCTAD (2007), Meeting on Globalization of Port Logistics: Opportunities and Challenges for Developing Countries, December, Geneva.