Global impacts of ship size development and liner alliances on port planning and productivity

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Agenda

- Container ship size growth
- Liner alliances and networks
- Impacts on ports and terminals
- Crystal ball gazing
Follow the leader…

Herd mentality – once one carrier upsizes, all others have to follow

Regina Maersk 7,400 teu
Mid 1990s
Other carriers followed…

Emma Maersk 15,500 teu
Mid 2000s
Other carriers followed…

Maersk Triple E 18,000 teu
2013
Other carriers following…

22,000+ teu vessels?
2018?
Carriers will follow…
Largest vessels deployed in Asia-N. Europe trade, Jan 2014

Herd mentality – once one carrier upsizes, all others have to follow

Source: Drewry Maritime Research
Global containership size development

Orderbook dominated by ULCVs, which are not restricted to Asia-Europe deployment

Total order book by teu size range (% of teu capacity)

Trade lane deployment of ULCVs - Jan 2014

<table>
<thead>
<tr>
<th>Trade Lane</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia-North Europe</td>
<td>130</td>
</tr>
<tr>
<td>Asia-Mediterranean</td>
<td>36</td>
</tr>
<tr>
<td>Asia-USWC</td>
<td>14</td>
</tr>
<tr>
<td>Asia-Mid East</td>
<td>9</td>
</tr>
</tbody>
</table>
Number of Ultra Large Container Vessels (ULCVs) per carrier by end-2016

MSC will have the most ULCVs. The smaller lines outside the main alliances will also have a significant number.

<table>
<thead>
<tr>
<th>Carrier</th>
<th>No. of 10,000-13,999 teu Vessels</th>
<th>No. of 14,000+ teu Vessels</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSC</td>
<td>38</td>
<td>26</td>
<td>64</td>
</tr>
<tr>
<td>CKYH</td>
<td>43</td>
<td>20</td>
<td>63</td>
</tr>
<tr>
<td>G6</td>
<td>44</td>
<td>10</td>
<td>54</td>
</tr>
<tr>
<td>UASC/CSCL</td>
<td>17</td>
<td>23</td>
<td>40</td>
</tr>
<tr>
<td>Maersk</td>
<td>18</td>
<td>20</td>
<td>38</td>
</tr>
<tr>
<td>CMA CGM</td>
<td>26</td>
<td>6</td>
<td>32</td>
</tr>
<tr>
<td>Evergreen</td>
<td>10</td>
<td>0</td>
<td>10</td>
</tr>
</tbody>
</table>

Notes:
Includes vessels on long term charter.
Zim has several 10,000 teu vessels.

MSC order cancelled
Vessel cascading

18,000 teu ships have implications for all ports, not just ones on the Asia-Europe route

Asia – Europe route

- Dredging and quay walls most expensive to change – so far the new ships are no longer or deeper than current largest
- Cranes are cheaper and easier to change (relatively speaking) – new ships are wider – so outreach but also crane height are key

Elsewhere

- Rapid vessel upsizing across all dimensions for ports elsewhere
- Not necessarily operating on maximum draft
- Not necessarily the ideal size of ship for the trade route
### Vessel cascading

**Ever larger ships are being cascaded ..........globally**

- Largest deployed vessels, January 2014:
  - **Asia - North Europe:** 18,270 teu
  - **Asia - Mediterranean:** 14,000 teu
  - **Asia - US West Coast:** 13,800 teu
  - **Asia - East Coast South America:** 9,700 teu
  - **Europe - East Coast South America:** 8,800 teu
  - **Asia - West Coast South America:** 9,200 teu
  - **Asia - Middle East:** 14,000 teu
  - **Europe - South Africa - Asia:** 12,500 teu

- Bigger Asia-North Europe ships =
- More cascading to other routes =
- More alliances on other routes (e.g. G6 Asia-USEC, P3 east-west routes) =
- Port/terminal choice shake ups

- There are currently 104 vessels of 7,000-10,000 teu deployed on the Asia-N Europe route.

- All will need to be cascaded elsewhere by 2016

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"India’s Mundra Port today handled one of the largest and longest container vessels in the world - MSC Valeria, having a capacity of 14,000 teu"  
*Source: Economic Times, 5 June 2013*
Cascading vs. deliberate vessel upsizing

Pursuit of economies of scale …… in all trade lanes

Maersk Line 18,000 teu vessels on Asia-Europe route

Hamburg Sud purpose built 9,800 teu vessels on Asia- East Coast South America route
Increase in average container ship size by trade route, 2006-2013

Massive increases in ship sizes, especially in north-south trades

- Far East - S. Africa
- Far East - West Coast S. America
- Far East - East Coast S. America
- Europe - East Coast S. America
- Far East - Med
- Far East - W. Africa
- Far East - N. Europe
- Europe - S. Africa
- Europe - W. Africa
- Far East - US West Coast
- Transatlantic

Increase in average container ship size by trade route, 2006-2013

- East - West
- North - South
Agenda

1. Container ship size growth
2. Liner alliances and networks
3. Impacts on ports and terminals
4. Crystal ball gazing
Recent developments in alliances

Mega carriers and mega alliances

• Relentless pursuit of economies of scale = ever larger ships

• To fill these ships, carriers have to come together in alliances

• Since 2011, the pressure for alliance size and geographical scope has intensified:
  • Maersk, CMA-CGM and MSC in P3
  • Grand and New World Alliances to G6 in Asia-Europe route. G6 expanding to Transpacific and Transatlantic
  • Evergreen joining CKYH

…terminals have to convince and negotiate with 3 (or 5 or 6) lines to call
Liner shipping market structure

Concentrated market operationally ………. but not commercially

Many ships and shipowners
• Around 400 container shipping companies and 5,100 container ships worldwide

but concentration
• Top 20 container lines account for over 80% of the market

and alliances
• Effectively just 3 major global carrier alliances now

…but market still highly competitive as alliances are operational only, not commercial
Asia - North Europe capacity shares by carrier/alliance

Essentially just three groupings. The “others” are under pressure to join

“Others” are: Evergreen, China Shipping, UASC and Zim

Evergreen joining CKYH alliance

Cosco and China Shipping co-operation

Source: Drewry Maritime Research
The P3 will be a powerful force but will still call at numerous ports.

Port rotations will be rationalised (esp. transhipment calls) but each line has too much at stake to completely drop any of their major gateway ports.....

......plus having the widest range of services and port calls will be a key selling point for P3.
P3 alliance network – Case study

Alliance port and terminal choices involve many trade-offs for each carrier

How can the best frequency of service and transit times be obtained?

What is the effect on schedule reliability?

Where is the cargo generated?

Is there a terminal operator in the port affiliated with the shipping line?

How can the widest range of direct port calls be delivered?

What are the benefits and pitfalls of consolidating port calls?

Is the port already established in at least one loop?

Can the ships physically access the port?
## P3 alliance network – Case study

### Terminal ownership appears to be a factor of limited influence in port choice

| Number of proposed P3 Asia-North Europe loops calling (out of a total of 8 loops) | Le Havre | Rotterdam | Tanger Med* | Bremerhaven | Antwerp | Xiamen, Zeebrugge | Shanghai | Ningbo, Tianjin, Pelepas | Singapore | Busan, Qingdao | Algeciras, Colombo, Nanha, ... | Aarhus, Dalian, Dunkirk, Gioia, ... | Yantian | Chiwan | Felixstowe | Hamburg, Hong Kong | Jebel Ali, Khor Fakkan, Kwangyang, ... | Beirut, Gdansk, Jeddah, Nagoya, ... |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All three P3 carrier related terminal operators have a stake in a terminal in the port | 3 | 3 | 1 | 1 | 1 | 1 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Two out of three P3 carrier related terminal operators have a stake in a terminal in the port | 2 | 2 | 1 | 1 | 1 | 1 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| One out of three P3 carrier related terminal operators have a stake in a terminal in the port | 1 | 1 | 1 | 1 | 1 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| None of the three P3 carrier related terminal operators have a stake in a terminal in the port | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |

* Unconfirmed stake reportedly held by MSC

Note: Some terminals still under construction

Source: Drewry Maritime Research
Agenda

- Container ship size growth
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- Crystal ball gazing
Nature of container port demand

Two dynamic aspects to demand… both affect terminal capacity needs

Demand growth

- Growth rate %
- Size of market

Change in the nature of demand

- Ship size growth
- Carrier alliances and partnerships

Terminal capacity requirements
Nature of container port demand

Irrespective of demand growth levels, the pressures on terminals are changing

Same volume in significantly bigger ships =

**Different kind of capacity needed**

Same volume concentrated in fewer alliances/players =

Change in the nature of demand

- Ship size growth
- Carrier alliances and partnerships
Bigger ships and bigger alliances

- Typically the same number of ports called at per loop, but less frequently
- Fewer port calls by bigger ships = greater peaks and troughs at terminals (shipside and landside)

**Asia - North Europe trade route**

<table>
<thead>
<tr>
<th>Number of weekly loops</th>
<th>Jan 2012</th>
<th>Jan 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
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<tr>
<td>15</td>
<td></td>
<td></td>
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<tr>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Number of port calls per week**

<table>
<thead>
<tr>
<th>January 2012</th>
<th>January 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>30</td>
</tr>
</tbody>
</table>

**Same list of ~10 North European ports called at**
Bigger ships and bigger alliances

Demand for bigger terminals due to consolidated volumes

- Annual volumes per “customer” are increasing - need for bigger terminals in each port and/or bigger ports

- Fragmented terminal capacity – both physically and in terms of ownership - is a challenge for many ports e.g. US west coast

<table>
<thead>
<tr>
<th>Port</th>
<th>Seattle</th>
<th>Tacoma</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013 throughput</td>
<td>1.6m teu</td>
<td>1.9m teu</td>
</tr>
<tr>
<td>No. of container terminals in the port</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>No. of container terminals with carrier stakes</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>
Case study illustration: UK deep sea container ports

Terminal capacity increase of 30% in face of flat demand – recipe for disaster?

Average UK major container port utilisation in 2013 was ~75%

UK container market showing little growth

Additional 3m teu of capacity in short term: 33% increase

…but you have to look at big ship capacity in isolation
UK ports – Ultra large container vessel (ULCV) capability

The market is actually fairly well balanced …..for the very big ships….. at present

**Container port demand**
- UK - Asia volumes ~3.5 million teu p.a.
- Assume ~0.5 million teu per berth p.a.
- Need minimum 7 berths in UK able to handle very large container ships

**Container port capacity**
- Felixstowe = 3 berths
- Southampton = 3 berths
- London Gateway = 2 berths by mid 2014
- 8 berths by end 2014
- 10 berths by 2017
- Potential for at least 14 berths longer term

...smaller/shallow berths currently serving Asia-Europe trade will be under-utilised
Containership service reliability

P3 members’ widely varying performance will create a challenge for them …. but may help ports if reliability becomes more uniform

On-time reliability of P3 carriers

Not all carriers are the same

- Wide gaps between most and least reliable carriers
- Alliances are grouping carrier results and lessening differentiation

P3 Network to raise standards

- Maersk expected to enforce high reliability on MSC and CMA CGM who have worse reliability records

Source: Drewry Carrier Performance Insight
Growing importance of transhipment

Transhipment is a central and critical part of liner shipping operations; bigger ships and alliances increase the need

Hub and spoke
- Connecting mainline and feeder vessels
- Used to serve smaller spoke ports from main hubs

Relay
- Mainline to mainline vessel connection
- Used to link together deep sea services at key nodes

Bigger mainline vessels generally mean greater use of transhipment – to fill the ships
Transhipment volumes at main Mediterranean hub ports, 2013

Bigger ships and alliances = more transhipment….for big hubs

Global container port growth: 3.3%
Med transhipment hubs growth: 8.2%

Source: Drewry Maritime Research. Includes some estimates

Large hubs: +11%
Small hubs: -5.6%

= One million transhipment teu
The challenge of ship size growth for ports

- Mega vessels = mega cranes
- Berth length and depth
- Air draft
- Outreach
- Intermodal capacity
- Crane and berth productivity

Bigger ships mean investment in equipment, infrastructure… and systems

Bigger ships have less choice of ports and terminals
Port/terminal infrastructure and equipment requirements

Wide range of requirements in order to both physically accommodate big ships….but also to achieve the required productivity

To be able to accommodate the current largest container ships, a port/terminal must have:

- Large enough cranes (i.e. at least 21-22 boxes across outreach)
- Sufficient large cranes (at least 3 cranes per vessel and usually at least 5 is desirable)
- Long enough berths (i.e. at least 400 metres)
- Deep enough water alongside the berth (i.e. at least 14.5 metres and up to 17 metres)
- Deep enough water in the approach channel (i.e. up to 17 metres)
- And a yard/landside operation …… and inland links …..capable of coping…….

Are shipping lines prepared to pay for these enhanced requirements?
Traditional ports out of the game?

Ever larger ships are still accessing ports with navigational restrictions

Maersk Line 18,000 teu vessel in Antwerp

Hamburg Sud 9,800 teu vessel in draft restricted Buenos Aires (at terminal using mobile harbour cranes)

CMA CGM 16,000 teu vessel in Hamburg
Vessel call volumes

Size of exchanges per vessel call get very large very quickly

Number of boxes exchanged if = 40% of ship capacity *

Maersk CEO: 6,000 moves in 24 hours

* i.e. 20% of vessel discharged and 20% loaded per port call
Berth productivity issues

Berth productivity is a combination of crane speed and crane intensity

Ship turnaround time is driven by:

- Individual crane cycle speeds
- Crane intensity across the ship
Crane intensity

It is currently hard to increase the average number of cranes deployed directly in line with ship size because ship lengths are not increasing.

<table>
<thead>
<tr>
<th>Ship size (teu)</th>
<th>Length (m)</th>
<th>Width (m)</th>
<th>Max draft (m)</th>
<th>Boxes wide</th>
</tr>
</thead>
<tbody>
<tr>
<td>12,000</td>
<td>365-380</td>
<td>48-50</td>
<td>15.5</td>
<td>19-20</td>
</tr>
<tr>
<td>15,000</td>
<td>400</td>
<td>56</td>
<td>16</td>
<td>22</td>
</tr>
<tr>
<td>18,000</td>
<td>400</td>
<td>59</td>
<td>16</td>
<td>23</td>
</tr>
</tbody>
</table>

Longer ships can result in lower teu per metre of quay p.a. if box exchange volumes per call are unchanged.
## Crane intensity and berth productivity

Crane intensity/berth productivity is a commercial as well as an operational issue

<table>
<thead>
<tr>
<th>Operational factors</th>
<th>Commercial factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>• How the ship is stowed for the port in question</td>
<td>• Speed of turnaround required or guaranteed</td>
</tr>
<tr>
<td>• Size of the container exchange per vessel call</td>
<td>• Flexibility, availability and cost of dock labour (and their normal hours of working)</td>
</tr>
</tbody>
</table>

What level of productivity does the shipping line want (they may not want the fastest) and are they prepared to pay for it?
Agenda

- Container ship size growth
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What will the container shipping and port world look like in 5-10 years?
Sheer scale of today’s container port industry

The container port industry is now a huge one

For example:

- Even if Shanghai only performs at the world average growth of 5% p.a. ……this will add almost 10 million teu to the port’s throughput by 2017

- A figure of 10 million teu is more than the entire container port throughput of the UK, India or Brazil.
What will the container shipping and port world look like in 5-10 years?

<table>
<thead>
<tr>
<th>No change</th>
<th>2000</th>
<th>Today</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empties share</td>
<td>~20%</td>
<td>~20%</td>
<td>~20%</td>
</tr>
<tr>
<td>Typical EBITDA margins (gateway terminals)</td>
<td>~40%</td>
<td>~40%</td>
<td>~40%</td>
</tr>
<tr>
<td>Typical EBITDA margins (transhipment terminals)</td>
<td>~20%</td>
<td>~20%</td>
<td>~20%</td>
</tr>
</tbody>
</table>
What will the container shipping and port world look like in 5-10 years?

<table>
<thead>
<tr>
<th>Big changes</th>
<th>2000</th>
<th>Today</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Largest container ship (teu)</td>
<td>7,060</td>
<td>18,000</td>
<td>22,000+</td>
</tr>
<tr>
<td>Super post-Panamax gantries</td>
<td>20</td>
<td>1,160</td>
<td>2,000+</td>
</tr>
<tr>
<td>Market share top 4 terminal operators *</td>
<td>~25%</td>
<td>~41%</td>
<td>?</td>
</tr>
<tr>
<td>Number of major liner alliances/players</td>
<td>7</td>
<td>3</td>
<td>2?</td>
</tr>
</tbody>
</table>

* total teu basis
What will the container shipping and port world look like in 5-10 years?

<table>
<thead>
<tr>
<th>Big changes</th>
<th>2000</th>
<th>Today</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>World port teu throughput</td>
<td>235m</td>
<td>623m</td>
<td>~1 billion</td>
</tr>
<tr>
<td>Global transhipment teu</td>
<td>58m</td>
<td>175m</td>
<td>~320m</td>
</tr>
<tr>
<td>Asian ports’ share of world teu</td>
<td>47%</td>
<td>56%</td>
<td>65%+</td>
</tr>
<tr>
<td>Chinese ports’ share of world teu</td>
<td>16%</td>
<td>30%</td>
<td>40%+</td>
</tr>
</tbody>
</table>
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Intelligence creates advantage. A collaboration with Drewry will provide the information to support sound business decision-making.

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