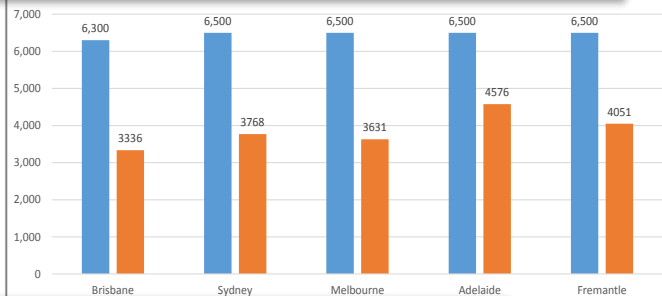


7th Intermodal Asia Conference 2016

Melbourne, 25th January 2016

**Mega-vessels, mega-alliances and
cascades – Impacts for port operations
and the Australia Market**

Dr Jonathan Beard, Vice President, ICF



Source: PoMC; SMH

Container Shipping Industry – Demand Remains Subdued

- 1990-99, container volumes grew 3.5x rate of global GDP growth; 2000-09 only 2.7x GDP growth; “multiplier” dropped to 2.1x, then to 1.5x in 2012 (~4.6% vs GDP growth of 3.2%)
- 2015 H1 global merchandise trade (incl. non-containerised) fell 13% yoy
- Reason for slowdown both cyclical and structural, include:
 - Economic uncertainty in Europe, US recovery relatively strong
 - China (fastest growing & 2nd largest economy) slowing down & restructuring away from dependence on exports....possible “hard landing”
 - China producing more semi-manufactured products
 - Slowing pace of trade liberalisation

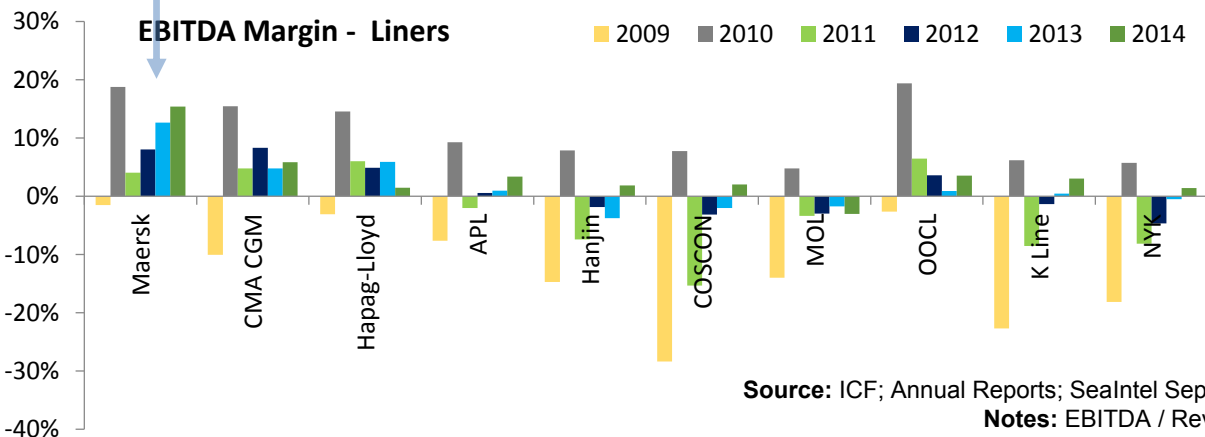
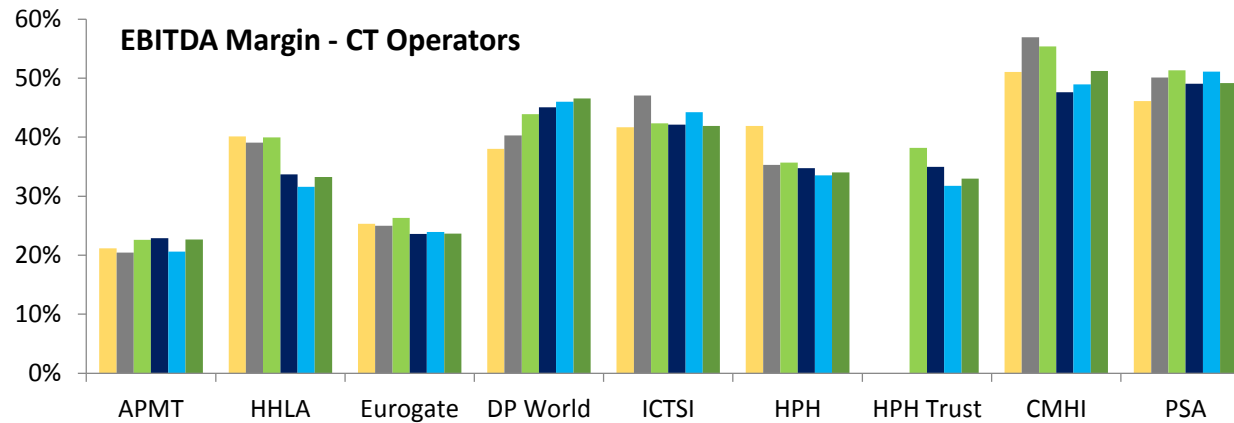


Source: ICF based on World Trade Organization (WTO) and National Bureau of Statistics China

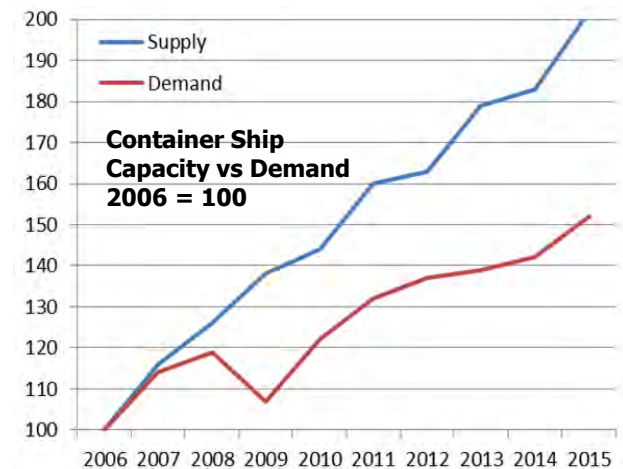
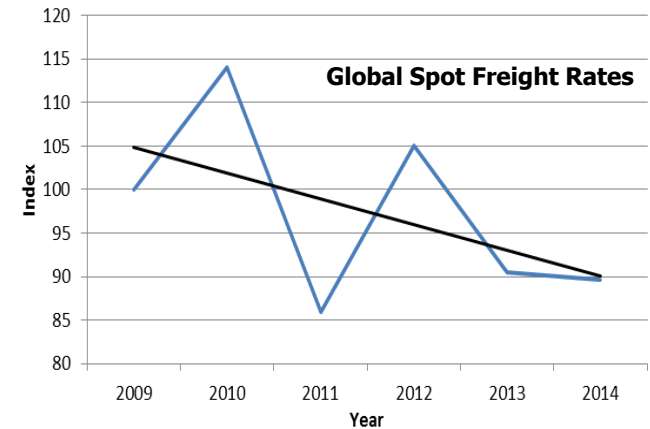
Port Customers Continue to Struggle Financially

Liner unit revenue has decreased placing huge pressure on cost reduction

- Terminal operators have generated healthy EBITDA margins - carriers have not
- Some recovery for carriers in 2014, but decline in 2015, despite a ~50% decrease in fuel costs
- Liners have struggled to sustain any price increases, not least due to **capacity over-supply**
- With unit revenue declining, **must focus on cost reduction**



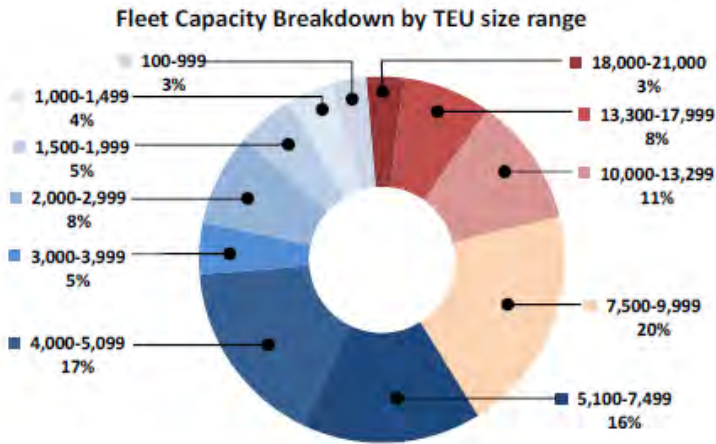
Source: ICF; Annual Reports; SeaIntel Sep 2014
Notes: EBITDA / Revenue



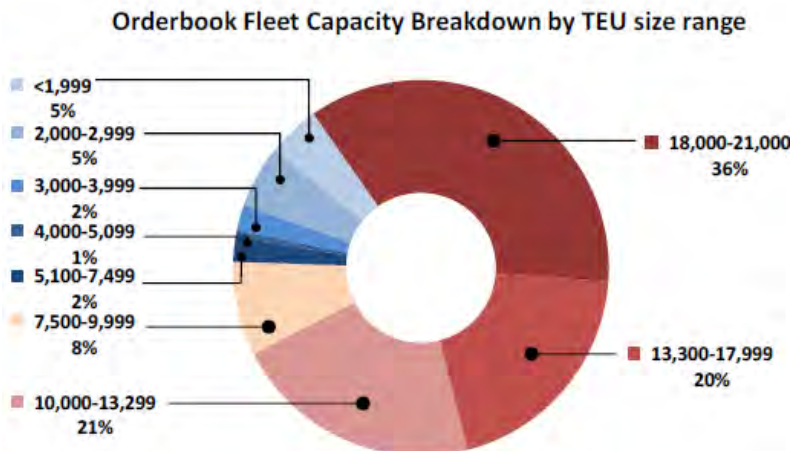
Economies of Scale to Reduce Unit Costs

Container vessels getting ever larger: Maersk EEE 18,000TEU, CSCL /MSC 19,000 TEU, OOCL 21,100 TEU

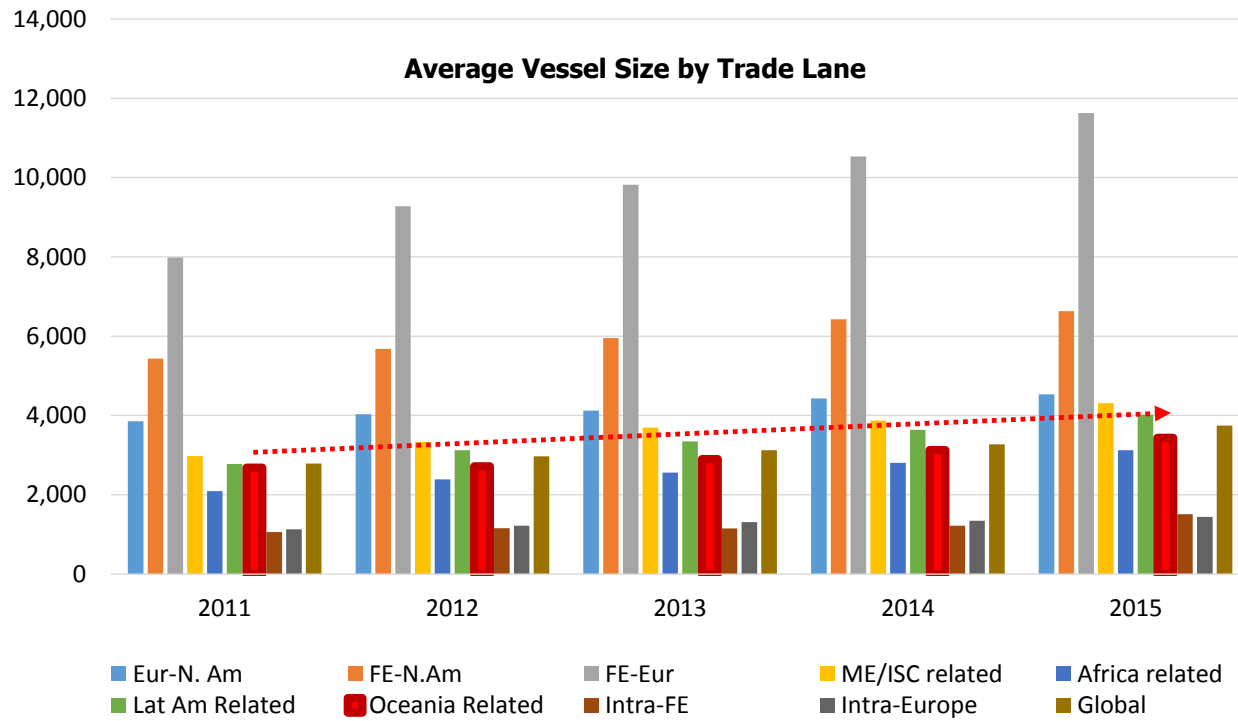
Current Fleet at Jan 16



Order-book at Jan 16



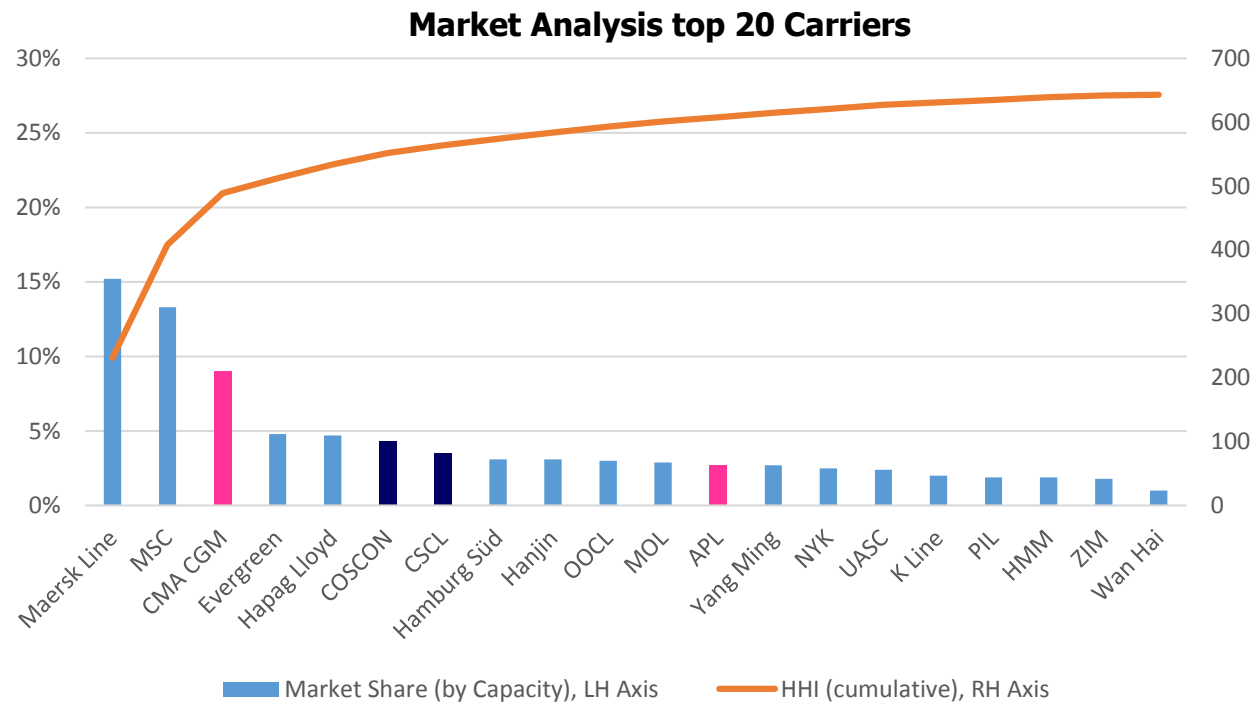
- ‘Herd’ mentality – where Maersk leads, others quickly follow
- OOCL order for 6 x 21,100 TEU, for delivery 2017



Note: data as of Jan 2016
Source: ICF based on Alphaliner

Container Shipping Industry Remains Fragmented....but is consolidation finally underway?

- Limited concentration of industry: top 5 operators account for about 47% of capacity; 86% for top 20 operators. Relatively little consolidation, but change underway?



- Herfindahl-Hirschman index (HHI) for industry of 767, well below the trigger point of 1,000
- Much higher for certain routes, where cabotage restrictions limit competition

Notes: Herfindahl-Hirschman index (HHI) measure for market concentration widely used by EU Directorate General for Competition, U.S. Federal Maritime Commission (FMC) and U.S. Department of Justice. Calculated by squaring market share of each firm competing in a market, and then summing the resulting numbers. E.g. if only one firm in an industry, that firm would have 100 per cent market share, and HHI would equal 10,000 (100²), indicating a monopoly. Or, if there hundreds of firms competing, each would have nearly zero market share, and HHI would be close to zero, indicating nearly perfect competition.

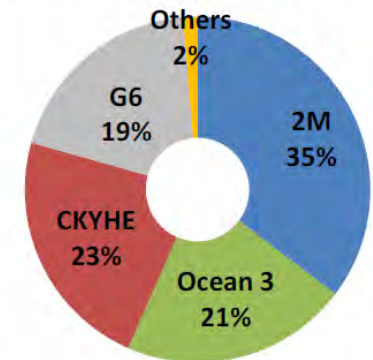
U.S. DoJ considers a market with HHI <1,000 to be a competitive; 1,000-1,800 to be a moderately concentrated marketplace; and > 1,800 to be a highly concentrated marketplace. As a general rule, mergers that increase the HHI by more than 100 points in concentrated markets raise antitrust concerns

Filling up the mega-vessels

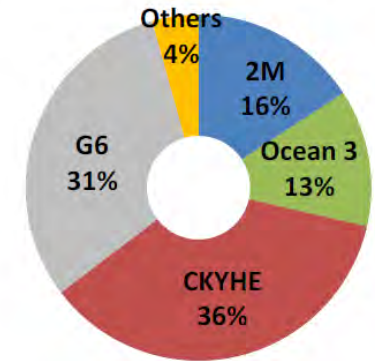
Economies of Scale via Larger Alliances

- New alliances to defray risk of introducing larger vessels in subdued demand conditions...
- ...and secure enough numbers of vessels that are of same magnitude of size to offer fixed or weekly schedule
- Following P3 rejection, four major alliances created / remain:
 - **2M**: Maersk Line and Mediterranean Shipping Company (MSC)
 - **Ocean Three (O3)**: CMA CGM, China Shipping Container Lines Co. and United Arab Shipping Co.
 - The **G6** (formed early 2012) serving Asia-Europe and some trans-Pacific routes: Nippon Yusen Kaisha, Hapag-Lloyd AG, Orient Overseas Container Line (OOCL), APL, Hyundai Merchant Marine, and Mitsui O.S.K Lines;
 - **CKYHE Alliance** serving Asia-Europe and trans-Pacific (i.e. Asia-West Coast North America), incorporating Cosco, “K” Line, Yang Ming, Hanjin Shipping and Evergreen.
- Account for significant portions of capacity on major trade lanes
- Fully accommodating an alliance in key transshipment markets (e.g. SE Asia) **may require 8-9 million TEU capacity**...
- ...or mitigate risk with dual hubs (at additional cost)
- Recent M&A may cause restructuring of alliances

FE-Europe Capacity Share by Alliance



FE-N America Capacity Share by Alliance



Source: Alphaliner; ICF

Port Planning & Performance Parameters

Invest to 'play the game' or be relegated to second division?

- CAPEX for mega-vessels
 - 18m water depth
 - long straight quays (1,000m or longer): maximum flexibility
 - adequate number of cranes with outreach for 23-24 across
 - land: adequate yard to support quay face operations & large box exchanges (ideally 600-650m av. yard depth / m quay)
 - capacity to accommodate all alliances partners
 - inland connectivity (for gateway ports)
- Major shipping lines demand performance
 - > 35 moves per crane per hour, 230-250 moves/ship hr @ berth for *larger* vessels
 - Reliable berth windows and turnaround time
 - Maersk EEE seeking **6,000 moves** within 24hrs from terminals*but this requires **adequate cargo**
- Major hub ports (& some gateway ports, e.g. Hong Kong) must efficiently accommodate variety of vessels sizes (e.g. from feeder / barges to mother vessels) - flexibility in design
- **Risk/reward:** investment requirements are higher but in the absence of **base-load import/export (IE) cargo**, incentives for largest vessels to call may be insufficient – challenge for smaller transshipment hubs, less so for the major gateway terminals...and major TS hubs?
- Possible scenario? **Winners “lock in” volume** and establish a virtuous circle, become mega transshipment (& gateway) hubs; losers see IE volume routed via a third port, increasing cost of import/export



Source: Maersk

* Eivind Kolding, CEO Maersk Line June 2011

Moving Goal Posts for Investment

Terminal investment is long-term, but requirements keep changing – how to future proof without over-investing?

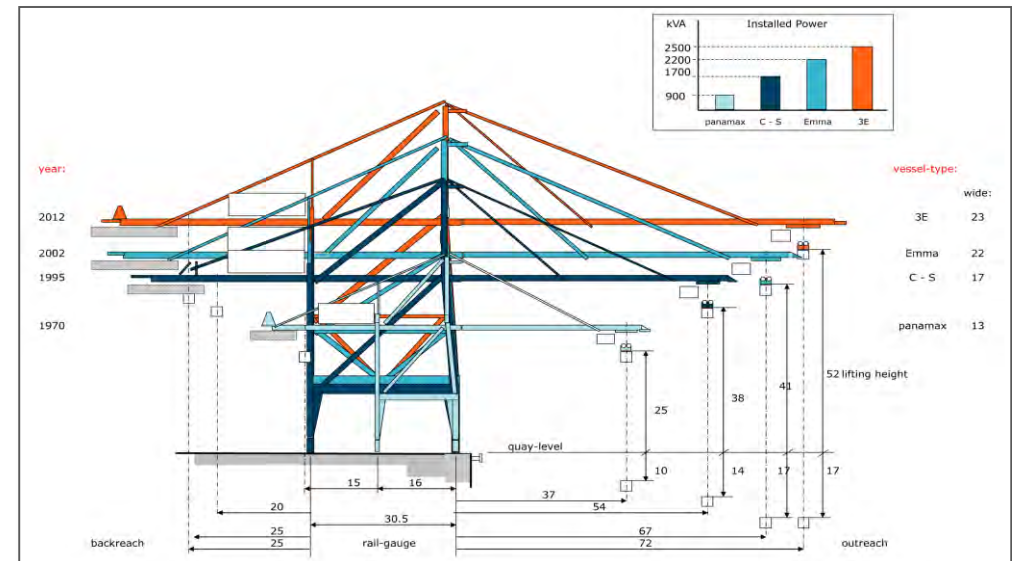
“The only way to add another 25% [carrying capacity] is in length, as the 18,000 TEU ships are very wide. Also trading flexibility and frequency must be considered; you would need a huge market share to fill them...I just don’t think we can accommodate larger vessels in the foreseeable future, maybe never”.

Søren Skou, Maersk CEO, quoted in Container Management, **April 2013**

However, June 2015 Maersk Line announced \$1.8bn contract for 11 vessels of 20,000 TEU (LOA 400m, beam 59m and increased **draft of 16.5m**.....but now on hold & one EEE laid up)

...quickly followed by OOCL order for 6x 21,100 TEU (for delivery 2017)

- E.g. investment planning for ship to shore cranes (20-25 year life cycle)
 - Emma Maersk, 2006: 22 rows across
 - Marco Polo, 2012: 21 rows across
 - EEE, 2013: 23 rows across
- Redeploy cranes, upgrade cranes, replace, etc. Quay may also need strengthening



6,000 moves per day

Glorious Carrot or Poorly Conceived Stick?

- Requires 250 moves /hr over three shifts for 24 hrs on a **regular basis**.
- 19,000-TEU ship would require **8 cranes**, each at 31-32 moves /hr, generating berth productivity of 250 moves/hr (MPH)
- 18,000-TEU box ship is only 25% longer than 7,400-TEU vessel yet has 150% more capacity, hence cranes have to reach further, but difficult to deploy more cranes
- Therefore 8 cranes per 400m or 1 per 50m: a high crane density
- Remember - travelling distances increase by 40-50% for mega vessels (13,000 TEUs+ vs Panamax) due to their scale
- Crane MPH is reduced unless shipping lines proactively plan their **stowage to support port productivity: e.g. XVELA cloud based TOS neutral collaborative aid to stowage management**

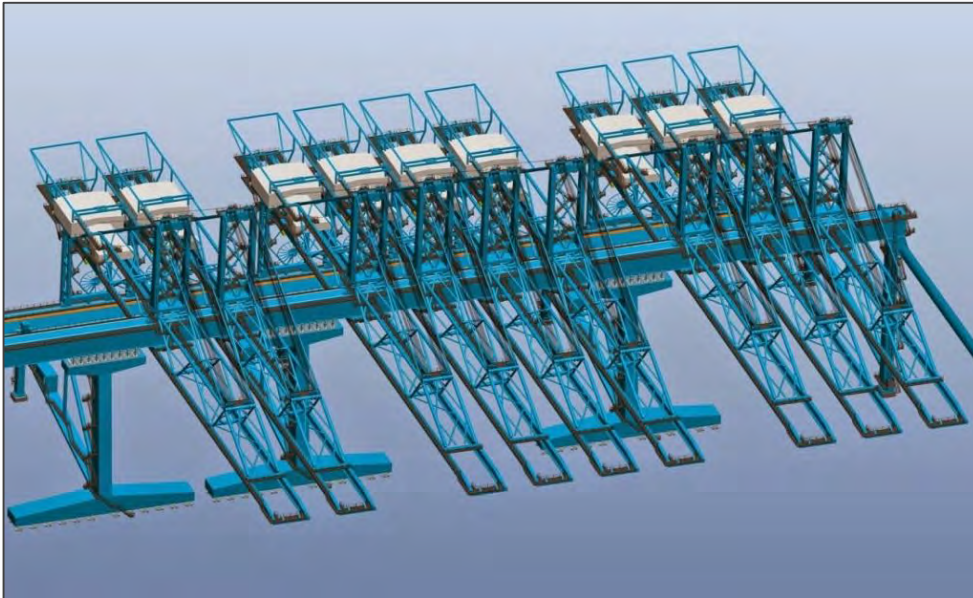


Source: MTL; ICF

6,000 moves per day

Step change in productivity required?

- Push up moves per crane per hour (e.g. new automated terminals at Maasvlakte 2 RWG & APMT: end goal 40)
- New crane operating arrangements?



E.g. APMT FastNet

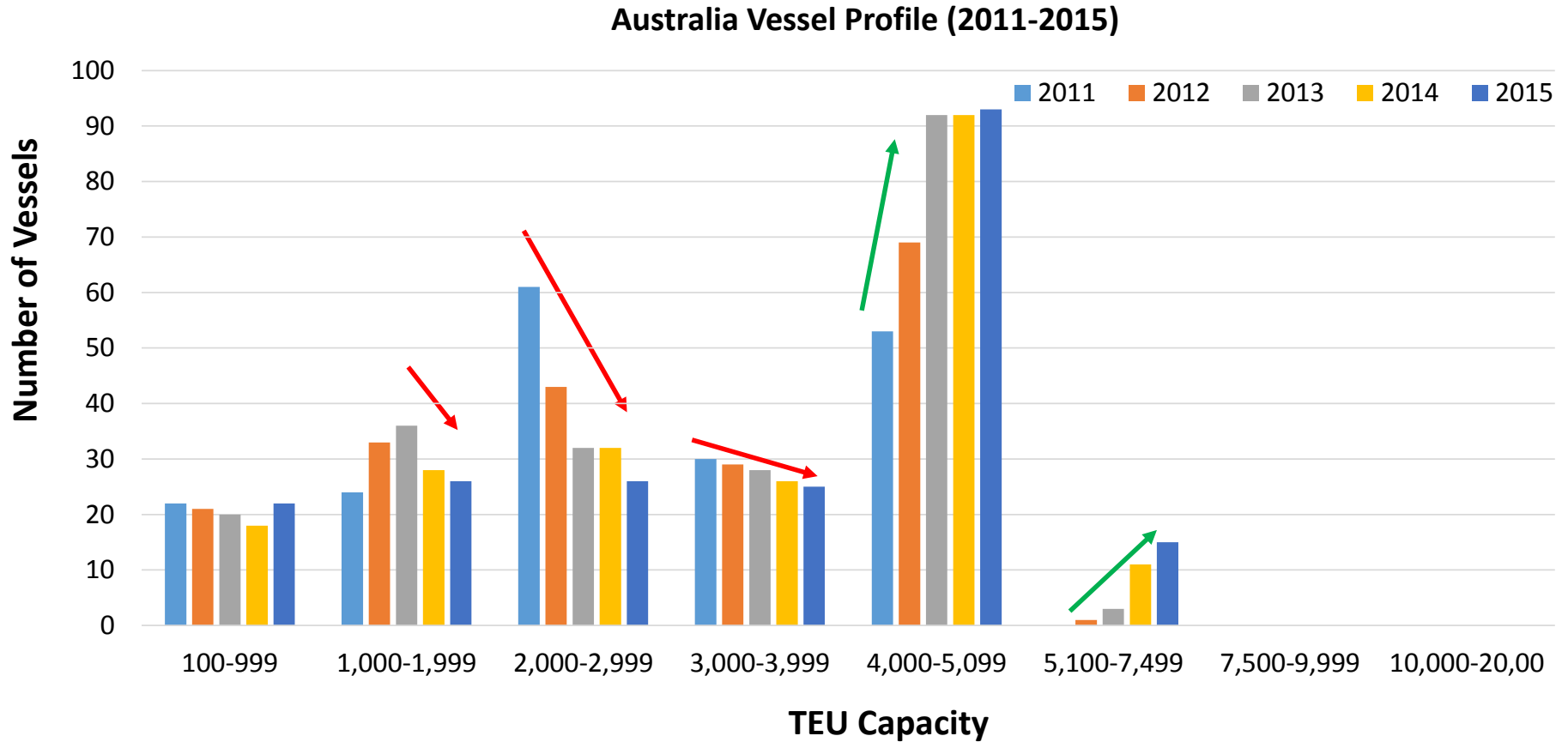
- Crane legs dictate minimum spacing of one bay, resulting in lost opportunities to maximise production
- With APMT FastNet cranes are as narrow as a 40ft container – aims to double berth productivity
- Return on investment?

Source: APMT

- Need to look at relative costs to achieve a realistic balance (best terminal operators already do this) ...sensible cooperation rather than relying on market power.
- What level of productivity does the line want and will they pay for it?

What Vessel Sizes Currently Serve Australian Ports?

<4,000 TEUs decline; 4,000 – 5,100 TEUs have seen significant increase; 5,100-7,500 also growth, but still relatively insignificant in terms of total TEU



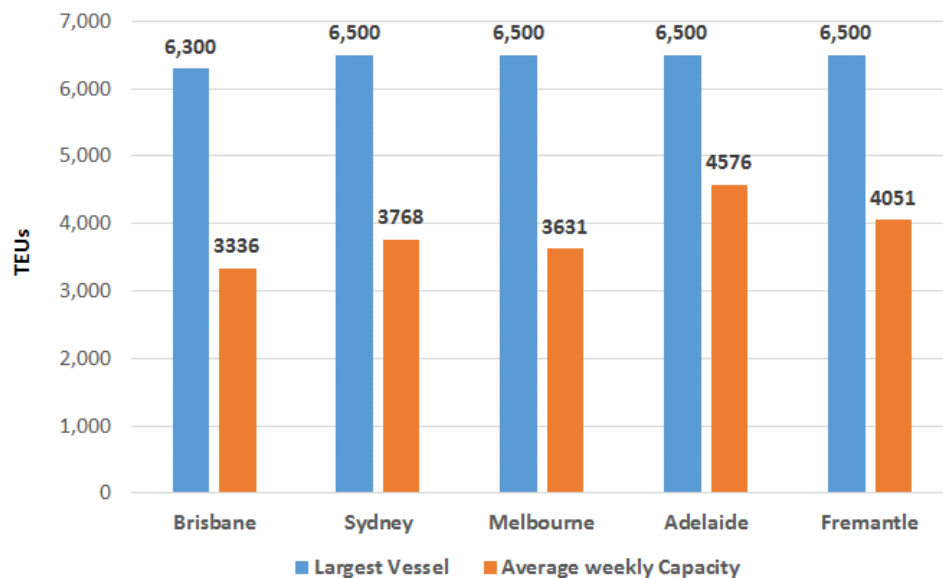
Source: ICF Analysis on Alphaliner data (Jun 2011-Jun 2015)

What is the Likely Maximum Size over Medium-term? (I)

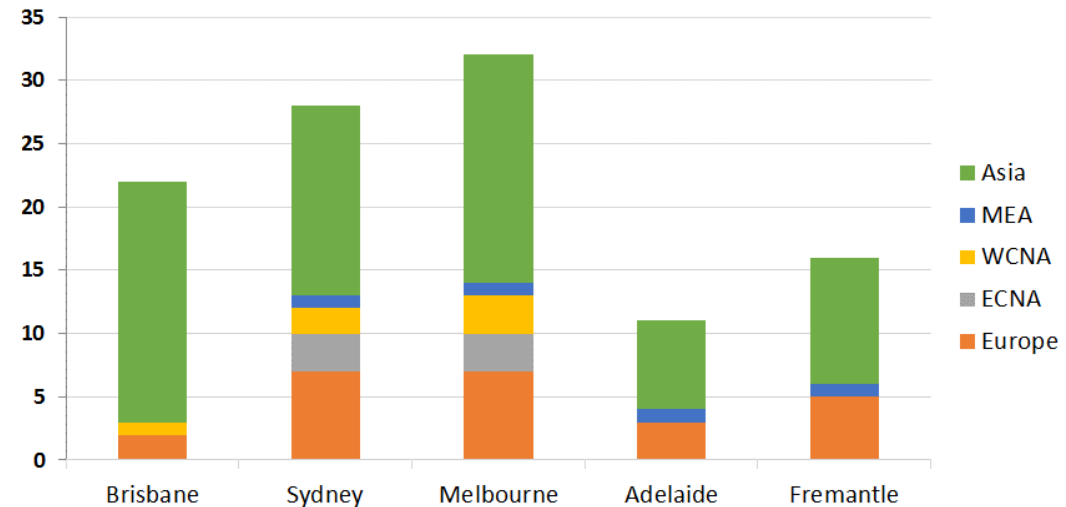
Largest vessels deployed on the Asia services; reaching 6,350 TEU size – current volumes & port infrastructure are key limits

- Container volumes (& calls) are concentrated in Sydney & Melbourne
- Dominant trading volumes are to & from Asia, transhipped in one of the larger Asian ports
- Largest vessels are deployed on Asia services, reaching 6,350 / 6,500 TEU (e.g. Hyundai Oakland calling both Sydney & Melbourne)

Average weekly capacity and largest vessel type (TEU) (2016)



Weekly calls per Port by Regional Trade destination (2016)



- Relatively small size of Australian market & organisation of services, carriers have tended not to have enough cargo to justify larger vessels.
- Vessel size limits for Australia also determined by lowest capacity envelope out of Melbourne, Sydney & Brisbane
- Brisbane can currently handle 8,000 TEU (planned increase in draft will permit 8-10,000 TEU). Botany Terminal 3, can handle up to 10,000 TEU. **Melbourne is current constraint.**

Source: ICF Analysis on Alphaliner data (accessed on 19 Feb, 2016)

What is the Likely Maximum Size over Medium-term? (II)

Australia market infrastructure constraints are at Melbourne, but some easing with opening of VICT

- Port Philip Bay channel depth allows max 14m vessel draft with a safe under-keel clearance
- Swanson docks additional limits: max vessel length (LOA) 300m, airdraft of 50.1m at average high tide (West Gate bridge).
- Therefore vessel max of 300m LOA and 42.9m beam. ~ 6,500-7,000 TEU (max 7,030 TEU).
- But further limits on number of these vessels that can be berthed at once
- VICT should be able to handle at least 8,000 TEU and likely up to 10,000 TEU
- Limits / drivers for upshift?



Source: ICF Analysis on Alphaliner data (accessed on 19 Feb, 2016)

Beyond Infrastructure, What Will Influence Vessel Size Upscaling?

NSCs, market volumes, productivity and cascade from larger trades

- Multiport National Stevedore Contracts offered by current duopoly may limit, but with surplus capacity at all three major ports from end 2016/17, influence should wane
- Volume growth e.g. 2.5% y-o-y or 4.5%?
- Call size. Average of 2,500-2,7000 TEUs per week (moves per vessel increase from 1,374 H1 2012 H1 to 1,582 H1 2014, ~15%)
 - What potential is there for consolidation of services to realise economies of scale?
 - How might alliances play out on the major trades and what might be the impacts for Australasia market?
- Productivity – moves per hour need to increase
- Bunker- “Shale buffer” USD35-75/ barrel of crude? Low prices reduce cost advantage of larger vessels
- Global increase in sizes may lead to cascade and ‘forced’ adoption of non-optimal sizes. Given continued introduction of ever larger vessels on EU-Asia trades (suffering slow growth), the pressure to remove / cascade smaller vessels (e.g. 8,000 TEU) to other trades will intensify e.g. to S America, Middle East- ISC, Australia / Oceania. Completion of Panama Canal upgrades (~2016 raising vessel cap from ~5,000 TEU to 13,000 TEU) will also trigger an upsizing of vessels on trades currently limited to ~5,000 TEU

Thank You – Any Questions?



Ports, Logistics & Transport Services



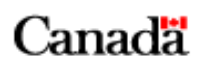
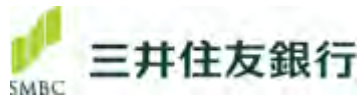
ICF Transportation Projects

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