

ECONOMIES OF SCALE IN CONTAINER SHIP COSTS

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Economies of Scale in the Container Fleet

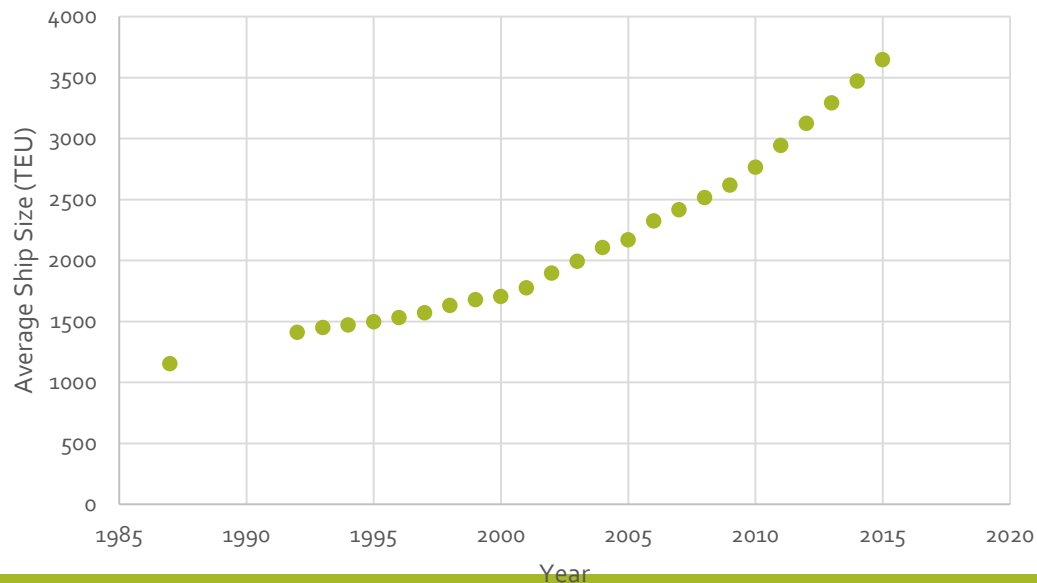
- How has the fleet changed in the past decade?
- What does the fleet look like today?
- How are capital, voyage, and operational costs influenced by ship size?

Changes in Ship Size

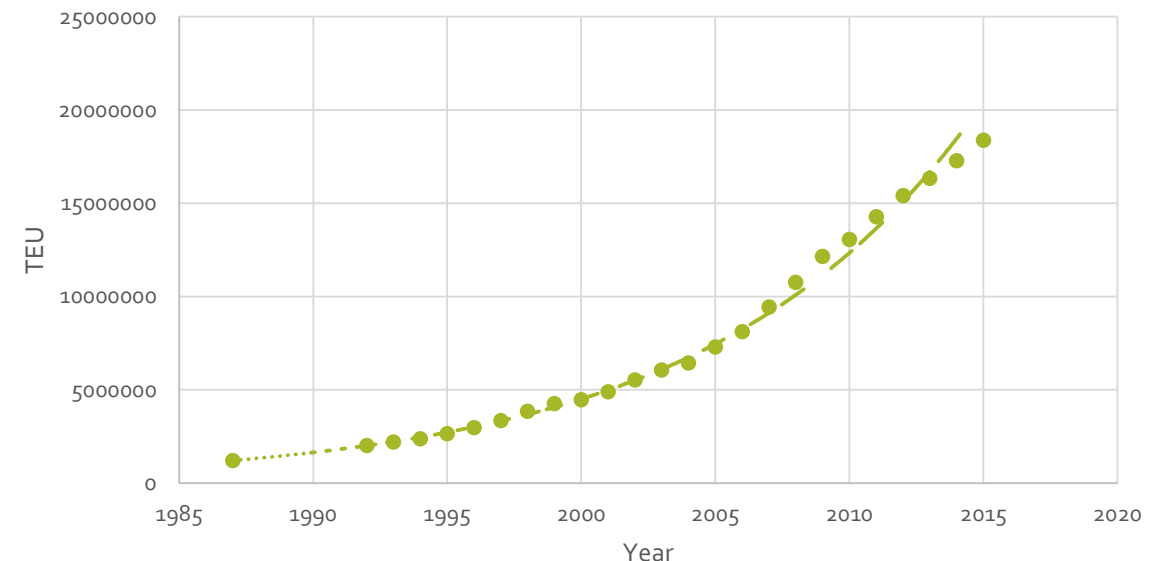
- Trend is towards larger vessels
- Mega ships have arisen in the past decade
- Records continually being broken
- Cost categories

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

Average Size of Container Ships (TEU)

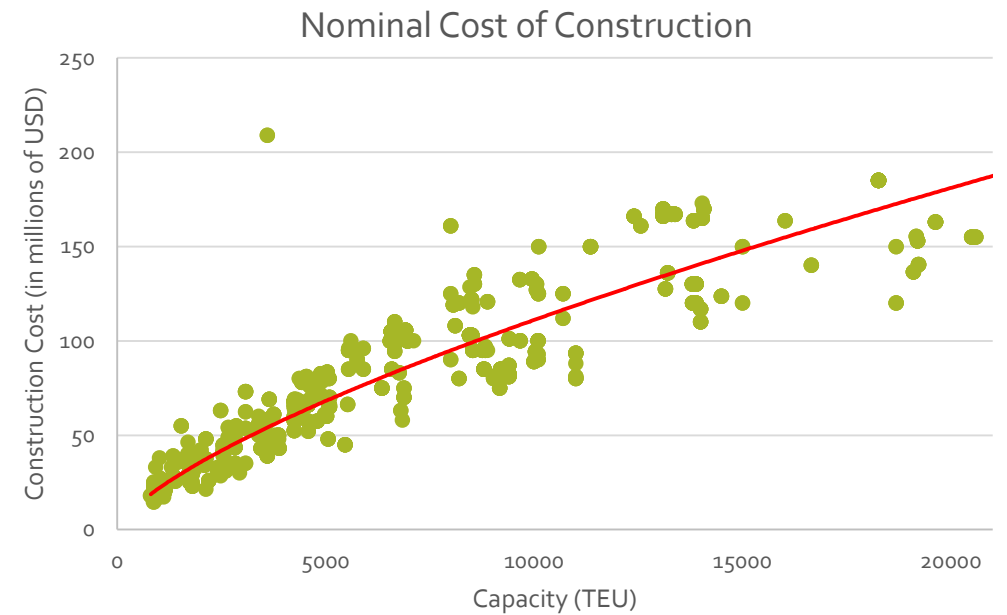
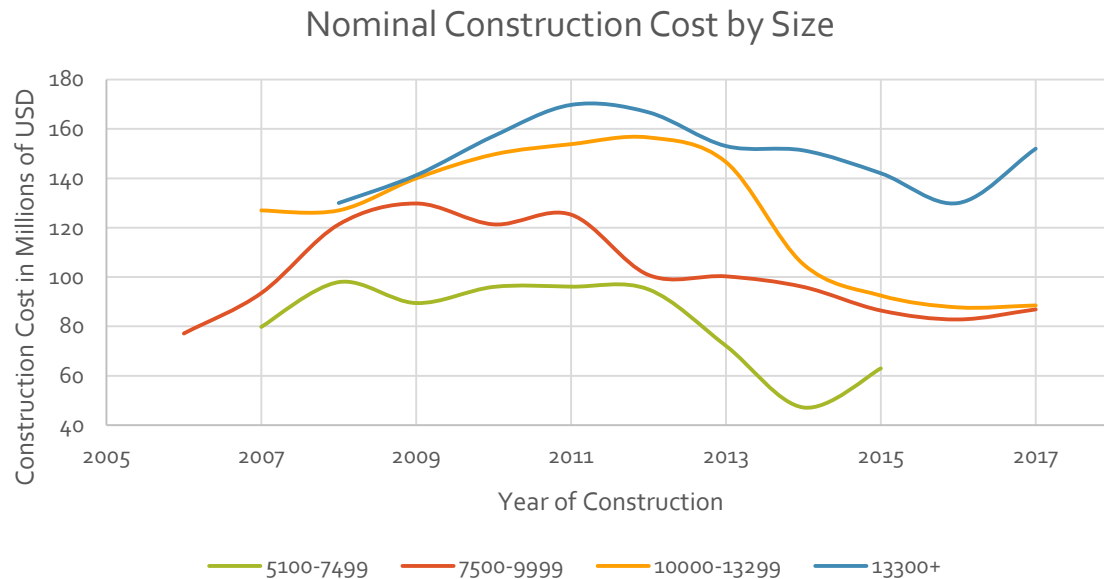


Fleet Capacity



Capital Costs

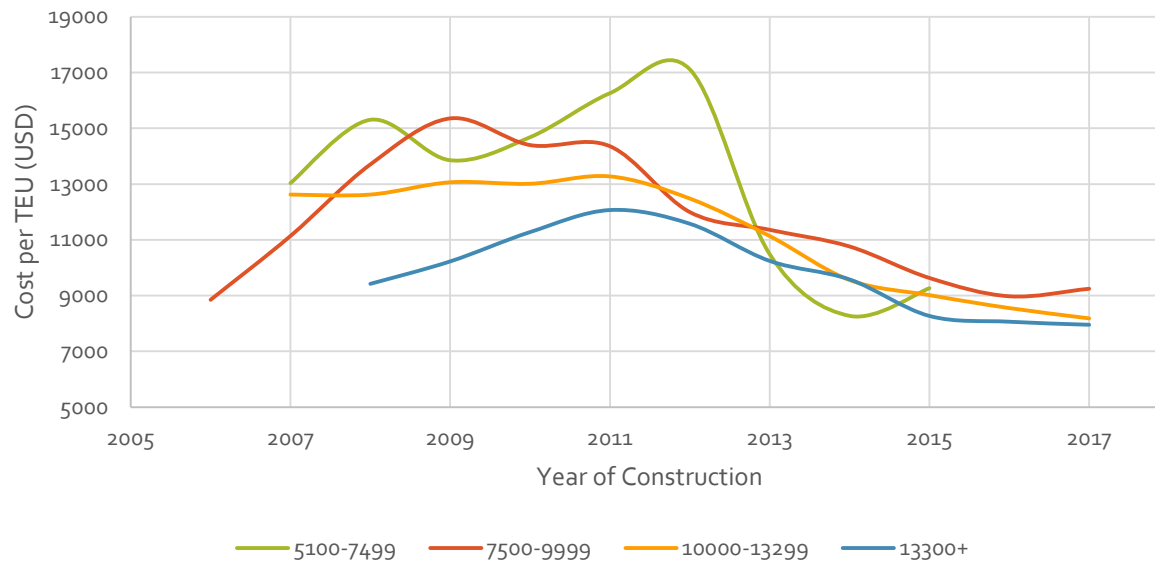
- Trend in nominal costs (larger ships cost more)
- Cost per TEU decrease as vessel size increases
- Diminishing returns



Capital Costs

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

Average Construction Cost per TEU

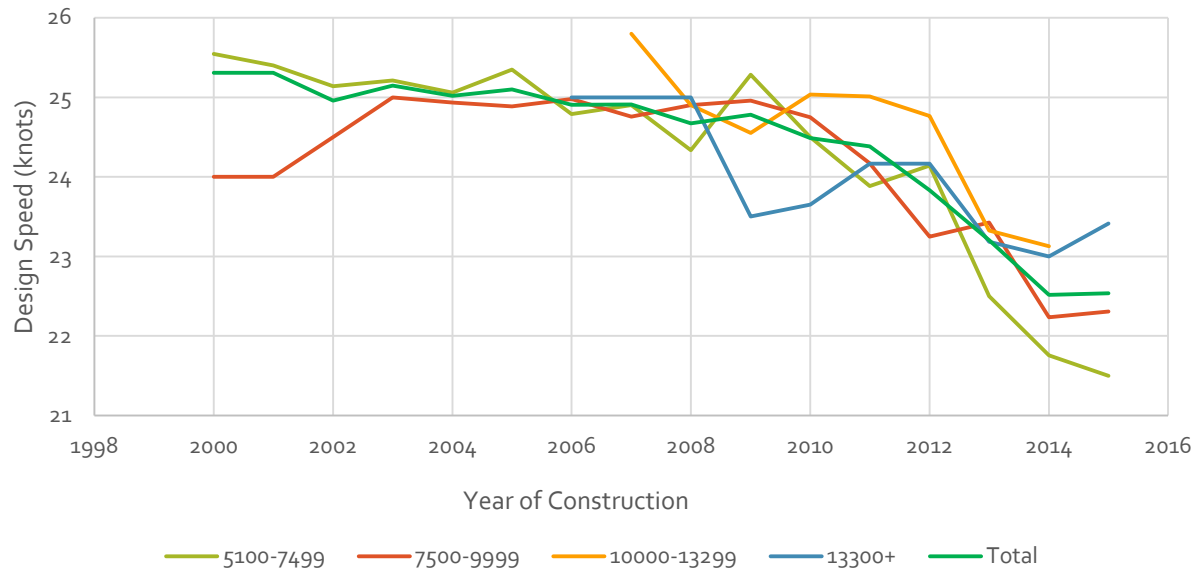


Size	Cost/TEU
0-999	\$ 23,065.11
1000-1499	\$ 20,606.62
1500-1999	\$ 19,215.59
2000-2999	\$ 16,436.43
3000-3999	\$ 16,255.45
4000-5099	\$ 14,672.54
5100-7499	\$ 13,912.16
7500-9999	\$ 11,491.36
10000-13299	\$ 11,234.63
13300+	\$ 9,298.82

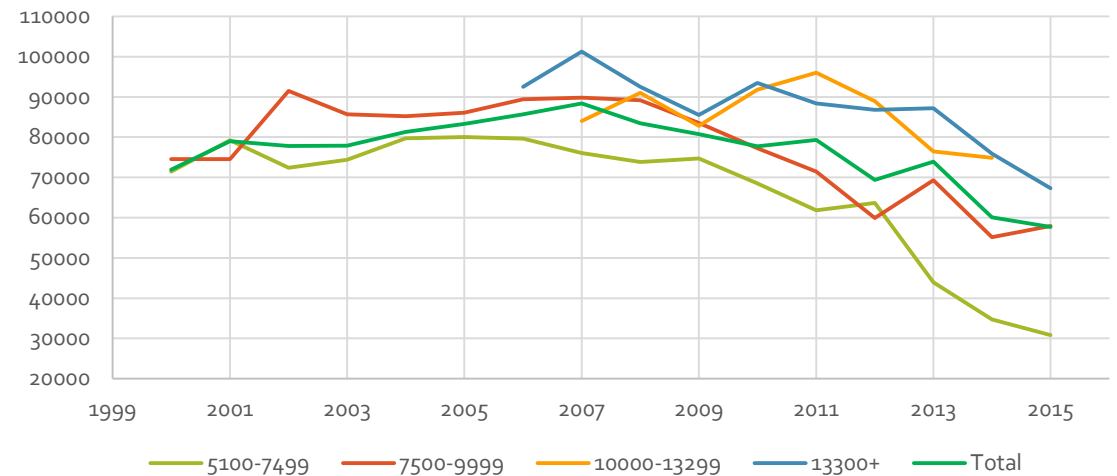
Voyage Costs

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

Change in Design Speed Over Time



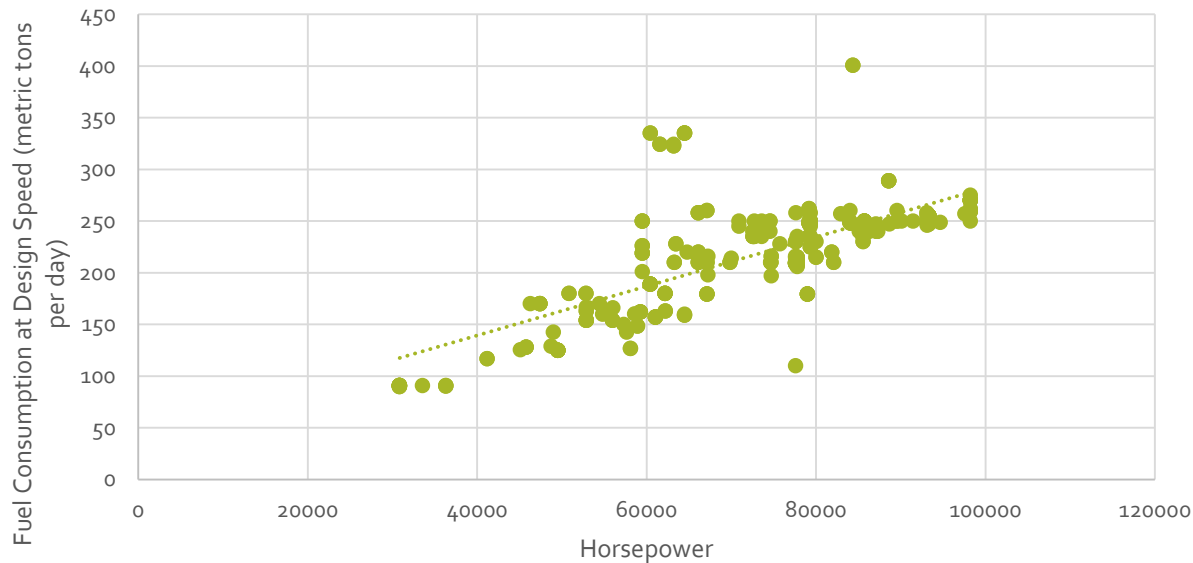
Average Horsepower



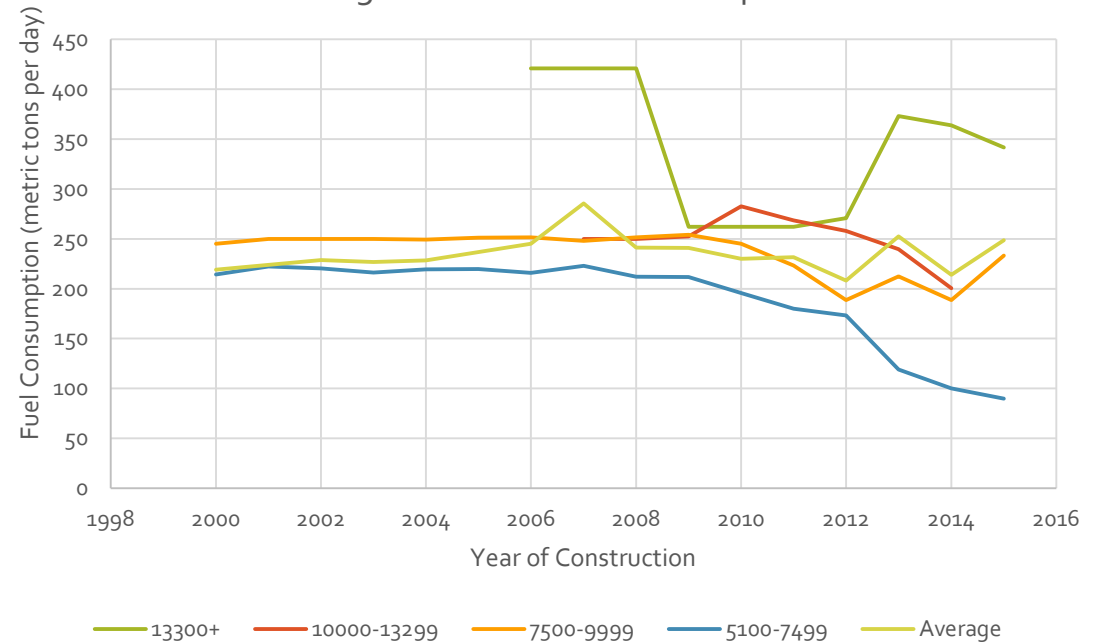
Voyage Costs

- Linear relationship between horsepower and fuel consumption

Horsepower vs Fuel Consumption

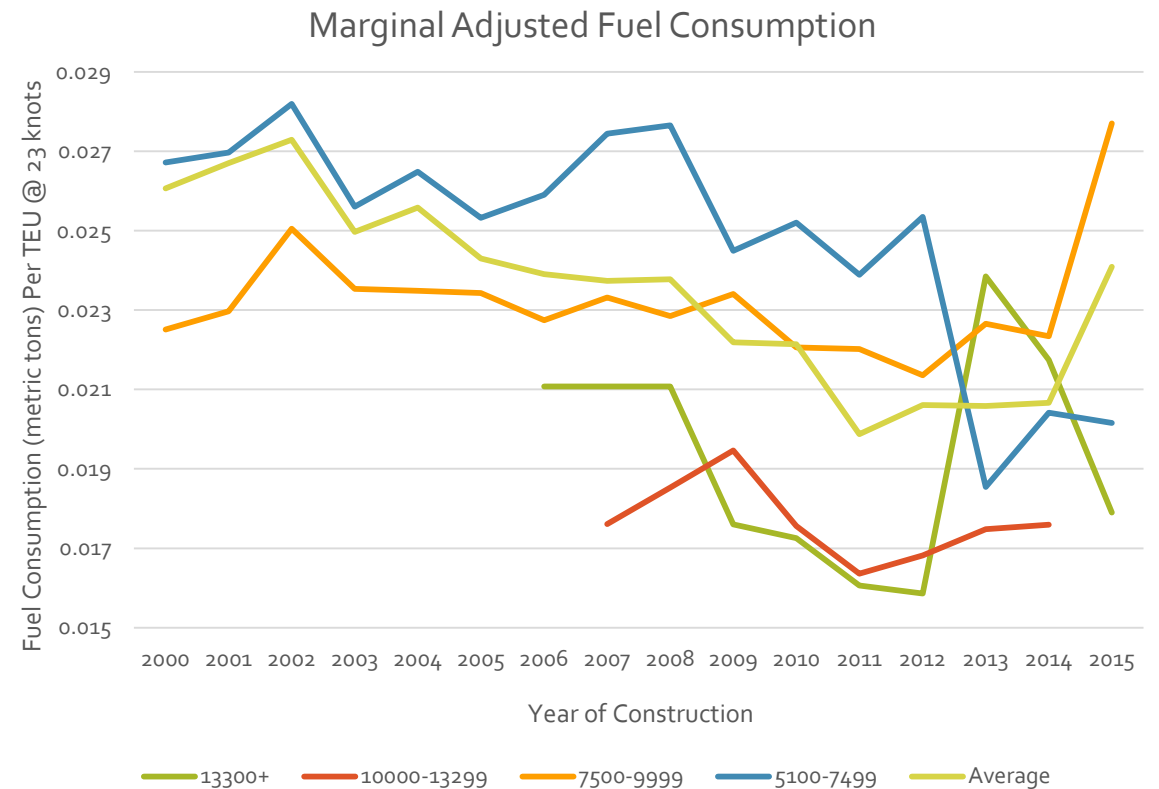
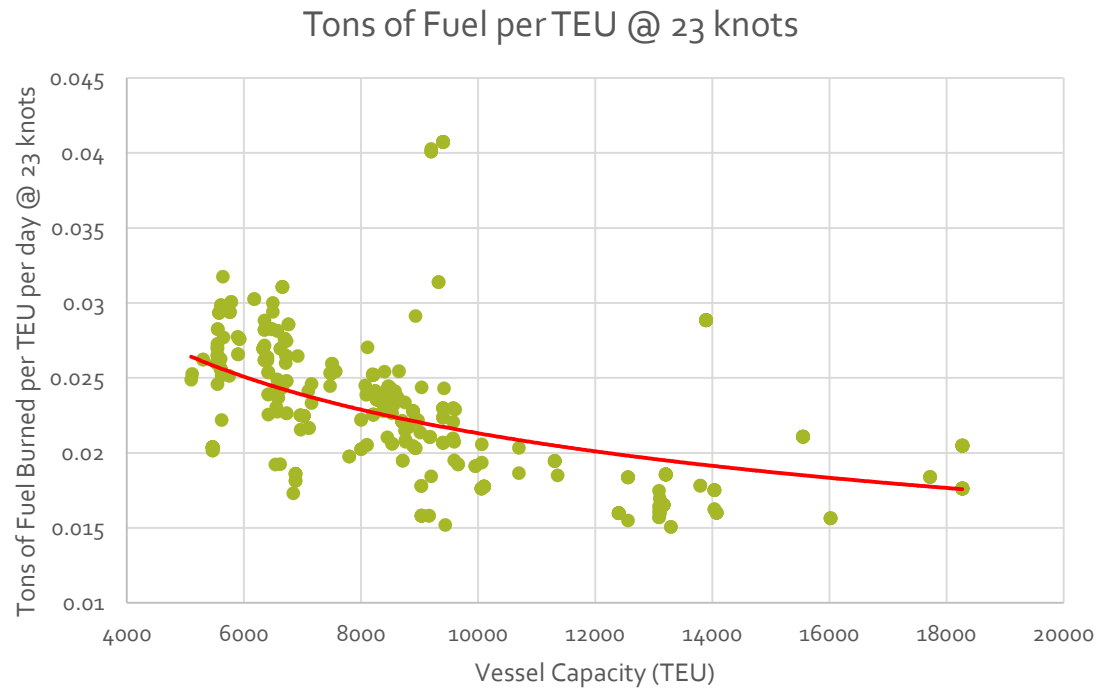


Average Nominal Fuel Consumption



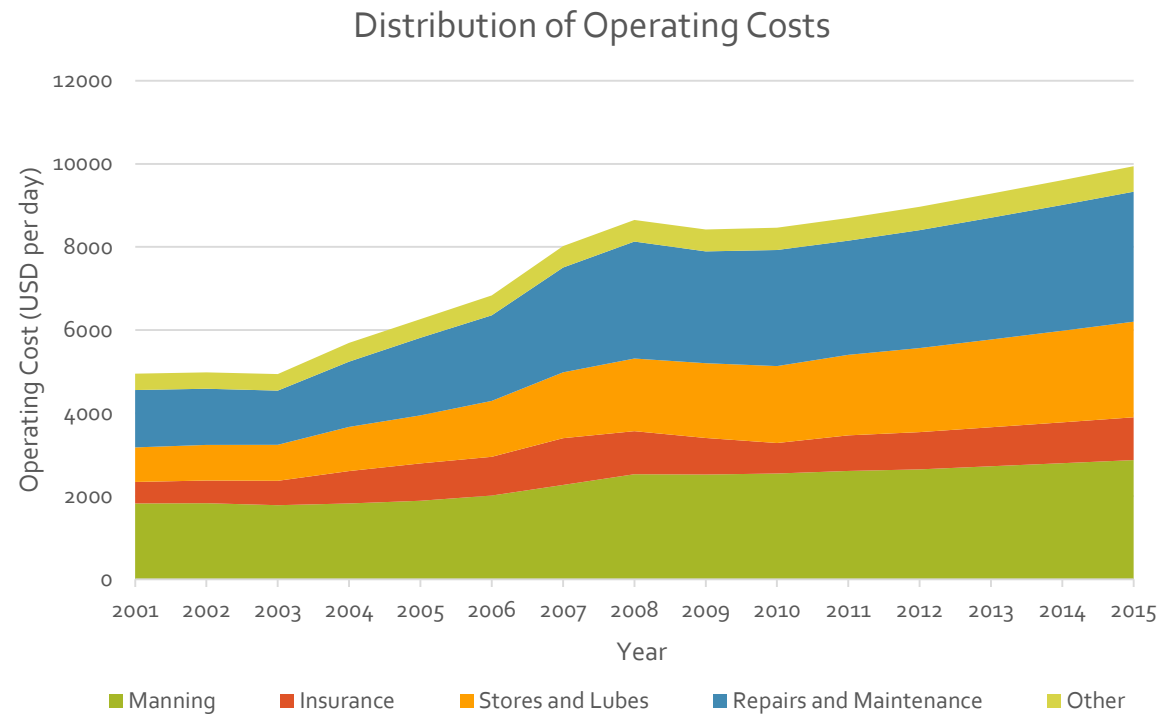
Voyage Costs

- Speed-adjusted fuel consumption comparison
- Recent trend?



Operating Costs

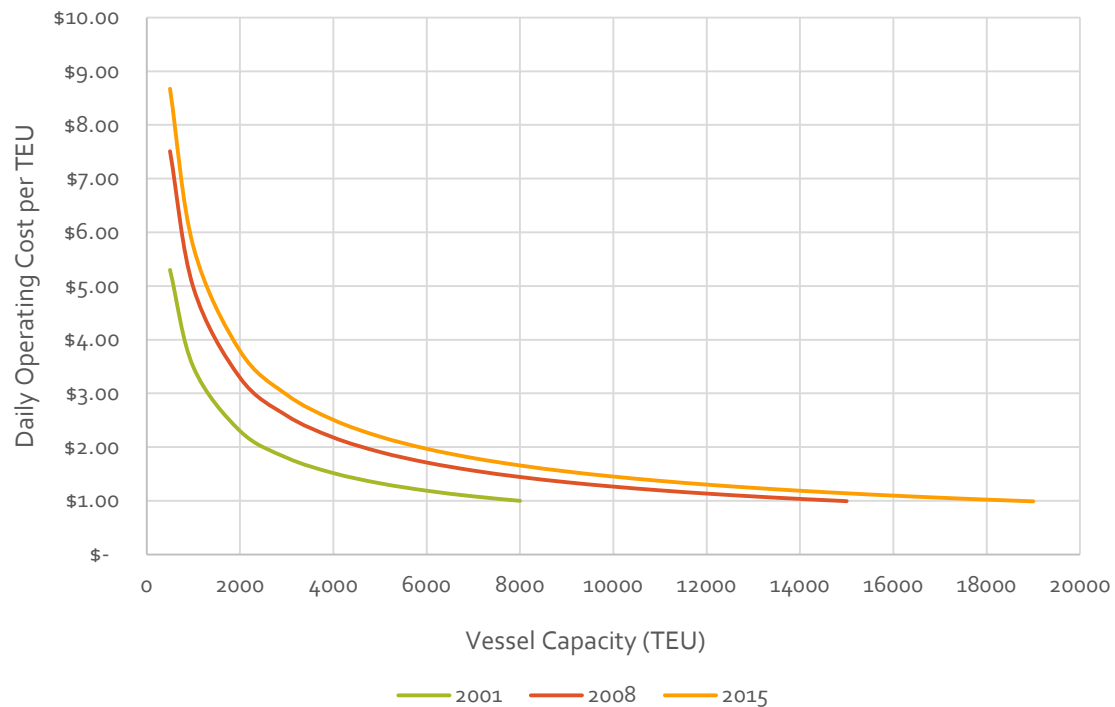
- Main categories are crewing, manning, insurance, stores and lubes, repairs and maintenance



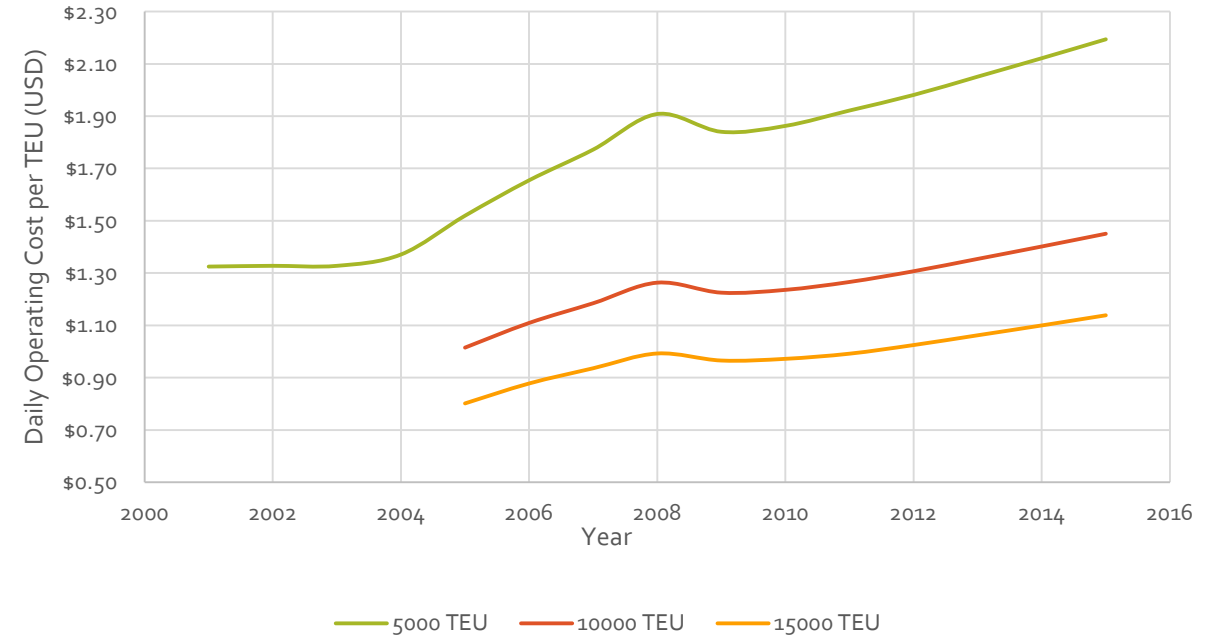
Operating Costs

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

Daily Operating Cost per TEU

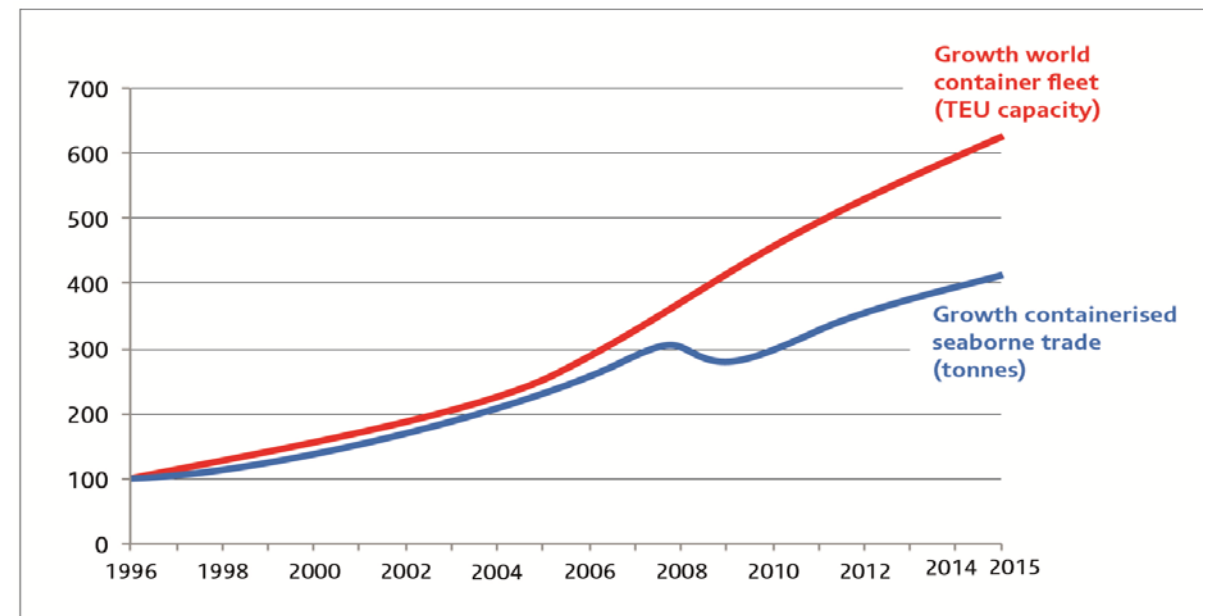


Daily Operating Cost



Conclusion

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



From ITF Report "The Impact of Mega-Ships"

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