Port Productivity

Data Insights 2019: Global, Regional, North America

Data and benchmarking creating value

JOC Events, Port Performance North America, December 10-11 2019

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Agenda

- Program, Database and Sample Size
- Productivity Development by World Region
- Ship Size and Call Size Development Trends
- Berth Productivity Development, North America
- Regional Comparison of Time Spent in Port
- Summary and Conclusions

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Database and Sample Size

- Data provided by 12 of the world's largest container ship operators who collectively operate nearly **70%** of the global cellular fleet (> 2,600 container ships)
- It is naturally skewed towards the larger vessels plying the main East-West and North-South corridors
- Data is aggregated, enhanced and verified by IHS Markit, calls or field elements considered outliers are removed
- Historical AIS and ship registry data is integrated to create a comprehensive and unique database, with historical records dating back to 2016 and before (*in 2016 we implemented many additional items of data*)
- The database for the study period, 2017H1 and 2019H1 consists of:

Aspect	Ports	Port Calls	Container Moves	Approximate TEU
Total Database	439	173,403	212.5 million	340 million
Asia, Europe and North America	255	128,953	161.1 million	258 million
Asia, Europe and North America 'Main Ports'	49	92,007	132.9 million	213 million
Asia, Europe and North America share of database	58%	74%	76%	n/a
Main Ports share of Total Database	11%	53%	63%	n/a

The 49 'Main Ports'

Asia	Europe	North America	Hubs
DALIAN	AMBARLI	CHARLESTON	ALGECIRAS
GUANGZHOU	BARCELONA	HOUSTON	BUSAN
NINGBO	GENOA	LONG BEACH	HONG KONG
QINGDAO	HAIFA	LOS ANGELES	KAOHSIUNG
SHANGHAI	MERSIN	NEW YORK & NEW JERSEY	MARSAXLOKK
SHEKOU	VALENCIA	OAKLAND	PIRAEUS
TIANJIN	ANTWERP	PORT OF VIRGINIA	PORT KLANG
XIAMEN	BREMERHAVEN	SAVANNAH	PORT SAID
YANGSHAN	FELIXSTOWE	VANCOUVER (CANADA)	SINGAPORE
YANTIAN	GDANSK		TANGER-MEDITERRANEAN
CAI MEP	HAMBURG		TANJUNG PELEPAS
CAT LAI	LE HAVRE		YOSU (KWANGYANG)
LAEM CHABANG	ROTTERDAM		
MANILA			
TANJUNG PRIOK	All handled more than 1 million TEU in the period		

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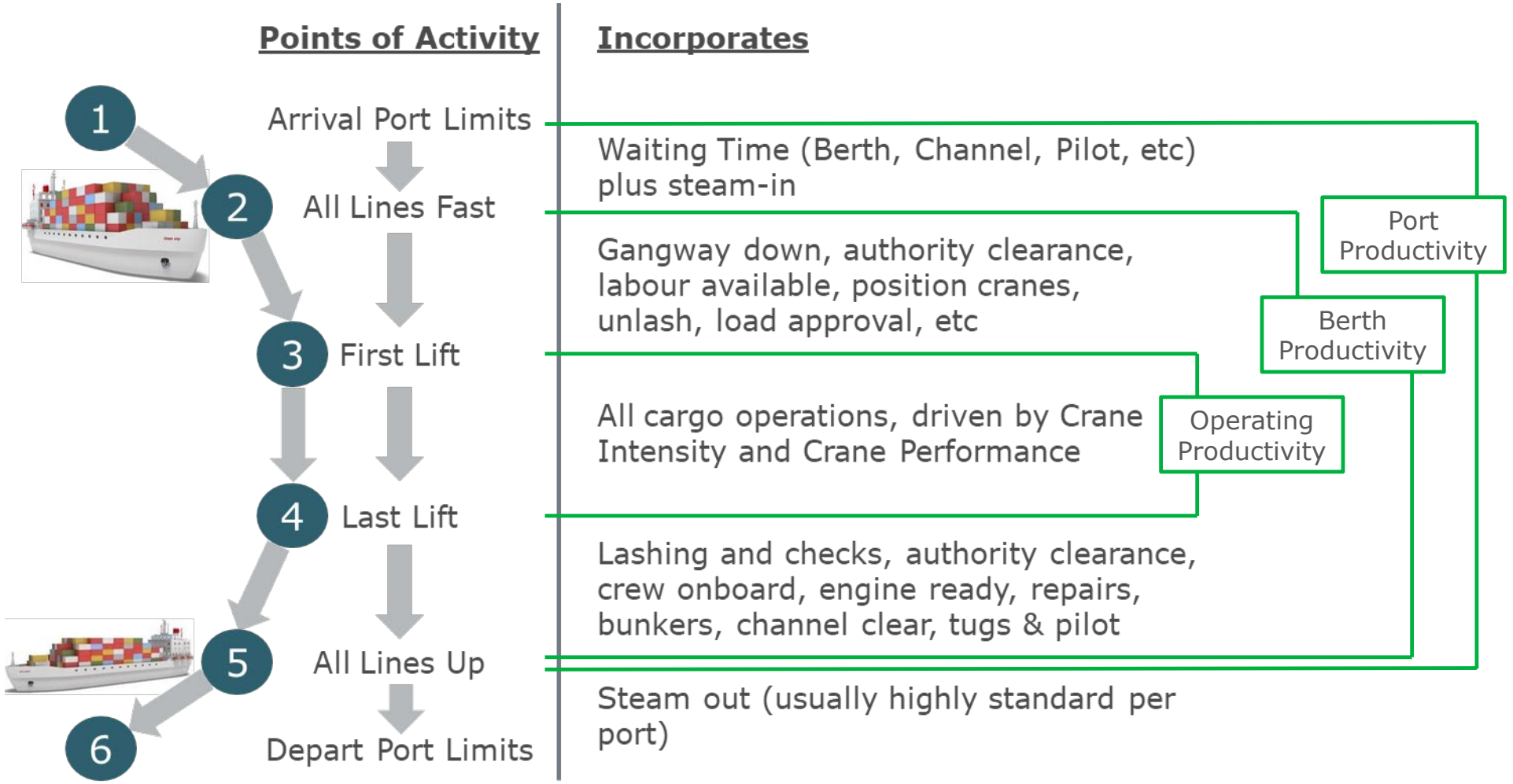
Different components of a port stay can be benchmarked



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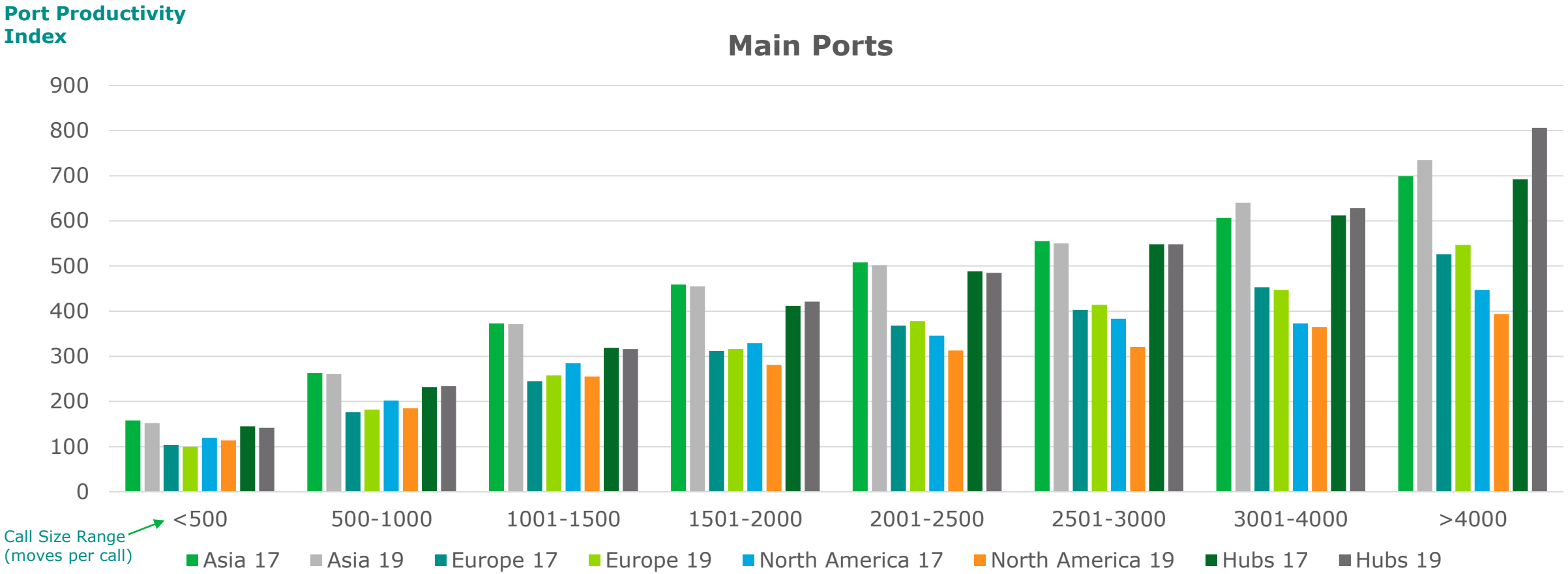
Global Port Productivity Development



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Ship Size and Call Size Development

Region	2017 Ship Size (TEU)	2019 Ship Size (TEU)	Change	2017 Call Size (Moves)	2019 Call Size (Moves)	Change
Asia	5,772	6,126	6.1%	1,181	1,299	10.0%
Europe	4,892	5,414	10.7%	1,076	1,236	15.0%
North America	5,900	6,673	13.1%	1,495	1,785	19.4%

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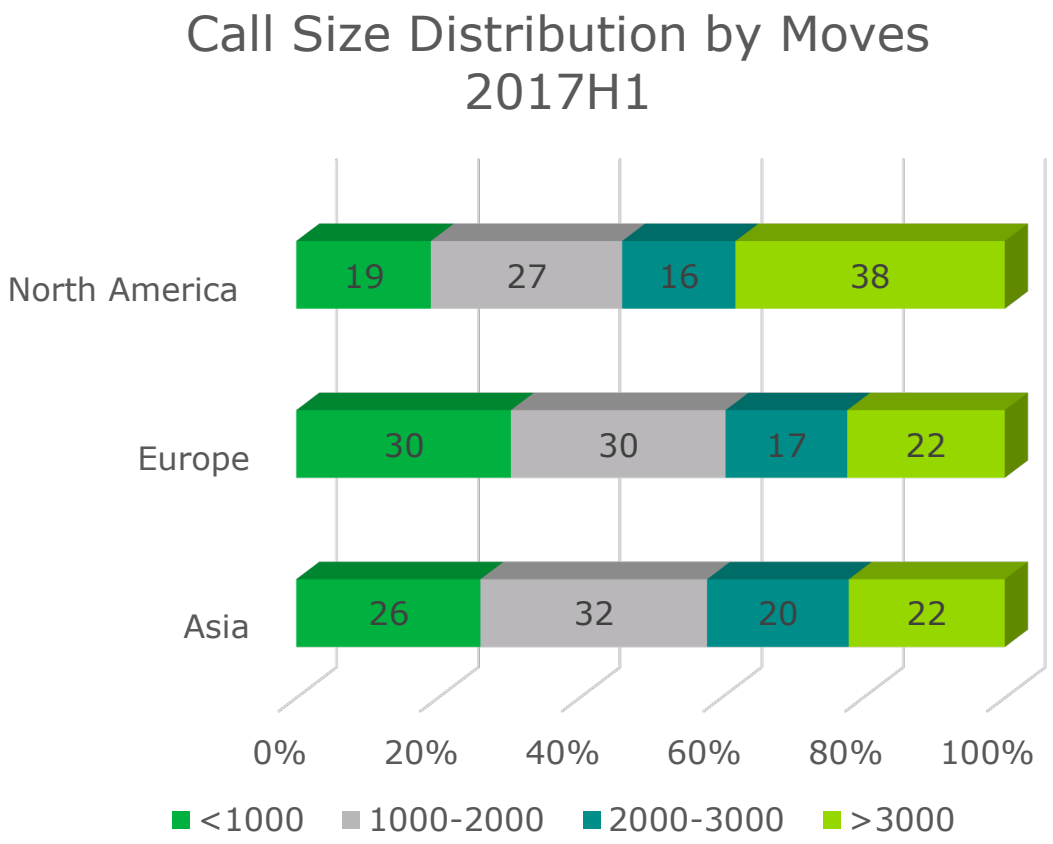
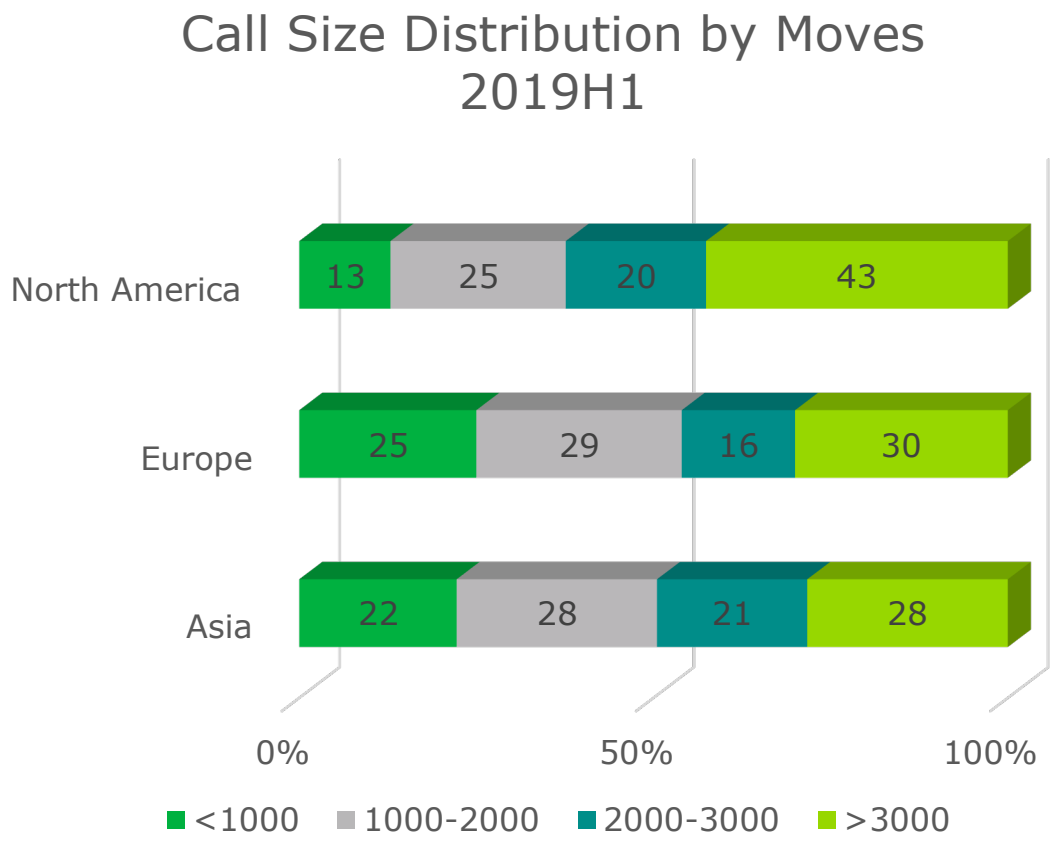
Call Size Distribution by Moves





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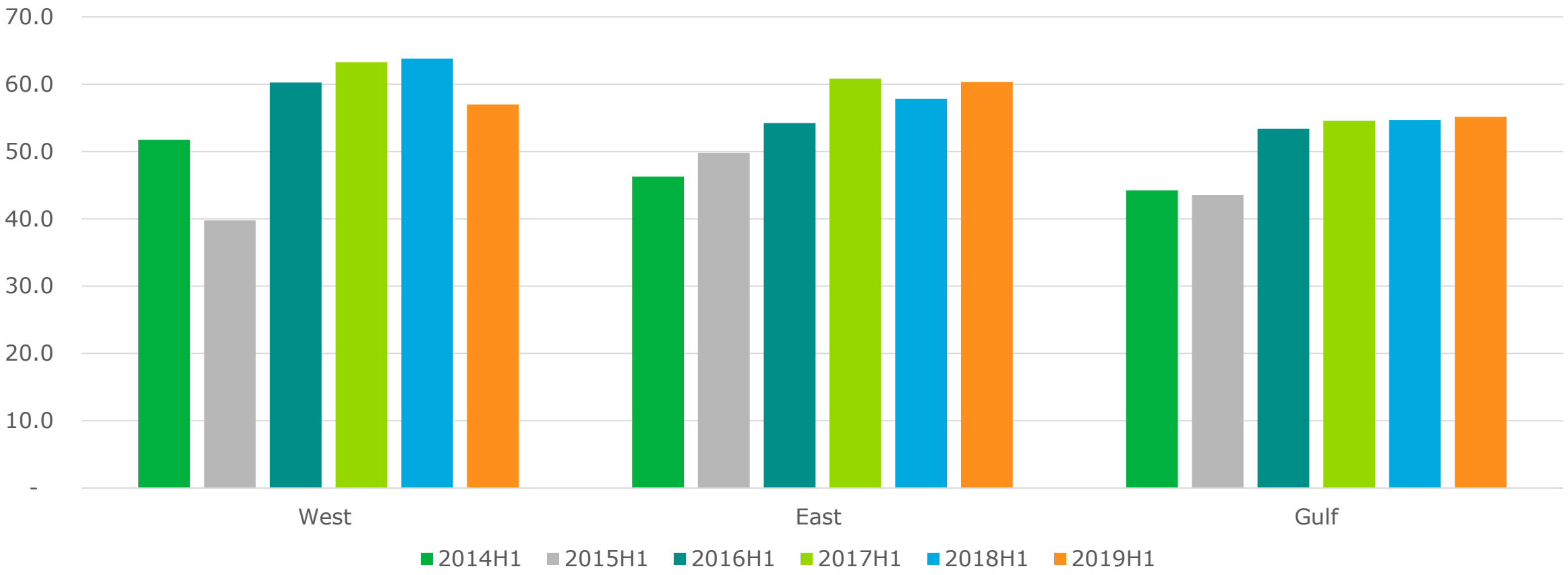
Berth Productivity Development



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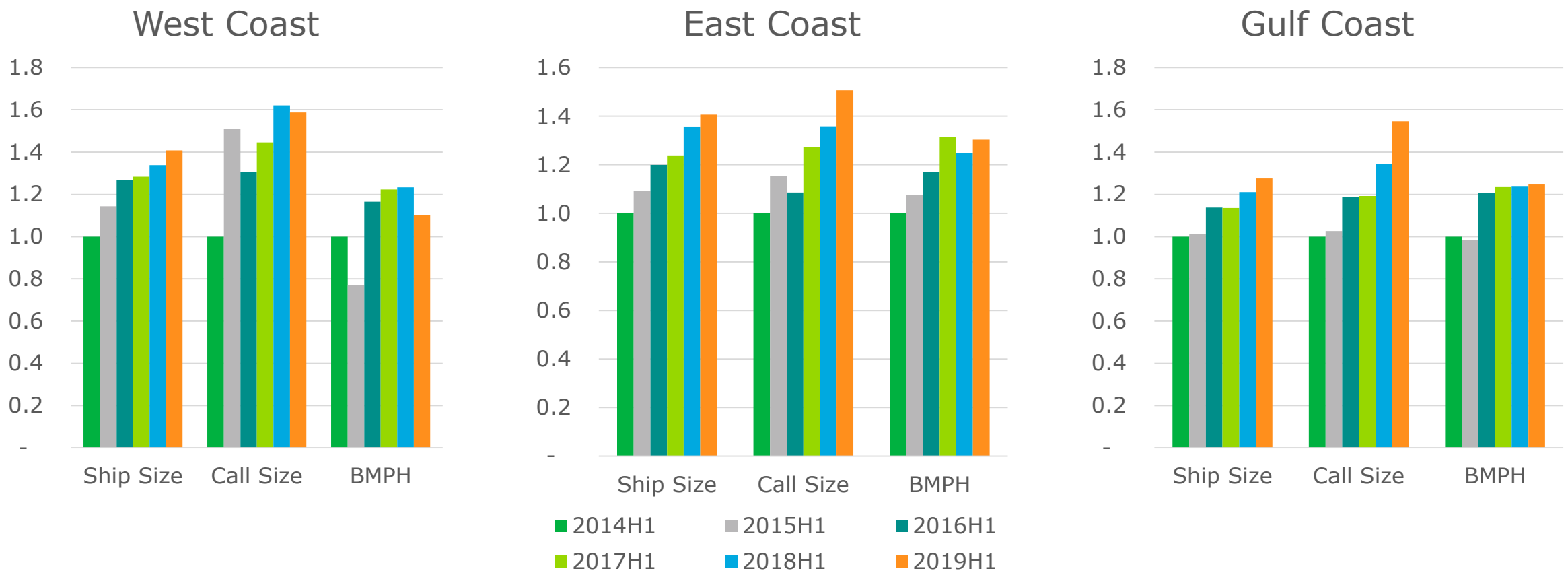
Ship Size v. Call Size v. BMPH Growth Index



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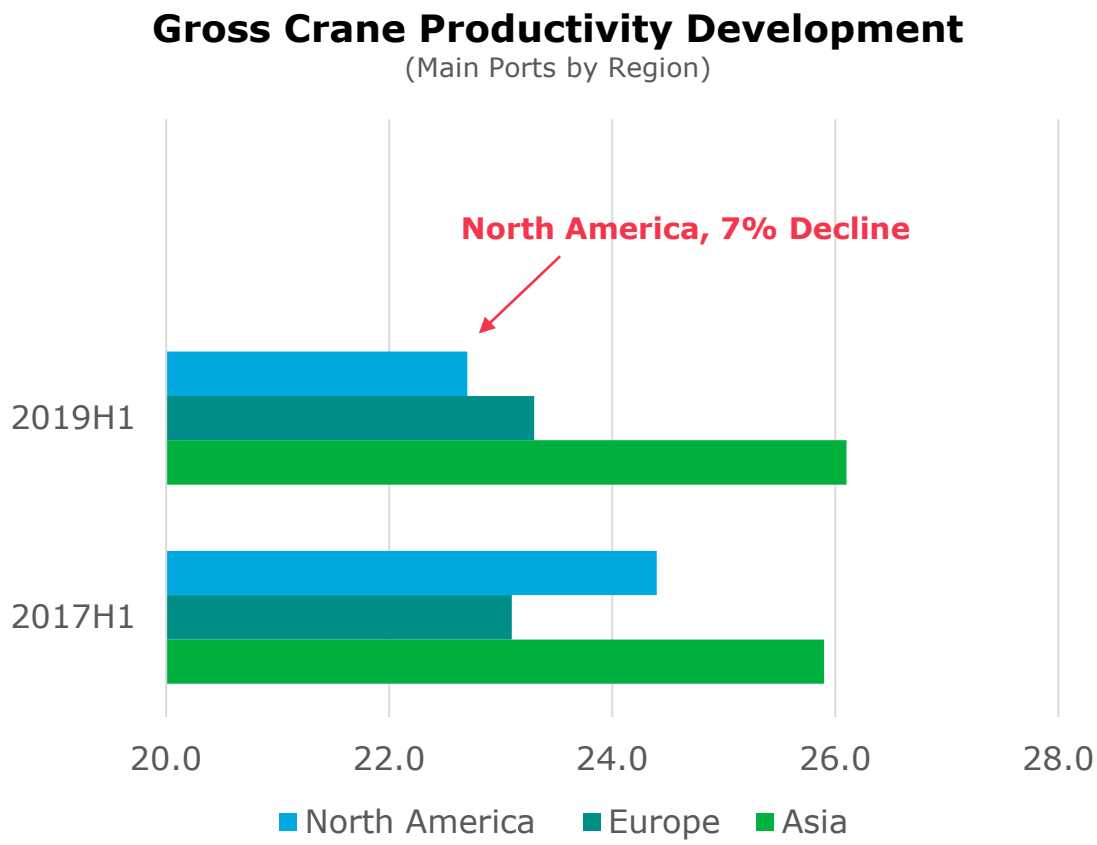
Crane Productivity Can't Keep Pace…

- Ship capacity growth mainly achieved through width and height (and depth) growth, and less so through length. Each bay holds far more containers
- Inability of **Crane Intensity** keeping pace with **Call Size** could be (somewhat) mitigated through higher crane productivity
- This is not happening. The result is **longer operating times**, which prolongs overall vessel port stays
- Vessels need to **steam faster** to make up for additional hours in port
- Which means **higher fuel consumption**
- And **increased GHG emissions** per nautical mile sailed



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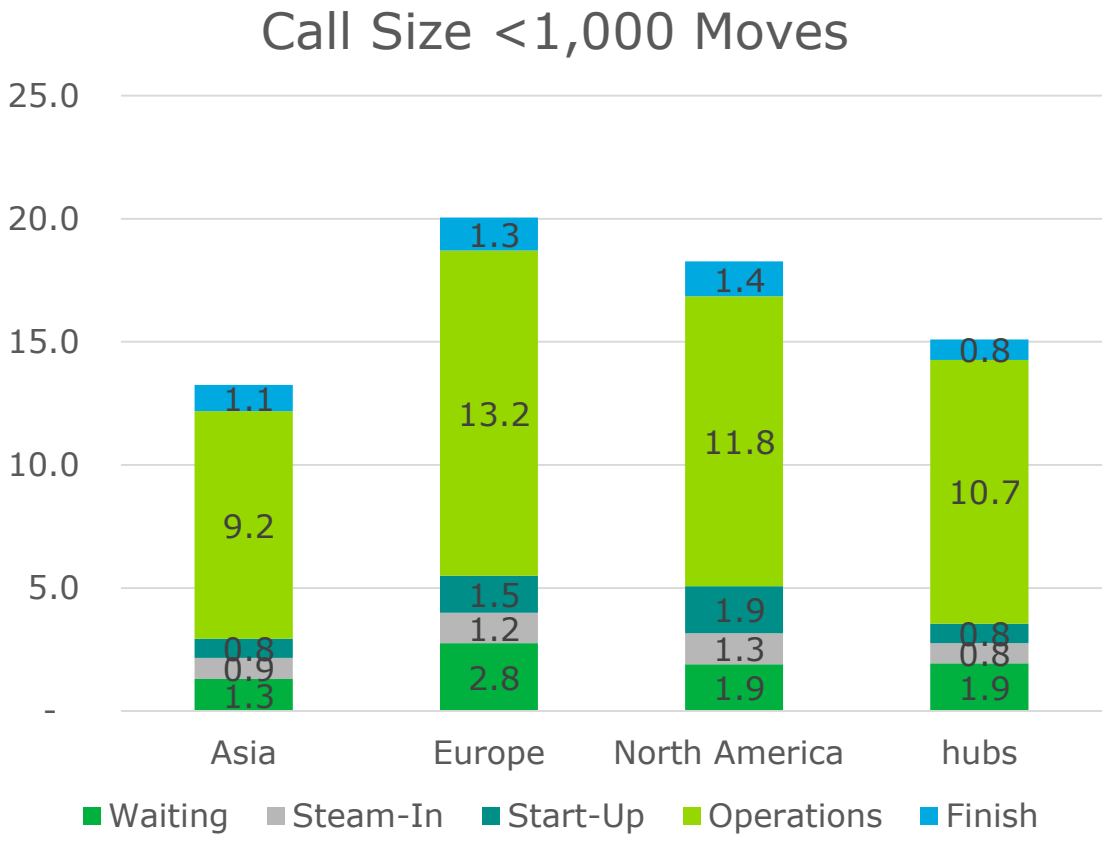
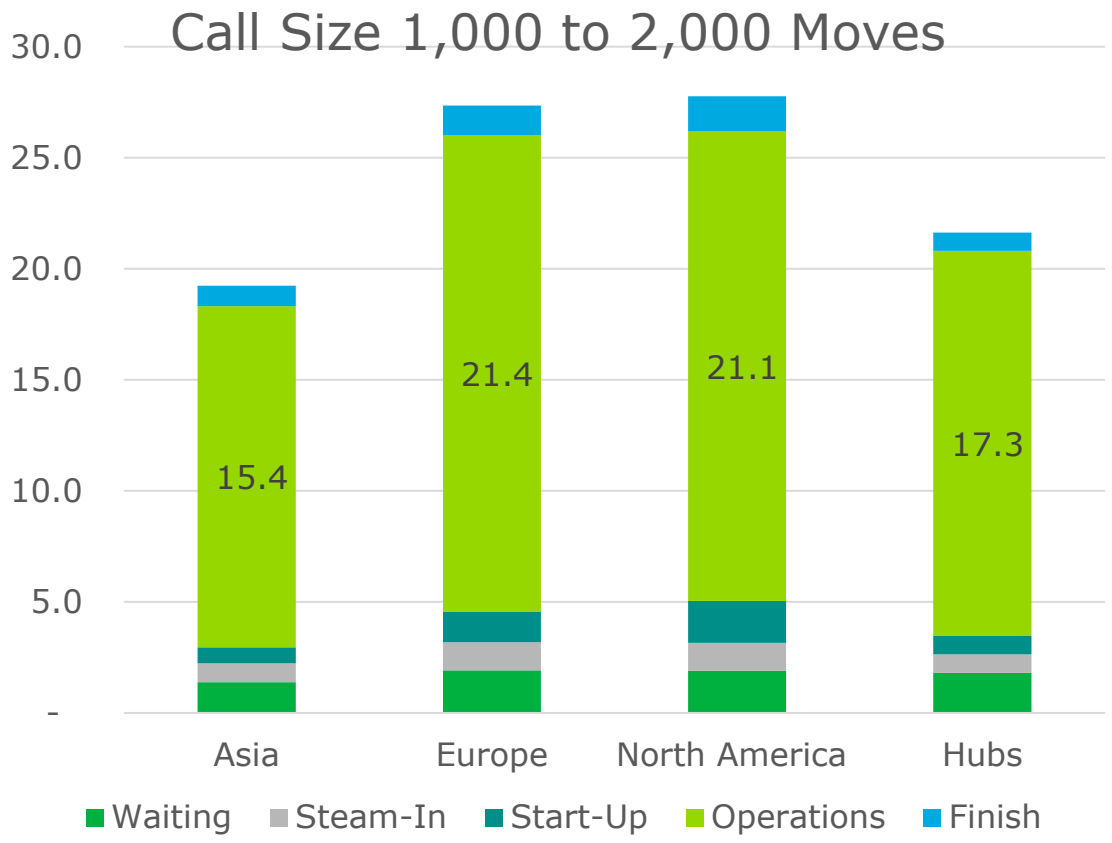
Time Spent in Port (2019H1)





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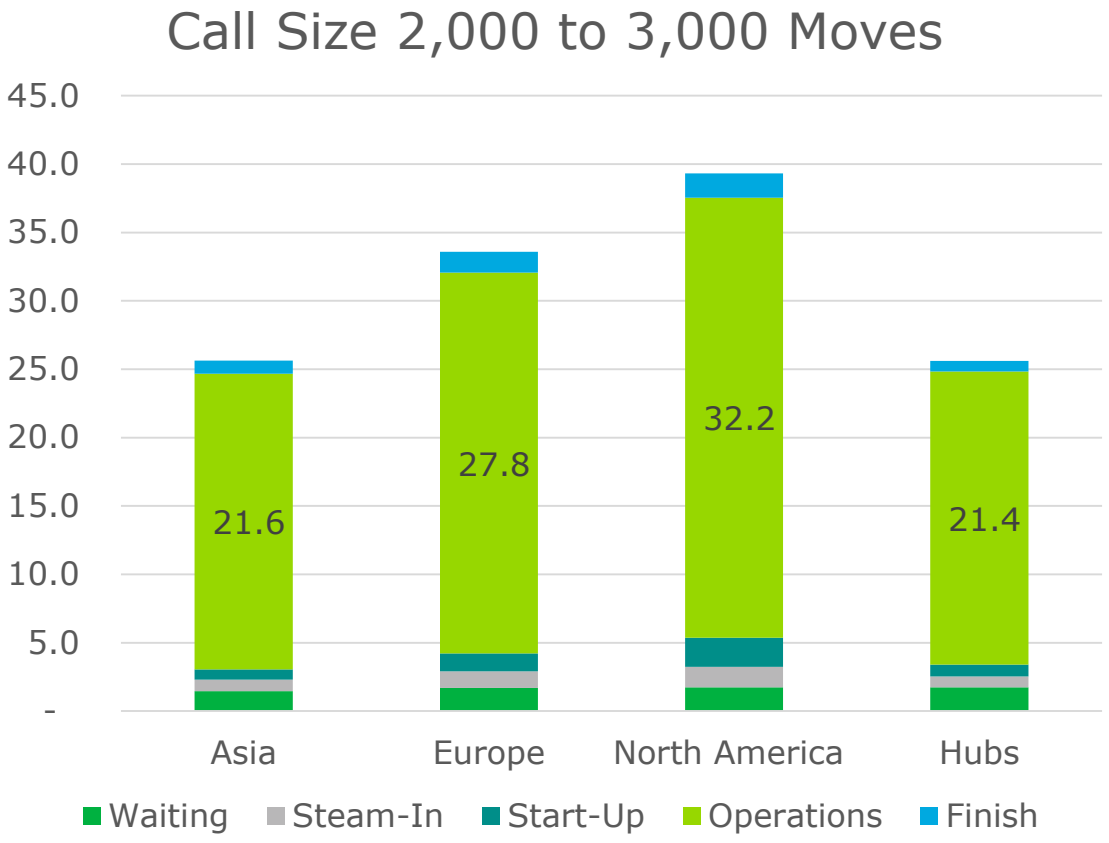
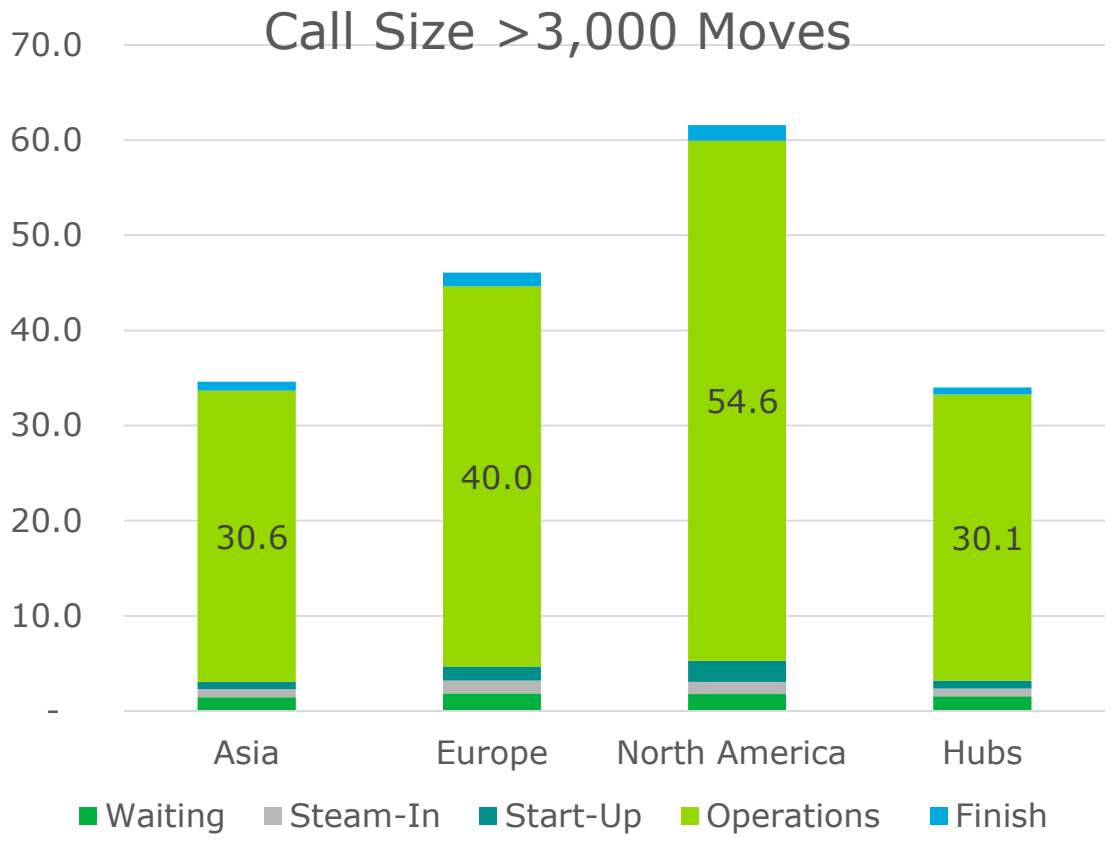
Time Spent in Port (2019H1)





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Summary and Conclusions

- Between the world's regions, there are differing levels of Port Productivity
- Call Size out grows Ship Size (Capacity), and both are likely to continue to grow in the short to medium terms
- Crane Intensity is challenged to keep pace with Call Size growth
- In North America, a decline in work rate per crane means growth in berth productivity is well behind call size growth
- That means vessels are spending more time in port
- Comparing time-in-port by region, we can see that improvements are possible, focus areas should be:
    - Gross Crane Productivity
    - Start-up and Finish processes
    - Reducing ship Idle/Waiting time
    - Improving stakeholder collaboration / data exchange to improve operations and facilitate JIT arrivals
- These improvements are unlikely to happen by chance…

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Thank you for your time

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Weighting and Relative Productivity benchmarking

Why is it necessary to weight productivity metrics (by call size)?

- Around 80% of a port call (as a global average) is consumed by Terminal Operations (the time between first and last container lifts).
- Generally the quantity of container moves ('call size') is a key determinant of how many cranes will be deployed. This is then also constrained by; ship operator's crane split, crane availability and crane density.
- Standard practice is to deploy one crane for every 500 container moves. This means a call size of 1,500 moves would be assigned three cranes and a call size with 2,000 moves might receive four cranes.
- All other things (mainly gross crane productivity) being equal, a 2,000-move operation would naturally operate 25% faster than one of 1,500 moves. Weighting Operating Productivity by call size to benchmark on Relative Operating Productivity ensures that we compare apples with apples.
- Once a call size goes beyond 4,000 moves, there is no further correlation between call size and crane intensity, and therefore the weighting is less relevant.

What is the weighting methodology?

- Two methods exist, depending upon whether we are comparing productivity between periods or between individual or groups of ports or terminals:

Periodic Benchmarking

$$\frac{\text{Previous Period Actual Productivity}}{\text{Previous Period Call Size}} \times \text{Current Period Call Size}$$

Compared against Current Period Actual Productivity

Locational Benchmarking

Port	Actual Productivity	Call Size	Relative Productivity
A	100.0	1,000	125.0
B	120.0	1,500	100.0
Average	n/a	1,250	n/a

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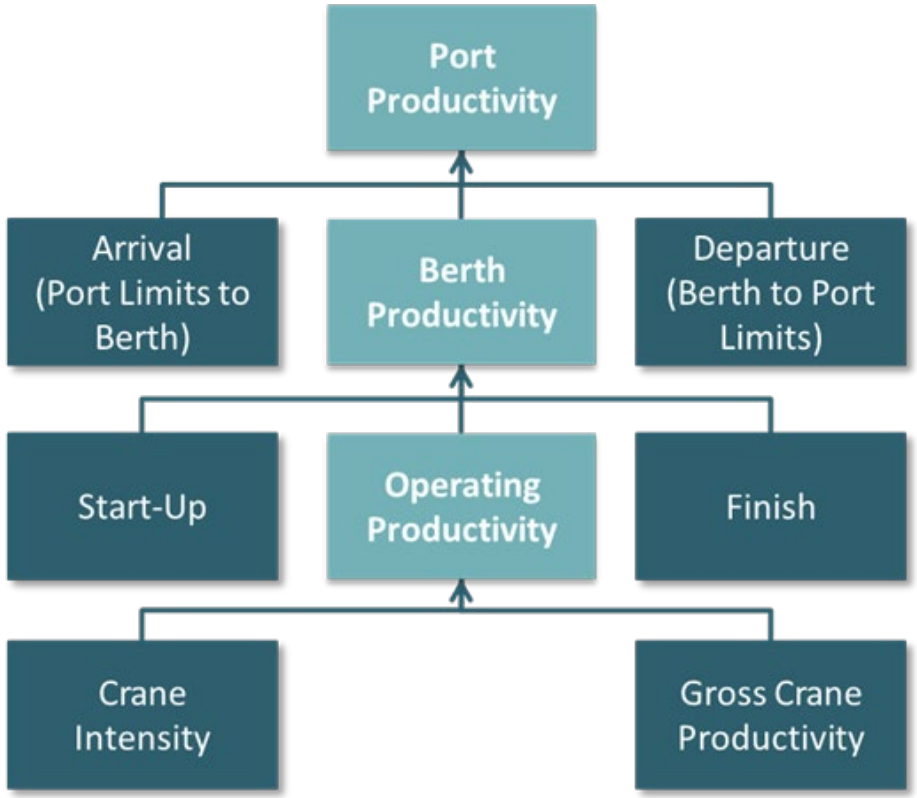
Productivity KPI Tree

The ultimate productivity benchmark for a ship operator is Port Productivity, which capture the entire port time consumed by a vessel or a group of vessels

In order to find improvement levers, further analysis into the various components of Port Productivity is required



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Definitions applied

During meetings and workshops with the participants previously, the following definitions were agreed to be the most objective.

Name	Description
Call Size	Total (or average) container moves per ship call: Discharge + Load + Ordered Re-Stowage.
Port Hours	Total elapsed time between vessel arrival at the port limits (as per IHS Markit AIS data and mapping) to when the last line is released at departure from the berth.
Berth Hours	Total elapsed time between all lines made fast on arrival to last line released at departure from the berth.
Operating Hours	Total time elapsed between when the first and last container moves are completed.
Gross Crane Hours	A summed total of all hours of all cranes deployed per the port call - each from first to last container moves - and not deducting any downtime.
Crane Intensity	Average quantity of quay cranes deployed during the port stay: Gross Crane Hours / Operating Hours.
Port Productivity	Call Size / Port Hours
Berth Productivity	Call Size / Berth Hours
Operating Productivity	Call Size / Operating Hours
Gross Crane Productivity	Call Size / Gross Crane Hours

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