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An evaluation of current trends in container shipping industry, very large container ships (VLCSs), and port capacities to accommodate TTIP increased trade

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Abstract

The Transatlantic Trade and Investment Partnership (TTIP) will increase containerized cargo flows on the Atlantic route. This increase will have to be accommodated by ports, terminals, and ships. The introduction of Very Large Container Ships (VLCS) and Ultra Large Container Ships (ULCS) changes shipping patterns and requires port expansions. Mutual relations among trade, shipping patterns, larger vessels, and port capacities are addressed. This paper makes a judgement if port and shipping capacities are sufficient to accommodate TTIP stimulated growth of maritime container shipments between the U.S and European ports.

Peer-review under responsibility of Road and Bridge Research Institute (IBDiM)

Keywords: VLCS; ULCS; container; TTIP

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1. Introduction

The container ocean shipping market quickly reacts to fluctuations in the World trade patterns. The Transatlantic Trade and Investment Partnership (TTIP) is expected to increase trade between U.S and Europe, and containerized cargo flows on the Transatlantic route. This increase will have to be accommodated by ports, terminals, and ships. The introduction of Very Large Container Ships (VLCS) and planned deployment of Ultra Large Container Ships (ULCS) changes shipping patterns and requires port expansions, and upgrades. Mutual relations among trade, shipping, larger vessels, and ports have to be addressed to assess if the projected larger trade flows created by TTIP can be efficiently shipped and accommodated by the U.S and European ports.

U.S. trade shipped via European ports. The current U.S. containerized trade shipped through European ports amounts to more than 4.7 million 20-foot equivalent units annually (in the 12-month period ending March 2015). It includes about 1.9 million TEUs in U.S exports and more than 2.8 million TEUs in U.S. imports. Import shipments represent 59.3 percent of this trade. The annual rate of growth for containerized U.S. maritime imports to European ports amounts to almost 10 percent while exports tumbled compared to the previous year by 4.6 percent. A number of ocean carriers serve this route. Mediterranean Shipping Co. (MSC) held a 26.3 percent share of the overall trade. Hapag-Lloyd after merging with Chilean carrier CSAV in 2014, held 18.3 percent of the U.S – Europe trade. Maersk Line, the world's largest container carrier in terms of capacity, was the third-largest carrier in the U.S. containerized trade via European ports, with a 11.2 percent market share. These three largest ocean carriers together controlled 55.8 percent of this market. They together increased containerized cargo volumes by 7.3 percent in the analyzed period. Other major Transatlantic route players were CMA CGM Group which ranked fourth with a 6.3 percent market share, and Hong Kong's OOCL which ranked fifth with 5 percent of the trade. In terms of annual growth for the period ending March 2015, CMA CGM was the fastest-growing Top 10 carrier in this market, with 18 percent growth in U.S. trade, led by 21.5 percent annual growth in U.S. imports and 12.3 percent in U.S. exports. An effective niche carrier Independent Container Line of Antwerp (ICL) was second-best among the top 10 Transatlantic carriers in terms of growth. Its U.S. import shipments were up 15.8 percent annually. This resulted in the overall 13.4 percent annual growth of this carrier's U.S. ocean containerized trade through European terminals. Salisbury (2015), Baker (2015), Illing (2015).

U.S. Containerized Ocean Trade with European Countries. Overall U.S. container trade with European countries increased 5.1 percent annually to nearly 4.7 million TEUs in the twelve-month period ending March 2015. The U.S. exports to European countries slipped compared to the previous year to 1.8 million TEUs, U.S. imports form European states, representing 60.7 percent of ocean containerized trade increased significantly. The rate of growth was 9.6 percent in 12 months which resulted in total shipments of more than 2.8 million TEUs. Four European countries were major trading partners for the U.S. and had a double-digit market share in ocean containerized U.S. trade. Germany was the largest U.S. trading partner with 19.2 percent of the total trade and ranked first in U.S. imports. Belgium was second with 12.8 percent of the total trade and was top-ranked in U.S. exports. Italy was third with an 11.1 percent market share (total ocean trade), and the Netherlands was fourth with 10.4 percent of the market. By country, major European importers of ocean going containerized cargo were: Belgium, Germany, U.K., Netherlands, Turkey, Italy, and Spain. Major exporters to the U.S. were Germany, Italy, Belgium, Netherlands, France, U.K., Spain, Turkey, and Poland. Poland was the fastest-growing trading partner with 12.1 percent growth in the overall U.S. trade via European ports, followed by Germany with 10 percent growth. Spain was the fastest-growing destination for U.S. exports via European ports, with 10.6 percent year-over-year growth. Turkey was the fastest-growing source for U.S. imports via European ports spiking 25.8 percent year over year growth. Salisbury (2015). The shown data indicate that: a) ocean containerized cargo transshipments in the U.S. – Europe trade are insignificant, b) there is a significant imbalance in ocean cargo containerized shipments in the Transatlantic route U.S. – Europe, with U.S. imports higher by about 0.9 million TEUs annually. Salisbury (2015), Baker (2015), Illing (2015).

2. U.S and European Ports

Major U.S. Ports. Major U.S. ports in Transatlantic container trade are the Port of New York and New Jersey, which accounted for 26.5 percent of the trade in the twelve months through March 2015. Three other largest ports (or port groups) also held double-digit market shares: Virginia Ports Authority, 13.8 percent; Houston, 13.4 percent; and

South Carolina Ports, 12.2 percent. Other important ports were: Georgia Ports, Oakland, Baltimore, New Orleans, Los Angeles, Delaware River Ports and North Carolina Ports. This indicates that the U.S East Coast ports do not have a monopoly in serving the U.S. transatlantic trade. The U.S. West Coast (USWC) ports – Long Beach, Los Angeles and Oakland account for a significant share of this trade.

Major European Ports. On the other side of the Atlantic three European ports held double-digit market shares in U.S. trade via European ports in the assessed period. Antwerp was the largest U.S. trading partner with 16.8 percent of the trade and ranked first in U.S. exports. Bremen-Bremerhaven was second with 16 percent of the total trade and ranked first in U.S. imports. Rotterdam was third with 14.3 percent of the market. Other important European ports serving U.S. – Europe trade were: Algercias, Southampton, Hamburg, Liverpool, Cagliari, Le Havre, La Spezia, Valencia, Genoa. Two European ports achieved double-digit growth in this trade: Southampton, England, skyrocketed with 80 percent growth, and volume at La Spezia, Italy, jumped 11.7 percent. Salisbury (2015), Baker (2015), Illing (2015).

In conclusion, containerized U.S – Europe trade is served by a number of ports in the U.S. (on both Atlantic and Pacific coasts) and a large number of European ports. In fact, the number of European ports serving this traffic is larger than a list provided in the preceding paragraphs. It is because the U.S. generated PIERS statistics provide information only about the first discharge port and the last load port. For example, the Port of Gdansk Deepwater Container Terminal (DCT) is also serving meaningful volumes of U.S – Europe cargo but it is not fully captured by PIERS cargo statistics.

3. Transatlantic corridor in the World ocean containerized trade

Transatlantic corridor was in the past the dominant U.S. trade corridor. It has stagnated in the recent 25 years and its role in the World ocean container trade slipped. In the recent several years, containerized cargo shipments between North America and Europe have developed slower than Asian corridors. This was caused by recession in U.S. and Europe economies, and continued growth of Asia's role in global economy (recently due to its fast growing industrial and manufacturing prowess). North Europe –North America total container shipments amounted in 2013 to more than 4.7 million TEUs while Asia – North-America shipments were 23.1 million TEU's and Asia – North Europe 13.7 million TEUs. (Table 1)

Transatlantic container shipment corridor is classified as mature and stable. This means that cargo flows are predictable with little possibility for unexpected and volatile changes. Consequently, shippers, ocean carriers, and ports can safely plan their activities, develop service patterns and prepare investment strategies. The situation is different for the fast growing Asian, other east-west and Pacific markets which are subjects for frequent volatile market ups and downs. The recent downturn in the container market related to slower growth rates in China well illustrates this situation.

4. Changes in World Container Markets

The world container markets are currently preparing for a significant structural change which will occur when a larger number of Very Large Container Ships (VLCS) and Ultra Large Container Ships (ULCS) are deployed. Ocean carriers, ports and terminals already make preparations and investments in anticipation of this development. The introduction of these ships will significantly change shipping and operation patterns for basically all major world routes. This will affect routes where these mega ship are deployed and also other routes. This will be some kind of a chain reaction or change. Many vessels which currently serve major routes will be replaced by VLCSs and ULCSs. They will be next deployed to other routes. Consequently, an average size of container vessel in international container trade will significantly increase. Ports, terminals, stevedores and many other entities must adjust for this development. In a stable and predictable North America – North Europe market these preparations should be easier and can be completed in an orderly fashion. Currently, transatlantic shipments are dominated by smaller container ships. However, this situation may change if cargo flows increase. So, we may expect two major reactions in Transatlantic routes. The first will a tendency of deploying larger vessels to these connections by shipping lines. The second will be growing demand for container shipments as a result of TTIP causing increased trade flows. We will evaluate further

if this may mean that VLCS and ULCS will be more frequently employed on this route and if port facilities and terminals are capable of accommodating these cargo volumes and larger vessels. (Illing 2015)

Shipping services. There are almost 500 liner shipping services providing regularly scheduled service (usually weekly) that enable goods to move between ports along the many trade routes of the world. 44 ocean container services serve U.S. – Europe trade (North Europe and Mediterranean) (Table 2)

Container Vessel Market Growth. As of April 2015, there were 5,059 cellular ships in operation of the total capacity 19.194 MTEUs. The container vessel market is growing. In the period April 2014-April 2015, this market grew by 7.2 percent. About 1.5 percent of container ships were idle. Vessels of total capacity about 3.590 MTEUs were ordered. Data indicate that the container vessel market develops slower than in the previous years but the trend to order and introduce larger vessels continues**.**

Table 1. Top Trade Routes (TEU shipped) 2013.

Route	West Bound	East Bound	North Bound	South Bound	Total
Asia-North America	7,739,000	15,386,000			23,125,000
Asia-North Europe	9,187,000	4,519,000			13,706,000
Asia-Mediterranean	4,678,000	2,061,000			6,739,000
Asia-Middle East	3,700,000	1,314,000			5,014,000
North Europe-North America	2,636,000	2,074,000			4,710,000
Australia-Far East*			1,072,016	1,851,263	2,923,279
Asia-East Coast South America			621,000	1,510,000	2,131,000
North Europe/Mediterranean-East Coast South America			795,000	885,000	1,680,000
North America-East Coast South America			656,000	650,000	1,306,000

* 2012 data.

Source: Trade Routes, World Shipping Council, 2013. Available at: worldshipping.org, website visited June 2015.

Table 2. Liner Container Services by Trade Routes.

Route	Services
Far East- North America	73
North Europe- Far East	28
Far East- Mediterranean	31
North Europe- North America	23
Mediterranean- North America	21
Europe- Mid- East/ South Asia	40
North America-Mid-East/South Asia	10
Far East- Mid- East/South Asia	72
Australasia	34
East Coast South America	26
West Coast South America	48
South Africa	24
West Africa	60
Total	490

Notes: Services may be counted on more than one route.

Source: Drewry Container Forecaster Q1 & Q2 2013.

5. Container Vessels

Vessel Type. Table 3 provides a listing of major categories of container vessels. There is no one commonly accepted definition of particular container vessel types. The table provides vessel categories based on evaluation of several sources. One of the most important criterion for dividing container vessels in particular categories is that if they can be accommodated by the Panama Canal and Suez Canal. In literature two terms are often used for the largest container vessels in the World: Very Large Container Ships (VLCS) and Ultra Large Container Ships (ULCS). Unfortunately there is no one, commonly accepted definition of VLCSs and ULCSs. For the purposes of this paper we have made the following assumptions: all vessels between 10,000 and 20,000 TEUs are Very Large Container Ships (VLCS), and all vessels larger than that are Ultra Large Container Ships. Based on this assumption, we may say that all currently used container vessels are VLCS but a number of ULCS (as defined) have been ordered. (Fig. 1)

Vessel Size. Shipping lines are fast introducing larger vessels. In 2000, there were 2,606 container ships, and an average vessel size was 2,606 TEUs. In 2015, there will be 5,035 vessels in operation, and their average size will be about 3,649TEUs. The major trend in the market is fast growth of large mega vessels. A large number of such VLCSs and ULCSs either has been or will be deployed to major shipping routes until 2019.

Vessel Size Growth Limitations. It is believed that container vessels size will not go beyond the current maximum of 400 by 60 meters, so the largest vessels may be able to carry about 20,000 to 23,000 TUEs. It is projected that cost savings resulted from increasing ships' cargo capacity will not justify further vessel size increase at the current and projected cargo flows. Major savings after 2020 will come from other actions such: further consolidation optimization of shipping networks and alliances, joint logistics and intermodal operations, optimization of ship utilization, performance optimization such as bunker purchase optimization, improvements in vessel procurement, maintenance, etc. leading to capital cost savings.

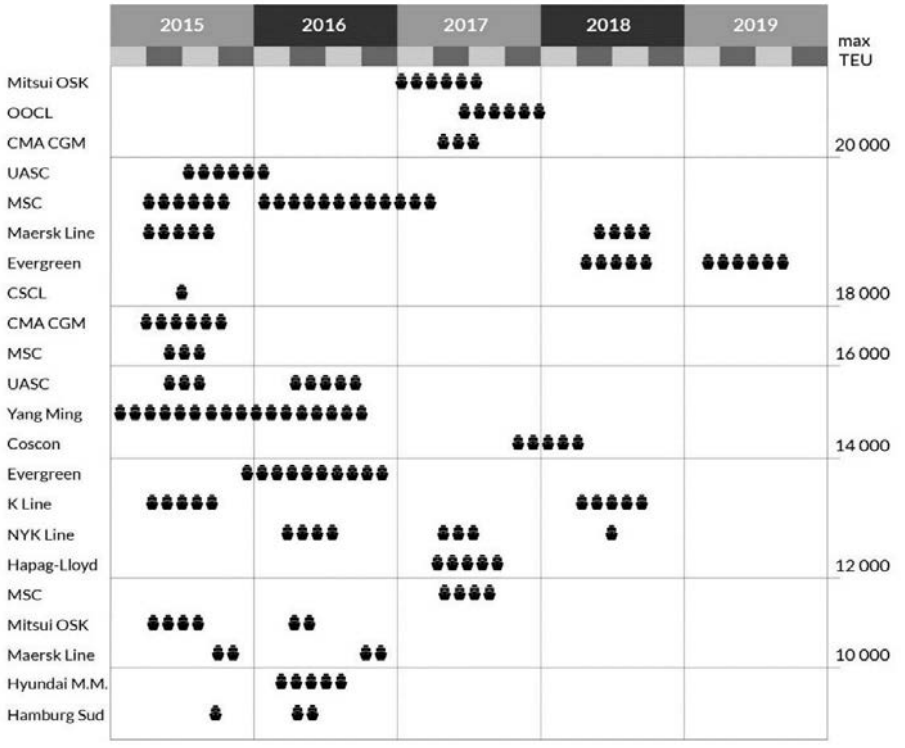

Fig. 1. Current and future deployment of VLCSs and ULCSs (2015-2019). Source: Tidemann, (2015) and data collected by authors.

6. VLCSs and ULCSs vs. cargo shipment patterns

Introduction of VLCSs and ULCSs has impact on ports which can and can't handle them. An analysis and observations of container markets indicate that some shippers may relocate their business to ports that can be served by these mega-ships. For example, some shippers looking for the most economic choice divert their cargo to Rotterdam which is served by the largest VCLSs from Hamburg which has limitations in handling these large ships. Next, Hamburg-bound containers are shipped on a feeder ship or are transferred by road or rail directly to the destination, depending on the distance. This may challenge many ports' top-tier status, their inclusion on a main haul itinerary, and their place in a hub and feeder network. So, VCLS contribute to changes in containerized cargo shipments patterns.

Current Trends in Vessel Placement. Introduction of larger vessels has significant impact on all major routes. VLCS ships are deployed primarily to the Asia- Europe and Asia-USWC routes. Secondary and tertiary trade routes have also to absorb larger vessels. These are smaller ships (including smaller VCLSs) which were replaced by larger VCLSs at the primary trade lanes. This creates a large number of consequences and implications for ports, terminal and related land transportation systems which need to be prepared for handling largest ships.

Table 3. Container vessels – type and technical specifications.

Name	Year	Capacity(TEU)	Length (m)	Beam (m)	Draft (m)	DWT
***Ultra Large Container Ships (ULCS*)**		20,000 and more				
Very Large Container Ships (VLCS)						
Next Generation VLCS	2013	18,500-20, 000	400	59	15-16	190,000
Neo-Overpanamax	2010	14,000-16,000	366	50-51	15.0-15.5	155,000
Neo-Panamax	2010	13,000-14,000	366	49	15.5	140,000
Standard Container Vessels						
Second generation over-Panamax	2005	8,500-10,000	335	43	14.5	100,000
Post Panamax Plus	2000	6,000-10,000	300	43	14.5	
Post Panamax	1988	4,000-5,000	285	40	13	
Panamax Max	1985	3,500-4,500	290	32	12.5	
Panamax	1980	3,000-3,500	250	32	12.5	
Feeders						
Feeder/Fully Cellular	1970	1,000-3,000	215	20	10	
Early container ship/Small feeder	1956	500-1,000	137	17	9	

Sources: Tidemann (2015); Rodrigue (2013) and data collected.

7. Trade growth stimulated by TTIP

The Transatlantic Trade and Investment Partnership (TTIP) – a proposed free trade agreement will increase Transatlantic trade flows. How much additional cargo may appear in the U.S and EU ports? The United States and EU together represent 60% of global GDP, 33% of world trade in goods and 42% of world trade in services. An economic impact study indicated that liberalizing trade would imply significant increases in EU-US trade. Several scenarios were considered. In the less optimistic scenario, EU exports to the US will increase by 16 per cent while US

exports to the EU increase by 23 per cent. At the more ambitious approach, the increase will be 28 and 37 percent, respectively. About two thirds of the projected increase in bilateral trade in the ambitious scenario is attributable to reducing non-tariff barriers (NTB) in goods sectors. Based on the above, and considering the current transport patterns we can safely assume that U.S- EU ocean container trade via USEC ports has a potential of increasing up 20 percent in less optimistic and more than 25 at more optimistic scenario. Francois (2013). Additional cargo (although smaller) cargo gains may come from U.S. West Coast ports via the Suez Canal. Based on the above, and considering current shipments, we may assume that the overall U.S. – Europe containerized ocean trade may grow as a result of TTIP implementation by 1 to 1.2 million TEUs annually. This is a substantial amount of cargo that requires serious consideration with respect to vessel deployment, port capacities, and other elements of logistics system.

8. Possible vessel deployment to Transatlantic routes

The increased cargo volumes and the described earlier in this paper trends to increasing vessels size may built incentives for shipping lines to more frequent directing VLCS to the Transatlantic route and vessel schedules. Introduction of large container ships with capacities of more than 10,000 TUEs promises higher rates of profitability for operators because of reduced fuel consumed per TEU. Also other operating costs can be reduced by using VLCSs. This opportunity is particularly important in the current market situation when freight rates are low and competition is fierce. Currently, U.S – Europe trade is not carried by large vessels. The average vessel calling on the U.S. East Coast, has a capacity of more than 5,000 TEUs, compared to an average cargo hold of 3,980 TEUs in 2009. Similarly, the size of the average ship calling the U.S.West Coast has grown from 4,682-TEUs to close to 6,000 TEUs. But this will change.

For many in the trade, anticipation in recent years has centered on preparations for the onslaught of large mega--ships that will begin to pour through the Panama Canal when its decade-long expansion project is complete in 2015. These big ships are arriving through the Suez Canal from Asia. Driving the trend is the introduction of new 10,000+TEU vessels on the Asia-Europe trade, cascading the 8,000 TEU ships that previously plied that trade to the trans-Pacific and, now, through the Suez Canal as carriers seek the economies of scale that they can't find on the 5,000 TEU ships that are the largest that can transit the Panama Canal. However, the larger VLCSs still will not be able to cross the Panama Canal – another lock expansion is needed. The largest vessels will be pushed to Asian markets, due to unsurpassed trade flows there. These trends will also impact U.S. – Europe ocean container shipments. Larger vessels will come there too. Will the U.S. and European ports be able to handle them? How the current limitations can be overcome?

9. Expansion of ports to accommodate large vessels

General. Maritime experts confirm that significant port and terminal improvements are needed to accommodate the growing VCLSs and future deployment of UCLSs. For Transatlantic route they are needed on the both sides of the pond. Employment of larger ships may challenge ports in several ways. Terminal capacity must be adjusted (increased). VLCS (and ULCSs) unload in a short period of time much larger container volumes than smaller vessels. Terminal capacities must be expanded. An additional demand for intermediate container storage space, marshalling yard space, plug-ins for cooling and refrigerated containers, and warehouse space must be provided. Moreover, ports will have to cope with a much higher variability in delivery volumes and larger impact of possible vessel delays on terminal operations. With VLCSs forwarding and distribution of cargo becomes a logistical challenge, possibly requiring additional rail and road capacity in ports including expansion of rail and truck yards, or capacities of port internal railroads such as New Orleans Public Belt Railroad. Also, significant additional investment in more freight handling equipment at terminals will be necessary. More efficiency can be provided by extensive usage of IT solutions by terminals, stevedores, freight forwarders, and logistic and transport companies. Uniform IT platforms for all participants in the port logistics process may be necessary to insure necessary capacities to serve VLCSs. These issues concern both U.S. and European ports. Baker (2015)

European ports. Many European ports have restrictions for quick deployment of larger VCLSs and UCLSs. For example, at Hamburg, restricted draught has been a limiting factor. The draught is 12.8 meters during low tide and 15.1 meters during high tide. As transpires from the earlier sections of this may paper this is may be a severe limitation

to larger vessels. Another important factor is related to vessel breadth and channel passing. The combined beam of two ships plus a safe separation zone between vessels is required for safe passing in a channel, this may be a significant problem for two large vessels. For example, the 19,000TEU CSCL Globe has a beam of 59 meters and draught of 16 meters when fully laden. It is apparent that ships of this size are too wide for the Hamburg Elbe Channel, which has a width of just 90 meters. It would not be possible for another ship to pass when arriving or departing. The left safety zone of just 15 meters is insufficient. To accommodate the majority of VLCSs, one-way traffic would have to be imposed, while such large ships pass down the channel. This would create long waiting times and congestion for other port users. Consequently, significant additional costs to the port and other users may occur which may prevent VLCSs calls. Similar problems may exist in some other European (and U.S. port facilities). A survey of 17 European ports, comprising 55 container terminals, found that at the end of 2014, however, combined container handling capacity stood at 86 million TEUs with an occupancy rate of 62%. To prevent capacity constraints, ports and terminal operators have to try to stay ahead of demand. If all intended expansions and new terminals are commissioned as planned, the 2014 overall capacity of 86 million TEU may increase by 5.2% to 143 million TEU by 2024. Illing (2015)

Few European ports were built with VCLSs (and ULCSs) in mind. The first 18,000 TEU ships were delivered recently, but the number of this size of ship will reach over 100 by the end of the decade. This is putting pressure on terminal operators to invest substantially in the cranes and equipment needed to handle VLCSs (and ULCSs). The consensus among big ship carriers nowadays is that terminals should handle 6,000 moves a day on vessels above 14,000 TEUs. This calls for improvements at almost all European ports. Larger cranes with longer outreach weigh more, and therefore need stronger quaysides to support their weight.

In 2014 only three of the 31 northern European ports were purpose-built for handling larger VLCSa and ULCSs: Eurogate Container Terminal in Welhelmshaven; Hutchison's Berths 8/9 at Felixstowe; ECT's Euromax at Maasvlakte I and II in Rotterdam. DP World's London Gateway has been also developed for larger VCLSs and ULCSs from scratch, but is not yet handling any megaships. Southampton Container Terminal has been expanded with a custom-built large vessel berth. Also in Hamburg part of the quays of Eurogate's Container Terminal Hamburg and HHLA Container Terminal Burchardkai have been expanded, the same occurred at APM Terminal Gothenburg. Many similar improvements take place in Europe. An interesting development is creation of new terminals (ports) which can handle VLCSs. The Port of Gdansk Deepwater Container Terminal has recently become one of the largest transshipment centers in the Baltic, using its 15 m depth as a competitive advantage for Maersk VLCSs. It was so successful that the second terminal is currently built. Europe's capacity for ultra large tonnage is set to expand massively during 2015 with the opening of three new terminals purpose-built for these ships: APM Terminal Maasvlakte II opened in April, DP World's Rotterdam World Gateway will be formally opened next week, and The Liverpool2 Container terminal is also due to open by year-end. These three terminals alone will increase northern Europe's container capacity by 6 million TEU or 7 percent. These examples indicate that at many terminals, the economies of scale carriers aim to achieve by operating increasingly larger ships, mean that mainline terminals have no choice but to invest substantial sums in their facilities. This may increase stevedoring and other terminal charges, but it is unlikely that they will slow down trends towards large vessels. Baker (2015)

U.S. Ports. VCLSs (and obviously ULCSs) are too large for most U.S. East Coast (USEC) ports if fully laden. Air draught, the height of the ship and its antennae above the water are also limitations. Along the U.S. East Coast, many bridges that are high enough to allow vessels to pass have insufficient clearance for the newest mega-ships. These factors will mean that shipping companies trying to use the largest vessels possible to serve their markets and ports will need to be actively engaged in dredging and upgrading their logistical capabilities to meet the mega-ship challenge. As shown in Fig. 2, the Virginia Port Authority is planning to increase the Hampton Roads approach to 55 feet. In fact, both the submerged tunnels of the Chesapeake Bay Bridge and the Hampton Roads Bridge can allow a channel depth down to around 60 feet. This will make both the Emma Maersk and the Triple-E type container carriers able to utilize the APM Terminal as a load center for the Trans-Atlantic container trade. It is important to insure that needed high capacity land connections are necessary to distribute containers carried by VLCSs. For example, the owners of CSX and Norfolk Southern railroads are eminently aware of the fact that APM has a brand new container terminal in Hampton Roads. They also know that the APM Terminal has a 50-feet deep access channel depth and 55 feet of alongside. What is also evidently clear is that the amount of container handling capacity APM is building up in Hampton Roads is not only aimed at the State of Virginia and its neighbors. The strategic move here is to landbridge (by rail) large amounts of its Hampton Roads container cargo to other north eastern and mid-west states,

and possibly to USWC. The landbridge railroad connection to these other markets are, economically, clearly in reach of the Hampton Road container facilities, particularly given the economies of scale of VLCSs such as Triple-E carriers and Emma Maersk. With double stacked trains, the APM will be able to easily reach most of the US hinterland and may even take away container traffic from the Port Authority of New York/New Jersey which has both airdraft constraints (Bayonne Bridge) and draft restrictions along the Kill van Kull. As can be seen, the access to Chicago and the rest of the Mid-West is relatively easy, particularly when one combines that with the economies of scale of the new ships and the double stacked trains. CSX shareholders are well aware of the fact that the Panama Canal Authority made a major mistake in the decision of size of the 3rd set of locks (which cannot handle the newest VLCSs (Table 4)). They see APM's bold movement towards VLCSs will prove a boon for both APM and the Hampton Roads Ports. Thus, the container cargo moving through the VPA and APM facilities will increase over time and make Hampton Roads one of the major container ports on the U.S. East Coast. Consequently, they have encouraged both CSX and Norfolk Southern to prepare for the coming comparative advantage that the Hampton Roads Ports have.

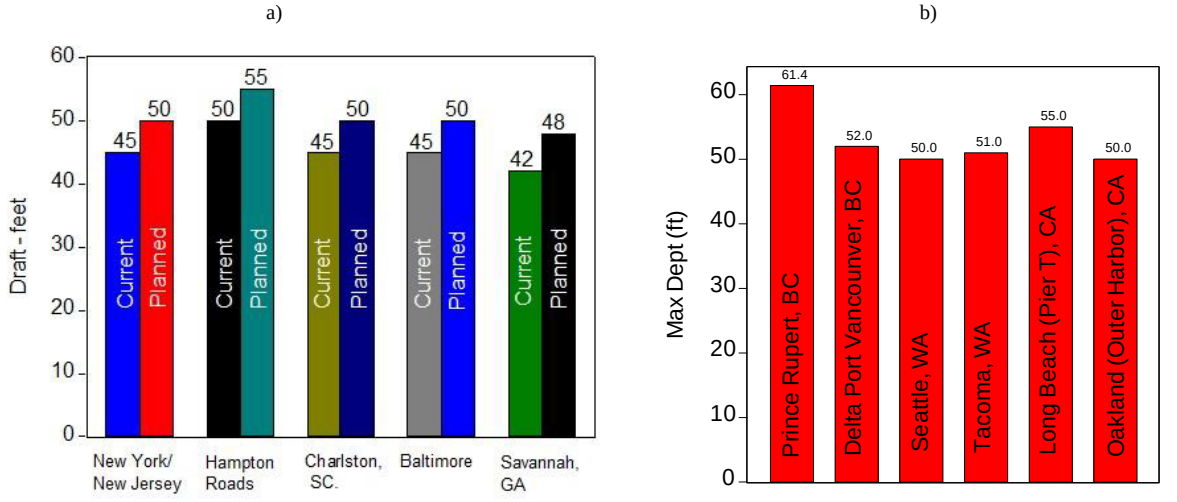

Fig. 2. (a) Current & Planned Water Access Depth For Some U.S. East Coast Ports; (b) Current & Water Access Depth For Some US West Coast Ports, Source: Berg- Andreassen (2014).

U.S. West Coast ports pose another problem for Transatlantic trade. They can handle ships of about 10,000 TEUs, but the average is about 8,000 TEUs, These vessels are still too wide and long for the Panama Canal. From the Far East to the U.S. East Coast, container ship traffic is restricted to vessels that can pass through Panama, which is currently only 5,500 TEUs. Even with the enlarged canal, the beam restrictions will mean that the maximum-sized box ship will be about 12,000 TEUs, meaning routes must be changed when VLCSs (and ULCS's) are employed.(Table 4). In sum, the situation for the VLCS is even worse on the US West Coast. At least the USEC has the possibility to be in the VLCS string with at least Hampton Roads as they can easily traverse the Chesapeake Bay Tunnel and sail under the Hampton Roads Bridge to reach the APM terminal despite that these strings rely on the Suez Canal. Most of the WC container ports have basically reached their maximum and initial efforts are in progress to adjust their port capabilities to receive these new behemoths. In Fig. 2 it is clear that only Prince Rupert, BC and Long Beach, CA can, theoretically accommodate the VLCS. So far, however, only Long Beach, CA will have the capacity to handle the landbridge traffic to the Mid-West and the East Coast of the US. Despite the fact that Prince Rupert, BC has the draft, it currently lacks both marshaling yards and the land bridge capacity to handle the two way traffic. Only CN serves Prince Rupert. Ships entering the Vancouver, BC Metro ports, i.e., Delta Port and the planned Robert Banks Terminal 2 are, however, forced to navigate through the Strait of Juan de Fuca and the Strait of Georgia. In essence, none of the USWC ports are built to handle the VLCS – nor the even larger ULCS (20,000 TEUs) expected to come on stream during the next 10 years. See: Berg-Andreassen (2014).

10. Conclusions

An assessment of the current and projected capacities of U.S. and European ports indicate that they will significantly increase. With current expansions, European ports will be capable to handle in ten years 143 million TEUs annually compared with the current 86 million TEUs. U.S port capacity (at both coasts) is also projected to increase by more than 50 million TEUs per year in 10 years (initial capacity expansion projects have recently started, however it is probably necessary to build a completely new terminal at USWC). A comparison of these numbers with the projected growth of the U.S-EU trade resulting from TTIP agreement indicates that there should not be any problems for accommodating in the next ten years of additional 15 to 20 million TEUs. Transatlantic container trade is a relatively small market when compared to the Asian routes. It may be expected that larger vessels will be introduced to this route in the coming ten years, however VLCSs above 15,000 TEUs will primarily deployed to Asian rotations, and UCLSs will be exclusively engaged in Asian routes, since major World container cargo flows are there.

Table 4. The third set of Panama Canal Locks and International Liner Shipping Industry's VLCS.

Ship Type	LOA		Beam		Airdraft		Draft	
	Meter	Feet	Meter	Feet	Meter	Feet	Meter	Feet
Triple-E	400	1312'4"	59	193'7"	73	239'6"	15.5	50'10
E-Class Carrier	397	1302'6"	56	183'8"	58	190'	15.5	50'10"
Marco Polo	396	1299'2"	54	177'2"	58	190'	16.0	52'5"
Panama Canal 3rd Set of Locks Restrictions	*366*	*1200'*	*49*	*160'*	*∞*	*∞*	*15*	*50'*

Source: Berg-Andreassen (2014).

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