Port Hinterland Divergence along the North American Eastern Seaboard

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Revised version, February 2009


Abstract

Since the mid 1990s, a substantial growth of the containerized traffic along the Eastern Seaboard took place. Even if containerization in theory “levels the playing field” by permitting a standard transport product, its spatial accumulation is far from being ubiquitous. While in prior stages deconcentration prevailed, the trend has reversed with a process of traffic concentration among the largest port gateways. This paper investigates port divergence taking place along the Eastern Seaboard. Hinterland access, the configuration of shipping line networks and supply chain management are the most significant factors driving the process.

Keywords: Freight Transportation, Ports, Containerization, North America, Eastern Seaboard.
Introduction: From Convergence to Divergence

Like all the major maritime ranges around the world, the North American Eastern Seaboard has been transformed by the joint forces of globalization, regionalization and containerization. Extending from Halifax to Miami, the seaboard ports link one of the world’s most extensive consumption markets to global maritime shipping routes. These ports collectively handled just above 20 million TEUs of containers in 2007, but actual volumes are much higher due to a substantial amount of Trans-Pacific containerized traffic routed through the West Coast rail landbridge towards various destinations along the Eastern Seaboard. This underlines a richer context in which maritime and inland freight distribution systems in North America are interacting and integrated. The traditional regional hinterland is complemented by transcontinental freight corridors where inland terminals create an acute discontinuity.

Investigations looking at economic and technological changes in the 1980s and early 1990s (Hayuth, 1988; Kuby and Reid, 1992; McCalla, 1999, Shashikumar, 1999) underlined that a process of deconcentration was taking place as ports were competing more aggressively over their hinterlands. In such a context, containerization was used as a mean to compete beyond established hinterlands, to venture into new market opportunities and capture additional traffic. It was anticipated that containerization would “level the playing field” and thus lead to a form of convergence; a more uniform distribution of traffic. However, since then the process has reversed and a concentration of traffic has taken place among a few major gateways. It is thus argued that port hinterlands along the North American Eastern Seaboard are going through a phase of divergence which will favor an ongoing process of concentration of containerized traffic.

Divergence is a commercial cycle that involves a concentration of containerized traffic along the major gateways of a maritime facade, implying that the conditions affecting freight distribution are advantaging some ports more than others, notably in terms of traffic capture. It is more than a process where some ports are growing faster than others; it also shapes the setting of hinterlands and long distance transport corridors. In
light of growing levels of congestion, conventional geographical factors such as accessibility are reasserting themselves along with changes in liner shipping networks and supply chain management practices. This leads to differences in infrastructure investments, the performance of transport infrastructures and flows handled by port and inland terminals.

Trade and Port Divergence in North America

Factors of Port Divergence

Divergence implies that even with containerization being a standard and ubiquitous mean of transportation, its functional and spatial diffusion leads to different traffic growth levels. As a force shaping accessibility and economic opportunities containerization and economies of scale has favored the emergence of large gateway complexes which are linked to their hinterlands through corridors. In view of these trends, it is argued that the main geographical and functional factors of port divergence are:

- **Port site.** This is the most conventional factor linked with the local geography and particularly concerns location and infrastructures. Port infrastructure serves as one of the key decision-making determinants in port selection by shippers. The divergence effect of the site is reinforced with each new generation of containerships, forcing in many instances dredging efforts to keep the port accessible to greater ship drafts.

- **Shipping networks** They have an effect through the selection of port of calls, which is made based on a set of criteria related to market (hinterland) access as well as the quality of port infrastructure or where the port stands in regard of the configuration of the shipper’s network. A port gaining or losing port calls, particularly from a large ocean carrier, can experience a significant variation of its traffic. The configuration of shipping networks is thus an important factor of port divergence and tends to favor major gateways.
• **Port policy.** Local port policies can have an impact related to the governance and funding. The major trend has been towards privatization, particularly of terminal facilities. The commitment of a port operator to invest in and/or develop a container terminal is a major sign behind future traffic generation as well as terminal productivity improvements. The outcome can however be marked by differences in productivity between the terminals of the same port.

• **Hinterland.** The hinterland is a conventional factor linked with the nature and level of port activity. However, with containerization the setting of high capacity corridors and inland terminals has become of fundamental importance in the capture of port traffic as hinterland competition increased. The future of a gateway port is increasingly decided over what takes place over its hinterland.

• **Supply chain management.** Logistics and commodity chains are dependent on the reliability of freight distribution. An important dimension of this reliability concerns delays and disruptions to the scheduling of transportation. A port, including its linked maritime and inland services, that offers a superior reliability and value added services is likely to secure additional traffic. Supply chain management appears to be an emerging factor of port divergence.

Overall, port competition for market share including hinterland market is determined not by a single factor, but by several: port infrastructure, liner service (frequency of services), the availability of modern distribution centers, and the market size that can be reached within 24 hours (Biederman, 2007). Like any competitive market, some ports prevail while others will have to address stagnation or even a decline in traffic. In recent years the growth of trans-pacific trade, the expansion of the North American intermodal network, supply chain requirements, port logistics infrastructure, hinterland markets, and liner service have played a role in the cyclic dynamics of port convergence and divergence.

*Containerized Traffic Trends*
The last decade was characterized by a cycle where containerized trade surged, particularly along Pacific Asia – North America trade routes. From 1997 to 2006, American container volume handled by its ports almost doubled, from 14.9 to 27.4 million TEUs. One particular and well acknowledged driver of this growth has been Asian imports, the outcome of outsourcing manufacturing activities, particularly to China (Figure 1; Marad, 2007). For instance, China’s total share increased from 12.4% in 1997 to 37.4% in 2006. The issue not only concerns the growth in volume, but also the growth in the imbalances of the transpacific container flows, which accounted for 10.5 million TEUs in 2007. Transatlantic trade shows a similar, albeit less extensive imbalances with imports to the U.S. growing 6.1% annually for the same period and exports to Europe growing at a much lower rate, 3.5% annually. On the U.S. – Latin America trade, which is dominated by commodities, imports to the U.S. and exports to Latin America grew at 8.1% and 6.3% annually respectively (MergeGlobal, July 2007). It remains to be seen to what extent past growth trends will endure in the future since containerization has achieved prevalence within the majority of supply chains. It is expected that container traffic growth has peaked and will likely decline until macroeconomic conditions, namely those linked with trade imbalances, are corrected (Notteboom and Rodrigue, 2009).

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1 When the volume of Hong Kong is included, China’s share increased from 20% in 1997 to 41.3% in 2006.
The trend in traffic concentration, both at the maritime range and at gateway levels is evident. The Pacific Coast now accounts for 55% of the total container volume handled, up from 50% in 1990, placing intense pressures on its main gateways. The share of the Los Angeles / Long Beach port cluster of the total U.S. container traffic grew from 32.4% in 1997 to 37.8% in 2006; during the same period, New York/New Jersey’s share increased slightly from 11.2% to 13.2% (Marad, 2007). Essentially, traffic doubled every decade, an indication of a rapid growth of international trade as well as the diffusion of containerization as a privileged mode of transportation. However, the extent to which this trend will endure is highly questionable as evidenced by the economic slowdown that began in 2008.

**Ranges of the Eastern Seaboard**

The Eastern Seaboard is characterized by ranges each having their own divergence dynamics and connectivity level to their hinterlands (Figure 2). Each range represents an economic region with its specific hinterland and transport system. From an analogical perspective, the seaboard can be seen as a set of sinks where containers “percolate” into the
hinterland through the path of least resistance. In theory, the deepest part of the sink should be the most active port but regional conditions are obviously modifying this assumption.

**Figure 2. A Schematic Representation of the Eastern Seaboard**

The Eastern Seaboard can thus be divided into four major ranges:

- **The St. Lawrence.** In simple terms, the St. Lawrence is a “funnel” where all the traffic goes straight to the bottleneck, which is Montreal. On each side of the funnel, the hinterland is excessively poor in terms of economic activity, except for a variety of resource export ports (e.g. Sept Iles). Any maritime services venturing into the funnel does not make any other port call along the East Coast, with the exception of Halifax. The Ports of Halifax and Montreal are thus in direct competition, with Montreal having a much better hinterland access but a weaker maritime access. The only way that Halifax may stand out would be as an offshore hub with activities linked with its “first port of call” Atlantic advantage as well as its deep harbor facilities, able to accommodate the largest containerships. The opportunity to use the St. Lawrence / Great Lakes system for inland containerized distribution is very limited, mainly because of the seasonal
shut down of the system which is incompatible with a constant frequency of services required by container distribution.

- **The Upper Range.** Also referred as the “empty sink” since the range handles a very low containerized volume. The traffic that could be handled by this range has “overflowed” (been captured) either in the “funnel” or into the Mid range. The level of economic activity in the hinterland is limited, particularly in the northern part of the range. The two major ports of the range, Halifax and Boston, can be qualified as “weak handles” since they have shown very limited growth in traffic (actual decline for Halifax in recent years).

- **The Mid Range.** Complex and rich hinterland corresponding to a large accumulation of economic activities, mainly along the Boston-Washington corridor. It is a “full sink” in the sense that the center has limited potential to accommodate additional traffic not because of capacity issues, but because of difficult maritime access. For instance, Baltimore has a central location, but calling the port involves a detour with Hampton Roads in good position to capture traffic. The range has two strong handles, New York and Hampton Roads, each having experienced substantial traffic growth. Each handle is attempting to establish regionalization strategies to capture the traffic with better hinterland rail connections.

- **The Lower Range.** An emerging port range, implying that the “sink is filling up” at the point of least resistance, which corresponds to the Savannah / Charleston port cluster. They offer a relatively uncongested access to their hinterland. The lower Florida handle with its port cluster has some potential to act as an offshore hub, although this function has been captured by nearby Caribbean ports (e.g. Freeport), particularly because of lower labor costs and deeper access channel.

**Port Hierarchy**

The geographical growth of containerized traffic is very specific (Figure 3). It is concentrated at both “handles” of the mid range – New York and Hampton Roads – and at
the center of the lower range – Savannah and Charleston. The “empty sink” has experienced a mere growth of about 40,000 TEU between 2000 and 2006. The largest growth rates, both in absolute and relative terms, are observed in the diverging ports underlining that the recent growth cycle is based upon different premises.

Figure 3. Change in Container Traffic at Eastern Seaboard Ports

An overview of the rank-size distribution of port traffic reveals a four tier grouping where each tier has roughly double the traffic of the previous (Figure 4). This distribution underlines a divergence threshold roughly at 1 million TEU where above this threshold there is strong absolute growth and below which there is stagnation. A four tier port hierarchy system can be observed:

- **First tier:** New York is the most prominent East Coast port, essentially acting as a continental gateway, a role it has played for more than a century.
- **Second tier.** Major gateways of the East Coast, each accessing a significant hinterland and commanding an economic region. Although the traffic of Montreal may place it as a third tier port it is the only significant East Coast Canadian port and thus has a more pronounced gateway function than many of its counterparts.

- **Third tier.** Smaller regional gateways that conventionally have been competing with first and second tier ports but mainly due to less efficient hinterland access are gradually fulfilling a niche role. Still, changing market conditions and the decision of a shipping line to call one of these ports could significantly change its traffic profile.

- **Fourth tier.** Small niche ports servicing a specific market and often of specific function.

![Figure 4. Container Traffic at Main Eastern Seaboard Ports, 2007](image_url)
While the top 5 ports accounted for 74% of the TEU handled in 1985, this share went down to 62% in 1995. This process linked with the diffusion of containerization among new ports, challenged the primacy of existing ports, such as New York. Additionally, numerous trucking services were taking shape, mostly in an un-congested setting. The 1980s also marked an era of deregulation, permitting ports to compete outside their designated hinterlands and capture additional market share, a process which went on until the 1990s. From 1995, the process reversed as the share of the top 5 ports climbed to 71% in 2006. The mid 1990s correspond to an acceleration of the forces of globalization in North America, particularly with the setting of NAFTA and the corresponding offshoring of manufacturing activities. Paradoxically, the relocation of production outside the United States lead to a traffic concentration around the major gateways providing better hinterland access.

Several factors can be brought forward to explain this divergence. First, major ports undertook investment in new infrastructures, including on dock rail facilities. Second, hinterland rail access became a more attractive option in view of growing road congestion levels, which privileged gateways connecting inland corridors such as landbridge services. Shipping companies are thus increasingly allocating port calls with the capacity and efficiency of hinterland access into consideration. Third, the North American economy shifted towards a consumption-based economy, which placed a preponderance on large population centers to a greater extent than a production-based economy. Ports having a substantial consumption (import-based) hinterland were more advantaged since it became increasingly a matter of servicing more diffused consumption markets at opposed to more clustered manufacturing functions.

**Shifts in Cargo and Shipping Services**

*Cycles of Convergence and Divergence*

Liner shipping companies are ultimately the ones that determine their port call configurations. There are several factors that affect port selection (Slack, 1985; Murphy and Daley, 1994); the deciding factors being port infrastructure, frequency and diversity of
carrier options, the strategic vision of the port, port costs, expansion potential, strategic location and port-dependent cargo, and lastly, logistics infrastructure in the proximity of the port. Put into practice these factors result in differential growth rates with their synchronism an indication of the extent at which they diverge or converge.

Figure 6 reveals the phases of change among the main ports of the Eastern Seaboard. Prior to the end of the 1990s, a process of deconcentration was taking place, as exemplified by the declining share of the top five ports in handling the total containerized traffic. In terms of synchronism of growth rates, there was a gradual convergence with deconcentration. Then, the trend quickly reversed with a divergence of growth rates and a concentration of traffic among the largest ports. Two ports in particular stand out, Savannah and New York, by showing a consistent growth over the past decade. New York still has the commanding lead and its growth seems to be very consistent after a phase of decline that endured until the early 1990s. Because of its large population base and
consumer market, 33 million people live within one hour drive from the port (Tirschwell, 2008); New York continues to dominate the East Coast market. Savannah has the fastest growth rate over the past decade, illustrating the importance of higher growths rates of the South Atlantic region. At the same time, the competition for hinterland market intensifies.

Due to continuing demographic shift southward, a large volume of cargo that was traditionally moved through Northeast and mid-Atlantic ports are now moving through South Atlantic ports. For Savannah, the combination of infrastructure improvement, transit time, delivery costs, and population proximity has contributed to port growth (Marchand, 2007). The port reacted to and anticipated these commercial changes with the establishment of several major retail distribution centers in its proximity helped to boost volume; intermodal facility development, terminal expansion, and operational improvement were important factors to maintain and improve its competitiveness.

New York has maintained its leading position due to its vast captive-consumer market, mainly the port-dependent cargo, and infrastructure improvement implemented since 2000. During the late 1990’s, the lack of port infrastructure improvement created inadequacies and at one point Maersk Sealand, the world’s leading maritime shipper, threatened to leave the port. Since then port authority undertook major capital improvement programs coupled with significant reductions in labor costs, which improved competitiveness. The labor cost reduction mainly came from a steep decline of container royalties paid to longshore labor displaced by containerization.

Norfolk, due to its intermodal connection and its natural deep harbor with a 50 foot channel, attracted shippers and maritime carriers. Its infrastructure improvement plans for terminal expansion and equipment upgrade helped boost cargo volume. For Charleston, despite its reputation of high productivity, its cargo volume growth lags behind Savannah, a port it has traditionally been intensively competing with since both are sharing essentially the same hinterland. It faced capacity constraints at its current container terminal. However, opposition from local resident and environmental groups forced the port authority to scale back its expansion plan in a green field site. Instead, it chose to develop a former naval base into a new container terminal, which will take more time to complete.
For the ports of Halifax and Montreal a strong divergence is observed from 1990 (Figure 7), which is mainly due to long distance inland access as well as the size of the regional market. Shipping lines are reluctant to call a port that has limited local market potential as very few container demand would be generated, which is compounded with an uncertain hinterland (particularly for Halifax). As a matter of fact, there are no all water services from Asia to Halifax (though OOCL is considering it). Additionally, shipping companies prefer to have their maritime containers bound to nearby consignees so they can be placed back promptly on the maritime circuit. Transloading cargo from maritime containers into domestic containers can offer an alternative, but repositioning empty domestic containers over long distances is not a desirable option. Again, this undermines ports that have limited immediate hinterlands.

![Figure 7. Strong Divergence: Montreal and Halifax, 1981-2007](image)

The growth rates for Halifax and Montreal also indicate a shift from convergence to divergence. While both ports were having a synchronism in their growth rates until the early 1990s, this synchronism shifted. The initial divergence appears to be a zero sum game where Montreal’s gain became Halifax’s loss. Then, the hinterland factor became
more prevalent in spite of Montreal being a less suitable maritime site (ship capacity limit is about 4,000 TEUs while Halifax can accommodate much larger post-panamax ships).

**The Resurgence of All Water Services to the East Coast**

In general, there are three routes for cargo coming from Asia and bound to the American East Coast; the landbridge route, the all water route via the Panama Canal, and the all water route via the Suez Canal. The landbridge route has two segments. The maritime segment from an Asian port to a West Coast port in North America and the inland segment from a West Coast port to destinations in the hinterland and regions along the East Coast (Figure 8). With the setting of double-stack long distance rail corridors in the 1980s, the landbridge route dominated for the transpacific trade since it offered a quick and cost effective mean for Asian goods to reach East Coast markets while maintaining the length of trans-pacific pendulum routes as short as possible. However, this dominance is being challenged by changes in the shipping environment with the resurgence of all water services between Pacific Asia and the East Coast. This provides an additional explanatory layer for the port divergence thesis because the ports selected for all water routes access a completely new maritime foreland.

The main factors behind changes in the shipping environment are thus the following:

- **Transpacific trade.** The growth of transpacific trade is well documented with the “China effect” being the main driver. Containerized exports bound to North America have consequently surged with a corresponding growth in maritime services, port calls and inland freight distribution.

- **West coast and landbridge congestion.** The West Coast is increasingly perceived as unreliable and costly due to congestion, environmental regulations and sometimes labor disputes. For instance, in 2002 a longshoremen job action resulted in a lock-down of most West Coast ports, incurring significant costs and delays for shipping lines and shippers. The Landbridge is the most favorable route from East Asia to East Coast due to its short transit time. East Coast Ports are in
an unusual situation since they not only compete among themselves, but also with West Coast ports due to Landbridge. The landbridge takes about 5-7 days in addition to transpacific crossing which takes about 9-12 days. However, rail transportation in North America was reaching serious bottlenecks at the beginning of the 21st century, with growing capacity constraints over rail infrastructure, with Chicago and St. Louis becoming major bottlenecks in the rail distribution system. Recognizing its value and the growing landbridge volume, railroads have raised freight rates by 25 to 40% between 2005 and 2007. In addition, the return on intermodal shipment is lower than on other commodities for railroads because intermodal contracts are established on the long term. Therefore, with near-double digit growth of international shipments on landbridge, apparently more capacity is needed and rate increase is an obvious option (Ferrulli, 2007). This prompted maritime shippers and freight forwarders to explore alternatives.

- **New East Coast gateways.** The Southeast coast, particularly the Charleston / Savannah port cluster and Hampton Roads, has experienced a significant growth in part because they are the closest East Coast ports through the all water route via Panama Canal and in part because they offer uncongested long distance inland access. In addition, general costs related to labor and land are also lower than other ports along the West Coast and in the Northeast. This has led many players related to supply chains to set up large retail distribution centers in Savannah and Virginia.
Figure 8. Factors behind the Resurgence of All Water Services to the East Coast

**Service Routes and Transit Times**

Table 1 provides a snapshot of the various origin-destination pairs between several major Pacific Asian ports and American East Coast ports. Except for Singapore (which involves the usage of the Suez Canal Route), the transit times for all water routes are based on the Panama Canal route.

<table>
<thead>
<tr>
<th>Origin</th>
<th>New York</th>
<th>Norfolk</th>
<th>Savannah</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Water</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Singapore</td>
<td>23</td>
<td>24</td>
<td>-1</td>
</tr>
<tr>
<td>All Water</td>
<td>23</td>
<td>24</td>
<td>-1</td>
</tr>
<tr>
<td>Landbridge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Singapore</td>
<td>25</td>
<td>28</td>
<td>-3</td>
</tr>
<tr>
<td>Port</td>
<td>Transit Time (in days)</td>
<td>Source: <a href="http://www.apl.com">www.apl.com</a>, <a href="http://www.hanjin.com">www.hanjin.com</a>, <a href="http://www.nykusa.com">www.nykusa.com</a></td>
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</table>

For New York, the difference between landbridge and all water services from North Asian ports such as Busan, Tokyo, Shanghai, and Kaohsiung is about 7 days. Therefore, high value goods in particular are most likely to be routed through landbridge services. However, as the load port origin moves southward towards Singapore, the difference narrows markedly. For cargo from Hong Kong, the difference is about 4 days. From Singapore onward, the all water service confers a slight advantage. Similarly for services to Norfolk, the difference between landbridge and all water service is slightly to the advantage of the former. However, from Hong Kong southward, the all water service is almost identical to the landbridge.

Figure 9 focuses more specifically on the respective advantages of New York and Savannah with water services to Southeast Coast ports become more competitive from Shanghai southwards. The most significant time difference concerns ports among the Middle coast of China, including Kaohsiung. They fall in the 3–4 days difference, which starts to be close to the threshold of indifference\(^2\) from a shipping time perspective. Under such circumstances, reliability in distribution can play an important role in tipping the balance.

\(^2\) The point at which shipping time for two alternatives is the same or not different enough to make a significant impact.
Figure 9. Eastbound and Westbound Maritime Routes: Zone of Contestability

Singapore appears to be the equilibrium point transit time-wise; the point of indifference to destinations along the East Coast. There is however a zone of contestability for services to New York (and other ports such as Hampton Roads) that includes most of Southeast Asia and up to Hong Kong. This zone is crucial as it includes several established manufacturing clusters (namely the Pearl River Delta) as well as emerging economies such as Vietnam and Malaysia. For services to Savannah, the zone of contestability could even be expanded a bit further to include Shanghai. Since Singapore is the major transshipment hub for Southeast Asia, it may actually capture additional traffic for the All Water Route to the East Coast.

Currently, the West Coast landbridge route accounts for more than 75% of the cargo from Asia destined for New York/New Jersey (PANYNJ). With the Panama Canal expansion and the increase in all water routes, the share of the landbridge is expected to
decrease to 60%. As a result, the Port of New York is expecting a shift of 2.5 million TEUs from West Coast ports to All Water Services to the East Coast by 2020. The planned expansion of the Panama Canal to accommodate about 12,000 TEU ships, makes any traffic distribution forecasting extremely hazardous. It will impact economies of scales on the all water route via Panama Canal, the configuration of shipping networks and the use of intermediate hubs\(^3\). It can however be assessed with relative confidence that the share of all water routes to the East Coast is very likely to increase.

The number of all water services serving the East Coast ports increased from 17 in 2002 to 26 in 2007, underlining the emerging commitment of maritime shipping companies. While the Panama Canal route accounts for the vast majority of all water routes, the Suez route is gaining new attention as it can employ bigger ships beyond the current 4,500 TEUs Panamax restriction. However, traffic volume is not yet high enough to justify the usage of the larger containerships capable of fully taking advantage of the scale economies of the Suez route. Still, the long sequence of intermediate hubs along the Asia-Suez-Gibraltar route (e.g. Singapore, Colombo, Salaha, Jeddah, or Algeciras) confers traffic capture opportunities by connecting different markets along the same route (South Asia, Middle East, Southern Europe). As a result, there are emerging East Coast hubs and calling configurations using the Suez Canal where the first North American port of call is Savannah and New York depending on the service configuration.

**Transit Time and Reliability**

Since the vast majority of retail good shipments are containerized, corporations are using supply chains to gain a competitive advantage through distribution strategies (Hesse and Rodrigue, 2004). Lower logistics costs and time are key factors in the distribution process (Mongelluzzo, 2008). In a typical supply chain, there are three major cost components: transportation costs, in-transit inventory costs, and warehouse inventory costs. To manage the supply chain effectively, reliability tends to be more important than

\(^3\) The term offshore hub is commonly used.
price. According to a survey conducted by MergeGlobal, transit time reliability was ranked as the number one importance among all logistics service attributes; price came in second. Transit time reliability has a direct bearing for in-transit inventory carrying costs (just-in-time) and safety stock costs (just-in-case). High transit time variability and unreliability impose additional costs during peak season resulting in lost sales and potential inventory write downs (MergeGlobal, 2007).

Since 80% of the American population lives east of a line drawn from Chicago through Dallas, recently there is a propensity for shippers to favor all-water service over the landbridge service via the West Coast ports so that supply chain reliability and integrity can be maintained. Most logistics processes involved transshipment and intermodal movement are deemed increasingly risky since they are prone to convey additional delays and even additional risks of damage (Ambruster, 2007).

Even if East Coast all water services from Asia are a few days longer than a Transpacific/Landbridge segment, reliability makes this service comparatively attractive.

**Figure 10. Service Time Reliability to the East Coast: All Water Services vs. Transpacific / Landbridge**

Even if East Coast all water services from Asia are a few days longer than a Transpacific/Landbridge segment, reliability makes this service comparatively attractive.
from a supply chain perspective (Figure 10). In maritime shipping delivery before schedule is very rare since shipping networks are configured with allotted port call slots. Both segments are facing the same problems of port congestion along pendulum routes, which can often compound delays. If intermediate hubs are used (such as Singapore, Pusan or Algeciras) some additional delays may incur, but at the benefit of generating more traffic.

Even though the landbridge route offers a shorter transit time service, there are additional delays and risks involved with its use. This includes port congestion along the West Coast which has gotten worse with the growth of containerized traffic and the difficulties to add more terminal capacity due to environmental pressures. Rail capacity along major long distance corridors is also a problem since many rail segments are running close to capacity. The average train speed is impeded due to limited rail line capacity, which in turn delays train departures from intermodal terminals and cause backlogs cascading up the entire network. Ultimately, rail congestion impacts maritime terminals by causing port congestion delaying ship schedules. Furthermore, drayage operation in Chicago may also add additional delay since containers have to be trucked across town from one railroad terminal to another, adding a day or more (Rodrique, 2008). Congestion along the East Coast transport system, particularly if a truck service is selected between Chicago and East Coast distribution centers, will compound additional delays.

For all water services there may be delays related to the usage of the Panama or Suez canals. Consequently, several distribution activities related to retail may find it less risky to trade a few extra days of transit time (which can be easily mitigated with frequency) for a better time reliability (Figure 10). Since many retailers work from a just-in-time perspective, the reliability factor is particularly important. The location of several new distribution centers in the vicinity of Savannah in recent years is an indication of these factors at play. Therefore, transit times to East Coast ports not only reflect geographical distances, but more importantly, are driven by product value and supply chain strategies. The short transit time from Japan and Korea to East Coast ports caters to the supply chain requirement of minimizing inventory carrying cost for high value products.
Port Regionalization and Port Hinterland Divergence

*Port Logistics Infrastructure Development and Intermodal Services*

The overall growth of the American East Coast ports indicates the need for infrastructure development. Furthermore, the volume growth leads another issue of traffic congestion especially in New York metropolitan area. Intermodal solutions become increasingly important. Port regionalization underlines that ports are following a hinterland strategy with the usage of inland terminals and corridors linking them to the main marine terminals (Notteboom and Rodrigue, 2005). Successful port regionalization creates a context promoting divergence by leveraging inland accessibility. All major ports along the East Coast have been undertaking infrastructure improvement projects to accommodate growing demand for port capacity. This includes not only the major ports, but also a variety of capital improvements projects to accommodate additional cargo at smaller ports. Still, the most ambitious projects are both concerning the harbor and hinterland access for two purposes, accommodating larger size containerships – post Panamax upward and competing for discretionary cargo in contestable hinterland markets. The combination of port-captive markets and efficient hinterland access via intermodal network becomes the core strategy for ports, underlining the divergence thesis of port regionalization (Figure 11).
<table>
<thead>
<tr>
<th>Harbor</th>
<th>Montreal</th>
<th>New York</th>
<th>Hampton Roads</th>
<th>Charleston</th>
<th>Savannah</th>
</tr>
</thead>
</table>

**Figure 11. Port Infrastructure Development at the Top 5 East Coast Ports: The Harbor / Hinterland Duality**

In addition to maritime related infrastructure, the availability of modern distribution centers in proximity of the port is another determinant to affect port selection. As distribution centers are part of the supply chain network, the locations of distribution centers are of importance. Currently, shipping lines are reluctant to serve inland markets because of the repositioning of empty containers they involve, particularly since the costs of repositioning are not always recoverable from shippers. Further, it complicates the
management of their container fleet as it is sometimes uncertain when containers shipped inland will be available again within maritime pendulum services. A growth of inland flows is often accompanied by a decline in container turnovers. Therefore, shipping lines prefer to turn containers around as quickly as possible. From a shipper’s perspective, it is preferable to locate distribution centers near the port so they can conveniently perform warehousing activities, transloading and distribute merchandises accordingly. Therefore, port logistics parks have become very attractive to shippers. For instance, Savannah developed the first American master planned logistics park with 1,700 acres of land. As a result, the metropolitan area hosts more than 18 import distribution centers totaling more than 15 million square feet (Biedeman, 2007). This further increases the port attractiveness as shippers benefit from supply chain integration.

**The Hinterland Factor**

Port expansion can be perceived as a matter of capital investment valorizing a favorable site with the accumulation of infrastructure, flows and logistical activities (Notteboom and Rodrigue, 2007). Although suitable sites are not common, particularly as draft requirements increase, the East Coast offers several alternatives. Pressures have also been made to dredge port channels to deeper drafts, such as for New York, Charleston and Savannah, which again underlines that capital investments can be a factor of convergence. To reconcile the theoretical convergence framework with a contradictory reality the “hinterland factor” remains, which in the context of long distance trade, congestion and rising energy prices, has become the dominant vector of port divergence.
Port Hinterland Divergence

For North American freight distribution, the hinterland system is articulated by a set of major long distance rail corridors dotted by inland freight distribution clusters and load centers. In light of the substantial growth in rail traffic, all the major rail operators have undertaken since 2000 a phase of substantial investments aimed at strengthening strategic corridors (Figure 12). Outside the main Transcontinental corridor which links the San Pedro port cluster to Chicago, the spatial pattern of the investments underlie a strategy at better linking the Southeast to the continental system (e.g. the Meridian Speedway, the Southeast Corridor and the Crescent Corridor). It illustrates the growing hinterland importance of the Southeast maritime facade. One particular project, the Heartland Corridor, links directly the Hampton Roads gateway to the Chicago rail hub, increasing its competitiveness in regard to New York.

In an effort to capitalize on the growing traffic by offering a new rail corridor suitable for double stack trains, Norfolk Southern Railroad expects by 2009 to complete a major rail project that will initially connect the new port terminal facilities of Maersk in Portsmouth, Virginia, with rail lines through West Virginia and end in Columbus, Ohio. At this point the corridor will link up with western rail networks or with the double-stack rail corridor to Chicago. Prior to this improvement, double-stack trains heading towards the Port of Virginal went through Harrisburg, Pennsylvania because of insufficient tunnel
clearance. Through an increase of the clearance of 28 tunnels at a cost of about $266 million, the Heartland Corridor project will bypass this loop, cutting 233 miles and 36 hours off the present route from Virginia to the Midwest. This setting is thus likely to increase hinterland competition at the margin of the Boston – Washington corridor and offer a new alternative to long distance transcontinental freight distribution (Virginia Port Authority, 2005).

In 2008, Hanjin Shipping reached an agreement with the Jacksonville Port Authority for a new 170-acre container terminal facility, which could handle 2 million TEU. The rail operator CSX will provide connectivity to its Southeast Corridor to Birmingham and Chicago (Figure 12). In this case the hinterland factor in terms of rail accessibility was very important.

**Conclusion**

After more than 50 years of containerization and intermodal transport developments, the North American Eastern Seaboard is going through a phase of divergence where major ports, as part of a system of gateways, are capturing a greater share of the traffic. This process corresponded to a phase of acceleration of globalization, notably with the setting of NAFTA and the emergence of China as a manufacturing cluster. The diffusion of production abroad and its corresponding traffic growth has been associated with traffic concentration along large gateways. The five largest ports accounted for the bulk of the absolute growth, leaving smaller ports with essentially niche market growth. This is a significant shift from the trend until the mid 1990s when smaller ports tended to grow at a faster rate. Since 1995, a clear divergence has emerged advantaging ports above the 1 million TEU threshold. Although no unique factor fully explains this reversal, a few have been underlined.

In light of larger containerships and the higher volume they imply, the number of suitable port sites appears limited. Additionally, the terminal facility must provide the capacity to handle the associated container volumes. It is thus not surprising that smaller ports are a risky proposition compared with large established terminals having access to
nearby consumption markets. If globalization is to reach a phase of maturity implying stabilization or even a decline of traffic in some markets, the position of smaller ports is likely to be even more compromised. The emergence of all water services represents a new configuration for port calls where supply chain management practices are playing a significant role. In spite of longer transit times, all water services tend to have a more reliable time window, which fits well the freight distribution strategies of large retailers. For the Eastern Seaboard, this has favored growth for Savannah, Charleston and Hampton Roads. Albeit, due to its large surrounding hinterland, the port of New York/New Jersey remains unavoidable and a must-call market.

The hinterland is also playing a growing role in port divergence, particularly in light of growing levels of congestion. While containerization has leveled the playing field for port competition and afforded new players the possibility to capture a market share, particularly if containers were moving inland by truck, the growth of container flows in the hinterland eventually reached a phase where conventional “natural” accessibility factors are reasserting themselves. The development of long distance rail corridors and major inland freight distribution centers also tend to reinforce the accumulation of infrastructure at specific high volume gateways. Indirectly, the strategies pursued by rail companies in terms of investment in corridors and terminals reinforce convergence along a specific number of gateways.

At this point there is little evidence that would indicate that the ongoing divergence could be reversed in a new cycle. Even the slowdown of globalization that began in 2008 is likely to promote divergence even further as maritime shipping companies rationalize their networks. The expansion of the Panama Canal, scheduled to open in 2014, may be the next paradigm triggering a wave of changes along the Eastern Seaboard. The setting of a new Panamax standard around 12,000 TEU and a draft of 15 meters (50 ft) is likely to become an important norm in shipbuilding, but the most important impact will involve the setting of an equatorial ring of circulation using high capacity ships in both direction (Notteboom and Rodrigue, 2008). Since the Suez and Panama canals will be “on par” in terms of
capacity, an equatorial highway serviced by high capacity ships becomes a tangible reality with a set of major intermediate hubs, each being the regional point of convergence.

The emergence of direct high capacity all water routes from Pacific Asia to the East Coast where a few port calls would be performed is much a possibility in this new context. This would place Southern East Coast ports at an additional advantage for distribution activities as considerable volume would be shifted from the landbridge route to the all water route (through the Panama Canal and Suez Canal). The reinforcement of transshipment activities at offshore hubs in the Caribbean can also be expected with some of the East Coast traffic serviced by short sea shipping services to intermediate hubs such as Nassau, San Juan or Kingston with connection opportunities to the east coast of Latin America. The configuration of such networks will be the outcome of the strategies of maritime shipping companies that will try to reconcile economies of scale, frequency of service, energy prices as well as the usage of specific gateways and intermediate hubs.

References
Port Hinterland Divergence


