



# BULLETIN

# FAL

## FACILITATION OF TRANSPORT AND TRADE IN LATIN AMERICA AND THE CARIBBEAN

# Latin America and the Caribbean: port system evolution, 1997-2013

## I. Introduction

The explosion of global container trade in the past two decades has significantly influenced the port geography of Latin America and the Caribbean, leading to a concentration of container traffic at selected ports. Previous research has examined the region's dominant ports, but has not included secondary ports, which are seeking to reposition themselves within emerging feeder markets through a variety of proactive and reactive strategies that involve different actors within a complex institutional environment.

An analysis of time series data on container port throughput is conducted in order to examine patterns of trade growth and trans-shipment location choices. This endeavour is aided by identifying critical moments and junctures. The goal is to identify some of the key moments relevant to secondary ports and show how they have been used to alter the port system.

Decision makers need to gain a clear understanding of the complexity of port development; such knowledge can potentially reduce risks and enable a view of port development that incorporates the wider impacts on the economic, social and transport systems at national and regional levels. At the same time, it will enable decision makers to reflect critically on their own role as a factor in port development. The quantitative and qualitative analysis in this issue presents a multidimensional view, offering new insights into port development and identifying challenges in a variety of contexts.

The first three sections examine peripherality, the role of concentration of container service provision at hub ports, port development strategies and the importance of liner network connectivity and discuss the port's ability to act. Based on this conceptual framework, separate analyses of the Latin American and Caribbean port system and its evolution are provided in the following sections for the Pacific coast, Atlantic coast and the Caribbean; these are followed by a discussion of the presence of international terminal operators in Latin America and the Caribbean, policy implications and conclusions.

This *FAL Bulletin* demonstrates the evolution of maritime networks and port development at primary and secondary ports in Latin America and the Caribbean. An analysis of time series data on container movements between 1997 and 2013 reveals patterns of cargo flows and trans-shipment location choices. The institutional context of devolution processes and new investments in the region provide additional insight into the performance of selected ports.

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## I. Introduction



## II. Peripherality and concentration



## III. Liner shipping networks and port system evolution



## IV. The institutional context of port development



## V. The Latin American and Caribbean port system



## VI. Policy implications: impact of private investment and port policies



## VII. Conclusion



## VIII. Bibliography



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## II. Peripherality and concentration

Peripheral regions face issues such as high transport costs and an inability to generate economies of scale and density (Nijkamp, 1998). In the context of maritime trade, peripherality is determined not by geographical distance but by economic factors, reflected in connectivity and market structures (Wilmsmeier, 2010, and Sánchez and Wilmsmeier 2011). This is relevant in the context of the increasing integration and reduction of economic, legal and operational barriers between countries within supranational trading blocs and, in the Latin American and Caribbean case, is related to the physical integration initiatives aimed at increasing regional integration through infrastructure development. Furthermore, a distinction may be drawn between peripheral regions within a country and peripheral countries. Nijkamp (1998) noted that “a system of regions is much more an open trade system without customs or institutional barriers. Thus, competitiveness plays a crucial role in regional development [and] . . . factor mobility tends to be much higher between regions” (p.8). The reduction of internal barriers can lead to a concentration of container traffic at fewer, larger gateway ports, but also to a diversification and decentralisation of port traffic through an extension of port hinterlands as a result of infrastructure development.

As a port system moves towards concentration, particularly for unitized cargo, significant challenges to hinterland infrastructure become apparent. Ducruet and others (2009; p.359) argued that “concentration stems from the path-dependency of large agglomerations”, while drivers of deconcentration include “new port development, carrier selection, global operation strategies, governmental policies, congestion, and lack of space at main load centres.” According to Barke (1986) and Hayuth (1981), port system concentration will eventually reach its limits and invert, leading to a process of deconcentration, a phenomenon discussed by Slack and Wang (2002), Notteboom (2005), and Frémont and Soppé (2007). Wilmsmeier and Monios (2013) argued that existing theory falls short of differentiating between deconcentration that emerges upon failure of a system in a reactive manner, deconcentration that materializes from proactive port development strategies and deconcentration that emerges from new economic and industrial development. Thus, the drivers of deconcentration processes can be related not only to the port system but also to the transport system (i.e. hinterland infrastructure and carrier strategy) and the economic system (e.g. logistics strategies, economic development (Wilmsmeier and Monios, 2013; Wilmsmeier and Sanchez, 2010; and Robinson, 2002)).

## III. Liner shipping networks and port system evolution

Port operators and shipping lines have both exhibited strong concentration processes as well as increasing vertical integration. In May 2014, the top ten carriers controlled approximately 63.7% of world container shipping capacity (Alphaliner, 2014), while in 2012 the top 10 port terminal operators handled approximately 36% of total container throughput (of which 26.5% was handled by just the top four), measured in “equity TEU” (Drewry, 2012).<sup>1</sup> Strategic alliances between them have exerted a profound influence on maritime network structure and also on the Latin American and Caribbean region’s integration in the global maritime transport network. These developments have, to a certain extent, made port development dependent on the network strategies of global players. The location of a port within the network influences the competitiveness of trade through that port and subsequently raises important questions regarding what determinants lead to the configuration of current networks and how these may be influenced.

The development of liner shipping networks is primarily driven by the demand for containerized transport, depending on the strategies of shipping companies and the demand of shippers for specific service characteristics. As such, the location of a port or a region within the global liner shipping network is determined by the density of trade flows to and from a specific port or region. These factors then become the determinants of the service frequency, loading capacity, number of port calls per roundtrip and trans-shipment or relay strategies (Fagerholt, 2004).

Port selection can be based on several criteria, from physical characteristics and geographical location to port efficiency, strategic carrier considerations and hinterland access (Wilmsmeier and Notteboom, 2011). Magala and Sammons (2008) argued that port choice is a by-product of the choice of a logistics pathway. Thus, port choice becomes more a function of the overall network cost and performance. From the carrier’s perspective, the economies of scale, scope and density in shipping, port operations and inland operations would favour a very limited number of load centres in a region (Cullinane and Khanna, 2000; and Frémont and Soppé, 2007).

It appears that networks in the Latin American and Caribbean region and its sub-regions are being served by a hub-and-spoke network; a secondary network of smaller regional services are starting to develop, and shipping lines can now offer direct services from these

<sup>1</sup> The “equity TEU” concept was devised by Drewry as a more accurate way than the simple twenty-foot equivalent unit (TEU) throughput to account for the fact that some terminal operators have shares in each other’s operations.

ports to overseas regions. In order to combat this process, which undermines their operations, existing hubs seek liner service connections to other ports in the region that still lack connectivity to overseas markets (for details see Wilmsmeier and Notteboom, 2011).

While network development and port choice are based on many factors, the ability of ports to “steer their own future” (Olivier and Slack, 2006; p.1414) can exert some influence. Ports can take on “the challenge of the periphery” (Barke, 1986; Hayuth, 1981; and Slack and Wang, 2002); in particular, secondary ports can take advantage of wider trends such as the limits of concentration and reposition themselves to take advantage of a network that may be changing from an outdated system of hubs to new structures. In order to understand how secondary ports act under such conditions, a more complex and nuanced understanding of the port’s ability to act is required.

#### **IV. The institutional context of port development**

A distinction needs to be made between shipping and port subsystems since the former consists of mobile elements, while the latter is made up of physical characteristics in space. The economic and the shipping systems together generate pressure on the port system in the form of ever-evolving specific requirements with respect to infrastructure, superstructure, equipment, efficiency and organization. This prompts a time-lagged reaction within the port system to satisfy this changing demand and it is this reactive progression that actually constitutes the port development process, determined by and reflected in its physical (infrastructure and superstructure), economic, social, environmental and institutional arrangements.

According to institutional approaches to port development, the port authority faces constraints on its ability to act, stemming from its specific nature. The key argument is that port development is path-dependent, heavily constrained by past actions and institutional design, but also contingent on private investment and public planning (Notteboom, 2009). Ng and Pallis (2010) showed how port governance is largely determined by local/ regional institutional characteristics, despite attempts to implement generic governance solutions. Notteboom and others (2012) applied the concept of institutional plasticity (Strambach, 2010) to port development, arguing that, while port development is path-dependent, a port authority can achieve governance reform by a process of adding layers to existing arrangements. In this way, the port authority does not break from the existing path of development, but develops new capabilities and activities via a process of “institutional stretching”. An example is given of port authorities investing in load centres in the

hinterland, beyond their traditional jurisdiction, and the particular importance of informal networking is noted (see also Monios and Wilmsmeier, 2012). Jacobs and Notteboom (2011) asserted the need for an evolutionary perspective, drawing upon the economic geography literature to define the movement from critical moments to critical junctures, concluding that port authorities have windows of opportunity in which collective action is possible. The authors concluded that “the question of to what extent critical moments require institutional adaptations in order to materialise into critical junctures needs further thought” (p.1690).

The aim of this issue is to put forward arguments for a more systemic view of port development (a discussion that usually only focuses on main ports) and to identify arguments that support secondary and emerging ports in their effort to develop their facilities and strategies through appropriate institutional structures.

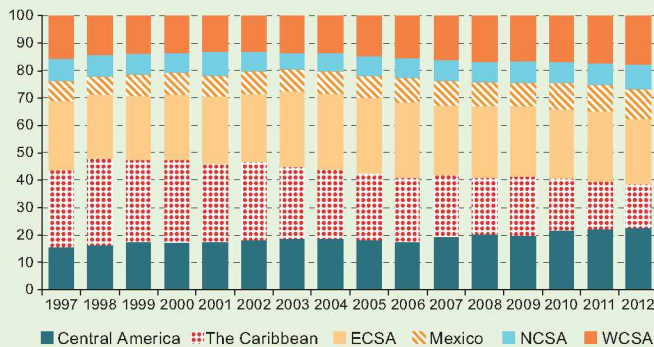
#### **V. The Latin American and Caribbean port system**

Container throughput in the Latin American and Caribbean port system grew from 12.7 million twenty-foot equivalent units (TEU) in 1997 to 45.6 million TEU in 2012. Throughput in 2012 was equivalent to 7% of all global port movements. According to ECLAC, over 17% of all containers in Latin America and the Caribbean are moved in Brazil, followed by Panama (15.0%), Mexico (10.7%), Chile (7.9%) and Colombia (7.4%). However, the port throughput at regional and country level is only a very crude reference of the current state of the port system. In order to understand the evolution of a port system it is necessary to take a spatio-temporal perspective, looking at disaggregated figures at country and sub-regional level over an extended time period.

This detailed analysis allows us to identify and to analyse individual trends of the main Latin American and Caribbean sub-regions, i.e.: Central America, Caribbean, the east coast of South America (ECSA), Mexico (both coasts), the north coast of South America (NCSA) and the west coast of South America (WCSA).

The analysis of port activity shares at the sub-regional level (see figure 1) reveals that Panama has gained the greatest market share and recorded the highest growth figures over the past 15 years. As port activity growth in Panama is particularly related to trans-shipment traffic, it might be argued that this is a first indicator of the changes in the port system towards the third phase hub-and-spoke structure as indicated by Wilmsmeier and Notteboom (2011), thus leading to a concentration in the port system towards trans-shipment hubs, a development that is driven by liner shipping strategies rather than economic development.

**Figure 1**  
SHARE OF CONTAINER THROUGHPUT OF THE DIFFERENT  
LATIN AMERICA AND CARIBBEAN SUBREGIONS,  
1997 TO 2012



Source: Authors, based on Maritime and Logistics Profile, Economic Commission for Latin America and the Caribbean (ECLAC).

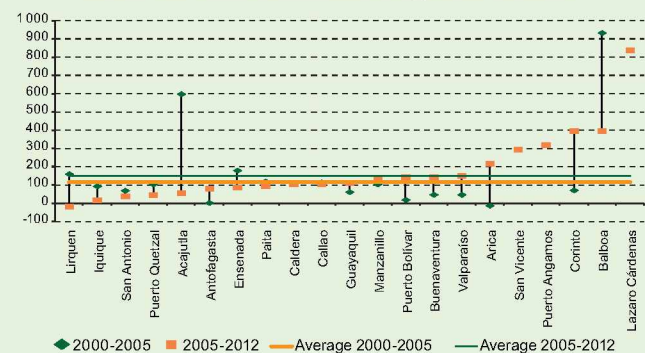
The Caribbean remains a key market for trans-shipment; however, it has been losing market participation in recent years, indicating a shift from the traditional trans-shipment hubs (e.g. Kingston, Jamaica, and Freeport, Bahamas) towards Panama and Cartagena, Colombia.

A further development is an activity shift in Central America and Mexico from the east coast of Central America (ECCA) to the west coast of Central America (WCCA). In the case of Central America (including Mexico), the share of container activities has transformed from a 72:28 split between east and west coasts to a 55:45 ratio in a market which, in 2012, moved almost five times more TEU than in 1997.

## 1. The Pacific coast

A comparison of the growth rates of Pacific coast ports for the periods 2000-2005 and 2005-2011 (see figure 2) reveals that the two leading trans-shipment ports (Balboa, Panama, and Lazaro Cardenas, Mexico) recorded the highest growth during the first period, and continued to register some of the highest growth rates during the second. The ports with the highest growth rates between 2000 and 2005 seemed to have experienced slower growth in the following period, probably indicating a conversion from the take-off phase towards more maturity after they had reached a certain size. Ports like Callao, Peru, and San Antonio, Chile, display relatively lower growth rates in comparison with other traditional gateway ports. What is interesting is the fast evolution of four secondary ports (Arica, San Vicente and Puerto Angamos in Chile; and Corinto, Nicaragua). The findings deliver arguments for two trends: first, continued strong growth rates of the trans-shipment ports and, second, very fast growth rates in emerging secondary ports between 2005 and 2011, partly combined with the entrance of new players, such as San Vicente (SVTI), Chile, in the port system.

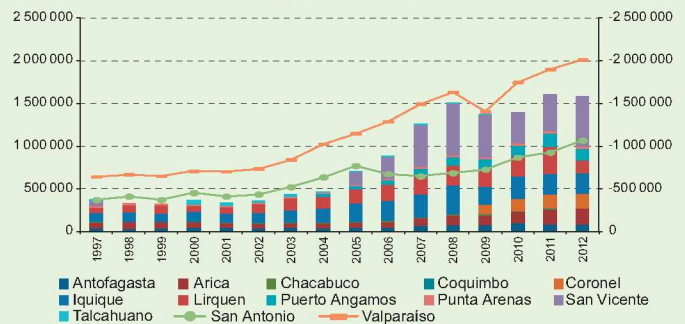
**Figure 2**  
GROWTH RATES OF PACIFIC COAST CONTAINER  
PORTS (WEST COAST CENTRAL AMERICA AND  
WEST COAST SOUTH AMERICA), 2000 TO 2012



Source: Authors, based on Maritime and Logistics Profile, Economic Commission for Latin America and the Caribbean (ECLAC).

The emergence of secondary ports is particularly notable in the case of Chile, which has witnessed a greater geographical spread of ports towards the south of the country (see figure 3).

**Figure 3**  
SHARES IN CONTAINER THROUGHPUT IN CHILE,  
1997 TO 2012



Source: Authors, based on Maritime and Logistics Profile, Economic Commission for Latin America and the Caribbean (ECLAC).

Note: Valparaíso and San Antonio are shown on a second axis in order to display the smaller ports more clearly.

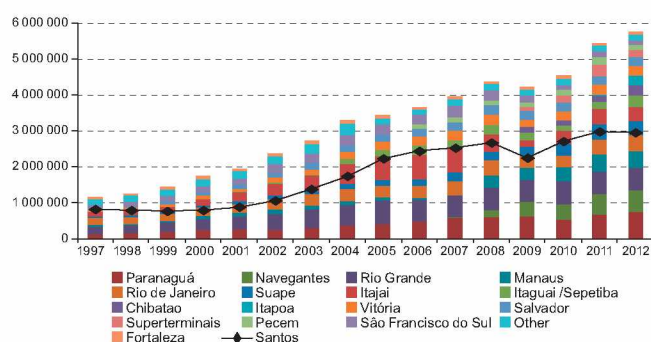
As mentioned above, the appearance of San Vicente (SVTI) as a new player in 2005 and the growth of the co-located Lirquen appear to support the emerging relevance of secondary ports in the region and a related transformation of the port system. The analysis also reveals that the two main traditional ports effectively lost over 11% of their market share between 2000 and 2012. However, the pure numerical analysis by port does not reveal the systemic relationships in the port system created by the privatization efforts over the last two decades and the internationalization of container port operations. In the case of Chile, this is particularly interesting as the operator of San Antonio is the same as in San Vicente. Thus, while the individual port San Antonio was not able to increase its market share of the port system (although it did grow in absolute terms), the private

operator's relevance and share in port activity grew strongly when one considers the ports of San Antonio, San Vicente and the other Chilean ports operated by the same company.

## 2. The Atlantic coast

When the focus of analysis shifts to the east coast of South America, a somewhat similar picture emerges (see figure 4).

**Figure 4**  
**SHARES IN CONTAINER THROUGHPUT IN BRAZIL,**  
**1997 TO 2012**



Source: Authors, based on Maritime and Logistics Profile, Economic Commission for Latin America and the Caribbean (ECLAC).

Between 1997 and 2012 overall container throughput in ECSA ports more than tripled to over 11.5 million TEU in 2012. This was accompanied by a significant shift in the market participation of the ECSA countries. Brazil's share of container movements expanded from 60% to 75%, while Argentina lost one third of its market share and in 2012 generated only 18% of all container traffic in the ECSA. This shift originates principally from the expansion of Brazil's economy, paired with its population size. By way of example, Brazil today is one of the world's largest exporters of chicken and beef, a trade that has only recently developed as a response to the growing demand in the emerging Asian economies. Uruguay, the smallest economy on the ECSA, was able to increase its market share to almost 7%. This achievement was driven not solely by the economic development of the country but also by its strategy to act as a trans-shipment hub and gateway for Paraguayan as well as southern Argentine cargoes (see also Wilmsmeier, Martinez-Zarzoso and Fiess, 2010).

In addition to the shift in market participation at the country level, the traditional concentration within each of the national container port systems is being diluted by the entrance and development of new players. In the case of Argentina the deconcentration process is still in its infancy, but it is worth noting that the container terminals in Buenos Aires lost about 9% of national market share between 2000 and 2012, reflecting the fast expansion of new container ports (e.g. Zarate) in the country. For earlier figures and discussion of competition in the River Plate region, see Sánchez and Wilmsmeier 2006.

Traditionally, Santos has been the principal container port in Brazil and its terminals handled 36% of Brazil's container throughput in 2012. Nevertheless, its market decreased in comparison with 1997, when the port was responsible for over 42% of Brazil's container movements. Rio de Janeiro, as the second biggest container port in Brazil in 1997, lost 50% of its market share over the past 15 years. A number of secondary ports and greenfield projects have emerged over the past 15 years. These not only led to a geographical spread of container activity but also initiated a deconcentration process. Rio Grande in the south of Brazil held an important market share of 10% in 1997 and was expected to evolve as a competitor to Montevideo and Buenos Aires as its infrastructural conditions and draught of 15m favoured the handling of post-panamax vessels. The port expanded and increased its market share to over 13% in 2003, benefiting from the repercussions of the economic crisis in the port of Buenos Aires (see Sanchez and Wilmsmeier, 2008). However, since then its share in Brazilian container throughput decreased to almost 7.5% in 2012. Its continued growth was, therefore, not sufficient to keep up with the speed of expansion of overall national container activity. As regards other ports, the port of Itajai (including the new Navegantes terminal) doubled its market share to 12% in 2012; Manaus also doubled its share to 6%, while Suape more than tripled its participation to over 5% in 2012.

## 3. The Caribbean

The ports in the port system of the Caribbean/east coast Central America and Mexico (ECCA)/north coast South America (NCSA) can be categorized as follows: pure trans-shipment hubs (minimum of 70 per cent trans-shipment cargo), hybrid ports (between 30% and 70% trans-shipment cargo), gateway ports (less than 30% trans-shipment cargo) and local and inter-island trans-shipment ports.<sup>2</sup>

Port throughput in these subregions grew from 7.0 million TEU in 1997 to 19.4 million TEU in 2012. The authors estimate that the share of trans-shipment cargo increased from 38% (1999) to around 50% of total traffic in 2011. Thus, the incidence of trans-shipment traffic in the region is significantly above the 2011 global average of 31% (see Drewry, 2013).

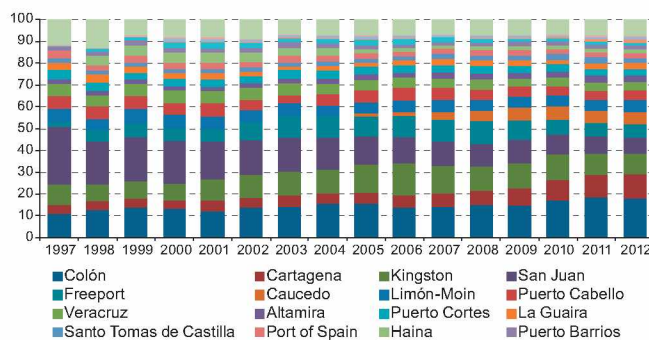
Figure 5 reveals that, while the market share of the trans-shipment ports grew from 33% in 1997 to 45% in 2011, the development of the hybrid ports was more diversified.

<sup>2</sup> Trans-shipment ports: MIT, Panama; PPC, Panama; CCT, Panama; Kingston, Jamaica; Freeport, Bahamas; Hybrid ports: Cartagena, Colombia; Puerto Cabello, Venezuela; Point Lisas, Trinidad and Tobago; Caucedo, Dominican Republic; Port of Spain, Trinidad and Tobago; Gateway: Limon-Moin, Costa; Veracruz, Mexico; Puerto Cortes, Honduras; Rio Haina, Dominican Republic; Local and inter-island trans-shipment: Jarry; Bridgetown; Phillipsburg; Oranjestad; Georgetown-Cayman; Vieux Fort, Castries; St John; CACP (Campden Park Container Port); Long Point Port (Nevis); Road Bay Port; Kingstown; Willemstad; Georgetown; Nieuwe Haven.



Cartagena, Colombia, was the most successful hybrid port, increasing its market share from 5.8% to 11.6% in the same period, while other hybrid ports including Port of Spain, Puerto Cabello or Point Lisas were not able to increase their market share.

**Figure 5**  
SHARES IN CONTAINER THROUGHPUT IN CARIBBEAN/  
EAST COAST OF CENTRAL AMERICA/NORTH COAST  
OF SOUTH AMERICA, 1997 TO 2011

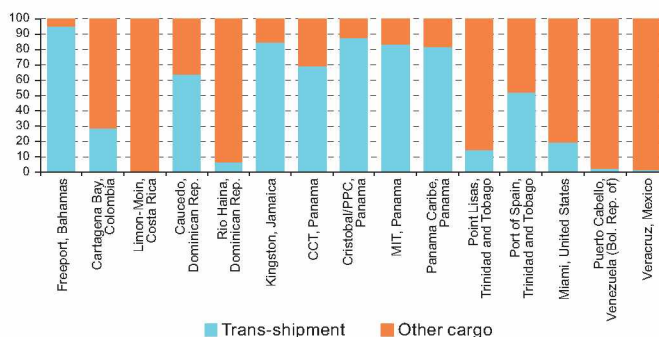


**Source:** Authors, based on Maritime and Logistics Profile, Economic Commission for Latin America and the Caribbean (ECLAC).

**Note:** Colón includes MIT, Evergreen, and Panamá Port.

Figure 6 shows the relative share of trans-shipment and gateway traffic at selected Caribbean/ECCA/NCSA ports in 2011.

**Figure 6**  
SHARE OF TRANS-SHIPMENT AND ORIGIN/DESTINATION OF  
CARGOES FOR SELECTED PORTS IN THE PORT SYSTEM  
OF THE CARIBBEAN/EAST COAST OF CENTRAL  
AMERICA/NORTH COAST OF SOUTH AMERICA, 2012



**Source:** Sánchez, 2012.

Cartagena's trans-shipment share in total container movements increased significantly since 2005 when Hamburg Sud decided to make the port its strategic trans-shipment hub for Latin America and the Caribbean, connecting to seven of the carrier's services between North and South America, the Caribbean, the Mediterranean and Northern Europe. Hamburg Sud's trans-shipment volume through Cartagena increased fivefold between 2006 and 2012 (Port Strategy, 2012). A particular case in this category is Caucedo, Dominican Republic. The outcome of a greenfield development, the port emerged in 2003 and is operated by the global terminal operator, DP World, whose intention is to transform it into a new trans-shipment port in the region. Since then, the port has developed into a hybrid port, capturing significant amounts of the increase in local destination cargo and at the same time pursuing the goal of attracting more trans-shipment cargo, which reached a share of above 50% of all container movements in 2011.

The gateway ports in this port system were not able to maintain their market share, despite the growth in container throughput. Sanchez (2012) observed a significant geographical shift in the Caribbean/ECCA/NCSA port system, driven by changes in the evolution of traditional trans-shipment ports and the emergence of new players as well as the expectation in the logistics system resulting from the forthcoming widening of the Panama Canal in 2015.

## VI. Policy implications: impact of private investment and port policies

Beyond the changes in throughput volumes, the appearance and evolution of port devolution processes in the region since the beginning of the 1990s have marked critical moments for those countries and the ports involved. This development is closely linked to the appearance of international port terminal operators in the region (see also Sanchez and Wilmsmeier, 2006). In 2006, 33 container terminals were being operated by international terminal operators in 12 countries of the region. By the beginning of 2012, the number had increased to 66.

While the simple presence of private port operators is not a guarantee of success in port and terminal development, it can be argued that these operators changed the level of competition in the different subregions. Until 2006 intra-port competition was restricted to the port of Buenos Aires, the Caribbean coast in Panama and the competition between Valparaíso and San Antonio in Chile as they serve a congruent hinterland. Since then the further influx of

international terminal operators has brought a new level of intra-port competition to Callao, Peru (APMT and DPW), Panama's Pacific coast (PSA and HPH), Buenaventura, Colombia (TCB and ICTSI), Lazaro Cardenas (APMT and HPH), Manzanillo, Mexico (SSA, HPH, ICTSI) and Santos (DPW, APMT and Santos, Brazil).

It is interesting to observe that each international operator shows specific geographical specialization strategies. In the first phase, during the influx of international operators, the interest concentrated on the countries' main ports, of which many (exceptions being Buenos Aires and Panama Caribbean coast) did not have sufficient scale in the 1990s to make operation viable for two competing operators. The continued growth in demand has changed this situation and, since 2005, the increase in competition can be observed, as described above. HPH has a clear dominance in the Central American market (i.e. Mexico). APMT has been focusing on new terminal developments with a strong interest not only in trans-shipment cargoes but lately in gateway ports with the potential to develop towards hybrid ports. DPW has a more equal presence in each sub-region. These findings underline the advances in the evolution of the port system as asserted by Wilmsmeier and Notteboom (2011).

A number of questions emerge from the preceding descriptive analysis of the evolution of the LAC port system and its sub-systems. What were the critical moments in the system and what were the criteria of success enabling some ports to convert these moments into critical junctures? If the Latin American and Caribbean port system is evolving from concentration to deconcentration, what implications does this have for the strategies of the region and the policies of individual countries within the region? What is the role of shipping lines in driving the emergence of new and secondary ports? Why are traditional ports beginning to lose their position in the system? Has the influx of global and international port operators contributed to the shifts in the port system? How far does economic development contribute not just to throughput growth but to a geographical diversification of the growth of container ports? Are other economic or institutional variables playing a role in the emergence of these ports? Which ports have been successful in taking on "the challenge of the periphery"? One paper cannot answer all these questions definitively; nevertheless, the next section will apply recent institutional thinking to the descriptive analysis in order to advance understanding of some of the above questions.

Policy implications: the devolution of port management and operations and, more generally, the deregulation of

transport services, have opened up new opportunities for development in the region. Port devolution transformed the institutional structure in which actors and their relationships were embedded; this transformation spurred new strategies, which required, at least on behalf of the successful ports, an identifiable process of institutional adaptation.

The focus in previous research has been almost exclusively on the development of main container ports, giving only residual attention to secondary port development in the region. Therefore many of the changes described in this paper and the resultant transformations in the different subregions passed almost unnoticed and have consequently not been part of a contextual debate on port system development challenges and opportunities in the Latin American and Caribbean port system.

These new developments offer opportunities for policy implementation that reach beyond the physical development of single port infrastructures and traditional operational facilities in main ports. What is required is to address more strategic and integrated possibilities of system development. Success in an increasingly competitive environment can only be achieved if public institutions and private sector actors are able to identify the critical moments and convert these into crucial junctures.

Derived from the preceding analysis, the figure below depicts the main critical moments that can be identified to have influenced port system development in Latin America and the Caribbean. These did not appear either in sequence or simultaneously but rather in a diversified spatio-temporal manner.

Given the historic need for infrastructure development in the region, most development took place in the main ports. However, in more recent years, secondary ports have started to engage in more integrated development strategies that also include the consideration of logistics development connected to the port (e.g. Manaus, Brazil, and Puerto Angamos, Chile). The analysis of the port system in this paper hints that some countries and individual ports (represented by their actors, either public or private) were thus able to make use of some of these critical moments. The focus on the geographical scale of the Latin American and Caribbean region precludes detailed analysis of specific ports; therefore, it is not possible in this analysis to specify which exact critical moments were utilised by individual ports. The goal is to identify some of the characteristics of the key moments in figure 7 and show how they have been used by secondary ports to alter the port system.

**Figure 7**  
**CRITICAL MOMENTS IN LAC PORT DEVELOPMENT BETWEEN 1990 AND 2012**



Source: Authors.

The available data suggest some evidence of a deconcentration of container traffic within the Latin American and Caribbean port system, related to a shift both in gateway regions and a shift from a gateway role to a trans-shipment role, thus supporting the movement of cargo through secondary ports in the region. More disaggregated research is required, but these identified shifts have potential benefits for secondary ports, many of which were identified in this paper as pursuing significant port expansions to take advantage of this expected trend. These ports seek to reposition themselves within an emerging feeder market that could reduce their peripherality within the traditional Latin American and Caribbean port and infrastructure system.

The use of the first mover advantage for greenport development (for example, in Caucedo) is already having repercussions on the market share of ports. The advantages gained by these ports in the battle for position, particularly in the trans-shipment market, will be difficult to replicate by competitors that have only recently started to develop their strategy in this direction. The nature of port system evolution is revealed in how the changing of each input alters the state of the system and can render a once-attractive strategy inadvisable if performed too late, after the system has changed its state. The paper thus raises questions about port policy and both public and private sector responses to a changing Latin American and Caribbean port geography. Global replication of identical strategies will not work unless the correct mix of critical

moments is arrayed in a suitable spatio-temporal pattern. Identifying and classifying such an ideal pattern for each development choice are not possible in this brief analysis, yet some insights can be gained from assessing a regional port system through this theoretical lens.

The introduction of larger vessels on global mainline routes, a trend already being observed, can be expected shortly to initiate a process whereby vessels cascade down to secondary Latin American and Caribbean routes, creating requirements for new infrastructure not only in the region's main ports but also in secondary ones. If some ports are not able to handle larger ships due to insufficient berthing or handling capacity, this would support the growth of regional second-tier hubs, which can then serve the smaller ports either by smaller feeders or even land transport in some cases (thus raising issues relating to the quality and capacity of hinterland infrastructure links).

When analysing the evolution of a port system and its sub-systems, it is important to be aware not only of path dependence exerted by previously-dominant ports but also of the impact of the contingency of port development on port devolution, competition and public planning approval. The work in this paper underscores the temporal aspect of path dependence with the recognition that, for overcoming peripheral status, the first mover advantage is of considerable importance. This observation supports the view of Jacobs and Notteboom (2011) that the "window of opportunity" has to be open long enough to achieve

the institutional transformation at the critical juncture, otherwise the opportunity is lost.

When fighting for a small regional market, coming in against an incumbent is difficult in a sector with large upfront investment, large sunk costs and a long payback period. However, proactive strategies such as those pursued by Caucedo and Cartagena seem to be challenging traditional path dependence.

## VII. Conclusion

The analysis and discussion in this paper demonstrate that port development in Latin America and the Caribbean has been driven first by significant and continued growth of container traffic. Strategies of liner shipping companies have evolved towards a wide implementation of hub-and-spoke networks, leading to patterns of concentration exhibiting significant effects of path dependence. However, the contingency of both private investment and public planning approval has been found to play an important role in port development, supporting newly-emergent port hierarchies. The work in this paper takes these notions forward by underscoring the spatio-temporal aspects of port system evolution, allied to the importance of a systemic view in order to identify where critical moments are turned into critical junctures where port actors can overcome path dependence. This paper has been able to identify some characteristics of these moments through an analysis of the port system in Latin America and Caribbean, but is necessarily limited by the focus on this geographical scale. More disaggregated research is, therefore, required in order to take these findings forward in more detail.

Results show that the manufacturing of strategic locations can be successful and may have driven the emergence of secondary ports in the Latin American and Caribbean system. This finding demonstrates how path dependence can be challenged by new developments, the identification and success of which are nevertheless contingent on factors such as the first mover advantage, port planning and diversification of port roles. These findings deepen understanding of the recursive relationship between shipping line and port development strategies, as well as their effect on wider maritime network developments.

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