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Liner shipping markets, networks and strategies: The implications for port development on the West Coast of South America

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Liner Shipping Markets, Networks and Strategies

The implications for port development
on the West coast of South America



Discussion Paper 2013 • 22

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Economic Commission for Latin America
and the Caribbean (ECLAC)

**Liner Shipping Markets, Networks and
Strategies.
The implications for port development
on the West Coast of South America.**

The case of Chile

Discussion Paper No. 2013-22

Prepared for the Roundtable on
Port Investment and Container Shipping Markets Roundtable
(7-8 November 2013, Santiago, Chile)

Gordon WILMSMEIER
Economic Commission for Latin America and the Caribbean (ECLAC)

November 2013

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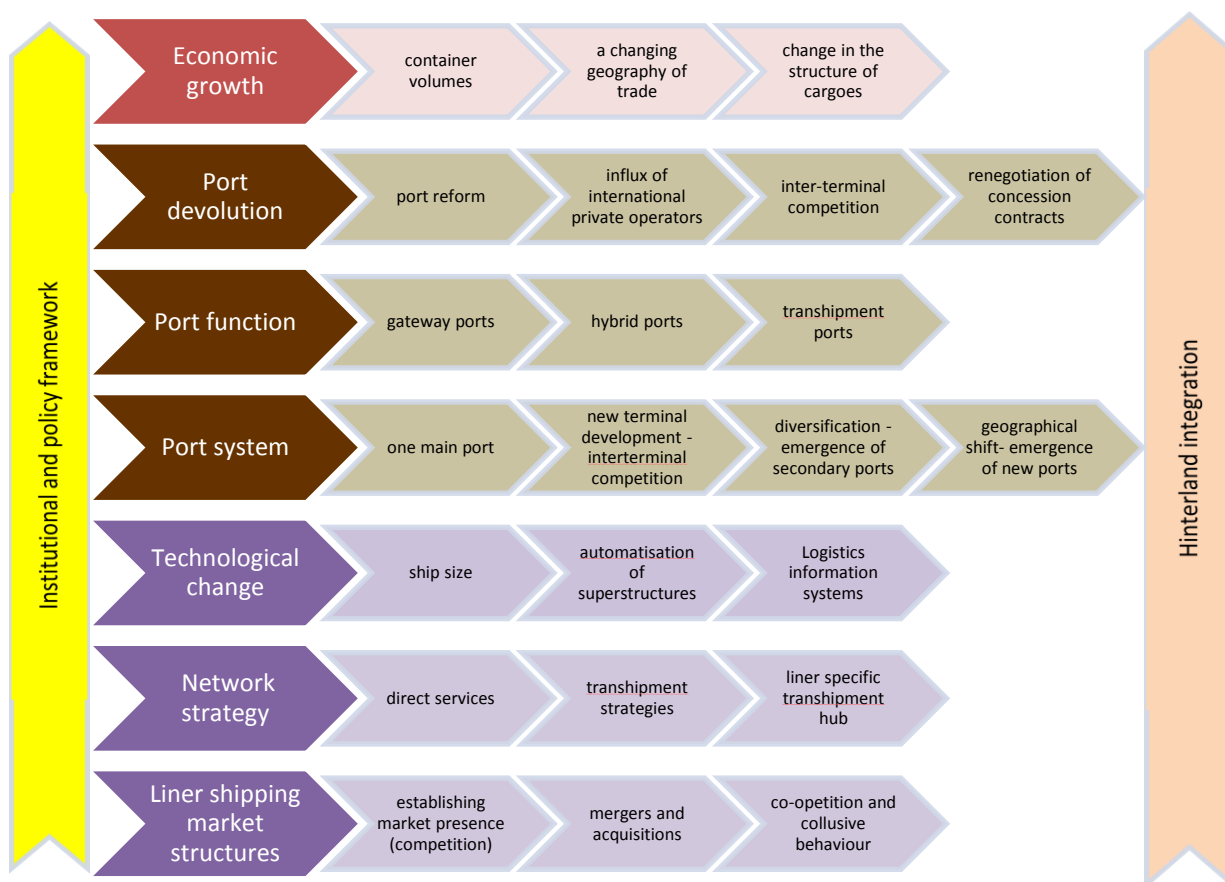
1. SETTING THE SCENE

This paper, predominantly on the challenges for port development, in some important sense cannot help but also be about the deeper phenomena of structural change in the maritime industry and geographical shift. The main objective is to analyse the evolution of symptoms of change in the liner shipping industry within South America and more particularly on the West Coast, as these changes are direct drivers for port infrastructure and port system development, which is both economically interesting and a matter of serious policy significance in its own right.

Port infrastructure and the quality of shipping services in a region or country are important determinants for the countries integration in the global market and the competitiveness of the same. Given the sustained growth in emerging economies, despite the recent crisis, port infrastructure development has emerged as a crucial issue for future economic growth. The West Coast of South America (WCSA) and particularly Chile have been experiencing significant economic expansion over the last two decades. However, the role of infrastructure and its contribution to continued economic and social development has only recently returned to the political agendas.

The growth in demand for port infrastructure, the structural changes in the maritime industry and a changing geography of trade have clearly revealed the limits of the current transport infrastructure in the region and the country. Infrastructure development, and in particular port infrastructure expansion decisions are politicized full of historicism and case-specific empiricism. Thus this work tries to stimulate a more systemic view to support more contextual, integrated and long-term policy decisions. Wilmsmeier et al. (2013) identified critical moments in Latin American and the Caribbean (LAC port development. Their work focused on the evolution of the port system in the region and its subregions (WCSA, ECSA, ECCA, WCCA, Caribbean and NCSA). Their findings are the starting point for the present paper which moves beyond the port to analyze the evolution and changes in the maritime industry and in particular the liner shipping services in the WCSA. Beyond the critical moments identified in the previous work this paper particularly focuses on the elements of technological change (related to ships), network strategies and liner shipping market structures.

Figure 1 - Critical Moments in LAC port development between 1990 and 2013



Source: author based on Wilmsmeier et al. (2013)

2. PORT THROUGHPUT DEVELOPMENT

Port throughput in Latin America and the Caribbean has grown from 10.4 million TEUs (1997) to almost 43 million TEUs (2012). With a CAGR of 9.9% this development has put enormous pressure on port infrastructure in the region. However, in a global context LAC ports are only responsible for 7.2% of throughput, with the total WCSA ports moving only about 1/6 of TEU compared to the port of Shanghai.

The analysis of the port system on the WCSA by Wilmsmeier et al. (2013) hints that ports (represented by their actors, either public or private) were able to make use of critical moments in more and less successful manners. The port reform processes in the 1990s, i.e. in Chile made it possible to advance port infrastructure development, particularly in terms of port productivity and to initiate significant container terminal development through the involvement of the private sector. However, the sustained growth has clearly attributed to the prevalent lack of port infrastructure, as well as other infrastructures to light.

Until today the focus has been almost exclusively on the development of main container ports, leaving only residual attention to secondary port development in the region. In this way port expansion planning is still usually port focused, but not developed from a systemic viewpoint. Hinterland transport infrastructure and logistics development is also not fully taken into account.

Path dependency and contingency are important elements in the evolution of a port system and its sub-systems. Port devolution, competition, hinterland integration strategies as well as public planning approval are directing determinants towards this context.

Path dependency is often created by historicism and institutional sclerosis. In Latin America the devolution process in many countries has left port development in the hand of the private sector, Wilmsmeier et al (2013) refer to Swyngedouw who argues that, 'the production of locational effects as a result of capital investment in space' (p. 424) left to private investors ignores important aspects when creating new ports. Fleming and Hayuth have also noted how the virtues of centrality and intermediacy that create strategic locations can be manufactured. But how will this affect future private investment and institutional capacities of current development, particularly in a region where government investment in ports is almost absent. There seems certain evidence from the above analysis that the manufacturing of strategic locations can be successful and may have initiated the emergence of secondary ports in LAC.

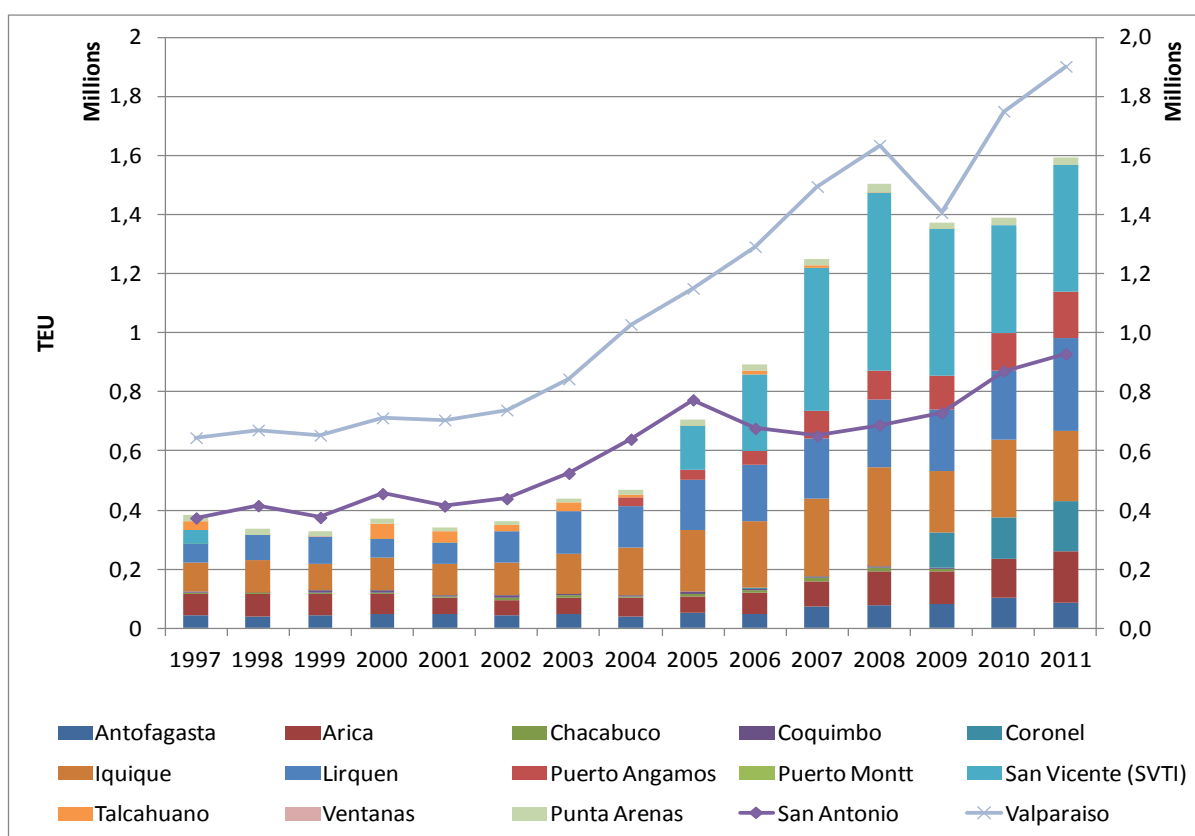
Ports and port systems undergo lifecycles (Cullinane and Wilmsmeier 2011) and on the WCSA the traditional main ports have reached maturity. Thus the current discussion on port development needs to be, whether the possibility of an extension of the life-cycle of current locations exists and what solutions are available or whether the development of a

completely new site in terms of a locational shift is the option to cater for future development and expansion of the existing port system.

The existing studies on port development in the region as well as the political discussion typically focus on the development of a single port, in the past usually the country's main port, and thus lack a recognition of changes in the overall port system. Wilmsmeier, Monios and Perez (2013) analyse the evolution of the Latin American and Caribbean port system as a whole. Particularly, for the sub-regions WCSA and ECSA the authors find clear indications of decentralisation processes. Over the last decade secondary ports have evolved much faster than the long-established main gateway ports in both sub-regions. Thus there is a diversification of ports serving the demand for containerized trade, which is also accompanied by a geographical dispersion of ports.

In the case of Chile the ports of San Antonio and Valparaiso moved over 2/3rds of the total containers moved within the country in 1997. By 2012 these two ports have more than tripled their throughput to over 1.8 million TEU. However, the overall share in container throughput of these two ports has reduced to just above 50%.

Figure 2 – Evolution of container throughput in Chile by port, 1997 to 2011



Source: Wilmsmeier, Monios and Perez (2013)

The ports in Talcahuano, San Vicente, Lirquén, all located in very close proximity have evolved much faster than the traditional ports of San Antonio and Valparaíso. In 1997 some of these ports did not even exist (STVI), and the ports which did only played a minor role in the port system. In 2012, these ports moved over 1/3 of all Chilean container trade.

Such diversification and geographical shift in the port system has occurred in parallel in Brazil and Mexico (Wilmsmeier et al. 2013). This diversification is being driven by the changes in the export structures and thus the emergence of new production centres in the South (esp. Perishable products). Additionally, secondary ports are starting to engage in more integrated development strategies which include the consideration of logistics development connected to the port (e.g. Manaus, Brazil, Puerto Angamos, Chile).

The changes in the port system are relevant for the future port development strategy of the country for two reasons a) the expansion of the production centers in the South and other parts of the country lead to a significant increase in hinterland traffic, not only to the ports in the regions, but to the traditional main gateway ports, and b) the shift of economic activity can be expected to also lead to population increase in the those parts of the country, creating a new pattern of demand.

Both strategies include new development of infrastructure to cope with new emerging and expanding markets and production centres. This can be achieved through the expansion of road infrastructure, the reimplementation of a significant railway network or the facilitation of coastal shipping.

The available data suggest some evidence for a deconcentration of container traffic within the LAC port system, related to a shift both in gateway regions and a shift from a gateway role to a transshipment role, thus supporting the movement of cargo through secondary LAC ports.

More research is required, but these identified shifts have potential benefit for secondary ports, many of which are 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 that has been embedded by the traditional LAC port and infrastructure system. The paper thus raises questions about port policy and both public and private sector responses to a changing LAC port geography.

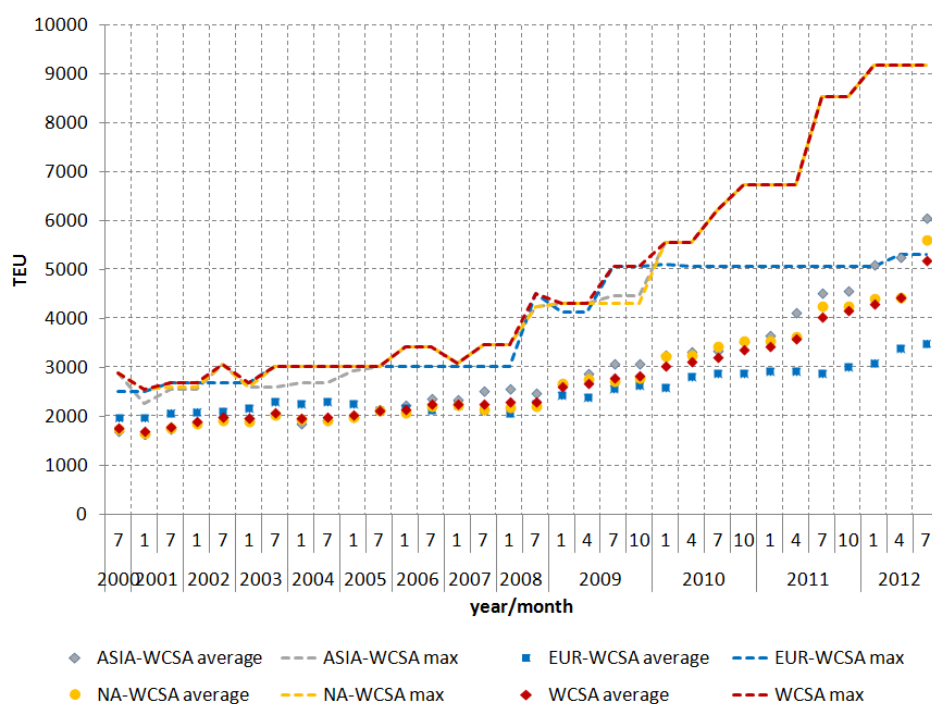
3. LINER SHIPPING

The analysis of port throughput and weekly capacity supply on the WCSA between 2000 and 2012 reveals a high correlation (0.9) over the whole period. However the growth rates vary significantly and particularly since the crisis capacity supply has been growing faster than port throughput. This section analyzes the technological change, capacity development and market structure in liner shipping on the WCSA since 2000.

Technological change

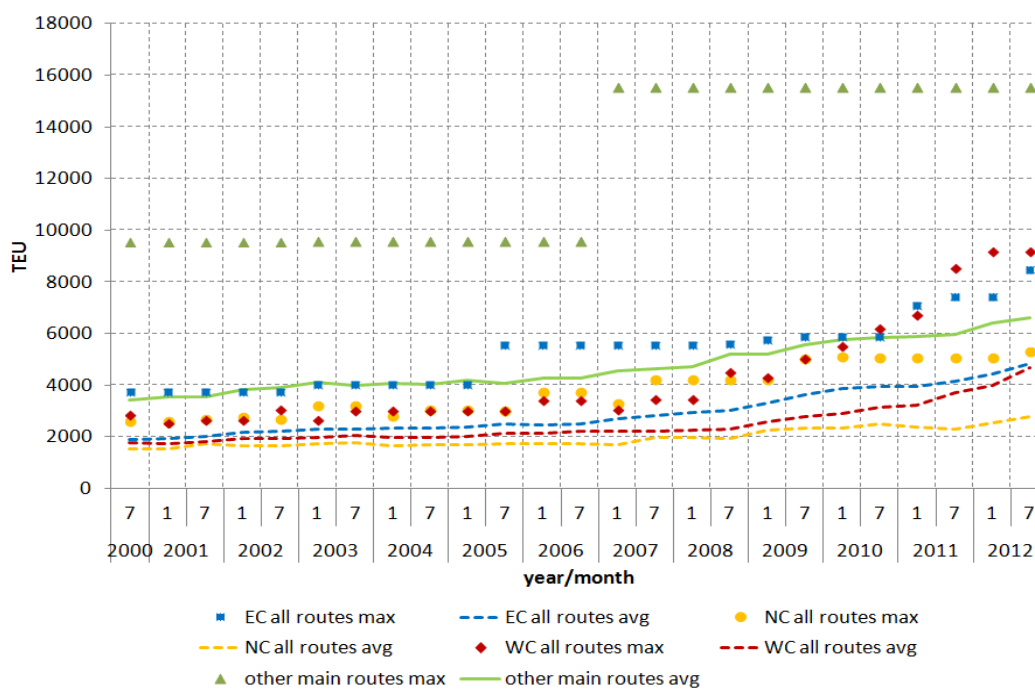
Technological change in container shipping has unequivocally been a driver of port development. As shipping lines are seeking economies of scale capacity adjustment has been mainly reached by deploying bigger vessels (Cullinane and Khanna, 1999). The following analyzes the technological change in terms of ship dimensions (capacity, draught, length and breadth) and its repercussions on port development in the WCSA.

The vessel sizes deployed on the WCSA and in South America in general have conventionally lagged behind the development in the principal trade routes (Perrotti and Sanchez, 2011). However, the evolution of vessel sizes and their TEU capacity has dramatically accelerated since the second half of 2008. On the WCSA a significant difference exists between the routes crossing the Panama Canal (WCSA-Europe) and the other main routes (i.e. WCSA-Asia and WCSA-North America). In the case of the former the Panama Canal is the limiting factor and since 2009 effectively Panamax vessels have been used on this route with an increasing share. On the routes to Asia and North America (WCUS) this limiting factor is absent and the biggest vessels deployed on these routes can now carry over 9000 TEU, while in 2008 the maximum vessel capacity was only half of that. At the same time the average vessel size (TEU capacity) is now above Panamax ship capacity. The figure below clearly depicts the acceleration in TEU capacity of vessels since 2008 and with that the cascading effect moving overcapacity from other main routes into secondary markets and thus replacing tonnage.

Figure 3 - Evolution of vessel capacity on West Coast South America main trade routes, 2000-2012


Note: main trade routes include transpacific, transatlantic and Europe-Asia.

Source: Wilmsmeier, based on CompairData, Lloyds List and Marine Traffic various years

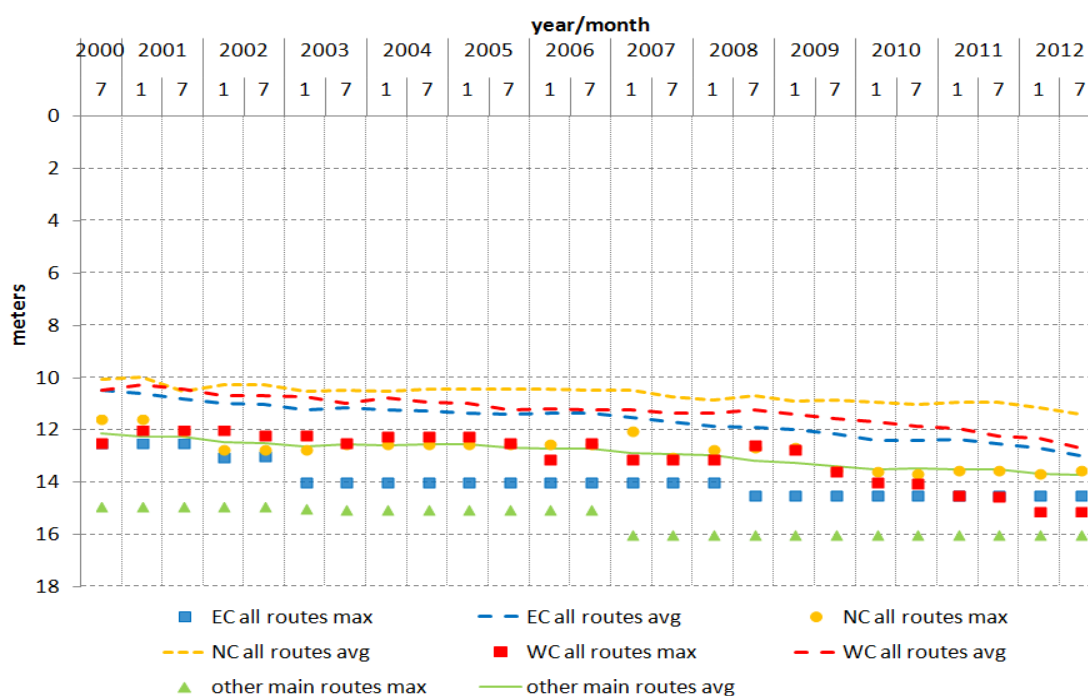
Figure 4 - Evolution of vessel capacity on South American and other main trade routes, 2000-2012


Note: main trade routes include transpacific, transatlantic and Europe-Asia.

Source: Wilmsmeier, based on CompairData, Lloyds List and Marine Traffic various years

While there is much talk about the evolution of ship sizes and the related requirements for infrastructure in the future, an analysis of the evolution of container ships since 2000 on the WCSA reveals that ships with a draft of 15m are already a reality. Further, even average draught of deployed vessels has increased by over 2m in the past 13 years. Thus, any new port development will have to consider vessel draught of at least 15m.

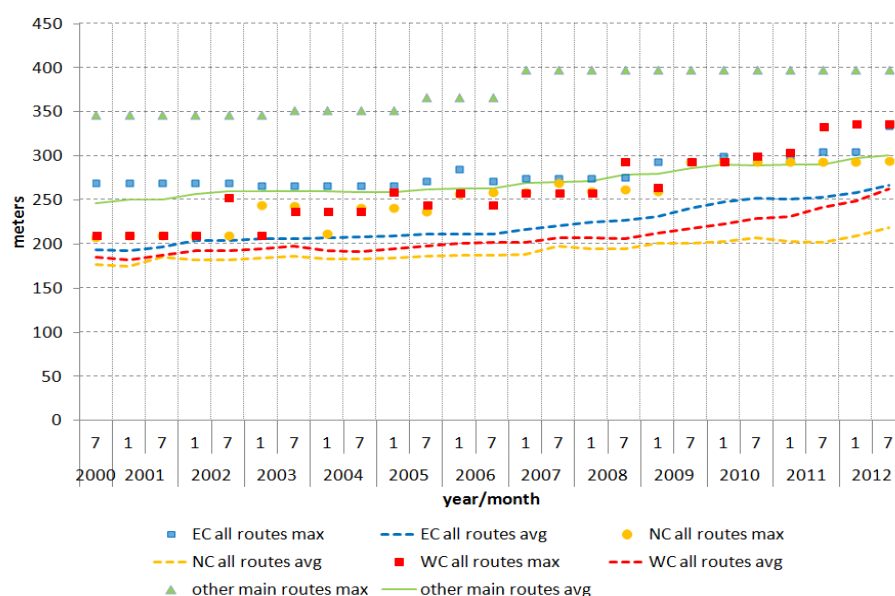
Figure 5 – Evolution of vessel draft on South American and other main trade routes, 2000-2012



Note: main trade routes include transpacific, transatlantic and Europe-Asia. Considered draft is the design draft of deployed vessels fully laden.
 Source: Wilmsmeier, based on CompairData, Lloyds List and Marine Traffic various years

The vessel draught is only one aspect of the technological changes of ships that impact port infrastructure requirements. Additional aspects are ship length and breadth. The former determines the quay length and berth layout required to accommodate ships. The latter is a key indicator for the superstructure (esp. reach of STS cranes) requirements in ports.

Figure 6 – evolution of vessel length on South American and other main trade routes, 2000-2012

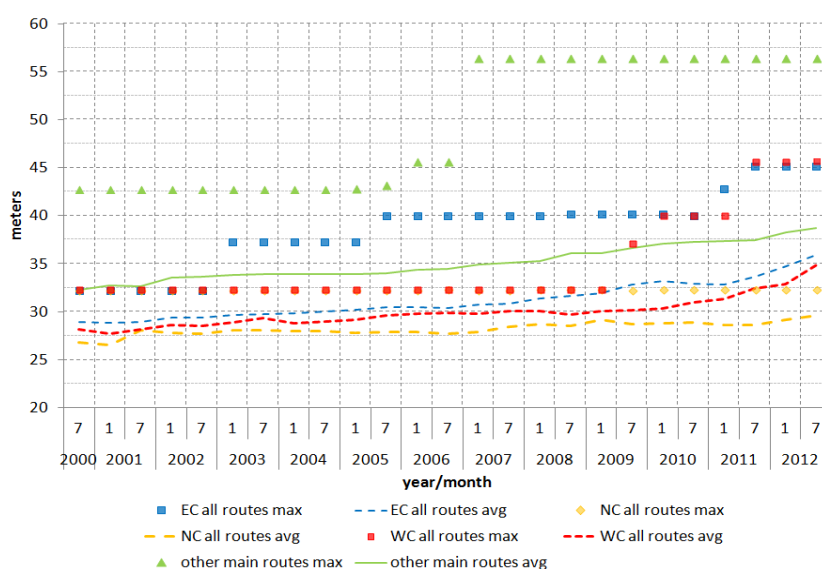


Note: main trade routes include transpacific, transatlantic and Europe-Asia.

Source: Wilmsmeier, based on CompairData, Lloyds List and Marine Traffic various years

The average vessel length on the WCSA was above 250m in 2012, where as the maximum vessel length has reached 340m. In 2000 the maximum vessel length was just above 200m. Beyond the actual length the variation of ship length serving a port is of high relevance to port productivity but also to planning processes. Additionally, the breadth of vessels serving the sub-region has increased from 32.5m (2000) to over 45m (2012).

Figure 7 – vessel breadth on South American and other main trade routes, 2000-2012



Note: main trade routes include transpacific, transatlantic and Europe-Asia. Considered.

Source: Wilmsmeier, based on CompairData, Lloyds List and Marine Traffic various years

The observed changes on the WCSA clearly show an acceleration of technological change particularly since the beginning of the crisis in 2008 and at the same time illustrate the multidimensionality of technological change affecting port development and future port plans. The observations indicate the increasing pressure to adjust existing port infrastructure to present requirements as well as the emerging pressures for new port developments. A recent study expects that 13,000 TEU ships will start to call regularly on the coasts of South America between 2016 and 2020 (Sánchez and Perrotti, 2012), which will have direct implication on the liner shipping networks and port infrastructure in the region. If some of the secondary ports will not be able to handle bigger size ships due to insufficient handling capacity to accommodate them, 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 (thus raising issues relating to the quality and capacity of hinterland infrastructure links).

Ports on the WCSA are urgently required to adjust the available draft in their port to 15m and above, but also any investment in port superstructure will have to consider a reach for STS cranes beyond 50m as current ships already require above 45m. The latter having special relevance as the reach of cranes will always have to be provided and does not give any flexibility as in the case of draught, where a less laden vessel will not require the max draft.

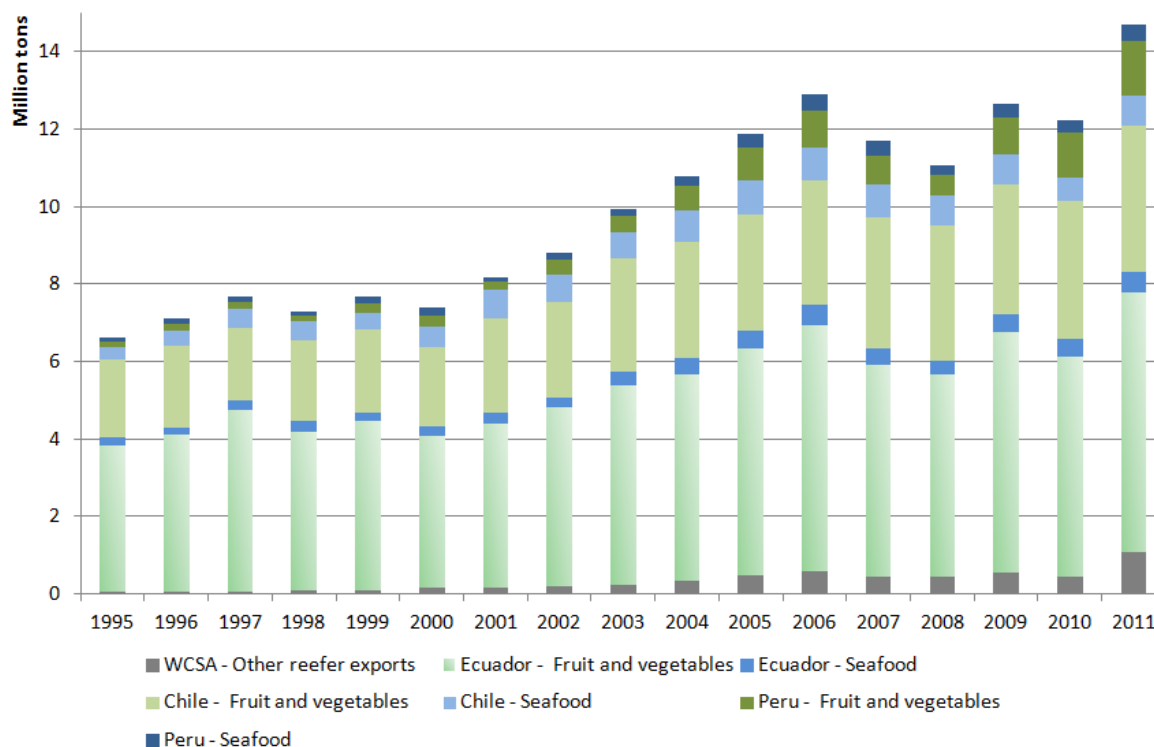
Additionally, the introduction of ever-larger vessels on mainline routes may be attractive for shipping lines but will strain ports severely. Ports invest large sums upgrading their facilities and competing to receive vessel calls, but handling such demand spikes is difficult. Large container drops can result in inefficient crane utilisation, as the numerous large cranes required to service large ships are not all required between calls; furthermore, such numbers of containers cannot always be moved in and out of the port in a smooth manner. Second, shipping lines already cannot meet their own schedules; current average reliability across the industry is below 70 per cent. The larger the vessel and the greater the volume of transferred containers at each call, the larger the knock-on effect of poor reliability on the rest of the container system occurs.

Finally, a further dimension technological change driven by the emergence of reefer cargo is discussed in the following section.

Structural change – reefer trades

The global demand for perishable products, especially fruit, has grown substantially, increasing the need for refrigerated seaborne transportation capacity. The associated trade flows mainly originate in the southern hemisphere and are directed towards the industrialized countries in the northern hemisphere. In 2010, total seaborne reefer trade was 86.1 million tons, and is expected to reach 112 million tons by 2016 (Drewry 2011). WCSA countries exported 14.2 million tons of perishable products valuing almost 15 billion USD in 2010, being 6% of overall export volume (tonnes) and amounting to 9% of the sub-regions total export value (Vagle 2012, based on BADECEL). Chile is the second largest exporter of perishable products in terms of volume after Ecuador with 4.8 million tons of produce. In 2010 the country's export value of perishables products was equivalent to 55% of the whole sub-region's export value, reaching almost 7.6 billion USD, making Chile the largest exporter of perishables in terms of value. The average annual growth rate between 1995 and 2010 was 8% in terms of export value, growing twice as fast as the export volume, by 4%.

Figure 8 - West Coast South America Reefer export evolution 1995-2011



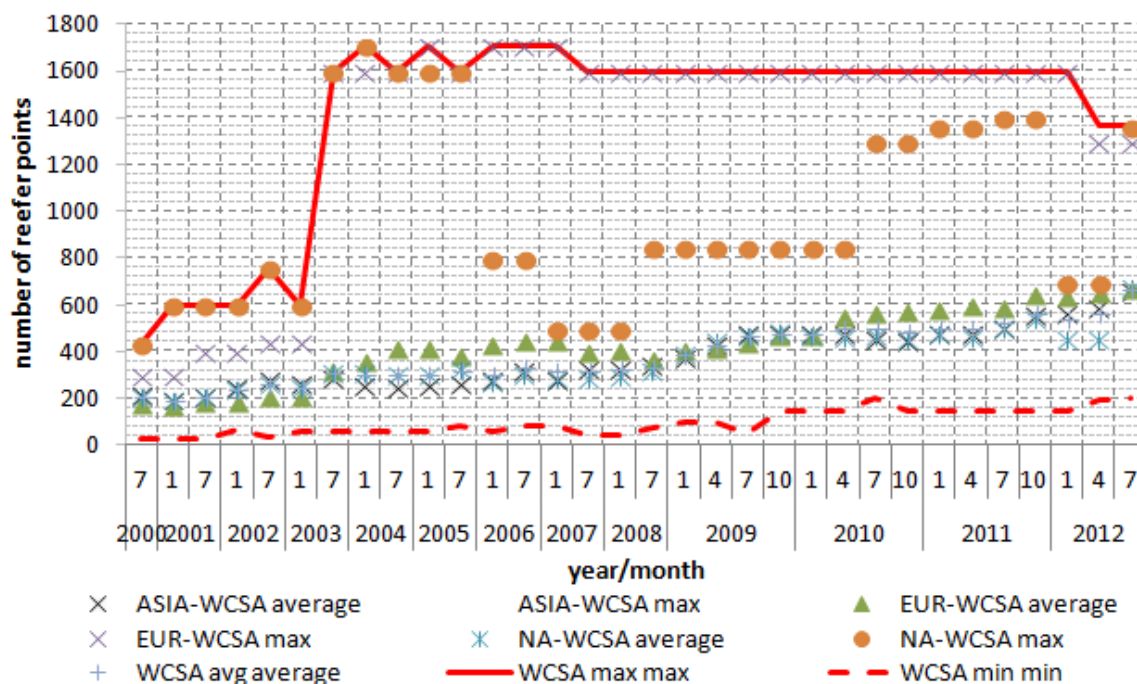
Source: Vagle, based on (BADECEL 2012)

The expansion of reefer trade has had important repercussions on the type of vessels deployed in the region, particularly as the transport of reefer cargo has been shifting away from conventional reefer ships to being containerized. By way of example between Chile and Northern Europe the share of containerized reefer transport increased from less than 10% (2000) to over 65% (2011).

The deployed weekly capacity of TEU and reefer plugs on the WCSA increased more than threefold on the sub-regions main routes. The WCSA-Europe route shows the highest share of reefer slots in relation to TEU capacity, 20% in 2012. On the WCSA-North America and WCSA-Asia routes the share of reefer slots is around 12% (2012). The average number of reefer plugs per string was for the month of June 2011, 364 reefer plugs (Wilmsmeier 2012).

This is also reflected in the number of reefer plugs in the ships deployed in the sub-region, which reach a maximum of 1400 reefer slots per vessel. The WCSA as the ECSA are the regions in the world where ships with the highest number of reefer plugs are being deployed.

Figure 9 – reefer capacity on vessels deployed in WCSA main routes, 2000-2012



Note: main trade routes include transpacific, transatlantic and Europe-Asia.

Source: Wilmsmeier, based on CompairData, Lloyds List and Marine Traffic various years

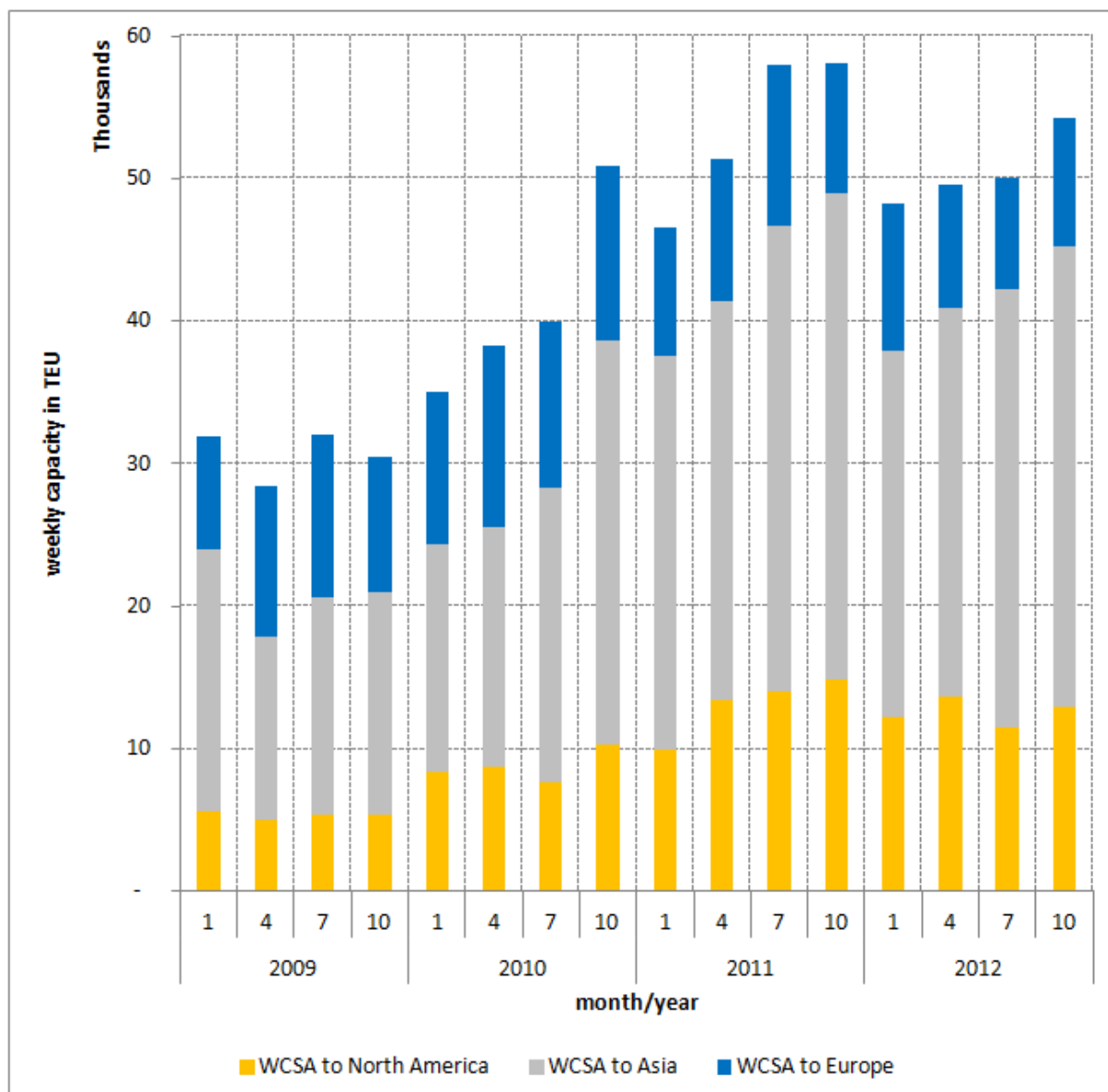
This structural change in trade also has significant repercussions on ports as the handling of reefer requires additional installations for cooling and specific services to manage the units. The number of reefer containers handled in Chile per year is around half a million TEU (2012).

Market structure

From the liner shipping perspective the region and Chile face the challenges of market concentration, the further evolution of liner shipping networks towards hierarchical networks driven by hub-and-spoke strategies and are already affected by the repercussions of the cascading effect in ship deployment, which has led to an exponential and accelerated growth of ship sizes deployed in the region.

The weekly allocated capacity in 2012 on the WCSA main routes reached 54 thousand TEU an increase of 70% in comparison to 2009. The WCSA-North America route experienced the greatest increase (130%) and capacity on the WCSA-Asia route expanded by over 75% in the same period.

Figure 10 – evolution of weekly capacity supply on WCSA main routes, 2009-2012



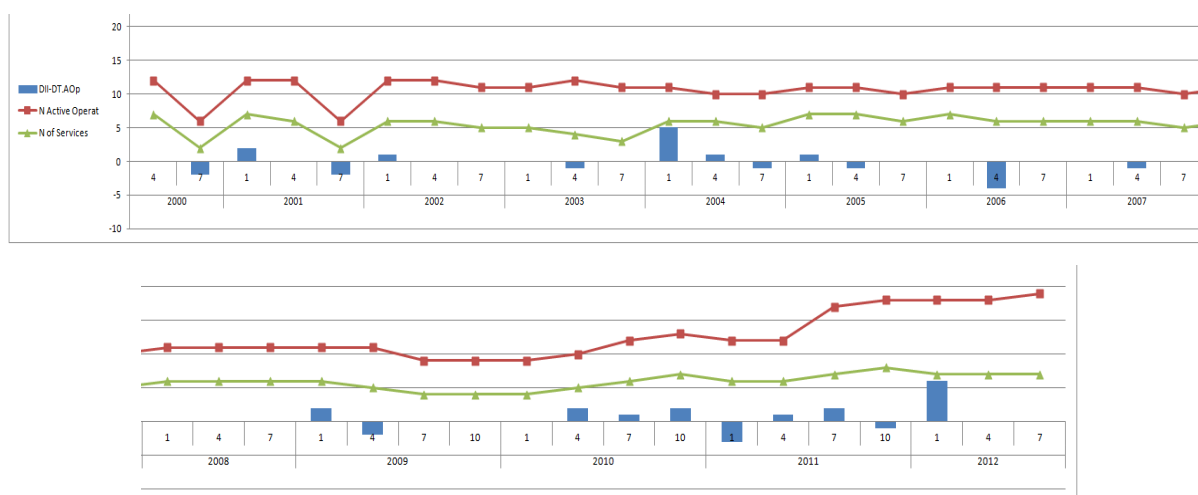
Source: Author based on ComPairData various years

In the period between 2009 and 2012 the nominal capacity increased significantly faster than weekly capacity. The strongest increase in nominal capacity can be observed in the WCSA-Asia services where the nominal capacity more than doubled between 2008 and 2012. Between 2000 the nominal deployed capacity on the three main routes WCSA-Asia, WCSA-Europe and WCSA-North America increased fivefold. The differences between nominal capacity are an indicator for the implementation of slow steaming on the routes particularly those to Asia and North America.

Beyond capacity the market structure is of high importance to understand potential strategies. In line with Wilmsmeier and Notteboom (2009) a penetration, consolidation and concentration phase can be observed in the period between 2000 and 2012. During the beginning of the millennium new operators appeared in the WCSA liner shipping routes (e.g. MSC on the WCSA-Europe route in 2004). Additionally, the mergers and

acquisitions in the maritime industry also had repercussions on the presence of operators in the sub-region (i.e. the takeover of PONL by Maersk). As a result of the crisis the pattern change and cooperation between shipping lines in terms of slot share agreements and jointly operated services increased. This leads to significant movements in the market and is captured in the figure below for the case of the WCSA-Asia routes. It can be observed that the changes in cooperation and entering and exiting actors particularly increase between April 2010 and January 2012 leading to a period of “instability”. A result of this period is a significant increase of active operators in the route. However, this is accompanied by a decreasing number of actual services offered.

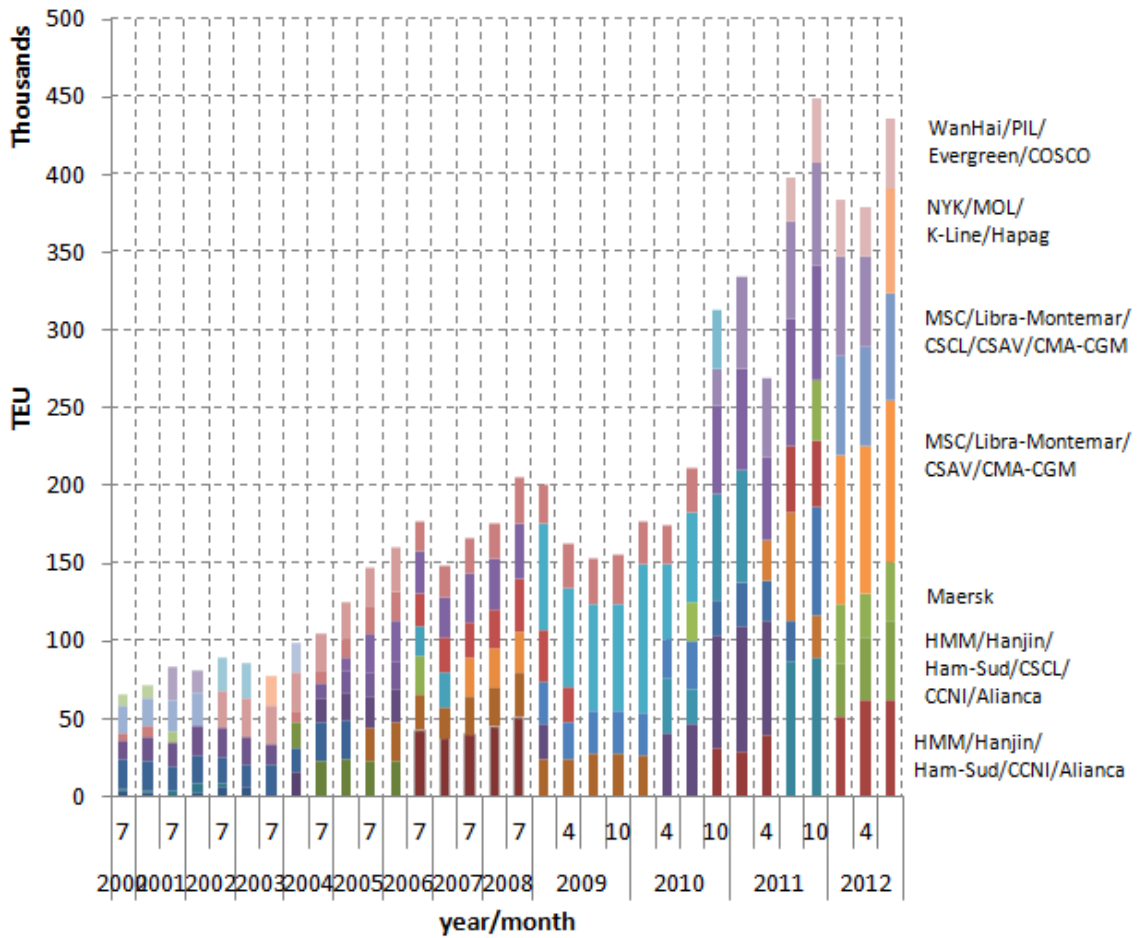
Figure 11 – WCSA – Asia changes in market structure, 2000-2012



Source: Wilmsmeier and Parushev 2013

This new form of cooperation also raises questions on the level of competition in the market. Emerging markets such as the WCSA offer the unique opportunity to investigate the behaviour and effectiveness of potential collusive behaviour and pricing. The latter might create negative impacts on the competitiveness of a country in external trade. By way of example the following figure depicts the challenges for the WCSA-Asia route. As the figure depicts 5 groups compete in this market, despite the fact that more 20 shipping lines are actually active in the market. However, further collaboration between shipping lines carries the risk of quasimonopolistic markets with the risk of collusive behaviour, a situation that is already present in the WCSA-Europe route.

Figure 12 – Market share in nominal TEU capacity by service WCSA- Asia, 2000-2012



The developments in the liner shipping market have high relevance for future port development as vertical integration in the market is advancing and thus future port concessions and terminals can create changes in the competitive environment of the shipping market, if a new terminal/port is controlled by a particular group.

4. CONCLUSIONS AND OUTLOOK

Port infrastructure in its own right, but the regional and national port system in Chile are at a crossroad, driven by the change in maritime liner shipping industry, the structural transformation and geographical shifts in trade. The traditional port focused infrastructure development needs to be extended to include the logistics relation into the hinterland and the future port system development will have to reach beyond the established centralist vision. Further, current and future changes in the maritime industry will have to be taken into consideration when engaging in long term development strategies.

These new developments entail changes beyond the physical development including the main ports which require solutions that allow future development. Success of port development in response to infrastructure development in an increasingly competitive environment can only be achieved, if the institutions and private sector actors are able to act jointly in critical moments and act based on integrated visions that enable them to convert these moments into crucial junctures.

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