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An Assessment of hub-ports competitiveness and its impact on the Mediterranean container market structure.

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Introduction

Globalisation and the development of the international transport network have increased the role of ports as nodes in the global logistics and supply chain systems. Meanwhile, seaports encounter great challenges, uncertainties and risks than ever before. The development of different markets has contributed to intensifying competition in the port industry (Haezendonck & Notteboom, 2002). The reform of liner shipping service networks as well as the increased bargaining power of the shipping lines, has contributed to the deterioration of existing ports and to the development of new ones which, in turn, causes change in market structure and port hierarchy.

Container ports, in particular, have not only encountered competition from the large load centers in the same port range but also from the medium and small load centers having the same hinterland and, to some extent, from load centers in other port ranges. The hub-and-spoke system that has emerged in liner shipping operation patterns has increased pressure on the supply chain network around load centers. Thus, the concept of containerisation has enlarged the geographical coverage of seaports to the extent that the concept of a captive market is no longer valid. The aim of this paper is to assess the competitiveness level of hub-ports and to analyse the impact of inter-port competition on the Mediterranean container market structure. In doing so, the research is divided into five sections. The first section comprises a general introduction that includes research aims and the research plan. The second section reviews the literature related to port competition and the methodologies being used to assess ports' competitiveness. The third section demonstrates the area of study, research problem and methodologies used to measure the impact of port competitiveness on the Mediterranean port market structure. The fourth section assesses the competitiveness of hub-ports in the Mediterranean container market. The last section introduces a comprehensive conclusion for the research outcomes.

Literature review

A series of studies has addressed the issue of port competition in a particular port market or range and explained key elements that could encourage or deter port competitiveness. Slack and Wang (2002) analysed inter-port competition, both local and regional, encountered by the ports of Hong Kong, Singapore and Shanghai from their competing ports in the same market. Cullinane *et al.* (2004) deduced that the port of Hong Kong will maintain its competitive position as a regional hub in spite of Shenzhen's present competitive advantage. Cullinane *et al.* (2005) evaluated the relative competitiveness between the ports of Shanghai and Ningbo in terms of price and quality of service. Yap *et al.* (2006) analysed the development in container port competition among the top five ports in East Asia. Heaver (1995) and Song (2002, 2003) analysed the benefits of cooperation versus competition in the port market. However, some scholars have attempted to study the Inter-port Competition throughout generic elements such as variations in market shares. Fung (2001) examined that to what extent the growth of South China Ports would influence the demand for other ports. Yap and Lam (2004) investigated the competition between ports in East Asia by using indifference analysis. Low, Lam and Tang (2009) assessed the hub status among Asian ports and proposed a novel network-based hub port assessment model. Acosta *et al.* (2007) investigated the factors that affect port competitiveness from the supply perspective.

Competitiveness of container ports has been measured in various ways, including time series analysis, AHP, DEA and SFA methods, multi-criteria evaluation, survey of shipping lines and logistics managers, shift-share analysis and diversification indices like Herfindahl-Hirschmann. Such methods are used to assess the relative competitiveness of ports within a specific market or region. Nevertheless, these methods do not consider competitiveness with respect to financing methods, cost recovery and impacts on port service quality that determine whether a port's operations are profitable and sustainable. Haralambides (2002) evaluated port competition for various pricing methods under different financing structure. Huang *et al.* (2001, 2002) and Huang *et al.* (1999) utilized Analytic

Hierarchy Process (AHP) and Grey Theory to assess the competitiveness of East Asian container ports. While Chang (1978), Dowd (1990), Robinson (1999) and Sachish (1996) extended such analysis to comprise production elements or productivity indicators to evaluate ports productivity, Hoffman (1985), Plumlee (1979), Thomas (1985), Tongzon (1995) and UNCTAD (1976) explored port performance by using ship, berth or terminal indicators. Huang *et al.* (2003) established a multi-criteria assessment model to assess the competitiveness of eight East Asian container ports. Lam and Yap (2008) used the annual slot capacity deployed by some container shipping lines to analyse the port competition in Southeast Asia. Chou *et al.* (2003) utilized SWOT analysis to explain the competitiveness of four Asian container terminals. Teng *et al.* (2004) identified port competitiveness characteristics by applying GRA model to eight East Asian container terminals. Huang *et al.* (2008) established a model of port competition that demonstrates the shipping lines port selection criteria. Zondag *et al.* (2010) provided a port forecasting approach that models port competition. Veldman and Buckmann (2003) addressed the issue of port competition by using the logit model applied to Rotterdam port. Anderson *et al.* (2008) developed a game theoretic best response model for understanding ports reactions towards the development of another port. Yeo *et al.* (2008) empirically used factor analysis to determine components which influence container ports competitiveness in Korea and China

Research problem and limitation of study

The container port structure in the Mediterranean mirrors the structure of the liner shipping industry on a worldwide level with hubs, relay centre, gateways and spoke ports. The establishment of transhipment (hub and relay) ports in the Mediterranean has benefited some ports over others, changing the competitive landscape. Traditional gateway ports such as Barcelona and Marseilles-Fos have been outgrown by transhipment ports such as Gioia Tauro, Algeciras, and Marsaxlokk. Currently, this new organization coexists with the previous one, obviously resulting in a different distribution in traffic quotas between the more traditional direct services systems and the new network systems. The primary function of the majority of Mediterranean ports remains as gateways to the national hinterland. Some ports also serve as hub centers such as the Spanish ports of Algeciras and Barcelona, the Italian ports of Gioia Tauro and Genoa, Malta, and Damietta and SCCT close to the Suez Canal. The forecast for the future is that the balance will be tipped in favour of hub and spoke organization. The significance of this research is to assess inter-port competition in the Mediterranean affected by the number of sub-markets that each port and terminal is able to compete in. The ability of a port to compete depends on various factors such as location, accessibility, port infra/superstructure, draft and throughput. These factors help to define the market (transhipment or origin/destination) for each port.

Research methodology

Following the inductive concept of the Industrial Organization (IO) and the Structuralists (Harvard school) methodology, the research assesses the competitiveness level of the hub ports and main container terminals in the Mediterranean container market that have significant infra/superstructure enabling them to expand their hinterlands such as the Suez Canal container terminal (SCCT), Damietta, Piraeus, Marsaxlokk, Gioia Tauro, Barcelona, Marseilles, Izmir, Genoa and Algeciras. Traditional industrial economics illustrates that market structure refers to the number of competing firms and their market share and is a fundamental determinant of market conduct. The structure-conduct-performance (SCP) concept assumes that an industry's performance depends on the conduct of suppliers and consumers which, in turn, are determined by the market structure (Bain, 1951; 1956). The market structure is affected by exogenous factors that encompass market concentration, market players, firm size, nature of products, degree of product differentiation, and conditions of entry, technological development, legal aspects and geographical scope.

Measures of concentration express characteristics of the size distribution of firms at a point in the time. The size distribution varies slowly over time and so do the companion factors of concentration (Lam *et al.*, 2007). The competitiveness level of hub-ports in the Mediterranean container market is assessed by analyzing the present condition, characteristics and structure of that market and the ability of such ports and terminals to compete in terms of the terminal throughput, market share, port location, accessibility and infra/superstructure. Market structure and concentration will be analysed by using concentration indices that will be measured by using the Hirschman-Herfindahl index that can be used as a direct measure of the degree of oligopoly versus perfect competition in the defined market (Scitovsky, 1955). Hirschman-Herfindahl Index (HHI) is a tool used to measure the size of firms in

relation to the industry and an indicator of the amount of competition among them. HHI is an economic concept widely applied in competition law, antitrust law and also technology management. The HHI was developed by Hirschman (1964). For the purpose of this analysis, it is defined as the sum of the squared values of each port's market share that is obtained by comparing the throughput committed by each port against the total throughput of the defined ports in the market. It is explained as:

$$HHI = \sum_{i=1}^n \frac{S_i^2}{n} \leq HHI \leq 10,000$$

Where S_i is the throughput of port i expressed as a percentage of total throughput of the ports defined in the market, and where n represents the total number of ports defined. Thus, in a market with two firms that each have 50 percent market share, the Herfindahl index equals $0.50^2 + 0.50^2 = 1/2$. Equivalently, if percents are used as whole numbers, as in 50 instead of 0.50, the index can range up to 100^2 or 10,000. HHI takes into account the entire size distribution of ports on the market by attaching a weight to both the number of ports in the market and the inequality of market shares. According to the US Department of Justice, the Federal Trade Commission, the agency considers that a market in which the HHI is below 1000 is un-concentrated. If the HHI is between 1000 and 1800, the market is moderately concentrated. When HHI is more than 1800, the market is highly concentrated (Cariou, 2007). An increase in the Herfindahl index generally indicates a decrease in competition and an increase of market power, whereas decreases indicate the opposite. Two advantages for using the Herfindahl index are that it considers all firms in an industry, and it gives extra weight to a single firm that has a particularly large market share.

Mediterranean container Market structure

Geographically, the Mediterranean Sea links not only East and West markets but also acts as an intersection points between Asia, Europe and Africa. The Mediterranean region can geographically be divided into two sectors, the East and West Mediterranean markets. These growing markets can offer and absorb containers and commodities due to the economic growth in North Africa and the Middle East (Francesetti & Danila, 2001). The Mediterranean container market has been characterized by strong long term growth rates. The driving forces of such growth are the increased penetration of containerized cargo, the increasing focus on port efficiency and effectiveness in port management, the growing trend towards privatization, the new investment of high quality equipment and container terminal facilities, the increasing trend of consolidation (merger and acquisition) and the change of the operational strategies of shipping lines that use transhipment on a wider scale to achieve a possible saving in time (Francesetti, 2004). Figure 1 shows the selected Mediterranean ports' throughput between 2005 and 2009. Gioia Tauro is the main hub port in the region with a throughput of almost 3.2 million TEUs in 2005 and decreased to 2.9 million TEUs in 2009. The main reason for such a drop is the emergence of new competition from the Suez Canal Container Terminal (SCCT), which is operated by APM. Maersk, as a key customer to Gioia Tauro, has switched a remarkable amount of its transhipment services to the Eastern Mediterranean and Black Sea with eight main lines calling weekly at SCCT (Woodbridge, 2006). The port achieved a throughput of 1.6 million TEUs in 2005 and 3.5 million TEUs in 2009 with an average annual growth rate of about 21%. Another hub with a massive feeder connection to the Mediterranean is Malta free port (Marsaxlokk). The terminal achieved an annual growth rate of about 14.4% between 2005 and 2009. In 2009 the terminal handled around 2.3 million TEUs winning new traffic, whilst the privatization of the terminal has enhanced its productivity by almost 65% (Woodbridge, 2006).

Meanwhile, Piraeus in Greece handled about 1.4 million TEU in 2005 but its throughput dropped by 4% in 2007. In 2008 another decline of 9.5% to 1.1 million TEU was incurred due to the problems of continuous strikes and berth congestion as well as the international economic crisis that took place in 2008 and affected the whole port industry not only in the Mediterranean region but also worldwide. Nevertheless, the terminal returned to growth again during the first half of 2010 due to the improvement of terminal productivity and the noticeable reduction in ship waiting time. Damietta container terminal recorded a throughput of 1.3 million TEU in 2009. However, the port encountered a slight decline in its throughput in 2007 and 2008 due to the strong competition of SCCT. Among the rivals, Algeciras is also a strong competitor in the Mediterranean with a remarkable throughput of 3.3 million TEUs in 2005, although it faced a little decline to 3.0 million TEUs in 2009 due to the fierce competition from Port of Barcelona which has a potential to be a main hub in the Mediterranean due to

its significant infra/superstructure and its strategic location near to the distribution centre in Spain and southern Europe. The port achieved a throughput of 2.1 and 1.8 million TEUs in 2005 and 2009 respectively. However, port competitiveness can also be assessed by the ports market share in the defined market.

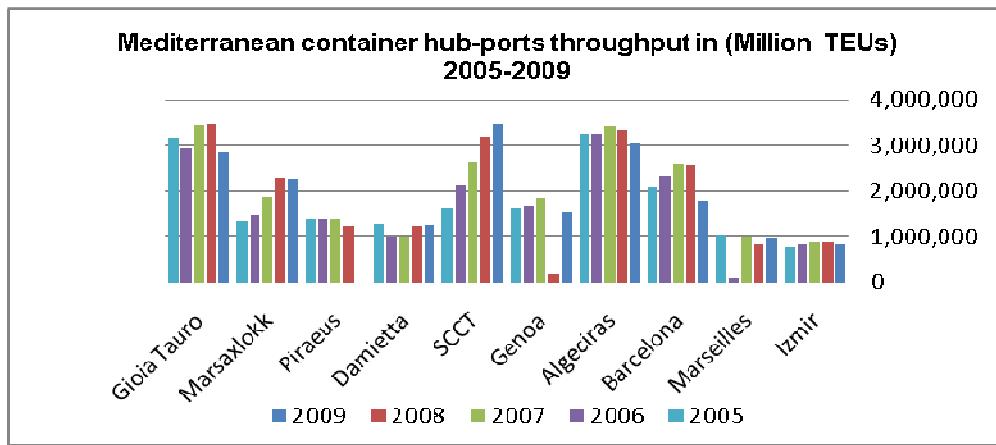


Figure 1- Mediterranean container hub-ports throughput (2005 – 2009)
Source, Authors, derived from various sources

Mediterranean container ports Market share

The market share of each port is calculated as a percentage of the total throughput of the ten selected ports. Figure 2 illustrates that although Algeciras was the Market leader in the Western Mediterranean market that include ports of Barcelona, Marseilles, Marsaxlokk and Genoa; with a market share of 19.0% in 2005, by 2009, SCCT became overall market leader with a 19.0% market share. Gioia Tauri's market share also dropped from 18% in 2005 to 16.0% in 2009 due to the emergence of new competition from Damietta and SCCT.. The operation of SCCT by APM affected Piraeus' market share, which declined from 8.0% in 2005 to 6.1% in 2009. Marsaxlokk market share has also increased from 8.0% in 2005 to 13.0% in 2009. Nevertheless, although the ports throughput and market share are influential factors that indicate the competitiveness level of a port, the port location also has a significant impact on its attractiveness and competitiveness.

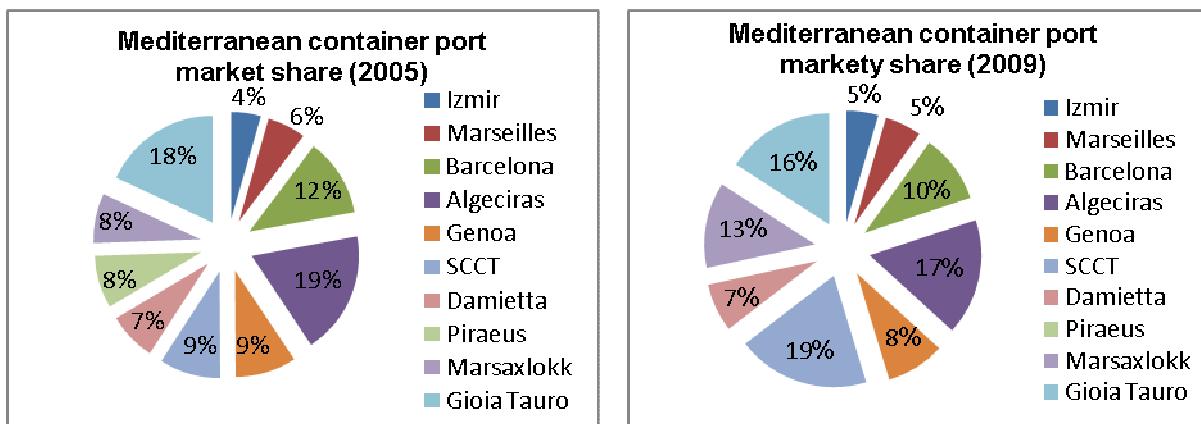


Figure 2- Mediterranean container hub-ports market share (2005 & 2009)
Source: Authors, derived from various sources

Mediterranean container port market concentration

The Herfindahl index (H) is a measure of the size of firms in relation to the industry as a whole. It is also an indicator of the degree of competition between firms in the market. Decreases in the Herfindahl index generally indicate a loss of pricing and bargaining power among firms and an increase in competition, whereas increases indicate the opposite (Cariou, 2007). Table 1 indicates that

in 2005 the Herfindahl index was relatively small (1208) which indicates that the market is moderately concentrated. Although the ports of Gioia Tauro, Algeciras and Barcelona account for about 49.0% of the total market share which means that these ports are in an oligopolistic situation, the market was highly competitive as there was great competition among other ports such as SCCT, Damietta and Piraeus that have a market share of 9.2%, 7.3% and 8.0% respectively.

However, in 2009 Herfindahl index increased to (1340). Such an increase in Herfindahl index reveals a decrease in competition between the market players. That in turn justifies the oligopolistic position of ports of Algeciras, SCCT and Gioia Tauro that have market share of 16.9%, 19.2% and 15.9% respectively. Nevertheless, the competition among other rivals is rather intensified as the increase of one port market share means a decrease of another ports market share. For instance, the increase of SCCT port market share from 9.2 % in 2005 to 19.2% in 2009 has negatively affected the market share of some ports like Gioia Tauro and Damietta. Such a fierce competition among ports in the Mediterranean has a positive impact on ports' customers in terms of service quality, port dues and terminal handling charges as far as, from the demand side, price elasticity is concerned.

Port	Throughput 2005	Throughput 2009	Market share (2005)	Market share (2009)	HHI (2005)	HHI (2009)
	(1000) TEU	(1000) TEU	%	%		
Izmir	784,377	826,645	4.5%	4.6%	20.2500	21.1600
Marseilles	1,014,420	953,000	5.8%	5.3%	33.6400	28.0900
Barcelona	2,070,726	1,800,213	11.8%	10.0%	139.2400	100.0000
Algeciras	3,256,776	3,042,759	18.6%	16.9%	345.9600	285.6100
Genoa	1,624,964	1,533,267	9.3%	8.5%	86.4900	72.2500
SCCT	1,621,066	3,470,000	9.2%	19.2%	84.6400	372.4900
Damietta	1,279,856	1,263,925	7.3%	7.0%	53.2900	49.0000
Piraeus	1,394,512	N/A	8.0%	0.0%	64.0000	0.0000
Marsaxlokk	1,321,000	2,260,000	7.5%	12.6%	56.2500	158.7600
Gioia Tauro	3,160,981	2,857,438	18.0%	15.9%	324.0000	252.8100
Total	17,528,678	18,007,247	100.0%	100.0%	1207.7600	1340.1700

Table 1- Mediterranean container market concentration in (2005 – 2009)

Source: Authors, derived from various sources

Port Location

The geographic location of a port in relation to the main trade routes is a very important consideration that may favour one port over another (Lu & Marlow, 1999). The carrier's main objectives are to provide the most comprehensive door to door coverage with minimum transit time and cost. Therefore, the closer the port is to the main route, the higher its competitive advantage is in the market (Guy & Urli, 2006). Table 2 shows that Gioia Tauro and Marsaxlokk have very advantageous positions as hub ports located in the centre of the Mediterranean. However, Gioia Tauro is distanced from the main East-west route by about 73 nm while Marsaxlokk is just 6 miles off the same route. Container vessels heading to Gioia Tauro from the Eastern Mediterranean need to navigate the Strait of Messina requiring a reduction of sailing speed and hence a longer transit time and extra cost for the shipping lines. Similarly, Piraeus is less competitive than Damietta and SCCT as transhipment hubs serving the Eastern Mediterranean. Unlike Piraeus which is 107 nm off the main liner route, Damietta is just 46 nm

off route. SCCT has the most competitive advantage due to its location at the tip of the Suez Canal with no deviation distance from the main route. Similarly, Although Algeciras is the leading transhipment hub in the Western Mediterranean with a strategic location of just 7.0 nm from the main trade route, Barcelona (200 nm) and Marseilles (370 nm) are poorly located in this respect.

Port	Dev. Distance (nm)	Port	Dev. Distance (nm)
Izmir	590.0	SCCT	0.0
Marseilles	370.0	Damietta	46.0
Barcelona	200.0	Piraeus	107.0
Algeciras	7.0	Marsaxlokk	6.0
Genoa	450.0	Gioia Tauro	73.0

Table 2- Deviation distance from the main East-West liner route and hub ports in the Mediterranean region.

Source: Lloyd's Register-Fairplay, (2010). *Distance tables. Fairplay world shipping Encyclopedia [electronic source]*. Coulsdon, Survey, UK: author.

Port accessibility and terminals Infra/superstructure

Transhipment ports can also gain a competitive advantage by having efficient land access. The introduction of larger ships has led to demand for container terminals close to the open sea in order to minimize transit time and to reduce costs. On the hinterland side, direct connections to highways, rail and inland navigation system is also strengthening the hub port competitive position (Fleming & Baird, 1999). Following the deployment of ever-larger vessels, the Mediterranean transhipment ports have emphasized the depth of their approach channels and terminals to be able to accommodate the large container vessels. Table 3 shows that transhipment ports such as SCCT and Piraeus have dredged their channels and terminals to 16.5 m, Marsaxlokk 17 m, Gioia Tauro 15.5 m and Damietta 14.5 m. Meanwhile, ports of Barcelona, Marseilles and Genoa, as potential hubs have terminals depth of 16 m, 14.5 m and 15 m respectively. Thus, most hub ports in the Mediterranean allow for easy access to the ports which reduces the manoeuvering and turnaround time accordingly. However, such time in port is also affected by the availability and optimal utilization of the port infra/super structure, which significantly influences the port competitiveness level.

The growth of container traffic and the introduction of ever-larger container vessels have put further pressure on terminals operators to introduce measures leading to improved ship turnaround time and reduced container dwell times. Meanwhile, terminal operators have to either reduce their operating costs or invest in new facilities such as quay length, quay cranes, yard equipment and yard stacking area to enhance their competitiveness. Table 3 shows that terminal operators in the Mediterranean container market are highly competitive in terms of terminals infra/super structure. Gioia Tauro is the largest terminal in the Eastern Mediterranean with an area of 130 hectares, quay length of 3011 m, storage capacity of 60,000 TEU and 18 quay gantry cranes (Degerlund, 2010). The port authority is investing heavily in the terminal by adding 400 m to the quay length with an additional area of 394,000 sq.m; whilst also enlargening the channel by 70 m and also ordering for four super post-Panamax gantry cranes to be able to accommodate more and larger vessels (Woodbridge, 2006).

Marsaxlokk also has a competitive advantage with terminal length of about 1480 m equipped with 23 quay gantry cranes. The port has expanded the terminal length to 3000 m, purchased new yard equipment and developed an area of 65,000 sq.m to increase the terminal storage capacity. Although Damietta has a relatively shorter terminal of 1050 m equipped with 13 quay gantry cranes, the terminal area of 60 hectares and the storage capacity of 30,000 TEU encouraged the port to invest in new facilities. The port has ordered 10 tractors and 2 RTGs to enhance the terminal productivity. In the same context, SCCT has decided to expand their terminal length to 2400 m by 2012 and they have ordered 3 new super Post-Panamax gantry cranes and 9 RTGs. Such investments will double the terminal throughput to around 4.5 million TEUs annually. Barcelona also competes in terms of infra/superstructure. The port has a relatively long terminal of 4048 m in comparison with Algeciras and Marseilles which have terminals length of 2171 m and 2750 m respectively. However, Genoa has a relatively high storage capacity of 38,156 TEUs in relation to other potential hubs in the Mediterranean, especially Marseilles which can store only 5000 TEUs.

<i>Port</i>	<i>Terminal operator</i>	<i>Terminal throughput (2009) 1000TEU</i>	<i>Terminal area (ha)</i>	<i>Storage capacity (TEU)</i>	<i>Quay length (m)</i>	<i>Terminal depth (m)</i>	<i>No. of gantry cranes</i>	<i>Yard equipment</i>
Izmir	EGE Konteyner Terminal	826,645	106.7	3,000	1325	13:17	7	19 RTG / 25 R.S / 46 Tractors / 74 Trailers / 23 F.E.L / 17 F.L / 16 M.C
Marseilles	Fos & Mourepiane Container Terminal	953,000	83	5,000	2750	10.8:14.5	17	31 S.C / 37 R.S / 52 F.L / 33 Tractors / 46 Trailers / 5 F.E.L / 2 M.C
Barcelona	Terminal de Conteridors de Barcelona	1,800,213	104.7	12,020	4048	8.7:16	27	8 RTG / 1 R.M.G / 26 R.S / 37 F.E.L / 48 S.C / 9 F.L / 13 M.C
Algeciras	APM Terminals	3,042,759	78.5	18,302	2171	9.0:16	23	60 RTG / 4 R.S / 5 F.E.L / 6 F.L / 128 Tractor / 64 Trailer
	Terminal de Contenedores de Algeciras SA							
Genoa	Ignazio Messina & CSpA	1,533,627	162.2	38,156	3768	10:15	22	31 RTG / 13 RMG/ 57 R.S / 54 F.E.L / 47 Tractors / 87 Trailers / 8 F.L
SCCT	SCCT	3,470,000	60	24,000	1200	16.5	12	39 RTG / 8 R.S / 87 Tractor / 95 Trailer
Damietta	Damietta container & cargo handling Co.	1,263,925	60	30,000	1050	14.5	13	12 RTG / 24 F.E.L / 24 F.L / 3 M.C / 55 Tractors / 60 Trailers
Piraeus	Port of Piraeus Authority	N/A	90	30,500	3100	11.5:16.5	15	68 S.C / 22 F.E.L / 1 M.C / 29 Tractors
Marsaxlokk	Malta freeport Terminal	2,260,000	68	15087	1480	15.5:17	23	35 RTG/ 9 R.S / 8 F.E.L / 7 F.L / 153 Tractors / 131 Trailers
Gioia Tauro	Medcenter Container terminal SpA	2,857,438	130	60,000	3011	13.5 - 15	18	59 S.C / 7 R.S / 6 F.E.L / 12 F.L / 19 Tractors / 93 Trailers

Table 3- Mediterranean container hub-ports throughput & infra/superstructure in 2009
Source, Authors, derived from various sources

Conclusion

The objective of this paper was to assess and analyzes the inter-port competition between container ports in the Mediterranean container market and the impact of such competition on the Mediterranean container market structure. The research followed the inductive concept of the Industrial Organization (IO) and the Structuralists (Harvard school) methodology to assess the market structure and to measure market concentration that demonstrates the market dynamics in terms of inter-port competition. The study is limited to ten main container ports in the Mediterranean. The competitiveness level is assessed by analyzing the present condition, characteristics, and structure of that market and the ability of such ports and terminals to compete in terms of the terminal throughput, market share, port location, accessibility and infra/superstructure.

The research concluded that the dynamic characteristics of the Mediterranean container market have a significant impact on determining not only the competitiveness level of hub ports and container terminals in such a market but also the degree of market concentration. The analysis concluded that the market was moderately concentrated in the period between 2005 and 2009. Moreover the degree of concentration is slightly increasing which reveals that the level of competition is decreasing as the market moves towards an oligopolistic situation. In the context of inter-port competition, the elements being used to assess the port competitiveness such as throughput, market share, port location, accessibility and terminal infra/superstructure should be used collectively rather than individually. For instance, from the above analysis it can be noticed that although Gioia Tauro is the market leader in the Eastern Mediterranean in terms of throughput and market share as well as terminal infra/super structure, it has less competitive advantage than Marsaxlokk and SCCT in terms of port location and accessibility.

However, the Mediterranean container port market can be segmented into two main categories, the present hub-ports and the potential hubs. The former such as Gioia Tauro, Marsaxlokk, Algeciras and SCCT have a competitive advantage in their strategic location near to the main liner trade routes, while the latter such as Barcelona, Genoa and Marseilles are trying to utilize their resources in terms of terminals infra/superstructure in order to enhance their competitive position and increase their market share. Nevertheless, the ability of ports to compete in such a dynamic market not only depends on the availability of ports infra/superstructure, location and throughput but also affected by the proper and optimum utilization of such facilities in terms of port efficiency. The next stage of this research is to evaluate the efficiency of the container ports in the Mediterranean market and the impact of such efficiency on port competitiveness.

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