

Analytical approach to the market of the container ports in the east mediterranean region using the concentration ratio, HHI, shift –share analysis

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Key words

Container Ports- East Mediterranean Egyptian Port - Concentration Ratio CR3, CR5, HHI (Herfindahl-Hirschman index technique), and shift-share analysis.

Abstract

Purpose: The aim of this paper is to illustrate the level of port concentration (container ports/Terminals) in East Mediterranean Region to determine the kind of this market (is it monopoly or pure and perfect competition).

Methodology

The annual containers throughput data during the period from 1995 to 2014 were collected and analyzed to measure this market behavior concentration by using the Concentration Ratio CR3, CR5, HHI (Herfindahl-Hirschman index technique) and the Shift-Share analysis.

Finding:

By studying the competition and the market in the Eastern Mediterranean region, the researcher found that the container port/terminal in this region is going to be concentrated in 2014 along with the continued growth rate and the market share of the port of Piraeus and Ambarli, this forecasts that the market tends monopoly.

Practice Implication: The Egyptian container terminals in the Eastern Mediterranean area, especially East Port Said, should accelerate the development of the port and container terminals. To attain such development; the Egyptian government is supposed adopt the following procedures:

- The fulfilment of the integration among of the Egyptian ports in this the area in order to gain a fair share of the container market.
- The review of the current laws and the regulations that led to the fled of the shipping lines from Egyptian Ports towards the port of Piraeus that - competes with Egyptian ports in the region.

Research Limitations: The research will be limited only to some selected container ports located into east Mediterranean Sea region, at the period from 1995 to 2014. In this research, the researcher encountered - a problem to collect detailed data; namely, the statistical data

Originality/ Value: This Paper adds to the understanding of the competitiveness - among the container ports in the East Mediterranean Region, - by using - the concentration / de - concentration analysis, and determining the competitive position of the Egyptian ports in this region.

Introduction

Maritime transport is the backbone of globalization and located at the heart of cross - border transport networks, supporting supply chains, and enabling international trade. In the past two decades, the steady growth of seaborne trade has resulted in the increase of container ships, container ports and their terminals. About 90% of the world trade goes through seaports, and more than 50,000 vessels are sailing all over the world. So, ports and container terminals are significant factors in the modern economy and the issue of container ports competitiveness has been an important matter over last decade. Sea ports, especially the container ports have been essential due to urbanization that comes along with the increasing of containerization in maritime trade. So, the

container terminals are the main facilitators of the maritime trade. All countries are competing whether developed or developing for the benefits of maritime transport services and used by port networks. The container market witnessed a dynamic growth and the introduction of many large vessels in the deep sea with the expansion of trade. The container market witnessed growth with a trading rate estimated at 5.3% and achieved 171 million TEUs (UNCTADE, 2015).

Concentration in the field of containers market means that relatively larger container ports are increasing their market share at the expense of the remaining smaller ports. The system of ports in the east Mediterranean region cannot be considered as a similar set of ports. It is formed of large ports as well as medium and small sized ports each with specific features.

The aim of this paper is to illustrate that the level of port concentration (container ports) in east Mediterranean Region to determine kind of market (monopoly pure and perfect competition). The annual containers throughput data during the period 1995 to 2014 were collected to analysis and measure the market concentration. The East Mediterranean market structure will be analysis by using, the CR3, CR5, HHI (Herfindahl-Hirschman index technique) and shift-share analysis.

Concentration Definitions

There is not a clear agreement on definition of concentration/de-concentration phenomena, in cargo traffic the most important definition are:

Hayuth (1981) studied the concentration/de-concentration in container port level in his five-phase model. The pre-container era is the first stage can be described as, moving to the next stage (introduction of containers), to the third one where the boost of containerization in the world economy is clear. The most important periods during his analysis are considered the fourth and fifth. More specifically, stage 4 includes the load center concept where concentration tendency occurs. Due to use of intermodal transportation with the rapid increase of container use create the concentration of container traffic in a small number of ports. During this stage, most of the cargos were concentrated at the bigger ports. Also, there is a clear variance concerning the competitors: The bigger ports that compete for the biggest share, and left the fractions for the smaller ports that compete with each other. Hayuth refers it for the following reasons: hinterland connection, proximity to strong markets, reduction of ports of call by the shipping lines for reduction of cost and the attempt of shipping lines to achieve economies of scale during the final phase (Phase 5) as load centers are still the dominant ports in port traffic. (Kitsos, 2014).

Generally, for container port, Concentration is the phenomenon of polarization of container traffic in a few numbers of ports and de-concentration is the phenomenon of spread of container traffic from a small number of ports to a wider set of ports. (Kitsos, 2014) Hayuth,(1991) defines "concentration as is the phenomenon of polarizing container traffic in the big load centers in the expense at of the small ports, moreover (united nation,1998) stated that concentration in maritime transport field means that relatively larger ports, shipping companies and their alliances are increasing their market share at the expense at of the remaining smaller players.

Literature Review

There are several papers and studies discussed the concentration/de-concentration in the maritime industry, especially in container market.

Notteboom,(2010) investigate and analyses the European container port system traffic at the period 1985- 2008 and to 78 container ports. The analysis used normalized Hirschman-Herfindahl index, Annual net shifts, and Market shares. Notteboom stated that, in the European port system, the container handling market remains far more concentrated than other cargo handling segments. Furthermore Kitsos, (2014) studied the Changes of concentration patterns in European container ports during and after the crisis, then found The European port ranges faced a de-concentration tendency when the crisis became obvious. Afterwards, the majority of the ranges seem to have a concentrated tendency with an exception of Scandinavian ports and Black Sea.

Elsayeh,(2015) analyzed the impact of ports' technical efficiencies on the improvement of Mediterranean container ports' competitiveness, by using K-CR, HHI, GC, and Shift-Share analysis. The researcher found the Mediterranean container port market tends to de-concentration the existence of inefficiency pertaining to the management of container ports in the region, since the total technical efficiency is found to be below 50% on average. Also study will contribute to assist port managers to optimize their resources and set operational plans that enable them to satisfy their customers' needs and requirements.

Varan& Cerit, (2014) analyzing the industry concentration and competition in the specific context of container ports in turkey to measure the outcome of Turkey's recent privatization process by using HHI, Shift share analysis, and concentration ratio. The statistical findings of this study suggest that the recent port privatizations have been successful in stimulating private investments and competition, also the improvement in the port policy and regulatory are very important to build the competitive advantage to attract new customers (shipping lines) and to have future advantage to compete globally.

Notteboom (1997) used HHI, Gini Coefficient, and Share-Shift Analysis to examine dynamics - in particular, concentration and De-concentration tendencies and load Centre development - in the European continental container port system for the period 1980-1994. The researcher found "Containerization would lead to further port concentration" is not confirmed, and the concentration eventually reaches a limit or might even develop into de-concentration.

Fageda, (2000) applied Gini, HHI, and the Lorenz Curve, to analyzing the impact of technological, economic and spatial changes associated to the introduction of containers in maritime transport in the Mediterranean Port Range, and the study of competitive position is analyzed by using the Shift-Share analysis All ports in the region becoming a load centers and will have to face a very competitive environment, with the requirements in terms of strategies, investments, price policies and so on this involves.

Trwrdy & Batista, (2013) present some simple analytical methods which have used to detect some internal connection among the ports in the North Adriatic. By applied, and present a market share analysis, shift share analysis and a simple Markov chain method to predict the behavior of the NA port system with respect to the growth of or decrease in the container traffic.

Elbayoumi & Dawood, (2016) This study provides a satisfactory understanding of the market share and competition of selected container terminals in the Middle Eastern region by using HHI to analyze 24 container terminals from 12 countries in the region. Based on analysis the 24 terminals in the region only 5 terminals (Dubai included Jebel Ali, Suez Canal C. terminal, Ambarli ,Salalah and Jeddah) are growing constantly; the rest of the terminals are inefficient. Aden terminal shows the lowest level of Market share with a score of 0.201.

Li & Lee, (2010) investigating the competence between, Shanghai Port and Ningbo Port which are spatial structure of the ports cluster and neighboring ports' attraction to cargoes at conjunct hinterlands. By Using the HHI index model and shift-share method to qualitatively and quantitatively analyze the data of container throughputs of ports in the shipping center, in order that investigates the spatial structure of ports cluster. The researcher found the ports cluster of the Shanghai International Shipping Center is highly centralized, and undergoes a process of first centralization then decentralization since the mid of 90s, last century.

Research Methodology

The quantitative approach is (adopted) applied and the secondary data is also used in order to analyze the concentration and the competition during the period from 1995 to 2014 in the East Mediterranean Region. The concentration is measured by using HHI (Herfindahl-Hirschman Index Technique), Elbayoumi& Dawood, (2016), Notteboom, (2010). Fageda (2011), Varan& Cerit, (2014) which stated that there is a need for a better assessment of competition in container ports, in addition to perform a shift- share analysis.

The Herfindahl-Hirschman Index measures the market concentration among firms in the market. It is defined as the sum of the squared market shares of (n) individual company. As such, it can range from (1/n) to 1 moving from a large amount of small firms to a single monopolistic organization where H=1. A decrease in the Herfindahl index generally indicates a decrease in concentration (Elsayeh, et.al, 2011).

Concentration ratios (CR3 and CR5) express the degree of competition in industry and high ratios may act as barriers to entry of new investors (Varan1& Cerit, 2014).

Varan & Cerit, (2014) refer to study shift- share analysis, that shows the growth and decline in ports, as it shows the effect of the expected "share" of container traffic in the port and the total shift refers to the total port productivity lost or won from the competing ports in the same range with the expected container traffic (share effect) as a reference.

Sample and Data Collection

The container ports (experienced) - many developments and changes. Also, the importance of the region itself is a key element in this scope. The main objective of this study is to analyze the throughput of the selected 14 container ports during the period 1995-2014. The data were mostly collected from terminals websites, annual reports of ports authorities and ISL, (Ocean Shipping Consultants).

Data Analysis

There are several steps that should be applied to achieve the aim and explain the statistical analysis.

The market share of each container port is calculated as a percentage from the total Throughput of the selected ports in the region.

Herfindahl-Hirschman Index (HHI) of container ports in Eastern Mediterranean. HHI stands for Herfindahl-Hirschman Index is often used to measure of market concentration. It is calculated by summing the squaring of each competing port' market share as shown in equation (1):

$$HHI = S_1^2 + S_2^2 + S_3^2 + S_n^2 \dots \dots \dots (1)$$

Where: S_i is the market share of the i^{th} port in the region comprising n port.

The range of HHI number is $1/n \leq HHI \leq 1$.

Where: s_i = port I throughput/ (total n ports throughput)

Then:

$$HHI = \frac{\sum_{i=1}^n TEU_i^2}{[\sum_{i=1}^n TEU_i]^2} \text{ of Which } \frac{1}{n} < HHI < 1 \dots \dots \dots (2)$$

HHI = degree of concentration of container port.

TEU_i = the container throughputs of port i .

n = the total number of the ports.

The low values are indicating a high degree of competition and, conversely, higher values are indicating a degree of monopoly. The HHI number can range from close to zero to 1. Generally, there exists concentration when HHI is larger than 0.1; and it indicates that a highly centralized when HHI is larger than 0.18.

Williams, et.al, (2003) stated that shift-share analysis used to analyze the differences between regional and national growth rate in variables such as export growth, employment and productivity. This paper focuses on container throughput growth over a period of time in the East Mediterranean region ports. In this thesis, we focus on the container throughput growth over the period of 1995-2014 in the East Mediterranean region; these ports are (Piraeus. Thessaloniki, Limassol, Laranca, Beirut, Mersin, Izmir, Ambrali, Latakia, Tartous, East Port Said, west port said El- Dekheila\ Alexandria, Damietta).

The aim of this analysis is to compare Egyptian ports’ performance, competitiveness in terms of container throughput against ports which are located in the east Mediterranean region – with the inclusion of their competitors. Shift-Share analysis is expressed as follows:

$$ABSGR_i = TEU_{it_1} - TEU_{it_0} = SHARE_i + SHIFt_i \dots (3)$$

$$SHARE_i = ((TEU_{it_1}/TEU_{it_0}) - 1) * TEU_{it_0} \dots \dots \dots (4)$$

$$SHIFt_i = ABSGR - SHARE \dots \dots \dots (5)$$

ABSGR = absolute growth of TEU in port in the period t₀-t₁;

SHARE = total SHARE effect of port in the period t₀t₁;

SHIFT = total shift of port in the period t₀-t₁.

Result and Discussion

Market Share Analysis

The following table will show the market share of each port in the Eastern Mediterranean region during the period (1995-2014).

Port	Total throughput 1995	Market share 1995	Total throughput 2000	Market share 2000	Total throughput 2005	Market share 2005	Total throughput 2010	Market share 2010	Total throughput 2014	Market share 2014
Piraeus	600.1	14.8	1161.1	18.4	1395.0	13.13	850.0	5.33	3493.0	17.5
Thessaloniki	143.4	3.5	229.7	3.6	365.9	3.44	273.3	1.71	350.0	1.8
Laranaka	107.5	2.6	2.1	0.0	4.7	0.04	499.0	3.13	227.0	1.1
Limassol	266.5	6.6	257.0	4.1	320.1	3.01	348.4	2.19	307.7	1.5
Haifa	524.0	12.9	870.4	13.8	1107.0	10.42	1266.0	7.94	1196.0	6.0
Ashdod	334.0	8.2	479.5	7.6	586.0	5.51	1018.0	6.39	1250.0	6.3
Beirut	254.3	6.3	266.1	4.2	463.7	4.36	949.2	5.95	1225.0	6.2
Mersin	147.6	3.6	299.4	4.7	596.3	5.61	969.0	6.08	1484.0	7.5
Izmir	302.2	7.4	470.6	7.4	784.4	7.38	727.4	4.56	678.7	3.4
Ambrali	0.0	0.0	354.7	5.6	1195.0	11.25	2464.0	15.46	3445.0	17.3
Latakia	132.5	3.3	192.1	3.0	390.8	3.68	585.7	3.67	0.0	0.0
Tartous	20.9	0.5	29.6	0.5	31.5	0.30	62.7	0.39	0.0	0.0
East port said	0.0	0.0	0.00	0.0	698.5	6.57	2578.0	16.17	3258.0	16.4
west port said	324.5	8.0	527.9	8.3	823.0	7.75	956.9	6.00	598.6	3.0
El- Dekheila\ Alexandria	304.1	7.5	602.0	9.5	733.9	6.91	1333.0	8.36	1678.0	8.4
Damietta	596.6	14.7	583.1	9.2	1130.0	10.63	1060.0	6.65	715.9	3.6
Total	4058.2	100.0	6325.3	100.0	10625.8	100.0	15940.5	100.0	19906.9	100.0

Table (1) container port Market share in East Mediterranean region

Source: Author.

In 1995, there is a strong competition between Damietta and Piraeus, each of them have market share 14.8% and 14.7% of East Mediterranean containers market. Piraeus is the Market leader in 2000 with a consistent growth of market share to 18.4% before drop to 5.33% in 2010. In 2014, it returns to take the lead in the market share as the Piraeus port grew significantly between the late 2010s and the late 2014s; it occupies the first rank in 2014 by 17.5% of the market. The significant improvement of the market share of the Piraeus was mainly the result of the investment of Cosco shipping line in the port. Also, the market share of Ambarli port has gradually improved from 5.6% in 2000s to the 15.46%, before coming back drop and then rise to settle in second ranked on the 2014 with 17.3% of market share. Despite the increase in throughput in Port Said East port, but it was unable to increase its market share and slipped to third ranked in 2014 with 16.4% market share. In the other side, Haifa and Ashdod maintained their market share in the range of 6% for each in the last years. The growth path in market share of each of the ports’ ranges is depicted.

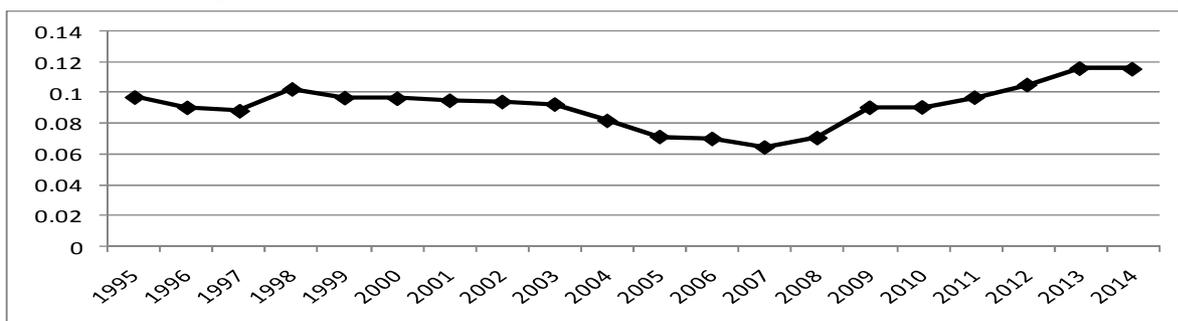
Herfindahl -Hirschman Index (HHI)

From figure (1), HHI is fluctuated between 0.064668 and 0.115914 over the period (1995 to 2014), in 2013 & 2014 the HHI greater than 0.1, indicating that the containers market in east Mediterranean region tends to a degree of concentration. At the same time, HHI first rises from 0.09715 (in the year of 1995) to 0.1024305 (in 1998) then falls to 0.064668 (in 2007), before re-rise to 0.115914, 0.115562 (in 2013 and 2014). The reason is that the Piraeus and Ambarli ports keep a growth rate and gain the shift of 2431 & 367.9 thousands TEUs from 2010 to 2014. It is expected that with further growth of container throughputs of Piraeus and Ambarli ports, the figure of HHI index of the port cluster will further increase. The port in east Mediterranean region tends to centralize.

Figure (1) degree of concentration In East Mediterranean Region from 1995-2014

Concentration Ratio CR3-CR5-

Figure (2) shows the statistical measures of concentration for container ports in East Mediterranean region over the period 1995-2014. CR3 to 2014 are less than 0.1 and tendency to de-

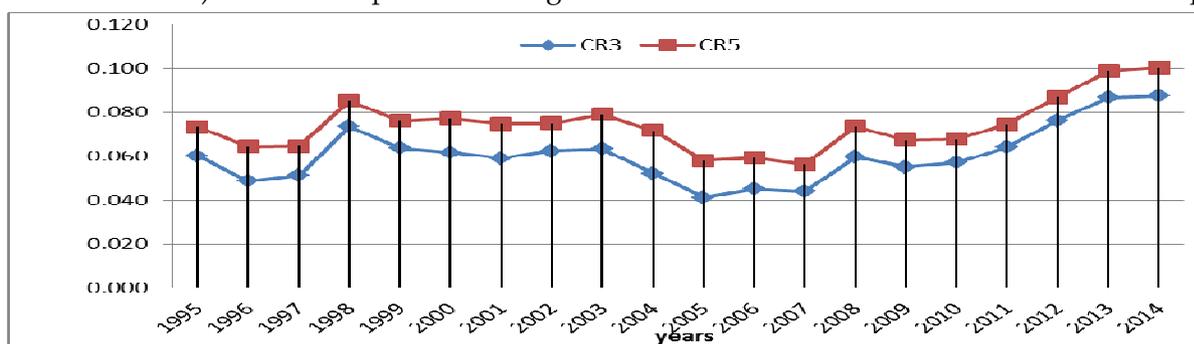


concentration Additionally CR5 are less than 0.1 up to 2013 but equal 0.1 in 2014 which indicating the market tendency to concentration due to the continuous development in the port of Piraeus and Ambarli, which increases their market share.

Figure (2) CR3 & CR5 in East Mediterranean Region from 1995-2014

The shift-share analysis

The result of shift- share analysis in eastern Mediterranean containers port during the period from 1995-2014). The subsequent three figures describe each of the three shift-share components



clearly. As shown in figures (3, 4, 5) there is a kind of an oscillatory behavior. There are also several peaks that can be seen on the figure. In the period from 1995 to 2004, it can be seen that that Piraeus,

Ambarli and Mersin, are ports with the best results. The port of Piraeus suffered a relatively great shift of the expected containers to other ports in the period from 2004 to 2010, but the situation recovered from 2010 to 2014. Egyptian ports have shown an oscillatory shift of containers, in the period from 2004 to 2010 East Port Said port was the biggest winner with 2547 thousands TEUs. But, the Damietta was the second loser in the region. In the period from 2010 to 2014, the Egyptian port lost the expected number of containers. A bit different situation has been for the port of Ambarli where we can see that, for a very long period, namely from 1995 to 2014, the port gains more containers than expected and it developed continuously.

Periods characterized by high net volume shifts refer to a considerable degree of dynamics and competition within the container port system. So, from the previous analysis, the Piraeus and Ambaril ports is seen as the main competitor for the Egyptian ports in east Mediterranean region.

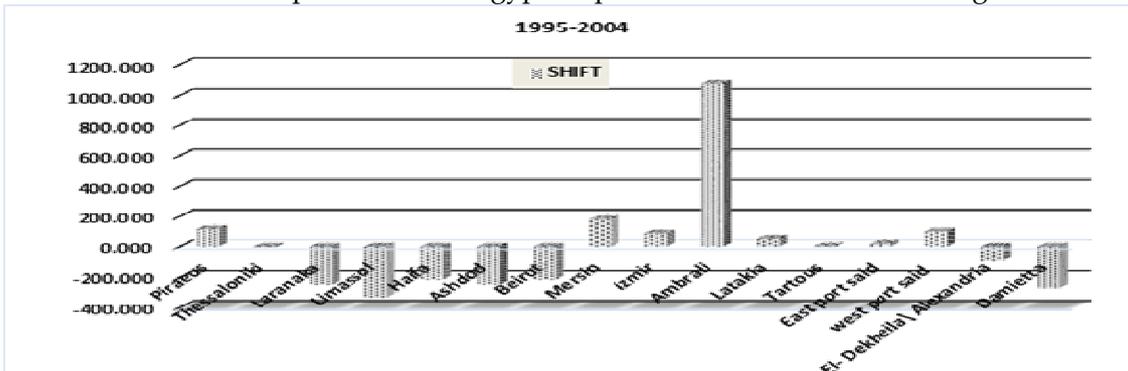


Figure (3) shift analysis of container ports in east Mediterranean (1995-2004)

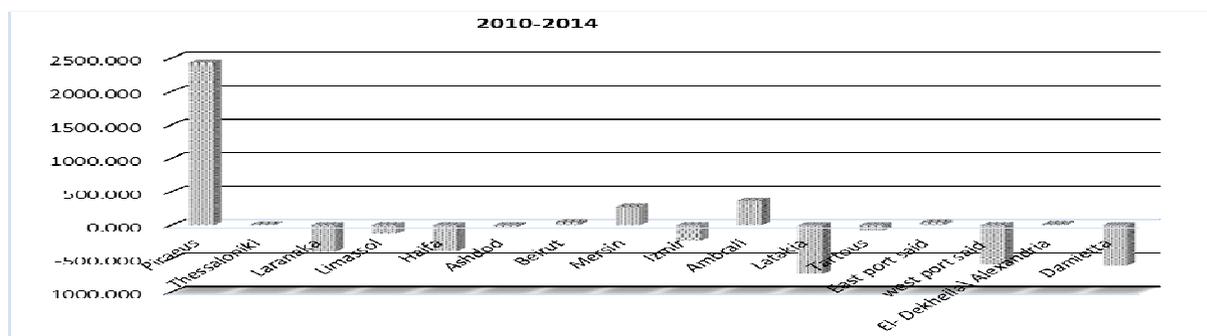
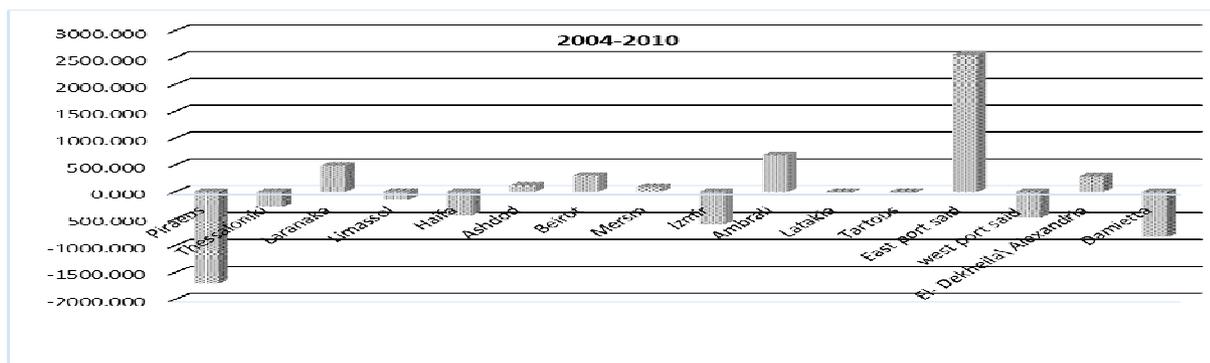


Figure (4) shift analyses of container ports in east Mediterranean (2004-2010)



Conclusion

Container port hierarchy and competition in East Mediterranean has become highly dynamic due to high investment by shipping lines in several ports in the region like Piraeus port, and Ambarli port. In this chapter, the container ports concentration / de-concentration in east Mediterranean region was investigated. Quantitative analysis approaches including the CR3, CR5, HHI and shift-share analysis have been (conducted) used to measure the degree of concentration of container ports over the period between 1995 and 2014. The dramatic changes in ports' environment that have taken place since the 2004 (the operation of East Port Said port) have had an impact on the observed tension between concentration in the region. While the hub port concept has a merit from the shipping line viewpoint, the containers market tendency to further port concentration in region is still there especially at 2010 when Cosco shipping line invests in Piraeus port. The continuous developments of several ports in the

region are leading to a highly competitive market. From the above analysis, the competitiveness is confined among Piraeus, Ambarli and East Port Said port. If the Egyptian government did not speed up the process of optimizing the exploitation of the East Port Said and didn't speed up the introduction of new terminals corresponding to the large investment in the ports of Piraeus and Ambrali, the Egyptian ports will inevitably suffer going out of the competition.

Research Recommendation

It is necessary to study and conduct a deeper analysis of the Egyptian ports and study (survey) the effect of the integration among the Egyptian ports on the concentration in the Eastern Mediterranean region. This should be conducted in parallel with an analytical study of the competition among the container terminals of each port separately in the area of the Eastern Mediterranean.

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