

The Dynamics of Containerized Transport in the Mediterranean Sea

Andrea Gallo[1,2(✉)]

[1] Ca' Foscari Venezia University, Dorsoduro, 3246, 30124 Venezia, Italy
and.gallo@unive.it
[2] University of Trieste, Via A. Valerio 4/1, 34127 Trieste, Italy

Abstract. The proposed study aims at analyzing the transport dynamics of containerized traffic in the Mediterranean Sea, trying to analyze the main development pathways of the different ports in relation to their geographic location and their afference to the different port ranges present in the Mediterranean Sea and with respect to the different functions they are called to absolve: transshipment hub, gateway or mixed port. Through the use of the Gini Coefficient and to the Shift Share analysis, this study highlights how for different port ranges, transshipment ports are subject to higher traffic volatility. The emerging development trajectories highlighted for the Mediterranean basin imply the strengthening of some gateway ports located in strategic positions with respect to the reference hinterlands, assisted by a growth of the main transshipment hubs located close to the East-West Suez-Gibraltar route, while leading to a loss of traffic shares for smaller ports due to the centralization of flows on a smaller number of ports.

Keywords: Maritime Transport · Transport Dynamics · Shift Share Analysis · Mediterranean Sea

1 Introduction

The Mediterranean port system can be considered as a non-homogeneous set of ports. In fact, we can see how this basin is inter-crossed with a multitude of different ports of call, from established large ones, to a wide range of medium and small ports, each with specific characteristics in which different locational and strategic dynamics intersect within the hinterlands served and the different commodity categories handled. This combination of different types and sizes of ports, supported by the presence of a vast hinterland, has led to the creation of a homogeneous space that is a perfect case study for trying to analyze the factors affecting port hierarchy and competition.

There are numerous studies in the literature that have investigated in depth the dynamics of competition and development of port systems on a regional scale or with reference to individual ports [1–3], and in particular the dynamics of transport flows in the Mediterranean basin have been studied in the works of [4–6]. The contributions just mentioned are the supporting pillars for an in-depth analysis of containerized traffic flows in the Mediterranean Sea area.

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This paper proposes to elaborate a conjunctural analysis about the variation of traffic volumes in relation to the evolutionary arc of different port ranges, considering the strategic role that different ports are called upon to play as gateways for traffic to port hinterlands or transshipment hubs, going beyond the concept of the port as a single node in a transport network, but considering different systems of ports related to each other by geographic location and common hinterlands, finally sketching the evolutionary profiles that different ports are experiencing. As mentioned, the Mediterranean basin is called upon to play a strategic role in maritime transport on a global scale: its location along major east-west trade routes, central to Atlantic, northern European, Asian and African markets offers significant connectivity advantages to shipping companies, allowing for reduced transit times and an important gateway to markets in continental Europe and the Middle East.

However, this contribution was designed and implemented based on the data and geopolitical situation before the crisis that has afflicted traffic transiting the Red Sea and the Suez Canal in recent months since October 2023, due to missile attacks on cargo ships by the Yemeni armed Houthi group in connection with the conflict between Israel and Palestine. As a result, the considerations and results achieved are, at present, obsolete. Given the strategic importance to global-scale traffic of the Suez Canal, however, it is to be expected that the situation can return to near-normality in not too long a time.

This article considers 29 ports located within the Mediterranean Sea basin, with the intention of identifying the main development trends of the region's port system.

2 Literature Review

The analysis of transport dynamics should not disregard the strategic role that different ports are called upon to play. The complex system of transport networks is increasingly articulated, has led to the development of intermediate positions that are called transshipment hubs [7]. These ports are deputed to the function of interface between global and regional routes and represent key nodes in the handling dynamics of containerized traffic. Consequently, container ports occupy two different demand segments from the point of view of transport mode: on the one hand we find sea-sea transshipment cargo handling and on the other hand gateway cargo handling involving a modal shift inland.

In the analysis of transport dynamics, it is crucial to introduce these concepts as it is highlighted in the literature that transshipment hubs are vulnerable to market fluctuations [8]. The possible causes of this vulnerability can be attributed to several factors: the inclusion of transshipment hubs in the transportation network may be only a temporary phase in the development of the port system on a regional basis [5], the strategic choices of shipping lines shift transshipment volumes from one port to another, and competition with gateways that can also handle transshipment traffic volumes [9]. In the opposite direction, gateways represent the main link between regional and global transport systems [10]: these, by nature, will find their geographic location in contexts characterized by a strong development of economic activity within their hinterland [11, 12], assuming a role as logistics "clusters," connecting maritime and land trade flows through the implementation of an infrastructure that is articulated from the waterfront areas to the back-port areas.

Given today's manufacturing environment, articulated along extremely branched production chains, an efficient and well-structured transport system is a factor of strategic importance, linking different modes of transport (maritime rail and road) and offering intermodal services for the distribution of goods. Such infrastructure represents the backbone of a regionalization of different port systems, which originates from the relationship between backport areas, distribution centers and infrastructure [13]. The complexity of the global freight distribution system requires a more pronounced integration between different modes of transport and greater efficiency in the management of supply chains, as well as the increase in freight traffic volumes and the concentration of cargoes on a limited number of ports of call and inland transport corridors, creating conditions for the development of gateway ports in strategic locations along these routes [14, 15].

The increase in traffic volumes on a global scale in the most recent historical period has led to a reorganization of the systemic processes of freight mobility between the port and its hinterland, calling rail transport to play a key function in the dynamics of spatial distribution [16, 26]. The locational characteristics of the various gateways, close to economic hinterlands of reference, determine that the traffic shares achieved by these ports are subject to less volatility than those of transshipment hubs.

3 Data Collection

The Mediterranean Sea plays an extraordinarily important role as a natural thoroughfare for trade flows connecting the Far East to continental Europe. This vast maritime area is bounded by two critical points known as "choke points": the Strait of Gibraltar to the west, which is called upon to fulfill the role of a junction and with the Atlantic Ocean, and the Suez Canal to the southeast, which is the most efficient route for handling the movement of goods on the east-west route. The basin is a key node for global trade, representing an intersection point between intercontinental "pendolum" routes, round-the-world routes, and regional and local flows [17, 18]. Its strategic location within the global macroeconomic landscape makes it a vital crossroads for supplying markets and manufacturing clusters in continental Europe also in relation to the supply markets of the Middle East. The importance of this maritime region is reflected in the complex and intricate port network that has developed in response to this need. The port infrastructure along the Mediterranean coasts has been carefully planned and developed to facilitate the efficient movement of goods and facilitate international trade. The interconnectivity among Mediterranean ports, together with their proximity to the main trade routes, has generated a highly specialized and interconnected port system [19].

These peculiarities have generated a steady increase in traffic volumes operated by the different ports, rising from a share of about 34.9 million TEUs in 2010 to 50.7 million in 2022 with reference to the sample under analysis.

In order to study the evolution of the dynamics of containerized traffic in the Middle-Eastern Sea, the analysis proposes to relate several factors. In addition to the simple quantification of traffic volumes, presented in the summary table below (Table 1), the role of the different ports in relation to the transshipment index was first analyzed, noting that for the macro-region under analysis, the different ports can be divided into 14 gateways, 5 mixed ports and 10 transshipment hubs. Preliminary observations on

traffic volumes and the role of different ports are summarized in Fig. 2. We can see that most of the gateways find location along the northern coasts of the Mediterranean basin while the main transshipment hubs are located along the main east-west route, with particular reference to the major hubs such as Piraeus port, ports located adjacent to the outlet of the Suez Canal such as Port Said and the port of Alexandria, the port of Marsaxlokk on the island of Malta in the center of the Mediterranean, the contenant terminal of the port of Gioia Tauro, and finally the Port of Algeciras near the Strait of Gibraltar.

We must also note how the evolution of mixed ports has led to an increase in transshipment shares for several strategic ports, among which are the ports of Barcelona, Valencia, and Mersin. We can highlight how the gateway function and management of direct trades toward the port hinterland has thus been coupled with the specific functions of transshipment hubs, thus serving as junctions for sea-sea inframodal trades for short- to medium-distance feeder services, effectively assuming a pivotal role in transport dynamics, as confirmed by the steady increase in traffic volumes (Fig. 1).

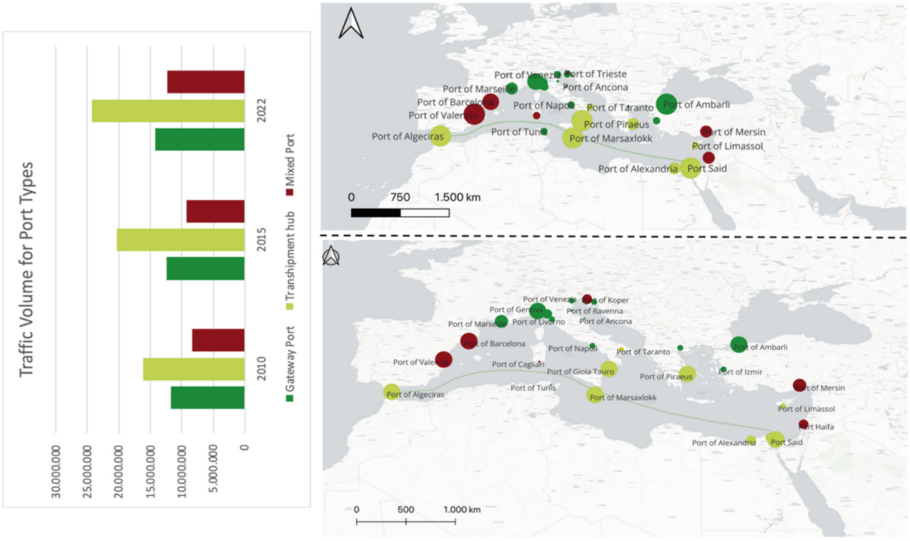

Fig. 1. Traffic volumes for different port types (Gateway Ports, Transshipment Hub, Mixed Ports) in the Mediterranean basin. Source: Personal Elaboration on Port Authorities Data

From this first analysis we can see that transshipment hubs move the largest share of containers, rising from 45% to 48% between 2010 and 2022, while gateways shunted a 32% share of flows to port hinterlands in 2010, falling to 28% in 2022. On the other hand, as far as mixed ports are concerned, deputed to play an ambivalent role in transport dynamics, with reference to flows to hinterlands that in transshipment operations have maintained a traffic share of 23% with some stability.

Table 1. Handled TEU volumes and main port functions by Mediterranean ports.

Country ID	ID	Main Service	2010	2015	2022
EL	Port of Piraeus	Transhipment	885,155	3,327,778	5,311,810
EL	Port of Tessaloniki	Gateway	273,131	351,407	470,645
ES	Port of Valencia	Mixed	4,206,937	4,615,196	5,052,272
ES	Port of Algeciras	Transhipment	2,806,884	4,515,768	4,767,282
ES	Port of Barcelona	Mixed	1,931,033	1,965,241	3,522,944
FR	Port of Marseille	Gateway	953,435	1,223,173	1,530,000
HR	Port of Rjieka	Gateway	137,048	200,102	520,866
IT	Port of Genova	Gateway	1,955,292	2,340,935	2,799,123
IT	Port of Gioia Tauro	Transhipment	2,852,264	2,546,805	3,380,053
IT	Port of La Spezia	Gateway	1,285,155	1.300,442	1,262,496
IT	Port of Livorno	Mixed	628,489	780,874	751,811
IT	Port of Trieste	Mixed	281.643	501.222	877.805
IT	Port of Venezia	Gateway	393,913	560,301	533,991
IT	Port of Napoli	Gateway	534,694	438,280	684,111
IT	Port of Cagliari	Transhipment	629,340	748,647	140,216
IT	Port of Ravenna	Gateway	183,577	244,813	228,435
IT	Port of Ancona	Gateway	110,395	178,476	165,346
IT	Port of Taranto	Transhipment	581,936	0	26,269
ML	Port of Marsaxlokk	Transhipment	2,370,729	3,064,000	2,890,000
SI	Port of Koper	Gateway	476,731	790,736	1,017,798
TN	Port of Tunis	Gateway	420,089	306,931	258,716
IL	Port Haifa	Gateway	1,263,000	1,035,920	1,491,180
TR	Port of Izmir	Gateway	695,799	649,567	390,274
TR	Port of Mersin	Mixed	1,250,873	1,428,300	2,059,309
TR	Port of Ambarli	Gateway	3,023,960	3,061,501	2,867,215
CY	Port of Limassol	Transhipment	382,000	389,000	384,000
EG	Port Said	Transhipment	3,627,813	3,600,000	4,764,583
EG	Port of Alexandria	Transhipment	812,446	978,281	1,488,436
EG	Port of Damietta	Transhipment	1,214,910	1,141,842	1,106,151

Source: Personal Elaboration on Port Authorities Data

It can be seen that the near-totality of the ports under analysis have either maintained their traffic volumes virtually unchanged or are experiencing an expansionary phase. With this in mind, it will be those ports that have seen a drastic reduction in traffic volumes that will be taken into analysis as a specific case study to try to grasp the

dynamics that have led to an almost complete abatement of traffic volumes. In particular, it should be noted how two transshipment hubs located in southern or island Italy have seen an extremely significant collapse in traffic: the port of Cagliari, Sardinia, which went from 748,000 TEUs in 2015 to 140,000 in 2022 and the port of Taranto, which went from over half a million TEUs in 2010 to zero in 2015. We will see below how the reasons for these slowdowns can be attributed to the strategic choices of shipping companies and different terminal operators.

To try to capture the effects of shipping companies' strategic investment choices on the dynamics of traffic volumes, following the general overview presented on the different ports, they were grouped into six different port ranges, presented in Fig. 3 based on geographic proximity.

This categorization divides the different ports into Spanish Med Range (Barcelona, Valencia, Algeciras), Ligurian Range (Genoa and Vado Ligure, La Spezia, Livorno and Marseille Fos), North Adriatic Range (Trieste, Venice, Ravenna, Ancona, Koper and Rjieka), Central Mediterranean Range (Gioia Tauro, Naples, Cagliari, Taranto, Malta Freeport and Tunis (Rades)), East Med Range (Piraeus, Thessaloniki, Izmir, Mersin and Ambarli) and finally South Med Hubs (Limassol, Port Said, Damietta, Alexandria and Haifa).

Considering this local subdivision, the ports of Barcelona, Valencia and Algeciras that make up the Spanish Med Range can catalyze a higher share of traffic than the other clusters, handling 26.3% of total flows in 2022. This subdivision also allows us to note how the northern Mediterranean ports, deputed to gateway functions to the different hinterlands are able to convey on average a more limited amount of containers than the transshipment hubs located along the east-west route. In particular, the ports of Gioia Tauro and Marsaxlokk for the Central Mediterranean Range, the port of Piraeus for the East Med Range, and Port Said for the ports that make up the South Med Hubs, represent the driving forces for the containerized flows of the different clusters.

4 Method

Understanding the dynamics of transportation in the Mediterranean basin must be treated through an organic and systemic analysis of the various ports and its complex set of interactions. With this in mind, the methodological approach taken is marked by two converging trajectories: first, through the application of the Gini coefficient, which is a measure of concentration within the different port ranges and provides useful information for understanding the dynamics of transport for the different ranges [20]. Application of the Gini coefficient suggests that if all ports in a range were of similar size, it would equal zero; conversely, if all traffic volumes were catalyzed on a single port, the Gini index would take a value of 1 [21]. Mathematically, the Gini coefficient is expressed with the following formula:

$$G = \frac{\sum_{i=1}^{n}(2i - n - 1)x_i}{n\sum_{i=1}^{n} f_i} \tag{1}$$

With the Gini Coefficient $= 0 \leq G \leq 1$.

n represents the total number of ports in the sample, f_i represents the frequency, and x_i represents the cumulative frequency.

The two indices just presented represent two fundamental measures for understanding the dynamic evolution of container flows and for trying to capture how localization and geographic components on the one hand, and competitive components among different ports on the other, influence the traffic volumes operated by different ports [19, 22].

In order to try to combine all the different factors highlighted above, however, it will be necessary to flank the two indices just presented with another methodological support capable of providing some more detailed information on transport dynamics, as much by virtue of the variability of traffic volumes in absolute terms as to try to capture the nuances due to the dynamics of development between different ports. For this purpose, as already covered extensively in the literature [23] and in particular by Professor Notteboom [17, 20], the proposal is to adapt the shift-share decomposition applied to ports pertaining to different port ranges.

This methodology approach, which originated in regional economics in the early 1960s, proposed to decompose regional growth, expressed in terms of employment by dividing growth into three different components. The first, named "Share Effect," attributable to national growth, where growth coincides with the growth rate calculated at the highest level of territorial agglomeration. The second component named "Shift Effect" represents how, at the local level, there are some economic activities that grow faster or slower respect to the growth rate of the whole sector at the national level. The third component is named the "Competitive Effect" and represents the portion of a region's growth that is attributable to the better or worse performance of local industries relative to the national average. In other words, it measures how much of the change in employment or economic activity growth can be explained by the relative competitivity of the region's industries relative to the national average [24]. It seems clear that the applicability of this model to our area of study is highly appropriate, by shifting the shift-share model from a regional economy analysis to one devoted to traffic volumes for ports pertaining to the different ranges of the Mediterranean Sea. Employment will be replaced by traffic volumes, the larger spatial unit will cover the total containers handled the Mediterranean area, the different ranges will represent the local level, and finally individual ports will replace industries.

Next, the mathematical formulation of the shift share analysis is presented:

$$v_i^{t+1} - v_i^t = v_i^t \left[\frac{V^{t+1} - V^t}{V^t} \right] + v_i^t \left[\frac{V_r^t - V_r^t}{V_r^t} - \frac{V^{t+1} - V^t}{V^t} \right] + v_i^t \left[\frac{v_i^{t+1} - v_i^t}{v_i^t} - \frac{V_r^t - V_r^t}{V_r^t} \right]. \tag{2}$$

where v_i^t Are the traffic volumes for the i-th port at time t, V Are the traffic volumes for the set of ports under analysis, V_r^t represent the total traffic volumes handled within the individual port range. From this formulation we can then decompose the analysis into the three components observed earlier:

$$\text{Share Effect} = v_i^t \left[\frac{V^{t+1} - V^t}{V^t} \right] \tag{3}$$

$$\text{Shift Effect} = v_i^t \left[\frac{V_r^t - V_r^t}{V_r^t} - \frac{V^{t+1} - V^t}{V^t} \right] \tag{4}$$

$$\text{Competitive Effect} = v_i^t \left[\frac{v_i^{t+1} - v_i^t}{v_i^t} - \frac{V_r^t - V_r^t}{V_r^t} \right] \tag{5}$$

In the application of shift share analysis, we can observe that the "Competititve Coponenet" within the same range is a zero-sum game: thus adding up the individual incremental or diminutive changes will always make the sum zero. The growth of an individual range is then attributable to the "share effect" and/or "shift effect" components.

This empirical application aimed at different ranges is able to highlight the peculiarities in the dynamics of containerized traffic flows, both in reference to growth prospects and to the distribution and concentration of traffic volumes on the various ports (Table 2).

5 Results and Discussion

Table 3 represents the distribution of traffic volumes for the mid-terranean ports within the geographical breakdown for the different ranges proposed earlier. We can first note that between 2010 and 2022, the value of the Gini Coefficient increased from 0.48 to 0.52 for the 29 ports that form the sample: this figure indicates that there is a moderate trend toward a system in which a few ports hold an extremely large share. This trend is practically reflected in the lowering of traffic on a few smaller ports such as the port of Taranto and Cagliari assisted by an expansive phase of the Gioia Tauro transshipment hub, the Port of Piraeus in the east and the ports pertaining to the Spanish Med Range in the west. We can also note that at the range level, the dynamics coerently trace what is expressed by the Gini Coefficient for the set of ports in its entirety, with the sole exception of the Spanish Med Range, which goes from 0.24 to 0.11 by virtue of an extremely balanced distribution of traffic volumes among its three component ports, through a growth phase for the Port of Algeciras between 2010 and 2015 and the Port of Barcelona between 2015 and 2022.

Table 2. Gini coefficient for different port ranges in the Mediterranean basin.

Gini Coefficient	2010	2015	2022
All Ports	0.48	0.50	0.52
Spanish Med Range	0.25	0.24	0.11
Ligurian Range	0.30	0.28	0.34
North Adriatic Range	0.34	0.36	0.37
Central Mediterrean Range	0.48	0.63	0.69
East Med Range	0.49	0.47	0.55
South Med Hubs	0.48	0.46	0.50

Source: Personal Elaboration

The second stage of the proposed analysis comes from the application of the shift-share model adapted to the port area (Table 4). As mentioned, this model allows us to decompose the growth for the different ranges into three different components. The "Share Component," which indicates the potential growth of different ports relative to the entire Mediterranean basin, and the "Shift Component," which represents the potential growth of different ports relative to ports in the same cluster. The third part is the Competitive Component, the sum of which at the range level is always zero, thus being analyzed separately [25].

The trend component (Share Effect) relating to traffic dynamics in the Mediterranean Basin is able to capture in its near totality the growth dynamics of the Ligurian Range in the period between 2010 and 2015 and those pertaining to the Spanish Med Range in the period 2015–2022.

The structural component (Shift Effect), on the other hand, highlights two diametrically opposite trends: on the one hand, that of the Central Mediterrenean Range ports and those of the South Mediterrenean Hubs in the period 2010–2015, which had a loss on potential intra-range growth of 1.53 and 1.38 million TEU, respectively, and on the other hand, we can observe how for the East Med Range this growth component represents potential growth of 1.65 million TEU. By the same token, the Central Mediterrenean Range lost more than 1.14 million TEUs of potential growth in the subsequent period.

The total shift-share component highlights the growth or decrease in traffic volumes for the different areas. As presented above we can see that the Mediterranean port system is experiencing an important expansionary phase, particularly between 2015 and 2022 where all port ranges have significantly increased the volumes of traffic handled, with particular reference to the Spanish Med Range, and South Med Hubs, with an incremental change of more than 2 million TEU each.

The East Med Range, driven by the growth of the Port of Piraeus saw sensational growth for both periods under analysis, translated into an increase in traffic volumes of more than 4 million TEU overall. We can certainly find a correlation between the propulsive drive for growth of Piraeus and the entire range and the strategic choices made by COSCO, by virtue of the commercial agreements initiated since 2008 between the Port Authority and the shipping company, which led to the subsequent acquisition of 51% of the port's shares starting in 2014, arriving in 2021 at the acquisition of 100% of the port of Athens, effectively making the port of Piraeus the nodal hub of maritime traffic transiting the Mediterranean.

The core component of the shift-share analysis, however, is the "competitive components," which can capture how, within the same port range, the distributions of traffic between the different ports have changed. In this sense, we can see how between 2010 and 2015 there was a redistribution of traffic volumes in the transport dynamics of the Spanish Med Range, in which the port of Algeciras absorbed part of the traffic volumes from the ports of Barcelona and Valencia, for an increase of more than 1.03 million TEU. Likewise, we can also observe how, associated with a vertical collapse in traffic volumes from the port of Taranto, these were absorbed by the port of Marsaxlokk. This result is extremely significant when coupled with the strategic investment choices effected by the CMA-CGM Maritime Company, which held control of the Taranto container terminal

until 2015 before deciding to channel most of its traffic in the Mediterranean area precisely to the port of Valletta. Finally, it must be emphasized how, in the traffic dynamics of the East Med Range, the port of Piraeus has assumed an increasingly central role, catalyzing part of the traffic from the Eastern Mediterranean area, and in particular from the port of Ambarli, Turkey.

For the period 2015–2022, on the other hand, we can see how the growth of the port of Barcelona was also determined through a channeling of traffic from the ports of Algeciras and Valencia: this resulted in an increase in intra-range volumes for the port of Barcelona by 1.16 million TEU. Secondly, it is curious to note that between 2015 and 2022, similarly to what happened to the port of Taranto previously, the port of Cagliari saw an almost total slowdown in handled traffic volumes. In this case we can see how this share of traffic has been completely absorbed by the port of Gioia Tauro, which, with the port of Marsaxlokk has assumed a role as a key transshipment hub in the center of the Mediterranean. Also, for the case of Cagliari we can observe how in 2019 the main terminal operator ContShip Italia decided to abandon the Sardinian terminal, effectively decreeing a decrease in traffic.

Table 3. Results of the shift-share analysis

Share Component (‘000 TEU)		2010–2015	2015–2022
	Spanish Med Range	1,513	2,219
	Ligurian Range	816	1,129
	North Adriatic Range	268	495
	Central Mediterrean Range	1,250	1.421
	East Med Range	1,037	1,764
	South Med Hubs	1,235	1,429
Shift effect (‘000 TEU)			
	Spanish Med Range	639	27
	Ligurian Range	7	−431
	North Adriatic Range	625	373
	Central Mediterrean Range	−1,534	−1,146
	East Med Range	1.653	517
	South Med Hubs	−1,390	660
Total Shift-Share component (‘000 TEU)			
	Spanish Med Range	2.151	2.246
	Ligurian Range	823	698
	North Adriatic Range	892	869
	Central Mediterrean Range	−284	275
	East Med Range	2,690	2,281
	South Med Hubs	−155	2.089

(*continued*)

Table 3. (*continued*)

Share Component ('000 TEU)		2010–2015	2015–2022
Highlights from the Competitive Componnet ('000 TEU)		2010–2015	2015–2022
Spanish Med Range	Algeciras	1,034	−663
Spanish Med Range Central Mediterrean Range	Barcellona	−430	1,160
	Valencia	−604	−497
	Cagliari	144	−637
Central Mediterrean Range East Med Range	Taranto	−560	26
	Gioia Tauro	−196	735
	Malta Freeport	785	−292
	Pireo	2,054	1,123
East Med Range	Ambarli	−1,290	−986

Source: Personal Elaboration

6 Conclusion

The Mediterranean port system represents an extremely complex and dynamic ecosystem, influenced by the strategic choices of different market players and geo-economic dynamics on a global scale [16]. The complexity of the shipping network in the Mediterranean basin has meant that individual ports no longer represent simple logistics nodes of modal shift of goods but represent strategic pivots of global networks along major supply chains. The complexity of the market is due to the desire on the part of all market players to want to maximize network effects by exploiting economies of scale wherever possible. These observations justify the trend toward concentration of traffic volumes in a small number of major logistics hubs, which represent the center of gravity of the integrated transportation system not only on a regional scale, but also on a global scale [17].

This analysis reveals how the strategic position of the Mediterranean basin in relation to the dynamics of global transport networks is bound to further increase traffic volumes. We observed how the volatility of traffic volumes for gateways is extremely more limited than for transshipment hubs. For this reason, the development trajectories that the Middle-Eastern basin will experience will involve the strengthening of a number of gateways located in strategic positions with respect to their reference hinterlands, assisted by a growth of the main transshipment hubs located close to the main Mediterranean route. At the same time, we can expect smaller and lesser transshipment hubs to lose their traffic shares due to the centralization of flows to a smaller number of strategic hubs or to gateway ports that are increasing their transshipment share, becoming de facto, mixed ports.

Finally, it must be pointed out that this paper was prepared before the geopolitical situation that has been affecting the Red Sea recently kicked off a major reorganization of sea routes transiting through the Suez Canal. Starting in October 2023 in fact, the Huthi, a Yemeni armed group a began a series of attacks on merchant ships transiting the Gulf of Aden and the Bab El-Mandeb Strait. This event, which is continuing to this day has resulted in a reorganization of the routes followed by the various cargo ships, which to date, for security reasons are circumnavigating Africa, passing through the Cape of Good Hope. These factors, determine that the considerations presented above may be obsolete or at least we are facing a moment of transition waiting for a return to normalcy that nevertheless is significantly affecting containerized traffic flows in the Mediterranean Sea basin.

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