J-READING
JOURNAL OF RESEARCH AND DIDACTICS IN GEOGRAPHY
2, 11, December, 2022, pp. 139-150 DOI: 10.4458/5598-13

The geography of container ports in Italy: the evolving role of gateway and transhipment functions

Marcello Tadini[a]
[a] Department of Economics and Business Studies, University of Eastern Piedmont, Novara, Italy
Email: marcello.tadini@uniupo.it

Received: June 2022 – Accepted: September 2022

Abstract

The paper tackles the issue related to the maritime containerized flows and their transport and handling in ports. The growth of maritime containerized traffic has determined a changing role of ports. The first part of the paper presents a brief review of the literature on the classification of container ports. Afterwards, it highlights the distinctive features and key functions of gateway ports, as well as the characteristics and role of transhipment hub ports. The second part of the article examines the case of Italy. Attention is focused on the main Italian ports that offer gateway and transhipment services. In particular, this study explores the geography of container flows and the recent evolutions of port functions. The paper aims to show the different roles of Italian container ports in the modern logistics supply chain. Besides it highlights how these ports can influence the national dynamics of imports and exports and their effects on the potential development of hinterland areas connected. The methodology used to analyse the Italian ports scenario can be proposed for educational aims, as well as to undertake similar studies in other areas.

Keywords: Maritime Containerized Traffic, Italian Container Ports, Gateway Ports, Transhipment Ports

1. Introduction

Addressing the themes of maritime containerized traffic, ports' role and relationship between transport and territories necessarily requires the analytical and interpretative support of geographical discipline and, in particular, of transport geography.

According to Rodrigue et al. (2006), transport geography is a sub-discipline of geography interested in movements of freight, people and information. It aims at linking spatial constraints and attributes with the origin, the destination, the extent, the nature and the purpose of movements. Within this mainstream vision, transport geography should analyse the cross interactions between "spaces" and "transports"; this is relevant from the local to the global level. In other words, transport geographers should analyse how the milieu constraints transport and how transport affect the milieu they serve or they go through (Dobruszkes, 2012). This means that transport geography examines the movement of people,

goods and information within or across different regions. The analysis of flows between regions implies the use of the so-called network approach (Black, 2003). Therefore, it is possible to identify three core dimensions of transport geography: flows, nodes/locations and networks (Hesse and Rodrigue, 2004). Nevertheless, transport geography also studies the different modes of transportation such as road, rail, aviation and ships.

This work[1] focuses attention on ports as strategical nodes of freight transfers but also on the shipping connectivity, the terrestrial infrastructures and the port functions that define their role in the maritime containerized flows.

Over the last few decades, the process of globalization of the world economy has led to significant growth in international trade. In this scenario, the transport service has played a fundamental role in transferring goods to ever greater distances and in an increasingly rapid manner (Vallega, 1997). Considering the geomorphological configuration of our planet, characterized by a prevalence of water on land surfaces, it seems intuitive to understand how the most used mode of transport to transfer goods on an international scale is mainly maritime.

Containerization led to the greatest transport revolution of the twentieth century (Maribus, 2010; Sellari, 2013) and can be considered an essential element of globalization processes (Fremont and Soppè, 2005). Since its introduction in 1956 until today, containerized traffic has assumed a continuously increasing trend, because it has allowed, within a production system that has progressively spread on a global scale, the most efficient interaction between spatially distant supply and demand and the improvement of the performance of the logistics networks that connect production, distribution and consumption (Hesse and Rodrigue, 2004; Notteboom and Rodrigue, 2008).

Containerization, together with the increasing use of intermodality that it has produced by offering the advantage of an integrated transfer of goods between the different carriers, has had significant effects and produced significant changes in maritime transport (Vallega, 1997; Vigariè, 1999). The easy transferability of the container produced a significant impact on the organization of geographical spaces along logistics chains and has led to a redefinition of port facilities and related links with territories (Porceddu, 2009).

According to the literature, in the last years containerization has reached huge dimensions (Figure 1) obtaining an essential role in international trade. This growth of containerization requires the optimal design of seaport terminals not only in terms of necessary space for activities but also in terms of operations and related equipment. The development of maritime containerized traffic has determined a functional port reshaping and a changing role of these nodes.

2. Characteristics and classification of container ports

In terms of port facilities, Vigarié (1979) devised the model of the so-called "port triptych" to represent the spatial relations between the maritime sphere, the port and the continental space. The containerized flows involve all these three components.

A shipping port specially equipped to handle containerized cargo is called container port. In detail, these ports are characterized by the presence of dedicated spaces: container terminals. A container terminal is a place where vessels dock on a berth and containers are loaded and unloaded. Besides, this terminal can be roughly divided into two main areas, the quayside for berthing vessels and the storage yard for holding containers. The quayside is made up of several berths for vessels to moor. The storage yard is typically divided into many blocks where the containers are stored. Each container block is served by several yard cranes (Lee et al., 2006).

[1] This research has received the support of the University of Piemonte Orientale and it is an original product.

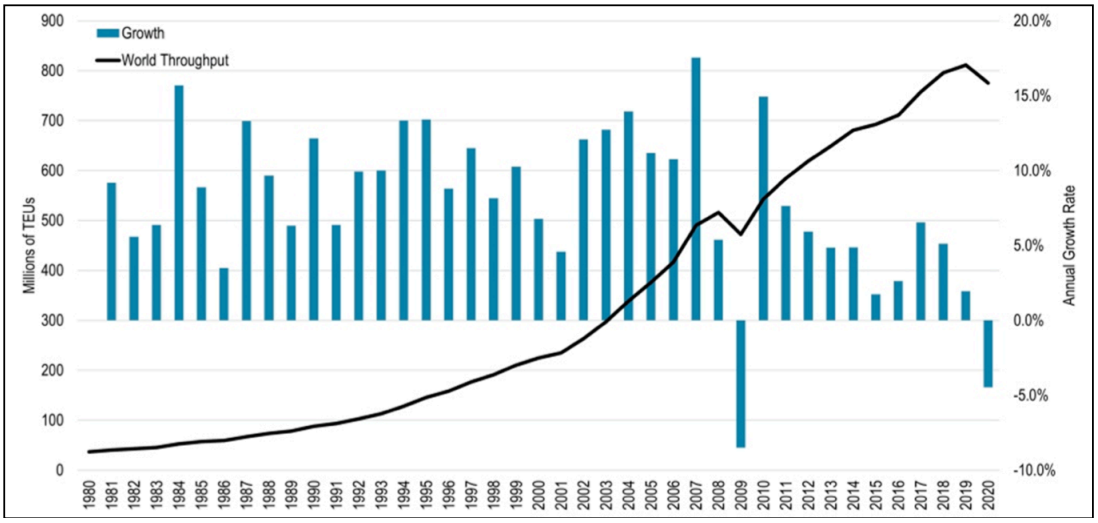

Figure 1. World maritime container traffic. Source: Notteboom et al., 2021.

The container activities can be categorized into three types: import, export and transhipment activities. For export activities, the containers are carried in port by shippers (through different modes of transport) and will be stored at designated locations in the storage yard. When it is time to load the ship, they are retrieved from the stored location and transported by vehicles to the quayside. The quay cranes then remove the containers from the vehicles and load them onto vessels. The processes for import activities are similar but they are done in the reverse order. For transhipment activities, the processes are different. The containers will be stored in the storage yard after they are unloaded from the main vessel and will be finally loaded onto other smaller vessels (Lee et al., 2006).

The mix of activities in container terminals determines the main functions of harbours and permits the container ports classification. This is based on levels of transhipment incidence that refers to the share of container transhipment traffic (ship to ship) taken regarding the total volume handled by a port. This share allows the classification of container ports into three transhipment dependency classes (Notteboom and De Langen, 2015; Notteboom et al., 2019):

- Gateway ports: the ports of this group are very hinterland-focused and only handle small sea-sea transhipment flows as a by-product of the gateway cargo loaded and discharged at the terminals. They have a strong focus on import/export cargo and on developing relations with the hinterland. The transhipment incidence for this group of ports is below 25%;
- Mixed ports: this group consists of seaports which combine gateway/inland cargo with the transhipment business. The transhipment incidence is between 25% and 65%;
- Pure transhipment hubs: this group includes ports with a transhipment incidence that exceeds 65%. The transhipment activity is the main handling and lies at the core of the port's operational and commercial base.

3. The gateway ports

Ports for general cargo before containerisation in the early 1970s were invariably gateway ports providing access to their hinterlands.

Thanks to the contribution of the geographical research, the concept of gateway emerged to understand the role played by the port in relation to the area in which it is located. Deepening the work of Bird (1980, 1983), Vallega (1984) emphasizes how it is possible to highlight the nature of the function that the port can assume for the coastal region in which it stands. As concerns the region to which it

belongs, the port plays a role as a door through which the region itself maintains relations with the outside. In this case, it is then configured as a gateway. This qualification, however, is not the prerogative of all ports but only of those that perform functions that go beyond the local area (i.e. limited within the coastal region to which they belong), that is, those that define the projection of the port outwards on a national and international scale (Vallega, 1984, 1997).

The strong expansion of containerization has changed the spatial interpretation of the port which has become a strategic intermodal node in the global transport network (Vallega, 1997). The gateway ports, which can also be defined as hinterland-oriented ports (Ridolfi, 1999), are characterized by an articulated and complex system of relations with the terrestrial context. Several regional studies have shown that the development of containerization has modified the network of global maritime connections and transformed not only port facilities but also their hinterland, favouring intermodal connection with ports (Hoare, 1986; van Klink e van den Berg, 1998; Guerrero, 2014). The inland is the area where a port carries out most of its activities; unlike the hinterland, which is a physical space, it is a relational and therefore economic space. Its infrastructure is decisive for the port system of reference (Sellari, 2013). The boundaries of the hinterland vary according to the goods, the dynamics of the global market and, above all, the degree of infrastructure (Slack, 2002).

With the continuous growth of unitized load traffic, the mode that is most affected by processes of reorganization of flows between port and territory is precisely the railway one, thanks also to its ability to transport a greater number of containers in a single journey, covering long distances (Vallega, 1997). Through the use of the combined maritime-rail transport, the conditions are created for a higher modal integration between land and sea, with a propulsive role that starts from the port and radiates towards the territory (van Klink, 1995). Thanks to these relationships, the port function finds new possibilities for development towards the hinterland and contributes to the formation of a regional distribution network, which is configured as an organized system characterized by a polycentric structure (Soriani, 2006; Notteboom, 2008).

In recent decades, gateway port structures have been involved in an evolutionary path that tends to the creation of a complex land-sea interaction system characterized by articulated infrastructural connections, effective intermodal solutions, integrated logistics activities and intense relations with the economic stakeholders of the territory (Tadini, 2021). This is a phase that Notteboom and Rodrigue (2005) have defined as “port regionalization”, characterized by higher levels of integration between seaports and systems of connection with the hinterland. Port regionalization implies a configuration aimed at improving the connectivity of gateway ports through a more flexible intermodal function; therefore, it does not change their function, but only the geographical space on which this function takes place (expanding it towards the hinterland) and its efficiency (Notteboom and Rodrigue, 2008). As a result, the evolution of the role of ports in modern transport chain management requires the development of terminals and internal logistics centres to accommodate new port-hinterland relationships.

4. The transhipment hubs

The development of containerization has modified the network of global maritime connections and transformed also port facilities.

As containerization has spread in ocean shipping, distribution patterns have increasingly evolved into a hub and spoke network. These developments are creating a hierarchy of ports and changing traditional port operations. As the size of container ships has increased, and the volume of containers has grown, container shipping networks have increased in complexity as well as in scale. The key development has been the evolution of “hub and spoke” systems with large mainline vessels serving a limited range of major ports to which cargoes are carried from tributary ports by feeder vessels (UNESCAP, 2005). The hub and spoke concept is intended to maximize the use of large containerships while providing market coverage to a maximum number of ports. This is

accomplished via a network of regional and sub-regional hubs with onward service to outlying locations. Large line haul ships provide service between regional hubs. Progressively smaller ships are used to pick up and distribute containers within the region (World Bank, 2007).

As the containerisation of general cargo enabled ships of increasing size with lower unit costs to be loaded and unloaded rapidly in ports equipped for that purpose, containers needed to be transhipped to and from smaller vessels to serve shallow ports unable to accommodate the large ships (due to quay, equipment and yard restraints or insufficient volumes) (Department of Transport, 2011). Transhipment hubs involve moving the container with the same mode of transport: they deal with the transfer of containers from one ship to another.

The current container shipping network connects the transhipment and gateway ports with the "hub and spoke" and "relay" networks (Ducruet and Notteboom, 2012). In a relay network, transhipment hubs act as joints between major intercontinental routes (from a mother ship to a mother ship), allowing shipping lines to potentially reach every port in the world. On the other hand, in the hub and spoke network, transhipment redistribute cargo from larger vessels (called mother ships) to smaller units (feeders) which are used to deliver cargo to regional ports which are not able to be called by larger ships (due to quay, equipment and yard restraints or insufficient volumes).

The most important attribute of transhipment port competitiveness is the geographical position of the hub relative to the primary origins and final destinations of container traffic, as it should require the minimum possible deviation from the main maritime route. Beyond the strategic location, other attributes include the ability to safely accept large ships, extent of terminal facilities, efficiency of container handling operations, availability of frequent feeder services with appropriate geographical coverage and attractive cargo handling charges (World Bank, 2007).

Considering the territorial implications of transhipment activities, some interesting observation can be done. In these ports, the handling of containers takes place from ship to ship and this does not generate land traffic because they are the expression of an organizational method adopted by large shipping companies to optimize global containerized itineraries. The hub port is characterized by an almost total dissociation between the port structure and the territory that hosts it, given that the connections with the terrestrial side are absent or in any case not considered relevant for the development of these nodes (Sellari, 2013). Besides, transhipment cargoes offer port authorities and terminal operators an opportunity to develop their businesses at a faster rate than the development of their economic hinterlands would permit. It is therefore not surprising that the competition for this business is fierce and also can be very volatile (UNESCAP, 2005). In this sense, the influence of shipping companies is evident in the development of transhipment ports, according to their service networks and commercial strategies.

5. The geography of Italian container ports and their evolution

This paragraph analyses the case of the Italian container ports considering the functional distinction described above. The sources used are Assoporti and the Port Authorities. They provide information on the volumes handled by ports in the period 2010-2021, on the basis of which two five-year averages were calculated (2010-2014 and 2017-2021). These traffic data allow to know the specific weight of the gateway and transhipment activities on the total port traffic. At the same time, it is possible to highlight the role of functions of each port in the national framework. Besides, the configuration of the gateway services and the transhipment ones of the main national ports was analysed in a diachronic perspective. The goal of the analysis structured as described is to identify the emerging territorial configurations linked to port activities, to highlight the development trajectories of the container ports and to discover any functional transformation.

Currently, in Italy nineteen container ports perform gateway functions. The geographical analysis of the recent evolution of maritime

traffic shows a specific territorial structure and a tendency to concentrate these activities. Using an approach based on port regions, selected using the criteria of the geographical proximity and the functional complementarities, it is possible to identify gateway port systems (Vallega, 1997; Sellari, 2013). In particular, Italy is characterized by three multi-port gateway regions (Figures 2 and 3): the first is known as the "Ligurian Range" and is formed by the ports located along the northern Tyrrhenian coast (Savona, Genova, La Spezia, Marina di Carrara and Livorno); the second one is the so-called "North Adriatic" which includes the ports located in the northern portion of the Adriatic (Koper, Trieste, Monfalcone, Venice and Ravenna) (Notteboom, 2010). The third one is the "Central Tyrrhenian" region, formed by the two nearby ports of Napoli (Naples) and Salerno. The Ligurian Range has emerged for its strategic importance, accounting for the majority of the domestic gateway traffic in the last decade. This share is not surprising, given that the ports of the Ligurian Range are nodes connected with a hinterland with many production sites and a large consumer market and constitute the international access/exit points for the territories that support them (Foschi, 2003).

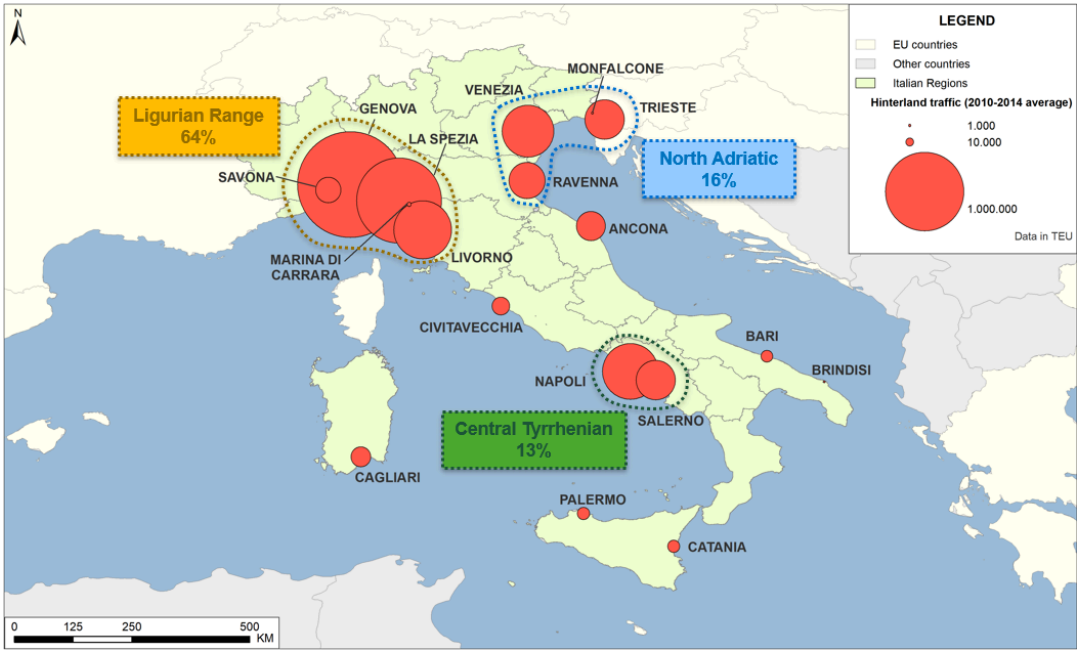

Figure 2. Hinterland container traffic in Italian gateway ports (2010-2014 average).
Source: author's elaboration on data of various sources (Assoporti, Port Authorities).

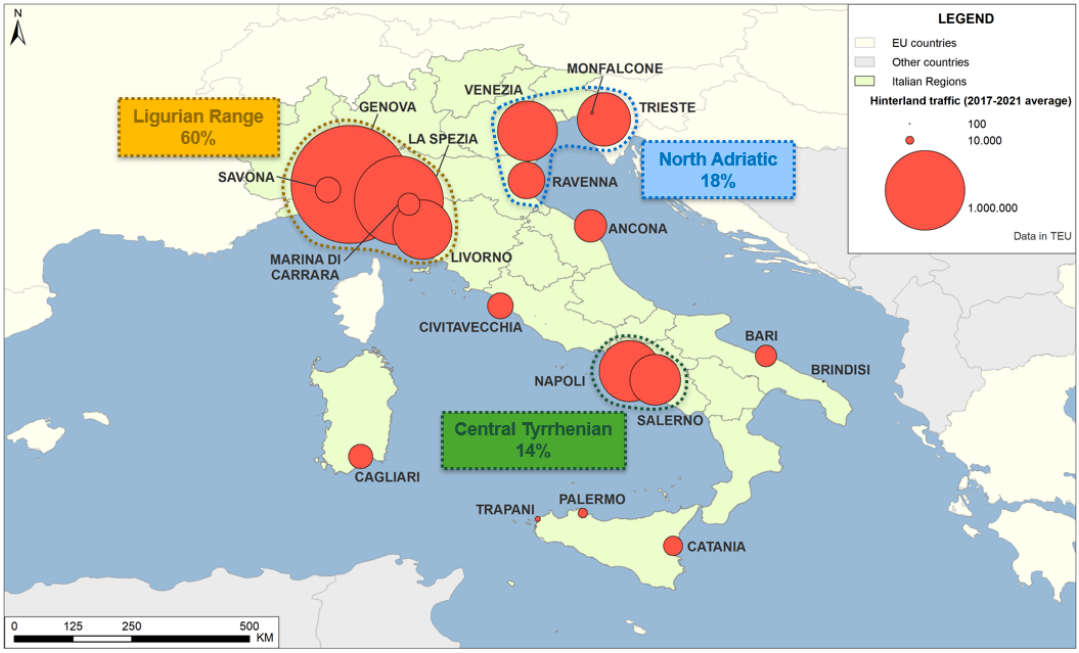

Figure 3. Hinterland container traffic in Italian gateway ports (2017-2021 average).
Source: author's elaboration on Assoporti data.

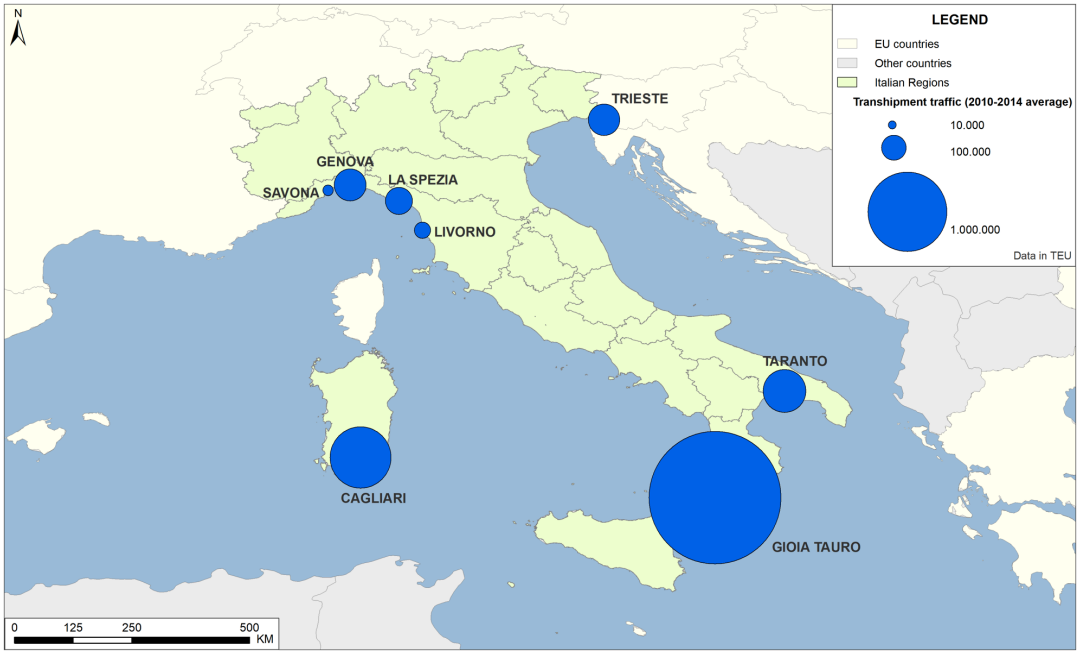

Figure 4. Transhipment container traffic in Italian ports (2010-2014 average).
Source: author's elaboration on data of various sources (Assoporti, Port Authorities).

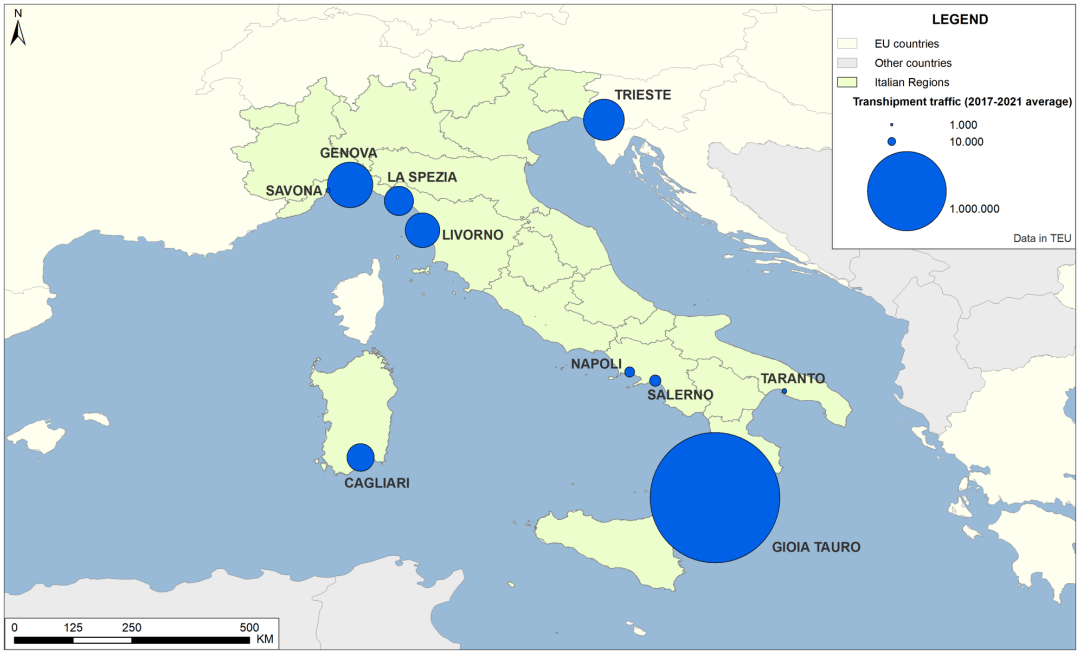

Figure 5. Transhipment container traffic in Italian ports (2017-2021 average).
Source: author's elaboration on Assoporti data.

Ports	Hinterland traffic				Transhipment traffic			
	2010-2014		2017-2021		2010-2014		2017-2021	
	% of port traffic	% of total Italy	% of port traffic	% of total Italy	% of port traffic	% of total Italy	% of port traffic	% of total Italy
Ancona	100	2.43	100	2.38	-	-	-	-
Bari	100	0.38	100	1.03	-	-	-	-
Brindisi	100	0	100	0	-	-	-	-
Cagliari	9.67	1.12	43.66	1.35	90.33	14.23	56.34	3.19
Catania	100	0.44	100	0.84	-	-	-	-
Civitavecchia	100	0.88	100	1.50	-	-	-	-
Genova	91.92	31.81	87.04	31.83	8.08	3.82	12.96	8.64
Gioia Tauro	-	-	-	-	100	66.94	100	71.27
La Spezia	90.97	20.63	90.18	17.88	9.03	2.80	9.82	3.55
Livorno	92.86	9.65	74.55	8.08	7.14	1.01	25.45	5.03
Marina di Carrara	100	0.05	100	1.09	-	-	-	-
Monfalcone	100	0.01	100	0.01	-	-	-	-
Napoli	100	8.86	97.34	8.57	0	0	2.66	0.43
Palermo	100	0.42	100	0.20	-	-	-	-
Ravenna	100	3.72	99.25	3.03	0	0	0.75	0.04
Salerno	100	4.44	95.25	5.83	0	0	4.75	0.53
Savona	84.87	1.81	97.29	1.49	15.13	0.44	2.71	0.08
Taranto	19.02	1.20	0	0	80.98	6.99	100	0.09
Trapani	-	-	100	0.06	-	-	-	-
Trieste	61.57	4.44	62.56	6.57	38.43	3.78	37.44	7.17
Venezia	100	7.69	100	8.25	-	-	-	-
Ligurian Range	91.54	63.94	86.42	60.36	8.46	8.07	13.58	17.29
North Adriatic	85.13	15.86	81.88	17.87	14.87	3.78	18.12	7.21
Central	100	13.30	96.49	14.40	0	0	3.51	0.96

Table 1. Hinterland and transhipment traffic of Italian container ports.
Source: author's elaboration on data of various sources (Assoporti, Port Authorities).

The comparison between the multiport gateway regions' (described above) traffic in the period 2010-2014 and those of 2017-2021 suggests some interesting observations. As can be seen from the comparison between Figures 2 and 3, the geography of container port in Italy has been characterized by a transformation in recent years.

Overall, the three gateway regions accounted for about 93% of the national hinterland traffic in both periods. In detail, the diachronic observation allows to outline the geography of Italian container ports characterized by the predominant role of the Ligurian Range for hinterland traffic (64% in the period 2010-2014) (Figure 2) which, however, has partially reduced in recent years (60% in 2017-2021) due to the traffic growth of the other two multiport gateway regions. The North Adriatic region has increased from 16% to 18%, the Central Tyrrhenian one has increased from 13% to 14%. Thus, container hinterland traffic appears slightly less polarized in the context of the northern Tyrrhenian sea for the benefit of the central Tyrrhenian and northern Adriatic (Figure 3).

Within the Ligurian Range region, the case of Savona is interesting. After the construction of the new Vado terminal in 2020, the port has progressively increased handling, focusing in particular on gateway traffic as evidenced by the significant increase in the relative share (from 85% to 97%). The case of Cagliari seems equally interesting, albeit for different reasons. The port, originally a transhipment hub, has seen its transhipment volumes progressively decrease since 2017 and even more since 2019 but has maintained a significant "island" gateway traffic whose share has grown significantly (from 10% to 44%).

Figures 2 and 3 show the cases of Civitavecchia and Ancona which are configured as gateway ports serving central Italy, characterized by a significant and growing container handling. Similarly, Bari, Cagliari and Catania are gateway ports that increase their container traffic and that serve southern Italy playing a non-negligible role (although less relevant than that of Napoli and Salerno).

More generally, the gateway ports have equipped themselves to improve their system of connections with both maritime space and hinterland, aware of the strategic importance of these links. In particular, the examples of some ports (Trieste, La Spezia, Savona, Genoa, Livorno, Ravenna) that have chosen to focus on intermodal rail connections are interesting: this has strengthened their link with the hinterland and their gateway function in a more sustainable way.

It should also be noted that some of the ports listed above (Genoa, La Spezia, Livorno, Ravenna) have simultaneously increased their share of transhipment traffic (Table 1) primarily because of the choices made by shipping companies and terminal operators. This has led one port (Livorno) to change its status (from gateway to mixed port) and some of them (Genova, La Spezia, Trieste) to strengthen their role as strategic seaports in the Italian landscape.

The origin of transhipment activities in Italy dates back to the Nineties. During this period, container traffic in the Mediterranean grew significantly in part due to the development of specialized transfer functions (i.e. transhipment) (CETMO, 1995). In fact, the Mediterranean was particularly well-positioned to take advantage of the emerging configurations of container shipping networks, because of the position along one of the major international container routeways: the Asia-Europe one. Italy has a central position in the Mediterranean basin (Ridolfi, 1999). For these reasons, transhipment activities have developed in some Italian ports. Initially, transhipment activities began in the Gioia Tauro one in the mid-nineties. Subsequently (starting from the new millennium) they also affected the ports of Cagliari and Taranto. As a result, three ports assumed the configuration of pure transhipment hubs although with different levels of traffic, with Gioia Tauro as the main national transhipment port. This configuration remained until the middle of the last decade (see Figure 4 and Table 1). More recently, only one port has remained to carry out exclusively transhipment operations, following the decisions of container maritime operators who abandoned the terminals of Taranto (in 2015) and Cagliari (in 2019) to choose other Mediterranean ports (Tangeri, Piraeus, Port Said, etc.).

At the same time, there was another dynamic: the increase of transhipment traffic in some gateway ports. This has changed the geography of the Italian transhipment, because alongside the strong polarization of Gioia Tauro (with an average share of 71% of the national total in 2017-2021), the traffic that was previously the prerogative of the two southernmost ports (Cagliari and Taranto), with less deviation from the main Mediterranean container route (from Suez to Gibraltar), has become an element of diversification for the ports of Genoa, La Spezia, Livorno and Trieste (Figure 5).

6. Conclusions

The paper outlines the geography of container ports in Italy and their evolution, underlining the different functions of the main ports deriving from the changing mix of activities offered. This depends firstly on the increase in transhipment activities and the development of transhipment hubs, secondly on the choice to strengthen the connections between ports and their hinterland.

Initially the transhipment ports were gateway ports with stacking space for the transhipment of the feeder containers. Congestion and delays resulting from the intermingling of transhipments with imports and exports and the consequent competition for stacking space motivated the idea of moving transhipment traffic to offshore terminals or ports that could be dedicated for that purpose, especially ports with space for greenfield development. Such ports then evolved into intercontinental hubs for large liners, with spokes of services by smaller liners of different sizes to and from lesser ports. Hub ports were (and now are) chosen by liner companies with regard inter alia to geographic location, depth of water, infrastructure and superstructure, capacity, logistics of services, efficiency and financial arrangements (as the liner companies often participate in financing the investment in hub ports) (Department of Transport, 2011).

This development regarded also Italy in the past. Nevertheless, the recent evolution of containerized traffic shows a different trend. In the last ten years it creates a pattern characterized on one side by transhipment function more polarized in the first national hub (Gioia Tauro) and on the other by the emerging role of some gateway ports in which the transhipment volumes increase in a significant way.

Besides, the Italian container ports are an emblematic example of the importance of gateway functions and the necessary interdependence between ports and hinterland in the modern logistics chains, considering ports as strategic nodes that support the international trade of the more productive and consuming areas of the country.

The methodology used to analyse the Italian ports scenario can be proposed for educational aims. The teaching of geography aims to explain above all methods of use and comparison of available information (De Vecchis and Staluppi, 1997). In this regard, the support of the cartographic tool is fundamental, because it allows the immediate visualization and localization of data and information and is the prerequisite for the analysis (even diachronic) and the critical interpretation of phenomena.

In the modern geography of transport, ports are configured as elements of a space, maritime and terrestrial, involved in processes related to logistics and transport (Maggioli, 2012). Therefore, from an educational point of view, the port is interpreted as a resource for the development of the coastal area but also of the hinterland in light of its role as a relevant territorial node of commercial flows. Consequently, it should be noted that among the educational intentions of this analysis there may be the consciousness of the constantly evolving port role by local institutions as well as the awareness of local communities on the strategic function of the port in global supply chain networks.

Finally, the methodology used in this paper can also be proposed to undertake similar studies in other geographical areas.

References

1. Assoporti, "Statistiche annuali", https://www.assoporti.it/it/autoritasistemaportuale/statistiche/statistiche-annuali-complessive/.
2. Bird J.H., "Seaports as a subset of gateways for regions: a research survey", *Progress in Human Geography*, 4, 3, 1980, pp. 360-370.
3. Bird J.H., "Gateways: slow recognition but irresistible rise", *Tijdschrift voor Economische en Sociale Geografie*, 74, 3, 1983, pp. 196-202.
4. Black W., *Transportation: A Geographical Analysis*, New York, Guilford Press, 2003.
5. Centre d'Etudes des Transports pour la Méditeranée occidentale (CETMO), *Les opportunités du cabotage maritime en Méditeranée occidentale par rapport aux nouvelles pratiques logistiques*, Barcelona, CETMO, 1995.
6. Department of Transport, *SA Maritime Transport Sector Study. Part 3*, Pretoria, Department of Transport – Republic of South Africa, 2011.
7. De Vecchis G. and Staluppi G.A., *Fondamenti di didattica della geografia*, Novara, UTET Libreria, 1997.
8. Dobruszkes F., "Stimulating or frustrating research? Transport geography and (un)available data", *Belgeo - Revue belge de géographie*, 1-2, 2012, pp. 1-15.
9. Ducruet C. and Notteboom T., "The worldwide maritime network of container shipping: spatial structure and regional dynamics", *Global Network*, 12, 3, 2012, pp. 395-423.
10. Foschi A.D., *The maritime container transport structure in the Mediterranean and Italy*, Discussion Paper n. 24, Università di Pisa – Dipartimento di Scienze Economiche, 2003.
11. Fremont A. and Soppè M., "Transport maritime conteneurisé et mondialisation", *Annales de géographie*, 642, 2005, pp. 187-200.
12. Guerrero D., "Deep-sea hinterlands: Some empirical evidence of the spatial impact of containerization", *Journal of Transport Geography*, 35, 2014, pp. 84-94.
13. Hesse M. and Rodrigue J.-P., "The transport geography of logistics and freight distribution", *Journal of Transport Geography*, 12, 2004, pp. 71-184.
14. Hoare A.G., "British ports and their export hinterlands: a rapidly changing geography", *Geografiska Annaler: Series B, Human Geography*, 68, 1, 1986, pp. 29-40.
15. Lee L. H., Chew E., Tan K. C., Han Y, "An optimization model for storage yard management in transshipment hubs", *OR Spectrum*, 28, 2006, pp. 539-561.
16. Maggioli M., "Civitavecchia: dimensione locale e proiezioni nel Mediterraneo", in Morri R. (Ed.), *Insegnare il mare*, Rome, Carocci editore, 2012, pp. 271-282.
17. Maribus, *World Ocean Review 2010*, Hamburg, Maribus, 2010.
18. Notteboom T., *The relationship between seaports and the intermodal hinterland in light of global supply chains*. International Transport Forum Discussion Paper 2008/10, OECD Publishing, 2008.
19. Notteboom T., "Concentration and the formation of multi-port gateway regions in the European container port system: an update", *Journal of Transport Geography*, 18, 4, 2010, pp. 567-583.
20. Notteboom T. and De Langen P.W., "Container port competition in Europe", in: Lee C.-Y. and Meng Q. (Eds.), *Handbook of Ocean Container Transport Logistics*, Cham, Springer, 2015, pp. 75–95.
21. Notteboom T., Pallis A., Rodrigue J.-P., *Port Economics, Management and Policy*, New York, Routledge, 2021.
22. Notteboom T., Parola F. and Satta G., "The relationship between transhipment incidence and throughput volatility in North European and Mediterranean container ports", *Journal of Transport Geography*, 74, 2019, pp. 371-381.
23. Notteboom T. and Rodrigue J.-P., "Port Regionalization: Towards a New Phase in Port Development", *Maritime Policy & Management*, 32, 3, 2005, pp. 297-313.
24. Notteboom T. and Rodrigue J.-P., "Containerisation, Box Logistics and Global Supply Chains: The Integration of Ports and Liner Shipping Networks", *Maritime Economics & Logistics*, 10, 1-2, 2008, pp. 152-174.
25. Porceddu A., *Evoluzione del porto commerciale di Trieste e dei suoi rapporti con il territorio di riferimento*, PhD Dissertation, Università di Trieste, 2009.
26. Ridolfi G., "Containerisation in the

Mediterranean: between global ocean routeways and feeder services", *GeoJournal*, 48, 1, 1999, pp. 29-34.
27. Rodrigue J.-P., Comtois C. and Slack B. (2006), *The Geography of Transport Systems*, New York, Routledge, 2006.
28. Sellari P., *Geopolitica dei trasporti*, Bari, Laterza Editori, 2013.
29. Slack B., "Globalizzazione e trasporto marittimo: competizione, incertezza, implicazioni per le strategie di sviluppo portuale", in Soriani S. (Ed.), *Porti, città e territorio costiero*, Bologna, Il Mulino, 2002, pp. 67-83.
30. Soriani S., "Riorganizzazione del ciclo di trasporto e spazi di influenza portuale. Dinamiche in atto e poste territoriali in gioco", in Salgaro S. (Ed.), *Scritti in onore di Roberto Bernardi*, Bologna, Patron Editore, 2006, pp. 165-177.
31. Tadini M., "Intermodalità ferroviaria e assetto territoriale dei porti gateway: il caso di La Spezia", *Rivista Geografica Italiana*, 4, 2021, pp. 104-136.
32. UNESCAP, *Regional Shipping and Port Development Strategies*, New York, United Nations, 2005.
33. Vallega A., "Nodalità e centralità: relais tra teoria regionale e teoria dei trasporti", *Studi Marittimi*, 6, 19-20, 1984, pp. 33-35.
34. Vallega A., *Geografia delle strategie marittime*, Milan, Mursia, 1997.
35. van Klink H.A., *Towards the Borderless Main Port Rotterdam. An Analysis of Functional, Spatial and Administrative Changes in Port Systems*, Rotterdam, Tinbergen Institute Research Series n. 104, 1995.
36. van Klink H.A. and van den Berg G., "Gateways and Intermodalism", *Journal of Transport Geography*, 6, 1, 1998, pp. 1-9.
37. Vigariè A., *Ports de commerce et vie littorale*, Paris, Hachette, 1979.
38. Vigariè A., "From break-bulk to containers: the transformation of general cargo handling and trade", *GeoJournal*, 48, 1999, pp. 3-7.
39. World Bank, *Port Reform Toolkit. Module 2 – The evolution of ports in a competitive world*, Washington, World Bank, 2007.

