Title:

Comparative analysis between Port of Genoa and the Port of Rotterdam: how to gain market shares over the industrial poles of Baden-Württemberg and Bavaria with the new Alpine-Rhine Corridor.

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Abstract

The research paper focuses on analyzing the competitive position of Genoa and Rotterdam ports to determine who will be able to serve the Baden-Wurttemberg and Bavaria regions, currently delivered mainly by German ports, after the realization of the Alpine-Rhine Corridor. The comparison among port systems was based on four factors: availability, operational cost, supply-chain reliability and business environment. Currently, Rotterdam has a greater chance over Genoa to gain market share over the contested zone. The efficiency, capacity and quicker implementation of the northern part of the Alpine-Rhine corridor clearly gives a set of advantages to Rotterdam. However, over the next five years Genoa will be capable to compete with the Northern range ports. Through the new governance setting, new infrastructure projects along port and hinterland, Genoa can truly aim to become a main market player. However, the recent collapse of the Morandi Bridge sets a question mark on the short/long-term future competitive scenario.

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1. Introduction

In the last decades international trade has boomed driven by economic globalization and production regionalization. Industries and markets are more and more interconnected and every product it's potentially now available in every corner of the world.

According to an estimation of the United Nations (International Maritime Organization, 2017), 80% of global trade volume is transported by ship. Maritime transport has always played an important role in the international trade but the dimension of the volumes reached nowadays made the sea logistic a real complex industry.
Ports efficiency and positioning are obviously a key success factors for developing a good logistic network but is not sufficient. Without an effective inland supporting infrastructure connecting markets and/or production centers by intermodal transports, the most efficient port cannot be attractive for the logistic industry. This is more evident in the container transport which is gaining more and more market share in the global logistic business.

The port of Gioia Tauro in the south of Italy is a typical example of a modern, efficient and high capacity port missing an efficient hinterland intermodal network. Built within the frame of a long-term investment to promote the South of Italy regions' economy, it was transformed in the nineties as container terminal to exploit its position close to the Suez Canal and to be part of the so called "autostrade del mare" as a transshipment port. Because of the bottleneck represented by the railway and the highways network and a non-favorable business environment, the port of Gioia Tauro cannot manage to profit of the growing containers transportation market because it does not function as a getaway node which directly distributes the European market. ("The decline of Gioia Tauro", 2018).

The geographical position has always played a key role for a harbor but the unfavorable location has been demonstrated that can be mitigated by other factors.

In terms of distance travelled, Northern Europe ports like Le Havre, Rotterdam, Antwerp, Hamburg are not well positioned to receive or to ship goods arriving or departing from the Far East if compared with Southern Europe ones. For vessel crossing the Suez Canal to connect Europe to Asia it takes in average five more days to reach northern ports against a Mediterranean

harbor. It means less vessel rotation, higher shipping cost, slower transportation. But this negative effect is mitigated by the port efficiency and the good intermodal transportation network through Europe which makes the total cost of transportation to the final clients cheaper and more reliable.

Currently, In the north of Italy, within the frame of the European investments in the transportation network development, major projects are under construction or already finalized which should change the scenario of ports competitiveness.

More specifically the first Italian harbor, Genoa, should gain some market share over the container transportation market profiting of the undergoing inland infrastructure projects.

Given this scenario, a central research question is formulated **comparing the Port of Genoa with the Port of Rotterdam and evaluating who between the two nodes, thanks to the new corridor, will be able to gain market share over the contested regions Of Baden-Wurttemberg and Bavaria.**

To answer the central research question, an -in depth- literature has been studied. In the Theoretical Framework, section 2.1 the new general trend in the shipping and global maritime industry will be analyzed. The Methodology section will explain which variables affect competition, how it is measured and what are the driving forces that define the competitive strength of ports and the logistic chains.

Following the theoretical and methodical part, the case study will be presented. In section 4.1 a description of the contested area will be given. Following, in section 4.2 a brief introduction of the port system of Genoa and Rotterdam is presented, highlighting the importance of the Alpine-Rhine corridor. In section 4.3, an extensive comparative analysis on container traffic will be performed between Genoa and Rotterdam. Based on the results gathered a summary and conclusion will be given, considering the new infrastructure project known as Terzo-Valico which may increase the competitive position of Genoa. However, a final section has been added to the research after the conclusion. The recent disaster of the Morandi bridge collapse happened which may change the competitive dynamics of the Ligurian port system.

2. Theoretical Framework

Ports can be viewed as the motor that pushes regional economic development because ports naturally attract multiple activities by its side (De Langen, 2004). The role of ports cannot be considered simply as a node of transport but a real cluster of economic networks of integrated activities. This is confirmed by the fact that port performance is normally measured not only by the total throughput handled but also by the added value created.

In line with a definition of Notteboom (2001) we can use the following definition:

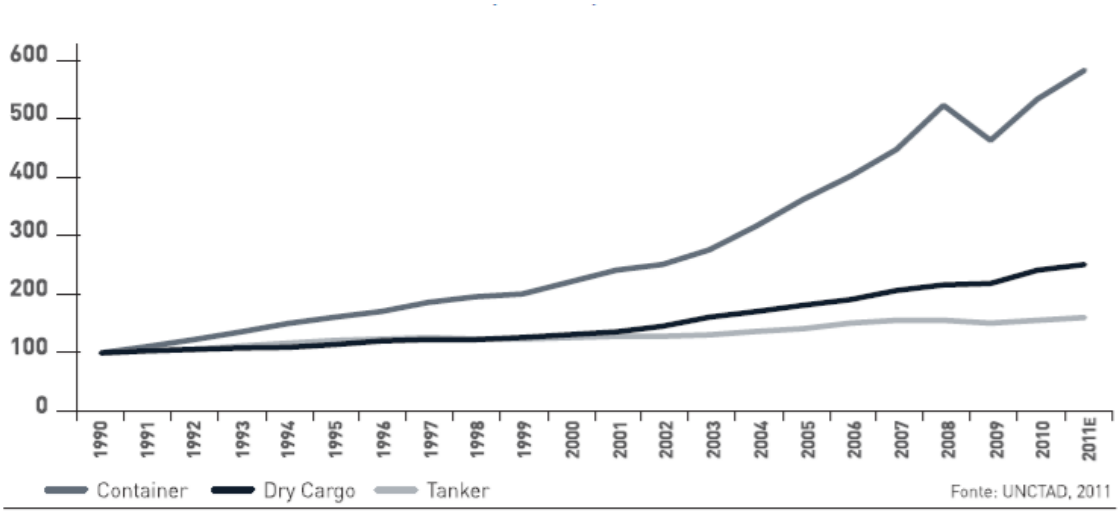
"A seaport is an area with maritime and hinterland access that has developed into a logistics and industrial sector, playing a fundamental role for the interconnections of all nodes and networks".

With respect to this definition, it is important to analyse the shipping sector, focusing on the general trends in the container market. Following in section 2.2 we will focus on the changing role of ports in the logistic network. This will give us the mean to have a better understanding on what aspects do port systems focus on in order to be competitive.

2.1. Focus on the container sector

According to the United nations statistics seaborne trade amounted to 10.6 billion tons in 2017 and it is projected to grow at an average 3% per year over the next 5 years (2017-2022). Container represents one of the most used system for the distribution of final and intermediate products. The use of containers has completely revolutionized the maritime transport. This standardized system has improved efficiency, flexibility, handling, storage and transportation costs in a dramatic way. The percentage of transported goods by containers has grown in the last decades thanks to continuous infrastructure investments in the sector and innovation (Table 1).

Table 1: World maritime traffic for different type of distribution system., 1990-2011

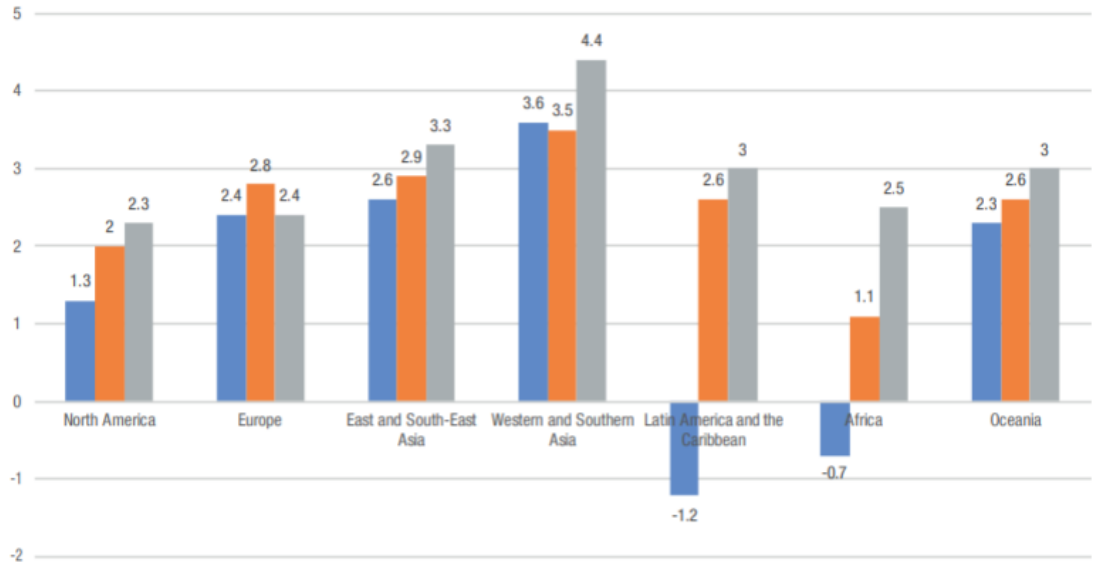


Source: UNCTAD, maritime transport indicator (2017)

While dry cargos and tankers volumes have been stable or have followed macroeconomics trends, container transportation experienced a faster growth pace. The first ones had a quite stable supply and market structure while the second one has been boosted by production delocalization and markets dynamic developments. Lower production cost combined with more efficient transportation of goods has pushed companies to move their production facilities in cheap labour cost countries (South East Asia) and then to distribute the products to the global market.

From the data retrieved by the World Maritime Transport Review of UNCTAD (2017) world container throughput, exceeded in 2017 700 Million TEUs and over the last 17 years it has grown at an exceptional 7,57% annual rate (World Bank, 2017). Because of its importance in the commercial aspect of the maritime industry the focus of this study will be concentrated on the container transportation sector. According to the World Shipping Council (2017), there are three main trade routes of deep-sea containerships are The Transpacific route that connects North America-Asia, routes connecting Asia-Europe and the EU and North America.

Table 2: Container Volume growth (2016-2018)



Source: Drewry Maritime Research, 2018.

Asia accounts for 64% of world container throughput handled in 2017. The rest is split among Europe 16%, North America 8%, South America 6%, Africa 4% and Oceania 2%. In table 2, Asia shows a growth increase of 3.3 % with the highest rate compared to Europe and North America which respectively handled 2,4% and 2.3 % in 2018.

The top 10 leading Asian port account for 21% of the world container market, proving the dominance of Asia in the world maritime trade. More specifically China has invested significantly first on its own port facilities and inland infrastructure and then internationally (Panaro & Ferrara, 2017). Convinced that to guarantee the commercial output of its export-oriented production it is necessary to have an extremely efficient and integrated logistic system, starting from the production clusters ending to the consumers market, China has been actively working to secure abroad concessions or access to existing logistics hubs or to develop with investment the necessary infrastructures. A typical example is represented by the Piraeus Port in Greece (Panaro & Ferrara, 2017). The container terminals controlled by COSCO (China Ocean Shipping Company) since 2010 with a 35-year lease contract, have seen exponential growth in

volumes, recording a 300% increase in throughput over the last 6 years. Thanks to new technology and infrastructure upgrade COSCO aims to make Piraeus one of the most important port and main getaway harbour for Europe (Demertzis & Sapir, 2018). The vision of COSCO is to be a world-leading business entity that provides integrated logistics and supply chain services by profiting and supporting the Chinese globalizing economy. Its vision is pursued by consolidating key strategic resources, by considering shipping as a global integrated logistics system and by defining its core business on related financial services.

Chinese investors consider South East Europe as a strategic location and therefore have decided to invest beyond the harbour, planning to build Land-Sea Express Route connecting the Mediterranean to the Balkan and north Europe territories, hoping to improve the logistic network system which indeed could decrease the current shipping time by 8-12 days (Demertzis & Sapir, 2018).

In parallel to the Land-Sea Express Route, Hungary, Serbia and China have agreed on a trilateral plan to build a new railway line between Budapest and Belgrade with the financial support of the Chinese Development Bank days (Demertzis & Sapir, 2018). While Serbia infrastructure plan already began, in Hungary it remains interrupted due to EU commission investigation on the opening of the project to public tender (Trade and Development Report UNCTAD, 2015).

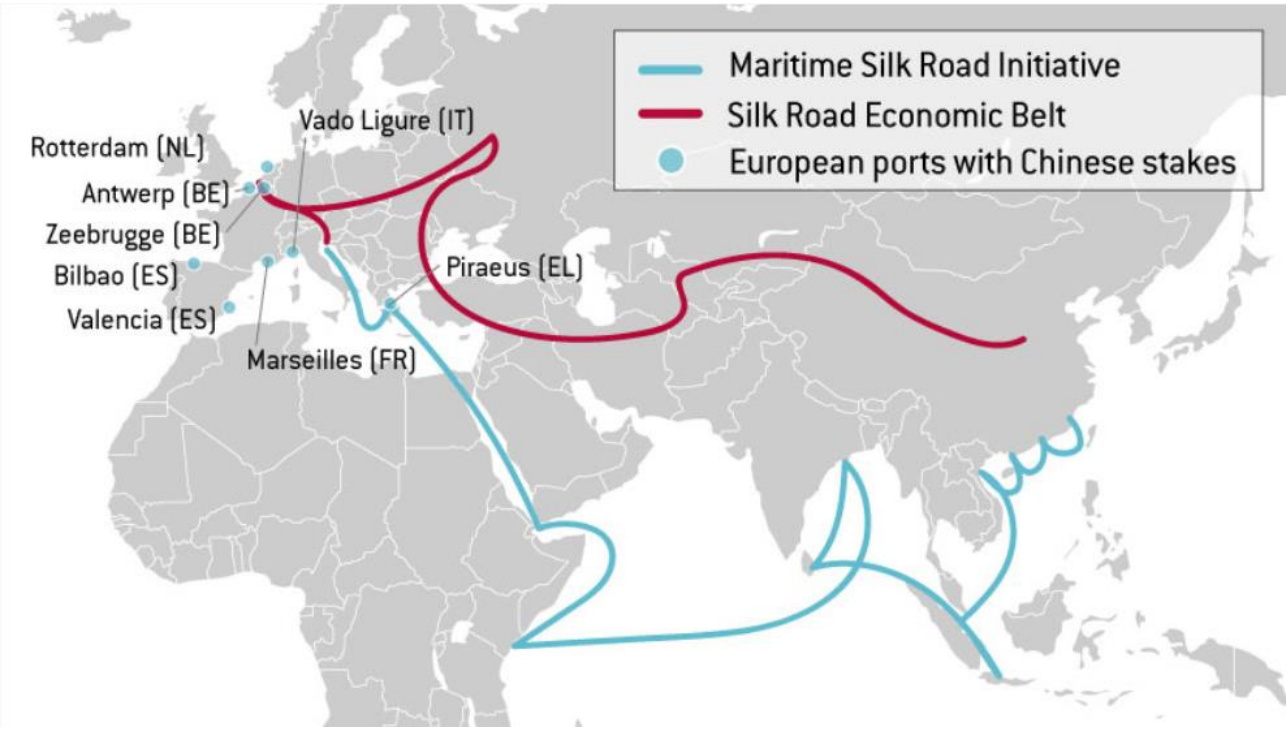
All these-projects are in conjunction with a larger scale infrastructure development: Belt and Road Initiative (BRI).

The BRI is ultra-national infrastructure and trade development project mainly financed by Chinese companies and government with the aim of better integrating China in the world economy (Yu, 2017).

As shown in the figure below, the railway infrastructure project will pass through Eurasia, connecting China to Middle-Est, Russia and Europe. The project funding was secured by the China Development Bank. Between 2014 and 2016, according to a study ran in 2017 by the CSIS (Center for Strategic and International Studies) the investment exceeded 340 billion USD and the total program in BRI venture could reach 1 trillion (Hillman, 2018).

All these European logistic networks leading positioning by Chinese state-controlled companies, as in the case of Piraeus Port, have to be considered strategic moves, quickly mutating the competitive environment of the continent (Demertzis & Sapir, 2018).

Figure 1: The Belt and Road Initiative and Chinese stakes in top European ports



Source: Bruegel, Global economics and governance, 2017

All these macroeconomic developments have to be considered to define the competitive environment of ports. It will be especially usefully in our case study, considering that the Italian ports, and more specifically Vado-Ligure (Genoa port system) is a key node for strategic integration of Chinese companies in Europe and may strongly increase its performance and growth in the future (see figure 2) (Demertzis & Sapir, 2018).

However, it is first important to review the changing dimension and objectives of ports analysed in literature before going to compare port systems.

2.2 Port role development

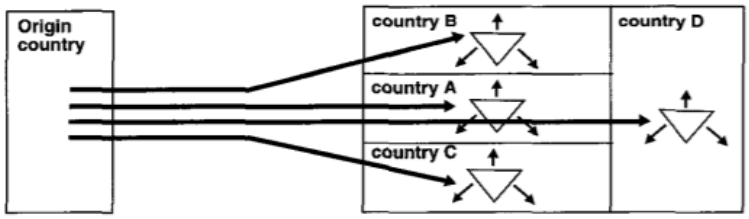
The role of ports has changed over time mainly because of markets global developments and product distribution. We simplify the historical development of markets in this last decade in three sections. A theoretical summary of academic research papers will be investigated to understand how logistic systems have evolved. Each section defines a stage in which different industry developments affect the role of ports and their network systems. This part gives an overview on the definitions of port functions, its evolution/development and its conditions and objectives for competition.

2.2.1 First stage: trade globalization

During the last quarter of the 20th century, large industrial entities focused on market expansion and cost reductions. Such process was favoured by trade liberalization (the GATT agreement in 1948), change in transport technology (introduction of the container in the 1960s) and change in communication technologies (telephone and internet). In this stage international markets are more accessible to foreign competitors but they are still not fully integrated and many frictions still rise with respect to foreign trade deals (Fawcett, 1992)

Industries become more competitive by shifting various activities in more cost-efficient countries. During this first stage of market integration and slow development towards globalization, markets in Europe are still seen as separate entities with their own regulations and customer preference. The logistic distribution is decentralized; the various markets are served independently by sea through their own port captive nodes. In this decentralized market structure, it is hard for ports to attract added logistic activities. As logistic activities are mainly directed within national market, complex intermodal activities are not required (as road is the main mode of transport used in Europe). At the same time ports are characterized by poor competition and high cost (Abrahamsson, 2003).

Figure 2: Stage 1, direct on decentralized delivery



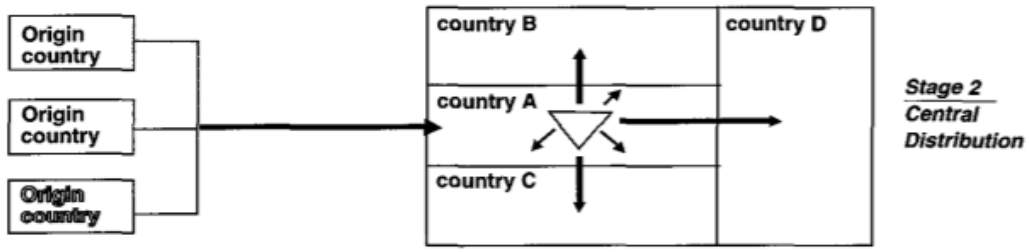
Source: Lugt & Langen (2005)

2.2.2 Second stage: logistic management transport

As globalization has become more developed, markets became more integrated and competitive. Companies and governments start to focus more on the management of logistics (Panayides, 2004). Companies realize that logistics is not merely an area of cost improvements but rather a source of competitive advantage Cooper (1990). Logistic becomes a key component on the value chain and it becomes a key factor to enhance competitiveness and market penetration. Within this frame, in Europe emerged a central distribution concept: one port facilities, serving multiple markets and multiple countries. Intercontinental shipping transport are focused on key port nodes capable to reach different markets and capable to become more efficient and cost effective because of economy of scale and because of more competitiveness. The Port of Rotterdam is one of the northern European ports that first managed to attract a substantial share of intercontinental transport contributing to develop the value creation of the supply-chain. Major investments have been done to improve hinterland connections; a clear legislation and regulatory framework together with a friendly business environment has been implemented to attract international players; universities focused on vocational and professional training attracting a specialized pool of experts.

The Rotterdam way has been followed and even more developed by other north European ports In Le Havre- Hamburg belt, in addition to the mentioned improvements, large investments have been implemented for the development of dry ports and free trade zone so to attract new activities and new businesses leading to a third stage of ports development (Lugt & Langen, 2005).

Figure 3: Stage 2, Central distribution



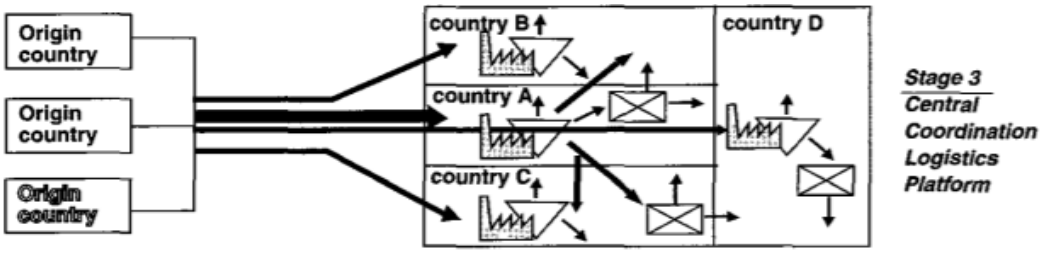
Source: Lugt & Langen (2005)

2.2.3 Third stage: Global supply chain Management

With a more interconnected marketplace, logistic in the last decade firmly grew in importance. Production sites are even more interconnected with components suppliers. Manufacturing sites are becoming integrated assembly systems. Flexibility, time to market, quality and price/cost attractiveness are becoming the key levers to be successful. In this scenario, we can observe a deeper integration between production and logistics. The combined focus to optimize processes as well as the interest to expand, obliges industries to share efficient logistic systems. This does not necessary translate into the creation of centralized distribution centres but more into central logistic platforms (Lugt & Langen, 2005). A logistic platform consists of operational centres cooperating with different entities, coordinated by third parties, in a business environment characterized by a dynamic and a flexible supply-chain system (Lugt & Langen, 2005). New logistic needs are appearing on the market: postponed manufacturing, direct delivery, cross-docking and merger in transit are recent examples and to answer to these market demands very sophisticated informatics systems have to be implemented. (Lugt & Langen, 2005).

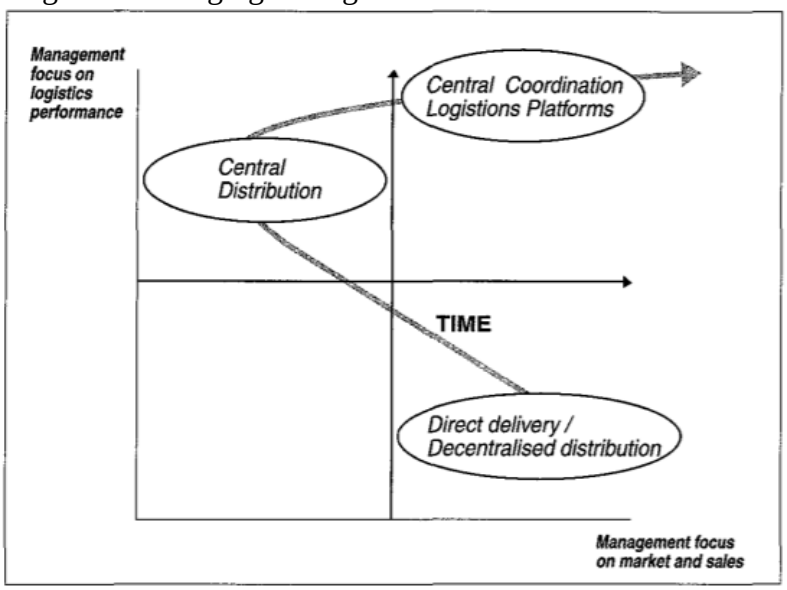
In this case, ports may face significant changes in their logistic function. A more integrated production / logistic facilities is requested and ports are now focusing on advanced hinterland intermodal connections, on the availability of integrated inland manufacturing facilities, on information technology for coordinating parties and increasing reliability of its node.

Figure 4: Stage 3, Central coordination logistic platform



Source: Lugt & Langen (2005)

Figure 5: Changing strategies of MNC



Source: Lugt & Langen (2005)

2.2.4 Conclusion:

The stages do not follow a precise historical path. Based on the different macroeconomic factors that influence a country, for each national port a stage can be attributed (Lugt & Lagen, 2005). For example, ports located in the so called Le Havre-Hamburg range can be considered mostly part of the third-stage port development. These cluster have a solid hinterland infrastructure, they develop new further complex supply-chain systems and they are leaders in the European market in terms of container handling. On the other side Mediterranean ports are mainly into the second phase stage. The objective of competitiveness remains similar but the way to tackle it depends on each network system capability to respond to specific market needs.

3. Methodology: What is competition and how can we measure it?

3.1 What is competition and how can we measure it?

Understanding which are the main drivers of competition, is fundamental to define what strategy port authorities need to focus on, to gain a consolidated competitive position in their market. However, competition in port systems is hard to define and even though it has been widely debated in literature, we are still far from giving a univocal definition.

Three decades ago Verhoeff (1981) suggested that that ports are homogeneous entities and the competitive environment unfolds at three levels between port terminals. At a first level (intra-port competition) between terminal located in the same port. At a second level terminals compete with other ports in the same port range making use of the hinterland interconnection and providing services to the same costumer basin. Finally, at the third level terminals compete with other terminal operators at a global scale.

Even though Verhoeff (1981) supports the theory that ports are homogeneous entities, recent literature suggests that ports are complex nodes in the value logistic chain and have different roles and purposes which makes it hard to compare them. For example, a container port can be distinguished if it functions as a gateway or transshipment harbor. A getaway port acts as an interface between hinterland and deep-sea routings of containerized cargoes, while transshipment as interchange of containerized cargo from one vessel to another. Already this function makes it difficult to compare two ports and such difference has a substantial effect on the competitive position. For example, Gioa Tauro port is a typical transshipment port as it has deep-sea terminal capable to attract large vessels and can redirect the cargo collected to other ports through small feeders, while Genoa Port, functions mainly as a getaway port for the distribution of containers in the national territory. Rotterdam with its capability to handle large vessels acts both as a getaway and transshipment port.

While it is important to segment port competition level with homogeneous port functions , literature strongly supports that a key issue affecting the competitive position of a port is efficiency. Ports capable to generate added value to the different players in the supply chain will become preferred channels (Yap, Lam, & Notteboom , 2006).

In the following section we will define efficiency with comparable key performance indicators focusing on the main players objectives. The evaluation will be limited to container's specialized ports.

In Table 3, Meersman, Van de Voorde, & Vanelslander (2010) tries to synthesize which are the main objectives of the port key players. As we can observe the objective of shippers, forwarders and shipping companies are of similar nature. They represent in a way the market/ the client. It is in the interest of port authorities, terminal and hinterland operators to satisfy the customers' needs so to attract volumes, to reduce unitary cost and to optimize profits.

Table 3: Port players, objectives and instruments

Players	**Objectives**	**Most important instruments**
Shipper/ owner of a good	Minimize generalized costs (including time)	Negotiating power (depending on volumes)
Forwarders	Minimize generalized costs plus profit margins	Negotiating power (depending on volumes)
Shipping company	Maximize Profit/ Maximize market share, control over the supply-chain	Rates/Cost Control
Port Authority	Private: Maximize Profit Semi-Public: Maximize profit has a balance of price and market share / volumes	Concession Policy Compétition (Port dues) Infrastructure Port Regulations
TOC-Terminal Operating Company	Maximize Profit	Handling Fees Technological Choice
Hinterland Operating Company	Maximize Profit	Rate Capacity Speed

Source: Meersman et al. (2010)

From the microeconomic perspectives three are the key endogenous factors capable to influence the capability of ports in gaining volumes and market share: **price, capacity and productivity**. These three items are strongly influenced by the following port characteristics: **infrastructure, operational costs, supply-chain reliability and business environment**. The latter competitive factors are not independent. They are obviously influenced by macroeconomic exogenous factors such as external environment and market trend. For the sake of completing the analysis it will be necessary to consider additional external" moderators": governance changes, competition among port in proximity, green and sustainability changes.

The above-mentioned items that characterize the competitiveness of a port are described here below and they will be used in the case study (Meersman et al.,2010).

The limited availability of specific data for the case study may have reduced the reliability of the quantitative analysis. For this reason, it has been decided to compare the result of the analysis and the business evolutions perspectives with some interviews with key logistic players. It is given for granted that Key Performance Indicators and numerical analysis do give a clear picture of the analyzed situation but sometimes are not sufficient. The human factor, the entrepreneurial approach, the managerial expertise, the daily accrued experience on the field, the competition itself often results in ideas or perceptions of the operators which may partially differ from the quantitative analysis.

People interviewed were selected on the basis of their position and their activities: port authority, entrepreneurs in shipping and forwarding activity, regulators. In appendix A6 list the people interviewed, their function and role, and the key questions. Interviews are reported in appendix, while in the case study only the most relevant information are mentioned. The interviews were approximately one and a half hour long and they were based by an introduction of the subject of this paper and by a number of questions previously prepared.

3.2 Microeconomic factors driving competition

Price

Shippers/good owners are price sensitive. Forwarders are price sensitive. For an equal quality of service, forwarders normally select a port of call that will provide him the lowest total transportation cost.

A forwarder is responsible for handling the distribution of a good/services from point of departure until point of arrival. The aim is to provide to a third party a punctual cost-effective service. As forwarders run on low margins, cost efficiency is the key. Therefore, when transporting a good forwarder plays a significant role in evaluating the total cost of transportation. In building the total cost, key factors are the distance from the departing point and the port, the port handling cost and finally the shipment cost.

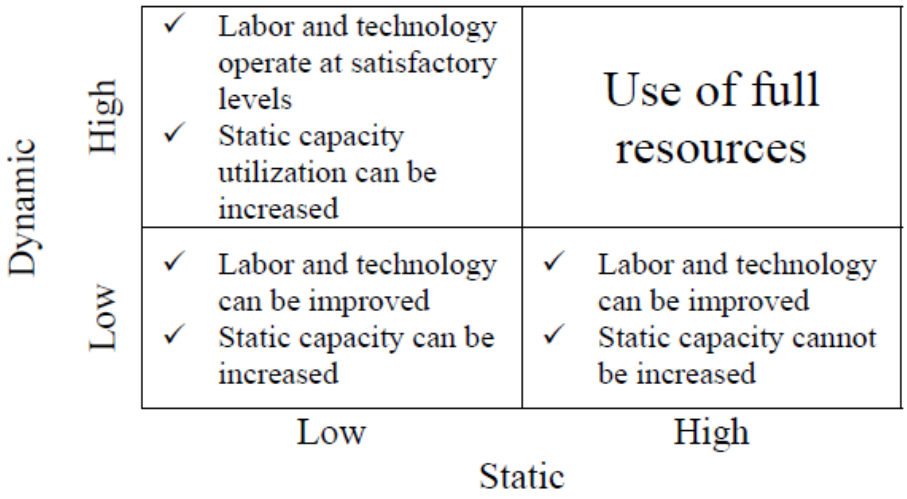
Port authorities have to optimize their margins without losing market opportunities. When setting port dues they have to evaluate their cost and the port competitive position VS other ports. Concessions time and price are also affecting the price levels of port service providers. Port Authorities have to promote internal transparent rivalry for port services. Quite often it's easy to find ports with very low level of competition for loading, for towing or for bureaucratic services. This generally generates price increases, poor quality of service and low productivity.

It is in the interest of all the involved parties not do defend acquired privileges but to generate continuous positive competition to promote efficiency and finally cost competitiveness (Martin, J., Martin, S., & Pettit, S., 2015). It is strange but most of ports have not a price definition department determining the price based on the typical criteria: competition, cost, offer /demand dynamics, time and quality.

Capacity

A standard port capacity definition is given by Frankel (1987, p. 170) according to whom
" A port' s capacity is normally defined as the cargo volume that the port is capable of handling within 1 year and is often expressed as a throughput in tons per unit length of a wharf per year, multiplied by the available berth length, for each type of berth separately."
In reality according to a study run. Lagoudis & Rice (2011) is worthy to highlight two dimensions of capacity: the static and dynamic ones (Figure 6).

Figure 6: Capacity dimensions

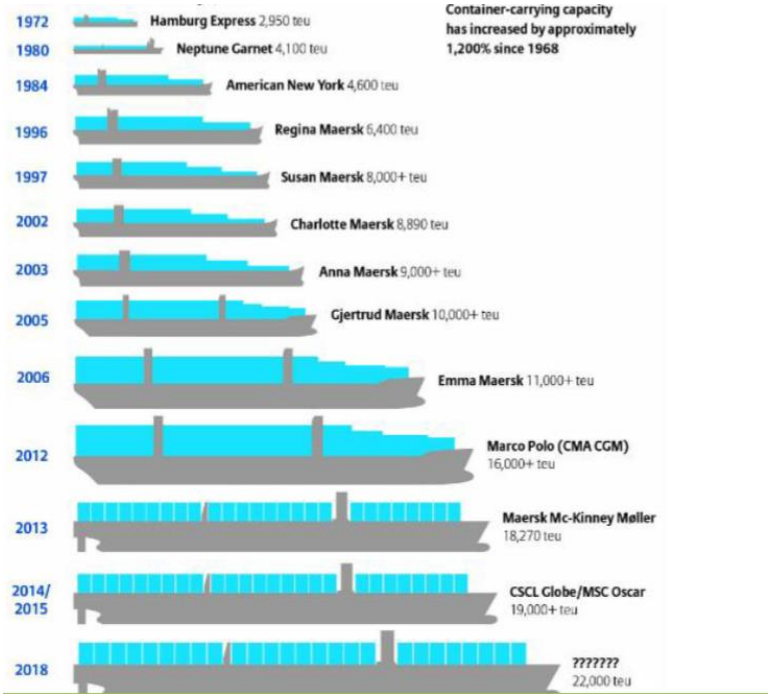


Source: Lagoudis & Rice (2011)

The static capacity indicates the capacity in terms of volume that a port can handle at a given point in time and related to space available. It refers to port physical assets such as terminals, waterways and links with the hinterland. Dynamic capacity indicates the capacity in terms of volume a port can handle during a period of time (usually a year) and involves of course two key components; labour and technology of equipment.

Port authorities and port operators have to focus on the development of both dimensions of capacity. Market is driving toward larger and larger vessels to reduce unitary fixed cost and increase productivity. The figure 7 below shows how quickly containers ships dimension is growing.

Figure 7: evolution of container shipping vessels

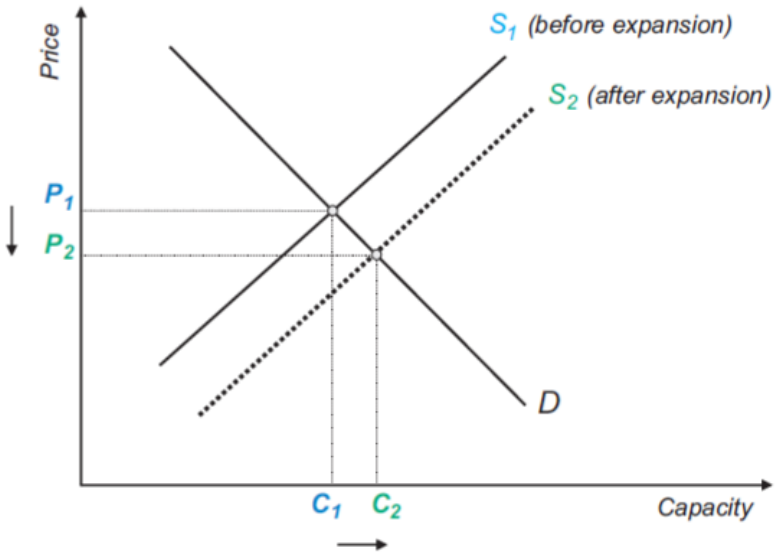


Source: World Shipping Council, 2016

Port authorities have to anticipate the market move and invest in port infrastructure and technology. Increase the number of berths or berths extension, expanding back-up areas, improving storage and handling capacity are strategic development options that every port has to face (Jansson and Shneerson, 1982).

Increased capacity through expansion leads to lower cost. In a simplified price/ capacity graph like the one presented in figure 8, where demand and supply linear evolution are represented, it's clearly possible to see that through capacity expansion, the supply curve would shift to the right. With constant demand, an increase in infrastructure and capacity would lead to a reduction in prices Price level depend on the evolution of the demand curve, however in a microeconomic prospective, additional capacity would unquestionably force market prices down at least in the short-run.

Figure 8: the effect of handling capacity increase. The linear curve explains the relationship between price and capacity increase.



Source: Parola, & Maugeri. (2013).

Productivity

Productivity is defined as the relationship between input and output. An increase in the output level while maintaining the same inputs would mean an increase in productivity (Valleri, & Van de Voorde (1996). Productivity for a port strongly depends by the good coordination between the multiple players acting over the entire supply chain. It is sufficient that in the internal process there is a bottleneck generated by one entity to slow down time or reduce volumes losing productivity. It is the responsibility of port authorities to favor an optimal link between such players by providing good infrastructures together with a business environment that may give space to develop new solutions to improve efficiency.

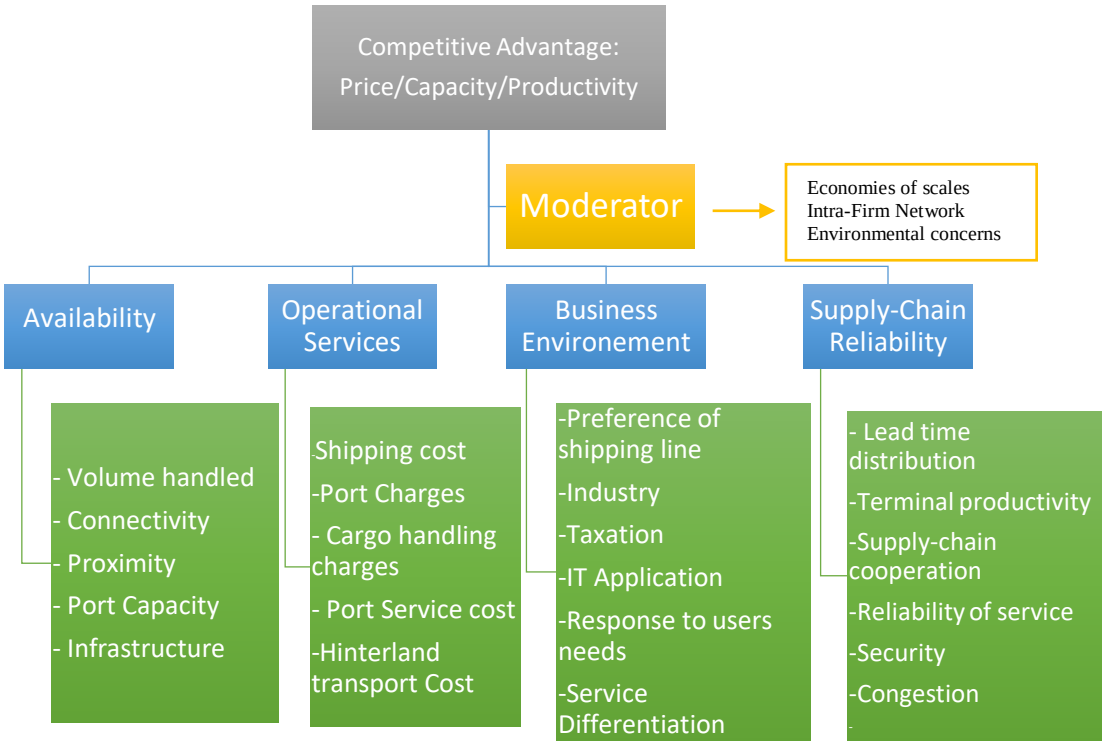
It's not rare that port operators try to vertical integrate their activity so to gain control over the entire distribution chain so to become more efficient and productive. Higher productivity leads to lower generalized costs and to lower prices, if part of the productivity gains is passed to the client (De Monie,1987; Estache et al., 2002).

3.3 Factors influencing ports competitiveness and used to compare port systems

Port's Price, Capacity and Productivity are microeconomic factors influencing the shipping operators in the port selection but these are not obviously the only ones.

Parola & Maugeri (2013) in an academic paper have analyzed ports competitiveness not only by the microeconomic factors but on a larger number of items that are obviously influencing the first one. These items can be used to compare ports relative competitiveness. These items are a collection of the most cited and relevant factors affecting port competitiveness, and are summarized in the Graph 1.

Graph 1: summary of the competitive environment and categories defined



Source: Author (2018)

In the following sections it will be provided a brief description of the single factors including the so-called moderators: business development elements (exogenous) conditioning the port logistic business.

3.2.1 Availability:

The availability of a port is an important factor that needs to be considered as it defines what position a port has within a logistic network system. We have to consider geographical availability as well as physical/infrastructural availability.

For geographical availability we refer to the position of a port in the commercial route networks: maritime and land ones. The port distance from the main industrial/logistic/market poles and how well is the port connected with other nodes is of paramount importance. To evaluate the geographical availability, literature suggest to use the following parameters: degrees of centrality and betweenness of centrality. which respectively define how many connections a port has and the number of times the port is crossed by different ships routes (Ducruet & Notteboom, 2012).

In terms of physical availability, we refer to the internal and external infrastructure of a port: Port and external areas, the number of terminals and berths, the docks length, the number of cranes, the berth capacity and the depth of the seabed. All these infrastructures are fundamental to define how much volume capacity can a port reach and to what extend it can satisfy the requirement of costumers. By comparing data on the available infrastructure and the volume handled we can extrapolate size, capacity, productivity, cost at which a port can operate.

As port is a node of a logistic network also the network that connects the port to the hinterland has to be considered. It's important to know which transport means are used and whether intermodal transport solutions (truck, train or barge) are available. Finally, it's important to know whether there is a dry-port connection and if it's well managed through efficient ICT infrastructure (Musso, 2006).

3.2.2 Operational service

Port Operational services consist in all the logistic and bureaucratic activities in the port and from/to the port to the hinterland. The relative cost is the sum of shipping cost, port charges and hinterland transport. To be an effective logistic node ports need to propose cost-efficient services.

Port charges are calculated by the sum of various tariffs normally based on vessels dimensions. Every port has its own way to calculate tariff and to include services. In ports operational cost it's possible to find harbor and light dues, pilotage; towage; mooring/unmooring charges, ancillary charges consisting in port clearance fees; port entry fee; maritime welfare charges, harbor cleaning and maintenance contribution fees, etc Imai, Nishimura, & Papadimitriou. (2013).

To compare ports competitiveness and cost it is necessary to have clear all these items so to evaluate correctly the impact on the total cost (Ducruet & Notteboom, 2012).

Time is also of essence for reducing total costs. The port needs to provide optimal handling service in order to minimize the time. Container vessels, needs to have the fastest rotation as possible so to generate higher revenues. Productivity becomes in this case essential. Time and speed are obviously dependent from the quality and the dimension of the infrastructures. The better the infrastructure available is, the lower the cost the port system can provide.

3.2.3 Business Environment

A favorable business environment is fundamental for the functioning of the port as now the competitive position is not analyzed solely by the amount of cargos that a port handles but also by the added-value that it creates (De Langen, 2004). With this prospect port should be analyzed not only for the efficiency of its logistic but also considering all the side activities available and the local business prevailing conditions. To be more explicit: a port having a "free port" regime is attractive for tax free activities. Shipyards, maintenance services or even export/import oriented assembly/manufacturing activities could profit of the port free regime and contribute to the total activity/value creation of the port.

Efficient and well-developed tertiary services in financing, insurance, brokerage business helps and supports the port business.

Simplified bureaucracy, clear and simple process are making the life easier to any port activity. Specialization and availability of human capital supported by adequate education (professional schools and universities) it's also of paramount importance: unitary personnel cost are often less important than quality, efficiency and innovative approaches (Choen, & Dwakin, 2010).

3.2.4 Supply-Chain Reliability

Shippers and forwarders are not only cost driven when choosing a port: efficiency and reliability of the services also taken in consideration. The World Bank collects information about port performances and makes evaluations through Logistic Performance Index (LPI). What is relevant in this database is the average lead time to import/export a good (basically how long does it take per container to be handled in a port), the amount of delays or the average time to pay custom dues. These monitored key performance indicators are the result of a complex industry which involves a large number of players and which need a continuous investment in infrastructure and process development. IT efficient systems are now often the key success factor granting reliable coordination between player, and process and operational optimization (Gilbert et al., 2008)

3.2.5 Moderators

As mentioned in graph 1 all the above-mentioned factors influencing the competitiveness and the attractiveness of a port are depending by other elements which are quickly evolving. There elements are called Moderators

Economies of Scales

The significant acceleration of leading shipowners, investing into mega-vessels represents a cutting edge for the maritime industry (Cullinane & Khanna, 2000; Martin, Martin, & Pettit, 2015). This fast trend has obliged port systems to adapt their infrastructures through major investments in order follow or to anticipate larger capacity needs. Small getaway ports without large terminals and without a fast investment plan to adapt their facilities, risk to be quickly cut off from the main shipping routes. Larger size vessels increase efficiency and reduce shipping cost but the port and inland logistic network have to be adapted to higher capacities. While economies of scale grants lower operational cost, on the other hand they oblige to major investments making the industry more and more capital intensive.

Governance changes

A second moderator relates to a profound change, in developing and advanced economies, in port and inland facility governance. Once considered a strategic asset to be state controlled, now in most of the world it has been experienced the shift from public to landlord model (World Bank, 2007).

This system allows private firms or consortiums to lead port operations with more efficient managerial and entrepreneurial approaches (Brooks & Cullinane, 2006; Debrie, Lavaud-Letilleul, & Parola, 2013). As a result of privatization or concessions, bureaucracy is immediately reduced, favoritism are disappearing, transparency is granted and normally operation improve thanks to free competition. State control, overview and eventually support in investments are normally a guarantee for a positive economic and social impact. The port governance structure is different from country to country and from port to port. There are examples of nearly totally privatized ports like in UK or close state and private management like in France. In Italy still, ports are managed by port authorities which are public entities without value creation scope. Multinational companies are trying to secure ports management internationally so to build controlled efficient distribution networks All these evolutions have to be considered when evaluating ports attractiveness,

Intra-Firm Network

A third cutting-edge trend that has to be considered as moderatos is the rise of intra logistic network agreements between different entities. On one side we have agreements between shipping/large logistic companies and ports and on the other side agreements between ports.

The first type of agreements is favored by the interest of ports to attract large shipping/logistic companies and their volumes by bargaining on volume/price and time concessions. A long-term commitment of a major company to set its operation in a given port automatically creates the conditions for a long-term growth for both parties Midoro and Pitto (2000). Shipping companies are successfully integrating the different phases of the process including the port management (i.e. COSCO).

The second agreement is a combination of competition/cooperation between two ports defined as coopetition. The ports collaborate to attract customers, develop costly joint projects and reduce

common fix cost with a centralized system of coordination, communication and marketing Notteboom and Rodrigue (2005).

Sustainable concerns

Change in port performance needs to consider also the emission requirements. After the Paris COP 21 agreement, governments start to apply more strict regulations on emission to enhance more sustainable technology (Acciaro, Ghiara, et al., 2014; Lam & Notteboom, 2014). As the logistic sector is heavily dependent on fossil fuels it is important that this sector, starting from the ports, supports this new challenge. Indeed, environmental sustainability represents a growing concern for Port Authorities, policy-makers, port users and local communities. In this regard, technical and process innovations can provide solutions to the main environmental issues, preserve quality standards and ultimately boost efficiency and competitiveness. Concerns regarding emission level are pushing ports to issue more and more stringent regulations: port authorities in defining long-term growth strategies have to weight and reduce the conflict between port and territory, to create a more cohesive collaboration (Bergqvist & Egels-Zandén, 2012). The introduction of green clauses has also increased the marginal social benefits of the port-city and favored increase of modal split transport (De Langen, Van Den Berg, & Willeumier, 2012).

4. Case study: Comparative analysis between Genoa and Rotterdam for the Rhine-Alpine Corridor

Today the import and export markets for south Germany Landers (Baden Wurttemberg and Bavaria) are served nearly exclusively by the Hamburg and Bremen ports. (table 4)

Table 4: TEU transport from ports to regions by freight (thousands)

Ports	Baden-Württemberg	Bavaria
Hamburg	174	270
Bremen	91	144
Rotterdam	8	2
Antwerp	6	3
Italy[1]	23	42

Source: Baden-Wurttemberg and Bavaria regional statistics, (2015)

Despite market liberalization, south German companies still prefer to work with German based ports. As a matter of fact, table 4 shows that most of the imports in Baden Wurttemberg and Bavaria are distributed through German ports (87% and 89 % of goods are respectively distributed by Hamburg and Bremen).

A scenario may change with the finalization of the Rotterdam-Genoa Corridor which is crossing these regions. Both Genoa and Rotterdam ports may penetrate the market to the detriment of traditional export /import channels. According to the database by the German regional statistics, in 2015, these regions reached approximately 3,4 mln TEU of import and export. Inland logistics were distributed in the following way: 37 % by rail 6% by inland waterway shipping and 57 % by road (Table 5).

[1] The Statistisches Bundesant had information regarding freight transport to Baden-Wuttemberg and Bavaria regions for the entire country and not specifically for the port of Genova as a result of the few freight transportation between the two areas. No information can be attributed to the distribution through Genova Port

Table 5: Import and Export of goods in Baden Wurttemberg and Bavaria (Containerized cargo only)

	Import	Export	Total
Tons	23,765	26,488	50,253
TEU	1,584	1,766	3,350[2]

Source: Statistiches Bundesant (2015)

3.4 mln TEU could represent a huge market opportunity and a possibility of volume increase for both Rotterdam and Genoa.

Who between Genoa and Rotterdam will benefit the most from the realization of the corridor, to profit of this new market will be the research question of this case study. To answer this central research, question the analysis will be structured in the following way:

In section 4.1 the description of the contested area will be presented. in section 4.2 a brief introduction of the port system of Genoa and Rotterdam will be given, highlighting the importance of the Alpine-Rhine corridor. In section 4.3, an extensive comparative analysis on container traffic will be performed between Genoa and Rotterdam.

The comparative analysis will be based on the factors affecting price, capacity and productivity of a port and its logistic chain identified in the literature as availability, operational service costs, supply-chain reliability and business environment (Musso, 2011).

Based on the results analysed, a conclusion will be presented evaluating which port may profit more taking into account of the new corridor under construction. Finally, while writing this paper, a major extraordinary event occurred: the collapse of the Morandi bridge. A section will

[2] The data was gathered by the regional databank of german statistics. The values were gathered manually by summing up all the data regarding provinces. The result may be underestimated due to the possible omission of some data.

be dedicated to analyse the impact on this event and on how this will affect the conclusions made on the case study.

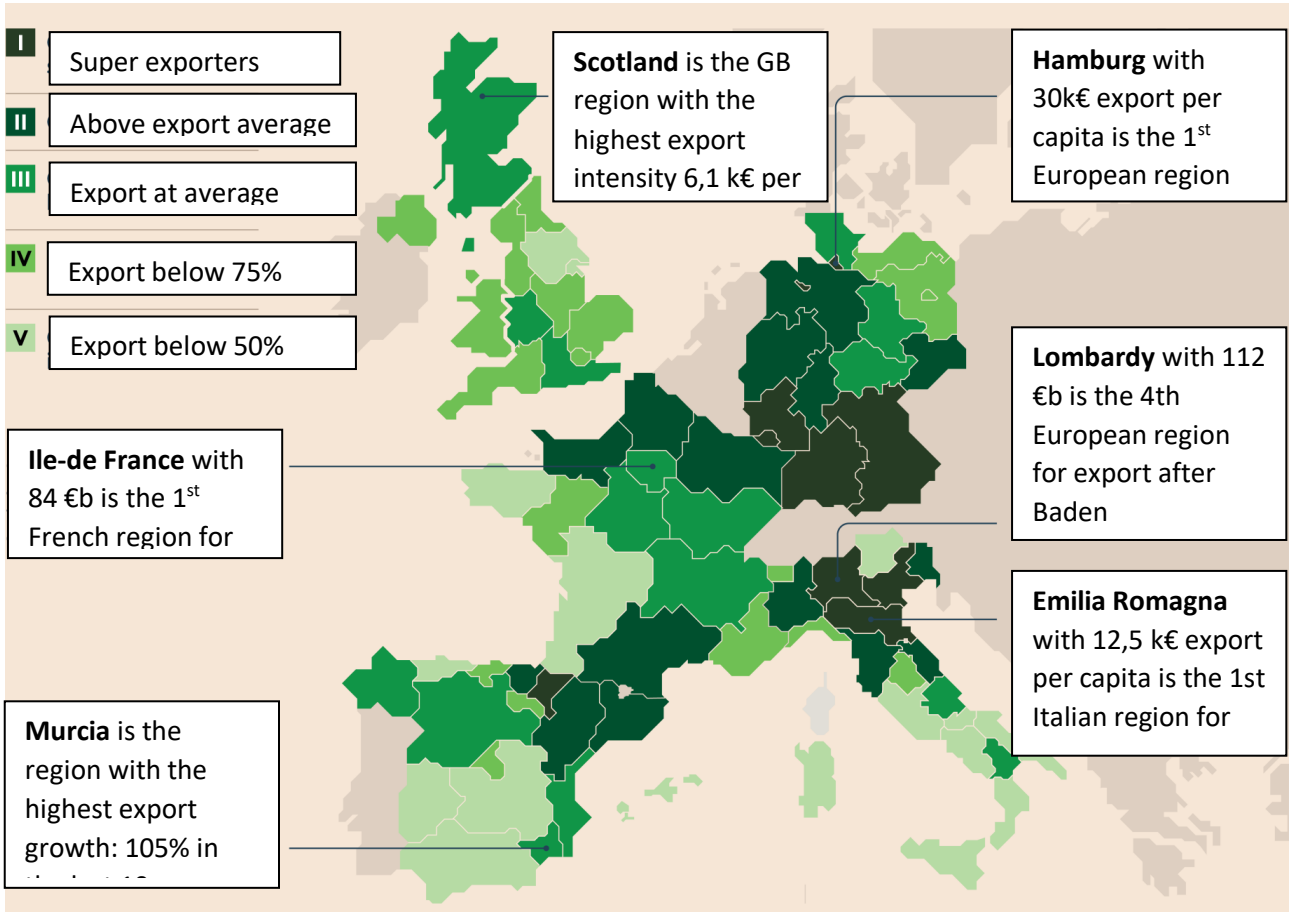
4.1 Define the decision over the contestable hinterland and its competitors

The World Trade Organization (WTO) publishes every year a study on global export where it ranks the exporting countries by value (billions of $) and volumes (tons). It's not a surprise that USA and China are in the first and second position respectively. Europe plays still a significant role in the global export arena and Germany, France, GB and Italy are surely the motor of this export activity.

A recent study published by the Italian Institute of Statistics (ISTAT) together with the Foreign Commerce Institute of Italy (ICE) puts in evidence that if a deeper analysis is done on regional basis there are clusters where there is a significant concentration of export-oriented activities (Parola & Maugeri, 2013)

In figure below is synthesized the study run by ISTAT (2015) for GB, France, Spain, Italy and Germany. The last two are characterized by regions that are leading in terms of export volumes and intensity: Baden Wurttemberg, Bavaria and Westphalia in Germany and Lombardy, Veneto and Emilia Romagna in Italy.

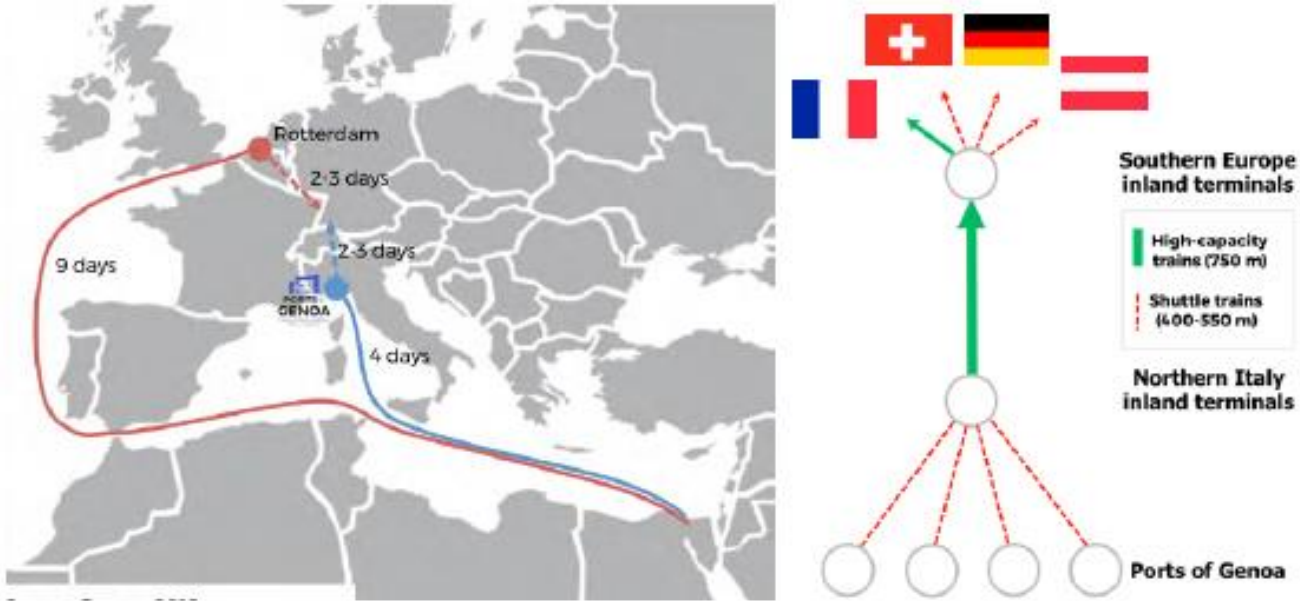
Figure 8: Illustration of the most export intensive regions. (ISTAT,2015); Author elaboration.



What it's interesting is that these export-oriented regions are mostly landlocked and logistics plays a significant role for an efficient access to foreign markets.

While some of the highlighted regions, because their geographical position, have a captive ports to serve their export, the Baden Wurttemberg and Bavaria Landers are equally distant from the northern ports and the Mediterranean ones. (See figure 9)

Figure 9: Illustration of route for contested area, respectively from Rotterdam and Genoa



Source: Drewry, 2006

It becomes obvious that to gain or to increase market share in this export/import-oriented market is of paramount importance for the northern and southern ports.

Baden-Württemberg is located in the southwest of the Federal Republic of Germany and has borders with France, Switzerland. The number of inhabitants is 10.9m, the population density of is 304 inhabitants per km² and the capital city is Stuttgart.

Baden Wurttemberg regional gross domestic product (GDP) in 2017 was close to 500 b€ accounting for 15.2% of the German GDP North Rhine-Westphalia (21.3%) and Bavaria (18.1%). Despite the financial and economic crises in 2007/8 the federal state managed to have a fast recovery track. In the last 7 years it experienced an average compound yearly growth rate of 3.7%. The GDP per capita is approximately € 41,300 (Eurostat, 2017) and the unemployment rate was 3.1%; in 2016, the export volume of Baden-Württemberg reached 192 b€, representing 15.9% of German exports (Wirtschaftsdaten Baden-Württemberg, 2017).
Baden-Württemberg is highly industrialized: in 2016, 35.1% of the employees were occupied in manufacturing and construction sectors, while the share of the service sector is 63.9%, and only 0.9% of the employees were occupied in the agricultural sector.

The strengths of the regional economy are the automotive industry, still on the rise, and mechanical engineering.
Foreign trade has been the most powerful motor for the economy for many years. In Baden-Württemberg, one job out of three depends upon the export market.

Companies from Baden-Württemberg are active in global markets. The larger players, notably the big car manufacturers, suppliers to the automotive industry, and mechanical engineering firms, are active worldwide. Small and medium-sized companies are also well known to industry experts globally as thanks to the over the years reputation for quality, reliability, high technological standards and innovation.

The State of Baden-Württemberg supports small and medium-sized enterprises to open up export markets through a specific marketing plan entitled "Baden-Württemberg International Gesellschaft für internationale wirtschaftliche und wissenschaftliche Zusammenarbeit mbH" (2017). The role of this organization is also to aid universities in promoting Baden-Württemberg as an attractive center of learning and research.

Dialogue and international cooperation play a key role in ensuring the global competitiveness strength of this German land industrial cluster. By launching an initiative promoting the construction of hubs for industry and commerce known as "German Centres", Baden-Württemberg has created a unique opportunity for small and medium-sized enterprises in particular to gain an established footing in distant and difficult markets. Baden-Württemberg-based companies have successfully defended leading market positions for many years and the stable/supporting government is a guarantee for a long standing and growing economy.

Bavaria is neighboring Baden-Württemberg in the southeast of the Federal Republic of Germany and it also has international borders with Austria and the Czech Republic.

Its population counts for 12.8mln. It is the second most populated German federal state and its capital city is Munich. With a surface of 70,550 km^2, its population density is182.0 inhabitants/km^2.

Gross domestic product (GDP) in 2017 was close to 600 b€ accounting for 18.1% of the German GDP and the per capita GDP exceeding 46,8 k€ is one of the highest in Europe.

From a traditional agricultural region, Bavaria's economy has dramatically changed over the past 50 years, becoming one of Europe's most competitive industrial regions. Over the last 7 years export has increased of 33,3 % reaching 192 b€. Bavaria's main export markets are USA and China which count for 30 % of total export. Imports as well have increased firmly, reaching 180 b€ with a 37% increase over the same period mainly from China, Austria and Italy.

Bavaria economy is characterized by specialization on the automotive industries, electrical engineering, mechanical engineering automation and robotics: all export oriented! Well known globally recognized industrial companies like Adidas, Audi, BMW, MTU Aero Engines, MAN and Siemens are not sole contributor to the state economy. The backbone of the Bavarian economy is characterized by small and medium-sized enterprises. They contribute to 55% to the regional GDP (340 billion euros). The spectrum ranges from traditional skilled crafts and trades and highly specialized manufacturing services to research and development projects in high-tech fields associated with universities.

What gives a further push to the export market is the Bavarian State governments' support towards businesses settled in the region, with assistance in knowledge and technological transfer. Trade fairs are all Landers' sponsored, permitting small/medium enterprises to having more international visibility. The regional government also organizes delegations visits abroad for group of companies together with the Ministry of Economic Affairs to facilitates presence in foreign markets. Through organized trips to business people, visits to ministers, organizations and companies, each group has the chance to have face-to-face presentations and individual discussions with potential clients or partners.

4.1.1 Why chose Rotterdam and Genoa as main competitors in the contested region?

A contestable hinterland (with respect to port logistics definition) is an area where different logistic systems engage in competition to gain market share (Musso,2011).

A logistic system (defined by the port, hinterland infrastructure connectivity and its players) will be competitive, in the distribution of a contested area, if it will be capable to provide cost effective and reliable services. Therefore, the decision of a port system to target a contested

hinterland will depend on three fundamental factors: strategic location, price gap with competitors and the economic attractiveness of contested area.

The location says if the port may distribute the contested area quickly and efficiently due to its proximity. The price gap defines (at the current stage) the distribution cost difference among the port and its competitors. Finally, the economic attractiveness delineates if the contested area may bring added value and throughput to the port and logistic node, with a high ROI.

For example, Genoa port system, will not set as a strategic goal to contest the Catalonia region in Spain because it is located far away from the Liguria port system, it would be too expensive to distribute it by rail/road as the area can be distributed directly at a lower price by the Barcelona port. Moreover, the potential throughput attracted by Genoa does not pay back the investment required to better connect the port to the region.

Genoa and Rotterdam where chosen for the distribution of Buden-Wuttemburg and Bavaria because of the reason aforementioned and further explained in the four points below:

- Genoa and Rotterdam ports proximity to the contested zone are similar. Baden-Wurttemburg and Bavaria are located on average 630 Km from Genova, 650km from Rotterdam and 680km from Hamburg,
- The quotations gathered from different sources (UNCTAD, EUROSTAT, Porto di Genova statistiche, Searates), in distribution costs for Genoa and Rotterdam do not differ significantly from its competitors: Hamburg and Trieste (price variable that defines the competitive position)
- Economic importance of a region, which was highlighted in the previous section (strategic volume attraction factor)
- Genoa and Rotterdam are part of the so called Alpine-Rhine corridor, infrastructure project which is part of the TEN-T, key element that will redefine the competition across the European logistic network

4.2 Port Description

Port of Genoa

Picture 1: port of Genoa image

Source: Port of Genoa website, 2018

The Genoa port system is composed by the harbor of Genoa, Pra, Savona and Vado Ligure. Together they make the largest port system in Italy handling over 69 million tons of all type of cargo, 2,6 mln of containerized throughput (Table 9) and over to 4,2 mln passengers. Genoa port system offers a large portfolio of complementary services: logistic services for freight handling, vessel construction/repairing (36'000 employees in this sector), IT service system and supply chain optimizations ("port of Genoa", 2018).

The port is organized with more than 100 decks, with a deep-sea bed of 18 meters, ready to accommodate the largest vessels and 7 million square meter operative area for storage and handling services. 30 specialized terminals permit the movement of every sort of goods: from solid and liquid bulk to container and RO-RO transport (in this last transport system, Genoa thanks to Spinelli group is a European and global leader).

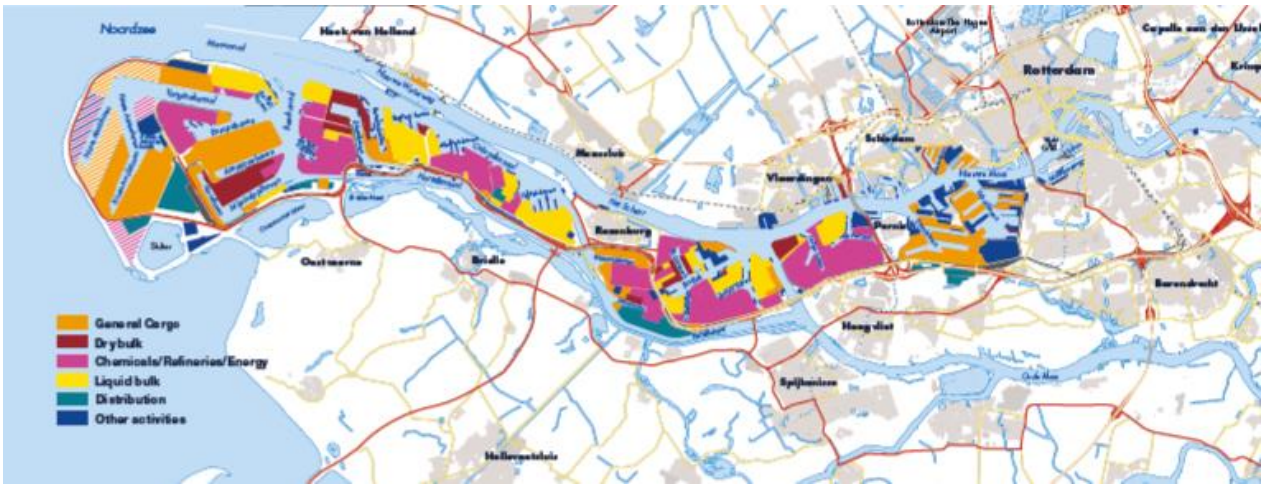
The port's harbors are also important for passenger transport. Genoa is the homeport of the main cruise companies. Port of call for multiple cruise ship that stop in Genoa to offer its customers a visit of the Liguria region and point of departure to the islands of Corsica, Sardinia and Sicily. Every year more than 4 million people choose Genoa for its cruise ("port of Genoa", 2018).

The port of Genoa is the main driver of economic growth for the region. The port system has a total of 122'000 employees, contributing 10 billion € to the region. The business involved in the port are also of primary importance for the sustained economic growth of the region, providing up to 8'000 job opportunities ("Port of Genoa", 2018).

Figure 10: Summary of economic impact of the Port of Genoa; Source: Port of Genoa website, 2018

Port of Rotterdam

Picture 2: Map of the port of Rotterdam



Source: Port of Rotterdam webpage, 2018

Rotterdam is the largest port in Europe and 10th largest port systems in the world (Port of Rotterdam Facts and Figures, 2017). In 2017 it handled 295 million tonnes of dry and liquid bulk, 142 million container and 30 million tonnes of breakbulk (Port of Rotterdam, 2018).

With-in the port of Rotterdam three distribution centres are present, capable to store and sort all type of cargo. The Eemhaven mainly accommodates third party logistic providers, the Maasvlakte is focused on more specialized logistic companies, while the Botlek District park is used for the storage of special chemicals ("Port of Rotterdam", 2018).

The port system can provide multiple services varying from bunkering, shipbuilding and maintenance to pilotage, towage and berthing. Moreover, it can supply a variety of gods such as crew, spare parts and nautical equipment.

The port covers a 42-kilometer-long area, has over 6 thousand hectares of infrastructure and water surface. The modern infrastructure, divided along the 90 specialized terminals, makes Rotterdam one of the most efficient port systems in the world (Port of Rotterdam, 2018).

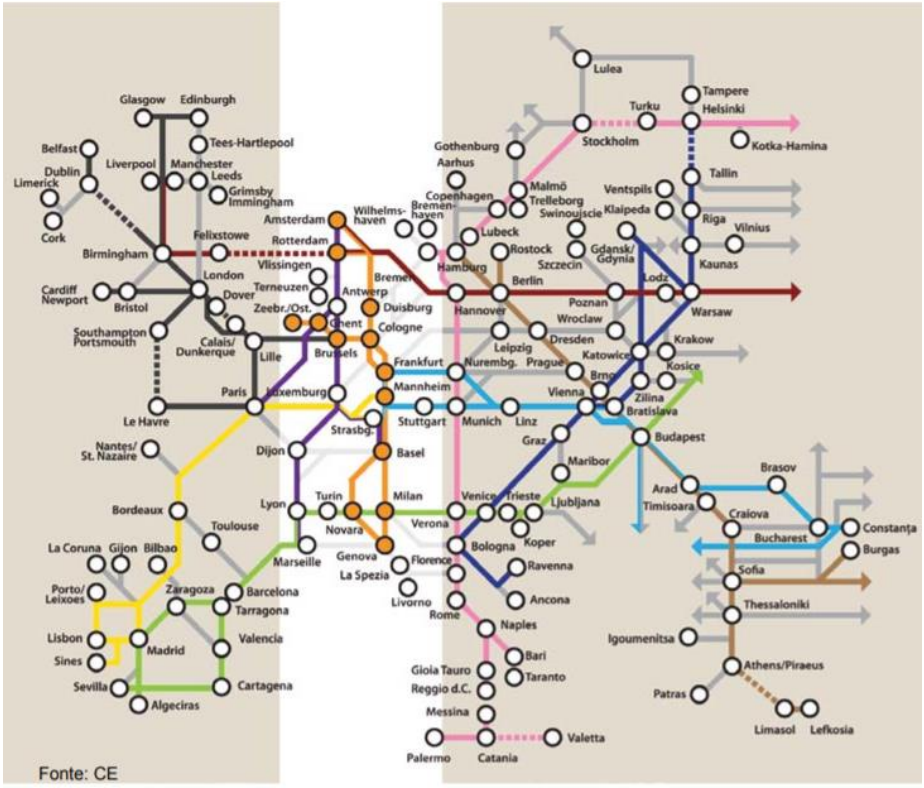
What makes the port so innovative and efficient, is its continuous focus on added value logistic activities which create 21 billion € turnover and creates further employment opportunities: 99'000 over a total of 180'000 employees across the entire port system ("Port of Rotterdam", 2017).

The added value activities consist on: investments towards corporate social responsability to create a more sustainable environment and social benefits to port community, new IT services through the use of blockchain and standard nautical information and also stronger alliances/ partnerships across the world and better cooperation for the realization of an integrated national port systems (Port of Rotterdam, 2018).

Alpine-Rhine Corridor

What makes these two ports so interesting in this case study is that they are part of the Alpine-Rhine Corridor (also known as Genova-Rotterdam corridor), a network and infrastructure project that cuts through the largest industrial and demographical areas of Western Europe, connecting the northern sea ports (Rotterdam, Zeebrugge and Amsterdam) to the Mediterranean ones (Genova, la Spezia) as shown in the figure 10.

Figure 10: Rail freight connection in TEN-T project



Source: CE, NEA (2011)

The area that covers the Alpine Rhine corridor has been nominated Banana Blue[3]. This area represents the most important industries across the continent: chemical, pharmaceutical, steal, automotive and energy industries. Moreover, the corridor may pass across one of the most populated areas across the world (in the Banana Blue there are 110 million inhabitants estimated). The corridor has been nominated between the 9 most important infrastructure project of the TEN-T and may change the infrastructure equilibria across Europe (Trans-European Transport Network). This European Network is the number one focus of European Transport commission, which is aiming on better interconnecting the common European market, guarantee the free movement of people/ goods and empower employment and productivity ("Rhine-Alpine Corridor", 2018). The corridor is aimed on favouring the multimodal interconnectivity across EU, increasing volume transported by rail, road and barge by enhancing flexibility/quality and reducing lead time distribution. The project may reduce transport costs and increase

[3] The term Blue derives from the color of the European flag, while Banana refers to the shape that this corridor has.

competitivity in the two ports (port system of Rotterdam and Genoa). To attain these results great coordination across the five countries involved in this project is needed. All countries need to apply the same standards: rail system eligible for 750-meter trains with a 2000 tons capacity ("Italian Institute of Transport and Infrastructure", 2016).

A European TEN-T coordinator, has been appointed to make sure that all the projects along the corridor follow the same standards and deadlines. However, many bottlenecks still remain. The access routes from the swiss tunnels to EU territory need to progress as well as a better multimodal connection from ports is needed ("Rhine-Alpine Corridor", 2018).

4.3 Comparative analysis: Port of Genoa and Port of Rotterdam over contested area.

The comparative analysis is between the port of Rotterdam and Genoa. These two ports are the nodes of the large infrastructure corridor (Alpine-Rhine) discussed so far. The comparison between Genoa and Rotterdam will give the means to understand which port will be in a better position to become a real competitor for Baden-Württemberg and Bavaria import/export. The comparison has been based on the estimates of Searate service quotations and COSCO shipping quotation for route costs, on a 20ft container. The comparison is based on the following factors: availability, operational costs, supply-chain reliability and business environment.

In order to simulate in the most accurate way the import/export of goods between the Asian market and the contestable hinterland we set a representative example route:

- Import: from Shanghai to Stuttgart/Munich (20ft full container: electric appliances and computer hardware)

-Export: from Stuttgart/Munich to Shanghai (20ft full container: automotive vehicles parts).

Shanghai was chosen as port of departure/arrival because it is the largest port in the world, most of the volumes from/to Europe transit through this getaway and there were plenty of quotation available through Searates and COSCO.

Electric appliances and computer hardware were chosen for the simulation of goods imported for two reasons. First because of the available quotation online for these goods. Second because these regions are large importers of these products from the Asian market (see section 4.1).

Automotive vehicle parts where chosen for the export comparison, due to the fact that Baden-Württemberg and Bavaria are large exporters of industrial and commercial vehicles. (see section 4.1)

The comparative analysis is mainly focused on the Port of Genova and the Port of Rotterdam. However, the port of Hamburg and Trieste are mentioned as well because of their proximity to the contested regions and because Hamburg is the main competitor for this market.

Each section will be terminated with a summary table where all the aspects are ranked in order to have a general overview on who between Genoa and Rotterdam is more competitive. Each aspects is ranked on an ordinal scale which gives the sign "+" if the port systems is competitive in an aspect and "-" otherwise. The scale of comparison is based on the information, data and interviews gathered during this research.

4.3.1 Availability

This section compares the competitive position of the two ports with respect to capacity, throughput handled and network level.

Geographical availability: Maritime transportation networks accessibility

Degree of centrality and port betweenness show how many connections a port has and the number of times the port is crossed by different ships routes (Ducruet & Notteboom, 2012).

These two variables, indicating geographical availability, are index based. The higher the index, the easier it is to access a global maritime freight transport system and thus have a more effective role in the international trade.

According to the table below, port of Genoa has lower connectivity than Rotterdam in the global maritime routes, but it still has potential to develop. The expansion of Sampierdarena and Calata Santità terminals will permit to the port of Genova to be a more relevant transhipment harbour and attract more volumes ("Port of Genoa"; 2017)

Table 6: Measurements of two ports` centrality4

Port	Degree of Centrality	Betweenness of Centrality
Genoa	371	9’547.00
Rotterdam	610	83’246.00

Even though currently the port of Genoa has a disadvantage in terms of global market connection, the centrality of the Mediterranean harbour is meant to increase. As shown from figure A.3 in the Appendix the container throughput and the betweenness of centrality of the PoG have increased through the years 1996-2006, reducing the gap with the northern range ports. Moreover, through a survey-based analysis on shippers and forwards, Musso et al. (2013) found out that Italian ports have an advantage over the other northern range European competitors because of the favourable geographical position in the world trade routes (“+” for positioning PoG). If we focus on the case of Baden-Wurttemberg and Bavaria, Genoa has a great advantage on Rotterdam in terms of nautical and terrestrial proximity. It takes on average 5 days less of navigation to reach Genoa from Shanghai and on average 30 km less of road from Genoa to Stuttgart.

Physical availability: infrastructure and capacity

There is still a large gap between the port infrastructure system of Rotterdam and Genoa. The cargo throughput in the Port of Rotterdam is approximately 6.5 times larger than Genoa. The Port of Genoa despite having a smaller infrastructure is growing at a faster rate (Table 7). Moreover by 2021 is expected to double the number of terminals (“Port of Genoa: Facts and Figures”, 2016).

[4] The Worldwide Maritime Network of Container Shipping: Spatial Structure and Regional Dynamics (2006)

Table 7: Capacity and growth of ports

	Cargo throughput (mln tonnes)	Total throughput growth rate (%) from 2010-2016	Container throughput (TEU)	Growth rate container (%) from 2010-2016
PoR	457.4	0.1 %	13’734’334	23.2 %
PoG	69	-1.0%	2’600’000	49.1%

Sources: Facts and Figures, Port of Rotterdam (2017); Facts and Figures, Port of Genoa (2017)

Table 8: Infrastructural elements of the two ports

	Length of the terminals	Number of cranes	Capacity TEU per year	Number of container terminals	Deap of seabed
PoR	89’000	103	18’700’000	9	25 meters
PoG	21’863	22	5’600’000	2	18 meters

Sources: Facts and Figures, Port of Rotterdam (2017); Facts and Figures, Port of Genoa (2017)

Table 8 further explains the port dimension difference between Genoa and Rotterdam. The latter, thanks to the numerous space and infrastructure, it can fully benefit from economies of scale (PoR infrastructure “+”). Port authorities in Rotterdam can aim on reducing costs and set better contractual deals with cargo shippers answering to market needs in an efficient manner (de Langen et al., 2012). Economies of scale could create some inefficiency in the distribution due to

the more complex supply-chain. However, this is not the case for Rotterdam. According to a study Kim (2012) through the use of Data Envelopment Analysis (DEA), Rotterdam ranks 3rd in terms of productivity between all European Ports, while Genoa ranks 19th. The strength of Rotterdam is the productivity of its working hours, while is less productive on berth, area and crane. Genoa shows low efficiency in labour but high productivity in its equipment and infrastructure (PoR productivity "+").

Connectivity by Rail:

Infrastructure is not solely limited to the port but also considers the hinterland connection. Rotterdam has a developed multimodal system which is favoured by the integrated use of train, trucks and barges to distribute the hinterland area. Through a developed railway system Rotterdam offers 250 international connections. Recently, PoR has empowered the direct rail connection to German territory and infrastructure. Through Betuwe Route reaches German boarder in less than 3 hours, with an average of 137 trains per day. Each deep-sea terminal has its own rail facility. Port shuttle facilities and incubators are privatized services which improve the efficiency in rail distribution within the port system. However, the use of rail service is still limited and should be further improved ("Port of Rotterdam", 2018).

As for the case of the port of Genoa, the Ligurian port system is one of the main providers of intermodal railway service in Italy. Thanks to two logistic hubs: the Genoa-Savona terminals focuses on the North-West side of Italy while the La Spezia terminal focuses more towards the distribution of the Emilia-Romagna region. However, rail connectivity from the terminals directly to the hinterland is still limited ("Port of Genoa", 2018). Only now the trend is changing. The Sampierdarena terminal will be connected by rail, through the Terzo Valico and outside the national territory by the new Brenner and Gotthard tunnels. The new infrastructure system is finally being privatized and the share of new private operators is growing from 7% in 2006 till 43% in 2016 (FerCargo, 2017). Currently a maximum of 180 trains per day may leave the port of Genoa. The current infrastructure does not accommodate 750-meter trains with a 2000 tons capacity. Moreover, the current block of the train systems from the Morandi bridge Collapse has congested and limited frequency even further.

Connectivity by road:

For short distances, road transport is of more efficient use thanks to its greater flexibility and speed. 40% of distribution from Rotterdam goes to the national territory and in such case, road becomes the most efficient and flexible mean of transport. A15 is the central artery to connect the port to the national highway transport service. Billions of euros have been directed to maintain maximum accessibility to the port. With the road system a Port Community database was developed. Carrier can use road planning system in the way to give advance notice of arrival to terminals or to empty depots. Environmental requirements from APM terminals in Rotterdam, are incentives which push carriers to use more sustainable means of transports together with the traffic ("Port of Rotterdam", 2018).

For Genoa, road is the main and most efficient mode of transport as most of the industrial hubs that Genoa handles goes to national territory, at a distance that on average does not encompass t 300 km radius. For this reason, the rail transport has been subordinated by road. Even though there are multiple corridors (A12, A6, A27) that connect Genoa to the hinterland, many bottlenecks remain because of congestion on roads. the Morandi collapse is a further element of disruption that will be taken into consideration. Structural adjustments are needed in the infrastructure, one to be mentioned is a direct connectivity between port and airport, which currently is not existing ("Port of Genoa", 2018).

Other mode of transport

Rotterdam has the value-added advantage of having inland shipping, thanks to the presence of the Maas and Rhine which then reaches the Danube. It may reach the contested area of Baden-Wurttemberg and Bavaria within 4 days, giving a more flexibility and dynamic solutions to its intermodal transport system ("Port of Rotterdam", 2018). However major coordination problem may arise which could reduce supply-chain reliability, creating inefficient transport solutions like return route with empty containers. Genoa on the other side does not have inland shipping access, pushing the Ligurian system to further innovate in rail and road transport solutions ("Port of Genoa", 2018).

Summary of comparison

availability	Port of Genoa	Port of Rotterdam
Proximity	+	-
Connectivity	+	+
Volume handled	-	+
productivity	-	+
Port Capacity	-	+
Infrastructure	-	+

Source: Author, 2018

4.3.2 Operational service

Distribution costs

The distribution costs are divided in shipping, port service and hinterland costs. Tables 9, 10 and 11 show separately the average cost aforementioned gathered from searates, while in table 12 and 13 we can find a summary of the transport quotation gathered by COSCO rates for both import and export.

As shown in table 9 the shipping rate costs are lower when vessels are distributed from Shanghai to the Northern ports. These results are anomalous consider that the route from Shanghai to Genoa is shorter and takes less time to arrive ("+" maritime shipping for PoR; "-" for PoG).

The reason for this price difference is that shipping companies opt for the port of Rotterdam and Hamburg due to its advantages. Even the largest ships can be accommodated 24/7 by the terminals in Rotterdam and Hamburg thanks to the absence of obstacles such as locks, tides or draught. That is why in North-West Europe these ports receive the highest number of calls from Asia ("Port of Rotterdam", 2017).

Genoa, on the other side, is not one of the main ports accommodating linear shipping services, but rather attracts smaller feeders (Genoa acts mainly as a getaway port while Rotterdam also as transhipment port). While Rotterdam is a direct port of call, for Genoa, ships need to stop in

several intermediary nodes before the final delivery, which increases total shipping costs (" -" maritime shipping for PoG).

Even though the new deep-sea terminals in Genoa can host large vessels, most of the routes still end in Rotterdam and Hamburg. Mainly because the port authorities have established more favourable contractual agreement with shipping lines which are based on the amount of times shipper makes use of the port, the gross tonnage of the vessel and the quantity of transhipments ("Port of Rotterdam", 2017).

Table 9: Shipping cost for a 20ft container from Shanghai to selected ports

Shipping transport (€)	Liner Shipping	
	Cost	Time
Hamburg	650	29 days
Rotterdam	650	28.5 days
Trieste	1100	22 days
Genova	1000	23 days

Source: (load calculator searates, 2018)

If we compare the port service cost per container, both Rotterdam and Genoa seem to be offering competitive prices Table 10 ("+" port service cost for PoG). However, in the total costs summed up from COSCO quotations shown in table 12 & 13, Rotterdam can distribute these regions in a more cost-effective way. This is thanks to the low shipping fares and the optimal multimodal hinterland connection that lies between the northern ports and contestable hinterland.

Table 10: Port service cost for a 20ft container from Shanghai

Port service Cost (€)	Rotterdam	Genova	Hamburg	Trieste
Agency documentation fee import	-	30	-	30
Ecological and Radiological service	15	15	18	15
Import Service	25	10	29	10
International ship and port facility code	-	-	12	-
Port dues	40	25	23	25
Agency Logistic fee Import	-	20	29	20

Destination Terminal handling Charge	235	230	269	200
Lift on lift of service	211	-	-	-
Total service costs	**315**	**330**	**380**	**320**

Source: (load calculator searates, 2018)

For the hinterland distribution, Italy has the highest percentage of road transport 85% ("Ferrovie dello Stato", 2017). Italy can offer a competitive price 0.9 €/km compared to the Netherlands 1.3 €/km for container transport by road. However, this does not apply for rail services. This mode of transport is more efficient and sustainable compared to road, for long distances. Genoa may distribute the contested areas in a competitive way only by road, while Rotterdam can benefit of a multimodal transport system with the combination of both rail, road and barge. The strategic position of Genoa in the contested area is clearly visible in the hinterland costs. Table 11 shows the cost estimates for a 20ft container by different mode of transport. Genoa is more competitive in road transport due to low rates and a limited incentive on rail transport. Such condition may be beneficial for limited amount of volumes. However, the trend is changing. The focus on reducing cost and emissions, together with increasing volumes imposes a larger use of railway service which Genoa cannot fully provide yet.

Table 11: Hinterland transport cost for train and truck: (Import and Export)

Hinterland transport cost (€)	Train		Truck	
	Stuttgart	Munich	Stuttgart	Munich
Hamburg	989.00	1,049.00	1,593.00	1,929.00
Rotterdam	838.00	1,078.00	1,490.00	2,043.00
Trieste	1342.00	1,265.00	977.00	685.00
Genova	1250.00	1,418.00	869.00	855.00

Source: (load calculator searates, 2018)

As most of the estimates were found separately, through COSCO shipping quotation some general rates were provided and were used as a mean of comparison even though they diverge from the average separate rates found on Searate because of market fluctuation. As we saw in the theoretical section, the logistic price trend has large fluctuation depending on the intra economic relations across two countries. Therefore, these quotes consider the current situation but may not have a future/historical validity.

From Table 12 we can observe that Rotterdam in imports currently provides the lowest fares from Shanghai. In table 13 instead, Hamburg node is more cost-efficient when compared to Genoa and Rotterdam in the export market. However, the cost different is not substantial, indicating that the distribution of Bavaria and Baden-Württemberg is not an illusion for both of the node. Genoa seems to be more competitive for exports while for import, Rotterdam is more competitive over Genoa ("+" Total costs for both PoG & PoR). When compared with Trieste, Genoa is more cost effective, despite Trieste having invested in private rail service across the Alps (Shore2Ship, 2017).

The limited price difference and the large gap in container volumes handled indicate that logistic distribution is not merely driven by price/cost, but other factors need to be considered.

Table 12: Total cost for contestable area distribution Import

Shanghai-Munich (electronic appliances)	Cost				
	Shipping	Port	hinterland	Total	var % total cost
Hamburg	600	380	1145	2125	0.00%
Rotterdam	650	425	1078	2043	-3.86%
Trieste	1000	300	1200	2500	17.65%
Genova	950	330	1000	2280	7.29%

Source: (COSCO quotations, 2018)

Table 13: Total cost for contestable area distribution Export

Shanghai-Stuttgart (ATV)	Cost				
	hinterland	Port	Shipping	Total	var % total cost
Hamburg	1145	185	450	1780	0.00%
Rotterdam	1200	210	450	1860	4.49%
Trieste	980	250	700	1930	8.43%
Genova	1000	175	650	1825	2.53%

Source: (COSCO quotations, 2018)

Summary of comparison

Operational costs	Port of Genoa	Port of Rotterdam
Shipping cost	-	+
Port Service cost	+	-
Hinterland transport cost	+	+
Total transport costs	+	+

Source: Author, 2018

4.3.3 Supply-Chain Reliability

Even though there are no considerable differences in terms of distribution price, the fact that Northern range ports have a larger market share along the contestable hinterland is because of a more reliable supply chain distribution network, which strongly attracts shipping companies.

First because Rotterdam has an extensive intermodal network of rail, road and inland waterways, it ensures that cargo will easily and efficiently find their way from and to the rest of Europe. The main industrial and economic centres of Western Europe can be reached from Rotterdam within 24 hours. Based on volume, desired speed, price and sustainability objective, the optimal mode of transport can be chosen. There is a suitable, reliable solution for any type of cargo (“Port of Rotterdam”, 2017)

Even through there was no available data regarding the specific handling time for the port of Genoa and Rotterdam, from the World Bank and route planner option on Searates we found more general data on lead and handling time. From table 14 we can observe that it takes approximately one day more in Italy to handle goods that are imported. This is because Italian ports and Genoa, in particular, lacks of strong investments in high tech customs clearance services, which minimises delays and prevents unnecessary cost for ship owners (Parola & Maugeri, 2013). Without a central customs centre and a digital scan system for dues and import paper submission, Genoa will remain an unattractive port. The port duty system in Genoa is not centralized and automatized like in Rotterdam. In general, it takes a few hours to do a control over duties in Rotterdam while in Genoa it can also take months (Baumgartner, Sole 24 Ore). However, these limitations are not present in the export, where Genoa proves to be an efficient node due to the more simplified procedures.

Table 14: reliability of service

	Hamburg	Rotterdam	Genoa	High-Low	Low-High
Lead time to import (days)	2.4- 3.0	2.6-2.0	3.5 - 3.0		
Lead time to export (days)	2.3-3.0	2.6-3.0	2.3-3.0		
Customs clearance process (port)	3.88-4.20	3.99-4.12	3.19-3.45		
Frequency of shipments	4.33-4.45	4.38-4.41	3.93-4.03		
Ease of arranging competitive price for shipments	3.91-3.86	4.05-3.94	3.57-3.65		
Ability to track and trace	4.12-4.27	4.14-4.17	3.66-3.86		

Source: data Retrieved by World Bank, country specific logistic performance index (2017)

Despite delays in handling time, the potential lead time distribution through Genoa is 6 days shorter than Hamburg and Rotterdam (table 15). Shorter lead time means lower cost for shipping companies which can bring to more competitive prices. However, the lead time advantage of Genoa cannot be fully exploited because of the limitations aforementioned in the previous sections. As a matter of fact, the frequency of shipment through Genoa are still lower than Rotterdam and Hamburg.

Table 15: Lead time distribution

Shanghai-Munich (electronic appliances)	Time			
	Shipping	Port	hinterland	Total
Rotterdam	29.29	2.3	1	32.6
Genova	22.63	3.25	0.75	26.6
Hamburg	29.29	2.8	1	33.1

Source: Searates, Logistic Explorer (2018)

Lack in technology is also visible in the low score of Italian port in track and tracing. This is a fundamental aspect demanded by costumers in todays globalized market where fast and on time services are key requirements (see table 14).

From table 14 we conclude that in terms of reliability and performance Genoa port system has a great set of disadvantages with respect to Hamburg and Rotterdam, as it ranks lower in each section (the rank was based on an evaluation of field interviews of carriers and shipping companies). Also, another disadvantage that has been studied in the research of AT Kearney (2011) shows that the variability in the time of distribution from Genoa is higher than in Rotterdam. By analysing the lead time to distribute goods from Singapore to Milan, the research found out that through Genoa there is a variability in time of 20 to 38 days while through Rotterdam of 32 to 37 days, indicating higher distribution uncertainty through Genoa. As logistic service providers run at minimal profit margins, a delay in distribution may lead to a loss in profit.

summary of comparison

Supply-Chain Reliability	Port of Genoa	Port of Rotterdam
Lead time distribution	+	+
Variability	-	+
Reliability of service	-	+
IT services	-	+
Frequency	+	+
Lead time	+	-

Source: Author, 2018

4.3.4 Business Environment

What the port of Genoa is missing is an attractive business environment. Even though important industries are settled in proximity to the port, the government was not capable to attract large foreign investments and create a flourishing business setting (Bathelt, 2004). Large groups working in the maritime, military and chemical sector such as Fincantieri, Finmeccanica and Ansaldo have the potential to create an important industrial cluster in the region. Even though the presence of such groups has favoured multiple sector services and innovative opportunity; the bureaucratic system, the inefficient governance, the power of unions and the high tax wedge have limited the economic expansion of Liguria region.

Rotterdam managed instead to attract an internationally renewed business community. Through well-established collaboration that port authorities consolidate with academic institutions and private sector. The fiscal exemptions push foreign companies to invest and settle in the Netherlands because of the low taxation, low interest cost, high loan multiplier and postponed payments on VAT for storage of non-EU goods in bonded warehouses. These characteristics, combined with simplified procedures for opening a business, mark a clear gap between the two harbours ("Port of Rotterdam", 2017).

However, there are also positive trends that may foresee the growth of the port of Genoa and the Liguria region. The reorganization of the port systems in Italy which is finally nurturing supply chain capabilities by promoting better synergic interaction between port authority and business operators (De Martino, 2013). A more organized institutional environment has been set, with Finport caring out training activities in the field of intramodality, logistics and transport network. Global operators in Genoa are merging existing terminals to improve efficiency and increase return on investments. Thanks to the independency of port authorities and the collaboration with private investors, rail systems are becoming a more flourishing sector to invest in and financial resources are better allocated. The fact that Chinese shipping companies such as COSCO have invested in Mar Liguria port System further defines the interest of China to set strategic alliances in Italy and may further increase the FDI in Genoa (Ship 2 Shore, 2016). The priority of TEN-T project to pursue the Rotterdam-Corridor gives a large financial support to Genoa (40% of Terzo Valico is financed by the EU), that with the current deficit, has limited public funding available

However, many other solutions are needed. Financial facilitations, tax reduction for FDI, advanced technological network and a low level of bureaucratic procedures to create a more flourishing and simplified business setting are needed.

Summary of comparison

Business Environment	Port of Genoa	Port of Rotterdam
Industry	+	+
Taxation	-	+
Differentiation of services	-	+
Bureaucracy	-	+
Cost of Capital	-	+

Source: Author, 2018

5. Evaluation of the inland new infrastructure projects impact on Genoa port-container traffic.

In this section will focus on the Terzo-Valico, a new connection with high speed and high capacity which improves the connectivity between Genoa-Milan-Turin and may lead to access the contested areas across the Alps namely the Baden-Wurttemberg and Bavaria region.

This new infrastructure, under construction, is part of the strategic plan of the Trans-European infrastructure network (TEN-T) and may change the competitive scenario for Genoa.

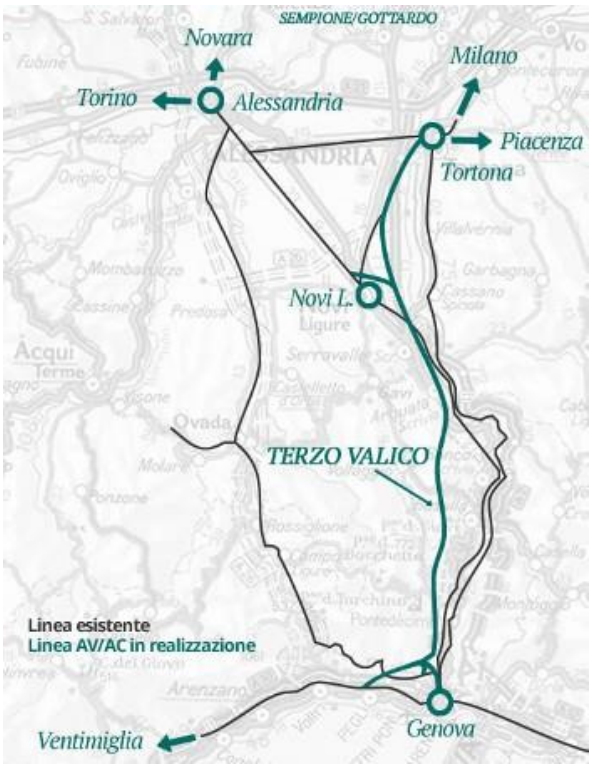
Because of the limited data and information regarding the Terzo-Valico impact on freight growth estimation it has been decided to run some field interviews with relevant people working in the Port of Genoa. The aim of these interviews was to get a qualitative perception of the operators on the benefits of this infrastructure.

Figure 11: TEN-T Project, Corridor Genoa-Rotterdam

Source: TENT Project website, 2018

The Terzo-Valico develops on a corridor long 53 km, it is formed by 37 tunnels and it will be connected to the already existing track through four interconnections 14 km long, located respectively in Voltri, Genova, Novi Ligure e Tortona. The project starts from Genoa, goes along the direction of the current Genoa- Milan track until Tortona and then along the Alessandria-Torino track until Novi Ligure. Finally, it reconnects to the existing infrastructure both to Milan and Turin. The infrastructure is in line with all the objectives that are defined in the TEN-T project, in order to satisfy the volumes and innovation requirements which are standard along the axe. Terzo Valico will be realized with two tracks, a 750-meter freight trains will be eligible to pass through the tunnels, reaching the maximum speed of 250 km/hour and with a 12,5 ‰ maximum slope. The current infrastructure is 30 ‰ slope, which is not optimal for the transport of cargo by rail and does not fulfill the European requirements for the TEN-T project. (“Terzo Valico, 2018)

Figure 12: Mapping Terzo-Valico Project



Source: Terzo-Valico website, 2018

In the table 16 a summary of the difference in performance between the current infrastructure node and the introduction of the Terzo Valico can be found.

Figure 13: subdivision of throughput in port of Genoa per type of cargo. ("Port of Genoa", 2017)

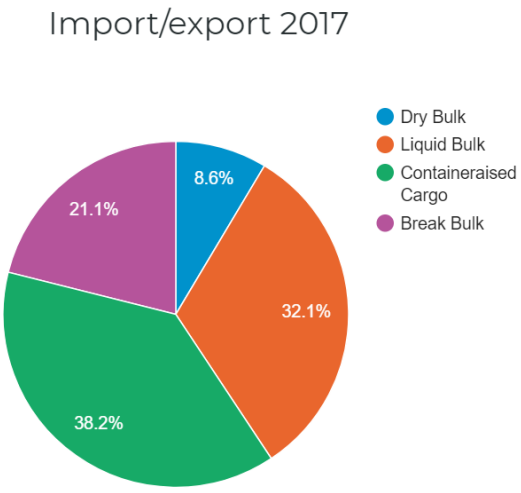


Table 16: Summary of the current/Terzo Valico performance. (Author, 2018)

Summary	Current Infrastructure	With new Terzo-Valico
type of trains (meter)	500	750
ton capacity per train	1,300	1,600
number of trains per day	180	360
residual amount number of trains	100	40
Maximum number of trains x day	265	400
Maximum capacity potential of TEU per year	1'600'000	3'500'000
number of days considered	330	330
speed of trains (km/h)	35	110

The current infrastructure has a limited theoretical capacity of 1'600'000. In 2017, 400'000 TEU were distributed through the current tunnel system towards the north of Italy (Port of Genoa, 2017). There is a residual capacity of approximately 1'160'000 TEU that the current infrastructure node could hold. However, there is only one track that connects Genoa-Milan and this one is shared among passenger and cargo trains, reducing the frequency of trains per day transporting containers.

Even though there is sufficient capacity on the current track, the failure to complete the Terzo Valico will limit the long-term strategic objective pursued by the port authority of Genoa: connect the port efficiently to the Baden-Württemberg region and Bavaria by 2030, reaching 3'000'000 TEU handled and distributed by Genoa, and managing 30% of its distribution by rail (Signorini P. E., personal interview, 10 July 2018). This would mean, reaching 1,836,000 TEU handled which overpasses the maximum theoretical capacity of the current infrastructure node.

In 2003 a cost benefit analysis report was submitted by the committee of infrastructure consortium of Treno Alta Velocità S.p.A. The estimates for infrastructure cost/benefits were set, considering that the new Terzo Valico would be terminated in 2013. Now the project is still under verification and with the new funding delivered in 2017 of 6 billion euros, it is expected to opened in 2021. It looks strange but no other analysis has been updated so far on such an important project. For this reason, in this research, some field interviews were performed in order to understand along the multiple players working in the port system, what is their opinion on the Terzo-Valico and on whether this infrastructure could be beneficial for the growth of container volumes directed across the Alps.

Interviews

There have been strong debates on the benefits that the Terzo-Valico can bring to the region. The instable political situation and the change in governments delayed the construction of the infrastructure. The Five Star Movement, now at the government, is against the Terzo-Valico realization (E. Molisani, personal interview, August 5th 2018). Alberto Zolezzi reported that the infrastructure will reduce the travel time to Milan by just a few minutes and will have a devastating effect on the territory (destroy the mountain which are rich of asbestos). Moreover, the cost of the infrastructure totals up to 16 billion euro of public funds. Enrico Molisani, on the other side, says that the decision of the 5 Star Movements does not consider the importance of infrastructure as base for the regional economic development. A lot of funds have been already spent on the Terzo Valico and it still remains a fundamental project for the sustainment and growth of the port and the region. First it will augment the capacity of the container traffic, which will be moved from road to rail from 15% to 30% by 2030 and 50% in 2050 and will considerably reduce the emission levels. This will have both positive impact from an economic and environmental prospective (E. Molisani, personal interview, August 5th 2018).
There are strong political movements NOTAV (No Treno Alta Velocità which translates to No High Speed Train Movement) more favorable to renovate the current infrastructure system rather than building a new one. The reason of this dispute is that according to the NOTAV movement Genoa has other urgent urbanistic priorities (E. Molisani, personal interview, August 5th 2018).

Augusto Cosulich, CEO of the shipping company Fratelli Cosulich (personal interview, 6th July 2018) reiterates that the services provided by the port for shipping and distributing to-and-from the port are not efficient in terms of time and reliability.

The Terzo-Valico will be a key element for the Port of Genoa in order to optimize and expand the market area the port may serve. At this moment Genoa is only capable to reach the national market. Together with the Gotthard tunnel that connects Italy to Switzerland, the Terzo Valico could become an important infrastructure node. However, many things need to be considered. First of all, the Terzo-Valico is long 57km and connects Genoa to Tortona. After that the railway reconnects to the old infrastructure which currently connects Genoa-Milan, may have some bottlenecks. Second, Italy does not have 750-meter trains which are a currently used in Germany and Netherlands, which considerably reduce unit cost and emission levels (Cosulich A., personal interview, 6th July 2018).

If the Genoa port authority does not act immediately to improve its processes, it may risk that the area defined as "contestable hinterland" among Mediterranean and Northern range ports, may reach the Italian territory, increasing the radius of influence of the Le Havre-Hamburg range ports. (Cosulich A., personal interview, 6th July 2018).

Ing. Manuala Sciutto, Sector Manager for Ports, Coastal and Marine Facilities RINA consulting which has followed closely the Terzo Valico project, believes that the only use of this infrastructure will be not sufficient to restore competitivity to Genoa.
Through the Terzo Valico we expect an increase in volumes of 20% in throughput over the next 4 years after the termination of the project (from 2022-2026), and it will have an annual capacity of 3.5 mln TEU/year. This is an improvement considering that the current rail system capacity is of 1.6 mln TEU/year and with it, it is not possible to currently propose a multimodal transport system. Moreover, Italy has a high dependence to road transport (on average 85% of total transport) and without this infrastructure it will not commit to the EU requirements of moving 30% of goods through rail in a more sustainable and efficient way by 2030. However, from an engineer's prospective the Terzo Valico by itself will not increase considerably the volumes handled in Genoa and will not lead to an expansion in market share across the Alps. Many other infrastructures need to be terminated or projected in conjunction with the Terzo Valico. For example, the expansion of terminal Calata Bettolo e Vado Ligure is fundamental to increase the capacity of the port, a centralized system for port dues control, the Gronda connection for road transport and the shuttle service that connects the port to the railway system.
Other problem that arises is that the Terzo Valico is still not connected efficiently through dry-port system directly to the port docks. For this reason, most of the trains still have to pass through the Sampierdarena station which has a maximum length of 575 meters and may not accommodate the 750-meter trains. It is for this reason that the Terzo Valico cannot be thought separately as an infrastructure but connected to a complex network. In symbiosis with the inter-ports, the Gotthard and Brenner tunnel, then the function of the Terzo Valico will be fulfilled and will be able to innovate the entire infrastructure system.
In conclusion, the limitation in the use of long-range trains reduces the competitivity in terms of price and efficiency of the Mar Liguria intermodal system. In 2013, a European Coordinator for the TEN-T Rhine-Alpine Corridor was appointed to synchronize the projects along the corridor

and attain the same interest between port systems, private international corporations, small companies and local communities. For example, the new Brenner Tunnel project, which connects Italy across the Alps from Milan-Basel-Stuttgart-Mannheim, will be completed by 2020. This project will suite for 750-meter trains with a capacity of 1600 tons and by the end of 2020 it is expected to held 260 trains per day as the Terzo-Valico. Once the existing inland intermodal systems will be integrated with the new infrastructure projects, Genoa will definitively increase the volumes handled by its port (de Martino, 2013).

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6. Conclusion

The research paper compares Genoa's port with Rotterdam one determining which of them will be in a position to profit more of the new Alpine-Corridor under construction, to serve the Baden-Württemberg and Bavaria Landers, currently served by German ports. To answer the central research question, the container sector was analyzed, in order to have a general overview of which are the driving forces/trends affecting the market. After that, port functions and developments have been analyzed based on prevailing criteria found in literature.

Ports' competitive position has been analyzed based on Availability, Operational service, Supply-Chain Reliability and Business environment; This system allows to compare ports with different functions, development and dimension.

Based on the above parameters, we observed that currently the Port of Rotterdam has generally a more positive competitive trend compared to Genoa (see table 17, below).

Table 17: Summary of current competitive position[5] (Source: Author, 2018)

	Port of Genoa	Port of Rotterdam
availability		
Proximity	+	-
Connectivity	+	+
Volume handled	-	+
productivity	-	+
Port Capacity	-	+
Infrastructure	-	+
Operational costs		
Shipping cost	-	+
Port Service cost	+	-
Hinterland transport cost	+	+
Total transport costs	+	+
Supply-Chain Reliability		
Lead time distribution	+	+
Variability	-	+
Reliability of service	-	+
IT services	-	+
Frequency	+	+
Lead time distribution	+	-
Business Environment		
Industry	+	+
Taxation	-	+
Differentiation of services	-	+
Bureaucracy	-	+
Cost of Capital	-	+

Rotterdam is well interconnected to the global maritime shipping routes, it is equipped with advanced and automatized infrastructure systems, it is interconnected with an efficient intermodal inland distribution and it has large and not totally exploited capacity.

From an operational service point of view, Rotterdam is currently more cost competitive in the import market but not in the export market. Hamburg is still preferred over Rotterdam because as being a more efficient port for national territory. With the new Alpine-Rhine Corridor the inland

[5] Rank "-" low competitive advantage to "+" high competitive advantage

distribution costs and lead time could further diminish, putting Rotterdam in a better cost-competitive position.

Rotterdam has a reliable supply-chain system: it has an advanced IT system for track-trace goods and for standardizing/simplifying processes. As a result, Rotterdam ranks as one of the best ports in the Logistic Performance Indicators.

Rotterdam has also a favorable Business Environment thanks to efficient governance, low cost of capital, low taxes and low social security contribution. The port benefits of a collaborative approach among private and public entities (government, academic institutions, corporations).

On the other side, Genoa, when compared with Rotterdam, on availability bases, results having lower international routes connections. The port' dimensions and volumes are smaller than Rotterdam, impacting on the efficiency. However, port capacity is not fully exploited and there are plans on terminal expansion. The geographical position plays positively on port call selection for EU-Asia routes because it allows shorter shipping time.

From the operational service point of view Genoa port distribution costs are more or less in line with Hamburg and Rotterdam. There are high cost reduction potentials once rail service along the corridor will be available (volume and price effect).

At this moment Genoa seems less competitive in the Supply-Chain Reliability parameter. Import process are long because of inefficient custom clearance bureaucracy. There are evident bottlenecks in the inland logistic infrastructure and there have been limited investments in IT services.

Finally, high level of bureaucracy, no clear port governance, high unions' power and high level of taxation generate an unattractive business environment.

Table 18: Summary of future competitive position[6]

	Port of Genoa	Port of Rotterdam
availability		
Proximity	+	+
Connectivity	+	+
Volume handled	+	+
Efficiency	+	+ +
Port Capacity	-	+
Infrastructure	+	+
Operational costs		
Shipping cost	-	+
Port Service cost	+	-
Hinterland transport cost	++	+ +
Total transport costs	++	++
Supply-Chain Reliability		
Lead time distribution	++	+ +
Variability	+	+
Reliability of service	+	+ +
IT services	-	+
Frequency	+ +	++
Lead time distribution	++	+
Business Environment		
Industry	+	++
Taxation	-	+
Differentiation of services	+	+
Bureaucracy	-	+
Cost of Capital	-	+

(Source: Author, 2018)

According to the findings from the comparative analysis, with the new corridor, Rotterdam will still have a greater chance to gain market share across the contested regions (see table 18). The earlier termination of the Northern part of the Corridor, will give a significant time advantage in promoting Rotterdam as an alternative port. A field research of Bayrolo(2017) found out that the

[6] In this case to the rank "-" and "+" was added a sign "++" and "- - " if the competitive position of the ports would respectively increase/decrease with the introduction of the Corridor along the contestable zone. The colored box indicates if there was a positive improvement in competition thanks to the new corridor.

Rotterdam-Bavaria connection is still not widely known. The termination of the corridor could surely increase the reputation of the port, as a faster and more efficient node.

The termination of the Alpine-Corridor could mean an increase of service frequency from Rotterdam to Bavaria which could leads to improved multimodal solutions offered by Rotterdam.

However, despite this gap, Rotterdam and Hamburg ports will need to consider Genoa as a real future rival. From table 18 it is possible to observe that the termination of the Corridor and Terzo Valico will bring larger benefits to Genoa than to Rotterdam.

The Terzo-Valico will double the amount of trains leaving the port of Genoa and will improve the direct connectivity from the harbor to the inland. This means better efficient solutions for the port, larger volumes handled, less bottlenecks and more consolidated services.

The termination of the Terzo-Valico together with the Brenner Tunnel in 2021, the further privatization in the rail system and the growth of intermodal solution across the Milan-Turin-Genoa will reduce hinterland distribution cost, lead time and reduce variability.

In conclusion, while Rotterdam will not benefit exponentially (in percentage growth) by penetrating the market of the contested zone, Genoa has all the interest in gaining market share in Southern Germany. Baden-Wurttemberg and Bavaria markets represent the only real growth target for the port of Genoa and the opportunity to become a large player among European ports. However, even with this new infrastructure project, the port of Genoa will surely be in disadvantage over the northern range port rivals. The termination of the Terzo Valico seems to not have strong positive spillover effects over the business environment of Genoa port system and Liguria region. The delays in constructing the TEN-T projects, the unstable political situation and the limited financial resources are surely macroeconomic scale problematic that can only be improved with better governance and political stability.

While writing this paper a major disaster occurred in the Genoa' inland infrastructure. The Morandi Bridge collapsed cutting of the road and rail connection between port and hinterland. In the next section it will be provided an analysis of the event and its impact on the above conclusion

7. Events affecting the port of Genoa short term traffic and accelerating infrastructure.

Figure 14: Collection for newspaper reporting the Morandi Collapse news (Author, 2017)

On August 14th 2018 a dramatic event occurred in the town of Genoa. A bridge on the A10 motorway collapsed with a total dead toll of 43 people. Designed by engineer Riccardo Morandi in 1967, the bridge over the Polcevera river and the railways from the Genoa, was connecting the Industrial area of Cornigliano with Sampierdarena district.

The bridge was having three functions (interview Gian Enzo Duci, 17th August 2018):

1) it was an important city axe between the east and the west part of the town,
2) it was a key linchpin for the goods transportation network connecting Italy France and Spain
3) it was a major infrastructure serving the port of Genoa

Picture 3: Location of the Morandi bridge in Genoa

Source: Sole24ore, Morandi Bridge (2017)

With over 60'000 daily transits, it is obvious that the impact of such an event has a radical affect the local commuting transportation, the city economy, the port efficiency, the northern Italy and Central Europe import/export cost and capacity, the Italian France logistic corridor on a short and medium term.

With less than a month since the occurrence of the bridge collapse there is not yet a clear evaluation of the consequences of such an event. The authorities and the motorway concessionaire are still managing the emergency and it's time now to take rapid decisions on how to give answer to immediate problems and on how to bring back to normality into the logistic network as soon as possible.

In a business world consolidating risk management as a key part of the company management structure it seems that neither the concession grantor, neither concessionaire, made any risk evaluation of a long-time interruption of the bridge.

Here below it has been tried to run a rough evaluation of the logistic impact and immediate remedies, the economic impact, the possible future scenario based on the information gathered immediately after the bridge collapse.

7.1 Logistic Impact and immediate solutions

Picture 4: Collapse of the Morandi Bridge

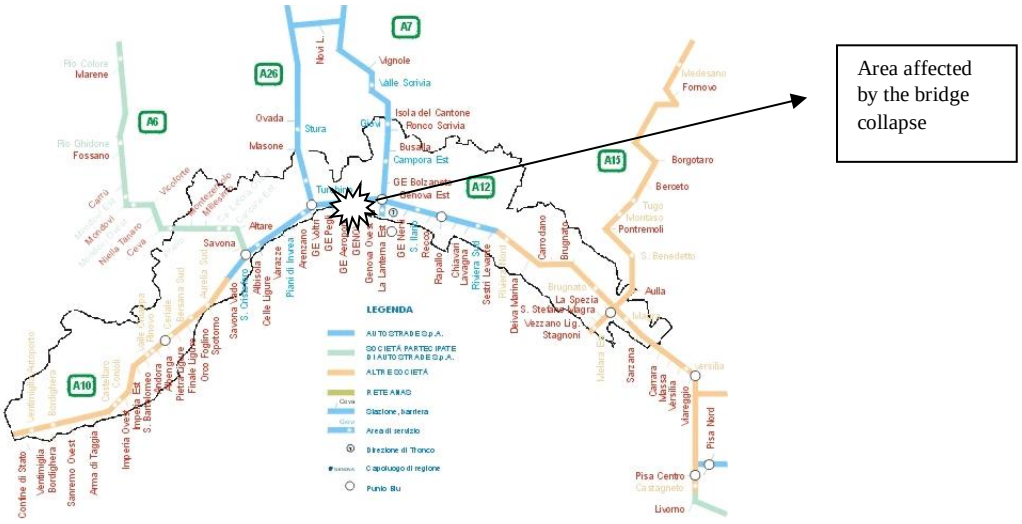
Source: Sole24ore, Morandi Bridge (2018)

As already mentioned the Morandi Bridge was crossed approximately by 60'000 daily transits; 2'000 were trucks transporting goods from and to the Genoa port or from and to France/Spain south corridor.

It's clear that the first major impact is on the car transit for local commuting traffic and for connecting the western part of the region to the east one. The traffic normally using the motorway to bypass the city will have to be through the city streets. That's it obviously nearly unfeasible. Traffic jams, city blockage, increased pollution, will oblige the administration to take alternative solutions. For the local traffic the municipality has already announced a plan to improve the public transportation service by increasing the number and the frequency of buses and the number of local trains for railway connection. An incentive will be given to use public transportation and eventually a city tax will be paid for those continuing using private cars. Options to use unutilized areas of the industrial site of Ilva (a steel company) and other belonging to the state close to the port are under investigation. Because of the vacation period, the mobility has not been put under stress yet but surely when the industrial, port, commercial and tertiary sector activities will restart together with schools and universities the situation will change significantly (Buonadonna, 2018).

The truck transportation, in some way will have not a significant impact. First of all, because of the relative limited number of vehicles transit on the collapsed bridge (2000/d). Second because, in case there is not the will to risk to lose time in Genoa's local roads, the motorway network around Genoa allows to take alternative solution. Actually, from the north of Italy industrial centers to Genoa there are alternatives to reach the western or the eastern parts of the A10 motorway (see Figure 15). There are at least two connections between the A7 and A26 highways and the A6 connecting Piedmont region to the western part of A10 and the A15 connecting the north eastern industrial districts to the eastern part of the A10. Of course, the cost of transportation will increase because of the longer distance and because the traffic charge of the mentioned highways tracks will increase. More difficult for the goods that will be transferred from the south of Italy to France and Spain and viceversa. There are no alternative solutions rather than exiting from the A10 where blocked, use local roads and re-enter at the A10 once over passed the interruption (Cafasso, 2018).

Figure 15: Highway system connecting Genoa



Source: Author (2018)

The collapse of the Polcevera motorway viaduct, is not affecting only the road transportation but also the railway transportation connecting the Genoa Port to the North Italy. The bridge debris have blocked and damaged the rails of the three railways lines: the Sussidiaria lines for the

passenger transportation between Genova Sampierdarena and Genova Rivarolo/Busalla; the Bastioni line for passengers and good transportation between Genoa and Ovada/Milan /Turin; Sommergibile line connecting Genova Marittima (port) and Genova Sampierdarena. From the port operation view point at this very moment the railways are now blocking approximately 20 daily trains transporting containers. The rail transport will be temporarily substituted by a not efficient truck transportation ("Trasporto Europa", 2018). The longer way, due to the bridge unavailability and the additional need for special containers trailers will increase the logistic cost by approx 100 € per trip according to Alessandro Berta, General Manager of Savona district Confindustria (Lombezzi, 2018).

During the day time along the alternative routes recently defined heavy trucks won't be allowed. This will oblige transportation companies to work during the night shift (35% additional cost for truck drivers) and to use small trucks (below 7,5 t) during the day. This may further increase the operational cost gap between Genoa and Hamburg of more than 15% difference (Lombezzi, 2018).

For the time being the impact of the collapsed bridge has not been seen significantly on the port activity. The confidence of the international shipping companies has not been lost and it seems that there are no significant changes in the maritime transportation plan in the short terms (one month).

Actually, there are not yet signs of northern Italy and South Europe industrial districts destinations/departures announced changes. Only three weeks from the event are not surely enough to understand which is the impact. Only September and October trends will give substantial indication of the trend ("Dopo il crollo di Ponte Morandi", 2018).

7.2 Economic impact

Genoa, with approx 580.000 inhabitants, as it has been mentioned is most important Italian harbor for container transportation. According to a study run by Sanguineri et al. (2016) in 2015 the Genoa port supply chain was employing 28.000 direct workers with nearly 7 billion euros annual sales and 2,8 billion euro added value. The research paper has highlighted that including the indirect activities the port of Genoa has generated 11 billion Euro sales and 4,6 billion euro

added value with 54000 people in Liguria region. Only 48% of the port supply chain activity is generated in Liguria. The impact at national level more than doubles in terms of total sales and employment.

On top of this in 2017 the port of Genoa has generated approximately 6 billion euro of Tax (VAT) and Duties collected at national level. The economic importance of the port for the regional and national territory is clear. The Morandi bridge may have a devastating effect on it. It has been decided to make an evaluation dividing direct and indirect economic impact being the second the most important one.

7.2.1 Direct economic impact

Atlantia the motorway concessionaire, has announced a provision of 500 M€ for compensating the direct involved parties (Buonadonna, 2018).

The bridge collapse had a dead toll of 43 people and 9 wounded people. There is no money to compensate the loss of a life but insurance companies in this case won't pay less than 2 M€ per person.

More than 550 people were evacuated from their houses in the so called "Red Zone" because the remaining part of the bridge was built over the houses. It's not clear what would be done in the future for these buildings but the most probable solution will be the demolition and the relocation of the people. Assuming 300 apartments of 150 square meter each, the total cost will be minimum 150/200 M€ (estimate Author).

Today the Atlantia has committed to pay the mortgage payment of the houses involved.

For the bridge demolition and reconstruction there are not clear evaluations. On 28th August 2018 Renzo Piano, the world wide famous Genovese architecture, has donated to the municipality a first rough project to replace the Morandi bridge (Buonadonna, 2018).

Picture 5: Image of the President of the Region Giovanni Toti and the Architect Renzo Piano

Source: Corriere della Sera, Renzo Piano progetto Ponte Morandi (2018)

It's just a concept design of a project but it gives the idea of the urgency in replacing the collapsed bridge. What could be the cost for rebuilding the bridge? It's obviously difficult to make an estimation. There is a study meant to support the anticorruption authority, made by professor Pier Luigi Maffei of the University of Pisa, which is defining standard cost for erecting motorways. There are of course different evaluations depending if the highway is having tunnels or viaduct. Considering this study, the minimum cost for the 1182 m long bridge reconstruction can't be lower than 50 M€. Actually, considering that demolition and waste disposal cost should be included as well and the need of accelerating the reconstruction will affect the cost, it is assumed that the cost will be around 100 million € (Cafasso, 2018).

For the railway the works to clean the area and to refurbish the railway after three weeks from the tragic event have not yet started. The cost won't be huge 1/1.5 million€.

In the first week after the bridge collapse the concessionaire company, Atlantia lost in Milan stock exchange approximately 6 billion € and it has not recovered. The market is discounting of course the direct cost for which the company will be directly responsible but also the risk that the concession might be revoked.

Without considering the Atlantia market capitalization losses, according to the estimation run in this paragraph it seems that the direct economic impact will be in the region of 450 million € close to provision made by Atlantia.

7.2.2 Indirect economic impact.

As for the direct economic impact the evaluation of the indirect ones is even more complicated and a detailed and deep analysis should be done after few months of the occurrence of the bridge collapse event. What is sure is that the indirect economic impact will be significantly higher than the direct one and it will depend from many factors but mainly by the time for which the situation will be restored.

Just one item will be sufficient to overpass the estimation of the direct economic effect. One of the major impacts will be linked to the forecasted reduction of port activities. According to the President of the Western Port Authority, Paolo Signorini, in the short term, there will be a negative volume effect equal to - 10%. Considering that the VAT and import/export duties generated by the Genoa port count for approximately 6 billion € on annual basis a reduction of 10% represents a reduced income for tax authorities equal to 600 million € (personal interview Paolo Signorini, 2018).

Another important impact is related to the industrial and commercial businesses of the companies having their activity in the vicinity of the disaster. Confindustria Genova has declared (28th August) that in the collapsed bridge, so called "red zone" where is impossible to have access for the time being, there are at least 100 companies uncapable to work (large, medium, small and micro businesses) (Cafasso, 2018).

One of the most important company in the area is Ansaldo Energia. with 750 employees Ansaldo was obliged to temporary close its activity for approximately three weeks ("Dopo il crollo del ponte di Genova", 2018). Only with a recent revision of the red zone perimeter a green light has been given to reenter in the factory but with modified logistic and a part of the factory still considered off limits.

Confindustria committed to collect all the economic impact of the involved companies in a transparent and consistent way. It is supposed that the bill won't be cheap.

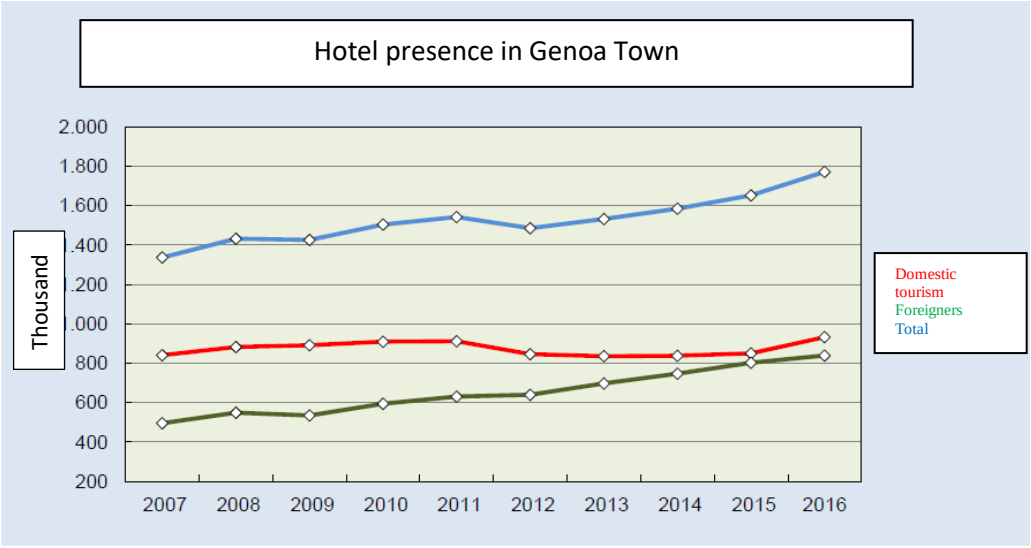
Atlantia after granting the support to the people obliged to move from their houses, has announced that will compensate the 20 companies in the red zone and their 400 employees. As of today, no one will be able to restart its activity.

A first estimation of the overall cost for bypassing the bridge area has been evaluated by the interview released on 21st August the president of the association Trasporto Unito, Giuseppe Tracognetti, declared a 6 M€ monthly over cost for the goods transportation by truck. No information has been found for the cost related to the railway interruption. It's nearly impossible to evaluate which will be the increased cost for the daily commuting of the Genovese citizens and the investment needed to reinforce the public transportation. It's too early and declaration up to now have been more qualitative than quantitative ("Contrasti sul retroporto genovese di Rivalta Scrivia", 28 August 2018).

The same issue is related to the impact of the tourism, the cruises and the ferry boats traffic.

Genoa in the last decade has invested a lot in promoting the town has tourism destination. Results reported by Institute of statistic for 2016 has shown a continuous positive trend in the town. and the presence of tourist in the Liguria region reached 15 million in 2017 according to Unioncamere (2017).

Graph 2: Trend of Hotel Presence in Genoa Town



Source: Comune di Genova, Database, 2017

Table 19: summary of the direct and indirect costs

Direct Impact	Value	Indirect Impact	Value
Involved parties compensation	500 Mln	Port Loss	600 mln
Bridge Construction	100 Mln	Cost for 3pl companies	6 mln
Building construction	150 Mln	Cost on region	450 mln
Railway work	1.5 Mln		
Atlantia	6 bln		
Total	6757.5 mln	Total	1056 mln

Source: Author (2017)

7.3 Possible future scenario

The following considerations and evaluations are based mainly on the information gathered through the media and the discussion with the interviewed people as there are no academic literature available on this topic.

The port system of western Liguria is actually a combination of three ports that are coordinated by the same port authority: Genoa, Vado Ligure and Savona. The port of Genoa is also composed of two different basins the Genoa harbor (eastern part) and the Prà one (western). A distributed activity over three ports, which is normally is considered an inefficiency because of the higher fixed cost and the need of coordination, in this case might result in a flexibility ("Port of Genoa", 2018). Actually, not all the ports are running at full capacity and some shipments can be diverted from one basin to the other according to the destination of imported or exported goods. There is the confidence of the port authority that actual port organization based on specialized terminals, can be improved by promoting flexibility and multi-disciplines when needed.

On top of this one of inefficiencies that characterized the port of Genoa vs Rotterdam one was the custom control time for imported goods. The emergency caused by the bridge collapse, has called all the operators to find immediate solution to reduce the time for controls. On 23rd August a working team composed by the regional Custom Agency director, the port authorities, port

operators, forwarders representatives, Confindustria and shipping companies started working actively to agree on an optimization of the organization model able to reduce the controls cycle. Improving connections between port and custom warehouses, distributing the control activity through flexibility and multi-functionality, reducing people, goods and documents transfer are the priority. Longer working time will be granted to accelerate the lead time between the arrival of the goods and the custom clearance. A better communication between forwarders and custom authorities will be implemented so to plan well in advance the control work and to distribute the work load (Buonadonna, 2018).

All these targets could have been reached before. Why the involved parties should be able to solve organizational issues in a short time while they were not capable or willing to do it before? It seems that the emergency has changed the attitude of the players: the defense position of single parties' interests is put aside and clear solidarity mood is pushing people to find fast and effective solutions renouncing to acquired rights or advantage positions. Will it be possible to reach these targets? I am quite confident on a positive reaction. Two weeks after the bridge collapse on 31st August the first protocol has been signed. An announcement of the Genoa port authority was stating "The Western Ligurian Sea Port Authority, the Spediporto Genoa Freight forwarders Association and the Genoa Terminal Operators Association, together with the Phytosanitary Division of the Liguria Region, have signed a cooperation agreement aimed at establishing a timed schedule of custom border inspections on agricultural commodities and food products imported across the Port of Genoa, to guarantee the completion of all inspections within 24 hours." (Interview Paolo Signorini, 2018)

The same day, the Ministry of Infrastructure and Transportation issued a new order (ORDINANZA N. 267/2018) reorganizing the internal port road network, allowing third parties to use few port roads to dilute the local traffic and increasing the opening period of the access to the port. The organization of the transportation in the port was frozen since 2007. These changes, which have a temporary validity so to evaluate their effects, were in part already requested by port operators and citizens since many years. Only under the pressure of an emergency the involved parties have been capable to find solutions and to come to an agreement.

The economic impact risk on the port operators, on state income, the employment care, the political need to show the capability to find quick solutions, will surely bring results on the "software" part of the port/logistic organization.

On the other hand, for the "hardware" part the answers will have a very long path. Despite some declaration of Atlantia management "we are able to rebuild the bridge with a steel structure within 8/10 months if we have free access to the area" and of the Ministry of Infrastructure and Transportation "we will have a new bridge within one year", I am convinced that the solution will take a much longer time.

This statement is based on historical experience in the Italian emergency management (i.e.earthquakes).

The first obstacle will be the Justice. The research of responsibilities seems to be at Government and at Judiciary levels a priority. Today, the judge for preliminary investigations, is focused in identifying the possible people involved in the responsibility of the disaster. On 6th September a Guarantee advise has been issued to 20 people with the accusation of negligent disaster, transport security breach and aggravated manslaughter. For the time being the judge has asked not to start any activity which can influence the preservation of proves. There already talks on how to keep the debris in a safe place for any future technical analysis. On top of this the concrete and steel structures, together with the asphalt are considered special waste (Cafasso, 2018).

It will be necessary to find an appropriate place were to move and stock such a material. To give an idea of the different perception of the priorities, for the time being the works to clear the railways which could give some relieves to the road traffic has not been allowed yet by the judge in charge Francesco Cozzi.

Even if the Government will issue an emergency decree at government level, the reconstruction won't be easy. The Government recently elected has a component (Movimento 5 Stelle) who made its political campaign against the realization of new infrastructures and against the ongoing project realization. They support the movement against the new railway between Turin and Lion (NO TAV), they are against the realization of the gas duct in Puglia region (NO TAP) and they were against the project La Gronda a road infrastructure project, supposed to start in 2018 aiming

to improve the competitiveness and logistics potential of both the port of Genoa and the entire region of Liguria.

Now at national level there is political battle against the concept of concessionaire. The Government is thinking to suspend the concession to Atlantia and to have the state in charge of the motorway network (Scozzari, 2018).

A discussion has started as well on who will be in charge for the bridge reconstruction: a state-controlled company, a pull of companies managed by a state authority, the concessionaire or a transparent international competition.

What is strange is that the discussion focus is on who will do the reconstruction and not on how and when. There is no indication if the bridge will be completely reconstructed or partially. There is not any idea of the technology to be applied. No idea about the material to be used. There is not even a drafted chronogram for the project. Time is of paramount importance and decision makers are delaying basic decision. The problem in Italy is that no one has a decision power and everyone has or thinks to have a veto power. As a result, long discussions, negotiation, consultations, will take place and because of the expected good results of the urgency provisional solutions decisions will be postponed (Scozzari, 2018).

The time intervention to restore the disasters caused by the earthquakes, that over the last century have destroyed the national territory, proves that the government is uncapable to find an immediate long-term solution within a year. The current unstable political situation, the limited financial resources available due to mounting deficit, makes us think that by 2021 the bridge won't be realized yet (2021 has been taken as a reference because is the planned date for the opening of the Terzo-Valico railway project).

7.4 Conclusions on the effect of the Morandi Bridge collapse

The catastrophe of the Morandi bridge has created a major damage to the Genoa' community. Beside the dead toll, the economy of the town and of the region is affected by reduced logistic connectivity for passengers and freight. Involved authorities have reset priorities: reestablish the road and train connection to avoid the Genoa port isolation is the sole target. The collapse of the Morandi bridge is the last of multiple disasters that have affected the city. The image of Genoa

has deteriorated in terms of poor administration and the limited investments. Hopefully, there will be a strong reaction of the port authority and the regional administration in order to fix the port system and logistic network in the Liguria region. The first positive visible reactions are the immediate extraordinary decisions taken to limit the traffic congestions. The adoption of flexible, multi-functioning and simplified custom clearance services will accelerate the transit time through the port. These actions are the proof that Genoa is capable to quickly react to this emergency situation. Moreover, after the bridge collapse, in some way the Terzo-Valico project will assume a more significant importance for the port logistic. In a country were road transportation is still playing a predominant role, the European and Italian target to increase the share of rail transportation will receive a further push. If the Morandi bridge will not be terminated by next year, the port authority needs to make sure that all rail connectivity, starting from the port and connecting the Piedmont and Lombardy regions are available and are efficiently functioning in order to reduce congestion from the highway system.

The above-mentioned reactions most probably will be just sufficient to maintain the current port clients. The delays in the bridge realization may further reduce the attractiveness of the Italian/Genoa business environment, reducing the role of Genoa in the Alpine-Rhine Corridor.

The port of Genoa is standing at a crossroad. If all the players involved in the logistic and port system are going to collaborate together in reconstructing the Morandi bridge, coordinate the new infrastructure project and providing the right incentives for businesses to invest in the territory then the future growth prospective will be in line with the recent positive trend seen so far. If not, the port of Genoa and its region may suffer a drastic depression, isolating Italy from other important markets and giving an “unbridgeable” advantage to Rotterdam to further expand its market influence onto Baden-Wurttemberg, Bavaria and North of Italy.

8. Discussion on long term growth prospect of Genoa, reaching the contested zone.

The earthquake in 1995 that completely destroyed the port of Kobe and the disaster over the Port of New Orleans in 2005 because of hurricane Katrina are catastrophic events that can give us a better picture of how the competitive environment may change for Genoa port in the long run (Cheng, 2000).

Both ports over the short run have suffered a period of depression in which all resources where allocated to rebuild and restructure the ports' infrastructure. The throughput handled diminished drastically over the short period and many activities stopped or diverted to nearby harbours. However, both cases show a surprising increase in efficiency and productivity to regain volumes and restart activities.

While the short-term prospects show similar reactions, long-term growth prospect are different. The Port of Kobe, which prior to 1995 ranked 6th among worldwide container ports, did not manage to restablish its dominance in the global maritime trade mainly because of high labour cost, slowdown of national economy and increase competitiveness in Asian maritime trade (Cheng, 2000).

New Orleans port, on the other side, managed to recover from the shock regaining its reputation as an important export node for the United States of America. However, limited are the financial resources available to further invest in innovative infrastructure to improve efficiency and capacity (Sayre, 2006). The reestablishment of New Orleans harbour was given by the efficiency gain in the short run and the economic stability regained over the last years of US economy.

So, what is the long term prospective for Genoa? Will it be still credible to gain market share over the contested region after the Morandi Bridge collapse?

To have a view of the long-term prospects we need to first look at the short-term situation. As mentioned in the previous section, for the short-run, if Genoa will terminate the reconstruction of the Morandi bridge, full operation could be restored in 2 years. At this moment President of the port authority Paolo Emilio Signorini estimated that within a year from the collapse of the Morandi bridge, the Port of Genoa will lose 10 percent throughput handled. This negative effect

will be subdued by the positive affects seen in this emergency situation: fast custom clearance, flexible paper submission and better coordination among parties.

We believe that in the long run prospective, the disaster will give a further push for investment in railway distribution, favouring better multimodal solutions for Genoa.

However, we do not think that, after the collapse of the Morandi bridge, Genoa' competitive prospective seen in table 18 could further improve (but rather could become worse).

Firstly because, even though there were efficiency gains due to emergency resolutions, the disaster will give a further time advantage to Rotterdam to consolidate the infrastructure and service provision from Rotterdam to Baden-Wurttemberg and Bavaria.

Secondly, because the political instability that Italy is currently facing is slowing down reconstruction processes and not granting a better general business environment. Taxation, bureaucracy and cost of capital will remain higher when compared to the Netherlands and Germany.

Finally, the limited financial resources budgeted by the government and the high cost involved with Morandi' bridge reconstruction may further saturate the resources available to further improve other bottlenecks along the corridor.

What limits the risk of Genoa losing competitiveness like the port of Kobe is the favourable position along the corridor, the central role of Genoa in FDI of Asian maritime companies and the fact that Genoa is currently one of the main ports for the distribution of the most important industrialized Italian regions.

We believe that with a fast resolution of the Morandi bridge, with a clear vision of this project along the corridor and a better approach of the Liguria administration towards viability competitiveness can be quickly restored. While the positive reaction is visible in the port authority, the chance of a positive spillover effect will depend of the resolution taken by the collaborative approach of political parties.

It is complex to give a prospect as the recent events are hardly quantifiable. What is sure that the case of Genoa can be useful for other ports to understand how to act and embrace future goals in emergency cases.

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10. Appendix

A.1 Introduction Italian port and market

The Italian port system and container market was (Assoporti, 2017). In table AA1 we can observe that the average growth in Italy over the last sixteen years was of 2.83%. This result is not in line with the growth of other European countries.

Table AA1: average growth of TEU in the main EU countries date retrieved: 2001-2017, Assoporti (2017).

Country Name	Average growth from 2001-2017
Belgium	5.51%
France	4.48%
Germany	6.62%
Greece	11.74%
Italy	2.83%
Netherlands	4.66%
Portugal	61.43%
Spain	6.51%
United Kingdom	4.86%

The other Mediterranean ports have grown and managed containers throughputs at a fast paste despite the competitive gap with the Northern range ports.

While twenty years ago the Mediterranean area was left out from the largest global sea routes, now this area has regained once again a central role over seaport traffic. The importance of the Mediterranean has grown due to the passage of vessels from Asia to Europe through the Suez Canal. In this way it takes 5 days less of navigation to distribute European hinterland via the Mediterranean rather than Northern ports (Bassanini, 2014).

Most of southern European ports managed to grow at a fast paste and reduce the competitive gap thanks to the foreign investments of Asian shipping companies, betting over the new routes to connect Asia to Europe. Italy on the other side did not manage to do so.

In order to understand what the reasons behind its slow development are, the port infrastructure of the country will be presented.

The Italian ports are characterized by a dual specialized system for the movement of container throughput: The southern regions, located in the Suez-Gibraltar axe, are specialized in transhipment and compete with other ports, set in the Mediterranean (Corsini, 2014). The northern regions instead, settled close to the main industrial poles have the function of gateway ports and compete with other main EU corridors. With this dual role, short sea shipping becomes of primary focus and Italy is leader in this transport mode. However, such dual system may be a disadvantage for a port, that in this way may be uncapable to attract larger vessels and reduce prices through economies of scale (Bassanini, 2014).

Moreover, Italy has a disadvantage over the other EU member states due to natural barriers (f.e. the Alps) that limit the traffic routes outside the country. For this reason, it is complex and costly to build well connected routes across the country.

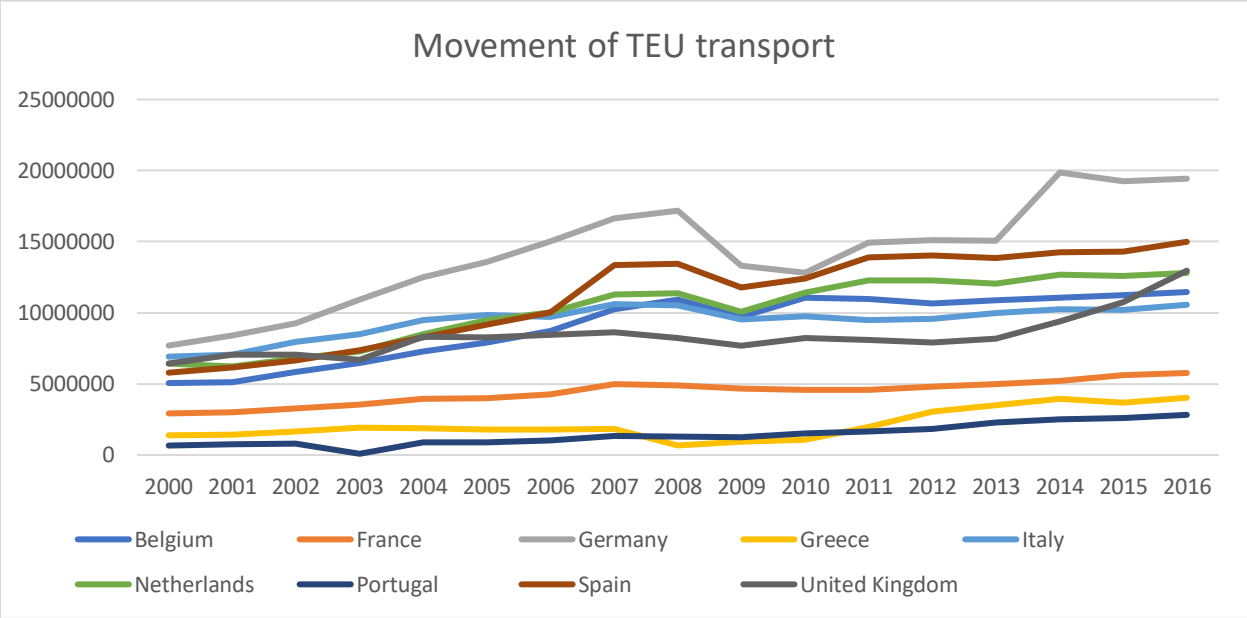
However, Italy still has huge potentials. With 7600 km of cost length and multiple ports throughout the country, it could potentially attract large volumes. Moreover, because of its strategic position, the country's nodes could potentially connect the main industrial areas across the Mediterranean against the more distant northern range ports (Report, 2018).

The government has realized the time lost so far and the huge gap with other competitors. The institution responsible for public policy over port development decided to act. In 2015 the "Legge Madia" was passed to reorganize the Italian ports and infrastructure. The law is focused on the restructure port governance. Through the creation of fifteen "authorities of port systems" instead of the twenty-four. This reform has simplified and improved the coordination among port bodies, reducing regional competition (de Forcade, 2017)

This reform has been issued with a broader view: to be connected and integrated to the EU infrastructure systems: The Trans-European Network Transport (TEN-T). However due to political instability, more effort should be done to improve the port system in Italy.

A.2 Italian ports: national distribution and limited market share

Figure AA2: movement of TEU in major EU countries (import and export) form 2000 till 2016



Source: Eurostat 2017, Infrastructure and Transport

By analysing table AA2, we can observe that the volumes gained throughout the years 2000-2016 by Italian ports do not surpass the volume handled by Belgium and the Netherlands even though these countries have a smaller GDP (Belgium: 466,4 Billion USD; the Netherlands 770 Billion USD) compared to Italy (1'850 Billion USD) (World Bank, 2016).

If Belgium and the Netherlands handle large volumes is because their logistic network manages to reach efficiently areas beyond national borders. Italy instead, is uncapable to distribute other foreign markets. As a matter of fact, Italian ports covers only 11.5% of the total European market. According to statistics retrieved from World Bank (2015), approximately 1'000'000 TEU overpass the Alps from Italian ports (which is less the 10% of total volume handled by the country according to table AA3).

Table AA3: Traffic and market share of the main port ranges

Range	Traffic TEU (2015)	Market Share 2015
Northern Range	44’997’754	50.7%
West Mediterranean	14’542’119	16.4%
North Africa & Middle Est	12’272’096	13.8%
Italian Port	10’189’476	11.5%
Est Mediterranean & Black Sea	6’730’493	7.6%

Source: Unicredit (2015): data on containerization and port authorities (World Bank, 2016).

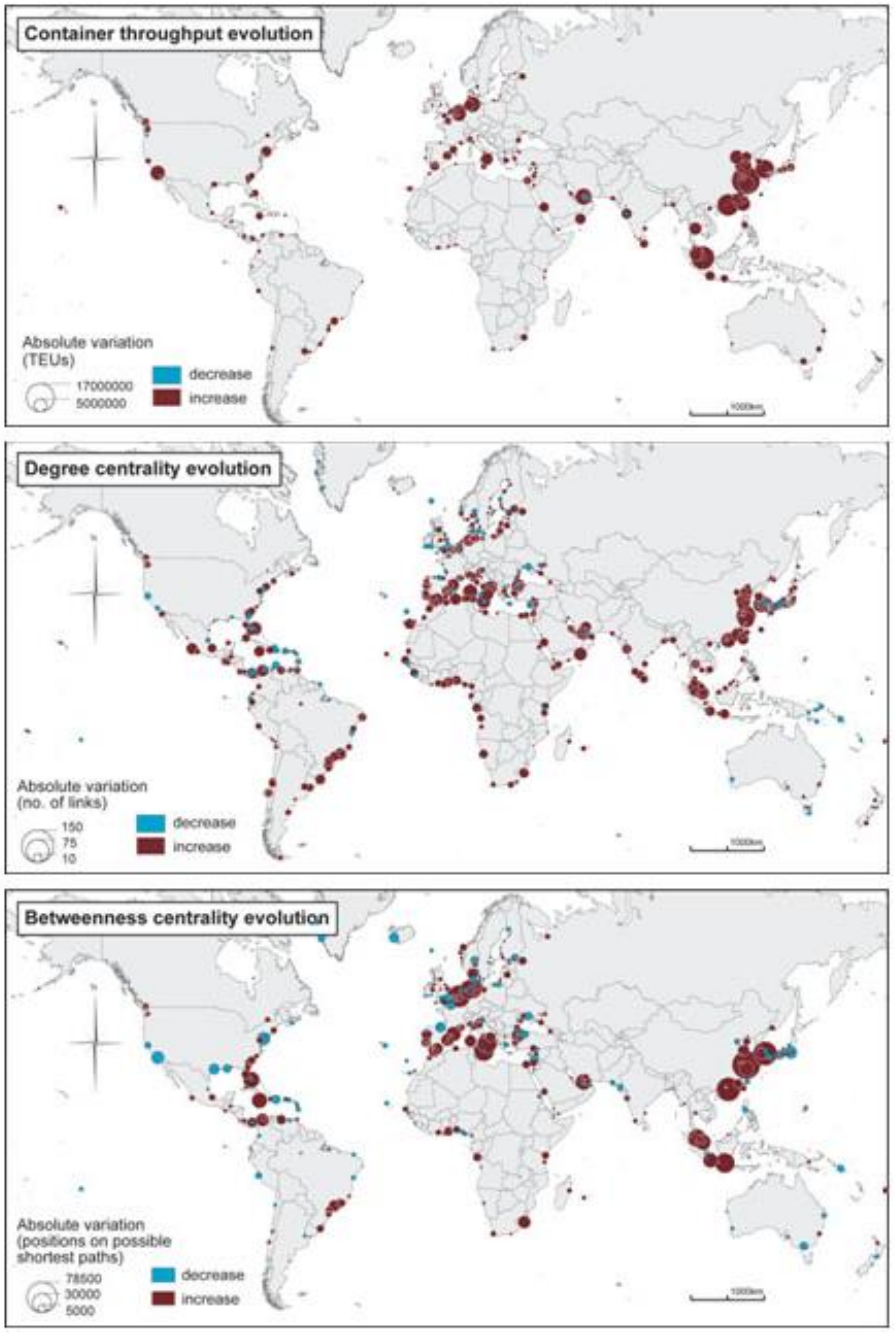
If Italian ports are set in a strategic position between the European-Asian routes and are located close to the main industrial areas, why can’t they distribute beyond the national market?

To give a concrete example, the southern German region Baden-Württemberg, is an important industrial centre, which could be frequently distributed by Genoa, geographically closer than Rotterdam and Hamburg (on average 530 Km from Genova, 550km from Hamburg and 611 from Rotterdam). However, according to the Statistisches Bundesant only 23’000 TEU are distributed by freight from Italy to Baden-Wurttemberg.

Hamburg and Zuid-Holland provinces, instead, respectively forward 174’000 and 91’000 TEU. How can this be possible considering the proximity of the Port of Genoa to the contested area and the centrality of PoG to the main shipping routes?

As this example gives a clear idea of the incapability of the Italian ports to gain market share across the Alps, in this case study we will focus on the competitive position of the port of Genoa to gain market share in the contested market.

A.3: Changing in throughput and centrality



Source: Ducruet & Notteboom (2012)

Table A.4 Connection Baden-Württemberg by rail 2015, number of TEU (2015)

Tabelle 3.1.4a Verflechtung nach ausgewählten Regionen der Eisenbahn - Container -
1 000 TEU

Versand-Verkehrsbezirk	Empfangs-Verkehrsbezirk																								Insgesamt
	Baden-Württemberg	Bayern	Berlin	Branden-burg	Bremen	Hamburg	Hessen	Mecklenburg-Vorpommern	Nieder-sachsen	Nordrhein-Westfalen	Rheinland-Pfalz	Saarland	Sachsen	Sachsen-Anhalt	Schleswig-Holstein	Thüringen	Antwerpen	Rotterdam	übrige Niederlande, übriges Belgien, Luxemburg	Italien	Portugal, Spanien, Frankreich	Schweiz, Österreich	Skandinavien, GB und Nordirland, Island, Irland	übriges Europa	
Baden-Württemberg	12	2	-	0	101	153	0	-	1	25	5	-	0	0	1	10	6	9	-	21	0	8	0	6	362
Bayern	3	37	12	11	183	227	19	-	18	43	5	-	10	2	0	-	-	2	-	47	0	5	0	7	631
Berlin	-	12	-	-	2	26	-	-	0	13	-	-	-	0	-	-	-	-	-	-	-	-	-	-	53
Brandenburg	0	8	-	0	9	40	-	2	15	13	12	-	0	1	-	-	17	-	-	-	-	1	-	9	127
Bremen	91	144	1	7	10	46	17	-	1	25	0	-	26	2	0	4	-	-	-	7	0	21	-	43	446
Hamburg	174	270	27	42	41	1	84	1	24	51	22	-	82	29	12	13	-	-	-	7	0	95	3	193	1 170
Hessen	0	28	-	-	17	72	0	0	0	0	0	-	-	-	-	-	-	0	-	4	-	3	-	0	125
Mecklenburg-Vorpommern	-	-	-	-	-	1	0	-	-	2	-	-	-	-	-	0	-	-	-	0	-	0	-	0	3
Niedersachsen	2	18	-	6	8	24	0	-	10	4	8	-	4	0	0	0	2	-	3	3	-	1	0	20	112
Nordrhein-Westfalen	28	39	3	10	23	53	0	2	3	110	16	0	12	5	13	-	24	99	0	74	20	27	19	66	648
Rheinland-Pfalz	4	6	-	13	0	18	0	-	8	16	21	3	-	9	19	-	41	25	-	20	23	11	-	1	238
Saarland	-	-	-	-	-	-	-	-	-	0	4	-	-	-	-	-	-	-	-	-	2	-	-	0	6
Sachsen	0	9	-	6	44	74	-	11	6	11	-	-	1	1	-	0	-	-	-	1	-	1	-	2	167
Sachsen-Anhalt	0	2	-	0	2	29	-	-	0	5	9	-	0	0	1	-	-	-	-	-	-	1	-	0	49
Schleswig-Holstein	1	0	-	0	-	12	-	-	0	13	20	-	-	1	0	-	0	-	-	0	-	0	0	0	49
Thüringen	10	-	-	-	10	9	-	0	0	0	-	-	0	-	-	-	-	-	-	-	-	1	-	3	35
Antwerpen	6	-	-	17	-	-	-	-	2	28	41	-	-	-	-	-	-	-	-	24	-	-	-	4	123
Rotterdam	8	2	-	-	-	-	0	-	-	106	26	-	-	0	-	-	-	-	-	79	0	30	-	43	294
übrige Niederlande, übriges Belgien, Luxemburg	-	0	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	129	-	0	5	8	146
Italien	23	42	-	-	7	8	4	0	3	84	28	-	1	-	0	-	31	78	132	-	-	-	5	-	446
Portugal, Spanien, Frankreich	0	0	-	-	-	-	-	-	0	20	26	4	-	-	-	-	-	0	-	-	-	-	-	6	55
Schweiz, Österreich	9	5	-	0	39	76	3	1	1	36	10	-	2	0	0	-	-	29	0	-	-	15	0	7	235
Skandinavien, GB und Nordirland, Island, Irland	0	0	-	-	-	3	-	-	-	20	-	-	-	-	0	-	-	-	6	3	-	0	0	0	34
übriges Europa	7	7	-	10	80	167	0	0	17	54	2	-	3	1	0	3	3	37	7	-	5	19	0	0	424
Insgesamt	378	633	43	122	576	1 040	128	18	113	679	256	7	142	51	47	30	123	279	149	420	51	242	33	419	5 979

Source: German National Statistics (2018)

Table A.5: Connection Baden-Württemberg by inland maritime transport (2015), number of TEU

Tabelle 3.1.4b Verflechtung nach ausgewählten Regionen der Binnenschifffahrt - Container -
1 000 TEU

Versand-Verkehrsbezirk	Empfangs-Verkehrsbezirk																		Insgesamt
	Baden-Württemberg	Bayern	Branden-burg	Bremen	Hamburg	Hessen	Nieder-sachsen	Nordrhein-Westfalen	Rheinland-Pfalz	Sachsen	Sachsen-Anhalt	Antwerpen	Rotterdam	übrige Niederlande, übriges Belgien, Luxemburg	Portugal, Spanien, Frankreich	Schweiz, Österreich	übriges Europa		
Baden-Württemberg	33	-	-	0	-	-	-	2	0	-	-	62	28	1	1	2	-		129
Bayern	0	-	-	-	-	-	-	0	-	-	-	0	0	0	-	0	0		1
Berlin	-	-	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-		7
Brandenburg	-	-	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-		0
Bremen	-	-	-	45	-	-	5	6	0	-	-	0	-	0	-	-	-		57
Hamburg	-	-	0	0	-	-	34	6	-	2	12	-	-	-	-	-	-		55
Hessen	0	-	-	-	-	0	-	1	0	-	-	33	30	0	-	-	-		65
Niedersachsen	-	-	-	7	21	-	-	-	-	-	0	5	0	5	-	-	-		38
Nordrhein-Westfalen	2	-	-	5	3	-	-	26	4	-	-	202	295	4	8	1	-		549
Rheinland-Pfalz	1	0	-	-	-	-	-	5	3	-	-	131	170	0	1	0	-		311
Sachsen	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	-		1
Sachsen-Anhalt	-	-	-	0	26	-	0	-	-	-	0	-	-	-	-	-	-		26
Antwerpen	44	0	-	0	-	33	5	122	131	-	-	-	-	2	2	32	-		373
Rotterdam	39	1	-	-	-	28	0	346	129	-	-	0	-	0	7	70	-		622
übrige Niederlande, übriges Belgien,	2	0	-	-	-	0	5	25	3	-	-	4	-	-	-	-	-		39
Portugal, Spanien, Frankreich	0	-	-	-	-	-	-	5	1	-	-	10	5	-	-	-	-		21
Schweiz, Österreich	1	-	-	-	-	-	-	0	2	-	-	42	51	-	-	-	-		96
übriges Europa	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		0
Insgesamt	123	2	0	58	58	62	49	544	274	2	12	490	580	12	19	105	0		2 390

Source: German National Statistics (2018)

A.6 Interviews:

The selection of the people interviewed was made on the basis of the position occupied in the different port activities: *port authorities, entrepreneurs in shipping and forwarding activity, regulators*

The interviews were approximately one and a half hour long and they were based by an introduction of the thesis and by a number of questions previously prepared.

Here below are reported the summary of the interviews and.

Table 5: list of the people interviewed

Name	**Function**	**Role**	**Question**
Paolo Emilio Signorini	President of the port authority of mar Liguria system	Port Authority Representative	- What are the key issues for the port of Genoa? - What instruments define its core competitiveness? - How will Genoa face the current and future challenges in order to be competitive at a global scale?

Augusto Cosulich	CEO of Fratelli Cosulich Spa	Shipping company	- What challenges is the port of Genoa facing? - How can the port of Genoa distribute the contested areas of Baden-Württemberg and Bavaria?
Manuela Sciutti	Sector Manager for Ports, Coastal and Marine Facilities RINA consulting	Responsible for the projection of infrastructure related to the port: Terzo Valico	- How long does it take to handle and move (on average) a container in the port of Genoa? - The new Infrastructure developments (example Terzo-Valico) will impact the growth and competitiveness of the port of Genoa? - Will the Terzo Valico improve the multimodal transport system?

			- Business envorinment in Genoa? And What is needed?
Enrico Molisani	CEO of MR International Lawyers	Shipping consultant and legal advisor	- What are the key issues of the port of Genoa? - What is its core competitiveness? - Will the Terzo Valico be Beneficial for the growth and expansion of the port?

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1) <u>What are the port of Genoa's key issues? What is its core competitiveness?</u>

"Genoa is a historical port, the most important in Italy for volumes, it has a strategic position with respect to the most important industrial pole in Europe. However, it lacks of a competitive position due to the bad infrastructure and not rigorous administration from port authority. As a matter of fact, many delays arose with large infrastructure projects to expand the dry-port connectivity and the expansion of the terminal to host large ships (20'000 TEU).

Moreover, the Italian territory amount of many medium-size harbors which are divided in port systems. The port of Livorno for example has invested in large terminal Lorenzini with 90'000 mq of surface, 180'000 TEU of annual capacity, backed by a 2'000 mq of warehouse and 400m of railway track to connect the port to the hinterland. The efficient functioning of the port has limited the expansion of the port of Genoa. On the other side internal competition has pushed the port of Genoa to try to maintain its dominant role in the Italian territory, enhancing further cooperation with the port of Savona and La Spezia.

Lawyer Enrico Molisani said that "the competitive position cannot be extrapolated from the historical contest of the Genoa region. For example, the Port of Genoa is a historical port and the city as well has a strong historical heritage. This urban characteristic makes it hard for the port to cope with the global trends. The center close to the port makes it hard to build efficient infrastructure to connect the hinterland regions of Lombardy, Piemonte and Emilia Romagna. The morphological characteristic of the region creates as well an extra barrier. Finally, the relation that the city has with the port is complex. Even though the port strongly contributes to the regional economy, the majority of the population does not agree with the expansion and growth of the port. There is no synergy and collaboration with the port and the city.

2) Does this apply also for the infrastructure development of Terzo-Valico?

There have been strong debates on the benefits that the Terzo-Valico can bring to the region. The instable political situation and the change in governments delayed the construction of the infrastructure. In this moment the 5 Star Movement, is impeding and blocking the continuation of the Terzo-Valico which is considered by them a useless infrastructure. Alberto Zolezzi reported that the infrastructure will reduce the travel time to Milan by just a few minutes and will have a devastating effect on the territory (destroy the mountain which are rich of asbestos). Moreover, the cost of the infrastructure totals up to 16 billion euro of public funds. Enrico Molisani on the other side says that the decision of the 5 Star Movements is ridiculous. A lot of funds have been already spent on the Terzo Valico ed it still remain a fundamental project for the sustainment and growth of the port and the region. First it will augment the capacity of the container traffic, which will be moved from

road to train from 15% to 30% and will considerably reduce the emission levels. This will have both positive impact from an economic and environmental prospective.

Considering that fact that the current infrastructure that connects the city is old, there are strong political movement (NOTAV) more favorable to restructure the current infrastructure system rather then building a new one. The reason for this is that the city has suffered water floods in 2014 and for this need to fix its current urbanistic setting.

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1) <u>What global challenges is the port of Genoa facing?</u>

In order to consider the competitiveness of the port of Genova we need to look at the global trend of logistic network. First the One-Belt-One-Road infrastructure that is under construction to connect China to Europe by rail and the Artic route that will reduce the lead time to distribute Europe through Asia. Now that the general trend and routes are moving, the geographical equilibria are changing. In the One-Belt-One-Road the Piraeus became an important center and many investments have been done so that the Greek port may become the main getaway harbor from where it is possible to distribute the Est-European areas.

In this contest also the Italian market and port system is considerably changing. In the terminal of Vado-Ligure (Genoa harbor), Chinese companies started to invest with the possibility to use Genoa as a gateway to distribute the hinterland areas across the Alps. For example, it would be more convenient to bring the containers to Genoa instead of Rotterdam to distribute the areas of Baden-Württemberg and Bavaria.

2) How can Genova expand its market share along the contested hinterland?

It is complex to estimate the costs to distribute the contested areas because at this moment some key infrastructure nodes are missing for which the port could become competitive. The element that strongly reduces the competitive position of Genoa is not so much related to the cost of the node, which is not high then the one of its competitors, but rather the cost and time and reliability in the services provided by the port for shipping and distributing to-and-from the port.

With this respect, the Terzo-Valico is a key element that the Port of Genoa needs to expand the areas that the harbor may distribute. At this moment Genoa is only capable to reach the national market. Together with the Gotthard tunnel that connects Italy to Switzerland, the Terzo Valico could become an important infrastructure node. However, many things need to be considered. First of all, the Terzo-Valico is long 57km and connects Genoa to Tortona, after that the railway reconnects to the old infrastructure which currently connects Genoa-Milan, one lane for both cargo and passenger freight which would create large bottlenecks. Second, Italy does not have 740 m trains which are a currently used in Germany and Netherlands, which considerably reduce unit cost and emission levels.

If the port authority of Genoa does not act immediately to improve its current infrastructure it may risk that the area defined as “contestable hinterland” may get closer to the Italian boarders or even down to the Italian territory. If the national infrastructure projects are going to have delays with regard to the TEN-T project on the country’s boarders (Brenner, Gotthard tunnels), then there is higher chance that shippers and operators will end up using e the Le Havre-Hamburg range ports also for the national territory distribution. With a greater advantage in efficiency, intramodality and innovation Rotterdam or Hamburg may offer solutions which are in line with the current projects that connect the Alps, while Genoa will be not capable to do so.

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1) How long does it take to handle and move (on average) a container in the port of Genoa?

The dwell time of the port of Genoa depends on the different condition the port is facing. On average it takes 3 to 11 days to move a container through the port of Genoa while for Rotterdam it takes 2 to 4 days in the port of Rotterdam and 3 to 5 days in Hamburg. The larger variation in in average dwell time is the proof that Genoa needs to improve the reliability and efficiency of its port system. For example, it has strong problems with the payment of dues due to the strict control, for which there is the risk (especially in imports) that a container stays blocked inn the port for several days.

2) With the new Infrastructure developments (example Terzo-Valico) how much is it prospected to grow the flow of container per year and do you think it has strong prospect to increase volume traffic and competitivity of the port?

Through the Terzo Valico we expect an increase in volumes of 20% in throughput over the next three years, and it will have an annual capacity of 3.5 Million TEU/year. This is an improvement considering that the current rail system is already at full capacity and it is not possible to currently propose a multimodal transport system. Moreover, Italy has a high dependence to road transport (on average 85% of total transport) and without this infrastructure it will no committee to the EU requirements of moving 30% of goods through rail in a more sustainable and efficient way by 2030. However, from an engineer's prospective the Terzo Valico by itself will not increase considerably the volumes handled in Genoa and will not lead to an expansion in market share across the Alps. Many other infrastructures need to be terminated or projected in conjunction with the Terzo Valico. For example, the expansion of terminal Calata Bettolo e Vado Ligure is fundamental to increase the capacity of the port, a centralized system for port dues control, the Gronda connection for road transport and the shuttle service that connects the port to the railway system.

3) What is the problem with the Italian multimodal transport system?

First Italy did not put large disincentives on cargo transport by road which consequently marginalized the amount of throughput transported by train (the cost per distribution by road is

0.9€/km in Italy compared to the Netherlands which is 1.2€/km. The countries that did, such as Switzerland (46% of transport by train) and Germany (22% of transport by train) had a large increase in rail transport.
Second, the inadequate infrastructure and the high cost of labor which amount for 40% of total rail cost creates even more barrier for the increased usage of trains in the exchange of goods and services.
Third, the toll system for rail transport is expensive and inefficient and does not propose flexible tariffs based on the quality, quality and time of transport of goods.

What is needed?
Flexible system of tolls, lower costs by implementing new efficient mode of transport: Shuttle from port to inter-ports, multiclient trains and digital systems to create more synchronization and reduce the amount of empty train (reload problem)

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1) What are the key issues for the port of Genoa? And how is the governance structure affecting the port growth and strategic improvement?

The port of Genoa is the largest gateway port in Italy for volumes and container handled. It has a strategic position because it is close to the main industrial poles in the north of Italy. It may have the potential to reach also across the Alps Switzerland, Bavaria and Baden-Württemberg. Even though the great advantages of the Genoa are clear within the global shipping network the bad administration, the low efficiency and the delays in new infrastructure have considerably reduced the competitive position of the port of Genoa. What the port of Genoa needs to focus on to regain market share is to change its governance structure, integrate its logistic chain and improve efficiency in a sustainable matter.
Thanks to the amendment "Sblocca Italia" the governance structure in Italy and for Genoa have changed considerably. First, the port of Genoa from fully public decided to move to a more

privatized system (landlord port system). In this way the port, by moving towards a profit oriented business scheme will be capable to satisfy the needs of shippers and forwarders more efficiently. Moreover, the privatization process has considerably reduced the bureaucracy of port decision tacking process and has further simplified the management system.
The fact that port authority systems were reduced from 24 to 15 makes the entire port system of Genoa more synchronized and integrated. For example, the Terzo-Valico infrastructure was not part of management control of the port of Genoa. Previously, the project was not strategically integrated and financed by the harbor. Now that Genoa is part of the mar Liguria port system the Terzo Valico has been recognized as a key node for the port, receiving private financing as well as contribution from the European Union.

The port of Genoa has been a pioneer of advancing a more digitalized and integrated logistic network in order to reduce bottlenecks in its infrastructure system. However many key nodes are still missing: an rail dry-port connectivity, a node that connects the port to the airport and a better road system (Gronda project).

Finally, the port needs to invest in innovation and sustainability in order to increase the credibility and social impact that the port has towards the city. For this reason, the port authority has invested in electrified terminal systems and is pushing towards a centralized due payment center to reduce delays in the supply-chain.

2) Terzo-Valico is it a key infrastructure for the port of Genoa?

The Terzo Valico is a fundamental infrastructure for the port of Genoa. Many are apposed with this infrastructure node because they argue that the current node whicg connects Genoa to Milan could have been improved without investing in a new track. However, the current infrastructure network is not in line with the EU standards and it is not capable to accommodate 750 meter trains, increased capacity of 360 train per day and hold a 2 ml tons weight capacity. The terzo Valico instead fulfills all standard will have a maximum capacity of .6 mln TEU per year and will have all standards which are rectified by the TEN-T network and the transalpine network such as Gotthard and Brenner tunnel to connect Italy to foreign markets.

3) How will Genoa face the current and future challenges in order to be competitive at a global scale?

- Improve the financing system, by attracting new investor through higher efficiency, reliability and business environment
- Reduce bottlenecks in the supply-chain system
- Reduce the environmental impact of the Port and but the infrastructure nodes in safety.