PORT LOGISTICS AND MARITIME SECURITY: 
THE CASES OF PORT OF PIRAEUS AND PORT OF 
THESSALONIKI

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Abstract

Over the last decades, logistics has gained even more attention from all industries recognizing its importance and the added value that offers. The trade globalization has resulted in radical changes in transportation by sea, land or air. Regarding maritime transportation and trade, nowadays, an increasing number of ships and ports is technologically equipped in order to ensure the timely and safe transport of products. Furthermore, maritime transportation is the most efficient, effective, reliable and economical way in order to transport commodities for long distances. Thus, maritime transportation comprises a crucial element of infrastructure for all nations involved with international trade.

Ports are also an inextricable element in a country’s economy. The port industry is confronting challenges and opportunities at the same time. Challenges are evident in the ongoing logistics environment and in the quest to keep the port efficient as a connecting node in the supply chain. On the other hand, opportunities arise from a plethora of new scholarly articles, addressing the port within issues of logistics, supply chain management and value-adding chains. Remarkably, the provision of distribution and value-added logistics activities within the gateway position of major seaports has become a source of competitive advantage and an important business model.

Greece is a country accessible mostly via sea and Greek ports are experiencing rapid changes in the maritime industry. The port of Piraeus, as well as the port of Thessaloniki, are two main ports in Greece that welcome high volumes of commodities, cars and passengers. Through these two ports a large amount of commodities (around 90% of EU external trade in terms of volume) flow to the rest of Europe. This percentage is high due to the fact that both ports are crossroads for Africa, Asia and Europe. Therefore, the preservation of the security of the ports need to be maintained in high levels. Every port has as priority to service effectively and safely the handled cargoes, vessels and passengers.
The main goal of this dissertation is to perform a research in order to study the similarities among the two ports. The research focuses on the literature review since it was particularly difficult to collect more data, which would be essential for an empirical analysis.
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<th>Full Form</th>
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<tbody>
<tr>
<td>AIS</td>
<td>Automatic Identification System</td>
</tr>
<tr>
<td>ASYCUDA</td>
<td>Automated System for Customs Data</td>
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<td>BTI</td>
<td>Binding Tariff Information</td>
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<td>CSI</td>
<td>Container Security Initiative</td>
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<td>CSO</td>
<td>Company Security Officer</td>
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<tr>
<td>DHS</td>
<td>Department of Homeland Security</td>
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<td>ECDIS</td>
<td>Electronic Chart Display and Information System</td>
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<td>ENC</td>
<td>Electronic Navigational Charts</td>
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<tr>
<td>FSA</td>
<td>Formal Safety Assessment</td>
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<tr>
<td>IALA</td>
<td>International Association of Marine Aids to Navigation and Lighthouse Authorities</td>
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<tr>
<td>IARP</td>
<td>Independent Authority for Public Revenue</td>
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<td>IEC</td>
<td>International Electrotechnical Commission</td>
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<td>IMO</td>
<td>International Maritime Organization</td>
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<td>ISPS</td>
<td>International Ship and Port Facility Security</td>
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<tr>
<td>ITU</td>
<td>International Telecommunication Union</td>
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<tr>
<td>PFSP</td>
<td>Port Facility Security Plan</td>
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<tr>
<td>SAFE</td>
<td>Security and Accountability for Every Port Act</td>
</tr>
<tr>
<td>SOLAS</td>
<td>Safety of Life at Sea</td>
</tr>
<tr>
<td>SSO</td>
<td>Ship Security Officer</td>
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<tr>
<td>TEU</td>
<td>Twenty-foot Equivalent Unit</td>
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<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>VHF</td>
<td>Very High Frequency</td>
</tr>
<tr>
<td>VSA</td>
<td>Vessel Security Assessment</td>
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<td>VSP</td>
<td>Vessel Security Plan</td>
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<td>VTS</td>
<td>Vessel Traffic Services</td>
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Chapter 1: Introduction

1.1 The importance of maritime transportation

Nowadays, both globalization and revolution of technology in the area of transport have determined anew the role of shipping in global logistics. The wide area of transport in this case also includes the containerization, the integration of logistics and the expansion of the maritime industry. Consequently, new patterns of freight distribution have been introduced (Song & Panayides, 2015). In order to be more comprehensive, the transportation sector constitutes a strong factor in terms of both economic and national integration to the world economic market (Dwarakish & Salim, 2015). More particularly, port locations are selected in order to optimize the access to the land and are one of the primary components of the general transportation sector (Dwarakish & Salim, 2015).

Maritime transportation is the most effective and safe solution in order to transfer great amounts of bulk, gas, liquids or containerized cargoes. Furthermore, it is an economic solution. The development of the global economy depends on the international trade. As the maritime transportation is an economic manner when transferring goods, the globalization of the economies forces the commodities to be shipped in large volumes with the least possible cost and taking into consideration the parameter of the time (Talley, 2009).

Logistics constitute a crucial area of interest as it provides enhancement to the performance and outcomes of the firm (Grant, et al., 2006). Thus, logistics and supply chain management form an inextricable part of every company and organization as there is a need for controlling the flow of materials, products, information in every stage from production to consumption in order to fulfill customers’ requirements (Song & Panayides, 2015). Maritime transportation enhances the development of integrated supply chains as the line of production is not the same with the point of consumption. Moreover, transportation constitutes the vital link for both regional and global supply chains. This happens due to some reasons. For instance, the raw materials must be available to the production units by transporting them from the origin point to the destination point within
a reasonable period of time. In addition, the commodities must be available to the customers, thus an effective and efficient transportation system is required.

The scope of this research is to analyze issues regarding maritime security, customs clearance and international barriers of trade as well as to present two case studies of the two biggest seaports of Greece. The case studies are related to the maritime security and the customs clearance in those two seaports.

The topic of this dissertation is of great importance as 90% of European Union external trade in terms of volume is transferred by the sea and 80% of world trade between all continents and regions is transferred by the sea (Goulielmos & Anastasakos, 2005a). This happens due to the fact that maritime transportation provides several advantages if compared to other modes of transportation, namely road, rail or air transportation (Song & Panayides, 2015).

1.2 Objectives

The scope of this dissertation is to analyze the role of maritime transportation, maritime security, customs clearance and international barriers of trade. Additionally, two case studies are presented of the two biggest ports of Greece, namely the port of Piraeus and the port of Thessaloniki.

At the beginning in the thesis there is a literature presentation of the basic issues such as maritime logistics and intermodal transportation and how those issues affect the maritime industry. Also, it is analyzed the port performance measurement both at an intra-port and at an inter-port level as well as the factors affecting them. Later in this dissertation is introduced the term of maritime security, its measures and marine safety. Afterwards, there is a concern regarding customs clearance procedure and the application of customs clearance in dry ports. In addition, there is an analysis about the international barriers of the trade and entry barriers. All those issues are based on the existing literature (academic resources and publications).
Furthermore, in this dissertation deals with two case studies of the two biggest ports of Greece, namely the port of Piraeus and the port of Thessaloniki. The presented data are associated with the issues that have already been analyzed such as the maritime security and the customs clearance. The data was collected by academic resources and publications of the Port Authorities of each port. There is a qualitative analysis aiming to differentiate the main activities of each port, the transit costs, the geographical position and the authority autonomy. Regarding the quantitative analysis, it includes issues such as the traffic volume, the measures used in maritime security and the customs clearance. Conclusively, this analysis is vital as it helps to the understanding of the differentiation between the examined ports.
Chapter 2: Maritime Logistics and Port Performance

2.1 Maritime Logistics

The term of maritime logistics refers to the primary means of transporting goods through sea globally and is strictly connected to the entire logistics flows that have been described previously. Regarding maritime transportation, all types of materials can be transported, such as raw materials and parts as well as finished goods.

Furthermore, maritime transportation provides both transport-related services and logistical services in a way more efficient and more effective. Alternatively, maritime logistics is the process of planning, implementing and managing the movement of both products and information which is involved in ocean carriage. Maritime transportation is responsible for carrying and handling cargoes across the ocean and connects consigners and consignees who may be geographically scattered (Song & Panayides, 2015).

Additionally, as stated by Robinson, a port is a place that handles ships and cargo within efficient and administrative and policy frameworks (Robinson, 2002). More analytically, ports are described as places, as operating systems, as economic units and as administrative units (Robinson, 2002).

Comparing maritime transportation with other modes of transport, it is assumed that is a major mode of transport. More specifically, the unmatched capacity, the ability to cover large distances, the low costs and the environmental-friendly nature render this kind of transportation an optimal choice in the distribution area. However, it must be considered that in order to use maritime transport to deliver materials or products, those products are necessary to have long lead times (Aarsæther & Moan, 2009). The main disadvantage of the maritime transportation is the difficulty to monitor the exact location of the vessel (Song & Panayides, 2015).

At this moment it must be declared the definition of intermodal transport. More specifically, intermodal transport is the use of at least two distinct modes or carriers in order to transfer goods or freight from shipper to consignee without handling the products
themselves when changing modes ((ECMT), 2002) (Song & Panayides, 2015). In general, the intermodal transportation is most suitable when the transported products are intermediate or finished (Song & Panayides, 2015).

The intermodal transport consists of the collection of goods, the trunk line and the distribution as it is illustrated in figure 2.1. More specifically, the term of trunk line refers to the transportation system which deals with long distances through traffic, or simply, a trunk line is the main line of a transportation system. Maritime transport is the most common transport mode for trunk line and the major part of a journey is realized by sea. Regarding the collection of products and their distribution, namely the initial and the final destination of the journey, road transport is typically used, and it is attempted the distance that will be covered by road to be as short as possible (Arnold, et al., 2004) (Song & Panayides, 2015).

![Figure 2.1: Components of intermodal transport](source)

As it has already been described, intermodal transport is a typical activity regarding the transportation. Intermodal transport is beneficial as provides the possibility to lower the overall costs as shippers have the ability to take advantage of lower rates. Moreover, in intermodal transportation the pricing can be predicted more easily and there is flexibility in the process of loading and unloading, thus the handling costs are decreased (Arnold, et al., 2004). Additionally, another advantage of intermodal transport is regarding the consolidation, meaning that in longer distances, due to the economies of scale, the products can be transported more economically ((ECMT), 2002).
The utilization of intermodal transport provides more competitiveness regarding the long distances that have to be traversed (Arnold, et al., 2004). Furthermore, intermodal transport includes the benefits of the maritime transportation and the road transportation. More particularly, the maritime transportation is used when the distances are long and the quantities are large while the road transportation is used in short distances (Arnold, et al., 2004).

The principal activity of any shipping system is the movement and distribution of goods from one port to another. The activity of shipping involves additional services in order to support both shipping and logistics flow. For instance, the activity entails the service of pick-up, delivery notification, a special handling service for clients that need a specific service, inbound and outbound bill of landing (B/L), tracking and information of the containers and intermodal services. Furthermore, the main activities of port or terminal operation is the loading and unloading of cargoes into or from a ship and the preparation of cargoes in order to be prepared to deliver the products to the destination via inland transportation. As the cargoes in maritime logistics constitute a crucial and inextricable element, logistics system contains value-adding services. For example, warehouse operations, inventory management, storage and packing operations, and arrangement of inland transportation modes (Bichou & Gray, 2004) (Song & Panayides, 2015).

Thus, the goal of maritime logistics is to achieve a high rate of operational efficiency and service effectiveness. More particularly, the term operational efficiency refers to the reduction of lead-time and business costs, while the term of service effectiveness refers to the flexibility, responsiveness and reliability of the service provided (Song & Panayides, 2015).
2.2 Port Performance

Nowadays, ports and maritime transport constitute an important element of the global commerce (Mangan, et al., 2008). It is very common for ports having multiple terminals in order to offer a variety of facilities. Generally, the term terminal is a section of the port which consists of a single or multiple berths dedicated to a specific type of cargo handling (Stopford, 1997). It is obvious that a port can handle different categories of freight such as container cargo, liquid bulk, dry bulk, breakbulk and ro-ro (Mangan, et al., 2008). Additionally, each port has its own regulations and operates in a different way of other ports, meaning that some ports handle all the types of freights while others focus on specific categories. This happens due to the specialization that a port needs to possess as different types of handling equipment are required depending on the type of freight (Mangan, et al., 2008).

2.2.1 Port performance measurement

Performance measurement and evaluation constitutes an essential part in every system, company or organization. According to (Mentzer & Konrad, 1991) the definition of the term performance measurement is the analysis and the process of investigation the effectiveness and the efficiency when accomplishing a specified task. The emerged evaluation is strictly connected to the achievement of the assigned goal, meaning that the objectives must be met (Mentzer & Konrad, 1991). More specifically, regarding the port the performance can be measured on terms of quality service, port availability, accessibility to the sea, technology provided, transaction procedures, cost, ship turn-around time, storage and capacity, connectivity to the landscape, cargo dwell time, efficiency of the port, transaction procedures and services provided (Marlow & Paixão Casaca, 2003) (Trujillo & Nombela, 1999).

In order the economic development, which is oriented in trade to be supported, the authorities of the ports attempt to improve their efficiency by providing internationally competitive port services. As ports constitute a crucial element in the overall supply chain,
their efficiency is also a valuable factor to a country’s international competitiveness (Poitras, et al., 1996). The managers of the port, the planners and the authorities require a reliable performance measurement system in order to assess both efficiency and effectiveness of their activities (Dayananda Shetty & Dwarakish, 2018). Thus, the principal purpose in the majority of current measurement systems is the optimization of the facilities and the operations (Dayananda Shetty & Dwarakish, 2018). Performance measurement is crucial for both the efficient and the effective management of organizations as it presents the objectives of the organization, the demand and the requirements of the clients and the external competitive environment (Kennerley & Neely, 2002).

A wide range of techniques for assessment and analysis are used in order to measure the efficiency of the port or the performance indicators (Bichou & Gray, 2004). The main reason of measuring the performance is to provide a detailed guide to the port management in order to plan and control effectively the operations of the port (Dayananda Shetty & Dwarakish, 2018). Furthermore, there exist two principal categories which can influence the factors in the port performance, the customer service issues and the freight handling capabilities (Murphy, et al., 1991).

According to UNCTAD report there are two main categories in order to measure the port performance and efficiency, the macro performance indicators and the micro performance indicators (UNCTAD, 1999). More analytically, macro performance indicators quantify aggregate port impacts on economic activity, while micro performance indicators evaluate both input and output ratio measurements of the operations of the port (Bichou & Gray, 2004) (UNCTAD, 1999).

There is a variety of ways in order the port efficiency to be measured but can be divided into three broad categories, the physical indicators, the factor productivity indicators and economic and finance indicators. More analytically, the physical indicators focus on the shipping side of port operations and consequently refer to time measures. Some representative examples are the ship turn-around time, the ship waiting time, the occupancy rate of the berth and the working time at berth (Bichou & Gray, 2004) (Trujillo & Nombela, 1999). Regarding factor productivity indicators, they focus on the maritime side of the port and can measure both work and capital which is demanded in order to load
or unload goods or products to a vessel. Finally, the economic and financial indicators are connected to the sea access. These include the operating surplus or the total income and expenditure related to gross registered tones (GRT) or net registered tones (NRT) or change per 20-foot equivalent unit (TEU) (Bichou & Gray, 2004; Notteboom & Yap, 2012) (Trujillo & Nombela, 1999).

2.2.1.1 Measuring Performance at an intra-port level

It is extremely common for the competitiveness of the ports, for the economy of a country and for customers to measure performance at an intra-port level. There exist two types of competition, the intra-port competition and the intra-terminal competition (World, 2000). More specifically, intra-port competition is the case that two or more distinct terminal operations in the boundaries of the same port are competing for the same market. Similarly, regarding the terminal level, intra-terminal competition refers to specific companies that are competing each other while providing the same services within the same terminal (De Langen & Pallis, 2005) (Marlow & Paixão, 2003) (Notteboom & Yap, 2012). However, the aforementioned types of competition are part of the definition of the intra-port competition (De Langen & Pallis, 2005).

The performance of the port at an intra-port level can be measured by comparing the actual throughput of a port, namely containers moved through a port, with the optimal value of throughputs (Marlow & Paixão, 2003) (Tongzon, 1995). Generally, port performance in a worldwide context is measured in terms of 20-foot equivalent units (TEUs) or cargo volume in tons, having as fact that the ports are throughput maximisers and their level of performance depends on the efficiency of the handling cargo (Marlow & Paixão, 2003) (Tongzon, 1995).

The size of a cargo in a port is determined by some factors such as the location of the port, the frequency of ship calls, the charges of the port, the economic activity and the efficiency of the terminal. More analytically (Tongzon, 1995):
• The number of containers that are moved through the port depends on the location of the port, meaning that the physical location of the port influences the size of the cargo.

• Additionally, regarding the location, the size of the cargo depends on the presence of free trade zone that some ports have adopted/applied, thus the performance is increased.

• The frequency of the ship calls is also an important element for the reason that influences the overall volume of the cargo that can be moved in the port. More specifically, the rise of the ratio of ship calls attract both importers and exporters.

• The charges of the ports comprise an important factor as there are also the indirect costs depending on the delays, the loss of the markets or the share of the market, the loss of customer reliability and confidence and the inefficient and unsatisfactory service provided. In general, the port charges form only a small percentage of the overall costs of international trading.

• The term of economic activity is strictly related to the demand for port services. As the demand for port services increases, the economic activity either within a country or between countries also increases. Its obvious that even the slightest change in the economic activity will induce a change on the level of demand.

• The terminal efficiency is the last factor that influences the throughput because as is measure in the number of containers loaded and unloaded per berth hour. Thus, the efficiency can be measured both work and capital levels.

Similarly, in order, the efficiency of a terminal, to be determined, some factors have to be presented, such as the container mix, the work practices, the crane efficiency and the vessel size and the exchange of the cargo. More analytically (Tongzon, 1995):

• The container mix is a crucial factor in order to determine the efficiency of a terminal as the combination of trade in relation to the proportions of 40-foot and 20-foot containers. It has to be noticed that a 40-foot container is tantamount to 2 TEUs and the handling time required is the same as when handling a 20-foot container.
• Work practices, also, constitute a vital part in the determination of efficiency. It is very common to be caused inefficiency due to delays. A delay occurs when there is a difference between berth time and gross working time or between gross and net working time. More specifically, gross working time is estimated from the time the personnel start to work to the time that the labor leaves the vessel after the fulfillment of cargo handling. In addition, the net-working time is taking into consideration the interruptions of the overall working process. These delays could be incurred due to equipment breakdown, ship problems, weather etc. The difference between the time of berth and the gross working time can be caused due to delays from the industrial disputation and award conditions such as the increased rates of penalty and shift allowances.

• The crane efficiency indicates the efficient utilization of working time. It can be measured either in crane hours per working hour or in effectiveness of crane operation. More particularly, crane hours are dependent both on the number of cranes used in order to load or unload a vessel and on the total number of working hours per day. The effectiveness of the crane productivity is connected to the productivity of the crane calculated in the number of lifts per crane hour.

• The last factor that influences the efficiency of the terminal is the size of the vessel and the cargo exchange. The term cargo exchange refers to the containers loaded plus the containers unloaded per ship. A larger cargo exchange permits a better selection regarding the containers in the vessel. Consequently, the berthing time as a percentage of total service time is decreased.
2.2.1.2 Measuring Performance at an inter-port level

Initially, the term of inter-port competition must be presented. Inter-port competition refers to the terminal operators that have to take into consideration for competitiveness with terminal operators located in other ports (Notteboom & Yap, 2012). This type of competition can take place either in national or regional levels. The ports that are operating in the same geographical level have to deal with significant competition among them. In such situations, the ports that are less competitive may continually lose patronage of shippers to adjacent ones with better attributes (Omoke & Onwuegbuchunan, 2018).

The major element of the inter-port competition is the cost factors. The elements that have to be evaluated in order to provide an indication of the competitive positions of the clients for particular trades, are: the prediction of the potential traffic for client ports, the freight rates from interior locations, port charges and ocean carrier rates (Slack, 2006) (Allen & Hamilton INC, 1981).

The topic of inter-port competition is directly connected with containerization, as before the era of containerization was of minor importance. Nowadays, as the maritime transport containerization increases, the nature of inter-port competition is changing in two directions. Firstly, the intermodality is encouraged as the emerged competition is allowed between ports which are located distant from each other. Additionally, the larger shippers are inclined to decrease port container calls on long distance trips in order to exploit economies of scale (Notteboom & Yap, 2012) (Slack, 2006).

In general, the performance of marine terminals has been evaluated by making a comparison between the actual and the optimum throughputs (Chang & Lee, 2007).
Chapter 3: Maritime Security and Marine Safety

Shipping is the most international of all great industries around the world but at the same time the most dangerous too. It has always been recognized that by developing international regulations is the best and the most appropriate way in order to improve and enhance safety. Those regulations are essential to be adopted by all shipping nations (IMO (International Maritime Organization), 2019).

The maritime transportation, namely the ports, waterways as well as their intermodal connectors, constitutes an inextricable element of the international trade (Helmick, 2008). The international commerce and the international relations are terms, strictly depended on maritime transport, thus its security becomes increasingly more important and gains more attention (Bueger, 2015) (UNCTAD, 2004). Additionally, maritime security has the same level of necessity in maritime transportation as safety, port performance and logistics efficiency (Helmick, 2008). During the last decade, major factors of the maritime logistics, such as maritime policy, ocean governance and international security, began to include the term of maritime security in their orders (Bueger, 2015). The topic of maritime security is related to the systems used in order to ensure a well-tempered situation in the sea which is connected with the performance of a port.

After the terrorist attacks occurred in 11 September 2001 in the United States, both maritime community and authorities realized that the appropriate security measures must be applied (Helmick, 2008) (Lenain, et al., 2002) (Pallis & Vaggelas, 2008). Those events provoked worries in an international level regarding safety and security (Zhang & Roe, 2019).

The issue of security awareness expanded and a few regimes regarding the policy of transport were developed. Their goal was to minimize the relevant threats and risks in each transport system in the operations of the supply chain (Pallis & Vaggelas, 2008). In addition, in order to confront this situation, the international maritime security regime developed some measures such as ISPS and CSI that will be analyzed extensively in chapter 3.3 (Helmick, 2008).
3.1 Maritime Security

The topic of maritime security is strictly depended on the threats that emerge and can put the trade at risk. More specifically, those threats include topics such as the maritime inter-state disputes, the maritime terrorism, piracy, trafficking of drugs, people or illegal products, arms proliferation, sabotage, illegal fishing, environmental crimes or maritime accidents and disasters (Bueger, 2015) (Edgerton, 2013) (Zhang & Roe, 2019). Consequently, maritime security can be characterized as the absence of the aforementioned threats. The term of maritime security is a critical component of an overall border security program. More particularly, maritime security addresses an important susceptibility both in national and international security programs. Moreover, as much as the maritime security cooperative engagement increases, the level of difficulty, for the terrorists to perform illegal acts, is also increased (O'Brien, 2018).

In order to be more specific regarding the aforementioned threats, the term of maritime terrorism can be defined as the involvement of violent actions or actors dangerous to people that encroach the law. These actions may entail harm or damage not only to a facility but also to a country, organization or people (Edgerton, 2013). Logistics infrastructure, such as ports and operational aspects of transport and cargo are main objects for terrorism attacks (Zhang & Roe, 2019).

There exist four different pillars that remark on the distinct dimensions of maritime security. These pillars are: seapower, marine safety, blue economy and human resilience. More particularly, the term of seapower is completely connected with maritime security as the naval forces are the one of the main factors in maritime security (Bueger, 2015).

Nevertheless, safety is an inextricable element of maritime security as these terms are codependent due to the involvement of environmental and cultural interests (Bueger, 2015). It is obvious that marine safety is connected with maritime security as the shipping companies and their employees are potential targets in addition to potential perpetrators. More particularly, they may be targets due to pirates, terrorists and criminals, and may be perpetrators because of the engagement of maritime crimes like trafficking of illegal products or weapons or because of the collaboration with violent actors (Bueger, 2015).
The term of maritime security is crucial, and ports must invest in this realm as the 90% of European Union’s external trade and 40% of internal trade is transported by the sea. Furthermore, 350 billion passengers and 3.5 billion tons of cargo are transported through European waterways. Thus, the maritime security constitutes a strictly necessary dimension of the security on a global level and economic stability (O’Brien, 2018).

Additionally, the term of maritime security is connected with the economic development. The concepts of “blue economy” and “blue growth” have as objective the connection and the integration of the distinct aspects of the economic development of the oceans and the construction of sustainable management strategies (Bueger, 2015). More specifically, “blue economy” can be defined as the sustainable use of the resources provided by the ocean and has as purpose the economic growth and the improved living and jobs. Simultaneously, “blue economy” maintains the health of the ocean ecosystem (World Bank, 2017). Moreover, the term of “blue growth” refers to the support of the maritime area in order to contribute to growth in a sustainable manner (Mare, 2014).

Finally, the last concept in maritime security is the human resilience and security. The principal aspects of human resilience include food, refuge, sustainable living and safe work (Bueger, 2015).

### 3.2 Marine Safety

It is necessary to distinguish two different terms, marine safety and maritime security. More specifically, with the term marine safety the emphasis is given to the safety of the vessel, to the protection of seafarers and the marine environment. Also, this term entails the regulations of the construction of the vessel, the installations of maritime, procedures regarding safety and the education of maritime professionals (Bueger, 2015). In addition, the term of marine safety can contain the protection of life and property through
regulation, management and technology development of all forms of maritime transport (Edgerton, 2013).

In 1993, it became applicable by the International Maritime Organization (IMO) the Formal Safety Assessment (FSA). This measure applied in order to ensure a strategic supervision of marine safety and the prevention of the pollution (Trbojevic & Carr, 2000). More particularly, FSA is the procedure which helps with the identification of hazards, the evaluation of the risks and the decision of the appropriate activities that need to be taken in order to manage the aforementioned risk in a cost-effective manner (Trbojevic & Carr, 2000). In order to be more clear, hazards are the possible events and conditions that may result in severity such as cause of significant harm (Kristiansen, 2013) (Stephenson, 1991). In the category of hazards can be included issues such as dangerous cargo (fire, explosion, poisoning, environmental damage), ocean environment and weather, substandard ships and difficulty to control safety due to its international character (Kristiansen, 2013). Moreover, the Formal Safety Assessment describes a rational as well as a systematic risk-based approach which is used in the assessment of safety (Kristiansen, 2013) (Weintrit, 2009). The FSA methodology includes five steps, the hazard identification, the risk assessment, the establishment of safety measures, the cost-benefit assessment and finally the recommendations for decision-making (Kristiansen, 2013).

Consequently, it is important for a port to encapsulate both concepts, namely marine safety (vessel safety and seafarer protection) and maritime security (terrorists acts and illegal cargo) (Kristiansen, 2013) (Zhang & Roe, 2019).
3.3 Measures of Maritime Security

3.3.1 Container Security Initiative

The first program that will be presented is the Container Security Initiative (CSI) which was created in order to deal with potential threats provoked by terrorists who used maritime containers in order to deliver weapons and illicit products. CSI was created in order to border security and global trade (Roach, 2003) (Zhang & Roe, 2019). Bureau of Customs and Border Protection (CBP) created this antiterrorism program, and a lot of countries adopted it in 2002, in order to ensure the security in United States, after the incident happened on September 11, 2001, U.S. (CBP, 2019). CSI focuses on security gaps in the facilities of the port and has a global impact as the security is increased (Pallis & Vaggelas, 2008),

According to (CBP, 2019), Container Security Initiative suggested a security government system in order to protect and guarantee that all containers are being examined critically in foreign ports before their placement on ships with destination to the United States. Moreover, the containers that were examined (prescreened) were those that had a potential hazard for terrorism. It is obvious that the containers with high risk were targeted, inspected and screened before their departure, and the CSI was firstly adopted from ports that had a great volume of containers that were going to be delivered to US (UNCTAD, 2004) (Roach, 2003) (Zhang & Roe, 2019). CSI has its basis on the premise that the overall security of maritime transport requires enhancement as the cargoes required a greater level of security (UNCTAD, 2004). Furthermore, CSI program offers the opportunity to enhance their shipment security, as in order to join CSI the criteria are: trade volume, terrorism connections and geographical interest (UNCTAD, 2004) (Zhang & Roe, 2019). Thus, the purpose of CSI is to ensure high level of security while the movement of trade remains unchangeable (UNCTAD, 2004).

Container Security Initiative is composed of customs professional personnel in ports worldwide aiming to target containers that may pose a risk for terrorism (Zhang & Roe, 2019). One of the principal intentions of this program is to identify, target and prescreen containers at ports around the world before are loaded and being sent to their
final destinations. Another intention of the CSI program is to include the security factors in a national level during the targeting process. Finally, this program provides additional outreach for cooperation to the industry of the United States and also provides data collection. The CSI program is crucial as it provides a higher level of security and develops secure and smart movement of containers (Pallis & Vaggelas, 2008) (Roach, 2003).

The Container Security System can be described with the following four steps (Allen, 2006) (CBP, 2019) (UNCTAD, 2004):

1. Establish the required criteria in order to recognize those containers which have high risk
2. Pre-screening the high-risk identified containers before their arrival to U.S. ports
3. Using the technology with non-intrusive inspection (NII) in order to pre-screen the containers with high-risk. The technology used can include systems such as radiation detection equipment, large-scale x-ray and gamma ray machines
4. Each port must implement either “smart containers” or tamper proof container-seals in order to ensure the security of the containers while sailing to U.S.

After the implementation of CSI, more than 80% of cargo transferred by the sea were pre-evaluated, meaning that the cargos were examined before shipping (CBP, 2019) (Pallis & Vaggelas, 2008). Before the implementation of CSI, less than 5% of containers loaded to USA were evaluated and examined (Allen, 2006) (Lenain, et al., 2002).

Nowadays, the Container Security Initiative has been adopted and implemented in 58 ports worldwide, including Europe. CSI ports pre-screen more than 80% of all maritime cargo shipped in containers and imported into the United States (CBP, 2019) (Zhang & Roe, 2019).
3.3.2 Automatic Identification System

The International Maritime Organization (IMO) contributes in the safer life at the sea. Hence, IMO helps with the improvement of both safety and efficiency of maritime navigation as well as protecting the maritime environment (Kerbiriou, et al., 2017). Great importance is given to the development of systems that have as goal to facilitate and make maritime navigation safer using electronic tools. In order to ensure the maritime security, IMO has adopted mandatory rules regarding the adaptation of Automatic Identification Systems (AIS) in almost all countries in order to provide data either from one vessel to another or to on-shore authorities (Kerbiriou, et al., 2017) (Marine Traffic, 2017). Furthermore, AIS has been developed with the cooperation of a number of different international organizations such as the International Maritime Organization (IMO), the International Telecommunication Union (ITU), the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) and the International Electrotechnical Commission (IEC) (IALA, 2016).

Currently, the number of bases, that have been developed in order to receive the real-time vessel information, has been increased even more (Weintrit, 2011). The Automatic Identification System (AIS) is an automated and autonomous tacking system which is used in the maritime transportation (Marine Traffic, 2017). AIS system facilitates the exchange of the information between the vessels and ships. This system became mandatory in 2004 by the International Maritime Organization (IMO) (Kerbiriou, et al., 2017). The electronically exchanged information is given between AIS-equipped terminals (Marine Traffic, 2017) (Weintrit, 2011). Furthermore, AIS is commonly used between ships and coastal Vessel Traffic Services (VTS) using the frequency of VHF (Very High Frequency) and GPS receiver (in order the position and the movement details to be recorded) (Marine Traffic, 2017) (Tetreault, 2005). In general, ships can receive data in a radius of 15-20 nautical miles (Kerbiriou, et al., 2017).

The Automated Identification System was firstly introduced as a tool for maritime safety in order to avoid the collision of ships but also improves the management of fleets and navigation (Kerbiriou, et al., 2017) (Tetreault, 2005). Except for the avoidance of collisions, AIS intended to help port and maritime authorities to monitor traffic and to have
a better surveillance of the sea (Kerbiriou, et al., 2017). In addition, the Automatic Identification System is a standard used worldwide in order to facilitate the communication of information for ship-to-ship, ship-to-shore and shore-to-ship. The aforementioned information can be vessel identification, position, speed, course, cargo, port departure, destination as well as other relevant information regarding navigation safety and maritime security (Tetreault, 2005). Moreover, the exchanged data are available to everyone and to the scientific community as well (Kerbiriou, et al., 2017). As the provided data are available, meaning that there are precise data regarding the ships’ position in real time, the management of the traffic becomes more efficient, providing a rapid reaction in a potential accident or incident while at the same time having more precise information regarding the hazardous or dangerous cargoes (Kerbiriou, et al., 2017).

System information (which comes from Electronic Navigational Charts (ENC)) is demonstrated in a modern display and is also incorporated with the information in the Electronic Chart Display and Information Systems (ECDIS) in order to facilitate ship monitoring (Weintrit, 2011). More particularly, the Electronic Chart Display and Information System is a system which provides geographical information and is used for nautical navigation and meets the requirements of the International Maritime Organization (IMO) regulation as an alternative to traditional paper nautical charts (International Hydrographic Organization, 2018). In the picture below, namely in picture 3.1, it is depicted a standard image of the AIS. The AIS coastal stations are depicted in filter-like symbols with green and red color, while the ships and vessels appear with colored arrows, the direction of which indicates the course of the ship. The chosen ship transmits the information inter alia and has as destination Piraeus port (Marine Traffic, 2019).
The information which are provided by the Automatic Identification System must be analyzed. More specifically, except for the parameters that have already been analyzed, AIS information contains 3 types of parameters, the static parameters, the dynamic and the travel/voyage parameters. Dynamic information is transmitted in almost real-time, namely every 2 to 10 seconds, and static and travel information is transmitted every 6 minutes. More analytically (Kerbiriou, et al., 2017) (Nauticast, 2019) (Tetreault, 2005) (Weintrit, 2011):

1. **Static Parameters:**
   - Maritime Mobile Satellite Identify (MMSI)
   - IMO identification number
   - the ship’s name and call sign
   - the dimensions of the vessel rounded to an integer number
   - the type of the ship
2. Dynamic Parameters:
   - the position of the ship
   - the synchronized global time
   - the true course from 0 ° to 359 °
   - the path to the bottom and the speed to the bottom
   - the shipping status of the ship, namely if it is at sea, anchored or unladen
   - turn rate
   - the reference refresh rate

3. Travel Parameters:
   - the draft of the ship
   - the type of cargo (i.e. hazardous nature etc.)
   - the destination of the vessel
   - the estimated time of arrival in synchronized world time
Figure 3.1: Nature of AIS data

Source: (Kerbiriou, et al., 2017), (Nauticast, 2019), (Tetreault, 2005), (Weintrit, 2011)
3.3.3 96-hour rule and 24-hour rule

The first security US policy that was developed, in chronological order, is called 96-hour rule. This policy was developed only a few weeks after the incidents of 2001 in order to secure the ports. More analytically, every vessel destined to the United States must send an advance notice of arrival 96 hours before the arrival (Pallis & Vaggelas, 2008). The relevant information that had to be send concern the crew, the passengers, the cargo and the vessel itself. It is obvious that this rule’s goal was to minimize the security risk at the last stage of the overall supply chain but the rule does not safeguard the transportation from the passenger origin to the loading port (Firestone & Corbett, 2003) (Pallis & Vaggelas, 2008). The main objective is the provision to the government with the ability to target certain ships for which there is a security concern (Bichou, et al., 2007).

In the beginning, the 96-hour rule was 24-hour rule, meaning that the ships had to submit the necessary information electronically to the CBP at least 24 hours before the arrival of the vessel (Firestone & Corbett, 2003). The aforementioned necessary information that need to be submitted allow both prescreening and targeting of containers, and is a more economical way than the traditional approach of random physical inspections (Bichou, et al., 2007). It is obvious that the 96-hour rule is a stricter version of the 24-hour rule, which the high-risk cargoes are not allowed being loaded into the vessel. Moreover, the 24-hour rule is dependent to the CSI as it focuses on the identification of high-risk cargoes before the vessel enters into the United States (Firestone & Corbett, 2003) (Pallis & Vaggelas, 2008).

3.3.4 International Ship and Port Facility Security Code

The International Ship and Port Facility Security Code (ISPS) is a modification to the Safety of Life at Sea Convention (SOLAS) regarding the minimum security pattern for ships, ports and government agencies (Goulielmos & Anastasakos, 2005b). More specifically, ISPS code is an inclusive set of measures that have developed in order to
enhance the overall security of ships and port facilities (Helmick, 2008) (International Maritime Organization, 2019).

The ISPS code became mandatory on 2004 and has as purpose to detect security threats and take preempting measures in opposition to security incidents affecting ships or port facilities (Helmick, 2008) (International Maritime Organization, 2019). Furthermore, ISPS is based on a risk management activity, namely the insurance of the security of ships and port facilities, in order to decide the appropriateness and suitability of the security measures and the evaluation of the imminent risks and threats (Helmick, 2008). The principal aim of the ISPS is to provide a standardized framework for the assessment of the risk while at the same time helping governments to counterbalance the changes at risk with changes in vulnerability, both for ships and port facilities (Helmick, 2008) (International Maritime Organization, 2002).

The ISPS code affects all shipping over 500 gr.t. (gross tonnage) and all ports involved with international travels. Thus, a clear and specific understanding must be provided from all ports and parties (International Ship Suppliers and Services Association, 2016). According to (International Ship Suppliers and Services Association, 2016), ISPS code is applicable to the following types of ships that do international voyages:

- passenger ships and high-speed passenger crafts
- cargo ships of at least 500 gross tonnage
- mobile offshore drilling units
- port facilities when the ships are engaged on international trips.

The ISPS code is separated in two parts. The first one (Part A) is the obligatory part and presents in details maritime and port security prerequisites that governments (that have been contracted SOLAS), port authorities and shipping companies are comply with. While the Part B of the ISPS code is voluntary and suggests some general rules regarding the meeting of the established requirements provided by Part A of the code (International Maritime Organization, 2019) (International Ship Suppliers and Services Association, 2016).
The code of International Ship and Port Facility requires that each vessel is mandatory to have a Company Security Officer (CSO) who will collaborate with the Ship Security Officer (SSO) in order to solve security issues that may arise. The ISPS code ensures that firstly the Vessel Security Assessments (VSA) must be received and then the Vessel Security Plan (VSP) will be implemented or applied. Moreover, the Port Facility Security Plan (PFSP) has been developed in order to ensure the right application of measures with purpose to protect port facility and ships, people, cargo and ships stores that are located within the port facility from the risks of a security incident. Consequently, the CSO, SSO and PFSO are the three principal security people (International Ship Suppliers and Services Association, 2016).

In this point it must be analyzed the Port Facility Security Plan (PFSP) more extensively. The plan must address some measures and procedures (International Ship Suppliers and Services Association, 2016). More specifically the main measures and procedures are (International Ship Suppliers and Services Association, 2016),

- measures in order to prevent unauthorized weapons or dangerous devices which are aimed to be inserted into the port facility
- measures in order to prevent unauthorized access to the port facility to ships moored at the facility and to the forbidden areas
- procedures in order to respond to the security threats
- procedures in order to respond in any security instruction
- procedures in order to review and update the plan
- duties assigned to the port facility staff for port facility responsibilities
- procedures in order to report security incidents
- measures in order to ensure the security of information which is included in the plan
- procedures in order to audit the PFSP
- responding procedures in case of a possible activation of a security system of a ship.
Furthermore, the code is differentiated form country to country, and from port to port within a country. This happens due to the distinct operations that exist in each port or country. For instance, the larger ports tend to have operations such as ferry terminal, bulk terminal, chemical and oil jetties and container berths. There are usually different security levels in each operation (International Ship Suppliers and Services Association, 2016).

There are three levels of security. The first one (security level 1) is the level for which the minimum level of protective security measures have to be maintained at all times. At security level 1, the activities that can be performed are: the insurance of the performance of all ship security duties, the control access to the ship, the control of embarkation of people, the monitor of restricted areas in order to make sure that only the appropriate people have access, the monitorization of deck areas, the supervision of the handling cargo and the insurance of the security communication. Moreover, it is the level at which the port operates in a normal basis (International Ship Suppliers and Services Association, 2016) (Port Facility Security Plan, 2013).

Regarding the second security level (security level 2), can be defined as the level for which appropriate additional protective security measures have to be maintained for a period of time as a result of increased risk of a security incident. Finally, the last security level that will be analyzed is the security level 3. In this case, the third security level can be described as the level for which additional protective security measures have to be maintained for a specific limited period of time. This level of security is applied when a security incident is likely to happen but it may not be probable to recognize the specific target (International Ship Suppliers and Services Association, 2016) (Port Facility Security Plan, 2013).

According to (International Maritime Organization, 2019) and (International Ship Suppliers and Services Association, 2016), the main objectives of the ISPS code contain:

- the determination of roles and responsibilities of all parties in international, regional or international levels, namely all the parties that participate in maritime security in ports.
- The guarantee of the effective and efficient collation and exchange of relevant information regarding maritime security at all levels
• The provision of a methodology for security assessments both for ship and port. This methodology will enable and facilitate the security plans for ship, company and port facility
• To make sure that the appropriate maritime security measures belong to the right place on board ships and in ports
• The establishment of an international framework which promotes collaboration between contracting governments, government agencies, local administrations and shipping and port industries. The collaboration is fostered with the assessment and detection of the potential security threats to ships or port facilities which are used for international trade. The purpose is to implement and put into effect preventive and precautionary security measures in opposition to threats.

For the purpose of the achievement of the aforementioned objectives, all the parties must comply to the ISPS code. More specifically, the involved parties are the SOLAS contracting governments, the shipping companies as well as the authorities of the ports. It is essential to be denoted the appropriate security officers and personnel not only on each ship but also on each port facility and shipping company. These security officers, namely Port Facility Officers, Ship Security Officers and Company Security Officers, are in charge for the assessment, preparation and the right implementation of the effective security plans in order to handle with any potential threat (International Maritime Organization, 2019).

3.3.5 Security and Accountability for Every Port Act

Another measure of maritime security of the Security and Accountability for every port act (SAFE) which was endorsed in 2006 but was set in force in 2012. The system was developed in order to enhance technologies and facilitate the detection of nuclear devices and radioactive materials in containers of U.S. (Helmick, 2008). This act provides better data collection as the scanning is performed in every container which departs from foreign ports and has as destination the United States (Pallis & Vaggelas, 2008).
According to (Helmick, 2008), SAFE Port Act calls to the Secretary of the Department of Homeland Security (DHS) in order to conduct direct research, development, testing and evaluation efforts regarding maritime and cargo security. Moreover, the DHS Secretary coordinates both with public and private sector in order to develop and test technologies as well as to evaluate the aforementioned technologies. The DHS is essential for the SAFE Port Act in order to develop, implement and update a strategy aiming to improve the security of the international cargo supply chain (Helmick, 2008).

The most crucial technology initiative of the program is the Transportation Worker Identification Credential (TWIC). This program requires the security checks and biometric credentials for all people working in the ports of the United States. More specifically, biometrics is a measurement that calculates the physical characteristics in order to establish the identity of a person. In the measurements of biometrics are included the fingerprint pattern, the geometry of the hand, the blood vessel pattern, the iris pattern and the face recognition (Talley, 2009). Every worker who has access to security areas both of vessel and port facilities should provide the aforementioned biometric information to the US government (Pallis & Vaggelas, 2008). The main objective of this program is to enhance the level of security in the port areas and to prohibit the access to those who may pose a security threat (Pallis & Vaggelas, 2008) (Talley, 2009).

The SAFE program is different from the CSI program as the process of scanning can take place regardless of the previous assessed risk of every container (GAO, 2007). In the case that a container does not pass the scanning process it has not the right to be transported to the United States. Furthermore, the CSI program is operational in a reciprocal base, while the SAFE uses an autonomous policy, which is not depended on the cooperation between the United States and other countries around the world (Pallis & Vaggelas, 2008).
Chapter 4: Customs Clearance and International Barriers

4.1 Customs Clearance

4.1.1 Introduction

In the majority of countries, the efficiency of the customs is obstructed by corruption, thus a barrier in the expansion of the trade is created. The results are visible in the national security as well as in the public finance (Hors, 2001).

Customs Clearance is the documented permission to pass that a national customs authority grants to imported goods. Also, it is associated with the preparation and submission of the required documents in order to facilitate both import and export processes. It represents the client during the phase of customs examinations, assessments, payments of duties and co-taking of the delivery of cargo from customs after clearance (iContainers, 2013).

In general, the process of customs clearance entails a great amount of required documents, thus the overall process is related to paper shuffling and bureaucracy (Appels & Struye de Swielande, 1998). When sending goods outside EU, the shipment will be subject to customs clearance prior to delivery. Every country has a customs agency that is responsible for some duties such as the control of goods and the payment of taxes and duties on behalf of the importer or the exporter (Appels & Struye de Swielande, 1998) (iContainers, 2013). The customs agent has the role of the importer as well as the exporter and copes with customs authority. Another responsibility of the agent is to communicate all the necessary information regarding customs to the customers (iContainers, 2013). Moreover, the customs clearance is given to a shipping agent in order to prove that all the customs duties that have been applied have been paid and the shipment has been approved (iContainers, 2013)
In order customs clearance to be provided, this information are required (iContainers, 2013):

- The information of taxes both of the importer and exporter
- The origin point and the destination point of import and export
- The name and the country of the means of transport
- The number of packages, their gross and net weight as well as the volume and the description
- Regarding the imports, information about payable taxes
- Inspections in certain types of goods such as health of pharmaceutical goods.

Generally, a customs clearance process includes the following steps which are depicted in figure 4.1 below (Hors, 2001). The whole procedure contains 8 principal steps. Firstly, when the cargo arrives at the frontier, the appropriate operator submits either the cargo document or the road/rail document to customs. More specifically, the cargo manifest is a shipping document which is used for shipments made by sea, air or land and contains details about consigner and consignee, and details about the product like the number, the value, the origin and the destination (Business Dictionary, 2019).

Continuing to the second step, this step includes the deposit and the registration of the goods declaration, meaning that the importer submits the goods declaration for registration by customs. It depends on the customs the authentication of the substance of the document, as some customs authenticate the content at the registration phase and some others treat it as a preparatory formality (Hors, 2001).

The third step is the selection process and the verification. The selection is realized either in a random basis or according to risk assessment criteria. In some cases, verification is an essential element of the process. Consequently, additional documents must be provided. For instance, additional documents include certificate of origin accompanying with physical inspections on the goods (Hors, 2001).

Afterwards, the next four steps include the processes of the release authorization, the collection of the merchandise, the exit of the customs perimeter and the payment of the
customs debt. More particularly, the goods could be released conditioned to the appropriate payment arrangements and then there is the arrival from the customs area. The final step contains the process of the full clearance and, in the most cases, is subject to satisfactory fulfillment of the payment of all duties and taxes, as well as the evidence of compliance with other specific requirements regarding customs (Hors, 2001).
Figure 4.1: The Standard Customs Clearance Procedure

Source: Fighting Corruption in Customs Administration: What can we learn from recent experiences? (Hors, 2001)
In order to apply customs clearance, some documents are required, such as the commercial invoice, the packing list and the bill of landing. In order these terms to be more comprehensive, it must be analyzed. Each country has distinct requirements regarding the documentation, but all of them must be satisfied. Firstly, the commercial invoice is a certification related with the trading operation between the parties (seller and buyer). More specifically, this document includes taxes-related data, description of the cargo, the suitable Incoterm and the value of the cargo. The second document that must be described is the packing list. The packing list is issued by the seller and is accompanied with the commercial invoice. In this document, it is included in detail the number and the type of the packages as well as the weights and the volume. The last needed document is the bill of landing or B/L which is issued only by the transport company. The bill of landing is a certification in order to ensure that the goods have been loaded in a transport mode (Grainger, 2007) (iContainers, 2013).

Furthermore, in order the whole procedure to be more specific some additional information must be provided. After the rating of a shipment, the necessary fees, duties and taxes must be paid to the responsible agent. The information is communicated by the carrier to the customer broker. The necessary information include data regarding the shipment including the appropriate document, namely the international commercial shipping invoice. The aforementioned documentation is reviewed by the importing agents and they verify the amount of the payment. Afterwards the customs clearance document is issued by the customs office to the carrier and represents that the delivery to the consignee can continue (Mack, et al., 2008).

In order the costs of storage and the delays to be as minimum as possible, the information provided to the customs office must be precise and complete. Thus, a timely clearance response for a shipment will be accomplished (Mack, et al., 2008).
4.1.2 Customs Clearance and Dry Ports

A dry port is an inland intermodal directly connected by road or rail to a seaport and operating as a center of the transshipment of sea cargo to inland destinations. A dry port is located inland while a seaport, as has been described previously, is located by the sea (Roso & Lumsden, 2010). Furthermore, a dry port has high capacity transport means where the clients can either leave or pick up their standardized units as if directly to a seaport. Dry ports are key components of intermodal transport and offer a variety of services related to the processes of handling and the storage of containers. Apart from these services, a dry port additionally offers services such as customs clearance, maintenance of containers and forwarding. If a dry port has international importance, it shall refer to an inland position with a high level of security in order to handle the temporary storage and the custom clearance processes of freight (Dwarakish & Salim, 2015).

At dry ports of international importance should be available the regulatory inspection of the international moving goods and the execution of the applicable customs formalities. This could avoid some services such as the double handling and inspection of international products at border check points and at the same time could facilitate the international trade. Thus, the movement of goods will process in a faster pace and the overall costs will be reduced (UNESCAP, 2012).

The key element in a dry port is the full customs-related services that are provided as well as the necessary inspections for cargo export and import that should be implemented whenever it is possible (UNESCAP, n.d.). It is necessary the efficient customs formalities to be implemented in dry ports because if there are inefficient customs procedures can result to delay of the clearances, increase of the transaction costs and provision of security risks. Furthermore, customs formalities are essential as it help to realize the vision of international and intermodal transport system (UNCTAD, 2006).
The existence of dry ports facilitates the procedure of the customs clearance. There are some reasons that justify this reference. More specifically, customs facilitate the dry ports due to (ESCAP, 2014):

- The pre-arrival intimation of the containers which have as destination the dry port
- The provision for filling of advance import manifest and Bill of entry in the Customs law/code
- The Customs Risk management system. This system has to decide in advance if it will facilitate the goods or if it will subject them to physical examination which is based on predefined criteria
- The release of goods from payment of taxes separately.

Nowadays, road and rail-based intermodal dry ports are closer to the production centers and industrial centers. These centers are being developed aiming to consolidate in an effective way and to distribute efficiently cargo. The majority of countries have established well-functioning dry ports, while some other are still at a primary stage of development (Hanaoka & Regmi, 2011).

Finally, in this chapter it has to be analyzed the Automated System for Customs Data (ASYCUDA). ASYCUDA is a software which was developed by UNCTAD and is a standard for the operation of the dry ports. It is a system that manages the customs and handles with the majority of trade procedures. The Automated System for Customs Data deals with manifests and declarations of customs, warehouse manifests and suspense procedures. The aim of the system is to reform the overall process of customs clearance. More specifically, it accelerates the process and simultaneously minimizes the administrative costs (Ciortesu, 2011) (UNCTAD, 2006).
4.2 International Trade Barriers

International trade is an essential element of the economy of a country both in a business level and a governmental level. As international trade is the action of buying and selling products over a country, is strictly dependent on the trade barriers (Gitman, et al., 2018). These barriers are restrictions which are compelled by the government and is necessary for all the involved members to comply with. The main purpose of these barriers is to add additional cost either on the imports or the exports of a country in order to protect the domestic industries and economy. As a result, the existence of the international barriers reduces the rate of imports and increases the net profit of a country (Gitman, et al., 2018) (Zeder, 2018). Every country uses protection measures in order to protect its market from the competition coming from foreign and the imports. The main reason that lead the countries to the protection of their markets are the maintenance of employment, the protection of domestic market, the conservation of natural resources and the defense of the nation (World Economic Forum, et al., 2013).

There are three main categories of trade barriers that need to be analyzed. These are the tariffs, quotas and non-tariffs. More analytically, tariffs are taxes which are enacted by the government either in goods or services that are imported in the country (Williams, 2017) (Zeder, 2018). Tariffs increase the cost of the goods and are used in order to collect the revenue on the imported products. Furthermore, tariffs serve on the protection of the economy of a country as the imported goods lead to the existence and increase of competition (Gitman, et al., 2018) (Ray, 1981) (World Economic Forum, et al., 2013). The main purpose of the application of the tariffs is to make the imported products more expensive, thus they have less possibilities to compete with the local products (Gitman, et al., 2018) (Ray, 1981) (World Economic Forum, et al., 2013) (Zeder, 2018). It is obvious that tariffs do not promote the free trade, namely the interchange of products without a cost, meaning that no import tariffs are paid or quotas (Gitman, et al., 2018) (Ray, 1981) (Williams, 2017). Furthermore, there also exist the protective tariffs which make the products that are imported in a country less attractive to the consumers comparing with the local goods and serviced. In most cases, the imported goods are less attractive due to their increased price (Gitman, et al., 2018). Furthermore, the overall amount of a tariff charge
for goods is designated by the responsible customs office in the phase of customs clearance (Ministry of Finance, 2016).

The second barrier that will be presented is the non-tariff barriers which are also used in order to limit trade but in an indirect manner. The non-tariff barriers include measures such as the quality and content requirements, for the products or services which are imported, subsidies to domestic producers and VERs (Zeder, 2018). More specifically, quality and content requirements limit the rate of imports as the imported goods must comply with particular rules and criteria (Zeder, 2018). Regarding subsidies to local products and services, these barriers allow to the companies to sell their products at lower cost comparing to the foreign markets. If some firms enter into the country’s market, then the government determines the appropriate amount of taxes that the firm must pay, and simultaneously decreases the taxes from the local production in order the price to be more competitive (World Economic Forum, et al., 2013). In addition, another measure of non-tariff barrier is the embargo, namely the prohibition of both imported and exported products between countries. An embargo is mainly applied for defense purposes (Gitman, et al., 2018). Regarding Voluntary Export Restraints (VERs) can be described as restrictions on the quantity of imported goods and are imposed by the exported country (Rosendorff, 1996). Finally, the Voluntary Export Restraints are created due to the fact that the exported countries wanted to set their own rules than risk sustaining worse terms from tariffs or quotas (Rosendorff, 1996).

Finally, the last barrier that will be analyzed and is related to trade is the quotas. More particularly, quotas are restrictions that restrict either the quantity or the monetary value of imported products. The concept of quotas is to decrease the quantity of potential competitive goods in local markets because this reduction increases the demand not only for local products but for services as well (Gitman, et al., 2018) (Vernon & Hufbauer, 1970) (Zeder, 2018). Consequently, the imports are limited to a specific amount of a given product (Gitman, et al., 2018). In general, quotas or other non-tariff measures and restrictions may provide an asset in the expansion of the markets while tariffs provide an asset in the protection of product markets and economy of a country (Ray, 1981).
4.2.1 Entry Barriers

Expect for the barriers in the international trade, it is necessary to mention the definition of the entry barriers in seaports. According to (Bain, 1956), an *entry barrier is anything that allows incumbers to earn above-normal profits, including high capital expenditure*. In addition, (Bain, 1956) added that an entry barrier is an advantage of well-established sellers in an industry comparing with the sellers that desire to enter to the market (Bain, 1956) (McAfee, et al., 2004). However, according to (Stigler, 1968) an entry barrier is a cost of producing which must be carried by the companies that want to enter to the market but is not carried by the companies which are already part of the market (McAfee, et al., 2004). Thus, the expenditure of high capital is not an entry barrier due to the fact that the incumbents have also incurred such expenditure (McAfee, et al., 2004).

Furthermore, there also exist entry barriers which are also divided into three categories (World Bank, n.d.):

- Economic entry barriers
- Regulatory and institutional entry barriers
- Geographical entry barriers

More analytically, the economic entry barriers are the existing service provider’s absolute cost advantage and the magnitude of switching costs. Regarding the existing service provider’s absolute cost advantage, when an entrant cannot challenge it, there is an entry barrier (De Langen & Pallis, 2007) (McAfee, et al., 2004). The following factors contribute in order to provide to a firm cost advantage (De Langen & Pallis, 2007):

- Better location in the port, namely when there is easy access to the transportation like rail, road or inland waterways, the entry of competitors is less attractive
- A larger scale of operations with associated scale economies, namely new entrants may have to deal with a competitive disadvantage which results
from a smaller scale or may have the necessity to create the same capacity as the imminent firm

- Incumbents benefiting from accumulated public investments, namely the new entrants have to deal with additional cost that incumbents do not have to pay. More specifically, in the majority of ports there is infrastructure such as rails terminals, in which the incumbents have long-term contracts, namely they gain long-term cost advantage. Thus, the new entrants cannot utilize those facilities, due to unavailability, and, as the opportunity costs of the land are not always included in the total price provided by the port-service providers, they face additional costs.

The magnitude of switching costs is the second economic entry barrier. The magnitude of switching costs consists of the costs which are associated with the switching from the incumbent port service to the entrant (De Langen & Pallis, 2007). For instance, switching between port facilities require investment of port users, In addition, the costs of switching are also high through the bundling services of the incumbent port-service provider. Arrangements such as the pilotage or the tonnage create a great barrier to new entrants in the market (De Langen & Pallis, 2007) (World Bank, n.d.).

The regulatory and institutional barriers entry barriers are caused by the involvement of the government and make the entry to the market expensive, time consuming or impossible in some cases (De Langen & Pallis, 2007).

Finally, the geographical or locational entry barriers can be described as natural barriers that restrict the capacity of the port; thus, they limit the entry. More specifically, firms which demand land in the port, their entry may be limited. This happens due to the fact that in many ports there does not exist additional space for berths, facilities or warehouses (De Langen & Pallis, 2007).
Chapter 5: Case Study of Piraeus Port

5.1 Introduction

The port of Piraeus is the largest port in Greece and one of the largest ports in the Mediterranean Sea. It constitutes the main gate of the Hellenic imports and exports. The role of the port, not only in the development of the international trade but also in local and national economy, remains undeniable. The strategic geographical location of the port and its infrastructure offers competitive advantages comparing with other European ports (Piraeus Port Authority, 2019).

The main functions of Piraeus port is passenger shipping and the container handling. Additionally, another advantage is that it is located in a crossroad between the west and the east trade, meaning that it is a crossroad of three continents (Europe, Asia and Africa). More specifically, as it is depicted in the figure below (figure 5.1), the port of Piraeus constitutes a gateway to Asia and Russia through to Black Sea; it is a central hub for Easter Europe; connection to the national road network; and it has a strategic proximity to both Northern Africa and Middle Eastern routes (Maritime Logistics, 2015) (Piraeus Port Authority, 2019) (Psaraftis, 2005). Moreover, it operates as an international cruise center and a commercial hub as its location is ideal in order to connect the port with the plethora of Greek islands that exist (Nan, 2016) (Piraeus Port Authority, 2019).
The port of Piraeus has 3 terminals in total with different capacity each and only the first one is operated by the Piraeus Port Authority (PPA S.A.), while the remaining 2 docks are operated by China Ocean Shipping Company (COSCO). After the privatization of the docks 2 and 3 of Piraeus port from COSCO in 2009, the container handling of the port was increased within a short time. This happened due to the update of the infrastructure, consequently the competition between Piraeus and other European ports started to increase.

As it has already been described, the three different terminals have distinct capacities. The first one has a capacity equal to 1 million TEUs, the capacity of the second dock is 3 million TEUs and the third terminal has a capacity almost 2.7 million TEUs. Thus, the total capacity of the Piraeus port is equal to 6.7 million TEUs and has the 39th position in terms of container capacity worldwide (Piraeus Port Authority, 2019).

The numbers of the traffic volumes are remarkable, as according to (Nan, 2016), the traffic volumes in 2015 in the port of Piraeus were more than 3.5 million TEUs, while its position in 2015 in the rank was 8th in Europe and 3rd in the Mediterranean Sea according to the Lloyd’s list for the top 100 global container ports (Lloyd's List, 2015) (Nan, 2016). In addition, the traffic volume for 2018 in the port of Piraeus was 4.9 million TEUs,
meaning that there was a raise of 40% comparing with the data of 2015 (Shipping Herald, 2019).

The port of Piraeus provides a variety of services and activities to ships of different sizes, types and cargoes. The principal activities of the business model that the port offers are (Clomoudis, 2015) (Maritime Logistics, 2015) (Piraeus Port Authority, 2019):

- The container handling
- The car handling
- Cruises
- Passenger shipping
- Ship repair.

The main activities of the business model must be analyzed in order to be more comprehensive. Initially, the container handling terminal possesses a strategic location and a suitable infrastructure and physical depths for every type of container ships and vessels. Moreover, operated 24 hours per day and 365 days per year, namely it is always accessible and available. The container terminal has a storage area of 180,000 m² and a traffic capacity of 25 million tones. Regarding the car handling terminal, also has a beneficial position for transshipment and is operated 24 hour – 365 days. The Piraeus port offers competitive volume scaled tariffs and owns a record almost equal to zero damages. There exist two car terminals in the port of Piraeus with 190,000 m², in which can be stored up to 12,000 cars. The capacity of transshipment is almost 670,000 units/cars annually. Afterwards, the cruises constitute a basic activity of the port. The port can serve every type and size of ship. There are 9 to 11 vessel berths (depending on the type of the vessel) and 2 to 3 berths for cruise ships (Maritime Logistics, 2015) (Piraeus Port Authority, 2019). Nowadays, Piraeus port is one of the largest cruise-home-ports by both passenger capacity and service infrastructure (Nan, 2016). The next main activity is the passenger shipping terminal which also operated 24 hours through the year and offers tide-free access. In addition, as it has already been described, as it is the largest passenger port in Europe, there are a lot of routes
with all Aegean islands in a daily basis. Finally, the port of Piraeus provides repairs for various types and sizes of ships (Maritime Logistics, 2015) (Piraeus Port Authority, 2019).

As the port of Piraeus operates in many different sectors, the variations are independent of the operated sectors, while other European ports depend on fluctuations of a particular sector. Consequently, the benefit of this port is that is not strictly defined as a car handling or passenger shipping port, but Piraeus port is all the above combined (Clomoudis, 2015).

5.2 Piraeus Port and Customs Clearance

As it has already been described on chapter 5, tariff duties are applicable on imported goods, or occasionally on exported products, from countries outside the European Union at customs territory of the EU are specified in the “Common Customs Tariff of the EU”. The overall amount of the tariff charge for the products that will be imported into the European Union ports, is designated by the responsible customs office, during the phase of customs clearance (Ministry of Finance, 2016). In order both importers and exporters to know in advance the amount of tariff that will need to pay, the issuance of a Binding Tariff Information (BTI) is required by the responsible Customs Authority. More specifically, the BTI is a written tariff classification on the imported goods and it provides the assurance that the products have the correct commodity code and is legally binding on all customs of European Union (HM Revenue and Customs, 2018) (Ministry of Finance, 2016). Additionally, the Binding Tariff Information is valid for three years and facilitates the calculation of the customs duties, export refunds, licensing requirements, quotas or other restrictions in advance (HM Revenue and Customs, 2018). An application for a BTI must be deposited before all the customs procedures have been finished. When a stakeholder wants to apply for a BTI, it is essential to provide a Government Gateway user ID and password, the EORI number, data in detail about the goods and brochures, manuals or samples when needed (HM Revenue and Customs, 2018).
It is important to be claimed that the procedure of the customs clearance can be performed either by the public authorities, namely IARP (Independent Authority for Public Revenue), or by private authorities, namely companies of the private sector (Phoenix Global Group, 2019). Those companies can handle any type of cargo, any type of commodity and provide any type of documentation required (Piraeus Port Authority, 2019).

In order in all ports, including the port of Piraeus, the tariff charges to be determined, there are some information and documents that may be demanded by the customs office. These documents are presented below (Grainger, 2007) (Ministry of Finance, 2016):

- Commercial invoice of the products in case that the products have been sold
- Sales contract document, which includes the possible restrictions, the currency in which the price of the goods is determined, and other documents related to the rights of the imported goods
- The royalties’ contract which specifies if the payment of royalties should be included in the value of the customs and if so at which degree
- The delegation agreement in order to set an additional amount for commissions or brokerage fees or for the exclusion of commissions market
- Documents related to the carriage and the insurance of goods for the determination of the terms of delivery (Cif, Fob, Ex Factory, etc.) and the costs of delivery at the place of entry into the customs territory and the shipping costs upon the arrival at the place of entry
- Accounting entries of the importer or buyer for obtaining information of the revenues or of the general costs.
5.2.1 Free Trade Zone in the Port of Piraeus

The free trade zones exist in some ports and constitute a special regime of the port. These zones are special economic zones with conducive custom terms, which operate individually in parts of the territory of customs and are separated from the rest of customs territory, within which the imported goods from non-EU countries are coming (Ministry of Finance, 2016). A free zone facilitates the process of importing goods and improve the cash flows (Piraeus Container Terminal, 2014). Among the facilities offered in the free trade zones are the handling, the warehousing, the storage, the transshipment and the reexport operations. All the aforementioned activities occur according to the existing customs regime and not subject to customs duty (Ministry of Finance, 2016) (World Bank, n.d.).

The main purpose of establishing a free trade zone is the storage of products importing from countries that do not belong to the European Union. Another important aim is the service and the facilitation of the international trade while at the same time ensuring the financial benefits (Ministry of Finance, 2016) (Piraeus Container Terminal, 2014).

As free trade zones exist mainly in seaports, also exist in the Piraeus port. One of the benefits of the free trade zone is the improved cash flow management by removing the obligation of payment of VAT or import duty. Another important advantage of the free trade zone is that can store products without paying import VAT and import duty until the products are removed or released into free circulation. Moreover, free trade zones can facilitate the carriage of particular handling and processing operation on the products while remain on the free zone (Piraeus Container Terminal, 2014).
5.3 Piraeus Port and Maritime Security

Generally, maritime transport and more specifically container terminals, is a sector that demands even more attention. Transportation is a mean or a target in order to achieve illegal searches of organized crime and terrorism. The maritime transportation has the highest level of security risk and at the same time is the main pillar of the international trade. Thus, the maritime security becomes a crucial issue for all ports (Tzannatos, 2003). As the port of Piraeus is located in a crossroad between the west and the east trade, it is necessary to ensure a high security level. It has to be ensured the smooth and correct operation of the port without any threats which can put the trade in danger such as piracy, terrorist attacks or transfer of illegal goods (Bueger, 2015).

5.3.1 Container Security Initiative

Regarding the measures, that have already been applied in order to ensure the right operation of the Piraeus port, the first that will be analyzed is the Container Security Initiative (CSI). Provided that CSI was created in order to border security and international trade, it must be applied in every port (Zhang & Roe, 2019). Generally, this measure can be characterized as an antiterrorism program aiming to deal with potential threats that may arise (CBP, 2019). The main focus of the Container Security Initiative is on the security gaps in port facilities and is achieved with the detailed inspection controls in containers (Pallis & Vaggelas, 2008). In addition, the CSI program, as it has already been described, increases the ability to intercept containers that may pose a risk for terrorism before the containers reach to the United States (Pallis & Vaggelas, 2008).

CSI is now operational in many ports around the world as well as in the port of Piraeus, which prescreens more than 80% of all maritime containerized cargo imported into the United States (CBP, 2019). Greece as part of the CSI program must target any cargo container that poses a risk for terrorism and has as destination the United States. Thus, port of Piraeus complies with this initiative (Piraeus Port Authority, 2019).
5.3.2 Automatic Identification System

The Automatic Identification System is crucial for the maritime safety in ports. More specifically, it is a system of automatic exchange of digital signals between ships and offshore circulation systems. Through this system the mutual briefing is achieved for all the ships, their identification, their cargo, their port of departure and their port of arrival. According to IMO, the main purpose of the development of the Automatic Identification System is the improvement of the level of safety at sea, the ability to execute both safer and more efficient shipping the recognition of the objectives, the facilitation of the tracking of the goals, the simplification of the communication and the exchange of information between the ships and the ports (International Maritime Organization, 2002) (Kerbiriou, et al., 2017) (Nauticast, 2018).

The Automated Identification System is applied in the Port of Piraeus. It facilitates the procedure of the monitoring and in every moment the vessels are depicted in the map. There is a full provision of information, the provided data are available to all parties through the platform, thus the monitoring remains in a high level (Marine Traffic, 2017).

5.3.3 International Ship and Port Facility Security Code

The International Ship and Port Facility Security code has been extensively analyzed in the chapter 3.3.4. This code is the basis for a comprehensive mandatory security regime for the international shipping (International Maritime Organization, 2002). It is applicable in passenger ships, cargo ships, mobile offshore drilling units and port facilities (International Ship Suppliers and Services Association, 2016).

As all ports involved with international travels comply with the ISPS code, the port of Piraeus also complies with. From 2011, the International Ship and Port Facility Security code came into effect at the Piraeus Container Terminal. The necessary forms must be completed at least 24 hours before the vessel arrives at the port. If the authorities of the vessel fail to complete the necessary documents, may the vessel either be delayed or its arrival be prohibited (Piraeus Container Terminal, 2014).
Chapter 6: Case Study of Thessaloniki Port

6.1 Introduction

The second case study that will be studied in this dissertation is the Port of Thessaloniki (ThPA S.A.). The port of Thessaloniki is the second larger seaport in Greece, after the port of Piraeus, and one of the busiest cargo ports in Greece. It has a strategic geographical location, as well as the Port of Piraeus, and offers competitive advantages if compared with other European ports (Thessaloniki Port Authority, 2019) (Komninos & Tsarchopoulos, 2012). In addition, the port of Thessaloniki serves as a vital node in the international road network due to the fact that it is close both to the city center and the airport, and provides a combination of transport nodes such as the maritime to road, rail and air transport (Gogas, et al., 2014).

The port of Thessaloniki constitutes a typical Mediterranean city-port, namely the port is located in the city center, and serves as a transshipment hub in the Aegean and Black Sea. The port serves as a gateway to the broader area of Northern Greece and the Balkan peninsula as it is depicted in the figure 6.1 below (Brochure of Thessaloniki Port Authority, 2018) (Thessaloniki Port Authority, 2014b). The geographical coverage of the port is international, national and regional, meaning that the chains of transport affect both destination and origin (Gogas, et al., 2012). Furthermore, the port of Thessaloniki has a dominant role in exports and transits in the northern region of Greece. It provides facilities of high level for both container and conventional cargo handling (Pallis & Vaggelas, 2005) (Thessaloniki Port Authority, 2019).
The port of Thessaloniki occupies an area of 1.55 million m² in total and includes three main groups of facilities: the conventional, the container terminal, and the passenger terminal. There are 6 piers in which the facilities are taking place (Vayona, 2011). The port in an annual basis handles around 16 million tons of cargo. The 7 million handled tons are general cargo (dry bulk) while the rest 9 million tons are liquid fuels (liquid bulk). Moreover, the port annually deals with 220,000 passengers (Thessaloniki Port Authority, 2019) (Vayona, 2011). Regarding the TEUs, the port of Thessaloniki has a capacity of 500,000 TEUs while in the future it is expected to have a capacity of more than 1.3 million TEUs (Brochure of Thessaloniki Port Authority, 2018). More analytically, the 6th pier that is under expansion, will enhance the capacity of TEUs annually. Consequently, this difference in TEUs is translated into 160% increase compared to the current maximum capacity.
The main operation of the port of Thessaloniki is the container handling. Concurrently, ThPA offers a variety of services such as (Thessaloniki Port Authority, 2019):

- Container handling
- Conventional dry cargo
- Vessel handling
- Cruises
- Passenger shipping
- Liquid cargo, mainly through private oil companies

Afterwards, the main activities provided by the port must be analyzed in order to be more comprehensive. Initially, the container handling terminal occupies an area of 350,000 m² with a storage capacity of 5,000 TEUs in ground slots (Thessaloniki Port Authority, 2014b). The container handling terminal is perfectly equipped with modern container handling equipment and has direct access to the double track railway to the national railway networks. In addition, the facilities of the port can handle any type of container and are operated 24 hours per day and 365 days per year, meaning that the port is always accessible. In the first quarter of 2019 the port of Thessaloniki handled 108,737 TEUs, having a surplus from the previous year (2018) in which the port on the first quarter dealt with 102,877 TEUs. Thus, there is an increase of 5.70% in container handling (Statistical Data Report, 2019).

The next principal activity that will be analyzed is the conventional cargo terminal. It occupies a surface of almost 1 million m² and its largest part belongs to the Free zone. From the conventional cargo terminal are transported cargoes such as solid bulk, liquid bulk, Ro-Ro vehicles as well as general cargo (Thessaloniki Port Authority, 2019). The terminal of the conventional cargo is not available during all day, but it operates in two different shifts adapted to the traffic of the terminal (Thessaloniki Port Authority, 2014b). During the last year (2018) an important increase of 29.61% was observed in cargo throughput comparing with the first three months of the current year (2019).
More particularly, the total amount of tones of commodities handled in 2019 was 2,140,151 as compared to 1,651,165 tons in 2018 (Statistical Data Report, 2019).

Regarding the activity of the vessel handling, the port of Thessaloniki provides a variety of services in order to perform services to a variety of distinct customers. For instance, according to (Thessaloniki Port Authority, 2014b) the provided services are:

- Berthing
- Water supply
- Power-telecommunications supply
- Waste and residue management
- Towage.

Additionally, there are other institutions that provide supplementary services such as fire-fighting services and navigation services (Thessaloniki Port Authority, 2014b). In the category of vessel handling an increase of 6.58% is also being observed in the first quarter of 2019. The vessels handled by the port was 470 in 2019 as compared to 441 in the first quarter of 2018 (Statistical Data Report, 2019).

The passenger terminal constitutes also a major element of the port of Thessaloniki as it is one of the largest passenger terminals in Aegean Sea and constitutes a transition from the islands to the mainland. This terminal is located between Piers 1 and 2. The passenger terminal operates 24 hours through the year, thus it is always accessible (Thessaloniki Port Authority, 2014b). During the last year (2018), a decrease of 11.69% was observed in the area of passenger traffic comparing with the traffic of 2017 (ThPa Statistical Data Report, 2018). More specifically, according to statistical data of 2018, 42,972 passengers were serviced in total by the port of Thessaloniki in 2018 (ThPa Statistical Data Report, 2018).

Regarding the passenger handling, the cruises are an extension of it. More specifically, due to the strategical position of the port of Thessaloniki, another service provided is the cruises. The port can serve ships of any size and type while providing a great variety of destinations and routes (MedCruise, 2019) (Thessaloniki Port
Authority, 2014b). The number of cruises was also decreased by approximately 38% comparing with the given data of 2017 (ThPa Statistical Data Report, 2018).

Finally, the port of Thessaloniki has the proper installations for the transportation of liquid fuel storage. It is also located in proximity to the international natural-gas pipeline and its management is made generally through private oil companies (Thessaloniki Port Authority, 2014a).

6.2 Port of Thessaloniki and Customs Clearance

Customs clearance is an inextricable part of each seaport. Therefore, it cannot be absent in the case of the port of Thessaloniki. Customs clearance is required due to the fact that the port deals with a variety of imported commodities. In order a vessel or its enterprise to enquire customs clearance, it must firstly cite the necessary documents such as the origin and the destination point, the amount of packages carrying, the payable taxes, etc. (iContainers, 2013).

In port of Thessaloniki, the customs clearance can be performed either by the Independent Authority for Public Revenue (IARP) or by third parties, namely private companies which help their customers with the process of customs clearance. In both cases, the service of the customs clearance is provided for cargo arriving into Greece or departing from Greece from the ports of Piraeus and Thessaloniki, meaning that they offer both import and export customs clearance. Furthermore, the service is also been provided for the transition of cargo for delivery to Balkan countries (Phoenix Global Group, 2019) (Press Release Thessaloniki A’ Customs Operation, 2018).

Tariffs are also present in the port of Thessaloniki. There exist a variety of different categories of tariffs regarding the type of cargo and the service that will be performed in the port (ThPa Regulations, 2013). The customs office of each port is responsible for the amount of tariff charge that will be paid for the imported or the exported products (Ministry of Finance, 2016).
6.2.1 Free Trade Zone in the Port of Thessaloniki

Free trade zones exist mainly in seaports, as well as in the port of Thessaloniki. The free trade zone of Thessaloniki is one of the 27 free trade zones that operate in the European Union. These zones were designed in order to operate and promote trade between countries within European Union and also with developing countries, and are totally harmonized with the community customs code (Vayona, 2011).

Moreover, the gate 16 of the port of Thessaloniki is operated as a free trade zone with surface 254,000 m² and being accessible 24 hours per day. The warehousing capacity of the free zone is 5,000 TEUs on ground positions. It is significant due to the offered facilitation to the international trade and the promotion of the development perspectives of the port (Thessaloniki Port Authority, 2019).

According to the official webpage of the port of Thessaloniki, the free trade zone deals with (Thessaloniki Port Authority, 2014b):

- Community cargo originated or destined from/to countries of the European Union
- Community or domestic cargo originated or destined from/to Greek harbors
- General cargo
- Solid bulk cargo
- Liquid bulk cargo
- Ro-Ro vehicles.

6.3 Port of Thessaloniki and Maritime Security

The necessity and the importance of the existence of maritime security remains undeniable. As the port of Thessaloniki gains even more importance after the years, even more security systems and regimes must be applied in order to ensure the right operation of the services provided by the port.
6.3.1 Container Security Initiative

The importance of the Container Security Initiative system has been analyzed extensively in this thesis. Regarding the port of Thessaloniki, has also applied the CSI system. Provided that Greece is part of the CSI, it is mandatory to target any type of cargo container which may pose a degree of danger for terrorism and has as destination the United States (Zhang & Roe, 2019).

6.3.2 Automated Identification System

Nowadays, the Automated Identification System is applied in almost every seaport around the world. The port of Thessaloniki has adopted this system and customers, authorities and enterprises can monitor at any time the vessels and the ships on the map (Marine Traffic, 2019) (Thessaloniki Port Authority, 2019). The data of each vessel, such as the IMO identification number, the name of the ship, its position, the type of cargo transported etc., is available to every associate through the special platform (Marine Traffic, 2019).

6.3.3 International Ship and Port Facility Security code

The International Ship and Port Facility Security code is obligatory aiming to detect potential threats. As it is applicable to every port having involvement with international travels, port of Thessaloniki has also adopted this code (Thessaloniki Port Authority, 2019). The port of Thessaloniki is fully compliant with the specifications of the ISPS code (Brochure of Thessaloniki Port Authority, 2018). The code is applied in every passenger ship and cargo ship (Thessaloniki Port Authority, 2019).
Chapter 7: Conclusions and Future Research

7.1 Conclusions

Initially, the observed ports, namely port of Piraeus and port of Thessaloniki, have many similarities. In both ports, the most common nodes of transportation that are used in combination, with maritime ones, are the road and the rail. In the case of the port of Thessaloniki there is an asset as the port has a direct connection with the rail network in all piers. Both ports remain on the position of the two top container ports in Greece and deal with the majority of the freight volumes arriving to Greece.

The geographical position of the ports is crucial. The port of Thessaloniki has a dominant role in northern Greece and in the greater South East Europe area, while the port of Piraeus has a competitive advantage in southern Greece and in the three continents that is close to (Asia, Europe and Africa).

In addition, both ports have a port authority autonomy, but in the case of Piraeus port there exist the participation of COSCO in the administration of the port. More particularly, China’s COSCO shipping company took 67% stake in Piraeus Port Authority in August 2016 and became the controlling shareholder (Xinhua News Agency, 2016) (Zhang & Roe, 2019). In the case of the port of Thessaloniki, the rights are granted for 40 years by the Greek State to ThPA (Thessaloniki Port Authority, 2014a). Thus, in both cases there exist partial or total government participation in the management of the port. As an extension to the administration of the ports, there is a major difference regarding port facilities. In the first case, namely Piraeus port, COSCO has been updated and renovated all the facilities of the port while in the second case the port facilities are outdated. Furthermore, in the case of PPA the logistics cluster is renovated and updated comparing with ThPA in which there is an absence of logistics hub in the main port hinterland.

Another similarity that both ports have is the provision of services such as the container handling, the car handling, the passenger shipping and the cruises. Nevertheless, the port of Piraeus provides the service of ship repairs for various types of ships and vessels while the port of Thessaloniki does not offer that service. Additionally, the port of
Thessaloniki is suitable for liquid fuel storage through pipelines while the port of Piraeus is not suitable for this kind of service. The main service provided by the port of Thessaloniki is the container handling while on the contrary, the main function provided by the port of Piraeus is the passenger shipping. Both ports are operational 24 hours per day and 365 days per year, meaning that there are always accessible and provide a full availability.

Another important characteristic that both ports have in common is the transit costs. Both ports (PPA and ThPA) have increased transit costs in countries outside European Union comparing with other competitive ports. The port of Piraeus and the port of Thessaloniki have free trade zones in order to facilitate the process of the imported commodities. Moreover, both ports have margin for development. More specifically, the port of Thessaloniki is still in the period of the development of the 6th pier which will increase significantly the handled TEUs, while the port of Piraeus can proceed to ship enlargement by COSCO.

A contradistinction between the two observed ports is that the PPA has 3 piers with total capacity of 6.7 million TEUs comparing with the ThPA which owns 6 piers but with total capacity of 500,000 TEUs. Consequently, the PPA can handle approximately 93% more TEUs than ThPA. More specifically, in 2018, the port of Piraeus handled 4.9 million TEUs while the traffic volume of the port of Thessaloniki was 102,877 TEUs. Those data are depicted in the table below (table 7.1).
<table>
<thead>
<tr>
<th></th>
<th>Maximum Capacity (TEUs)</th>
<th>TEUs handled in 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Port of Piraeus</strong></td>
<td>6.7 million</td>
<td>4.9 million</td>
</tr>
<tr>
<td><strong>Port of Thessaloniki</strong></td>
<td>500.000</td>
<td>102.877</td>
</tr>
<tr>
<td>Difference (%)</td>
<td>93%</td>
<td>98%</td>
</tr>
</tbody>
</table>

*Table 7.1: Quantitative characteristics of PPA and ThPA*

Regarding the maritime security both ports utilize the same systems. In order to be more comprehensive, the Container Security Initiative, the Automated Identification System and the International Ship and Port Facility Security code are applied to both ports. All the commodities that are imported or exported from/to countries outside European Union must comply to the aforementioned systems and codes.

Finally, port of Piraeus and port of Thessaloniki can perform the activity of the customs clearance through the Independent Authority for Public Revenue (IARP) or through private companies. Both ports have the option to provide this service either for cargo that has as destination point Greece or has as departing point one of those two ports, namely port of Piraeus and port of Thessaloniki. The import and the export customs clearance procedure can be performed by both ports.

The main results of this thesis are that the port of Thessaloniki despite is role, meaning that its main activity is the container handling, has significant less capacity in terms of TEUs than the port of Piraeus. Furthermore, both ports are located in notable geographical locations aiming to service a wide range of markets in Europe, Asia or Africa. Depending on the type of activity needed, namely container or vessel handling, cruises,
passenger shipping and liquid cargo, one can choose the most appropriate port in order to perform the necessary service. The presented data has already been stated in the previous chapters of this dissertation and was collected from academic resources and publications.
7.2 Future Research

This dissertation provides a brief analysis regarding the port of Piraeus and the port of Thessaloniki. It covers sectors such as the maritime security and the customs clearance. Nevertheless, there are plenty of research opportunities that can be conducted on the topic such as the optimization of the already existing maritime security measures and their expansion in order to ensure the highest level of security which forms a vital role of maritime transportation.

In addition, similar analysis can be used for two ports of different countries or for competitive ports in the Balkan peninsula. This kind of analysis can be also applied to ports that have many differences in the offered activities.

Moreover, another important proposal that could be considered is a cost analysis based on transportation cost. For instance, a case in which a cargo arrives to the seaport of Piraeus and continuous via road transportation to Northern Greece comparing to a cargo that arrives to the seaport of Thessaloniki and afterwards is directed to northern Greece. For this analysis, it is necessary the destination point to be the same.
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