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The case of the Piraeus Port as a gateway for the
Balkan region and Central-Eastern European
countries.

By

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Acknowledgements

This thesis, is for me, the culmination of my educational journey, which started several years ago. The end point is marked by this survey and leads me to the next step and my professional career.

One year ago I started this program without any particular knowledge about shipping. Thus, in order to deal with this challenge, I put in a great deal of personal effort but most importantly, major help from a number of people whom I would like to acknowledge.

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Abstract

The purpose of this survey is to show that the project of the creation of a Southeastern European gateway port in Piraeus, is utterly plausible. The idea is to track down all the key elements of this ongoing project, from the privatization of the port in 2008 by COSCO Pacific which is an ultimate chance to change the fate of that port, to the future role of the port in the European continent. It is a quite interesting research, from a scientific aspect, as this case of the Piraeus port is a rare situation where we witness a major modification in a port, which tries not only to grow as a port in a specific region but changes the fundamental transshipment function, adding also the gateway function in parallel. Starting right from the beginning, the study tries to assess the privatization of the port, based on the previous case of British ports back in the 80s. The interesting part and the link between the two cases, is the privatization of the regulatory function (i.e. Port Authority), which, contrary to the UK case, in the Piraeus port case can be a positive factor. The next point of this research is to examine the benefits that the Piraeus port can have by exploiting the gateway function too. This positive impact has three dimensions; the sustainability of the port, the creation of a logistic cluster and the development of the metropolitan area around the port. Then, using a Spatial Interaction Model as a tool, this survey evaluates the influence of the Piraeus port in the Balkan Peninsula and Central-Eastern European countries. The Piraeus port recorded a percentage up to 33% of the total interaction flows in that area, based on two main ingredients which reflect the potentialities of a port; the strategic location of the port and the capacity of the container terminals. After revealing that the port has the position and the dynamic, among the competition, to exploit its hinterland, the final step of this study is to examine the key determinant which can facilitate this exploitation. This analysis discloses several “pathogens” and chronic issues of the Greek society and the port that need to be lifted. Finally, the Chinese company should come up with a hinterland strategy which needs intensive investments and negotiations, in order to create a new inland route from Piraeus to Central Europe.

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List of Abbreviations

CEE	Central Eastern Europe
PA	Port Authority
BOT	Build, operate transfer
OLP	Piraeus Port Organization
PCT	Piraeus Container Terminal
HRADF	Hellenic Republic Asset Development Fund
PPA	Piraeus Port Authority
ABP	Associated British Ports
BTDB	British Transport Docks Board
NDLS	National Dock Labor Scheme
SIM	Spatial Interaction Model
PoR	Port of Rotterdam

1. Introduction

The landscape of the European ports, seems to have been unchanged through the years. Each port has its own role and functions and based on that, we define the competition among them and the market share for each one. For example, we cannot compare the Malta Freeport with the Port of Antwerp. Not because of the difference in traffic volumes or in position, but because of the different role and function they have. The former is a transshipment port in the Mediterranean Sea and the latter an industrial port in the Northern Range with a lot of inland connections.

In general, we can conclude that the southern European ports are mostly transshipment hubs with a local or national inland activity. Exemptions are the ports of Barcelona and Valencia, which combine the important gateway function with the transshipment role (Notteboom, et al., 2014). While the northern range ports are used as gateway ports for the goods from and to all over the world. The major investments in inland infrastructure and the proximity to the heart of the European industrial and commercial life, have created a stable framework that seems threat-averse for future challenges.

This stability comes from the fact that the gateway role is far from easy to be obtained and it requires major investments and time. This node must integrate its function to all possible connection modes and invest certain amount of capital to upgrade its infrastructure. Additionally, the port should have an economic, political and tax environment, that will facilitate the trade and minimize any barriers (Oum & Tongzon, 2007).

On the other hand, the transshipment role is rather easier, because it is based on the location over the competition, the quality and the cost of the handling services. Therefore, a transshipment port faces uncertainty, since a competitor can easily imitate those characteristics by investing into the terminals' infrastructure and gain a market share as a transshipment port from the shipping lines that can easily swift into another port seeking for better options (Rodrigue & Notteboom, 2010).

A new big challenge for the stable framework of European market is already ongoing, since the Chinese giant COSCO decided to invest in Piraeus port a vast amount of money, changing the role and the power of this historical port. Having firstly upgraded the internal infrastructure of the port, this state-owned company is now planning to create an alternative gate for the Asian goods to Europe, via the Piraeus port. With the implementation of that plan, the Northern Range ports may face new competition from the southern part of Europe for the Central Eastern European market, which could easily become a contestable hinterland for the Piraeus port.

This ambitious plan, even now at this initial phase, has already created an enormous growth rate for the Piraeus port, which has already reached nearly 4 million TEUs traffic volumes compared with merely 0.5 million TEUs in 2008, placing it into the major players of the European market. The next step for the port, after the launch of the inland investments, is to become the leading port in the Mediterranean Sea and one of the strongest in Europe.

The aim of this research is to examine how a rather small port a few years ago, can now become a gateway port for the Balkans and the CEE market. Those regions can easily become the contestable hinterland for Piraeus port, thus this area is chosen to reflect the potential influence of the Piraeus port. Greece is the strongest player in the Balkan Peninsula and Piraeus the busiest port, but the CEE countries will be a challenge for Piraeus port. This market is far more lucrative than the Balkans but it faces fierce competition. In addition, by searching the influence of the Piraeus port in that area, can show the potentialities of the port as well as its limits.

This study is going to assess the competition at the key Eastern Mediterranean and Western Black Sea ports and examine the potentialities of those ports over the sampled areas. The major contribution of this study is the analysis of the specific key determinants and success factors for the gateway role of the Piraeus port, based on the literature review and research.

1.1 Problem Identification

The role of the Piraeus port as a transshipment hub in the Mediterranean Sea is recently undisputed, after the major investments of COSCO. The port's currently annual traffic volumes are more than 3.5 million TEUs, ranked 8th in Europe and 3rd in the Mediterranean Sea, while the Chinese state-owned company is planning to reach more than 6 or even 10 million TEUs in the future (Nan, 2016)

In order for the Piraeus port to become the leading port in the Mediterranean Sea, it should not be based solely on transshipment function. Throughout the next years, COSCO's investments in the port's infrastructure, will reach a limit. The volumes created by the transshipment function are not enough to fill the planning capacity. The next step should be to explore the Balkan Peninsula and CEE market too and use the Piraeus port as a gateway for it. Then the Piraeus port can expand its potential growth even further and exploit that large amount of capacity already mentioned. Therefore, major hinterland modifications should also take place, in order to support an efficient transportation route.

Inland transportation and hinterland markets have become crucial for a port to attract more trade flows. Only recent port authorities have started to be more active outside the area covered by a port (Van den Berg & de Langen, 2011). Inland costs are still a major factor of total transaction costs, thereby port authority realize that the connection between ports and hinterland with upgraded infrastructure is crucial for the efficiency of transportation and the maintenance of the port's role in a specific region (van der Horst & de Langen, 2008) (Van den Berg & de Langen, 2011)

The Chinese plan, after the concession agreement for the Piraeus port, includes several investments not only in Greek hinterland infrastructure, but also in other countries like Serbia, Hungary, in order to connect the port with the CEE.

Therefore, based on the geographical location, the competition in that area for the gateway role and the hinterland infrastructure, we will try to investigate the potential role of the Piraeus port as a gateway port. Considering the importance of that project for the European maritime environment and the fact that there are not any previous studies to cover that case, this research deals with quite an important, up to date and uncovered issue. Thus, in the end we can be in a position to understand more and assess not only that project but all the future major-investments needed to change a port to its foundations.

1.2 Motivation

The Piraeus port has been a jewel in the Mediterranean Sea since ancient times, symbolizing the Greek naval tradition. But in 2008, with merely 433,000 TEUs traffic, the Piraeus port was far from a symbol of Greek naval power. COSCO's invests in 2010 during the Greek crisis, was one of the few success stories during that period. With the world's highest growth rate (699%), the Piraeus port is now handling more than 3.5 million TEUs and stands at the 8th place of the biggest European ports.

The potential role of the port at the European market creates quite an impressive scenario, which is the trigger for this research. Throughout this study an opportunity will be given to deal with several issues of port management. At the end a position to know the strategic decisions needed to be taken will be available as well as the investments and the framework in order for the whole role of a port to be changed and established as a new gate.

From a scientific aspect, this study offers the interesting factor to work with a case that is rarely on the spotlights, since the Balkans is one of the less attractive markets in Europe and the ports in that area lack in traffic volumes. Moreover, the ongoing project in the Piraeus port is quite new to attract the interest of researchers. Thus, a new field for research is open, making the contribution of this study quite unique.

The modification of a European port in such an extent so as to drive major changes in the framework of market influence and shares in the whole Balkan Peninsula and CEE, is a trigger to start a research. Most studies usually deal with the assess of the current performance of the ports. This study takes a plausible scenario and investigates the potentialities and the way in which this scenario might become reality.

1.3 Research Questions and Objectives

With reference to the identified problem, this study is guided by the following main research question:

How can the port of Piraeus become not only a transshipment port, but also a gateway port?

Basically, this main research question contains two elements. First, it is understood that currently the Piraeus port is an important transshipment hub in Europe. Thus the majority of the traffic volumes now, as well as the majority of the growth through the recent years, is due to that role. Second, we conclude that the main research does not focus on the benefits or on the possibilities of that further gateway role of the port, but how it can succeed in becoming that.

The objectives of the main question are to show under which circumstances and strategic plans can the Piraeus port extend its operations by also serving the Balkan Peninsula and CEE countries as a gateway port. Even though currently the growth rates of the port are increasingly high, there will be a point in which the port will reach its full potential growth. In that point inland transportation can open a new market for the Piraeus port, making it the leading port in the Mediterranean Sea.

In order to provide a profound answer to the main research question, the following sub-questions need to be answered. The whole structure of this study is based on these sub-questions and the answer of each one will lead us step-by-step to the final outcomes of the main research question.

- 1. What is the current state in the Piraeus Port, after COSCO's concession?*
- 2. What will the benefits for the Piraeus Port be when it becomes a gateway port too?*
- 3. What is the competition frame in the Eastern Mediterranean Sea regarding the gateway role?*
- 4. How can hinterland infrastructure become a key element, facilitating the connection between the Piraeus port and CEE countries?*

The four sub-questions can be grouped into two sets, according to the path used to reach the answer. Hence, the first two sub-questions will be answered in Chapter 4, based on the literature review part and the aim of those sub-questions is to create the base, in order to understand the general frame in which the further research is conducted.

The next two sub-questions are to be answered in the analysis part, in Chapter 6. The goal of the third sub-question is to investigate the potential competition that the Piraeus port might face, based on the position of each port among the sampled area. Finally, in the last sub-question there will be an investigation of the most important elements for the success of a gateway port, such as the hinterland infrastructure. The objective is to give a frame of the current situation as well as to suggest further activities and the

potential strategic movement from the Chinese investors in order to facilitate the trade flows from Greece to the targeted markets.

1.4 Thesis Structure

Chapter 2 deals with several important issues, crucial in order to create the path for the analysis of the case. This chapter describes the process of the privatization of the ports, the functions of transshipment and gateway and the hinterland strategies. Chapter 3 gives the basic knowledge of the Spatial Interaction Model, which is used to assess the competition among the sampled area. Then, Chapter 4 introduces the case of Piraeus port, giving important information and answers. Chapter 5 presents the findings of both the qualitative and quantitative analysis used. Chapter 6 provides suggestions and recommendations for further research and policy advice. Finally, Chapter 7 concludes that research by gathering the basic findings.

2. Literature Review

This chapter provides an overview of the literature required for the understanding of the research. The tools used to gather all the paper for the study are Google Scholar and the Electronic Library of Erasmus University Rotterdam.

The first section presents the literature about the concept of privatization with a close view to the UK ports privatization which has a lot of similarities with our case. Next to that, there is a section references to the two functions of a port: Transshipment and Gateway. Finally, Section 2.3 proclaims the importance of the port's hinterland, especially in the case of a gateway port.

2.1 Port Privatization

This study starts with a key element which is the privatization process of the port. Without that process, the whole research would have been a fictitious scenario with an imaginary implementation, as the state, in this situation, cannot support such intensive investments. In the case of the Piraeus port, the privatization changed the face of the port completely. This chapter provides the theoretical review of the case of privatization, in order to understand the current situation in the Piraeus port and finally assess whether or not this strategic decision was beneficial for the port.

First of all, Section 2.1.1 shortly introduces the concept of privatization in ports, giving the definition and the types of privatization. Afterwards, Section 2.1.2 argues about the success of the privatization, using the previous case of UK ports privatization. Our aim is to observe the aftermath of those privatizations, combined with previous scientific studies, to gather the required knowledge to later conclude in whether this was beneficial for the port in the case of Greece.

2.1.1 Definition and Types of Privatizations

Worldwide, the private sector tends to get more and more involved in the operational or even the ownership of strong industries in developed and developing countries, like airports, highways, energy-supply and assuredly ports (Haarmeyer & Yorke, 1993). Privatization is a very general concept, as in reality it only describes the situation where a private entity involves somehow the once public port. But it does not define which functions of the port are in private hands and to what degree.

Defining port privatization is not easy because the role of private and public parties can vary (Baird, 1999). Baird used three elements that influence the extent of the involvement of private sector in ports. Those elements are port regulator (or port

authority), port landowner and port operator which can be privatized either individually or collectively.

The port authority is entrusted with the functions of developing, maintaining and monitoring the port's well-being, hence it is the least possible element to be transferred into private hands. The second element that can be privatized is the land. Usually in this element, the stakeholders that are involved are the municipality and/or the state, while the private sector can play the role of the tenant. The final function of a port is the operations with reference to the physical process of handling the goods (Baird, 1999).

According to Baird (1999) there are four possibilities to ascertain the extent of the privatization in a port. The following table presents the four Port Models given by Baird.

Port Models	Port Authority	Port Landowner	Operator
Public	Public	Public	Public
Private I	Public	Public	Private
Private II	Public	Private	Private
Private III	Private	Private	Private

Table 1: Port Models of Privatization (Baird, 1999)

Private I is by far the most common form of privatization in ports, where the state or the municipality – or both – owns the land and the PA while private entities such as terminal operators, lease the land.

Pagano et al (2013) also mentions that there are several stages between the purely public and the purely private port based on its functions. In this model there are six approaches, which are shown in Table 2.

Title	Public Sector Role	Private Sector Operating Role
Pure Public	Public sector owns and operates port	None
Landowner and Regulator	Public sector owns port and regulates private sector	Operation – Competition among terminals
Build, operate transfer – BOT – Greenfield Concession	Negotiation with private companies, regulation	Operation

Long-term Lease of existing facility – Brownfield Concession	Negotiation with private companies, regulation	Operation – Competition among terminals
Pure Private	None	Operation – Competition among terminals
Publicization	Public sector owns and operates port	Operate and maintain

Table 2: Six approaches of privatization (Pagano, et al., 2013)

In the first approach the public sector owns and operates the port while the private sector plays no role at all. The second approach presents the familiar case where the public sector is the landlord and the port regulator and leases the land to several terminal operators, who own the equipment, such as cranes. In BOT approach or Greenfield concession, the public entity builds, maintains, finances the port's new facilities and then a private company takes over those facilities for a period of time. This model was firstly launched in Panama. The difference between the Greenfield and Brownfield concessions in this model is that the facilities are new in Greenfield but existed in Brownfield. The concession structure in both cases is similar with the second approach, but in those two cases there is an initial payment, followed by payments related with the revenues. At the pure private approach, the private sector takes full control of the port either by buying the port from the public sector or by building its own port. The final approach of Publicization is not nationalization as the port is not taken by the public sector. In this case the public sector starts to get involved in a once fully private port.

2.1.2 Arguments about Privatization Based on British Ports Privatization

Arguments against any type of privatization is a very common situation. This is true especially in Greece, where throughout years of negotiations, labor was trying constantly to protest with major strikes against the approval of this project. Most of the time the main argument against privatization is that the country sells the assets and land to foreign capital and companies that act like conquerors.

In theory, comparing the public and private party, can lead to the following results: public owned and operated firms do not face competition and they cannot go bankrupt. Additionally, public enterprises can potentially be exposed to governmental influence or pressure (Haarmeyer & Yorke, 1993).

Nevertheless, the main indicator that can show whether a privatization is beneficial for the port or not, is its efficiency. In this competitive, globalized and international trade environment, port efficiency in the operational part is crucial. There are a lot of scientific works, trying to argue and find the connection between port efficiency and privatization (Pagano, et al., 2013). Cullinane et al (2002), who used a stochastic frontier model of

the efficiency of major container terminals in Asia. Another stochastic frontier model is that by JoseTongzon and Wu Heng (2005), who tried to determine the quantitative relationship between port ownership structure and port efficiency. Wang and Knox (2011) used the case of ports privatization in the US to estimate the impact on the efficiency.

This study is based on one of the most well-known privatizations, which is that of UK's ports. The part below presents the timeline of the case, the objectives and the results after the privatization. Hence, a comparison can be afterwards made between this example with the case of the Piraeus port and asses the privatization so far.

2.1.2.1 The Case of British Ports Privatization

One of the most notable and successful privatizations in the history of ports started in the 80's, when the British government proceeded into the privatization of 19 ports. Scientific researches by David Haarmeyer and Peter Yorke (1993), Baird and Valentine (2007) and Baird (1995) describe the process of those privatizations. Those studies can give us a great example to compare and see the similarities and differences between those two cases.

In February 1983, based on a program of denationalization, the British government privatized 19 public owned ports. Thatcher considered the privatization as a solution against the "corrosive and corrupting effects of socialism". In 1979 the losses from nationalized industries were incurring each taxpayer with £300 annually (Baird & Valentine, 2007)

In the case of nationalized ports, Haarmeyer and York (1993) pinpoint more specific reasons for the privatization. The first reason behind this decision was that most port services were under public labor boards and trusts. The result was that they restricted competition and increased service costs. The second reason was that those trusts blocked any move into new markets and more profitable commercial ventures. Finally, the British ports were struggling to compete with the other European ports, at the onset of the era of the containerization (Haarmeyer & Yorke, 1993).

The first wave of privatizations in the UK started in 1983. By that time, UK had had around 70 port authorities and the private entity Associated British Ports (ABP) was the largest one. Before that the 19 public ports were operated by the British Transport Docks Board (BTDB), which was restructured and became the ABP in 1981.

The privatization occurred in two phases. The British government wanted to sell the 19 ports as a group and in 1983, 51.5% of the total share was offered, followed by the remaining 48.5% one year later. The majority of the shares was at the hands of the private ABP, except for a 2.5% which was owned by port workers. In the end, the privatization of the 19 ports raised £80 million or \$150 million (Haarmeyer & Yorke, 1993).

The profitability of the private company was halted by the fact that the National Dock Labor Scheme (NDLS) had some degree of control in port operation. The government was forced to pass a legislation to abolish the NDLS, which finally happened in 1988. The profits that the company recorded after the privatization and the freedom in operation control, illustrates the prosperity of the port. In 1981, the ABP made a profit of £1 million with 9,300 workers compared with the 1990 profit of £60.2 million with only 3,633 workers (Haarmeyer & Yorke, 1993).

At the second wave, in 1992, five of the trust ports, Teesport, Port of Tilbury, Forth, Clyde and Medway were privatized. The reason behind this strategy was again the constrain in terms on expansion, because the ports failed to raise capital and invest in new facilities and diversify their activities (Baird, 1995).

2.1.2.2 Results and Lessons from the UK case

Several studies have been conducted so far in order to assess the British ports' privatization. The nature of the privatization, as well as the importance of the economic and social results, makes that case the cornerstone of privatization studies.

Cullinane and Song (2002) conclude that it is generally difficult to identify any improvements on the efficiency or the productivity of the ports after the privatization. An important reason can possibly be that post and pre privatization eras are not the same, having different factors that affect the ports' performance.

In general, the privatization of the Associated British Ports (ABP) was remarked as a successful one, providing positive evidence. This decision led to a more cooperative and efficient workplace. Haarmeyer's and Yorke's paper, shows that the productivity of the labor rose as did the cargo handled from 78-million metric tons to 90-million metric tons. In addition, capital investments also increased and generally the port upgraded throughout the following years. The value of the market share also indicates the success of the 19 ports privatization. In 1983 the price of a share was 112p, while ten years later it had reached the price of 386p (Haarmeyer & Yorke, 1993).

On the other hand, opponents of the privatization said that the trust ports, because of this unique structure, were already profitable before the privatization and that in the case of the ABP privatization, it was the property upgrade and not the port operation which was the reason behind the increase in profit (Baird, 1995). Cullinane and Song (2002) also mentioned that it was the abolition of the NDLS in 1989 that had a direct impact on the efficiency of the port and not the privatization.

From the first until the last acquisition, the state received in total \$824 million, apart from the additional taxation income. Baird and Valentine (2007) were more skeptical about the success of the privatization. They believed that the ports were heavily discounted during the sale process, and in order to support that they gave an example. They compared the cost for a new container terminal in London (e.g. P & O Ports

London Gateway Terminal), which was \$1.1 million. In other words, the cost for one terminal exceeded the revenues from all the privatized ports (Baird & Valentine, 2007).

To further illustrate this argument, we can take the case of Medway port. It was privatized for \$13 million and just 18 months later, another buy-out team bought the port for \$104 million. The CEO and other senior managers became millionaires overnight (Baird & Valentine, 2007).

What makes the case of the UK's ports special and very relevant to our case is that the government decided the privatization of all three functions of a port – port authority, landowner and port operation. Contrary to many other countries which also privatize their ports, but they keep the role of PA as a public entity (Baird & Valentine, 2007). As we saw previously at the types of privatization, there is no need for a total sell of the port in order to secure private investments and consequently, all the benefits of private activity. There are structures like concessions where the functions of the ports are split in a way that public and private sector may coexist in harmony.

2.2 Transshipment and Gateway Port

This study tries to deal with the gateway role of the Piraeus port. Thus, it is necessary in this section to present the two types of the port's functions; transshipment and gateway. Most ports focus on one of those two functions, which in the end contributes mostly at port's traffic volumes. However, there are also exceptions, where a port tries to combine and somehow balance both functions. It is very important to classify the role of a port, because each role has different requirements regarding the strategy, the infrastructure and the type of the investments, as well as the competition from other ports with the same function.

Normally, in a study dealing with the Piraeus port, the role that dominates the discussion is transshipment, given that the port bases its traffic volumes mostly on transshipment flows. Since this research is about the potential role of the Piraeus port as a gateway port, this section will focus on that role. Section 2.2.1 describes what a transshipment and a gateway port are in practice and tries to pinpoint the differences. Then, the next part introduces the benefits for a port that chooses to act as a gateway. This is a very important part because before we explore how the Piraeus port can also become a gateway port, it is crucial to understand why and how this can be beneficial for the port.

2.2.1 Differences Between Transshipment and Gateway Role

The transshipment role is essential for a lot of ports, which are solely based on this type of traffic flows in order to be competitive. The most important factor for a transshipment hub according to McCalla (2008) is the location of the port in

accordance to other ports. The port has to be in a location to attract shipping lines, because for a lot of shipping lines, there is a number of ports that are used as an intermediate point between the origin and the final destination. Companies want to reduce the port cost of international transportation of containers, choosing the cheapest transshipment port (Chang, 2009).

The concept of transshipment is based on economies of scale. Shipping lines launch bigger vessels to transport goods for long distances. With this big vessel they can reduce the cost and to do so they fill the vessel with the demand from several markets. This vessel needs a point where it can unload the cargo once, decreasing the port calls. The further process of distributing the cargo to the exact locations, is undertaken by other vessels or feeders. This point is a transshipment hub, playing only this simple but important role.

The majority of papers related to transshipment port mostly deal with the competition between ports for the transshipment volumes within a region. The aim of this study in that point, is just to give in this section the theoretical framework of the transshipment, in order to understand the difference with the gateway role and the importance of the latter for the Piraeus port.

In his paper, McCalla (2008) makes an important remark. He mentions that transshipment can be either intramodal or intermodal, because in both cases the cargo is unloaded and loaded – transshipped. But when the cargo is transferred to different modes, then we use the term intermodal transportation. So, transshipment is considered to be the intramodal between vessels (McCalla, 2008).

Genco and Pitto (2000) present three different types of transshipment. Hub and Spoke, where containers are transshipped from deep-sea vessels to feeders, Relay Transshipment, where containers are transferred between deep-sea vessels operated in different long-haul routes and Interlining Transshipment, where containers are transshipped through deep-sea vessels operated in parallel routes with different port rotation (Genco & Pitto, 2000).

On the other hand, a gateway port wants to attract trade flows in order to distribute them into the hinterland using other modes like trucks or rail. Berechman (2007) in his study about the social costs of the New York gateway port gives the following definition: *“A global gateway city is defined as a coastal metropolis with port access to the rest of the globe, which captures a substantial share of total regional and international trade volumes.”* (p. 1).

A very important study about port performance in gateway logistics was conducted by Tongzon and Oum (2007). The gateway port is presented as a node in a globalized supply chain that links regions with different types of inland infrastructures like roads, rail, marine and air.

For these nodes, the key element to encourage the gateway role is the logistic cluster which has to be developed in that area. It is crucial to understand that gateway hubs are part of a global supply chain network, connecting markets from all over the world. Specifically, in order for gateways to provide this function efficiently, there should be a perfect connection between the different types of modality and a state-of-the-art

transport infrastructure. Additionally, a very important remark is that the environment of the port must facilitate the free trade flows, with no barriers (Oum & Tongzon, 2007).

In both cases ports are used as an intermediary point where goods are exchanged in order to be transferred to other places. In the case of transshipment, this transfer occurs only by the involvement of other vessels – deep-sea or feeder. Gateway ports facilitate this transfer to hinterland markets by a well-organized connection, world class infrastructure and logistic activities.

The transshipment role is theoretically easier to be developed than a gateway one. The former may require efficient service and good location, relative to other ports, but the latter requires all the previous factors plus an adequate inland infrastructure to support the global supply chain. In the Mediterranean Sea there are some ports that are mainly transshipment hubs, namely, Port Said (Egypt), Algeciras (Spain) or Gioia Tauro (Italy) and others that are based on the hinterland market like Ambarli (Turkey), Barcelona (Spain) and Genova (Italy). Piraeus is currently a transshipment port. A port that has managed to split its operation into those two roles, quite successfully, is the port of Valencia. In 2014, the port handled around 4.4 million TEUs, half of those being transshipment and the rest serving the geographical area (National Bank of Greece, 2013).

The transshipment role of a port is considered to be riskier and it can expose the port into rapid decline of volume traffic. That happens because the port depends its activities solely on the transshipment flows. If a competitive port invests in this project and upgrades its facilities or operation with lower costs, offering also an attractive position, shipping lines can easily swift into this port, which is more preferable at this moment. This change has no cost for them and it can happen quite rapidly. Major transshipment hubs in the Mediterranean Sea used to be the Gioia Tauro or the Taranto port. This booming period for Piraeus port in transshipment moves, led to a decline of those ports, which are sinking due to this swift (Rodrigue & Notteboom, 2010).

Hinterland service on the other hand, offers an additional market, in order to increase the traffic volumes. It may require more investments, but the aftermath is that the port sustains the position and the role in the region. It is less easy for a competitive port to invest that amount of money in the short term. A port that will not depend only on transshipment flows, can maintain its position, have access to new markets and reduce the risk and pressure from competition.

2.2.2 Benefits of a Gateway Port

It is important to understand that it is not only possible, but also essential for a port to have both transshipment and inland gateway traffic, in order to be included among the strongest ports. After this review of the definitions and differences between those two types of ports, this section shortly mentions the main benefits for a port from this hinterland accessibility and exploitation.

As can be inferred from the previous section, the major advance of the gateway role is the sustainability of the position over competition. Rodrigue and Notteboom (2010), concluded in their research that the hub-and-spoke role is vulnerable and risky, because of potential changes in market growth and basically because of new entrance. The reason is that those intermediate hubs are based on basic resources such as location, accessibility, terminal infrastructure and performance. Those characteristics can be easily imitated by competitors and consequently it is difficult to create competitive advantages.

Therefore, the consolidation of the position in service cluster for a port is linked with investments that cannot be easily imitated by competitors. Those investments go beyond the frame of the port and the terminal area and there are complex processes relative to inland connection and supply chain network (Rodrigue & Notteboom, 2010). Those factors stabilize the position of the port among the competition, because they create a strong base for the port.

Savage et al (2014), mentioned in the study about the development of Walvis Bay Port into a logistics gateway for southern Africa, the importance of the global supply chain and logistic cluster for the port. In other studies, this cluster is mentioned as logistics facilities. Those clusters are for some regions the base of their development. The power of a cluster is that it creates an attractive environment of a bundle of companies, agents, information, labor and technology. Those entities are closely related to each other and by this connection they lower the costs and operate more efficiently. According to Porter (2000), "*Clusters are geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (e.g., universities, standards agencies, trade associations) in a particular field that compete but also cooperate.*" (p. 15). Hence, the benefits from the creation of a logistic cluster can enhance productivity, bring more innovation and attract new business and new jobs (Savage, et al., 2014).

Rodrigue and Notteboom (2010) argued that, apart from the hinterland-based regionalization, there is also the foreland-based regionalization where intermediate hubs capture a maritime hinterland. They conclude that: "*The positive outcome of foreland-based regionalization is that it enables the system to support a level of traffic which otherwise would not be feasible*" (p. 26).

Another perspective is given by Berechman (2007), who presents the benefits from the point of view of the city. Studying the social impact of the gateway port to New York city, he concludes that there is an economic development at the metropolitan area.

2.3 Hinterland Strategies

The gateway function of a port is directly related to the exploitation of the hinterland, as the cargo in the case of the gateway port, are exchanged in order to be distributed in the inland part, either national or regional. This section goes through the literature

review about the hinterland of a port and contributes to the study with that key knowledge towards the methodology part.

2.3.1 The Importance of Hinterland Infrastructure

Port Authority and its developments are engrossed most of times with the area within the port. That is not enough for a port which wants to achieve a hinterland regionalization. As seen before the connectivity and the inland infrastructure are key requirements for a port in order to serve the region and expand its services. The role of the port and the transport chain has changed and the port must take actions to extend and maintain its hinterland (Notteboom & Rodrigue, 2009) (Klink & Berg, 1998)

Therefore, it is crucial for every leading port to have good hinterland connection either by trucks, rail or barge, because inland transportation adds extra cost and sometimes higher than total door-to-door service (Van den Berg & de Langen, 2011).

According to Notteboom and Rodrigue (2009), the amount of throughputs for a port indicates the most efficient way of transportation. For example, in a small port with a low amount of traffic volumes and short distances to serve, trucks are dominant for inland serving. But as the port grows, other intermodal transportations become important elements, taking advantage of economies of scale. This is the exact situation in the Piraeus port, in which the rapid expansion of trade volumes makes truck transportation no longer an efficient solution to serve other areas, apart from Greece.

Slack (1999) mentioned that terminal traffic of a port can be increased by a direct connection with an inland terminal. This supports our assumption that in order to push into a further expansion at Piraeus port's volumes, PA should develop inland connection adding extra demand from the Balkans and CEE countries.

2.3.2 The Role of the Port Authority at the Inland Developments

Van den Berg and de Langen (2011), focus on the role of port authorities at a hinterland strategy. They argue that PA should abandon the role of landlord and act as network manager. The incentives for a PA are not only the revenues but also the sustainability accessibility and competitiveness. Using the port of Barcelona as a case, we saw that PA realized that road transportation solely, restricts the expansion of the port. They start to develop a plan for intermodal transportation that will attract trade flows even for distance market like South France. In order to do this, you must have high standards at your network that will satisfy the customers (Van den Berg & de Langen, 2011).

PA can either invest in the port infrastructure or in the hinterland to increase the competitiveness of the port. Now that PA in Piraeus is in COSCO's hands and after several modifications within the ports area, PA can play also a leading role in the

hinterland investments. Moreover, it supports the initial argument that in the Piraeus case, the privatization of the regulatory function can be beneficial since it gives the freedom to the Chinese state-owned company to achieve the project of the creation of a logistic cluster and an inland route.

2.3.3 Intermodal terminals

One of the most important factors for the regionalization of a port is the construction of dry ports. According to Haralambides & Gujar (2011), *“A dry port is the inland equivalent of a marine container terminal”*. It is a key element in the supply chain, reducing congestions, delays and costs (Haralambides & Gujar, 2011). UNESCAP report (2009) mentioned that there should be one dry port per one million TEU handled. Monios (2011) also launched the term of Inland Clearance Depot (ICD) as a synonym for dry port with the distinction that the former is used more for a landlocked country. Roso et al., (2009) gave the following definition for dry port: *“A dry port is an inland intermodal terminal directly connected to seaport(s) with high capacity transport mean(s), where customers can leave/pick up their standardized units as if directly to a seaport.”* (p.341).

Chinese plans are concentrated on the Thriasio Freight Center, a dry port near the Piraeus port that attracts significant interest (Ekathimerini, 2016). This infrastructure can become the cornerstone of efficient transportation and logistics services, not only for Greece but even for the Balkans and CEE countries, since a hinterland is not only relative to the country that a port belongs. Hinterland can be each market that a port can serve cheaper or faster than another port (Wilmsmeier, et al., 2011). From the same paper we can underline that *“With the advent of inland terminals, inland ports and dry ports, hinterlands are now extended even further inland”* (p. 1).

2.3.4 Captive and Contestable Hinterland

Those two terms have to do with the area that a port influences. Much of the literature dealing with gateway and regionalization, often refers to the captive and contestable hinterland of the port. This part briefly defines the difference among these two types of hinterland. It is quite important, before the research methodology, which examines the influence of each port at certain countries of the Balkans and CEE, to launch the meaning of those terms.

According to de Langen (2007), regions in immediate proximity to the port are considered as captive, since the port has the advantage of distance over the competition. It is important for a port to have a large and developed captive hinterland, because it gives straight from the beginning a substantial volume to the port. Ports with small or poor captive areas, are limited or doomed to serve only transshipment volumes.

Regions where more than one ports are competing fiercely for the larger share, are contestable hinterland. De Langen (2007) gave an analysis for one of the most attractive contestable hinterlands, which is Austria. A country in the center of Europe, without ports, which has flow from/to northern but also southern European ports.

Ferrari et al (2011) observed that containerization and intermodality expansion through the recent years, have also extended the potential hinterland for a port. This creates a competition for all ports, even if they belong to different regions. By way of illustration, in the case of Austria, we can understand that once the Port of Rotterdam is able to create such an efficient inland connection, it can also influence that market despite the fact that the ports of the Adriatic Sea are much closer. Thus the captive hinterland is currently only a small area close to the port, because for the rest, all possible ports can compete for a share, changing the monopolistic and oligopolistic market into a competitive one.

3. Research Methodology and Data

Considering the competition between the Eastern Mediterranean Sea and the Black Sea, this chapter aims to introduce the tools used to assess the potential gateway role of each port in that area. This quantitative tool will focus on the possible interactions between the origin points and the destination, hence it can present a measure to quantify the influence of a port in each market.

Taking the image of that region of Europe, we can observe three groups of ports. The North Adriatic ports, which are the Port of Trieste, the Port of Venice and the Port of Koper, the Greek ports, which are the Piraeus port and the Port of Thessaloniki and finally the Black Sea West, which includes the Port of Constantza.

On the other hand, there are the countries of the Balkans and CEE, which are: Greece, Albania, FYROM, Bulgaria, Montenegro, Kosovo, Serbia, Romania, Bosnia and Herzegovina, Croatia, Hungary, Slovenia, Austria, Slovakia and Moldova.

Trying to cover the concept of the Piraeus gateway role, this thesis contributes to that case from different angles. Thus, this chapter presents the Spatial Interaction Model in order to assess the potential gateway role for each of the above ports, based on the distances between the ports and the markets, the capacity of the ports and the GDP of the markets.

This study has already proclaimed the importance of the hinterland exploitation for a strong port. Throughout the previous chapters we had the opportunity to focus on basic knowledge regarding the hinterland area of a port. In this point, the research conducted, takes all that knowledge and using the Piraeus port as a case study, leads us to the coveted results of the analysis.

An important step towards the analysis is to introduce the model that will give us a good picture of the ports' influence. The Piraeus port is the core of this analysis and this case study is used to elaborate more and observe in practice the implementation of the theoretical knowledge. In our case, the whole research is built around the Piraeus port, as the major investments and the bright future of the port, gives an attractive scientific environment to work on.

By the end of this part, this study launches the Spatial Interaction Model, which is the model used to define the influence of the ports in the sampled area. Extending the knowledge about the model, this part also gives a close view to the data collection, the previous studies and the limitations of the model. The contribution of this section is to understand what method is used and why, before the analysis of the results and the suggestions.

3.1 Spatial Interaction Model (SIM)

Distance is considered to be a factor that reflects in a good way the economic influence of a port on a land (Ferrari, et al., 2011). Starting from Newtonian Analogy and the gravity model, there are several attempts to extend that model, creating a so-called family of spatial interaction models. This gravity based model is quite common in sociology and economics. It is used to reflect human process, including migration, information, commodity flows, customers' shopping decisions etc. Spatial Interaction Model calculates flows between origin and destination places in a specific geographical area. To do so, those flows are based on the attributes of origin and destination places as well as an inhibiting factor which is the friction created by the distance between the locations (Ferrari, et al., 2011).

Thus, this model can be used to show the possible flows between a port and a market. The container flows from a port i to a destination country j , are reflected by the attractiveness between those entities and the distance that separates them (Fotheringham & O'Kelly, 1989).

The traditional equation of that model can be written as:

$$T_{ij} = \frac{O_i D_j}{d_{ij}^n} \text{ (Equation 1)}$$

Where T_{ij} is the interaction between origin i and destination j . The attribute O_i is the "mass term" of i in the old gravity model and in this case is the capacity of the port, reflecting the emissiveness of the origin place. D_j is the "mass term", which is now translated into the GDP of j , associated with the attractiveness of the country. Finally, d_{ij}^n is the distance between port i and country j (Wilson, 1971).

In the case of distance, we need a starting point and a destination point. In our case the destination is not a specific place, but a whole country. When it comes to contract a matrix with the distances among i and j , there is a need for abstraction. That distance is calculated by using the location of the port and the location of the most populated city of the country as a centroid of the whole area (Ferrari, et al., 2011).

The power n is an exponent to show the importance of the distance in each case. Haynes and Fotheringham (1984) gave an example to illustrate the meaning of that exponent. In the case of airlines, the cost per mile of traveling usually decreases as the distance grows. Thus, the effects of the distance in that model should be reduced in order to reflect realistic results. So, even though distance always affects that model in a negative aspect, in some cases this negative effect is greater. The power n is there to represent those variates (Haynes & Fotheringham, 1984).

In our case this friction of distance is reflected by all those inland transportation constrains such as bottlenecks, infrastructural and operational. The closer to zero is the value of n , the lower the friction of the hinterland. In case the value is equal to one, then the friction is directly proportional to the distance. For higher values, the role of distance becomes increasingly important (Ferrari, et al., 2011). The majority of the

literature trying to derive the most suitable exponent, concludes in numbers close to the Newtonian analogy, where the power is equal to square (Haynes & Fotheringham, 1984). Thus, this methodology will also use this classic square approach.

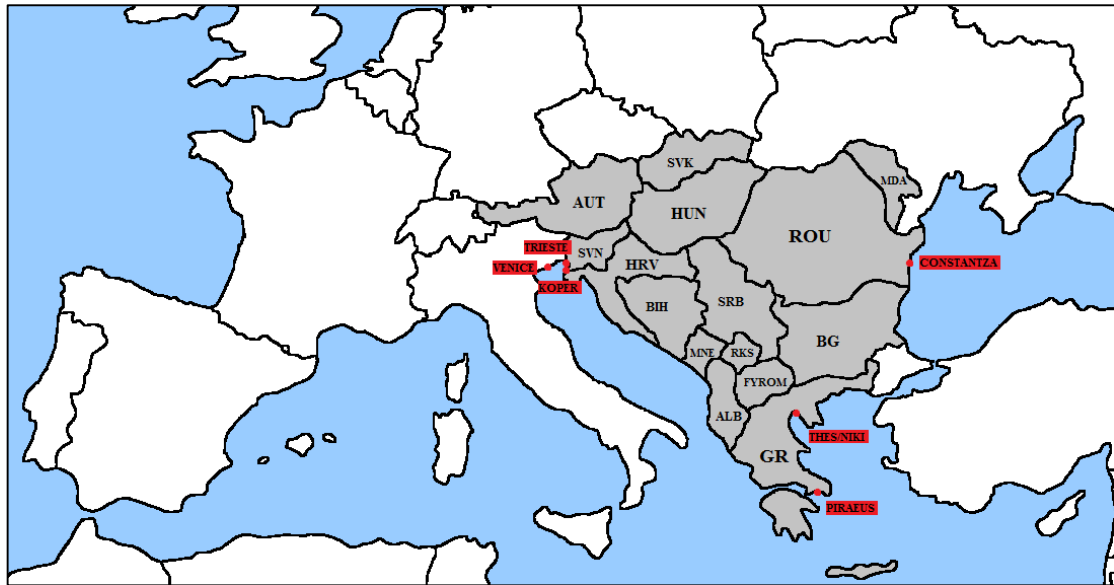
The logic behind the decision to choose that model was that the whole study is based on a theoretical scenario. All those ports that we put under test, are not currently gateway ports and their attributes are based on transshipment moves or on demand from local market. Trying to extract results from the current performance of those ports will lead to impasse, as almost none of the indicators of the port efficiency now can present a port with potential to become a gateway port. The only indicator which is stable and unchanged in the future projects and in every scenario is the location of the port. Also the capacity of the port is an attribute that in the short term remains constant, as it requires several investments and time.

Therefore, this model fits the needs of that research, because it is based on attributes that reflect the potentialities of a ports and not the assessment of its current performance.

3.2 Data Collection

For the goal of the study and in order to implement the Spatial Interaction Model in our case, the following two matrixes have to be conducted, using secondary quantitative data. The *OD* (i.e. Origin-Destination) matrix which reflects the observed flows between ports and countries and the *Distance* matrix. This section presents the steps after the methodological approach, to collect the data and create the mentioned matrixes.

Using that model this study aims to define the potential contestable inland market for each port. Given that the captive hinterland is the area-country that the port belongs to, we want to enrich that area by adding also all the countries of the Balkan region and CEE.



Picture 1: Sampled area and ports

In total, the sampled area has a population of 90.1 million people, which is the 15.1% of the European continent and a GDP of \$1.4 billion or 6% of the overall European (Eurostat, 2015 data). As already mentioned, the nominal GDP is used as the attribute of the destination places in order to create the *OD* matrix. It is quite a common indicator to reflect the attractiveness of an economy. The larger the GDP for a country, the higher the interaction with a port. The other factor of the matrix is the port capacity, which also reflects perfectly the emissivity of a port. The capacity of the port is considered more suitable for this research compared with the annual throughputs, because the former represents the potentiality of the port to deal with larger volumes in a better way. As already mentioned, the capacity of the port is one of the factors that is considered to be stable in the short term, as it requires major developing projects and investments that take several years.

The last matrix to be created has to do with the distance factor. As described previously, the distance between a port *i* and country *j* is the straight line between the location of the port and the location of the highly populated city.

To collect the mentioned data, sources like Eurostat and several Annual Reports of the chosen port were used.

3.3 Previous Studies

The sampled area that is chosen for this research is the less explored through the previous researches. In fact, there are no previous studies dealing with the Balkan region and CEE. The reason may be the fact that this area consists of some of the least developed countries in Europe, countries that do not yet belong to the European Union and rather small ports compared with the larger northern ports. But, as there

was already mentioned, this less attractive market is the contestable hinterland for the Piraeus port at the first phase of the Chinese investments.

The trigger for that research methodology was the study conducted by Ferrari et al (2011). In this study they explore the hinterland accessibility of the Ligurian ports. Using the Spatial Interaction Model, they found the potentialities for the ports in that region. It is a quite relative study, dealing with the same approach and also with a less attractive local area.

3.4 Limitations

As already mentioned, this model uses only three parameters to find the results. Indeed, there are several other factors that can affect the influence of one port in a specific area. The geography of the inland, the difficulties in accessibility, even historical, cultural and geopolitical parameters can contribute to the results. But as argued before, the aim of this model is not to assess, currently and using all possible indicators, the competition and the market share of each port. The aim is to conclude to results that can give us a picture of potential influence of the ports of the sampled area, giving stable, main and important factors.

This approach also did not consider into the calculation, the competition from rather small ports in the area (e.g. Rijeka, Ravenna) or the influence that currently existed from the Northern Range ports. For example, taking the case of Austria and the other CEE countries, northern ports such as PoR, have a strong influence. By not accounting those ports in our approach, does not mean that the market share of Austria and the other CEE countries is split between the Mediterranean and Black Sea ports. What this study seeks is to find the division of the portion of the total share, that southern ports have through this competition with the stronger northern ports.

4. Piraeus Port: Case Study

The Piraeus port has since ancient times been the port which served the great city of Athens. Throughout history and after ups and downs, the Piraeus port is currently one of the most important ports in Europe. With a size of 3,900 ha and employing more than 3,000 employees, Piraeus has always been a landmark for the Greek maritime.

Once, the only source of power for the port was passenger flows, as the Piraeus port serves a touristic country with numerous islands. Quite recent, COSCO won the tender, changing the fate of the port, which was lacking in investment and planning for the future.

Below there is an introduction to the basic knowledge of the Piraeus port. Essentially, this section gathers the previous information from literature review and creates a base for the specific environment of the Piraeus port. Starting with the current situation that is established in the port, this part gives shortly some key figures about the port. After that, Section 4.3, presents the privatization of Piraeus by giving a short timeline of the story from 2008 until today. Next to that, sub-section 4.3.2 tries to assess the process based on the facts and results from the previous literature review and the UK case. Finally, the last part of this section proclaims the major benefits for the Piraeus port by investing also in the gateway function.

4.1 Introducing the Case Study

Conducting research using a case study always gives a better understanding of the theoretical knowledge. This specific situation and the unique conditions of that case, gives an excellent environment for research methods (Van den Berg & de Langen, 2011). Thus, the case of the Piraeus port is a rare situation where we witness a major modification in a port, which tries not only to grow as a port in a specific region but changes the basic function in parallel. A so-called transshipment hub, for so many years, was based on flows that transferred to another vessel and rarely distributed inland.

Now the privatization of the port by the Chinese giant COSCO, is an ultimate chance to change the fate of that port and the competition frame in European ports. By the time this research is conducted, we are in the middle of the implementation of that project. Thus, the whole scenario is neither a theoretical research nor on the other hand, an implemented project, where this research evaluates the results. This research assesses the potentialities of this ongoing project, as well as contributing to the scientific field by suggesting strategies and decisions regarding the gateway role of the port.

Apart from the unique characteristics of this Piraeus port project, the case also has particular interest because of the limited previous research done in the past, regarding

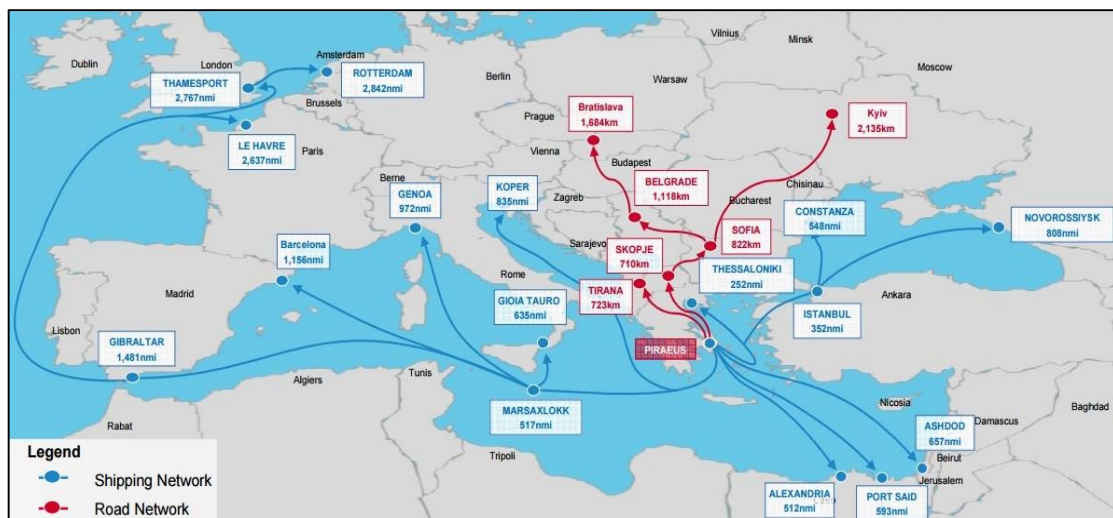
this specific area of Europe and those Eastern Mediterranean ports. This market is quite limited apropos of the demand and the resources. The distribution of the flows is split through all the ports in a way that each port serves its captive hinterland. At present, there is a possibility that a dominant port will merge after those several modifications and exploit the whole Balkan market, but also become an alternative for the CEE market. All the previous arguments give an attractive scientific field to work on and support the decision to choose Piraeus port as a case study.

This survey has to use several qualitative and quantitative data so as to create the framework for the chosen case. The approach of that case is from different angles, so different sources have to be used to cover all those angles. For example, in order to assess the privatization of the port, all the important news, rumors and confirmed deals have to be gathered and blended with previous cases and knowledge. Following that, the study tracks down previous scientific papers in order to find the benefits observed after launching the gateway function.

4.2 Piraeus Ports: Current Standing

The following chapter provides key figures and details about the Piraeus port such as cargo throughputs, infrastructures and facilities for inland transportation and an introduction to the main competition currently facing as a transshipment hub. One step before the methodology part of the analysis, it is crucial to give some important information in order to have a better view of the port that is investigated.

Piraeus is a suburb of Athens the second biggest municipality in Athens metropolitan area. The Piraeus port is located eight kilometers from Athens and in a central position towards the communication with the Greek islands, achieving a worldwide fame as one of the busiest passenger ports with more than 20 million passengers every year (World Port Source, 2016).



Picture 2: The Crossroad of Trade (Maritime Logistics, 2016)

The port is also a strong player in the Mediterranean Sea, located in a crossroads between west and east trade, as can be seen from the above picture. This fact offers tremendous location advantages, which few ports have.

The business model of the port includes container terminals, coastal, cruise, car terminal and other services. The Piraeus container port is the only transshipment hub in the Eastern Mediterranean Sea. Equipped with adequate infrastructure, natural accessibility and depths to facilitate the largest and most modern container vessels. It operates 24/7 throughout the year having three Piers. Pier I is under PPA and Pier II/III under Piraeus Container Terminal S.A., a subsidiary of COSCO (Maritime Logistics, 2016).

The Table 3 below presents the overview of the port's business model for 2014.

Container Terminals	Coastal	Cruise	Car Terminal	Other Services
-3.6 million TEUS container throughputs	-16.8 MM passenger traffic	-1.9 MM passenger traffic	-0.36 MM number of cars throughputs	-3083 cargo ship calls
-€60 MM revenues	-2.5 MM vehicle traffic	-605 vessel calls	-€12 MM revenues	-€11 MM revenues
	-€10 MM revenues	-€12 MM revenues		

Table 3: Port's Business Model Overview 2014 (Maritime Logistics, 2016)

4.2.1 Containerized Cargo

As observed previously, the containerized cargo has become the most important of the activities for the Piraeus port, contributing 57% of the total amount of annual revenues. Looking at the graph below, there are three different periods for the modern history of the port. The pre-concession era (until 2007), the era during the negotiations (2008-2011) and the post-concession era (2012-today). During those periods several political decisions, infrastructure modifications and changes in port's dynamics and attractiveness contributed in order to conclude to the following chart.

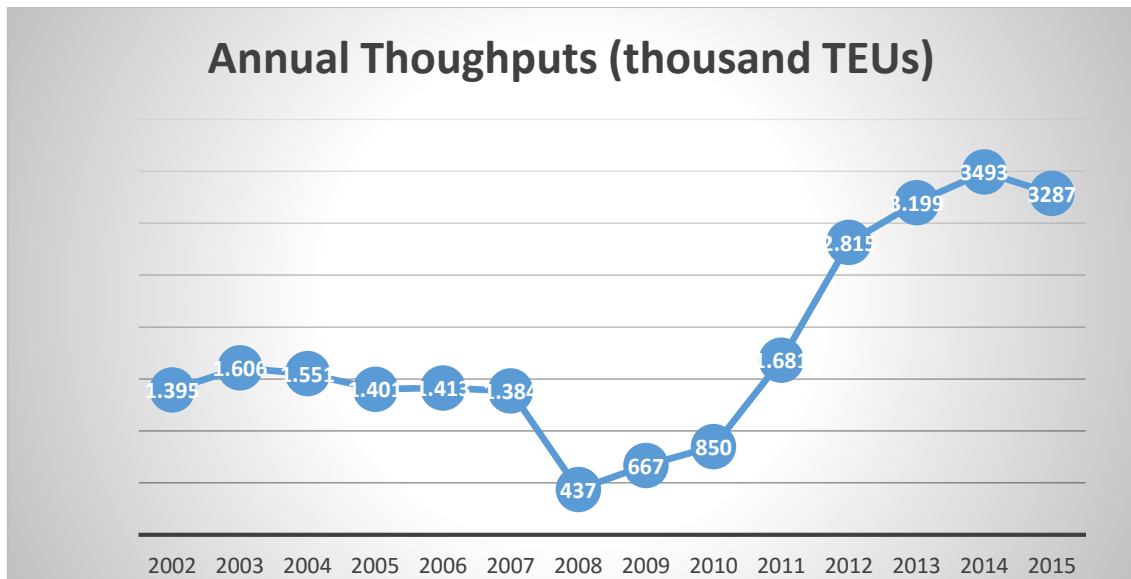


Figure 1: Annual Throughputs for Piraeus port for the period 2002-2015 (thousand TEUs) (Eurostat, 2014) (Notteboom, 2015)

During the pre-concession era the port was operating as a public port, showing stabilized traffic flows of approximately 1.5 million TEUs. Those volumes were mainly transshipment flows and also domestic flows. From 2008 a sharp decrease sunk the volumes to nearly 0.5 million TEUs, which was almost solely for the domestic market. The reasons behind this rapid loss of the transshipment volumes could possibly be the economic crisis which struck Greece in that period and also the imminent privatization of the port which caused unrest among the employees. At the post-concession era the port returned to the previous volumes and followed by several upgrades in Pier II and Pier III, the flows climbed for the first time up to 3.5 million TEUs.

4.2.2 Greek Transportation Infrastructure

The following section presents in two parts the main transportation infrastructure in Greece, which is basically road and railway network. Essential information will be shortly given, in order to take a general view of the Greek hinterland connectivity.

4.2.2.1 Road Network

Greek road network covers 117,000 kilometers in total, including mainland and island. More than 2000 kilometers of the total network, is estimated to be highways. Over the past two decades, several modifications have occurred, modernizing the existing infrastructure (Greek-Motorway, 2009).

Below, in Table 4, the European routes are shown, part of them crossing Greece.

European Road Number	Main Road Axes
E55	Preveza – Rio – Patra – Pyrgos – Kalamata
E65	Borders with the FYROM – Florina – Kozani – Lamia – Galaxidi – Rio – Corinth – Kalamata
E75	Borders with the FYROM – Thessaloniki – Athens -
E79	Bulgarian Borders – Serres – Thessaloniki -
E86	Albanian Borders – Florina – Edessa – Gianitsa – Thessaloniki
E90	Igoumenitsa – Thessaloniki – Borders with Turkey
E92	Athens – Corinth

Table 4: Main European Routes Crossing Greece (Greek-Motorway, 2009)

4.2.2.2 Railway Network

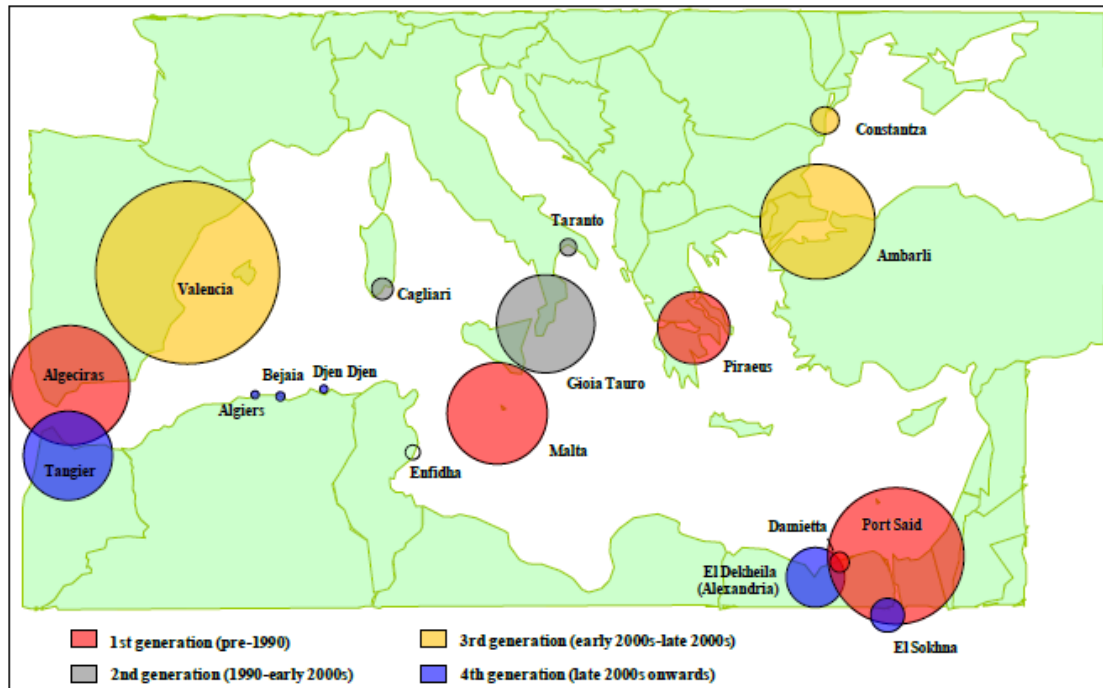
The Greek railway network is 2,571 kilometers and covers the core of the mainland, connecting the country with Central European countries and Turkey. The stakeholders of the Greek railways are OSE, which owns and maintains the infrastructure and the operator TRAINOSE, which is recently privatized by The Italian railway Ferrovie Dello Stato Italiane S.p.A.



Picture 3: Greek Railway Network (Wikipedia, 2016)

4.2.3 Current Competitors

The Piraeus port is currently a transshipment hub in the Mediterranean Sea, thus, at this point, the study looks at the competition from this perspective in order to observe the current standing of the competition. Notteboom et al (2014) conducted a study about the European transshipment ports, and below we can observe the main ports in the Mediterranean Sea operating with hub-and-spoke flows.



Picture 4: Mediterranean Transshipment Ports (Notteboom, et al., 2014)

The Piraeus port was one of the first generation transshipment ports in the Mediterranean Sea. Currently, it competes in this field with ports such as Gioia Tauro and the Port of Malta, as these three ports operate in a very close area of the Central Eastern Mediterranean.

4.3 The Privatization of Piraeus Port

Previously, at the literature review chapter, we had a close view at the concept of privatization of ports. Choosing a very relevant case of British ports, where the government decided to privatize the three functions of the ports collectively, this section gathers that knowledge and blends it with our case of the Piraeus port.

Below, a timeline of the privatization process is given until the very recent news and decisions. Finally, using the previous knowledge, we can conclude into a short assessment of the privatization of the Piraeus port case study.

4.3.1 Piraeus Port Privatization Process

Since 2008 and through all those years, there has been a slow but steady process of the privatization of the Piraeus port. Political uncertainty, strikes, bureaucracy and also the difficult negotiations of such a deal, put the investment into jeopardy in some cases.

Below, all the important dates and facts are gathered, recording the whole process of the Piraeus port privatization.

In October 2008, COSCO announced that it had won the concession to run Pier 2 and 3 for the next 35 years. The two sides agreed that COSCO would pay the PA 831.2 million euros. For the first time COSCO pacific – the terminal operator of the group – announced that the capacity in 2015 would reach the amount of 3.7 TEUs (Commonwealth Business Media, 2008). One month later the two sides signed a 4.3-billion-euro deal to upgrade the existing terminal in Pier 2, but also build a new one in Pier 3. COSCO will operate both terminals for 35 years and apart from the capacity expansion, this investment will create more than 1,000 jobs (Financial Times Ltd, 2008). The year of the agreement was one of the worst in the history of the port, as the throughputs had fallen by more than 60% per cent, due to strikes of the dockworkers and Greek labor unions, protesting about the loss of job guarantees.

The project of the state-controlled company is to create a bundle that includes the port, logistic centers and railways to deliver Chinese goods to Europe, reviving a modern “Silk Road”. Shortly afterwards, the Greek government revealed the plan to privatize also the second biggest port in Greece which is the port in Thessaloniki, attracting competitors in that region, like Hong Kong's Hutchison Port Holdings.

In 2010, COSCO revealed for the first time its intentions to invest another 252.2 million euro in a logistic hub near the port and also started negotiations to buy the state-owned railway system in Greece, which struggled during the economic crisis (Commonwealth Business Media, 2010).

Overcoming labor unrest, the port recorded its first major growth in 2012. By the end of June, the traffic volumes were 117% higher than the year-earlier period, as a result of the successful upgrading of Pier 2 terminal (United Business Media Global Trade, 2012).

In 2013 a new agreement was reached between Piraeus Port Organization (OLP) and Piraeus Container Terminal (PCT) – subsidiary of COSCO. The amount of this new investment was 230 million euro and included the construction and exploitation of Pier 3 by PCT and the construction of an Oil Refueling Pier (Hellenic Republic - Greece in the UK, 2013)

In 2014, the Greek State announced its intention to sell 67% of the Piraeus Port Authority (OLP or PPA), which operates the first terminal, with 0.7 million TEUs in 2014. By this year the other terminal operated by COSCO had 3 million TEUs traffic. Hellenic Republic Asset Development Fund (HRADF) owned 74.1% of the PPA and the rest was listed in the Athens Stock Exchange (Euromoney Institutional Investor PLC, 2014).

New political changes in Greece further delay this agreement. Meanwhile, the traffic in 2014 was for the first time more than 3 million TEUs, consolidating the port's position among Europe's top 10 container hubs (United Business Media Global Trade, 2015). In 2015, Greece's privatisation authority Hellenic Republic Asset Development Fund (HRADF) invited three parties to submit binding offers in September 2015 for the acquisition of the Piraeus Port Authority (Euromoney Institutional Investor PLC, 2015).

The three parties were Cosco, Dutch APM Terminals and International Container Terminal Services (ICTSI).

In January 2016, HRADF accepted the 368.5 million euro offer by COSCO, for the 67% of PPA. The next step before the two stakeholders signed the contract was the approval from State Audit Council (Ekathimerini, 2016). Studies from Greece's Foundation for Economy and Industrial Research (IOBE) and other experts concluded that this investment would bring an annual revenue of 5.1 billion euro to the Greek economy and create around 125,000 jobs until the expiration of the agreement (China Daily Information Co, 2016). On July 4, the Greek Prime minister signed a letter confirming Cosco Shipping's acquisition of 67%. Additionally, further investments in shipyard sector were agreed upon, in cruise terminal and also in the port's car terminal boosting the capacity to 20,000 vehicles. The annual volume of containers is currently 4.3 million TEUs, with an imminent increase to 7 million TEUs, and ultimately 10 million TEUs (Glass, 2016).

In July 2016, Greek railway faced new strikes and unrest as the employees continuously declared their opposition to the imminent privatization of the rail operator TRAINOSE. Finally, the acquisition of TRAINOSE was announced on July 4 by HRADF. The Italian railway Ferrovie Dello Stato Italiane S.p.A acquired the total amount of shares for 45 million euro. This progress on the railway ownership in Greece may facilitate the Piraeus port, dealing with the workers' unrest and the obsolete infrastructure (Tornos News, 2016). Piraeus port activities brings to the railway company its main sources of income, when it comes to the non-passenger service (Zikakou, 2016).

4.3.2 A Brief Assessment of Piraeus Port Privatization

In our case it is not very difficult to infer that the port has benefited from this privatization. Through recent years, the Piraeus port is the first port worldwide in growth rate and has been established as one of the leading ports in the Mediterranean Sea. But as observed following the previous analysis of the case of British ports, a more meticulous view of the subject can give as some very important remarks.

Firstly, the most preferable model of privatization worldwide is the Private I, as it brings several benefits according to Baird (1999); Private sector investment, improved infrastructure, private sector management skills and expertise, downsizing of port authorities. The case of UK is an exception that is usually mentioned as a major mistake from the government to privatize all functions of the port, in other words, using the models Private II/III.

In our case surely it would have been more beneficial for the Greek state if it had also followed a concession approach and had kept the regulatory function as a public entity. On the other hand, it can be argued that the Chinese company did not come at the port just as a terminal operator, but as an investor who wants to change the port's role fundamentally. So, coming as a developing entity too and having an undisputed know-

how on that, it is quite logical and even preferable to privatize also the PA. Otherwise, the whole strategic plan of the Chinese state-controlled company to create a gate for Chinese goods, could not be achieved.

Second, as we saw from the UK ports' case, a lot of arguments were raised about the undervalue of the acquisitions. Following the same example as in the case of Medway port, the deal for the Piraeus port's privatization was at €831.2 million, while the investment from the buyer in the existing terminal and in a completely new terminal was at €4.3 billion. We cannot argue that the price of that acquisition was as low as in the case of UK's ports. In fact, if we take into account the obsolete infrastructure and the economic situation in Greece during that period, then the value of the port was not heavily discounted.

Nevertheless, this study focuses on the impact of the privatization on the port itself, not on the state revenues or the labor force. Thus, looking at the port, it is obvious that the privatization of the Piraeus port was beneficial as it stimulated a rapid growth in traffic volumes, several investments in infrastructure occurred at the terminal part but also at the external part of the port with investments in logistic hubs and inland connection.

4.4 Benefits by Introducing the Gateway Function

After researching the benefits for a gateway port previously, this part blends that knowledge with the case of the Piraeus port in order to focus specifically on the positive impact for Piraeus port after exploiting the gateway function. This positive impact has three dimensions: the sustainability of the port, the creation of a logistic cluster and the development of the metropolitan area around the port.

Since the transshipment function is based on specific attributes that can be easily imitated by competitors, the port can become vulnerable towards competition. The Piraeus port is located in an area quite rich in transshipment flows. The Mediterranean Sea, just after the Suez Canal or the Strait of Gibraltar is the middle point between the largest markets of the world, the Northern European, the US and the Asian markets.

Thus, competition can become fierce for all those ports, as shipping lines continuously seek for the best possible option for their cargo. One of the main characteristics of the transshipment hubs is the location over the competition and we can conclude that the ports located in the Mediterranean Sea have more or less the same location advantages. So, the rest characteristics such as the terminal infrastructure or the performance of a port can just be developed by a competitor.

Think about how fast the growth of the Piraeus port was from 0.5 million TEUs in 2008, to more than 3 million TEUs a few years later. This situation is currently in favor of the Piraeus port, but it also gives a disturbing and alarming fact. That no matter how fast the growth of the Piraeus port and the introduction through the list of the major European ports was, other ports in this region can easily grow as fast too. All that is needed is a vast amount of investment and a few years before a port with decent flows

records becomes a major player. Of course there are natural limitations but generally it is a plausible scenario.

Gateway function requires attributes that maintain and stabilize the role of the Piraeus port throughout the Mediterranean Sea. Moreover, those inland flows can create a volume that will fulfill the planning capacity of more than 6 million TEUs, which the transshipment flows may not be enough to cover. That is the main benefit for the Piraeus port, since the transshipment flows solely cannot guarantee the growth and the strength for the following years.

A major gateway port linked with a logistic cluster at a respective magnitude to support the created demand from the inland areas. As described previously, a cluster is a bundle of entities which take the advantages of being in the same place, increasing the knowledge and decreasing costs through the close transactions created. In our case this logistic cluster has three main links. The port itself, the Thriasio Freight Center and the railway connection. The stronger those links are, the more companies and other entities will be attracted by the logistic environment.

Multinational companies such as Hewlett-Packard Co. and Huawei Technologies Co. have already expressed their interest to invest in that area. The constant strikes and unrest created by employees, most recently in the railway company against the imminent privatization, constituted a major disadvantage. COSCO fears the consequences of such an unstable environment and conducts alternative plans to swift the logistics activities to other places like FYROM. This scenario will be devastating for the Piraeus port as it loses a lucrative source and a core of the success as a gateway port.

The cluster that can be created in the surrounding area of the port means that several different entities will start operating there. Freight forwarders, warehouses, agents, distribution companies, truck companies and other logistic services which can exploit the facilities and infrastructure, access to freight capacity, choose from all alternative modes and special services (Sheffi, 2012). The Piraeus port becomes the center of those activities and reaps all the benefits which are mainly the access to capacity and flows from loyal customers who have their activities at the port's area.

Finally, considering the port as a part of the city and a core of the economic activities, the impact of such a growth from the port site can be transferred to the economy of the city. New job openings, real estate market and major developments can be offered in a place where almost half of the total population of the country resides.

5. Results and Data Analysis

This chapter presents results of the SIM about the ports influence on the sampled area as well as results from the analysis about the key determinants for a successful implementation of the gateway role of the Piraeus port. Both are the final outcomes of the research, concluding firstly whether the Piraeus port has the potentialities to exploit and influence the extended hinterland of the Balkans and CEE, and secondly if indeed the port has the potentialities, then what are the key factors to achieve such a desirable integration.

5.1 Spatial Interaction Model Analysis

The analysis of the Spatial Interaction Model starts with a presentation of the chosen ports. After that, the next part is about the basic results of the model and how those results are reached. Sub-Section 5.1.3 gives a deeper evaluation of the results, illustrating them with pictures and graphs. Finally, in the last sub-section, there is a short discussion about the results of the model.

5.1.1 Selected Ports

This case study tries to examine the gateway role of the Piraeus port. As described previously, the role of the port, defines the competition it might face. Thus, in the case of the Piraeus port, the competition is different when we consider the current function of the port, which is transshipment, and different when we consider its potential gateway function.

Trying to exploit that role, the Piraeus port might face competition from ports operating in the same hinterland, such as North Adriatic ports, other Greek ports and Western Black Sea ports. Evaluating all the ports in that region, this research concludes at the following ports, which have a significant power.

The **Port of Trieste** operates in the Adriatic Sea, in Italy. Even though Italy is not among the sampled area, the port of Trieste is selected because it can serve the same area as the Piraeus port, being on the west flank of the chosen hinterland. In 2015, the port of Trieste recorded 501,268 TEUs, slightly lower than the previous year (Autorità Portuale di Trieste, 2015). The container terminal has a quay length of 770 meters and is equipped with seven cranes. It also has a storage area of 40 hectares and depth of 18 meters which is the highest among the North Adriatic ports. Finally, the maximum annual capacity of the port is 600,000 TEUs (Neagoe, 2015) (Twrdy, et al., 2014).

The **Port of Venice** is a few kilometers farther from Trieste, with proximity to the sampled area from the west part. It is chosen because it belongs to the same group of NA ports with the same power or even better than Trieste. The Venice port showed a significant increase in 2015, reaching volumes of 560,301 TEUs, which is 22% higher than the previous year (Autorità Portuale di Venezia, 2015). The container terminal covers 1,910 meters and it is equipped with nine cranes. The storage area is more than 30 hectares and the depth only 11.4 meters, which limited to port. The nominal capacity of the port is 800,000 TEUs (Twrdy, et al., 2014).

The **Port of Koper** is the last of the group of NA ports, a group of ports with a lot of similarities, spread out in a very small area. It is a Slovenian port, but 70% of the traffic is for non-Slovenian market. The port has an annual throughput capacity of 750,000 TEUs (Twrdy, et al., 2014) (Neagoe, 2015), and in 2015 almost reached its maximum capacity. The total quay length is 596 meters and it operates with eight cranes. The storage area spreads on more than 18 hectares and the maximum draft is 13,5 meters (Twrdy, et al., 2014).

The **Port of Thessaloniki** is in the northern region of Greece. This port is the smallest of the selected ports and normally, its rather small throughputs and strength of the port would have excluded it from the list, however, there are two factors which drove to the decision to take that port into consideration, as well. First of all, it is the closest port to Piraeus, thus its most direct competitor. Secondly, the port is under ongoing negotiations for privatization, making it a hot prospect for the future with a lot of potentialities for investments. The port has a quay length of 550 meters, equipped with 4 cranes and the draft is 12 meters (Neagoe, 2015). In 2015 the port recorded annual traffic of 351,407 TEUs (ΟΛΘ - TPA, 2015) and the total capacity is estimated at 450,000 TEUs.

Finally, the **Port of Constantza** is the strongest representative of the Western Black Sea ports. Located in the Eastern part of the sampled area, it can easily become a competitor for the Piraeus port. The port is located in Romania, consists of the old north part and the new south. Its total quay length is 1086 meters and it is equipped with 8 cranes. The depth of the water reaches 13-15 meters, depending on the part (Neagoe, 2015). Before the recession of 2008, Constantza had recorded traffic of nearly 1,500,000 TEUs, but now it is struggling to recover, reaching 689,012 TEUs annual traffic volumes last year (Constanta Port, 2015). The nominal capacity of the port is 1,500,000 TEUs, split between the 200,000 TEUs of the first terminal and 1,300,000 TEUs from the second terminal (Neagoe, 2015).

The table below summarizes the main details for the selected ports.

Port Name	Trieste	Venice	Koper	Piraeus	Thessaloniki	Constantza
Region	North Adriatic	North Adriatic	North Adriatic	Aegean	Aegean	Black Sea West
Nominal Capacity (TEUs)	600,000	800,000	750,000	4,700,000	450,000	1,500,000
Total TEUs handled in 2015	501,268	560,301	750,000	3,287,000	351,407	689,012
Maximum Draft (meters)	18	11.4	13.5	17	12	13-15
Quay Length (meters)	770	1,910	596	3,783	550	1,086
Quay Cranes (gantry)	7	9	8	27	4	8

Table 5: Selected Ports Overview

5.1.2 SIM Results

Based on the previous methodology of Spatial Interaction Model and the data collection, the following matrixes have been conducted. The calculations are based on the Equation 1 of the SIM. At the denominator we find the distance factor, which as described in the methodology part is the line between the port and the highest population city of the country. Table 6 gathers all those distances between the selected ports and the countries of the sampled area.

Additionally, at the numerator of the Equation 1, there are the attributes of the origin and destination places. Which means the capacity of selected ports and the gross domestic product of the chosen countries. Tables 7 and 8 present the attributes mentioned in both cases.

The next step is to put all the data at the Equation 1. The results are summarized in Table 9. In this table we can observe the interaction between port and country, constrained by the distance factor.

Destination Matrix															
Destination (km)	GRC	ALB	FYROM	BG	MNE	RKS	SRB	ROU	BIH	HRV	HUN	SVN	AUT	SVK	MDA
Trieste	1182	686	737	830	565	678	530	978	418	172	452	72	346	375	1165
Venice	1256	760	830	930	650	771	641	1089	513	288	563	183	436	472	1282
Koper	1179	679	732	826	561	674	533	979	413	178	460	82	358	385	1174
Piraeus	8	497	489	529	622	566	805	749	788	1080	1126	1175	1282	1249	1094
Thes/niki	305	270	197	230	365	268	504	494	516	803	824	908	989	953	852
Constantza	800	784	630	457	782	630	652	203	818	1011	830	1127	1043	990	315

Table 6: Destination Matrix

Ports Capacity (TEUs)					
Trieste	Venice	Koper	Piraeus	Thessaloniki	Constantza
600000	800000	750000	6200000	450000	1500000

Table 7: Ports Capacity (TEUs)

GDP of Countries														
GRC	ALB	FYROM	BG	MNE	RKS	SRB	ROU	BIH	HRV	HUN	SVN	AUT	SVK	MDA
195212	11455	10086	48952	3992	6385	36513	177945	15995	48732	120687	42746	374055	86581	6551

Table 8: GDP of Countries (millions of US dollars)

	GRC	ALB	FYROM	BG	MNE	RKS	SRB	ROU	BIH	HRV	HUN	SVN	AUT	SVK	MDA
Trieste	83834	14604	11141	42634	7503	8333	77991	111624	54926	988345	354433	4947453	1874711	369412	2896
Venice	98995	15865	11712	45278	7558	8592	71092	120038	48622	470023	304602	1021135	1574173	310905	3188
Koper	105327	18634	14117	53811	9513	10541	96394	139245	70330	1153547	427765	4767920	2188923	438089	3564
Piraeus	18911162500	287523	261512	1084553	63973	123571	349339	1966590	159706	259034	590167	191960	1411078	344103	33936
Thessaloniki	944320	70709	116949	416415	13483	40004	64684	328128	27033	34009	79986	23331	172089	42899	4061
Constantza	457528	27954	38117	351584	9791	24130	128837	6477165	35856	71515	262781	50482	515772	132508	99032

Table 9: Interaction Between Selected Ports and Countries of the Sampled Area

5.1.3 Evaluation of the Competition

The aim of this section is to take the scattered numbers shown in Table 9 and turn them into valuable results. Thus, in order to evaluate the competition and the influence of each port at the sampled area, the results from SIM are transformed into percentages of influence. To do so, this study simply takes the total interaction between a specific country and all the ports and finds the percentages of the influence of each port of the given country. By repeating this process for all countries, we have the following table, which summarizes the percentage of influence for each port at the selected countries and the picture that illustrates the results more clearly.

	GRC	ALB	FYROM	BG	MNE	RKS	SRB	ROU	BIH	HRV	HUN	SVN	AUT	SVK	MDA
Trieste	0	4	3	2	8	4	11	1	15	34	19	45	25	24	2
Venice	0	4	3	3	8	5	10	1	14	16	16	9	21	20	2
Koper	0	5	4	3	10	6	14	2	20	40	23	44	30	28	3
Piraeus	100	60	51	48	50	50	38	17	34	7	24	1	15	17	19
Thessaloniki	0	19	30	24	14	22	9	4	7	1	4	0,5	2	3	3
Constantza	0	8	9	20	10	13	18	75	10	2	14	0,5	7	8	71
	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Table 10: Percentages of the Hinterland Influence of Selected Ports

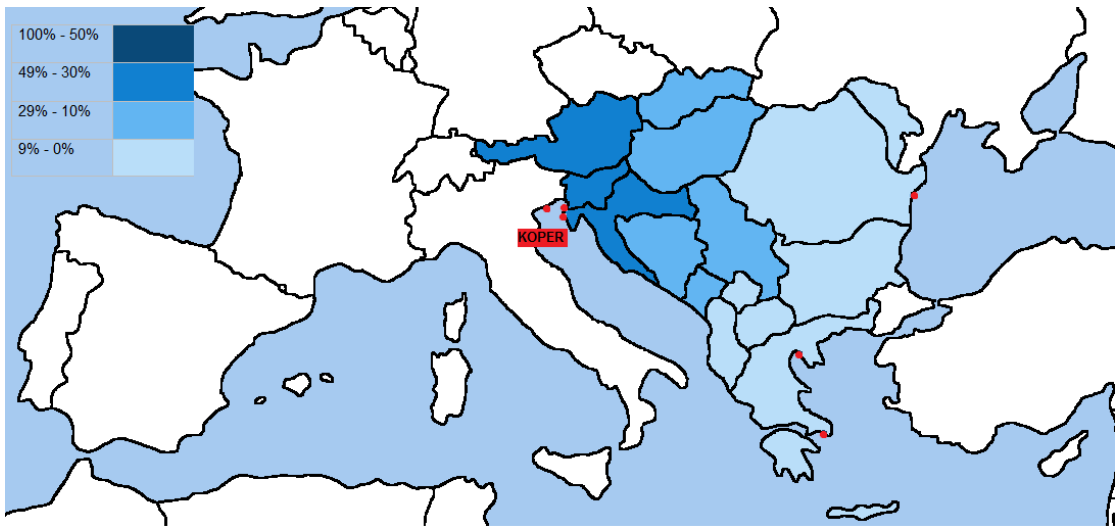
Trying to further illustrate the influence of each port at the sampled area, the pictures below present the market share using different scales. Countries where the market share of the port is more than 50% are considered as dominant or captive hinterland. Respectively, a share between 49% and 30% represents a strong influence of the port on this hinterland. For market shares between 29% and 10%, the influence of the port is considered decent and when the percentage is lower than 10%, then the influence is low and insignificant.



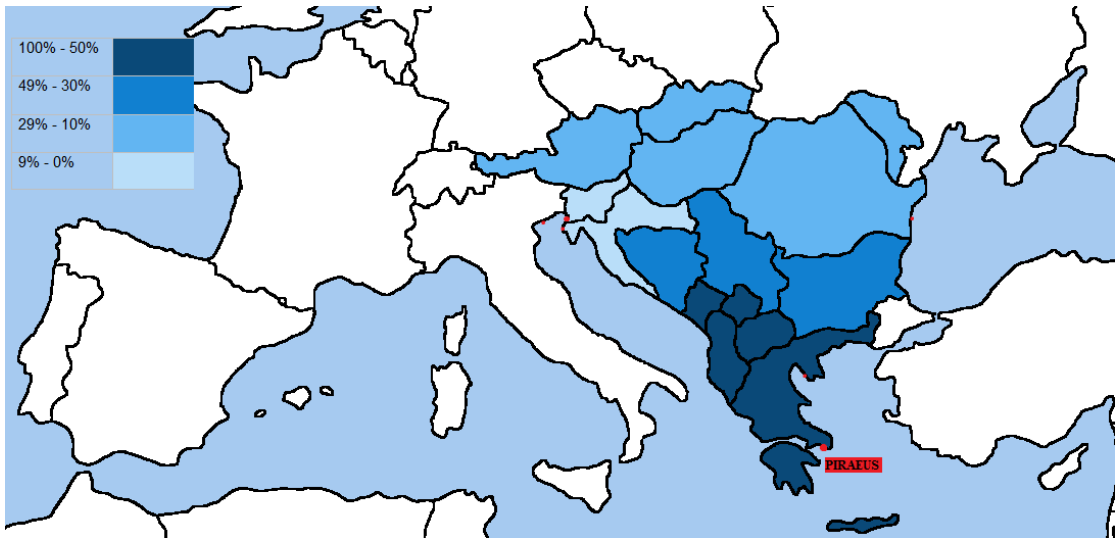
Picture 5: Port of Trieste Hinterland Influence



Picture 6: Port of Venice Hinterland Influence



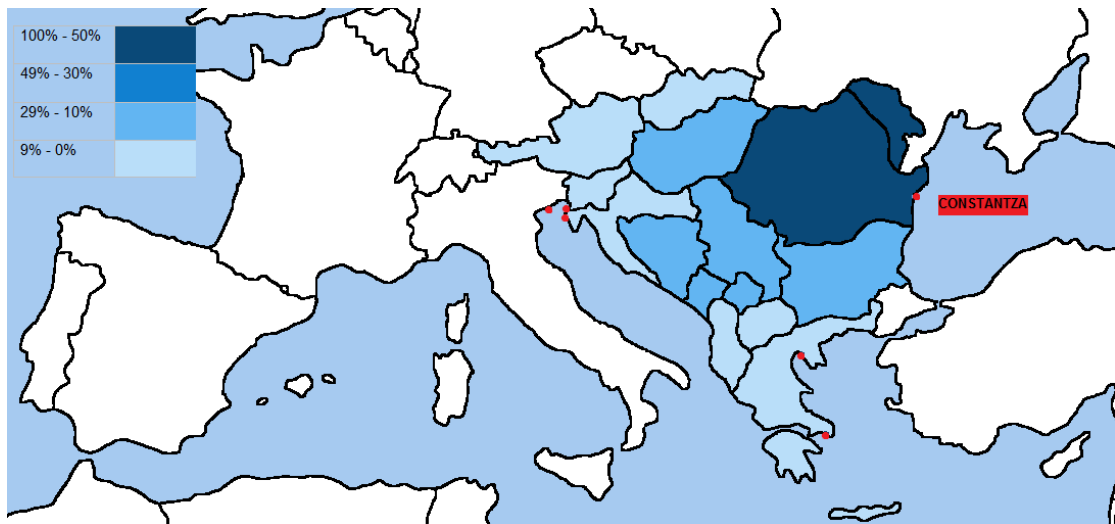
Picture 7: Port of Koper Hinterland Influence



Picture 8: Port of Piraeus Hinterland Influence



Picture 9: Port of Thessaloniki Hinterland Influence



Picture 10: Port of Constantza Hinterland Influence

5.1.4 Discussions

The hinterland influence is an indicator of the strength for a port and the level of exploitation of the given market. Our case study tries to focus on the potential market share of the selected ports and not on the current share, using factors that reflect this potentiality such as the location of the port in relation to the market and the maximum capacity of the port.

The results clearly show that the Piraeus port, based on the position over the hinterland and the dynamic of its capacity, can become the leading port both for inland transportation and the sampled area. Ranked first among the competition, the Piraeus port shows significant strength in the Balkans, with shares that range up to 50%. With

this percentage being foreseeable, what is interesting is the influence of the Piraeus port on the CEE market. There, the port records potentialities of 15% over the selected competitors. In this point it is crucial to mention that since the analysis does not consider the influence of the Northern Range ports at the sampled area, those percentages reflect the competition among the selected ports.

In total, the market share of the Piraeus port at the sampled area is 33%. Figure 2 illustrates the total percentage of each selected port

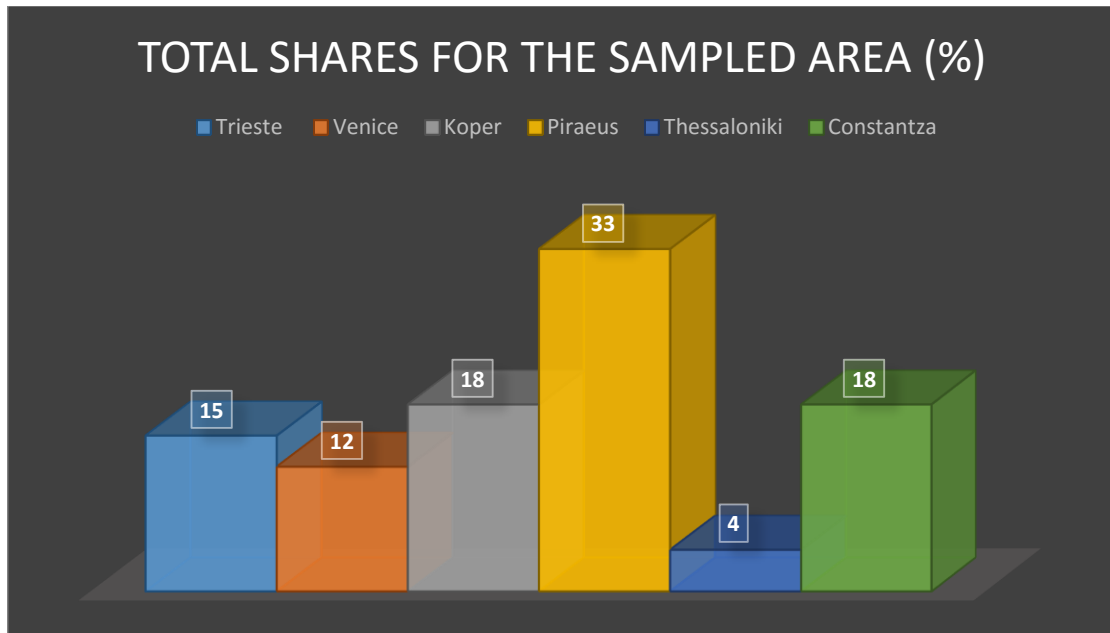


Figure 2: Total Market Shares for the Sampled Area

Talking only about the Balkan Peninsula, which does not have any influence from northern ports, this specific region has a total of more than 1 million TEUs from imports and exports, without taking into account the Intra-European trade (World Shipping Council, 2015). The CEE market has surely more flows but also fierce competition. From the same source we can calculate that only three central European countries, Austria, Hungary and Slovakia, contribute another 1 million TEUs to the trade. Thus the total flows at the sampled area can be up to 2.5 million TEUs.

Based on the aforementioned percentages that the Piraeus port recorded and the imports/exports of the sampled countries, the Piraeus port can exploit around 600,000 TEUs from the Balkans and up to 300,000 million TEUs from the rest of the CEE countries. This amount of volumes is quite significant for this first stage of the regionalization of the Piraeus port.

This analysis considers the capacity of the port and the location, the main ingredients that reflect the potentialities of the influence for the port, supporting that those ingredients can have slight or no change in the short-run. The location indeed is an unchangeable factor, which can give the comparative advantage to a port. The capacity on the other hand is not unchangeable, but it reflects the dynamic of a port. A port with 1 million TEUs capacity, cannot transform rapidly into a 3-million-TEUs port.

Changes are small, require several modifications and investments. The capacity of the Piraeus port is a major advantage and the main reason behind the dominant influence in this analysis. Without this capacity, any further discussion for its gateway role would be void.

5.2 Key Determinants of Gateway Port in Piraeus Case

After analyzing the results from the SIM and concluding that the Piraeus port has the potentialities for a strong influence on the sampled area, in this part a qualitative analysis is conducted for the key determinants that can support our previous findings and facilitate the gateway role for the Piraeus port.

In the previous quantitative analysis, two factors of the ports were used that reflect the potentialities for the gateway port. The capacity and the location are stable attributes, almost unchangeable in a short period of time. The Piraeus port gets high marks when it comes to location or capacity. But there are some other characteristics that are not considered as unchangeable, but they require effort and investments. When a port invests and exploits those attributes, then it can have an advantage over the competition.

Below, three key determinants are presented, giving firstly the current standing of the Piraeus port in accordance with those determinants and secondly, the suggestions and developments required in order to reach an ideal level. The determinants that are considered essential for the gateway role of the Piraeus port are hinterland infrastructure and connectivity, political-economic stability and the adequate port's infrastructure.

5.2.1 Hinterland Infrastructure and Connectivity

Inland transportation is the most direct attribute for a gateway port. In fact, it has such importance that without adequate infrastructure, the port cannot achieve any connectivity with the hinterland. In general, there are three modes used to distribute the cargo to its destination; road, railway and waterway transportation. The exploitation of each mode, whenever possible, and the efficient splitting of the flows among the modes gives the port the flexibility and comparative advantage over competition.

Trying to discover the inland transportation frame in Greece, the results are quite disheartening. Greece shows similarities with the island countries of the EU (e.g. Cyprus, Malta, Ireland), which have natural constraints to develop an efficient railway infrastructure. But Greece does not have such constraints and the lack of railway freight transportation is due to the limited investments.

Below, Figure 3 presents the modal split of inland freight transportation. Greece has no waterway transportation, as there is not any significant river to support this mode. Road transportation is the absolute dominant, with a percentage of more than 95%.

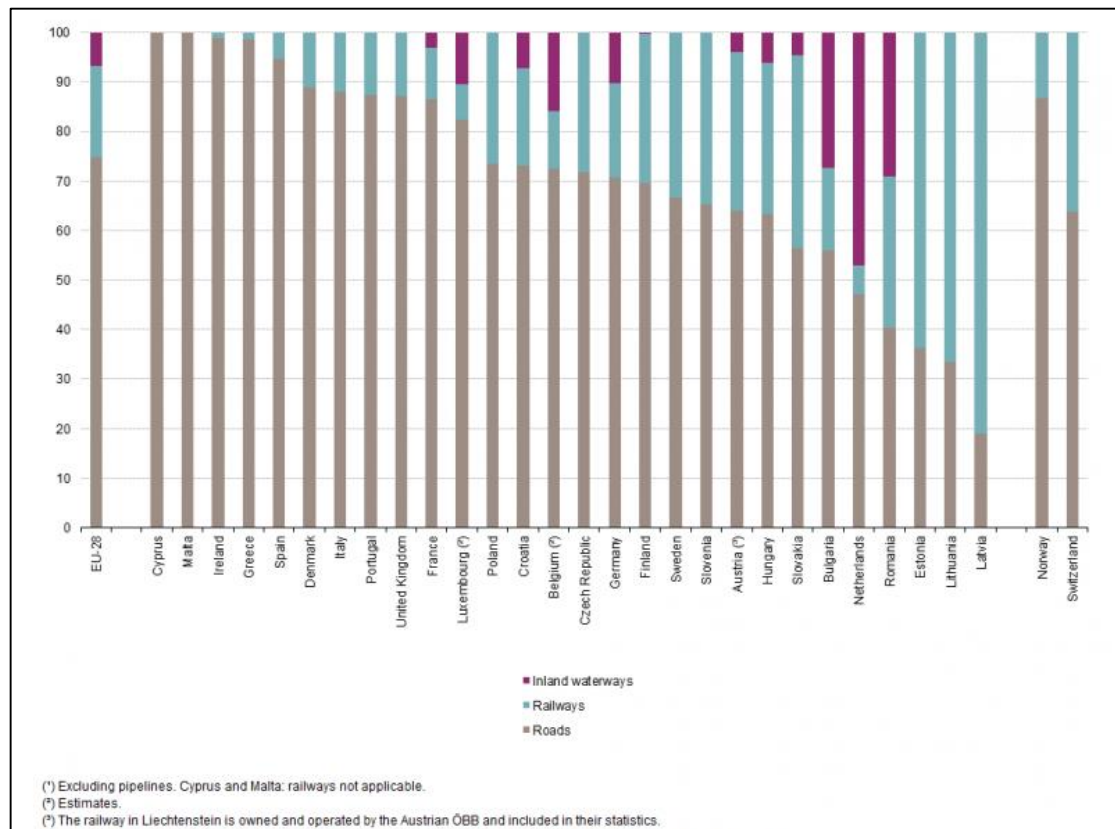


Figure 3: Modal Split of Inland Freight Transport (2013) (Eurostat, 2014)

Currently, the railway system is inadequate, as a result of the chronic economic problems and lack of investment by the state-owned OSE (i.e. the landlord of the infrastructure) and the state-owned TRAINOSE (i.e. the operator). The ongoing privatization process gives the operation function of the railway service to the Italian giant Ferrovie Dello Stato Italiane S.p.A. This progress, similar to the Piraeus case, can bring knowledge and investments to the railway transportation, facilitating a stronger presence of this mode to the total Greek freight transportation.

The dominant position of the road transportation is logical for a port whose traffic volumes are both transshipment and local flows. Trucks are the first choice when it comes to serve short distances. But in our case, the gateway role of the Piraeus port requires the distribution of cargo to longer distances. Adequate and reliable railway service is crucial in order to support the additional volumes from the hinterland.

The logistics center, which facilitates the inland freight flows, also plays an important role. A logistics center is considered as part of the hinterland infrastructure, as it cannot be located into the port due to limited space and congestion. Thus, it is usually located

near the port, supporting the core function of the distribution of the cargo to inland markets.

In the case of Piraeus, the Thriasio plain can be taken into account as a railway freight center with a lot of potentialities. The Thriasio center is one of the biggest in Europe, standing between 4 different modes (i.e. port, rail, road, airport), while other European freight centers have access to only two modes of transportation. The exploitation of this area can give a tremendous advantage to the Piraeus port, facilitating new satellite activities, supporting the transport link and adding extra capacity with new warehouses (Hadjimichalis, 2016).

As the benefits from the creation of a logistic cluster have already been discussed, it is crucial for the Piraeus port and generally for Greece, to support this plan. An alternative scenario that COSCO is currently processing, is to create this logistic center in other countries (e.g. FYROM) and distribute the cargos from Piraeus to this center via trucks. This will be a massive blow for the Piraeus port, losing one of the key determinants for its successful implementation of the gateway function.

5.2.2 Stability (Political-Economic-Labor)

Stability is a desirable element for every company, country and generally every entity. It secures that in the future there will be no fluctuation, no undesirable and unpredictable situations that put any plan, project or the activity of the entity at risk. This stability can take the form of political, economic or stability in labor force.

So far, this lack of stability in Greece and in the Piraeus port has put the project at risk, delayed the plan and furthermore incurred economic cost. Taking a view from the political perspective, the unstable governments and the constant elections in Greece throughout the crisis, put the investment of COSCO Pacific in jeopardy. In 2015, the newly elected government in Greece intended to reconsider the deal with the Chinese state-owned company, before reality forced them to fall back.

The economy of Greece is in the eye of the storm. Struggling to recover for more than six years so far, this has had far-reaching consequences for the entrepreneurship. At the outbreak of the crisis, the port of Piraeus lost almost all the transshipment flows, as a result of the lack of trust from the customers. Looking at it from another angle, the economic uncertainty in Greece drives constant tax changes to the business environment. A new investor may conduct a business plan based on the current laws and taxation, but in less than one year, this plan may be outdated.

The final factor of uncertainty in Greece is the labor force. The privatization of the biggest port in Greece, as well as the privatization of the national railway system, leads to several strikes and unrest in the public labor force. Recently, during the finalization of the deal for the TRAINOSE, the strike was so long-standing, severing the main artery of the trade. The logistics segment is so dependent on strict time schedules and

reliability that any unpredictable delay can cost not only money but also the whole relationship with the customers.

Therefore, a key point for the successful implementation of the gateway function of the Piraeus port, is the stability in those three fields. Certainly, everybody wants political stability, but no one can guarantee it, to the benefit of the port. But what should be ensured is that the government will not interfere with the port's well-being or reconsider any signed agreement.

The nightmare of the economic crisis looks endless in Greece. The uncertainty in economic indicators is one factor that deters any investments. The Greek economy is desperately seeking for new investments to lead the restart. It is known that a reason behind the lack of investments can be the low competitiveness of the economy, squeezing the Greek minimum wage even further. But even with competitive wages, the Greek economy cannot attract investments, having numerous changes in taxation in a small period. The government should create an attractive business environment, giving stable taxation and incentives for investment. This is a crucial factor for the creation of the logistic cluster next to Piraeus.

Last but not least, the labor force when it comes to the public sector, is a chronic Greek problem. The Piraeus port was always a company with surplus workers, when it was a state-owned company. Pier 1 is still a public entity and operates with more than 1,000 employees. While Pier 2, operated by COSCO Pacific, has 300 workers and records higher productivity. Labor unions have still power in Pier 1 of the port and we may focus on COSCO's Pier 2 and 3, when it comes to the Piraeus case, but the total image of the port includes the operation by OLP in Pier 1. Several discussions should be conducted with the stakeholders and the unions, because it is generally agreed that there no modern and strong port can exist with strikes. The PPA can, in this case, play the role of the middleman. Following the practices in the UK case, where employees got a small amount of stock share, might be a solution in our case too.

5.2.3 Efficiency and Productivity

Although some ports may not have the advantage of location, they still attract high flows. The reason is efficiency, which is cited as a major factor by shippers. Efficiency refers to how fast and reliable a port can be, including time for berthing, piloting, terminal operations, unberthing and further connection of the cargo (Oum & Tongzon, 2007). In this time oriented industry, with fast-paced delivery, the part of terminal operators is to offer fast and reliable service.

Polyzos Serafeim and Spyros Niavis (2013) conducted a survey evaluating port efficiency in the Mediterranean. The results placed the Piraeus port 14th over the Mediterranean ports. Even though the survey was during the first phase of the Chinese project in the Piraeus port, the low score revealed the problems in efficiency.

Berth productivity is defined as the total container moves per hour, divided by the number of hours that the vessel is at berth. According to JOC research (2013) about the port's productivity, Piraeus ranked in a low position in a group with the top European, Middle East and African ports. Table 11 illustrates those important results, which shows that the Piraeus port has better productivity than the other selected ports (i.e. the direct competitors). But if Piraeus wants to compete with the major gateway ports from the Central European countries, then berth productivity needs improvement.

PORT	COUNTRY	BERTH PRODUCTIVITY*
Jebel Ali	United Arab Emirates	81
Khor al Fakkan	United Arab Emirates	74
Salalah	Oman	72
Southampton	U.K.	71
Zeebrugge	Belgium	65
Rotterdam	Netherlands	63
Bremerhaven	Germany	62
Hamburg	Germany	62
Algeciras	Spain	53
Port Said	Egypt	52
Diliskelesi	Turkey	52
Beirut	Lebanon	52
Jeddah	Saudi Arabia	51
Antwerpen	Belgium	50
Felixstowe	U.K.	49
Tanger Med	Morocco	46
Piraeus	Greece	43
Karachi/Port Qasim	Pakistan	42
Le Havre	France	41
Barcelona	Spain	41

Table 11: Berth Productivity of Ports in Europe, Middle East and Africa (The JOC Group Inc, 2013)

6. Recommendations and Policy Advice

This survey takes an ongoing project of the modification of the Piraeus port and tries to give persuasive answers on how those modifications can lead to the exploitation of the port's hinterland. The framework of this study is quite unique, in that it deals with a very recent subject, in a region that is hardly on the spotlights and with only few research about this port by the academic community.

After this quantitative and qualitative analysis, the findings of this research concludes that the gateway scenario for the Piraeus port is utterly plausible, but it requires concrete actions. Apart from the "pathogenesis" of the Greek port, such as the unstable environment and the lack of attractiveness for investments, this study mentions the hinterland strategies which is a very important factor for a successful gateway port.

Perhaps an open field for further research can be a survey that focuses specifically on the hinterland strategies and the connections between Southern and Central Europe. The Southeastern part of Europe is one or more steps behind Northwestern Europe when it comes to inland transportation. This unexploited region can be further researched to examine interesting findings such as the number and the location of dry ports and inland distribution centers required, the train's capacity and frequency per week for this route in order to meet the demand and the alternative modes to serve the regions of the Balkans and CEE countries. Another interesting study could also be one which will be able to show whether it is plausible or not for Southern Ports such as the Piraeus port to become future competitors for the Northern Range ports.

This part also gives a summarized policy advice to PPA, as a result of this research. Chinese investments in ports infrastructure are doing really well so far. But COSCO had a major blow after falling back on the acquisition for the railway system. The railway connection is very crucial and in this particular case there are several obstacles. First of all, the Chinese company is now depending on the Italian companies' investment in the infrastructure. Secondly, the total railway system in the Balkans is inadequate. Finally, through all the journey to reach the Central European market, there are several countries and a very difficult frame. The Chinese should start negotiations in a region with historical disputes in order to secure entrance to this market.

Special attention was paid to Logistics in this study because of the importance and the benefits that a port can gain from those additional activities. However, during the period of this research, it was not clear whether or not the Chinese giant is going to exploit the Thriasio Freight Center. Whether the blame is on the Greek government or on the Chinese company, losing such a massive, supplementary investment is a major setback for this project.

It is true that without the Chinese presence, the Greek government or any other terminal operator could not handle such a massive investment. The Chinese company has the unlimited support of the state and access to a great amount of capital. On the other hand, COSCO is just the operator and the regulator of the majority of the port, after a concession with the Greek state, which means not a total domination over the

place. COSCO Pacific, Greek operators in Pier 1 (i.e. OLP) as well as the Greek state must have a harmonious cooperation and coexistence.

7. Conclusions

This thesis is guided by the main research question of how the Piraeus port can become a gateway port in the Southeastern part of the European context. From a scientific aspect, this study offers the interesting factor to work with a case that is rarely on the spotlights. This is because the case of the Piraeus port is a rare situation where we witness a major modification in a port, which tries not only to grow as a port in a specific region but changes the fundamental transshipment function, adding also the gateway function in parallel. Additionally, the Balkan Peninsula is one of the least attractive markets in Europe and the ports in that area lack in traffic volumes.

In order to provide a substantial answer to the main research question, four sub-questions were used as steps to guide the survey to the final outcomes. This survey includes a literature review and a qualitative-quantitative analysis, which are blended in order to have the following results.

First, the Piraeus container port is one of the biggest in the Mediterranean Sea. Currently, it competes in this field with ports such as Gioia Tauro and the Port of Malta, as these three ports operate in a very close area. Now, the privatization of the port by the Chinese giant, COSCO, is an ultimate chance to change the fate of that port. Since 2008 and through all those years, there has been a slow but steady process of the privatization of the Piraeus port. In October 2008, COSCO announced that it had won the concession to run Pier 2 and 3 for the next 35 years. The two sides agreed that COSCO would pay the PA 831.2 million euro. In 2014, the Greek State announced its intention to sell 67% of the Piraeus Port Authority (OLP or PPA) and after two years, HRADF accepted the 368.5 million euro offer by COSCO. By this time, the major upgrades occurred by the Chinese state-owned company had led to an increase of the throughputs of the port, up to almost 3.5 million TEUs.

In our case it is not very difficult to infer that the privatization was beneficial for the port, as it stimulated a rapid growth in traffic volumes, several investments in infrastructure occurred on the terminal part but also on the external part of the port. The assessment of the privatization also showed that privatizing the regulatory function in the Piraeus port, as in the UK case, was positive as the Chinese company did not come at the port just as a terminal operator, but as a developing entity too and having an undisputed know-how on that. Finally, it cannot be argued that the price of that acquisition was as low as in the case of the UK's ports. In fact, if we take into account the obsolete infrastructure and the economic situation in Greece during that period, then the value of the port was not heavily discounted.

Second, it is crucial to understand why the gateway role is so important for the Piraeus port. Based on the previous scientific works and blended with our case's data, the answer to that question is the following. The Piraeus port is located in an area quite rich in transshipment flows. Thus, competition can become fierce, as shipping lines continuously seek for the best possible option for their cargo. Since the transshipment function is based on specific attributes that can be easily imitated by competitors, the port can become vulnerable towards competition. The gateway function requires

attributes that maintain and stabilize the role of the Piraeus port throughout the Mediterranean Sea. That is the main benefit for the Piraeus port, since the transshipment flows solely cannot guarantee the growth and the strength for the following years.

Moreover, a major gateway port linked with a logistic cluster at a respective magnitude to support the created demand from the inland areas. Multinational companies such as Hewlett-Packard Co. and Huawei Technologies Co. have already expressed their interest to invest in that area. The cluster that can be created in the surrounding area of the port means that the Piraeus port becomes the center of those activities and reaps all the benefits which are mainly access to capacity and flows. Finally, considering the port as a part of the city and core of the economic activities, the impact of such a growth from the port site can be transferred to the economy of the city.

Third, considering the need to assess the potentialities of the Piraeus port to exploit the gateway function, based on the dynamic of the port and the competition, this study used the Spatial Interaction Model. The logic behind the decision to choose that model was that the whole study is based on a theoretical scenario. All those ports that were put under test, are not currently gateway ports and their attributes are based on transshipment moves or on demand from local market. Trying to extract results from the current performance of those ports will lead to impasse, as almost none of the indicators of the port efficiency now can present a port with the potential to become a gateway port. The only indicator which is stable and unchanged in the future projects and in every scenario is the location of the port and also the capacity of the port, which is an attribute that in the short term remains constant.

Therefore, this model fits the needs of that research, because it is based on attributes that reflect the potentialities of a port and not the assessment of its current performance. The strategic location and the capacity of the port are the main ingredients for the exploitation of the hinterland as it is difficult or impossible for the competitors to imitate those characteristics. Without those two ingredients, any further ambitions for inland service, are out of the question.

The results clearly showed that the Piraeus port is able to become the leading port for inland transportation in the sampled area. Ranked first among the competition, Piraeus port marked significant strength in Balkans, with shares up to 50%. With this foreseeable percentage, what is interesting is the influence of the Piraeus port on the CEE market. There, the port recorded potentialities of 15% among the selected competitors. Considering the total interaction flows between the selected ports and the sampled area, the Piraeus port records 33% of the total interaction. Those results showed that the Piraeus port is indeed able to become a gateway port, showing a predominance over the competition, based on the two fundamental characteristics of a gateway port.

Finally, after completing the research, analyzing the results from the SIM and concluding that the Piraeus port has the potentialities for a strong influence as a gateway port, this survey concluded to the following three key determinants that can facilitate the exploitation of the Piraeus' hinterland; the adequate hinterland infrastructure, the political-economic-labor stability and the efficiency of the port.

Following the investments in port's terminals, the Chinese company has to continue investing in the inland infrastructure of the port. In fact, it has such an importance that without an adequate infrastructure, the port cannot achieve any connectivity with the hinterland. Greece has no waterway transportation, thus, road transportation is the absolute dominant, at a percentage of more than 95%. Currently, the railway system is inadequate, as a result of the chronic economic problems and lack of investment. The logistics center may also play an important role, since it may facilitate inland freight flows. In the case of Piraeus, the Thriasio plain can be taken into account as a railway freight center with a lot of potentialities. The Thriasio center is one of the biggest in Europe and the exploitation of this area can give a tremendous advantage to the Piraeus port, facilitating new satellite activities, supporting the transport link and adding extra capacity with new warehouses

So far, this lack of stability in Greece and in the Piraeus port has put the project at risk, delayed the plan and furthermore incurred economic cost. Therefore, a key point for the successful implementation of the gateway function of the Piraeus port, is stability. Taking a view from the political perspective, the unstable governments and the constant elections in Greece throughout the crisis, put the investment of COSCO Pacific in jeopardy. Unfortunately, no one can ensure the political stability, but what should be ensured is that the government will not interfere in the port's well-being or reconsider any signed agreement. The economic uncertainty in Greece drives constant tax changes for the business environment. The government should create an attractive business environment, giving stable taxation and incentives for investment. The final factor of uncertainty in Greece is the labor force. The privatization of the biggest port in Greece, as well as the privatization of the national railway system, leads to severe strikes and unrest in the public labor force. Several discussions should be conducted with the stakeholders and the unions, with the PPA acting as a middleman, because it is generally agreed that no modern and strong port with strikes can exist.

As for the last key determinants, the efficiency refers to how fast and reliable a port can be and the berth productivity is defined as the total container moves per hour, divided by the number of hours that the vessel is at berth. In this time oriented industry, with fast-paced delivery, the terminal operators on their side, must offer a fast and reliable service. Unfortunately, recent researches about the efficiency and the productivity of the ports, had shown insignificant records for the Piraeus port, comparing with other European ports. But if Piraeus wants to compete with major gateway ports from the Central European countries, then berth productivity and efficiency need improvement.

Certainly, there are a few limitations that must be taken under consideration in order to better assess and appreciate the results. First, the indicator of the attractiveness for the countries may be better reflected by the total TEU needed, rather than GDP of the countries that finally was used. The reason that this approach was not followed is that we could not find any valid and reliable formula to convert the GDP of a country into TEU needs. At the same equation, the friction of distance (i.e. the power n) is assumed to be equal to square, as it is commonly used. But a better approach would have been if a new survey would have defined the precise friction of distance for this specific case, something that needs extended research. Finally, the limited data sources for Balkan

countries obstruct a more precise quantification of the influence of the Piraeus port at the sampled area.

After all, the last remark of this research is that the project of a major Southeastern gateway port in Piraeus is utterly plausible. The Piraeus port shows that it has the potentialities, based on the main ingredients which are the strategic location and the dynamic of the port. If the Chinese investors can overcome some “pathogens” and chronic problems of the Greek society and the Piraeus port, as well as integrate with several investments in hinterland infrastructure, then it can agitate the framework of European ports, opening a new route from the Southern part of the continent.

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Appendices

I. Illustration of the Selected Port's Influence

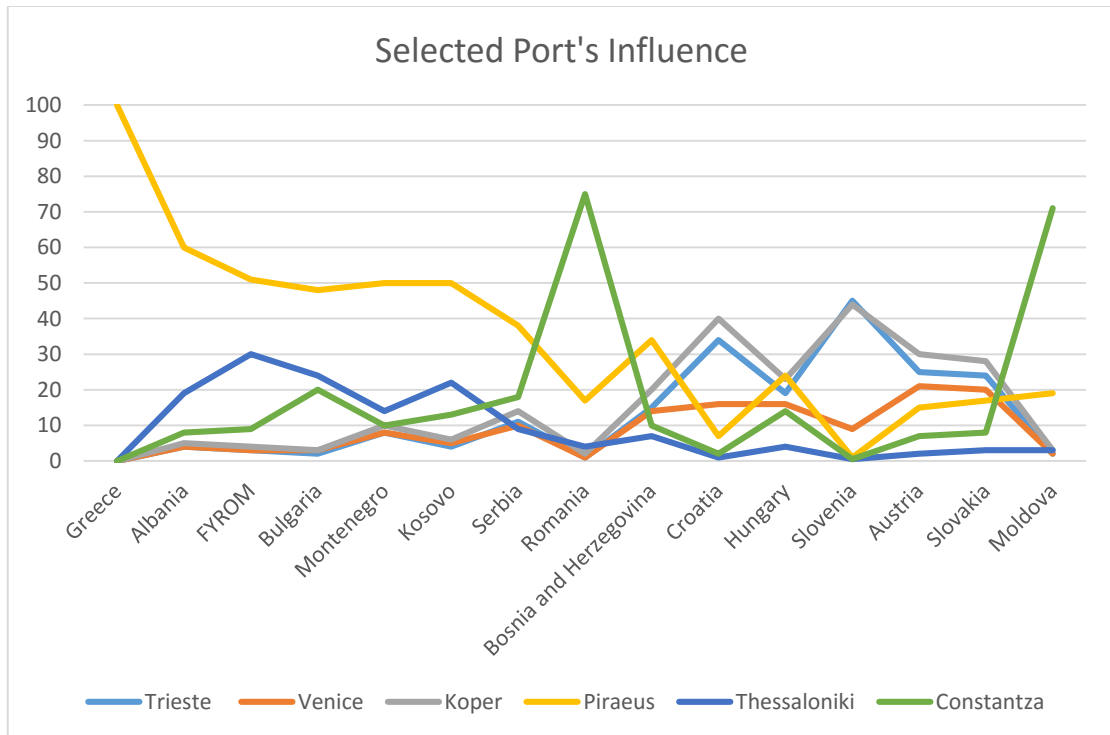


Figure 4: Selected Port's Influence 1

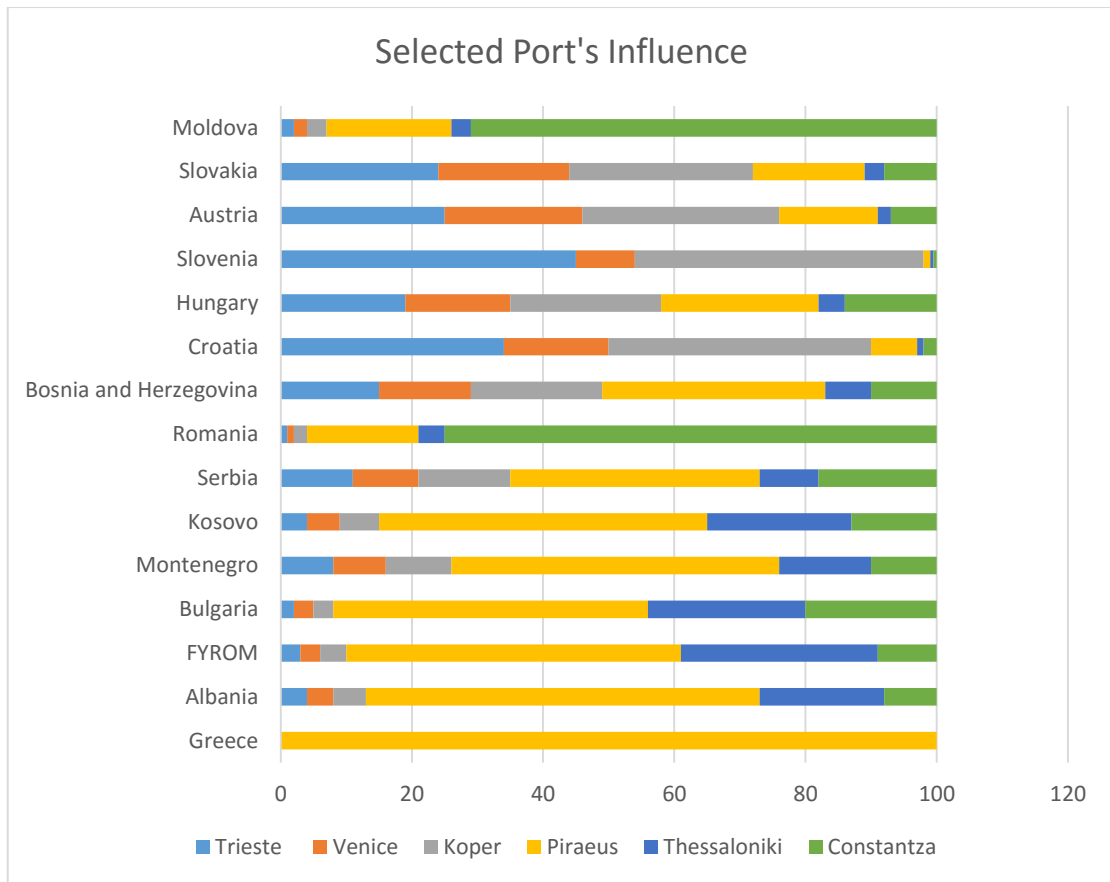


Figure 5: Selected Port's Influence 2

II. Total Interaction Flows

	GRC	ALB	FYROM	BG	MNE	RKS	SRB	ROU	BIH	HRV	HUN	SVN	AUT	SVK	MDA
Trieste	0	0,04	0,03	0,02	0,08	0,04	0,11	0,01	0,15	0,34	0,19	0,45	0,25	0,24	0,02
Venice	0	0,04	0,03	0,03	0,08	0,05	0,1	0,01	0,14	0,16	0,16	0,09	0,21	0,2	0,02
Koper	0	0,05	0,04	0,03	0,1	0,06	0,14	0,02	0,2	0,4	0,23	0,44	0,3	0,28	0,03
Piraeus	1	0,6	0,51	0,48	0,5	0,5	0,38	0,17	0,34	0,07	0,24	0,01	0,15	0,17	0,19
Thessaloni ki	0	0,19	0,3	0,24	0,14	0,22	0,09	0,04	0,07	0,01	0,04	0,005	0,02	0,03	0,03
Constantza	0	0,08	0,09	0,2	0,1	0,13	0,18	0,75	0,1	0,02	0,14	0,005	0,07	0,08	0,71
Total	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Table 12: Market Share of the Selected Ports

GDP of Countries															
GRC	ALB	FYROM	BG	MNE	RKS	SRB	ROU	BIH	HRV	HUN	SVN	AUT	SVK	MDA	
195212	11455	10086	48952	3992	6385	36513	177945	15995	48732	120687	42746	374055	86581	6551	

Table 13: GDP of Countries (millions of US dollars)

	GRC	ALB	FYROM	BG	MNE	RKS	SRB	ROU	BIH	HRV	HUN	SVN	AUT	SVK	MDA	Total Interaction
Trieste	0	458,2	302,58	979,04	319,36	255,4	4016,43	1779,45	2399,25	16568,88	22930,53	19235,7	93513,75	20779,44	131,02	183669,03
Venice	0	458,2	302,58	1468,56	319,36	319,25	3651,3	1779,45	2239,3	7797,12	19309,92	3847,14	78551,55	17316,2	131,02	137490,95
Koper	0	572,75	403,44	1468,56	399,2	383,1	5111,82	3558,9	3199	19492,8	27758,01	18808,24	112216,5	24242,68	196,53	217811,53
Piraeus	195212	6873	5143,86	23496,96	1996	3192,5	13874,94	30250,65	5438,3	3411,24	28964,88	427,46	56108,25	14718,77	1244,69	390353,5
Thessaloniki	0	2176,45	3025,8	11748,48	558,88	1404,7	3286,17	7117,8	1119,65	487,32	4827,48	213,73	7481,1	2597,43	196,53	46241,52
Constantza	0	916,4	907,74	9790,4	399,2	830,05	6572,34	133458,75	1599,5	974,64	16896,18	213,73	26183,85	6926,48	4651,21	210320,47
Total GDP	195212	11455	10086	48952	3992	6385	36513	177945	15995	48732	120687	42746	374055	86581	6551	1185887

Table 14: Calculations of the Total Interaction Flows for the Selected Ports

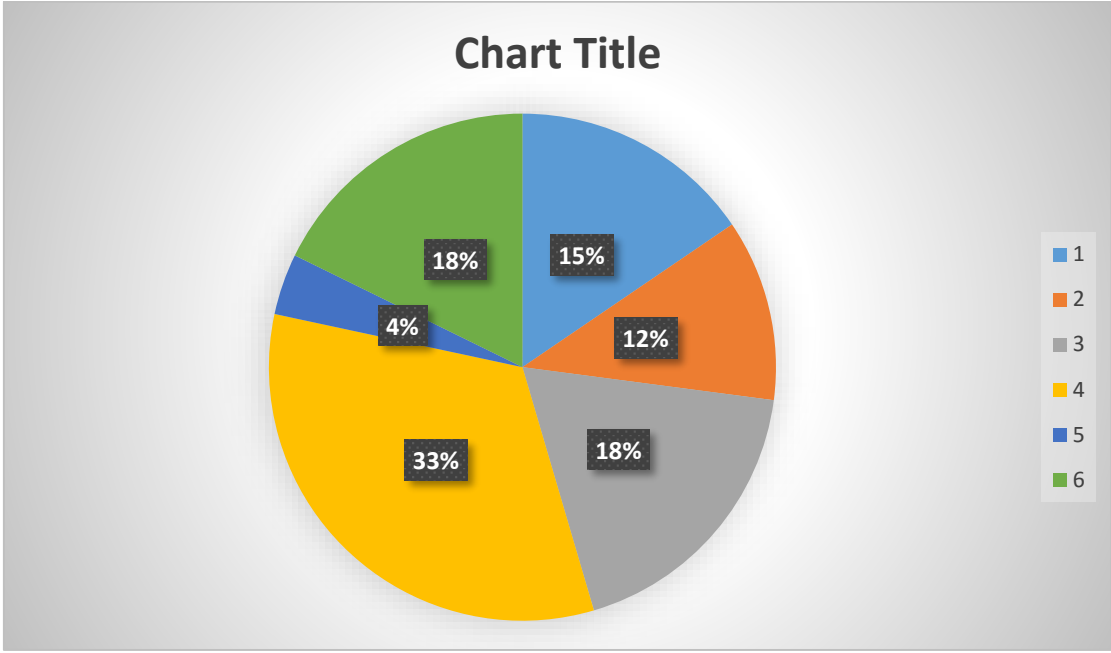


Figure 6: Total Interaction Share for Each Port