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Analysis of the Competitive Position and Competitiveness of the Port of Manzanillo in the Containerized Cargo Industry

by

Kassandra Magana Elizondo

“The strongest competitive force or forces determine the profitability of an industry and become the most important to strategy formulation. The most salient force, however, is not always obvious.”

— Michael E. Porter

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The experiences lived and the knowledge acquired during this year at MEL were the most pleasant and challenging for me, I feel happy that I have accomplished one of my most ambitious dreams. I am grateful for all the knowledge, tools, and skills that I have acquired, I am sure that great professional opportunities will come for me. This year in The Netherlands I became a persistent, energetic, proactive, and strong woman, which allowed me to face all the challenges that arose in the year. But it also brought me valuable friendships, with which I have learned, laughed, and enjoyed. The preparation and completion of this thesis required me a lot of commitment and effort, definitely, it was a stage that I really enjoyed.

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Sincerely,

Kassandra Magana Elizondo

Abstract

The importance of planning strategies to achieve greater competitiveness has become more evident in the context of seaports, this due to the intensification of global competition in the container industry. For this reason, analyzing and determining the strategic competitive position of ports together with their competitive advantages that distinguish them is essential. The port sector is one of the key sources that stimulates the growth and development of the Mexican economy. In each analytical procedure, the researcher takes into account the important role of containerized cargo in the Mexican port sector and Manzanillo's ambition to become the leading Latin American container port in the Pacific Ocean, with world-class and sustainable infrastructure and operation. Hereby, this quantitative and qualitative research demonstrates the strong relationship between the nature of the market structure of the container industry and Manzanillo's competitive position vis-à-vis its competitors, namely the ports of Lázaro Cárdenas, Los Angles, and Long Beach. To solve the research question addressed in this thesis, *What competitive determinants underly the competitive position of the port of Manzanillo in the container industry?,* the full SPA tool and Porter's diamond model were executed, based on the primary and secondary data collected in relation to the port sector in Mexico and the United States, along with relevant information about the containerized industry. The results reveal that Manzanillo has positioned itself positively as "High Potential", which means that the port has a low market share but high growth rates. Likewise, the findings reveal that the port of Manzanillo and the Mexican Port System have a variety of competitive advantages, which has allowed the commercial evolution and competitiveness of Manzanillo. Despite that, operational disadvantages are also identified, which API Manzanillo and its port users must address and solve.

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List of Abbreviations

AMANAC	Asociación Mexicana de Agentes Navieros (Mexican Association of Shipping Agents)
AMTI	Asociación Mexicana del Transporte Intermodal, A.C. (Mexican Association of Intermodal Transport)
ANTP	Asociación Nacional de Transporte Privado, A.C. (National Association of Private Transport)
API Lázaro Cárdenas	Administración Portuaria Integral de Lázaro Cárdenas S.A. de C.V. (Integral Port Administration of Lázaro Cárdenas)
API Manzanillo	Administración Portuaria Integral de Manzanillo S.A. de C.V. (Integral Port Administration of Manzanillo)
APL	American President Lines Ltd.
APM Terminals	Container terminal part of A.P. Moller - Maersk
ASCE	American Society of Civil Engineers
ATOP	Asociación de Terminales y Operadores Portuarios, A.C. (Association of Terminals and Port Operators)
BA	Benchmarking Analysis
BCG	Boston Consulting Group
BNSF	Burlington Northern Santa Fe Railway
CANACAR	Cámara Nacional del Autotransporte de Carga (National Trucking Chamber)
CG	General Cargo
CGPyMM	Coordinación General de Puertos y Marina Mercante (General Coordination of Ports and Merchant Marine)
CMA CGM S.A.	Compagnie Maritime d'Affrètement and Compagnie Générale Maritime
CMSA	Contecon Manzanillo
COMCE	Consejo Empresarial Mexicano de Comercio Exterior, Inversión y Tecnología A. C. (Mexican Business Council for Foreign Trade)
CON	Containers
COSCO	China Ocean Shipping Company
CSCL	China Shipping Container Lines
DB	Dry Bulk
Evergreen	Evergreen Marine Corporation
Ferromex	Ferrocarril Mexicano, S.A.
FIDENA	Fideicomiso de Formación y Capacitación para el Personal de la Marina Mercante Nacional (Maritime Education Trust).
FSIDCN	Fondo Sectorial de Investigación y Desarrollo en Ciencias Navales (Sectorial Fund for Research and Development in Naval Sciences)
FTA	Free Trade Agreement
GDP	Gross Domestic Product
Hamburg Süd	Hamburg Südamerikanische Dampfschifffahrts-Gesellschaft A/S & Co KG

Hapag-Lloyd AG	Hamburg-American Line and North German Lloyd
HHI	Herfindahl-Hirschman Index
LA	Los Angeles
LATAM	Latin America
LB	Liquid Bulk
LB	Long Beach
LC	Lázaro Cárdenas
LCL	Less than Container Load
M	Manzanillo
Maersk	A.P. Møller – Mærsk A/S
MRT	Metric Revenue Tons
MSA	Market Share Analysis
MSC	Mediterranean Shipping Company S.A.
MT	Metric Tons
ONE	Ocean Network Express
OOCL	Orient Overseas Container Line
PCD	Port Competitiveness Degree
PDA	Product Diversification Analysis
PESTEL	Political, Economic, Social, Technological, Environmental, and Legal
PIL	Pacific International Lines
PMDP	Programa Maestro de Desarrollo Portuario (Port Master Development Program)
PPA	Product Portfolio Analysis
R&D	Research and Development
RMG	Rail Mounted Gantry
Ro-Ro	Roll on-Roll off
RT	Revenue Tons
RTG	Rubber Tired Gantry
SBU	Strategic Business Unit
SCT	Secretaría de Comunicaciones y Transportes (Secretariat of Communications and Transport)
SPA	Strategic Positioning Analysis
SSA	Shift Distribution Analysis
STU	Strategic Traffic Unit
SWOT	Strengths, Weaknesses, Opportunities, and Threats
TEC I	Specialized Container Terminal I
TEC II	Specialized Container Terminal II
TEU	Twenty-Foot Equivalent Unit
TIGER	Transportation Investment Generating Economic Recovery
UP	Union Pacific Railroad
US	The United States

1 Introduction

The subject matter of this thesis is to analyze the strategic competitive position of the port of Manzanillo, Mexico within the containerized cargo industry. Along with identifying and evaluating the sources of competitive advantages of the containerized shipping industry in Mexico and understanding the competitiveness of the port of Manzanillo in a global aspect. The study focuses mainly on determining the port's competitive position and the elements that drive its competitiveness and commercial growth through a comparative analysis with the ports of Lázaro Cárdenas, Los Angeles, and Long Beach, i.e. its competitors. Hereby, this chapter will present a brief research background in the context of the Mexican port system within the containerization industry. After this, a description of the problem definition will be made. Therefore, the objective of this study will be introduced and the research question and sub-questions that the study pursues to answer will be presented, followed by the explanation of the data collection used in the research. In this way, the chapter concludes with a presentation of the structure of the thesis.

1.1 Research Background

Port activities generate a significant contribution to the economic development of countries, allowing an increase in globalized transport trade (Mustafa, Khan, and Ahmed Farea, 2019). However, the appearance of containerization revolutionized the shipping and port industry, requiring special equipment and infrastructure for the correct and efficient handling of containerized cargo. Seaports facilitate the transport of large volumes of goods worldwide, playing a fundamental role in international trade, and generating intense competition among all users (Bobadilla Falla and Venegas Camargo, 2018). Likewise, other factors that have caused this intense competition are globalization, the vertical and horizontal integration of companies, and the global reallocation of the workforce (Dang and Yeo, 2017). Thereby, it can be stated that economies of the world with access to the sea, a properly structured port system, and efficient hinterland connectivity offer wide competitive advantages for its commercial partners and port users (SCT, 2008a).

The Mexican port system plays a fundamental role in the country's economic growth, which links it to the global markets, thus generating competitive advantages at the national, regional, and local levels. The geographical location of Mexico gives it a significant advantage for the increment of its port and commercial activities. According to the Secretariat of Communications and

Transportation[1] (SCT), in 2030, Mexican seaports are expected to transport approximately 38% of the country's total merchandise, which has required improving the conditions of specialized terminal infrastructures and the territorial expansion of certain ports located on the coasts of the Pacific Ocean and the Gulf of Mexico in order to be able to perform high quality, efficient, and effective services (SCT, 2008a).

Similarly, five of the 102 Mexican ports (i.e. ports of Manzanillo, Lázaro Cárdenas, Veracruz, Altamira, and Ensenada) have stood out for their competitive capacity to handle different types of cargo (i.e. dry bulk, liquid bulk, Ro-Ro, general cargo, and containers), nonetheless, due to the globalized behavior of international trade and the high demand for containerized cargo, there has been national and international competition between the different ports and terminals to capture larger volumes of containers, and as a result to become world-leading and advanced ports (SCT, 2008a).

1.2 Problem Definition

Undoubtedly, Mexico's geographical proximity and its commercial ties to the United States are some of the competitive advantages of the Mexican seaports. In the case of the port of Manzanillo, its strategic location on the Pacific coast has allowed it to occupy the number one place as the leading port in container traffic coming mainly from Asia. The reality is that Manzanillo is a fundamental piece in the country's international trade, having the world-class infrastructure in its specialized terminals, despite that, the key lies in the development of all the services that can be used through it in order that the global trade can see Manzanillo as a competitive, functional, efficient, and safe gateway. The Port Authority of Manzanillo[2] is aware that for preeminent competitiveness of the port, the level of productivity has to improve and the waiting times for inspections and customs processes have to decrease, together with better integration between the maritime transport, port operations, terminal infrastructure, hinterland connectivity, and the multimodal transport system (SCT, 2008a).

Therefore, the **value-added** of this study is that not only the Port Authority of Manzanillo and the Mexican government but also the port terminals together with the stakeholders will understand that in order to maintain and increase the competitiveness of the port of Manzanillo, they must first identify the current competitive position of the port within a specific market (i.e. container segment)

[1] Secretaría de Comunicaciones y Transportes (SCT), a Federal Entity of the Government of Mexico.
[2] Integral Port Administration of Manzanillo (Administración Portuaria Integral de Manzanillo, S.A. de C.V.).

and then determine strategies to achieve greater port competitiveness, through the intensification of efforts for better integration of the port sector. The basis for the selection of the port of Manzanillo is due to its natural vocation to be a dynamic and commercial port, a leader in the traffic of container cargo on the Pacific Coast of Mexico, the vision of its port authority, its competitive geographic location, and its strategic development plans for the coming years.

1.3 Aim of the Study

This multiple case study focuses on the comparative analysis of four of the main container ports in the American continent located in the Pacific Rim. Having stated the above, the aim of this study is to analyze the strategic competitive position of the port of Manzanillo within the containerized cargo industry in comparison to its largest national competitor, the port of Lázaro Cárdenas, and its two international competitors, the ports of Los Angeles and Long Beach, located in California, US. Subsequently, the study is complemented with the identification of the main elements that increase or decrease the competitiveness of the port of Manzanillo in the container industry and port sector, by evaluating the four national determinants of competitive advantage proposed by Michael E. Porter.

1.4 Research Questions

To achieve the objective of the study, it is necessary to carry out different levels of research, both quantitative and qualitative. The first phase is to determine the competitive environment in which the port of Manzanillo in Mexico operates. Secondly, the criteria underlying Manzanillo's strategic competitive position are analyzed in-depth, with solid arguments obtained from interviews with the members of API Manzanillo, followed by a meticulous analysis of annual throughput statistics for four categories of cargo traffic, i.e. containers, general cargo, dry bulk, and liquid bulk; of the four seaports. Lastly, an evaluation of the elements that drive and affect the competitiveness of the port of Manzanillo.

The **contribution** of this thesis aims to expand the existing knowledge base by combining different analytical approaches and models to provide a comprehensive and valid answer to each research question. Likewise, to provide recommendations for future competitive strategies for the port of Manzanillo based on the reliable results obtained.

Hereby, the research question that raises in this thesis is: ***What competitive determinants underly the competitive position of the port of Manzanillo in the container industry?*** Additionally, to thoroughly investigate this question, the following sub-questions are defined to be solved.

1) In terms of containerized cargo traffic, which are the main competitors of the port of Manzanillo in the Pacific Rim?
2) What have been the strategies of the Port Authority and the terminal operators that have prompted the port of Manzanillo to perform so well?
3) According to API Manzanillo, what type of port does Manzanillo want to become in the coming years?
4) What is the strategic competitive position of the Port of Manzanillo in the traffic of containers?
5) Does the port of Manzanillo have a strategy to diversify its cargo traffic portfolio? or Does it specialize in handling only one type of cargo? If so, what type of cargo?
6) What are the competitive advantages of the port of Manzanillo that have allowed it to grow its merchandise traffic volumes annually, especially containerized cargo?
7) What are the competitive advantages of Mexico in the global container industry?

1.5 Data Collection

Hox and Boeije (2005) state that to collect data, social scientists use different primary and secondary data collection strategies. Nevertheless, it is essential to distinguish one from another, the primary data is information that is collected for the specific research problem in hand, using procedures that are better suited to the research problem. Every time primary data is collected, new data is added to the existing store of social knowledge. As a consequence of this contribution, more and more materials created by other investigations are made available for reuse by the general research community, calling this secondary data (Hox and Boeije, 2005).

Using secondary data previously collected by other researchers, or for different purposes of the current research, is typically data such as official statistics, administrative records, or other accounts that organizations maintain updated continuously. Despite this, Hox and Boeije (2005) mention that the use of secondary data can present some problems, such as locating reliable sources of data, obtaining relevant data, and collecting data that meet the required quality (Hox and Boeije, 2005). See **Chapter 4, section 4.3** for more details about the issues and limitations that the author faced during the collection of secondary data.

The three most common techniques of primary data collection are experiments and quasi-experiments (strong causal inferences), surveys using structured questionnaires (a large number of variables and large sample), and qualitative research design and interviews (a small sample) (Hox and Boeije, 2005). For this study, the most relevant primary data collection strategy within the qualitative research design was **in-depth interviews**, where a large amount of data was collected from a fairly small sample, thereby, three interviews were conducted with members from the port of Manzanillo community, i.e. employees of API Manzanillo:

- The General Director of API Manzanillo (position assumed in the period of 2013 – 2014): Dr. Jesús Orozco Alfaro
- The Head of the Statistics department: Julieta Juárez Ochoa.
- The Executive Assistant of the Commercial department: Kevin Emmanuel Rubio Ceja.

The qualitative interview was used as the primary data collection technique for this study, the main reason is due to the fact the interviewees had the floor to speak about their experiences, points of view, and knowledge in relation to the port of Manzanillo. Rather than applying a rigidly standardized instrument, the interview guides were used with a variety of topics and questions that could be adjusted during the study. In this way, to proceed with the interviews, extensive communication was previously carried out with the interviewees in order to explain the objectives of the research and the information that the interviewer sought to obtain, noting that one of the main purposes of the interviews was to identify national and international competitors of the port of Manzanillo in the context of the container industry, since this information is critical for this multiple case study, specifically, to achieve effective use of the selected methods, i.e. the Strategic Positioning Analysis (SPA) and Porter's diamond model. Subsequently, the interviews were conducted using the Skype tool.

During the three interviews, valuable data were obtained, mainly information about the competitive position of the port of Manzanillo vis-à-vis Mexican ports, the vision and mission of the Port Authority, the elements of Mexico that have contributed to the growth of Manzanillo, the expected growth in the traffic volume of containers, the logistics and hinterland connection problems that the port presents, the modernization and expansion projects for the coming years, the strategies of the Port Authority, the advantages and weaknesses of the port of Manzanillo, the port strategies to diversify its cargo traffic portfolio, and a detailed explanation of those considered to be competitors of the port of Manzanillo. As a result, the researcher was able to conclude that Manzanillo's main competitors in the context of the container industry are the ports of Lázaro Cárdenas (Mexico), Los Angeles, and Long Beach (the US).

On the other hand, as the theory says, for correct preparation and planning strategies for the collection of primary data, it is important to first collect secondary data, which allows to have a clearer knowledge and to identify the information that is necessary to obtain from the interviewees. (Hox and Boeije, 2005). Taking into account the above, the main sources of information used for the collection of secondary data in this study were: (1) the eleven-year port statistics (2007 – 2019) of the selected ports, since they are easy to retrieve, followed by this, (2) government records, i.e. annual reports and master plans of the port of Manzanillo and its three competitors, which are considered important and authentic sources of secondary data, and finally (3) the use of books, journal articles, and scientific literature, traditional and reliable sources to collect data and prepare an effective literature review.

This leads the author to conclude that the use of multiple methods or data sources in qualitative research for the development of a comprehensive understanding of the phenomena is known as "triangulation". Triangulation is recognized as a qualitative research strategy to test validity through the convergence of information from different sources (Carter et al., 2014). As described above, the researcher used different sources to collect reliable primary and secondary data (i.e. data triangulation), among the most important and necessary were interviews, port statistics, port master plans, government records, journal articles, scientific literature, and books. The objective of this data triangulation is to increase confidence in the research finding, confirming results through the use of two or more independent sources of information. In other words, the combination of findings from two or more rigorous approaches provides a complete picture of results that any other approach could not achieve on its own (Heale and Forbes, 2013).

Thereby, in **Chapter 4, section 4.2** of this study, the author presents a more in-depth description of the uses that will be given to the primary and secondary data collected. Therefore, the data necessary for the effective application of the SPA tool and Porter's diamond model will be explained.

1.6 Thesis Structure

Taking into consideration the above, the study has been structured in seven chapters; the content of each one is described below:

Chapter 1 – Introduction to the study: This chapter presents the research background and the identified problem derived from it. Followed by the aim of the study, the description of the research question, and the sub-questions. The last section presents the different sources of data collection and the selection of the competitors that will be used for the comparative analysis with the port of Manzanillo.

Chapter 2 – Literature Review: Based on an extensive review of the available literature, this chapter addresses in detail the definition of port competition along with its different levels. Subsequently, the definition of port competitiveness and its relationship with the port competition is described. The chapter ends with the discussion of certain theoretical frameworks commonly used to analyze the competitive position of seaports and port competitiveness.

Chapter 3 – Methodology: The choice of the methodologies for this study are introduced in this chapter. The SPA is the method chosen to analyze the competitive position of the port of Manzanillo vis-à-vis its competitors within the containerized cargo industry, while Porter's diamond model will be used to identify the elements that drive or affect the competitiveness of the port of Manzanillo and its competitors.

Chapter 4 – Multiple-Case Analysis: The chapter begins with the theoretical introduction of the multiple case study, followed by the description of the primary and secondary data that have been collected. Additionally, it will be explained certain issues that arose during the collection of secondary data (i.e. port statistics). The chapter continues with the descriptive analysis of the geographic, commercial, and relevant characteristics of the port of Manzanillo and its competitors, namely the ports of Lázaro Cárdenas, Los Angeles, and Long Beach, all together with the comparison of their annual container throughput. As a result, the competitive advantages of the port of Manzanillo in the container segment will be identified.

Chapter 5 – Results and Interpretations: The results obtained from the implementation of the SPA and Porter's diamond model will be illustrated in this chapter. Followed by interpreting and analyzing them, with the aim of identifying the competitive position and competitiveness of each seaport in the range.

Chapter 6 – Discussion of the Results: As a complement to the previous chapter, this chapter has the purpose of discussing in greater depth the competitive position and competitiveness of the port of Manzanillo, this will allow the author to identify the competitive advantages and the areas of opportunity that the port presents. Thus, the chapter will conclude by presenting recommendations and strategies for API Manzanillo and the port users, in order to achieve greater competitiveness for the port of Manzanillo in the container industry.

Chapter 7 – **Conclusions:** This chapter will present the final conclusions from the analysis and discussion carried out previously. Similarly, based on the findings, the research questions and sub-questions will be solved. The chapter concludes with the limitations of the research, along with recommendations for future research.

2 Literature Review

2.1 Introduction

The aim of this chapter is to review the literature that forms the theoretical background of this research. Thereby, based on the available literature, the definition of the port competition will be present together with the different levels or types of competition. Subsequently, the definition of port competitiveness and the analysis of its relationship with the port competition will be presented. The chapter ends with a discussion of some of the frameworks commonly used to analyze the port competition and competitiveness.

2.2 Defining Port Competition

Port competition is an important field of study of the transport economy. Throughout history, seaports have allowed the exchange of large volumes of goods, causing the performance of ports to have a direct effect on their competitiveness, as well as on job opportunities and investment attraction (Meersman, Van de Voorde and Vanelslander, 2010). Hence, port authorities, terminal operators, and related governments are the main parties interested in analyzing the competitive position of their seaports (Mustafa, Khan, and Ahmed Farea, 2019).

Each seaport is different from the rest, the difference prevailing mainly in its roles, assets, functions, and institutional organizations (Bichou and Gray, 2005). Based on the literature, it can be found a variety of definitions for the port. For the purposes of this study, the definition of port established by Notteboom (2001) will be used as a reference, in which it is established that a port is a logistic and industrial center of an openly maritime nature, which plays an active role in the global traffic system, characterized by spatial and functional clustering of activities that are directly and indirectly involved in the transport of cargo and in the information processes (Notteboom and Yim Yap, 2012).

Likewise, Notteboom et al. (2012) state that container ports serve as important nodes to facilitate the efficient flow of containerized cargo. Container ports are distinguished from others by their primary function, which is mainly to serve as a gateway port that acts as an interface between the hinterland and deep-sea routings of containerized cargo, or differently, to serve as a transshipment port that acts as an interface for the interchange between deep-sea routings of containerized cargo. Moreover, the authors point out that productivity in cargo handling, excellent maritime, and hinterland connections, and an efficient pace of expansion capacity are some of the aspects that influence the attraction of containers to seaports (Notteboom and Yim Yap, 2012).

According to Goss (1990), the main economic function of a port is to benefit those whose trade passes through them. This means that for proper operations, ports must count with three fundamental elements: maritime access, good-handling capacity, and distributive capacity (Meersman, Van de Voorde and Vanelslander, 2010). Thus, it can be implied that the port product is a chain of interlinking functions, while the port as a whole is only one link in the overall complex logistics chain (Suykens and Van de Voorde, 1998).

Without a doubt, seaports are essential to transport links in supply chain networks, nonetheless, they are also fundamental elements for economic development and world shipping structure. It is evident that evaluating the competition and competitiveness of the ports is necessary for better performance and planning strategies (Kim, 2016). Despite this, to identify the competitive position and competitiveness of ports, it is important first to understand their definitions with solid foundations of scientific literature.

In the literature is widely recognized that there is not a single definition for port competition, in accordance with Verhoeff (1981), Slack (1985), Van de Voorde and Winkelmas (2002), and Notteboom and Yim Yap (2012) this is due to its complex and multifaceted nature. However, Notteboom et al. (2012) argue that the nature and characteristics of the competition depend directly on the type of port involved (e.g. gateway port, local port, transshipment port, container port, etc.) and the type of cargo handled (e.g. containers, dry bulk, liquid bulk, Ro-Ro, etc.) (Notteboom and Yim Yap, 2012).

Further, Verhoeff (1977) claims that the complex nature of port competition manifests itself primarily in the number of levels that must be distinguished in relation to the competition. Nevertheless, it is vital to understand that in practice it is not possible to separate the different levels of competition as he has done in his analytical study. Consequently, competition at a certain level also depends on those other levels. The second reason for this complexity is due to the fact that a single port is not the same as another regarding its economic structure and its combination of functions, as a result, each port performs differently. Last but not least, it arises from the characteristics of the port services market, it is believed that a limited number of ports only serve a certain partial market (Verhoeff, 1977).

By contrast, Heaver (1995) notes that terminals are the main aspect of a competitive strategy, not ports. Regarding his argument, it can be said that port competition involves mainly competition for trades, with terminals as competing physical units, transport concerns and industrial companies as chain representatives of the respective trades, and port authorities as representatives of the port sector committed to offering good working conditions (Notteboom and Yim Yap, 2012).

Although, certain scholars argue that port competition can be identified at different levels, depending on certain economic factors and the competitive behaviors of port authorities, port operators, port terminal operators, or the port as a whole. For the purposes of this research, the author will describe below the most relevant levels of port competition found in the scientific literature, in this way it will be possible to identify the levels of competition that the port of Manzanillo presents vis-à-vis its competitors.

2.3 Levels of Port Competition

Indeed, Verhoeff (1981) was the first academic to study port competition in a structured way and certainly, his contribution has influenced other scholars in the study of port competition. He divided seaport competition into five geographic levels, including competition between seaports and other terminals, competition among port ranges (ports located along the same coast), competition between port clusters (a group of ports close to each other with common geographical characteristics), competition among ports, and competition between private companies in a certain port (Verhoeff, 1977).

Similarly, Verhoeff (1981) emphasizes that the determinants that influence competition would vary from one level to another. In other words, the competition of individual companies within a port is determined by factors of production, such as labor, capital, technology, and energy. Differently, competition between ports, port clusters, and port ranges is affected by regional factors, such as geographic location, infrastructure, degree of industrialization, government policy, port performance, and costs generated by the transshipment, storage, and overland transport activities (Meersman, Van de Voorde and Vanelslander, 2010).

Later, Slack (1985) attributed to the literature two dimensions to define port competition and prevent market power, **inter-port and intra-port** competitive structures (Slack, 1985). On the contrary, Van de Voorde and Winkelmans (2002) suggest that port competition should include factors such as port traffic structures and port undertakings, port system, port authority expertise, port innovation capability (technology), government intervention, etc.

In comparison to Brian Slack (1985), Van de Voorde et al. (2002) identify three levels of port competition, see **Figure 2.1.** In the first leve**l, intra-port competition at the operator level** between port operators within a given port is presented, with respect to a specific traffic category, the competition includes all aspects in relation to cargo, traffic routes, and shipping lines. At the second level, there is an **inter-port competition at the operator level** between operators from different ports, mainly within the same range, same traffic category, and providing services more or less to the same hinterland regions. At the last level, there is **an inter-port competition at the port authority level** that focuses on the mission of public services of seaports, where port authorities from different ports compete to each other (Van de Voorde and Winkelmans, 2002).

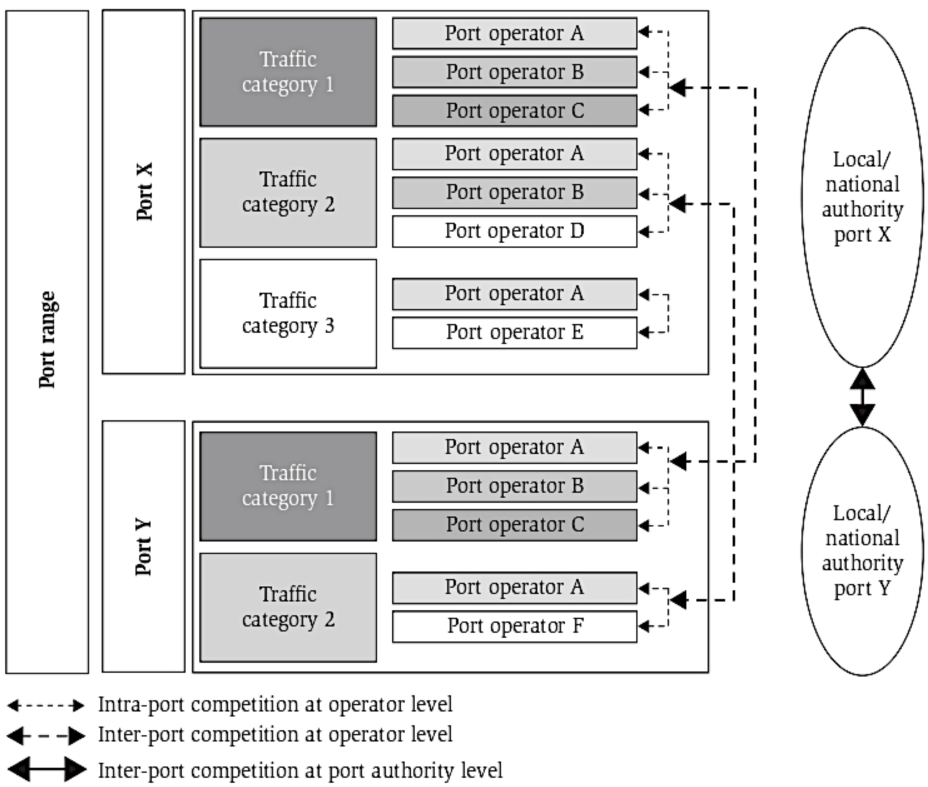

Figure 2.1 Three Levels Port Competition within a Port Range

Source: Van de Voorde and Winkelmans, 2002.

Haezendonck (2001) agrees on certain aspects of the above criteria and differs in some respects from the levels of competition proposed by Van de Voorde et al. (2002). As a consequence, Haezendonck (2001) defines port competition as *"acquiring trade in specific traffic categories, with port operators (and their terminals) as the main actors engaged in this competition and with port authorities as supporting actors providing opportunities for–and imposing constraints on– the port operators directly and on the broader port cluster indirectly."* (Haezendonck, 2001, p.14). Pursuant to her definition, Haezendonck (2001) states that traffic category structures are a relevant aspect for port competition, therefore, it is essential to make a distinction in the competition between port authorities and port operators, with the objective to generate a functional and autonomous port management and avoid monopolistic activities.

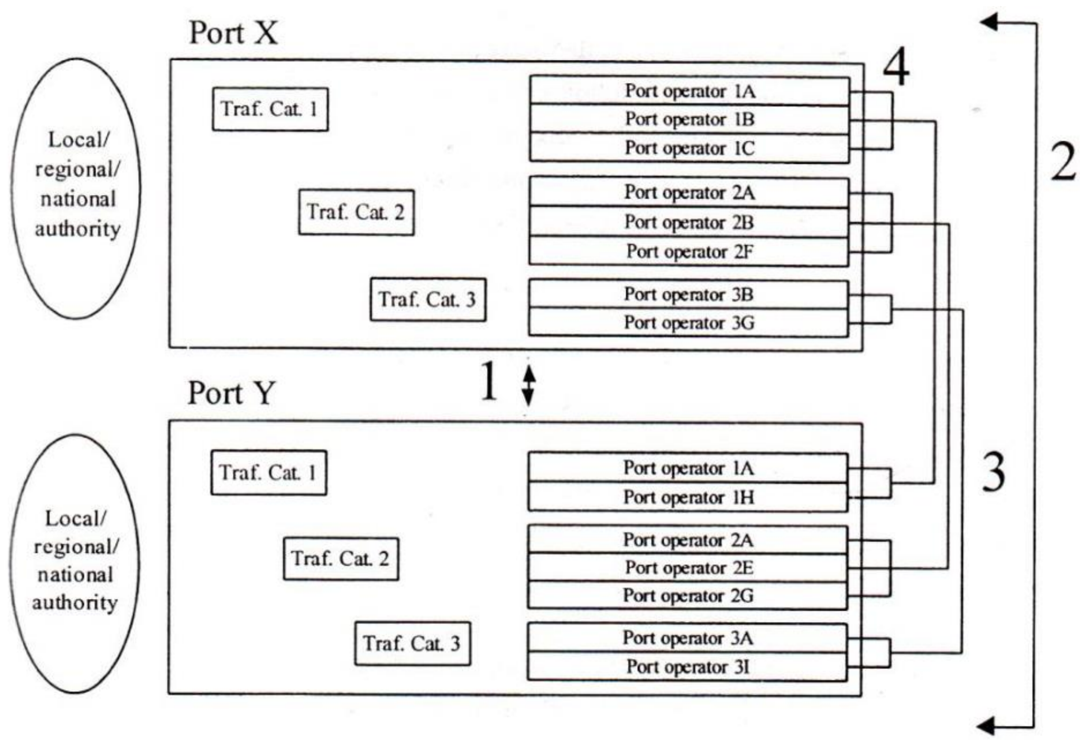

Figure 2.2 Four Levels of Port Competition within a Port Range

Source: Haezendonck, 2001, pp.15.

Appropriately, Haezendonck (2001) reestablished structure is integrated by four levels of competition, as illustrated in **Figure 2.2.** At the first level, **inter-port competition on a port authority level** is recognized, a competition between different ports where port authorities primarily pursue to increase the competitive position of their seaports by providing adequate infrastructure or attracting public investment, optimizing working conditions, and preventing monopoly activities. At the second level, **inter-port competition at the commodity level** is identified, where port users compete to increase their market share, in other words, to lead the handling of a specific traffic category. At the third level, is observed an **inter-port competition at**

the operator level, competition between operators of different ports, mainly within the same traffic category. Last but not least, the fourth level consists of an **intra-port cluster competition**, a competition that occurs between operators within a same port (Haezendonck, 2001, pp.6 – 38).

Distinctively, the World Bank (2000) mentions that two types of competition can be defined within a port complex. First, an **intra-port competition** is found, in which two or more different terminal operators within the same port compete for the same market. On the other hand, an **intra-terminal competition** is perceived, where the companies that compete to provide the same services are located within the same terminal (The World Bank, 2000). Chlomoudis and Pallis (1998) notice that these two types of competition are part of a definition of an inclusive intra-port competition among similar and/or complementary cargo traffic, which provides port services in the same port complex (De Langen and Pallis, 2006).

Understanding the meaning and importance of port competition together with its different levels that a port as a whole can present is a fundamental part of this study. The literary review presented above, allowed the author to have more solid foundations to determine if the port of Manzanillo presents internal competition (i.e. between container terminals) or if it faces external competition, i.e. between port authorities or container terminals from other ports.

In addition to the different levels of competition that can occur within a specific industry, Notteboom et al. (2012) express that the competitive position of a port is determined by its competitive offer to the host of shippers and shipping lines for specific trade routes, geographic regions, and other ports to which it is connected (Notteboom and Yim Yap, 2012). Despite, in the broadest dimension, Haezendonck and Notteboom (2002) observe that the competitiveness of a port is determined by the range of competitive advantages that the port acquires or creates over time.

2.4 Defining Port Competitiveness

Notteboom et al. (2012) mention that a seaport (e.g. a container port) has global competitiveness if the port as a unit enjoys proximity to the main production and consumption centers (trade routes), has excellent maritime and hinterland access (market connectivity), can reduce port costs by increasing productivity, is able to persuade carriers and shippers regarding their cargo routes (value-added to commercial activities), is capable to expand their capacity on time to satisfy demand and has enough space for future expansions of territory, it allows users to compete effectively with other modes of transport, it is qualified to face the challenges posed by the new logistics business environment, it is able to capitalize on complementary and reinforcement of the port cluster, the private sector has a greater participation in terminal operations, is perceived as a key driver of the local economy, and it has a long tradition of supporting the port community (Notteboom and Yim Yap, 2012).

Altogether, the factors observed by Notteboom et al. (2012) demonstrate the complexity to establish a single definition of port competitiveness. When diverse port industry and community users are integrated, the analysis of competitiveness becomes even more complex. Therefore, the meaning, perception, interpretation, measurement, and implication of these competitiveness determinants will surely be different for each of the port's stakeholders. Notwithstanding, it is also believed that the competitive offer depends not only on the terminal operators but also on the performance of the entire port community (Notteboom and Yim Yap, 2012).

Port competitiveness has been also a field of study for various academics. When reviewing the literature, it can be stated that port competitiveness is made up of determinants that have led to competition between ports and competitive advantages. This means that competitiveness is the aspect that influences shipping lines and shippers in the selection of a specific port, all under the fulfillment of various competitive functions (Kim, 2016). Additionally, Kim (2016) argues that competitiveness can be recognized as an indicator that identifies the opportunities and threats of seaports. Given the above, it can be argued that competition requires competitiveness, which means that in conditions where there is competition in the market (i.e. containerized cargo industry), ports have to be competitive vis-à-vis their rivals. Thereby, stakeholders should ask themselves which port is competitive towards which port and what are the elements that distinguish it, this means, what are its competitive advantages (Jolić, Štrk, and Lešić, 2007).

2.5 The Relationship between Port Competition and Competitiveness

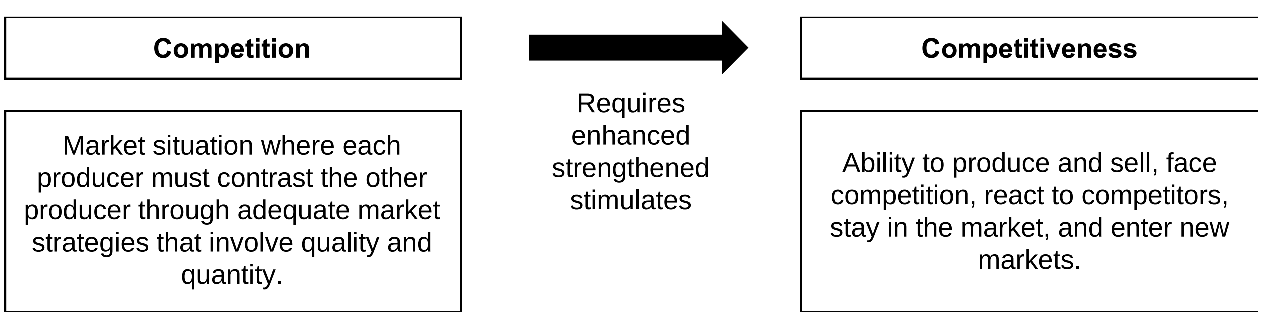

Figure 2.3 Relation between Port Competition and Competitiveness

Source: Created by the author based on Jolić, Štrk, and Lešić, (2007) information, 2020.

Figure 2.3 provides a broader view of the relationship between the literary terms of port competition and competitiveness, which are directly linked to improving and strengthening the quality of port services and the position of the ports in the market where they operate (Jolić, Štrk and Lešić, 2007). Following the same logic, Fleisher and Bensoussan (2007) define the competitive position of an organization compared to its competitors in the same market or industry. They argue that competitive positions allow companies to design tactical strategies to maintain or improve their current positions or possibly withdraw from the current market. Thence, knowledge of the competitive position of an organization vis-à-vis its rivals is essential. Day (1984) claims that rivals are defined as organizations that can obstruct a company's market objectives and performance.

Regards seaports, the intense competition between them is believed to have been caused by the trade globalization and the accelerated growth of the international economy, which has forced ports to restructure their operations and management to increase their competitiveness and market share (Dang and Yeo, 2017). Pardali and Michalopoulos (2008) identify that determining the position of ports today is a crucial issue for the port industry worldwide, especially in container ports, since container traffic has become a highly competitive market.

Panayides (2003) points out that design strategies to increase competitive advantages and improve port performance are fundamental techniques for seaports. While, Basta and Morchio (2008) argue that successful strategies should address the improvement of the entire set of port, transport and logistics services, for an efficient and complete port function. Moreover, Van de Voorde et al*.* (2002) mention that the competitiveness of a port may also be affected by the participation of some interested parties.

However, Haezendonck, Verbeke and Coeck (2006) affirm that when planning strategies to achieve higher competitiveness, those responsible, such as port authorities, port operators, and port users, must first understand and analyze their strategic positioning and the dynamics of international competition in seaports. For this reason, the following section aims to present in general terms some of the frameworks that support the analysis of the competitive position and competitiveness that seaports present nowadays. This next section is a fundamental part of the study since after the analysis of different frameworks it will be possible to determine which are the most effective methods that should be used in this multiple case study.

2.6 Overview of the Theoretical Frameworks

As mentioned before, the port sector is characterized by its great complexity due to the variety of actors and decision-makers involved, i.e. carriers, shipping lines, port operators, port authorities, among others. The complexity to study all the aspects justifies the multiple uses of frameworks for an effective analysis of competitive position and port competitiveness. However, as Basta et al. (2008) say, the choice of the methods to implement depends strongly on the objective of the analysis and the broadness of the research field, i.e. analysis of individual ports or terminals (Basta and Morchio, 2008).

Typically, the techniques use to analyze the competitive position of the ports and the determinants of competitiveness are classified into quantitative and qualitative. According to Notteboom et al. (2012), quantitative methods focus on measurable and comparable variables of port competition in selected samples of ports and container terminals. Therefore, these techniques consider operational, financial, and production indicators of the port's performance that are directly related to the efficiency of the use of resources, the productivity achieved by the assets used, and the participation of the traffic handled. While, qualitative tools are potentially used to determine competitiveness in an objective way, so the factors are generally covered by analyzes that are descriptive in nature (Notteboom and Yim Yap, 2012). Hence, a general and systematic description of different quantitative and qualitative frameworks will be present below.

2.6.1 Frameworks for Analyzing Port Competition

Market Share Analysis (MSA) is a framework used to study the competitive position of maritime ports. In accordance to Michalopoulos, Pardalis, and Stathopoulou (2007), the model analyzes the competitive positions of the selected ports on the basis of their determining market shares (e.g. container traffic). Nevertheless, it is considered to be a fairly simple technique, since the results will only indicate the degree of competition equivalent to its participation in the studied market, for which some academics argue that it does not take into account basic competitive factors (Michalopoulos, Pardalis, and Stathopoulou, 2007).

On the other hand, the **Strategic Positioning Analysis (SPA),** an analytical approach implemented by Haezendonck, Verbeke, and Coeck (2006), stands out as a more complete and complex analysis tool, which is integrated by three different methodologies to evaluate strategic positioning of a port with reference to a range of selected ports. In other words, the SPA is a comparative analysis that describes the performance of ports and traffic categories within ports in terms of market share, growth rate, diversification, and added value (Haezendonck, Verbeke and Coeck, 2006).

The main advantage of the SPA is the easy data collection and the reliability and certainty of the information used since it does not require confidential information (e.g. financial or marketing data), but mainly traffic flows of each respective port to study. In addition, this technique allows the graphical representation of the results from the different methodologies, which grants the researcher to conduct analyzes and accurate conclusions regarding the current position of the port range. Nonetheless, it is important to remark that before carrying out this tool, the researcher must have a correct and careful selection of the ports to be included, the traffic flow groups to be studied, and the observation period to be used (Haezendonck, Verbeke and Coeck, 2006).

Similarly, the three methodologies that integrated the SPA are the Product Portfolio Analysis (PPA), based on the analysis of market shares and their growth, the Shift-Share Analysis (SSA), which simulates the effects that an acquisition, specialization, increase, or shrinkage of a certain traffic cargo category would have on a port’s performance, and the Product Diversification Analysis (PDA), which evaluates port traffic diversification and efficiency levels (Basta and Morchio, 2008). A more comprehensive explanation of the three methodologies will be provided in **Chapter 3, section 3.2.**

Meanwhile, **Benchmarking Analysis (BA)** is another popular and flexible framework for determining the competitive position and competitiveness of the port, as both qualitative and quantitative variables of a group of ports can be analyzed. In other words, BA is an adopted method to benchmark competitors within the port industry, while its attractiveness is the combination of both variables. Pardali and Michalopoulos[3] (2008) suggested and applied a model for the positioning of the port business in a competitive market based on the use of the benchmarking technique. Three main attributes were identified during the conduction of this framework, (1) the port business can estimate its competitiveness using the Port Competitiveness Degree (PCD), (2) the results provided are an indirect method of estimating the port’s performance, and (3) the model can be used as a strategic tool to identify the operational

[3] The case study of the port of Piraeus in the Mediterranean port market.

weaknesses that must be faced in order to achieve the best relative performance vis-à-vis competitors (Pardali and Michalopoulos, 2008).

The main advantage of the BA is that it can include a flexible number of variables, both qualitative and quantitative, at the analyst's discretion. As a result, it is possible to capture some of the complexity that affects port and terminal operations and performance. For a better model application, Pardali et al. (2008) determine two categories of variables, the features (FE) and the quality criteria (QC), where each category has several subcategories such as, demand (D), supply (S), labor (L), others (O), information systems (IS), application to ships (AS), application to cargo (AC), and miscellaneous (MS). Given the above, this framework is highly applicable and easily understandable, making it attractive to port authorities, port terminals, and other port users (Pardali and Michalopoulos, 2008).

The performance of the ports analyzed is evaluated through the positioning process that includes calculations such as benchmarking scores for each variable of features and quality criteria of each port in the market, benchmarking scores of the average port in the market for each variable of features and quality criteria, calculations of the best score of the ports in the market for each variable of features and quality criteria, and the PCD (Pardali and Michalopoulos, 2008). Therefore, the results obtained will determine the Leader-Port in the market using the criterion of the maximum number of best scores and the PCD, it will also identify the differences between the determined port and the average port in the market, as well as the differences with the leading port of the market (Pardali and Michalopoulos, 2008).

2.6.2 Frameworks for Analyzing of Port Competitiveness

PESTEL is an acronym for six factors of change: Political, Economic, Social, Technological, Environmental, and Legal. PESTEL analysis is a widely used tool to identify the macro-environmental (i.e. external) factors faced by an organization and to understand its strategic risks. Hence, it identifies the changes and effects of the external macroeconomic environment on the competitive position of a company (Sammut-Bonnici and Galea, 2015). In other words, the PESTEL framework seeks to understand external factors and evaluate how business models (i.e. container seaports) should evolve in order to adapt to their competitive environment. Similarly, the academics affirm that the impacts of external factors are mitigated through strategies and the use of new opportunities obtained as a result of the new competitive positions that may be generated in the process (Sammut-Bonnici and Galea, 2015).

Differently, for a national or regional analysis of port competitiveness, some scholars propose a classic and influential framework, **Porter's diamond model** (1990), a method that helps to understand the environment and competitive advantages of a particular industry in a specific country or region, due to certain available factors. Economic theory mentions that the comparative advantage factors for countries or regions are land, location, natural resources, labor, and population size (Deng, Yeo and Du, 2018). Porter's diamond framework consists of four national determinants of competitive advantages, i.e. factor conditions, demand conditions, related and supporting industries, and firm strategy, structure and rivalry, where these factors interact with each other to form the conditions where innovation and competitiveness occur (Bakan and Doğan, 2012). A more comprehensive explanation of the Porter's diamond model will be provided in **Chapter 3, section 3.3.**

Nonetheless, during the conduction of other studies, certain academics expanded the diamond model with certain modifications. For example, Rugman and D'Cruz (1993) proposed to implement the **Double diamond model**, an extension of Porter's original framework, where both national and foreign diamonds were considered, using this tool as a key to the analysis of port competitiveness. Whereas Rugman and Verbeke (1993) suggest expanding Porter's framework to incorporate the modern theory of the multinational enterprise in a variant of SWOT analysis to operationalize Porter's diamond (Rugman and Verbeke, 1993).

Last but not least, **SWOT Analysis** is a strategic planning framework used to help organizations to identify their Strengths, Weaknesses, Opportunities, and Threats related to competition in the industry where they operate. In the context of the port sector, Ircha (2001) is one of the academics who identified the SWOT analysis as an appropriate method for the competitive analysis of ports, where it is possible to identify qualitative variables, such as external opportunities and threats and internal strengths and weaknesses of the ports. The study carried out by Ircha (2001) provides a complete understanding of the effects caused by internal and external changes in a port, as a result, it is possible to define the elements or factors that positively or negatively affect the competitiveness of the port, allowing the planning of new strategies and action plans (Ircha, 2001).

2.6.3 Remarks on the Theoretical Frameworks

It is important to note that the combined implementation of two types of analysis, i.e. quantitative and qualitative, is of complementary interest. Given the circumstances that when measuring and analyzing port competition, the researcher only obtains an overview of the current situation of the analyzed port (i.e. the competitive position of the port vis-à-vis its competitors), while the analysis of port competitiveness allows understanding the reason for the situation previously identified. In other words, the analysis of port competitiveness will give the researcher much more information about the strategic position and allow the development of strategies if necessary. Therefore, the combination of both frameworks is a complementary function that allows a more complete study.

2.7 Conclusions of the Chapter

It can be concluded that each seaport is different from the rest, differentiating itself by its roles, assets, functions, and institutional organizations (Bichou and Gray, 2005). However, Notteboom et al. (2012) point out that container ports are distinguished to serve as a gateway port that acts as an interface between the hinterland and deep-sea routings of containerized cargo, or as a transshipment port that acts as an interface for the interchange between deep-sea routings of containerized cargo. Considering those characteristics, Verhoeff (1981) analyze port competition in a structured way, determining five geographic levels of competition. Van de Voorde et al. (2002) identify three levels of port competition. In spite of this, Haezendonck (2001) agrees and disagrees with previous studies, proposing a new structure composed of four levels of competition,

For the purposes of this study, the author will use as a reference the levels of port competition proposed by Haezendonck (2001), in order to carry out a better analysis of this multiple case study. On the other hand, as Haezendonck and Notteboom (2002) establish, the competitiveness of a port is determined by the range of competitive advantages that the port acquires or creates over time. Taking into account the above, it is concluded that competition requires competitiveness, which means that under conditions of competition in the market, ports must be competitive against their rivals.

In other words, port competitiveness is the ability of a port or specialized terminals to produce and sell, to face internal and external competition, to react to the strategies of competitors, to compete successfully in a specific market or industry, and even the power to enter new markets (Basta and Morchio, 2008). Therefore, competition is the situation or position of the market (i.e. container industry) where each producer (i.e. seaports) has to face their rivals through appropriate strategies (i.e. quality, prices, safety, efficiency, etc.) , while competitiveness is the condition of the port (Basta and Morchio, 2008). In summary, as Basta and Morchio (2008) mention, to face port competition, a port has to be competitive.

Last but not least, Haezendonck et al. (2006) state that when planning competitive strategies, port stakeholders must first understand and analyze their strategic positioning and the dynamics of international competition in seaports. Therefore, the complexity to study all the aspects justifies the multiple uses of frameworks for a correct analysis of competitive position and port competitiveness. Without forgetting that the choice of the method to implement depends strongly on the objective of the analysis and the broadness of the research field (Basta and Morchio, 2008). Thereby, the following chapter will describe in more detail the methodologies chosen for this multiple case study (i.e. the SPA method and Porter's diamond model), together with an explanation of the data necessary for the proper functioning of the models.

3 Methodology

3.1 Introduction

This chapter will present the methodologies chosen to carry out in this multiple case study in order to properly solve the research question and sub-questions. It is important to note that some of the sub-questions were answered during the interviews with the three API members (i.e. primary data), while the rest of the sub-questions were answered based on the findings obtained when applying the SPA technique and Porter’s diamond model. In other words, some sub-questions will be answered through the interviews, while others through the quantitative and qualitative models, confirming the answers through the information collected from the interviews.

Based on the scientific literature review, a detailed description of the methods to be implemented will be presented, followed by the explanation of the procedures necessary for the correct use of these analytical tools, together with the exposition of the primary and secondary data that will be used. Hereby, the theoretical framework chosen to analyze the competitive position of the port of Manzanillo vis-à-vis its competitors in the context of the container industry will be described in-depth (i.e. the SPA). The chapter will end with the presentation of the qualitative model to be used to identify the competitive advantages (i.e. competitiveness) of the port of Manzanillo in comparison to its competitors (i.e. Porter’s diamond model).

3.2 Strategic Positioning Analysis (SPA)

As explained in **Chapter 2**, the SPA[4] is a complete analysis technique, which is integrated by three different methodologies in order to quantitatively describe the performance and evolution of individual ports and traffic categories in terms of growth rate, market share, diversification, and value added. Similarly, the SPA considers the position of the port with respect to the value added originated by the different traffic categories (Haezendonck, Verbeke and Coeck, 2006).

Haezendonck, et al. (2006) used the SPA method, along with the growing participation matrix, originally introduced in 1968 by the Boston Consulting Group (BCG), in order to analyze the positioning of the nine most important seaports in the Hamburg – Le Havre range. Given that the SPA is integrated by three interrelated analytical analyzes, the Product Portfolio Analysis (PPA),

[4] Several authors have used this tool for the analysis of port competitiveness, among the most prominent can be noted: Haezendonck, Verbeke, Coeck (2006) and Winkelmans, Meersman, Van de Voorde, Van Hooydonk, Verbeke, Huybrecht (2002).

the Shift Distribution Analysis (SSA), and the Product Diversification Analysis (PDA), the results obtained allow us to determine the competitive position of a port as compared to the other ports in the port range considered (Haezendonck, Verbeke and Coeck, 2006).

For this study, the full implementation of the SPA tool will be carried out, with the purpose of analyzing the competitive strategic position of the port of Manzanillo vis-à-vis its containerized cargo competitors, i.e. the port of Lázaro Cárdenas located in Mexico, Los Angeles and Long Beach, both located in California, US. Similarly, the traffic flow data concerns the actual throughput of four different commodity categories (i.e. containers, general cargo, dry bulk, and liquid bulk) of the selected ports during the 2007 – 2019 observation period. In this way, the data concerning cargo traffic will be measured in metric tons.

3.2.1 Product Portfolio Analysis (PPA)

The PPA is in principle a model that can be applied to the port sector, which is based on the "growth-shared matrix" originally developed by the BCG, in the field of strategic business planning. The BCG matrix allows studying the performance and position of the business units, based on two fundamental variables, (1) market share and (2) growth index. Moreover, its function is to determine the current position of a specific business unit (e.g. seaport or traffic category) vis-à-vis rivals (e.g. port competitors or traffic categories within ports) and its potential to increase their market share (Haezendonck, Verbeke and Coeck, 2006).

Haezendonck et al. (2006) argue that the basic concepts of the BCG matrix can be easily translated in terms of seaports. Hence, the Strategic Business Units (SBUs) of the BCG matrix when applied in the port sector can come up as the different categories of traffic under consideration (e.g. liquid bulk, dry bulk, containers, Ro-Ro, or general cargo), as a result, they will be considered as "Strategic Traffic Units" (STUs). It is significant to note that the traffic flow for each port is described in terms of relative market share and traffic growth (Haezendonck, Verbeke and Coeck, 2006).

As illustrated in **Figure 3.1**, the BCG matrix is divided into four market positions, depending on the position of the seaport, while the arrows indicate the "normal" evolution of the traffic flows of a seaport. Under a conventional commercial context, "Question Marks" are those units with a high growth rate and low market share, which have potential and require investments to increase their market share. The "Stars" are characterized by a high market share and high growth rates, where it is recognized that the units in this category are those that are really successful in business. In a different way, “Cash Cows” have a large market share but at the same time they have low growth rates, they are important for the business since they generate financial resources, but their position in the market is determined. Last but not least, “Dogs” are the units that have a low market share and a low growth rate; hence they are those units that a company should consider getting rid of due to its low economic potential (Haezendonck, Verbeke and Coeck, 2006).

PRODUCT MARKET GROWTH RATE	*HIGH*	**“Question Marks”**	**“Stars”**
	LOW	**“Dogs”**	**“Cash Cows”**
		LOW	*HIGH*

RELATIVE MARKET SHARE

Figure 3.1 Boston Consulting Group-Matrix

Source: Created by the author on the basis of Dibb, Simkin, Pride and Ferrell (1991), in (Haezendonck, Verbeke and Coeck, 2006).

Notwithstanding, Haezendonck et al. (2006) state that when applying portfolio analysis to port traffic structures, the conventional implications of the technique were not sufficiently satisfactory and unlikely to be valid. Consequently, the academics modified the model to allow port authorities and operators to obtain useful information on the structure of port traffic flows compared to their rivals. In this way proposing new terminologies to describe the four possible positions in the portfolio matrix (Haezendonck, Verbeke, and Coeck, 2006), see **Figure 3.2.**

The “High Potential” units are those that have a low market share but high growth rates, in the sense that growth rates are an observable phenomenon over time, it may be that the market share also grows, and these units could become “Star Performers”. Thus, “Star Performer” are units with a high market share and high growth rates, where it is believed that long-term sustainability is not guaranteed in this position. While, “Mature Leaders” are those units that have a high market share but a low growth rate. Lastly, the units of “Minor Performer” are those with low market share and low growth rates, their functionality is not as good as the rest (Haezendonck, Verbeke and Coeck, 2006). Regarding the empirical analysis of this study, the competitive position of the traffic categories for each container port will be analyzed based on this new proposed BCG matrix, see **Chapter 5**.

PRODUCT MARKET GROWTH RATE	*HIGH*	**“High Potential”**	**“Star Performer”**
	LOW	**“Minor Performer”**	**“Mature Leader”**
		LOW	*HIGH*

RELATIVE MARKET SHARE

Figure 3.2 BCG Matrix adapted for the Port Industry

Source: Created by the author based on Haezendonck, Verbeke and Coeck (2006) information, 2020.

Likewise, the portfolio analysis approach applied to the traffic structure of ports in a particular range is made up of four “levels”, where instead of representing a hierarchy between STUs, they are complementary and provide additional information (Haezendonck, Verbeke and Coeck, 2006). Based on the four “levels”, a dynamic analysis is obtained in different periods of time, which allows more specific conclusions to be drawn about the changes in the competitive position over time.

3.2.1.1 PPA Level 1

At the first level, the PPA compares the global market shares and total growth rates of the selected ports. In other words, classifies the ports according to their overall traffic evolution within the observation period. In this study, the portfolio is constituted by the port range determined previously, i.e. the ports of Manzanillo, Lázaro Cárdenas, Los Angeles, and Long Beach. Similarly, in line with the original construction of the BCG matrix, the horizontal axis shows the market shares and the vertical axis shows the growth rate. Thus, the vertical line represents the average market share of the port range, while the horizontal line represents the average growth rate recorded by the port range (Haezendonck, Verbeke and Coeck, 2006).

3.2.1.2 PPA Level 2

At the second level, the PPA analyzes the traffic structure of each individual seaport in the range. Unlike the first level, this one describes the share and growth rate of each category of traffic in the port's total traffic. For the purposes of the study, four categories of traffic were determined for each port, i.e. containers, general cargo, dry bulk, and liquid bulk. As a result, the four categories of traffic will be positioned in the matrix according to their average growth rate in the traffic structure, as well as their share of the total traffic structure. This level allows the author to identify which categories are stronger or weaker for each port (Haezendonck, Verbeke and Coeck, 2006).

3.2.1.3 PPA Level 3

At the third level, each commodity group in the range considers itself as a "portfolio of ports", this means, as a total volume of traffic that can be decomposed between all ports. Therefore, it is necessary to choose one of the categories, for the general purpose of the study, the container category is the one that will be analyzed at this level. As a result, with respect to the container category, the ports of Manzanillo, Lázaro Cárdenas, Los Angeles and Long Beach will be ranked according to their market share in the range and their growth rate in that category (Haezendonck, Verbeke and Coeck, 2006).

3.2.1.4 PPA Level 4

The fourth level differs from the third level, in the sense that the X-axis represents the share of a specific category within a port, rather than the share of this category in the range of ports. In the context of the study, this level will show the structure of containerized cargo compared to the rest of the port's total traffic categories, adding a dimension of the container traffic category. Because this level introduces an additional dimension to the portfolio analysis, the graphic representation of the ports is illustrated with circular shapes, whose surface is proportional to the absolute volume of traffic of the port considered in the total range (Haezendonck, Verbeke and Coeck, 2006).

The advantage of this level is that for each seaport in the range the position (of the containerized cargo in the merchandise structure of a single port), the size (of the containerized cargo in relation to the size of the same merchandise in the other ports in the range), and the growth rate (of containerized cargo for the port in question) can be visualized simultaneously. From an analytical point of view, the fourth level is the most relevant, however, the combination of the four levels provides an eclectic set of perspectives on the competitive position of each seaport in the range (Haezendonck, Verbeke and Coeck, 2006).

The results and interpretations of the PPA are presented in **Chapter 5, section 5.2.2.**

3.2.2 Shift-Share Analysis (SSA)

The SSA[5] is recognized for its advantages and complementation to the PPA since it allows an unbundling of the general evolution (growth or decrease) of the traffic volume of a port into various components, i.e. the SSA enables to decompose the growth or decrease of a flow of traffic, in three relevant elements: share-effect, commodity-shift, and competitiveness-shift (Haezendonck, Verbeke and Coeck, 2006).

A negative result indicates an unfavorable position, while a positive figure reflects good performance. The higher the positive number, the better the situation can be considered. In spite of that, the results of an SSA can be influenced by the choice of ports, the relevant traffic categories, the base year, and the observation period. On the other hand, the share-effect indicates the estimated hypothetical growth of traffic in a port, assuming a constant market share. This implies that the share-effect describes the change in the volume of traffic that would have occurred in a case where all types of commodities had evolved in the same way. The difference between the registered actual growth and the calculated share-effect reflects an increase or decrease in the actual participation registered in the market and is represented by the shift-effect. This effect indicates that a port has not evolved as expected based on the share-effect and is divided into a commodity-shift and a competitiveness-shift (Haezendonck, Verbeke and Coeck, 2006).

In a particular traffic structure, the commodity-shift represents the degree of specialization of a port in the best performing traffic categories. As a consequence, this effect considers the impact

[5] De Lombaerde and Verbeke (1989) were pioneers in the application of the SSA technique in international port competition, analyzing the composition and evolution of port traffic flows.

of a unique traffic structure of each seaport. A positive commodity-shift indicates that the port is specialized in these categories, in other words, it has a favorable traffic structure. However, a negative change reflects an unfavorable traffic structure (Haezendonck, Verbeke and Coeck, 2006). It should be mentioned that the calculation of a commodity-shift assumes that all traffic categories maintain their initial share in the traffic of the individual port. In effect, a port specialized in traffic categories should see its overall market share grow in the range analyzed. Thus, given a specific (favorable or unfavorable) commodity structure of a port's traffic, a positive change in competitiveness-shift implies that the port outperformed its rivals in the traffic categories in which it specializes. This means that this shift is a general indicator of the improvement or deterioration of the port's market share in different traffic categories (Haezendonck, Verbeke and Coeck, 2006).

The composition of the actual growth of the traffic volume in a seaport in the period *t* to *t+x* can be represented as follows (Lombaerde and Verbeke,1989):

$$\text{Actual growth} = Share - effect + Commodity - shift + Competitiveness - shift$$

$$P_j^{t+x} - P_j^t = p^{t+x} P_j^t + \sum_i \left(p_i^{t+x} - p^{t+x}\right) P_{ij}^t + \sum_{ij} \left(p_{ij}^{t+x} - p_i^{t+x}\right) P_{ij}^t \qquad (1)$$

where

P_j^t = total traffic in port j in year t.

P_j^{t+x} = total traffic in port j in year $t+x$.

$P_{ij}^{t+x} - P_{ij}^t$ = actual growth of traffic volume of traffic category i in seaport j.

$\sum_i \left(P_{ij}^{t+x} - P_{ij}^t\right)$ = actual growth of traffic volume in seaport j.

$p^{t+x} P_{ij}^t$ = share − effect of traffic category i in seaport j.

$\sum_i \left(p^{t+x} - P_{ij}^t\right)$ = share − effect in seaport j.

$\left(p_i^{t+x} - p^{t+x}\right) P_{ij}^t$ = commodity − effect of traffic category i in seaport j.

$\sum_i \left(p_i^{t+x} - p^{t+x}\right) P_{ij}^t$ = commodity − effect in seaport j.

$\left(p_{ij}^{t+x} - p_i^{t+x}\right) P_{ij}^t$ = competitiveness − effect of traffic category i in seaport j.

$\sum_i \left(p_{ij}^{t+x} - p_i^{t+x}\right) P_{ij}^t$ = competitiveness − effect in seaport j.

P_{ij}^{t+x} = traffic in port j of traffic category i in year $t+x$.

P_{ij}^t = traffic in port j of traffic category in year t.

p^{t+x} = relative groeth of traffic in the seaport range in year $t+x$.

p_i^{t+x} = relative growth of traffic category i in the seaport range in year $t+x$.

p_{ij}^{t+x} = relative growth of traffic category i in port j in year $t+x$.

The above mathematical formula will be applied in **Chapter 5** of this study in relation to the traffic figures of the ports of Manzanillo, Lázaro Cárdenas, Los Angeles, and Long Beach. Notwithstanding, the limitation of the SSA method is the static and numerical representation of the calculations, which makes it difficult to clearly visualize the results and conduct correct conclusions. As a solution, Haezendonck et al. (2006) suggest introducing a graphical representation for the study of the results, as illustrated in **Figure 3.3.**

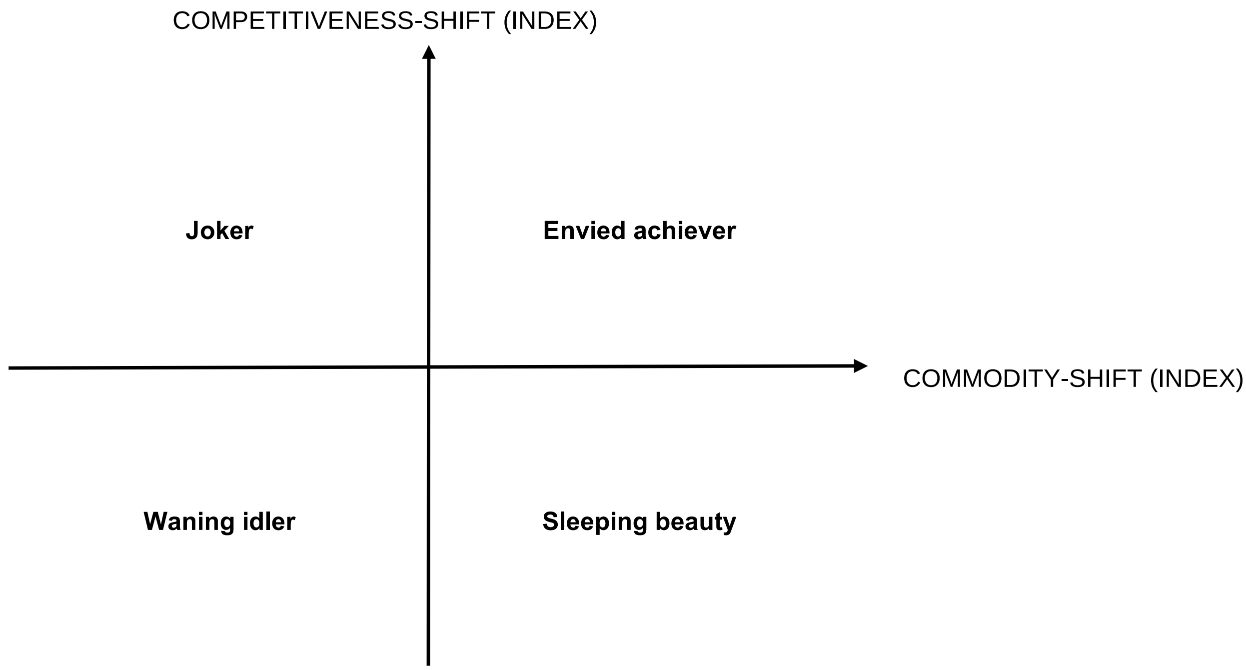

Figure 3.3 Graphical Representation of SSA-Results

Source: Created by the author based on Haezendonck, Verbeke and Coeck (2006) information, 2020.

In conventional portfolio analysis, only the growth rate parameter shows the "dynamics" of port competition. On the contrary, the graphical representation of the SSA reflects the dynamics of rivalry in both parameters (commodity-shift and competitiveness-shift). By combining these two elements, four different market positions are obtained, see **Figure 3.3.** The arrows in the matrix indicate an improvement in the competitive position of the port during the observation period. Consequently, "Sleeping Beauty" is considered a favorable traffic structure, although specialization in the fastest growing traffic categories should confer a long-term advantage vis-à-vis rivals ("Beauty"), if the port has not functioned well with this favorable traffic structure is indicated by the term "Sleep" (Haezendonck, Verbeke and Coeck, 2006).

Despite that, if the port improves its market position in these niches with rapid range growth, its position will become an “Envied Achiever”, indicating that “envied” by its rivals due to its attractive mix of initial traffic, and an “achiever” due to its effective leverage from this starting position. In contrast, “Jokers” are ports characterized by an improvement in the competitive position, but they face an unfavorable traffic structure, so the sustainability of a good market position is ambiguous unless the port manages to become the “Mature Leader” in declining traffic categories. Ports placed on the quadrant “Waning Idler” indicate that they have unfavorable competitive performance along with unfavorable traffic structure. These ports should be viewed as declining unless corrective action is taken (Haezendonck, Verbeke and Coeck, 2006).

Finally, an additional dimension (share-effect) can be added to the representation. A three-dimensional representation where the total SSA-effect of the seaports is shown graphically during a sequence of time periods considered relevant. The consideration of different time periods is relevant since it can be concluded that the relative position of the ports in terms of shift-effects will evolve over time (Haezendonck, Verbeke and Coeck, 2006). The results and analysis of the SSA are presented in **Chapter 5, section 5.2.3.**

3.2.3 Product Diversification Analysis (PDA)

PDA is the last analytical approach that complements the SPA, it consists mainly of analyzing the diversification of port traffic during a specific period (De Lombaerde and Verbeke, 1989). The traffic diversification index determines the relative importance of the different traffic categories in the total traffic volume of the seaport and assesses the composition of this traffic. For a better analysis, it is necessary to apply the Herfindahl-Hirschman Index (HHI), used mainly to establish the level of diversification of a seaport and to identify the relative importance of the different traffic categories within the total traffic structure of each seaport (Haezendonck, Verbeke and Coeck, 2006). According to De Lombaerde et al. (1989), the algebraic expression of the diversification index is represented as follows:

$$D_j = \frac{\sum_{i=1}^{n} P_{ij}^2}{\left[\sum_{i=1}^{n} P_{ij}\right]^2} \leq 1 \tag{2}$$

where

$D_j = \text{diversification} - \text{index for port } j.$

$P_{ij} = \text{traffic volume } i \text{ of port } j.$

The degree of concentration of the different traffic categories within the analyzed port is represented by the index. This means, if the index reaches a value of 1, that the total traffic structure of the modelling port is dominated by a specific traffic category. Differently, an equal division of the total traffic volume over the studied categories would result in the lowest possible diversification-index of 1 over *n*, with *n* representing the number of traffic categories under consideration. In other words, a high diversification-index reflects a high degree of inequality, indicating that the port is specialized in a niche, while a lower diversification-index reflects a balance in volume between traffic categories (Haezendonck, Verbeke and Coeck, 2006). The results and analysis of the PDA are presented in **Chapter 5, section 5.2.4.**

3.2.4 A "Weighted" and "Unweighted" Analysis

For a correct use of the SPA model, the "unweighted" and "weighted" values of the traffic structures must be taken into account. According to Haezendonck et al. (2000), the rationale for a "weighted" analysis is the existence of differences in value-added between traffic categories. To calculate "weighted" traffic figures, it is necessary to apply a "weighting" coefficient. Determining a differential value added created by various categories of traffic allows obtaining information on the success of the seaport in attracting cargo that generates high value-added, such as container traffic. Similarly, a "weighted" analysis provides positioning of the ports, taking into account their performance in terms of "intrinsic cargo handling tons". The "weighting" of the traffic data allows us to focus on the well-being created in terms of contribution to the gross product of a city, region, or nation, and together with links in terms of employment, production, and government income (Verbeke and Debisschop, 1996)

Haezendonck et al. (2000) argue that conventional rules for "weighing" traffic categories such as the "Bremen Rule" and the "Rotterdam Rule" lack transparency and have limited validity. Therefore, the authors developed a "Range Rule"[6] that allows appropriate use of the value-added concept in comparative traffic studies that include all ports in Europe. Since the rule reflects the differences in the value added between the different categories of traffic in European ports, in this multiple case study it is not possible to apply the same rule, considering this to be one of the main limitations. Consequently, the full implementation of the SPA together with the results to be

[6] The "Range Rule" reflects that the value of 1 ton of conventional cargo equals that of approximately 1 ton of ro-ro, 3 tons of containers, 5 tons of dry bulk, and 12 tons of liquid bulk (Haezendonck, Verbeke and Coeck, 2006).

obtained will only be represented in the **“unweighted”** values of the four predetermined traffic categories (i.e. annual port statistics represent in metric tons).

3.3 Comments on the Chosen Methodologies

The implementation of the SPA tool for the study of the port of Manzanillo vis-à-vis its port competitors in the container segment will allow the author to obtain a conceptual understanding of the dynamics of international port competition, based on the information available. Therefore, applying the three methods together (i.e., PPA, SSA, and PDA) will indicate the overall strategic position of the port range in conjunction with the range of traffic categories (i.e. Manzanillo’s competitive position in the container traffic). Likewise, it will allow the formulation of hypotheses and planning strategies for the effective development of the port.

On the other hand, the author identified the SPA as the ideal model to carry out this multiple case study, due to the easy secondary data collection required. This means that the data to be used concern the total traffic of four categories of traffic (i.e. containers, general cargo, dry bulk, and liquid bulk) within the observation period of eleven years (2007 – 2019). It is worth mentioning that for reasons of information limitation of certain ports, the total traffic will not be divided into exports and imports but will only analyze the total metric tons per year. Following this, the SPA model allows the graphical representation of the results, resulting in a more complete analysis of the competitive position of Manzanillo and the rest of the ports. The results of SPA are illustrated in **Chapter 5, section 5.2.**

After a comparative analysis of the results regards the market share structures, growth rate, and portfolio diversification of the ports of Manzanillo, Lázaro Cárdenas, Los Angeles, and Long Beach within the container industry, it is essential to identify the elements that affect or benefit the competitiveness of the port of Manzanillo. To carry out this qualitative analysis, the author chose to apply Porter’s diamond model in two levels, in the first instance, the model will be executed at the national level to analyze the competitiveness of the two Mexican ports, i.e. the port of Manzanillo (Colima) and the port of Lázaro Cárdenas (Michoacán), followed by the application at a regional level, to identify the competitive elements of California, and determine the competitive advantages of the ports of Los Angeles and Long Beach.

The performance of Porter’s diamond model at two different levels will allow the researcher to have a broader vision and understanding of the factors that increase or decrease the competitiveness of the port of Manzanillo compared to its container port competitors. Thus, allowing recommendations on what should be done to increase Manzanillo's international competitiveness in the container industry. In other words, in order for Manzanillo to be recognized as the leading container handling port in the American continent, it is essential to determine the current strategic position, identify elements of competitiveness, and plan strategies to increase the competitiveness and competitive position of the port.

3.4 Porter's Diamond Model

Michael E. Porter (1990) introduced in his book "Competitive Advantage of Nations", a model that examines why some states are more competitive and why some industries within states are more competitive than others (Bakan and Doğan, 2012). Porter (1990) mentions that productivity is the main factor for international competitiveness and that the standard of living of a country's population can be improved as a direct result of an increase in this factor. The productivity consists of increasing workers' skills, developing technologies, producing quality products, and reducing costs. At the national level, productivity can increase when the industries in a particular country are "upgrade" to improve efficiency (Porter, 1998, p.5 – 7).

To establish theoretical foundations about the competitive advantages of an industry in a particular country, Porter (1990) developed the diamond model, which consists of four national determinants of competitive advantage in a particular industry: factor conditions, demand conditions, related and supporting industries, and firm's strategy, structure, and rivalry. In theory, Porter (1998) establishes that these four sources of competitive advantage can produce fertile soil to build an internationally competitive industry in a country. However, certain industries, in a particular country, present strong diamonds, while other weaker diamonds. In addition to these four determinants, two other indirect variables were added to the model; the chance and the government (Porter, 1998, p.122 – 130), see **Figure 3.4.**

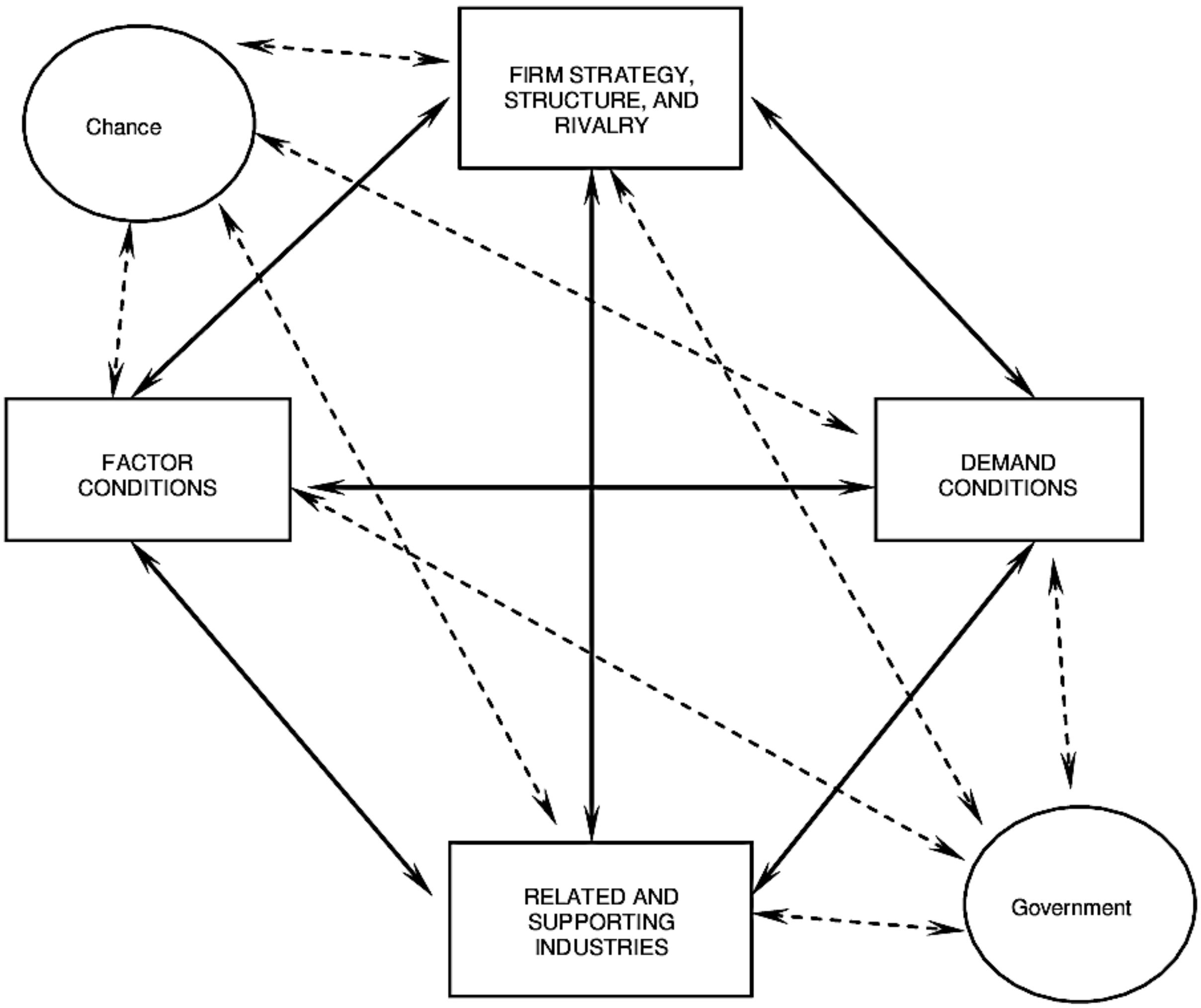

Figure 3.4 Porter's Diamond Model

Source: Porter, 1998, p.127.

3.4.1 Factor Conditions

Factor conditions are the production and infrastructure factors necessary to compete in a particular industry. The values of this determinant include labour skills and natural resources that in the early stages of development can provide a competitive advantage. Porter (1998) proposes to divide the factors into five large categories, i.e. human resources, physical resources, knowledge resources, capital resources, and infrastructure (Russell and Stalker, 2003), see **Table 3.1.**

Furthermore, Porter (1998) notices that three distinctions can also be made between factors. The first distinction is to divide the factors into basic or advanced factors, where the basic factors are natural resources, abundance of cheap labor, and geographic location, while advanced factors are skilled workers, high-tech infrastructure, and research and development in institutions. The second distinction is between generalized and specialized factors. And the third distinction is whether the factors are inherited (e.g. geographic location or natural resources) or provided by the nation. In spite that, Porter (1998) argues that advanced, specialized, and created factors provide more sustainable advantages than basic, generalized, or inherited factors, which are necessary to achieve sophisticated forms of competitive advantage. On the contrary, advanced and specialized factors are considered a more decisive and sustainable basis for competitive advantage (Bakan and Doğan, 2012).

Table 1 Factor Conditions of Porter's (1990) Diamond Model

Factor Conditions	Description
Human resources	Quality, cost and skill of the staff.
Physical resources	The abundance, quality, accessibility, and cost of physical resources, such as land, timber, water, mineral deposits, hydroelectric energy sources.
Knowledge resources	Scientific, technical and market knowledge that affects the quantity and quality of goods and services.
Capital resources	The amount, cost, and capital resources that are available to the financial industry.
Infrastructure	The type, quality, and cost of the infrastructure, such as communication systems, transportation systems, the health system, and other factors that directly affect the quality of life in the country.

Source: Created by the author on the basis of Porter (1998), in (Russell and Stalker, 2003).

3.4.2 Demand Conditions

Demand conditions is one of the most important dimensions to understand, since it is related to the nature of consumers in the domestic market. This determinant represents pressures based on buyers' requirements in terms of quality, price, and services in that particular industry, affecting in some sense the formation of some factor conditions. As a consequence, they have an effect on the pace and direction of product innovation and development (Bakan and Doğan, 2012). On the other hand, the demand conditions include the composition of the demand in the local market, as defined by the sophistication of the buyers, the existing market niches and a higher level of needs in the local market compared to the buyers in other markets (Russell and Stalker, 2003).

3.4.3 Related and Supporting Industries

Related and supporting industries are networks of suppliers and distributors that cooperate with the industry to support it in international competition. In most cases, these networks already compete internationally. Porter (1998) states that relationships between these clusters of industries are crucial to the success of a given sector within a nation, as they operate learning, innovation, and competitiveness. Therefore, it is difficult to compete if the industry does not have access to networks that reduce costs through efficient supply chain management and produce high-quality raw materials and components. Vertical integration is an alternative that creates high quality, while horizontal integration creates highly competitive companies (Bakan and Doğan, 2012).

3.4.4 Firm's strategy, structure, and rivalry

The firm's strategy, structure, and rivalry have effects on the competitiveness of the national sector. Despite that, the fact that a sector is extremely competitive at the national level will affect the productivity increase required to compete internationally. Porter (1998) suggests that internal competition and the pursuit of competitive advantage within a region can help provide organizations with a stronger foundation for achieving such an advantage on a more global scale. In global competition, the rivalry is very important if successful companies compete vigorously at home and limit each other to development and innovation (Bakan and Doğan, 2012).

3.4.5 The role of Government

The role of government, policies, and regulations at all levels of government can benefit or affect the competition of a country and an industry. In other words, a government dedicated to reducing bureaucracy and facilitating the process of opening a new business will foster an entrepreneurial spirit. Instead, a protectionist government will protect its national industry from foreign competition, applying taxes or any other type of restriction (Bakan and Doğan, 2012).

3.4.6 The role of Chance

Porter (1998) considers chance events as matters that have little to do with situations in the nation. For this reason, it is argued that chance events can affect or benefit the competitive position of a country or industry, however, they are events that are beyond the control of governments or managers within industries (Bakan and Doğan, 2012). For example, new inventions, changes in the policy of a foreign government, wars, a significant shift in world financial markets or exchange rates, discontinuities in input costs such as oil shocks, sudden increases in the world or regional demand, or technological advances (Russell and Stalker, 2003).

3.4.7 Limitations of Porter's diamond model

Porter's original framework focuses exclusively on the variables that determine national or regional competitiveness, while Dunning (1997) empirically demonstrates that other nations can also play an important role in the competitiveness of a company or industry. Grant (1991) has suggested that substantial ambiguity remains regarding the signs of the relationships among the determinants and the predictive power if the "diamond" framework (Haezendonck et al., 2000).

Since Porter did not consider the nature of international and multinational activities (Rugman and D'Cruz, 1993 and Cartwright, 1993), Porter's original diamond model has been extended to a double diamond model (Rugman and D'Cruz, 1993, and Dunning 1996) whereby multinational activity is formally incorporated into the model. The "double diamond" model requires managers and policy makers in a specific industry to design their own national and foreign "diamonds" to be globally competitive (Moon, Rugman, and Verbeke, 1998).

In the same context, ports and port operators in small open economies target markets in a national and global context. It is also related to privileged linkages with foreign locations, whereby these foreign locations "strengths" are leveraged to improve the port's competitiveness. Likewise, international shipping companies and other global users may also play a fundamental role in improving the port's competitiveness (Haezendonck et al., 2000). Yim Yap and Lam (2004) present the extension of the single diamond model for the port industry, see **Figure 3.5,** where the inter-container port demand relationships can be quantified, measures, and analyzed in a holistic manner, similarly, the framework also analyzes the inter-port relationships from the perspective of other key actors in the value-driven chain system and modified accordingly to incorporate various indicators that are considered relevant to these parties (Yim Yap and Lam, 2004).

In this multiple case study, in order to analyze and understand the main factors that increase or decrease the competitiveness of the port of Manzanillo vis-à-vis its container port competitors, the single Porter's diamond model with the extension to the port industry proposed by Yim Yap and Lam (2004) **see Figure 3.5**, will be applied at the national level for the two Mexican ports (i.e. ports of Manzanillo and Lázaro Cárdenas) and at the regional level for the two American ports located in California, US (i.e. ports of Los Angeles and Long Beach).

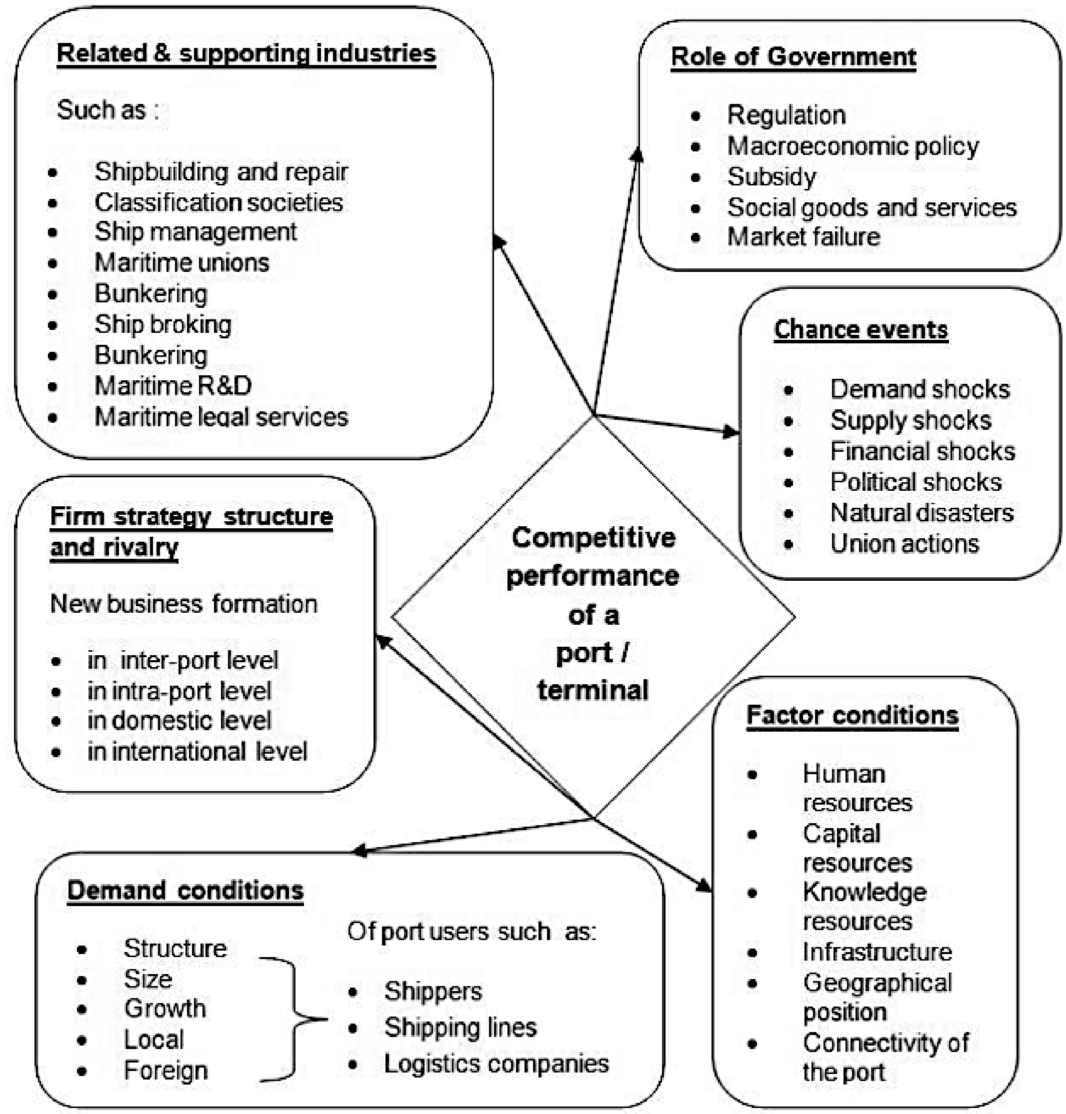

Figure 3.5 Porter's Diamond Model extended for the Port Industry

Source: Yim Yap and Lam, 2004.

3.5 Conclusions of the Chapter

In this chapter, a theoretical review of the chosen methodologies to be applied to analyze the port competition and competitiveness was presented. Followed by the justifications of what motivated the researcher to select the SPA and Porter's diamond model for the study of the strategic position and the competitiveness of the port of Manzanillo vis-à-vis its competitors within the container segment.

The next chapter is considered one of the most important and interesting of this thesis since it presents the primary and secondary sources of data collection necessary for the effective application of the SPA technique and Porter's diamond model, as well as the description of certain problems faced during data collection.

Additionally, a deep description of the multiple cases to be studied will be presented, exposing relevant information about the ports of Manzanillo, Lázaro Cárdenas, Los Angeles, and Long Beach, along with an analysis of their commercial growth in the eleven-year period of observation. Likewise, the most relevant geographical and commercial characteristics of the four container ports will be presented.

4 Multiple-Case Analysis

4.1 Introduction

Thomas (2011) states that a case study can be defined as an analysis of systems that are studied with an integral vision by one or more methods. This means that the case study method is not intended to analyze cases, but rather is a tool that helps define cases and explore their environment (Cousin, 2005). Similarly, Creswell (2012) argues that *“the case study method explores a real-life, contemporary bounded system (one case) or multiple bounded systems (cases) over time, through detailed and in-depth data collection that it involves multiple sources of information.”* (Creswell, 2012, p.97).

Researchers have to consider whether it is prudent to do a single or a multiple case study, all under the interpretation of the phenomenon and the context of the research (Yin, 2003). When a study involves more than one case, a multiple case study is essential in order to understand the differences and similarities between the cases (Baxter and Jack, 2008). Typically, multiple case studies were used to predict contrasting results for expected reasons or to predict similar results in the studies (Yin, 2003). Thereby, the author can clarify whether the findings are valuable or not (Eisenhardt, 1991). When the case studies are compared with each other, the researcher will provide the literature with an important influence of the contrasts and similarities found (Vannoni, 2014). Another advantage of multiple case study is that they create a more compelling theory when the suggestions are based on various empirical evidence. As a result, multiple cases allow for a broader exploration of research questions and theoretical evolution (Eisenhardt and Graebner, 2007).

Dyer and Wilkins (1991) say that the researcher’s ability to understand and describe the context of the cases is a challenging task, in such a way that the reader can interpret and produce theory in relation to the context described. One of the fundamental processes of the writer is to identify the study audience and compare it to previously conducted reliable studies. Once this is done, the writer must decide whether to do a single or a multiple case study (Gustafsson, 2017).

In this thesis, the author decided to do a multiple case study to comprehend the similarities and differences between the ports of Manzanillo, Lázaro Cárdenas, Los Angeles and Long Beach, in the context of the container industry. Therefore, the evidence generated from the multiple case study will be solid and reliable, allowing the author to demonstrate whether or not the results are valuable to the Port Authority of Manzanillo and the rest of the port users. Furthermore, the writer firmly believes that the suggestions to be proposed will be based on different empirical evidence, creating a more convincing theory.

In this manner, the aim of this chapter is to present the most relevant geographical, commercial, and general characteristics of the four container ports (i.e. multiple cases) to be studied, namely the ports of Manzanillo, Lázaro Cárdenas, Los Angeles, and Long Beach. Consequently, the competitive advantages of the port of Manzanillo in the container industry compared to its competitors will be identified. It is important to point out that the port range has been defined according to the primary data collection, the homogeneity of the markets, the similar territorial range, and the similarity in the traffic structure, as it was stated in **section 1.5.**

4.2 Data Collection

As described in **section 1.5**, to ensure the credibility of this study, it was significant to apply the triangulation method of research data sources, thus, the data sources consulted by the author correspond mainly to the interviews, scientific literature, journal articles, books, annual reports, port statistics, and port master plans. The primary and secondary data collected throughout the research were used in different ways but with the same purpose, to obtain reliable results that allow an adequate answer to the research question and sub-questions.

For an effective application of the SPA, the author must first properly identify the competitors of the port of Manzanillo within the container industry. To accomplish this step, as mentioned in **section 1.5,** the researcher conducted three interviews with API Manzanillo employees (i.e. primary data), which confirmed that the ports of Lázaro Cárdenas, Los Angeles, and Long Beach are considered to be Manzanillo’s main competitors in the context of containerized cargo. What justifies the competition between these ports, prevails merely in their installed capacity, their strong network of suppliers, influence on internal demand, and the rivalry for the traffic of greater volumes of containers from Southeast Asia, mainly China, South Korea, and Japan. Likewise, these four ports have certain characteristics in common, such as their geographic location in the Pacific Rim, their commercial partners, their long-term vision, their capacity for container traffic and their public availability of information.

After determining the range of ports to be analyzed in the SPA tool, in Porter’s diamond model, and in the multiple case study, it is important to proceed with secondary data collection. The secondary data required for the SPA correspond to the total traffic flows of the four seaports, where four different traffic categories are distinguished, i.e. containers, general cargo, dry bulk, and liquid bulk. The values of port statistics must be measured in metric tons during a period of eleven years (2007 – 2019). Similarly, for a better analysis, three consecutive periods must be distinguished (i.e. 2007 – 2011, 2011 – 2015, and 2015 – 2019).

As Haezendonck, Verbeke, and Coeck (2006) mention, to effectively apply the three analytical instruments (i.e. PPA, SSA, and PDA) it is important to collect reliable and accurate traffic figures, such as port statistics, however, sometimes these data is not entirely reliable, due to the differences in the definitions adopted by the different ports. In this research, the author faced these small limitations in relation to the units of measurement used by American ports and the different traffic categories established by Mexican ports. These data imperfections are described in more depth in the following **section 4.3**. Fortunately, none of these limitations is critical, since the study focuses mainly on the relative position of seaports and their evolution during the eleven years of observation (Haezendonck, Verbeke and Coeck, 2006).

Followed by collecting port statistical data, it is necessary to proceed to study and understand the current situation in which ports are found, i.e. to collect relevant information for the effective use of Porter's diamond model. Hereby, the following sections will present and analyze primary and secondary data obtained mainly from interviews, port master plans, and government reports. Consequently, relevant information in relation to developments, projections, strategies, and problems of seaports will be obtained. The intention of doing a study of multiple cases is to identify the advantages and disadvantages of each port, so the author firmly believes that it is essential information for the correct design of Porter diamonds at the national and regional levels.

4.3 Data Collection Issues

The data regarding the total volumes of port traffic can be published in different units of measurement, such as metric ton, freight ton, or revenue ton. However, each unit of measure is different from each one, so it is not possible to convert it into a single standardized unit. Likewise, on some occasions, ports only publish their statistics of annual container throughput measured in units equivalent to twenty feet (TEU), a standardized measure of the maritime industry that is used when counting cargo containers of different lengths (Port of Los Angeles, 2020b). Therefore, in order to convert the statistical data from TEU to metric tons, the European Commission in the Shipping MRV Regulation determined a standardized conversion factor, where a unit of TEU is equivalent to 12 metric tons, while an empty TEU is equal to 2 metric tons (European Commission, 2017).

Taking into account the above, it is important to note that for the efficient implementation of the SPA model, the port statistics of the four ports together with their four selected traffic categories (i.e. containers, general cargo, dry bulk, and liquid bulk) must be measured in metric tons, if the data is not represented in this unit of measure, the reliability of the results will be affected. If for any reason, some of the ports selected in this study only provide annual container statistics measured in TEU, it will be necessary to apply the conversion factor established by the European Commission.

In the case of Mexican ports, the official websites of API Manzanillo and API Lázaro Cárdenas have published their historical statistical data measured in metric tons, however, their annual statistics are classified into five categories of traffic (i.e. containers, general cargo, mineral bulk, agricultural bulk, and crude oil and derivatives). Because the author only determined four categories of traffic in the SPA, the categories of mineral bulk and agricultural bulk were integrated into one, i.e. dry bulk represents the sum of those two categories, while crude oil and its derivatives are represented in the category of liquid bulk. On the other hand, the port authority of both ports has published the annual container statistics in two units of measurements, i.e. TEU and metric tons. Given the above, the data in metric tons were used only in the SPA model, while the values in TEU were used to analyze the evolution of Manzanillo vis-à-vis its competitors (i.e. the graphs illustrated in Chapter 4 correspond to these data).

While the author was analyzing and comparing the annual statistics of containers in TEU and metric tons of the Mexican ports, she observed a peculiar characteristic that contradicts the conversion factor determined by the European Commission. For the port of Manzanillo, when dividing the total volume of containers in metric tons by the total volume in TEUs per year during the eleven years of observation, it was identified that on average each container weighs 7.70 metric tons, while for the port of Lázaro Cárdenas by doing the same calculation, it was identified that on average each container weighs 7.35 metric tons. Based on the information presented in the Master plans[7] of both ports, it is believed that one of the main reasons for this low weight per container is due to the fact that approximately 40% of the total containers handled in Manzanillo

7 Port Master Development Program (PMDP).

and Lázaro Cárdenas correspond to transshipments, therefore, on some occasions certain containers are empty, causing an imbalance in terms of weight in metric tons.

In a different way, during the collection of traffic flow data of the US ports, i.e. Los Angeles and Long Beach, the author identified a different problem. The researcher observed that both ports do not publish annual port statistics measured in metric tons, on the contrary, their statistical data is only represented in TEU and metric tons of revenue (MRT). However, a ton of revenue (RT) is a measure that is used for billing purposes, so the MRT measure represents a combination of metric tons, cubic meters, and port revenue (Port of Los Angeles, 2019a), which it is not compatible or comparable with the metric tonnage figures for the ports of Manzanillo and Lázaro Cárdenas. Given the above, the author contacted the statistical departments of the ports of Los Angeles and Long Beach by email in order to request support and an explanation of the situation.

Theresa Adams López, Director of Community Relations of the port of Los Angeles, explained to the researcher that neither of the two US ports has a standard conversion factor to convert TEU to metric tons, in the same way, she established that the ports do not receive information directly from terminals or shipping lines on the content or actual weights of the cargo, but the United States Customs is the authority responsible for that information. For more details on port statistics for Los Angeles and Long Beach, Adams López recommended to the researcher consult the official website of the United States Census Bureau, the official source for trade statistics. Taking into consideration the above, the port statistics of Los Angeles and Long Beach used in the SPA correspond to this new source of information. Fortunately, the United States Census Bureau does publish statistics measured in metric tons for all four categories of traffic, so it was not necessary to use the European Commission conversion factor.

Similarly, while the author analyzed and compared the annual container statistics in TEU and metric tons of the ports of Los Angeles and Long Beach, she observed the same characteristic of the Mexican ports that contradicts the conversion factor determined by the European Commission. As previously explained, the total volume of containers in metric tons was divided by the total volume in TEUs per year during the eleven years of observation, in this way it was identified that for the port of Los Angeles, on average each container weighs 5.90 metric tons, while for the port of Long Beach each container weighs 3.11 metric tons. This surprised and caught the author's attention, so she decided to contact Theresa Adams López again. The Director of Community Relations confirmed that on average a container in Los Angeles carries 5.8 metric tons of cargo, while Long Beach 4 metric tons. This is due to two reasons, most of the containers exported by ports contain agricultural products, while container imports correspond to empty containers shipped from Asia. As a result, imports have a greater effect on the general average weight of containers of the two American ports, which drastically unbalances the statistical reports, since these ports register high volumes of TEU handled per year, but most of the time these are empty, so in terms of weight it appears to be less volume.

4.4 Overview of the Mexican Port System

The International Transport Forum states that almost 90% of the merchandise commercialized in the world is transported by sea, which facilitates trade and reduces logistics costs for many of the users involved. Through constant development and modernization, the seaports have scaled-down certain processes, making the supply chain more efficient (DICEX Integral Trade, 2019b). Surprisingly, despite the size of the territory, geographic location, and economy, Mexico generates a small volume percentage of cargo transported by sea. Overland transportation is the number one modality for this country, due to the strong commercial relationship with the United States and its geographic proximity. Nonetheless, experts consider that Mexico's port system has a promising future and potential growth, moreover, it is argued that with capital investments in modernization and expansion, certain ports of the country would have a significant economical increment (Netherlands Enterprise Agency, 2019).

Mexico has 102 functional ports and 15 terminals outside the port along its 11,500 km of coastline, allowing the country to connect with more than 145 countries. The seaports of Lázaro Cárdenas, Manzanillo, Ensenada, and Salina Cruz are the four main ports located on the western Pacific coast. While, on the east coast facing the Gulf of Mexico are the ports of Veracruz, Altamira, Coatzacoalcos, and Dos Bocas, see **Figure 4.1.** Despite that, Lázaro Cárdenas and Veracruz are considered the two largest ports in the country in terms of territorial size (Netherlands Business Agency, 2019).

In the last 10 years, Manzanillo has become the most dynamic port in the Pacific Coast of Mexico and leader in the movement of containerized cargo in the Mexican port system. Nowadays, the port of Manzanillo has containerized cargo handling as its strength, while Lázaro Cárdenas focuses more on handling bulk minerals, however, this does not mean that over time this cannot change. Furthermore, the competitive advantages that reinforce the port of Manzanillo are its specialized terminals, safe social climate, favorable geographical position, and hinterland connectivity. The port of Manzanillo is also recognized for its positive impact on the tourism sector, nevertheless, its port authority and port community have the mission of increasing international trade, generating jobs, and creating of new business opportunities for its citizens (Ochoa Júarez, 2020).

Figure 4.1 Map of the Mexican Port System

Source: SEMAR, 2017.

4.5 Port of Manzanillo

4.5.1 Geographic location of the Port of Manzanillo

The port of Manzanillo is located on the coast of the Pacific Ocean of Mexico in the state of Colima, approximately 350 km north of the Port of Lázaro Cárdenas, as illustrated in **Figure 4.2.** After the ports of Lázaro Cárdenas and Veracruz, Manzanillo is the third most important Mexican port (Netherlands Business Agency, 2019). For Mexico, the port of Manzanillo is the main entrance for container transport, representing 63.2% of the containerized cargo on the Pacific coast and 43.2% throughout the national territory (API Manzanillo, 2014b).

Manzanillo has managed to position itself as the number one player for the management of international goods, serving the Central and Bajío regions (west) of the country, the port represents 67% of the national GDP and 55% of the total population (API Manzanillo, 2014b). On the other hand, the port of Manzanillo has stood out for the diversity of the products handled on the port area, as well as for the value of the cargoes transported (Martner Peyrelongue and Ruiz Gámez, 1998).

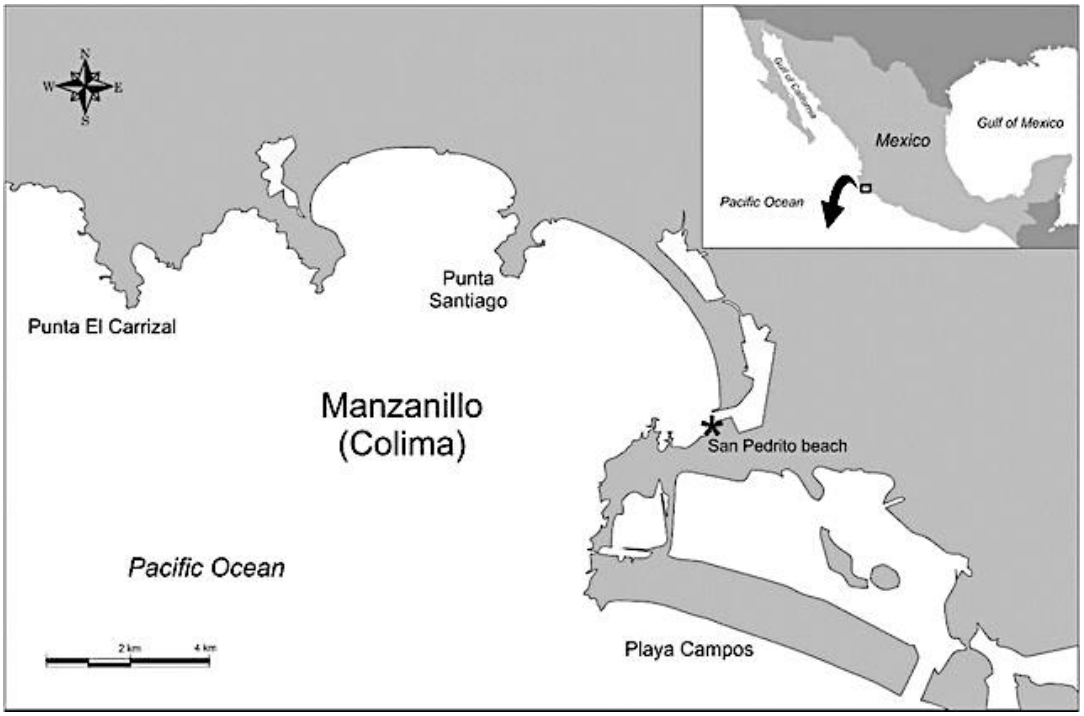

Figure 4.2 Geographic Location of the Port of Manzanillo

Source: Galván-Villa and Rios-Jara, 2018.

4.5.2 Port Authority of Manzanillo (API Manzanillo)

The commercial opening of Mexico and its maritime-port sector benefited after the restructuring according to the Ports Act of 1993. This regulation redefined the role of the Mexican Government in port activities, for which reason the law established that the role of Federal Government will have to be exclusively normative and supervisory, allowing to the private and/or social capital for the port administration, the construction of terminals, and the port operations (Martner Peyrelongue and Ruiz Gámez, 1998). Consequently, as part of the National Development Plan (1989 – 1994), in 1993 the 21[8] Integrated Port Administrations (API) were created with the aim of

[8] At present, the General Direction of Port and Administration Development of the General Ports Liaison and Mercantile Marine coordinates the national port system through 16 Federal APIs: Ensenada, Guaymas,

assuming responsibility for the administration of Mexico's port facilities. Since the introduction of APIs, Mexican maritime ports have become self-sufficient, maintaining in each of the ports its generated revenues and resources (API Manzanillo, 2014a).

API Manzanillo[9] is the Port Authority of Manzanillo, an entity of the Federal Government of Mexico created in December 1993 and began operating in February 1994, its main functions are management, promotion, planning, programming, construction, developing, and maintenance of port infrastructure and operations (API Manzanillo, 2014a). Further, in 1995 API Manzanillo began to privatize its terminals, facilities, and services, transferring the rights to private investors. Today, the port of Manzanillo is operated by private companies, directly benefiting all its clients and creating an atmosphere of healthy competition between the port users (API Manzanillo, 2014a). Among other functions, API Manzanillo is also responsible for the general management of port facilities, such as internal roads, customs, equipment, docks, and disposal areas for port users (Inter-American Development Bank, 2015).

Additionally, API Manzanillo's sources of revenue come mainly from port services such as, berthing, docking and mooring, loading and unloading, storage, and other services. Likewise, API Manzanillo has been dedicated to stimulating industrial investment, consolidating services, and generating commercial opportunities, similarly, it has continuously worked to attract foreign investors and companies for port development and infrastructure (Netherlands Enterprise Agency, 2019).

4.5.3 Traffic Cargo Flow

The port of Manzanillo handles a wide variety of goods; nonetheless, general cargo and agricultural products are the most imported by this port. The general cargo handled in the port consists mainly of products such as paraffin, fertilizers, plywood, steel products, paper rolls, auto parts, spare parts, vehicles, and livestock. Similarly, bulk agricultural cargo constitutes a significant portion of goods such as canola, wheat, turnip seeds, oats, and sorghum (API Manzanillo, 2020a).

Differently, most of the port's exports are containerized cargo and mineral products such as cement, mineral fertilizers, urea, zinc concentrate, sulfur, iron granules, gypsum, and potassium

Topolobampo, Mazatlán, Puerto Vallarta, Manzanillo, Lázaro Cárdenas, Salina Cruz , Puerto Madero, Altamira, Tampico, Tuxpan, Veracruz, Coatzacoalcos, Dos Bocas, and Progreso.

[9] Administración Portuaria Integral de Manzanillo, S.A. de C.V.

nitrate. Furthermore, products such as milk powder, perishable products, clothing and footwear, chemicals, household appliances, electronic products, auto parts, spare parts, and tequila are transported as containerized cargo (API Manzanillo, 2020a).

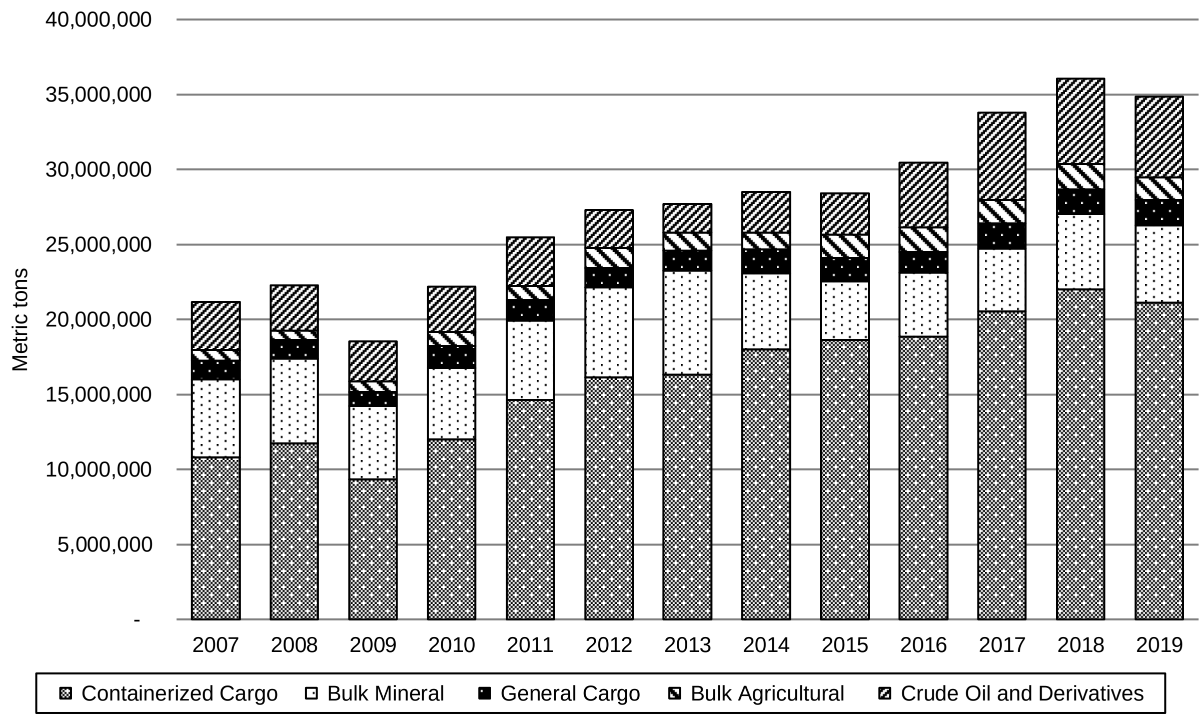

Figure 4.3 Total Throughput by Commodity (2007 – 2019) of the Port of Manzanillo

Source: Created by the author based on API Manzanillo port statistics, 2020.

4.5.4 Hinterland

The potential of the port of Manzanillo is due to its privileged geographical location on the Mexican coast of the Pacific Ocean and the excellent conditions of the roads and railways connect it with the Central states and the Bajío regions of the country. By having these advantages, the dynamism of the economy of its area of influence has been fostered and has generated a constant flow of goods from national and international trade (API Manzanillo, 2014b).

The hinterland of the port of Manzanillo comprises an area of influence integrated by 17 states of the Mexican Republic, i.e. Colima, Aguascalientes, Coahuila, Federal District, Durango, State of Mexico, Guanajuato, Hidalgo, Jalisco, Michoacán, Morelos, Nayarit, Nuevo León, Querétaro, San Luis Potosí, Tamaulipas, and Zacatecas, as shown in **Figure 4.4**, which has positioned it as the main entrance for containerized cargo in Mexico. Similarly, the Mexican states that make up the internal zone of influence are characterized by being economically dynamic and with high long-term growth prospects, representing 42.1% of Mexico's gross domestic product (API Manzanillo, 2014b).

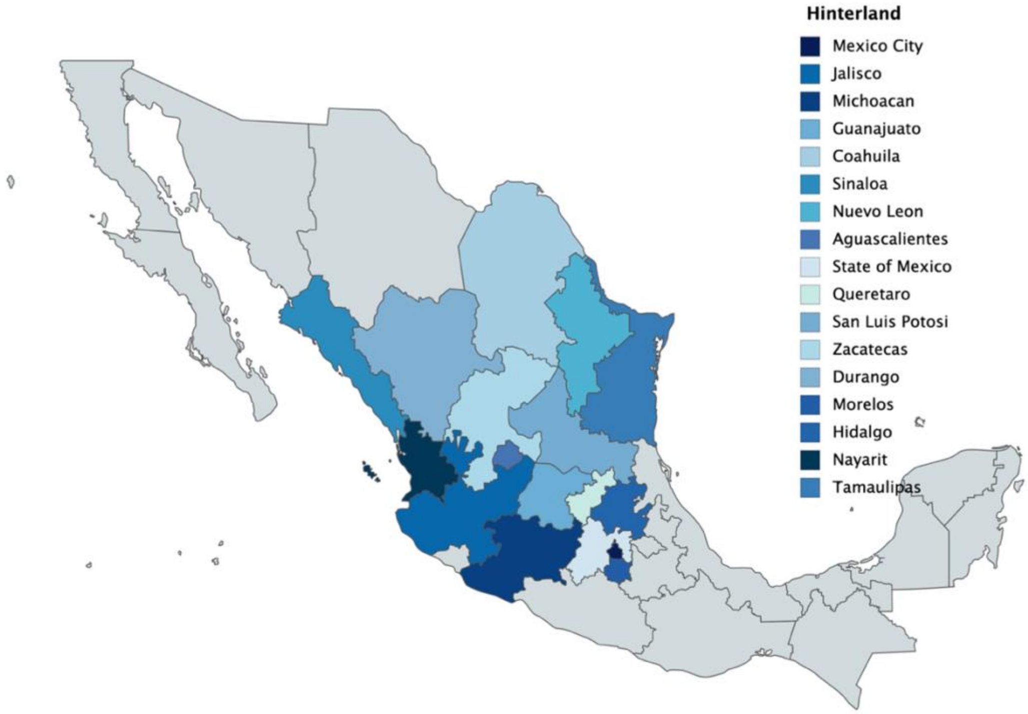

Figure 4.4 Hinterland of the Port of Manzanillo

Source: Created by the author based on API Manzanillo data, 2020.

4.5.5 Foreland

The port's international area of influence is mainly oriented towards the west coast of the American continent and the Pacific coast, with an international exchange of goods to the main countries such as the United States, Canada, Panama, Ecuador, Costa Rica, Guatemala, El Salvador, Nicaragua, Colombia, Chile, Peru, Japan, China, South Korea, Taiwan, India, Indonesia, Malaysia, Singapore, Vietnam, Myanmar, Cambodia, Sri Lanka, Pakistan, the Philippines, South Africa, Russia, Australia, and New Zealand (API Manzanillo, 2015), as illustrated in **Figure 4.5.**

Likewise, the transshipment of containers in the port of Manzanillo is highly relevant, which has made it a hub port for the distribution of containers from Asia, destined for the countries of Central and South America and the west coast of the United States and Canada, in addition to the repositioning of empty containers with destination to Asian countries (API Manzanillo, 2014d).

Figure 4.5 Foreland of the Port of Manzanillo

Source: API Manzanillo, 2019.

4.5.6 Maritime, highway, and railway connectivity

In accordance with Peyrelongue and Ruiz Gámez, the maritime routes determine the importance of the port in two ways. Firstly, it links its connections at the international level, and secondly, it allows the diversification of its links with the rest of the regions of the interior of the country (Martner Peyrelongue and Ruiz Gámez, 1998). The port of Manzanillo stands out for its main maritime trade routes to China, South Korea, Japan, the United States, Guatemala, Colombia, Ecuador, Peru, Panama, and Chile. However, the port has expanded its commercial routes and increased its volume of cargo exchange through the strong commercial relationship with 35 international shipping lines that work formally with specialized terminals (i.e. container terminals) in Manzanillo, shipping companies such as Hamburg Süd, CMA CGM, APL, Maersk Line, MSC, Hapag-Lloyd, COSCO, CSCL, etc. (API Manzanillo, 2015).

Currently, the port of Manzanillo has an excellent internal connection with the rest of the country through roads and railways. Likewise, through the four-lane highway, the port offers the facility of transporting cargo to important productive centers of the country such as Guadalajara, Aguascalientes, Zacatecas, Michoacán, San Luis Potosi, Mexico City, Bajío's main cities, and the center of the country, see **Figure 4.6.** (Martner Peyrelongue and Ruiz Gámez, 1998), consequently, this route represents the key entry/exit node for the seaport, connecting it with the rest of the 16 Mexican states (API Manzanillo, 2014d).

Figure 4.6 Highway Corridors of Mexico and its connection with the Port of Manzanillo

Source: SCT, 2006.

In the case of rail connectivity, the port works with Ferromex[10], the rail company with the largest network in Mexico, covering 80% of the national territory, as illustrated in **Figure 4.7.** Large-scale coverage has allowed the port of Manzanillo to connect with three ports in the Pacific (i.e. Lázaro Cárdenas, Ensenada, and Salina Cruz), three ports in the Gulf of Mexico (i.e. Altamira, Veracruz, and Dos Bocas), and with all rail networks in the United States and Canada (API Manzanillo, 2015). Likewise, for the distribution of merchandise, the port of Manzanillo has 10.775 km of internal roadways and 29.511 km of internal railroad tracks, which allows it to have internal properly and safely transit cargo (API Manzanillo, 2015).

10 Ferrocarril Mexicano S.A. de C.V.

Figure 4.7 Rail Connectivity of the Port of Manzanillo

Source: API Manzanillo, 2019.

4.5.7 Port Infrastructure

The port of Manzanillo has a total area of 437 hectares, including water, docks, and storage areas. Currently, it has 21 berth positions, 16 dedicated for commercial operations, three for hydrocarbons, and two for cruise ships. The port has an official maximum draft of 15 meters and a maximum capacity for ships of up to 9,200 TEUs or 100,000 tons of mineral. Besides, the port infrastructure has a loading and unloading rate capacity of up to 45 containers per hour per crane. Furthermore, nine customs checkpoints modules are established in the San Pedrito area and two in the North area, with a custom average capacity of cargo dispatch of 100 units per hour (API Manzanillo, 2015). On the other hand, the access channel of the port of Manzanillo is 500 meters long and up to 14 meters deep. The north turning basin contains three berthing positions having the capacity to receive vessels of up to 300 meters long with a draft of 16 meters. Likewise, the southern turning basin contains three berthing positions with capacity for boats up to 300 meters long with a draft of 14 meters (Waters, 2020).

4.5.8 Port Terminals and Facilities

Within the 437 hectares of total area, the port of Manzanillo has 14 private specialized terminals and facilities for handling all types of cargo, providing high quality productivity, which has allowed it to compete with other ports on the Pacific Coast of Mexico. As part of the concessions, terminal users are responsible for maintaining their equipment and infrastructure for their day-to-day operations, such as cranes and their office buildings. Similarly, terminals must follow the environmental protocols established in the port's general environmental management plan (Inter-American Development Bank, 2015).

The port of Manzanillo has two specialized container terminals equipped with Super Post Panamax cranes, two multipurpose facilities for handling general and containerized cargo, two terminals specialized in refrigerated and perishable cargo, one terminal specialized in frozen cargo (focused on frozen seafood), one terminal for the handling of minerals bulk with a capacity up to 2,000 tons per hour, a facility for handling steel products, two dedicated terminals for handling and storage of cement bulk and raw materials, two terminals for the handling of agricultural bulk, a terminal focused on the handling and storage of hydrocarbons (crude oil and derivatives), and a terminal for the arrival of cruise ships managed by the Government of Colima and with a capacity to receive two cruise ships up to 300 meters in length (Waters, 2020).

4.5.9 Container Handling Facilities

The port of Manzanillo has a total throughput capacity of 4,350,000 TEUs per year through the performance of the two specialized container terminals operated by SSA Mexico and Contecon Manzanillo (CMSA) (Inter-American Development Bank, 2015). The Specialized Container Terminal I (TEC I) operated by SSA Mexico, is considered the leading terminal in the port and the most equipped and sophisticated in Mexico. It has a yard capacity of 33,000 TEUs, an inspection area with a daily capacity for 365 inspections, 5,500 m² of a warehouse consolidated cargo (LCL), 1,064 connections for refrigerated cargo, and two external courtyards with a capacity of 15,000 TEUs (SSA Mexico, 2020). Its main clients are shipping lines such as; APL, CMA CGM, COSCO, Evergreen, Hamburg Sud, Hapag Lloyd, Maersk, MSC, ONE, PIL, and OOCL (SSA Mexico, 2020).

On the other hand, the second Specialized Container Terminal II (TEC II) operated by Contecon Manzanillo has a loading and unloading capacity of three container ships simultaneously with a maximum productivity of 120 containers per hour per vessel. It also has a capacity of 650,000 TEUs, along with a dedicated space for temperature-controlled, hazardous and general cargo and empty containers (Contecon Manzanillo, 2020).

4.5.10 Port Master Development Program (PMDP) 2015 – 2020

The port development plans that are proposed to be carried out in the port of Manzanillo must be reviewed by API Manzanillo which is responsible for managing and reporting all the Master plans to the SCT[11], the only federal entity with the power to analyze and approve the development plans proposed, the process has a duration of up to five years. Moreover, the SCT is in charge of the Mexican Port System through the General Coordination of Ports and Merchant Marine (CGPyMM), the entity responsible for the port policy and promotion of Mexican ports in terms of world trade (Netherlands Enterprise Agency, 2019).

Nowadays, the Port Master Development Program[12] (PMDP) 2015 – 2020, aims to define the strategic planning of the port of Manzanillo with a 20-year vision and to establish actions to be carried out in a five-year execution period (API Manzanillo, 2014d). According to the PMDP, Manzanillo's natural vocation is to be a commercial port, with high competitiveness in handling containerized cargo, due to its installed capacity and the specialization it has developed (API Manzanillo, 2014d).

Correspondingly, the PMDP 2015 – 2020 states as a **Vision**: *"To be the **leading Latin American container port in the Pacific Ocean,** with world-class and sustainable infrastructure and operations, linking from Mexico the productive multimodal logistics chain between **America** and **Asia.**"* (API Manzanillo, 2014d).

4.5.11 Statistics of the Port of Manzanillo

The annual reports of API Manzanillo indicate that in the last decade the port of Manzanillo has undergone great transformations and economic growth, immersing itself in the process of development of the industrialized world and the great demand of the maritime sector. Innovation

11 Secretariat of Communications and Transport.
12 Programa Maestro de Desarrollo Portuario 2015 – 2020.

and technology have generated a continuous increase in the size of container ships, causing an increment in the global exchange of goods through containers (API Manzanillo, 2015).

- **Worldwide Standing**

As reported by Lloyd's List Intelligence, in 2018 the port of Manzanillo presented an annual container throughput of 3,078,513 TEUs, increasing 8.8% compared to 2017 (2,830,370 TEUs), and positioning it in 2019 in the 56th place in the global ranking, therefore that the port of Incheon occupied the 55th place and the port of Said in the 57th rank. Similarly, the port of Manzanillo has shown positive behaviors, rising its international position in the last ten years (Lloyd's List, 2019).

- **Latin America (LATAM) Standing**

According to the Economic Commission for Latin America and the Caribbean, in 2018 the port of Manzanillo increased its position to third place in terms of annual container throughput with an increase of 11% compared to 2017. Manzanillo's position is below the port of Colón, Panama who held the first place and the port of Santos, Brazil in second place. Additionally, in 2017, total Latin America and the Caribbean container throughput represented 6.6% of the global throughput (ECLAC, 2019).

However, if it is analyzed the competitive position of the port of Manzanillo vis-à-vis all the ports of the American continent located on the Pacific Rim, it can be observed that American ports such as Los Angeles and Long Beach hold the first positions in terms annual container throughput (Ochoa Júarez, 2020).

- **National Standing**

In terms of territorial size, economic impact, and annual container throughput the five top container ports in Mexico are port of Ensenada, Manzanillo, Lázaro Cárdenas, Altamira, and Veracruz, three located on the western Pacific coast and two on the Gulf of Mexico (SCT, 2017). As informed in the annual report of the SCT, the port of Manzanillo is positioned in the number one range in terms of annual container throughput compared to the other four ports, as illustrated in **Figure 4.8.**

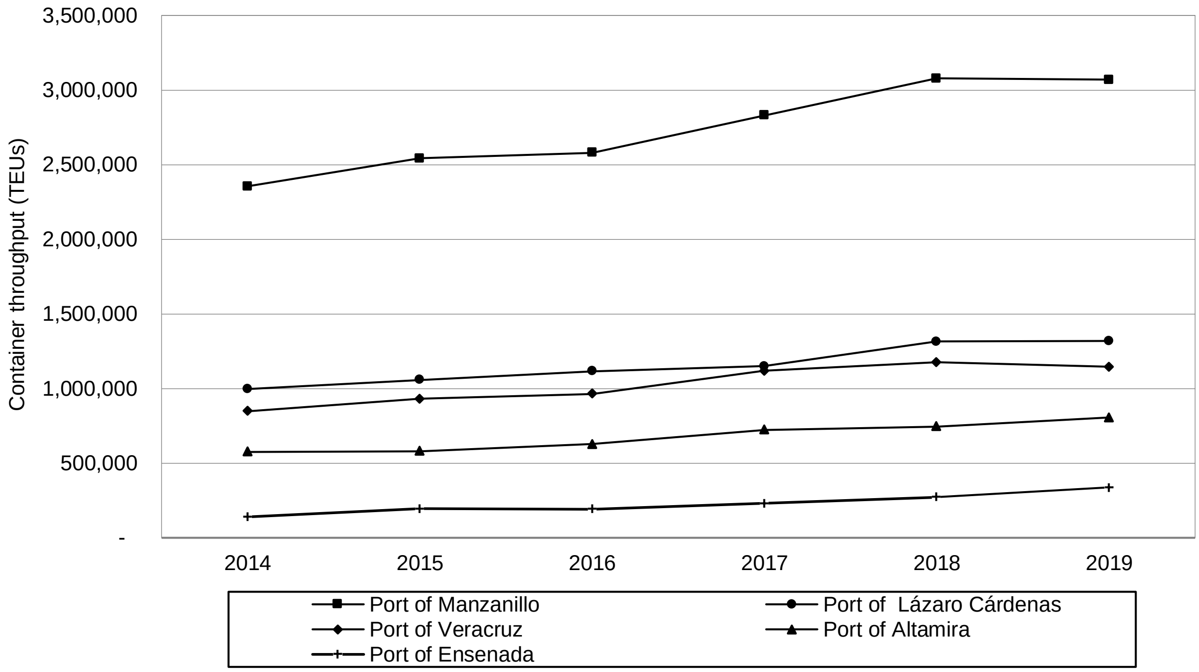

Figure 4.8 Annual Container Throughput (TEUs) per Mexican Port

Source: Created by the author based on API Manzanillo, API Lázaro Cárdenas, API Veracruz, API Altamira, and API Ensenada data, 2020.

4.6 Competitors of the Port of Manzanillo

Taking into account the literature reviewed in **Chapter 2**, the evaluation of the competition and competitiveness of the ports is essential for better performance and strategic planning (Kim, 2016). Similarly, Haezendonck and Notteboom (2002) point out that the competitiveness of a port is determined by the range of competitive advantages that the port acquires or creates over time. For this reason, it is argued that the stakeholders of the port (i.e. port of authorities, port operators, etc.) must continuously monitor their national and international competitors, in order to identify opportunities that provide access to new markets (Inter-American Development Bank, 2015).

The objective of the next section is to analyze and describe the general and commercial characteristics of container ports recognized to be the main competitors of the port of Manzanillo in the Pacific Rim, namely Lázaro Cárdenas, Los Angeles, and Long Beach.

4.6.1 Overview of Port Competition of Manzanillo

On the Pacific Ocean coast, the ports of Manzanillo and Lázaro Cárdenas lead the most important access of the Mexican economy to the international markets that flow through the Pacific basin. Both ports are the main logistics platforms for the dynamism, competitiveness, and diversification of Mexico's international trade, which facilitates the operation of maritime trade routes with Asia, Latin America, and the United States (API Manzanillo, 2014d). However, as Kevin Emmanuel Rubio Ceja stated, in the last decade, both ports have demonstrated their ability to serve the containerized cargo market in the center and west of the country. Despite that, in 1995, SSA México terminal (i.e. TEC I), obtained the container handling concession at the port of Manzanillo, causing that container cargo flows to be concentrated in this port, and resulting in a drastic drop in the total volumes of the port of Lázaro Cárdenas (Rubio Ceja, 2020).

On the contrary, in the international aspect, the port of Manzanillo faces strong competition for the traffic of containers vis-à-vis the ports of North America located on the west coast, i.e. the ports of Los Angeles and Long Beach. The main reason is due to the high installed capacity, specialized terminals, high rates of performance and productivity, and the constant frequency of arrival of container ships in both American ports (Martner Peyrelongue and Ruiz Gámez, 1998).

According to Governmental reports, the port of Manzanillo has presented difficulties in achieving the same high levels of port efficiency, as well as better connectivity with the interior of the country and intermodal productive integration to capture the flow of containerized cargo. Similarly, it has been determined that the containerized cargo flows through the port of Manzanillo to the central and western regions of Mexico have turned out to be as economic as the operations of the US, however, in the operational aspect, Manzanillo does not achieve the same high standards during containerized cargo operations, presenting the need to improve coordination between customs authorities that control, inspect and dispatch cargoes, in order to streamline and accelerate cargo flow between the sea and landside (Martner Peyrelongue and Ruiz Gámez, 1998).

4.6.2 Port of Lázaro Cárdenas

Lázaro Cárdenas is a young and dynamic port located in the state of Michoacán on the western coast of the Mexican Pacific, where Michoacán limits with the state of Guerrero, see **Figure 4.9.** The geographical location of the port of Lázaro Cárdenas has provided considerable growth in the flow of containers from Southeast Asia since its location classifies it as a viable alternative for cargo movement and a key logistics point to serve the domestic market (API Lázaro Cárdenas, 2012a). Initially, the natural vocation of the port of Lázaro Cárdenas was to emerge as an industrial port, nevertheless, as demand in the container market began to increase, the port of Lázaro Cárdenas found an area of opportunity for the movement of commercial cargo. The port is recognized for its modern facilities, equipment, and quality to perform the activities of an industrial and commercial port with efficiency, safety, and productivity (API Lázaro Cárdenas, 2012a).

Figure 4.9 Geographic Location of the Port of Lázaro Cárdenas

Source: DICEX Integral Trade, 2019a.

The Integral Port Administration of Lázaro Cárdenas (API Lázaro Cárdenas) is the Port Authority, an entity established as a concessionaire by the Federal Government with the purpose of being in charge of the integral administration of the port through functions such as the use of property, promotion, planning, development, and maintenance of port infrastructure and terminal operations. API Lázaro Cárdenas is headed by the General Management and integrated by 100 employees who are members of six different managements, i.e. Administration and Finance, Commercial, Planning, Operations, Legal, and Engineering (APILAC, 2016).

The port of Lázaro Cárdenas handles five types of cargo, i.e. general cargo, containers, bulk mineral, bulk agricultural, and crude oil and derivatives. In spite of this, 53% of its operations are dedicated to handling bulk mineral, while only 27% to containerized cargo, see **Figure 4.10.** The main products that the port imports are clothing and textiles, personal and household items, hardware items, electronic devices, office supplies, auto parts, and containerized cargo. While, the main products exported by the port are construction items, chemical and medical products, food, metal waste, plastic waste, and containers (APILAC, 2016).

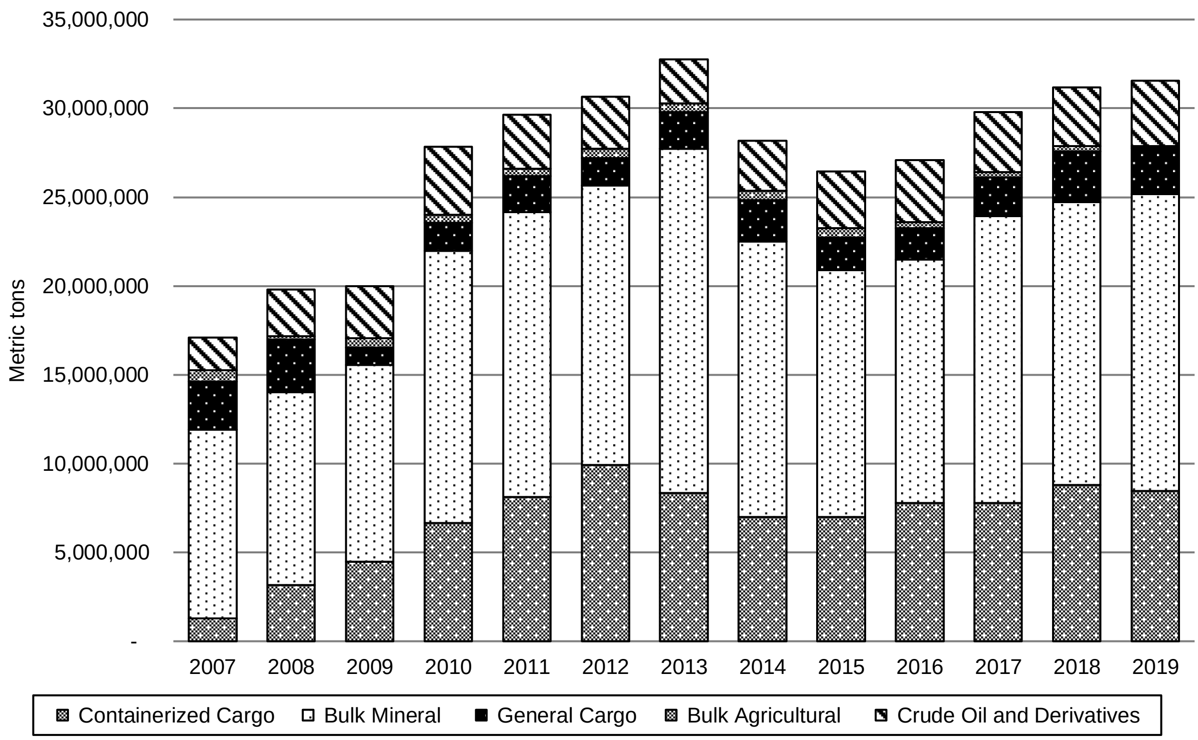

Figure 4.10 Total Throughput by Commodity (2007 – 2019) of the Port of Lázaro Cárdenas

Source: Created by the author based on API Lázaro Cárdenas annual statistics reports, 2020.

The local market of the port of Lázaro Cárdenas is composed of three industries, i.e. steel, fertilizer and energy, demanding high volumes of bulk mineral, sulfur, sulfuric acid, ammonia, phosphoric rock and coal, which are handled by conveyor belts from the docks to industrial plants (API Lázaro Cárdenas, 2014).

On the other hand, Lázaro Cárdenas is the Mexican Pacific port geographically closest to the center of the country. The hinterland of the Lázaro Cárdenas comprises an area of influence made up of 13 states of the Mexican Republic, i.e. Michoacán, Jalisco, San Luis Potosí, Morelos, Puebla, Veracruz, Tamaulipas, State of Mexico, Guerrero, Guanajuato, and Nuevo León, as shown in **Figure 4.11.** Its total coverage represents more than 60 million inhabitants, concentrated in the most important economic zones of the country. Thereby, its internal area of influence covers the central and northern states of Mexico, which has increased the demand for domestic consumption and the establishment of industrial production factories (APILAC, 2013).

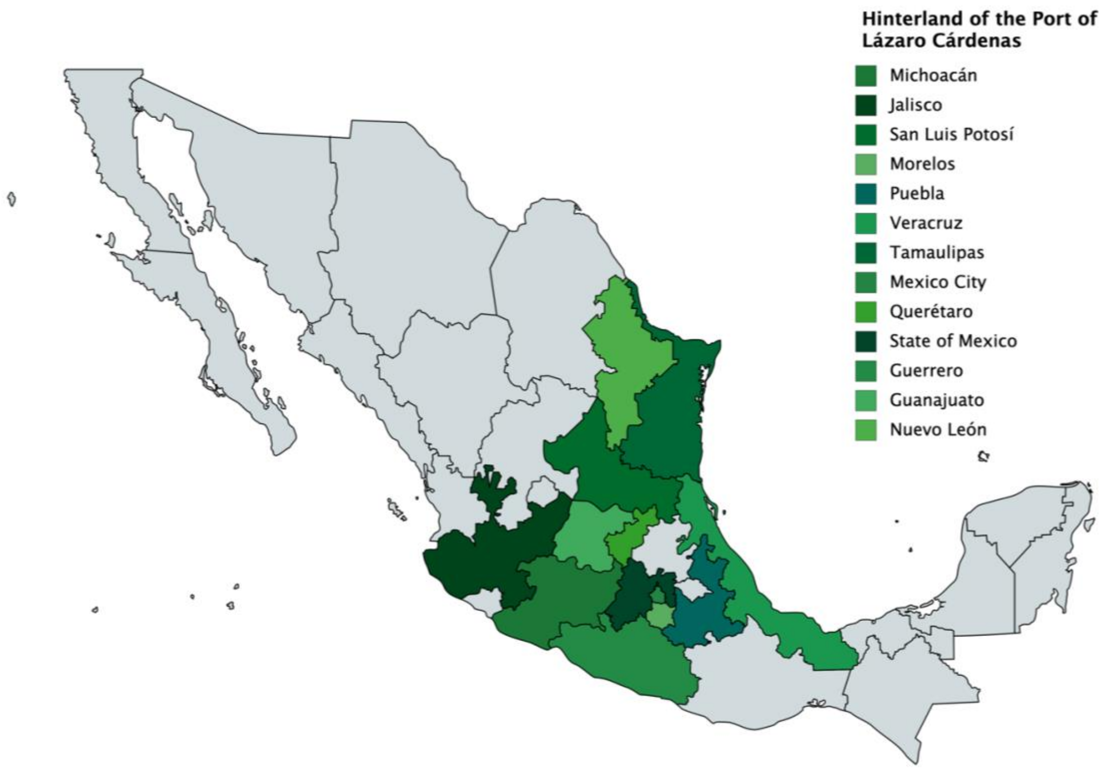

Figure 4.11 Hinterland of the Port of Lázaro Cárdenas

Source: Created by the author based on API Lázaro Cárdenas data, 2020.

Furthermore, the global influence area of the port has been expanded as a result of commercial maritime services with 38 shipping lines that call at the port and an extensive rail and road connectivity within the country (APILAC, 2013). The foreland of the port of Lázaro Cárdenas is oriented mainly towards the West Coast of North America, Central and South America, and the Eastern Pacific Basin, with international exchange of merchandise to countries such as the United States, Canada, Guatemala, El Salvador, Ecuador, Colombia, Panama, Chile, Argentina, Peru, Japan, Malaysia, Philippines, Singapore, Taiwan, Korea, Russia, China, Taiwan, Indonesia, Thailand, Pakistan, New Zealand, and South Africa (APILAC, 2013), see **Figure 4.12.**

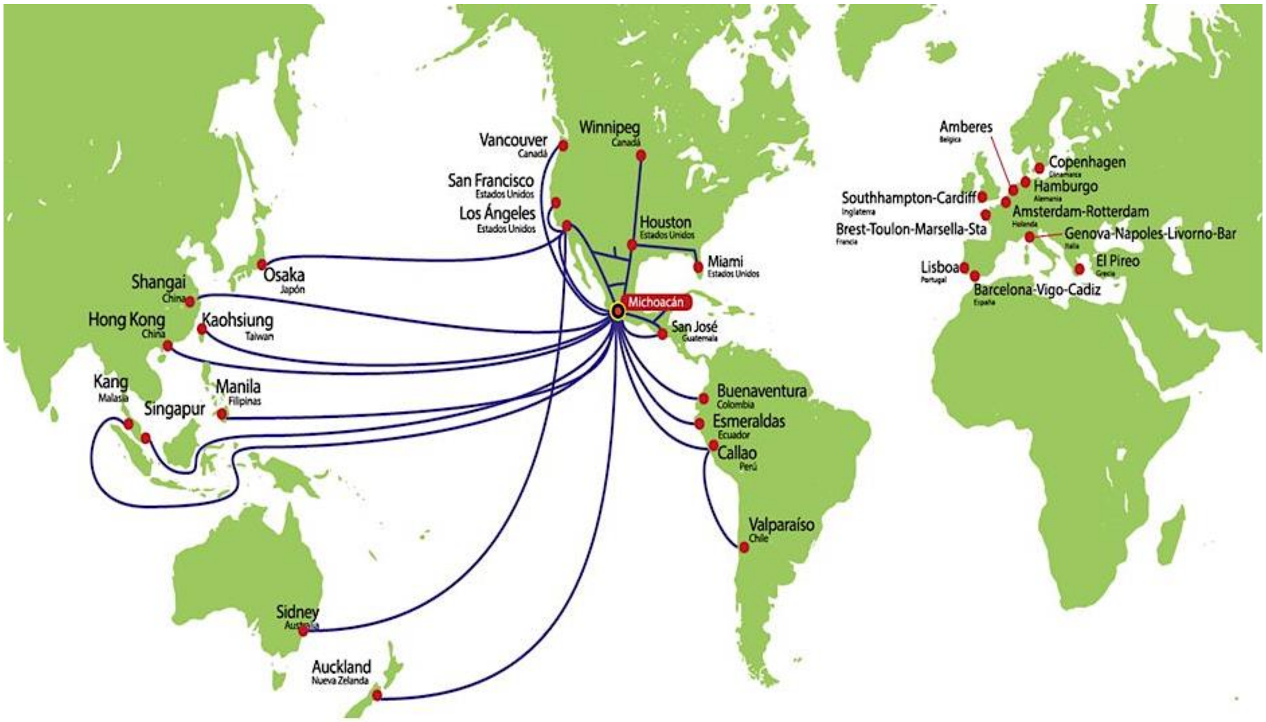

Figure 4.12 Foreland of the Port of Lázaro Cárdenas
Source: Araceli, 2015.

The connectivity of the port to the rail and road network allowed Lázaro Cárdenas to expand his connectivity with the center, north and the Bajío area of the country. According to the SCT, the port has good conditions for direct access to roads, rail connections, and intermodal terminals (APILAC, 2016), see **Figure 4.13.** Besides, direct rail access has allowed the port to connect to distribution centers in the United States. In addition, the railroad is privately owned with 15 intermodal terminals operated by Kansas City Southern de Mexico (Netherlands Enterprise Agency, 2019).

In terms of capacity, Lázaro Cárdenas is a large and dynamic port with the potential to grow even more. Today, the port has an adequate infrastructure to receive ships of up to 165 thousand tons and all types of cargo. The port has 1,500 hectares where there are established seven public terminals (i.e. two specialized container terminals, three for multiple uses, one for bulk mineral and one for bulk agricultural), five private terminals (i.e. one for coal handling, one for metal and mineral, one for fertilizers, and two for crude oil), and three facilities for inspection, storage, and repair (APILAC, 2016). The specialized container terminal I (TECI) is operated by Hutchison Ports LCT, with an annual capacity of 2 million TEUs, while the second terminal (TEC II) is operated by APM Terminals, with an annual capacity of 1.2 million TEUs (API Lázaro Cárdenas, 2012b).

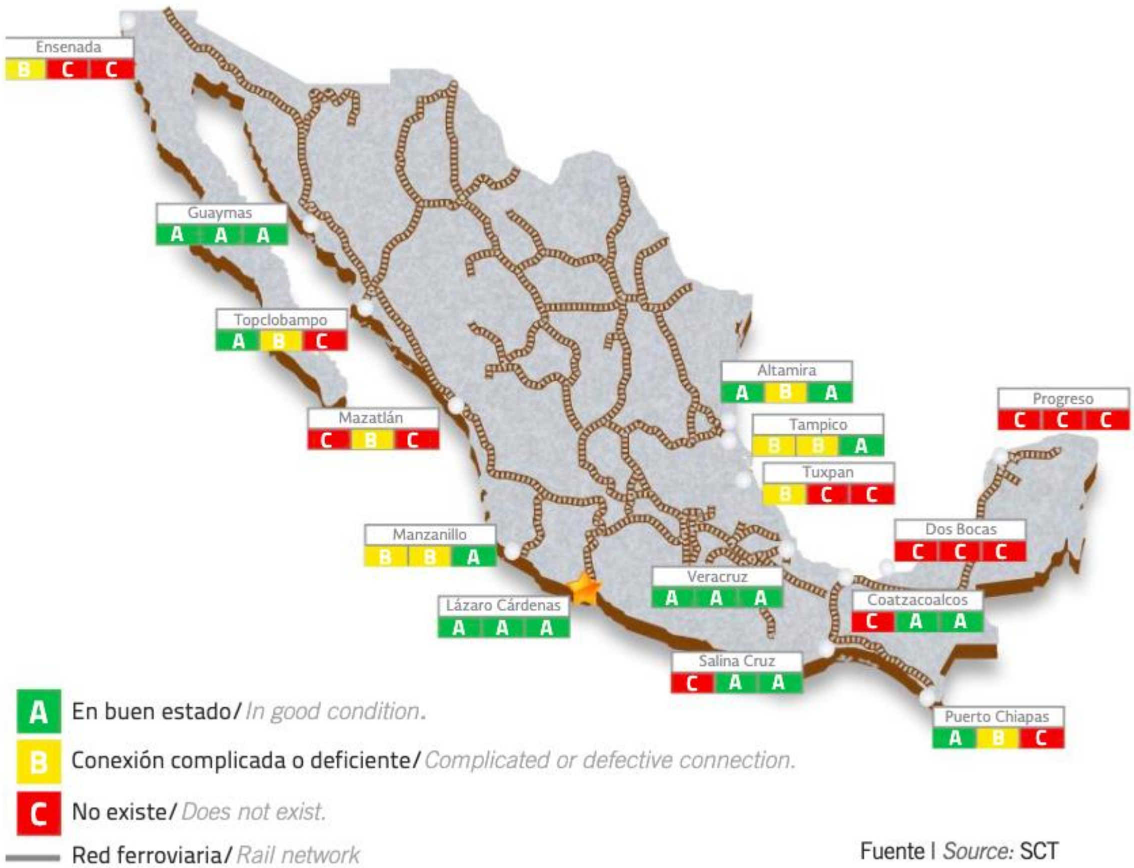

Figure 4.13 Rail Connectivity of the Port of Lázaro Cárdenas

Source: APILAC, 2016.

4.6.3 Port of Los Angeles

The Port of Los Angeles is one of the most active and dynamic seaports in the world and the main gateway for international trade and container handling in North America and Southern California (Port of Los Angeles, 2020a). The port is located in San Pedro Bay, 25 miles south of downtown Los Angeles, encompassing 7,500 acres of land at along 43 miles of coastline (Port of Los Angeles, 2018a), see **Figure 4.14**.

Similarly, the port's success to become an American economic engine with a wide range of diverse uses and benefits for the community has been based on providing infrastructure that economies of scale demand. Currently, the port has 25 specialized terminals for handling different types of merchandise; of which there is one automobile terminal, four general cargo terminals, seven container terminals, three dry bulk terminals, seven liquid bulk terminals, two passenger terminals, and one multiple-use terminal (Port of Los Angeles, 2019b).

Figure 4.14 Geographic Location of the Ports of Los Angeles and Long Beach

Source: Hamburg Süd, 2020.

Since 2000, the port of Los Angeles has been ranked as the number one US port for container handling and traffic from Asia. According to statistics, in 2019, the port moved 9,337,632.4 TEUs despite trade tensions in the US and the rest of the world and tariff uncertainties. In the same way, since 2010, the port has shown accelerated growth in its cargo handling volumes, demonstrating its high efficiency, productivity and global competitiveness (CPCS Transcom Limited, 2018). Despite that, the commercial ambition of the port of Los Angeles goes further. In accordance with the Port's 2018 – 2022 Strategic Plan, the **vision** is *"We are America's Port® - the nation's #1 container port and the global model for security, sustainability, and social responsibility."* (Port of Los Angeles, 2018b).

On the other hand, the port is governed by a five-member Board of Harbor Commissioners, who are appointed by the Mayor and approved by the Los Angeles City Council. Public lands and water are held in trust by the City of Los Angeles under the State Tidelands Trust (Port of Los Angeles, 2018a). The port follows a model as a landlord port with more than 200 leaseholders, where all port operations are managed by the Board of Harbor Commissioners in accordance with the Public Trust Doctrine with the main function of promoting maritime, commercial, navigation, fishing, and public access to the California coast (Port of Los Angeles, 2020a).

Pursuant to the Port Master Plan, the development of the port has been driven by changes in domestic and global consumption. The main factors that have led the port to be the US' major waterborne containerized trade gateway with Asia are the increase in the containerization goods movement, the rise of Asia as a trading partner for the US, the trend toward larger container ship sizes, and the faster times to market via land-bridge service (Port of Los Angeles, 2018a).

The port of Los Angeles moves more containers than any other port in the Western Hemisphere, presenting the highest container volumes and trade value each year. Consequently, the port must constantly work on the improvement and modernization of facilities, to ensure that trucking companies have good access to and from the interior of the US (Port of Los Angeles, 2019a). Likewise, the port has extensive and modern rail networks at the on-dock and near-dock, connecting 35% imports and exports from the US to international markets (Port of Los Angeles, 2020e).

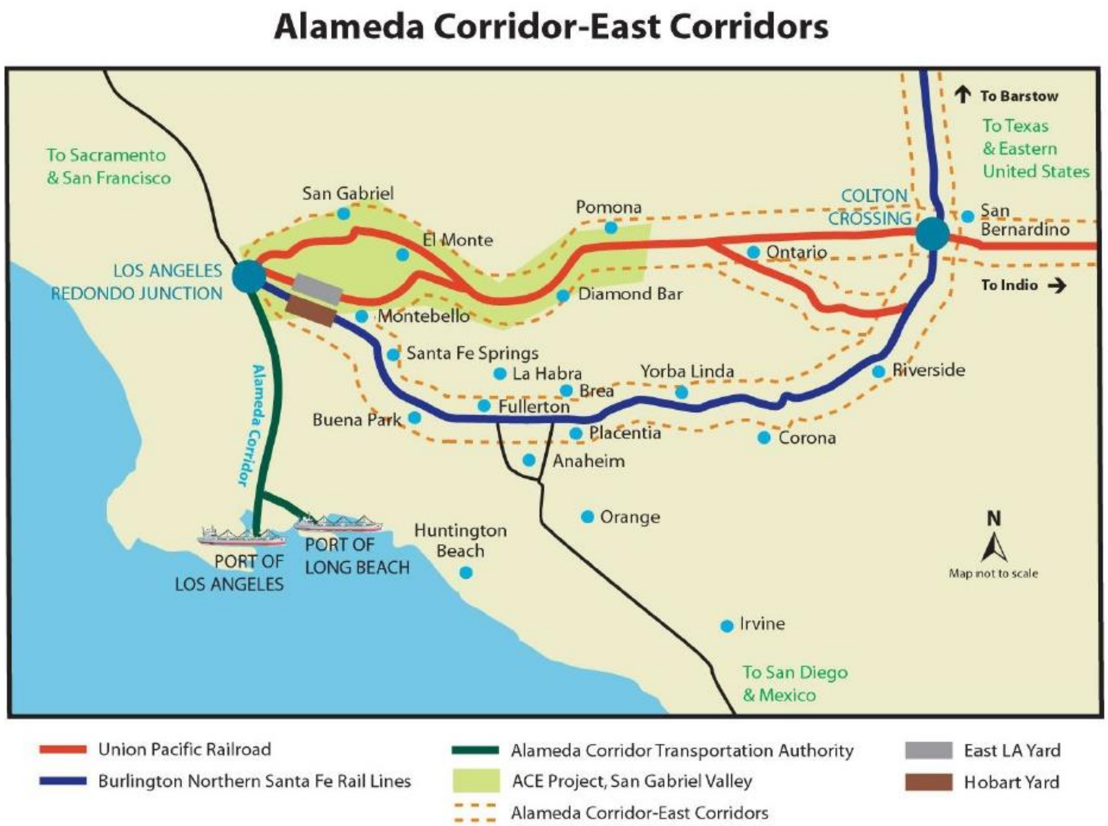

Figure 4.15 Rail Connectivity of the Port of Los Angeles

Source: Braymer, 2017.

The world-class rail infrastructure of the port consists of more than 65 miles of on-dock track to build and classify double-stack trains that speed imports to markets across the country and

American goods to the port for delivery to consumers around the world. The network operates 24/7 and connects to the Alameda Corridor, a dedicated rail expressway that connects the docks to the transcontinental rail system for cargo to flow nonstop between the port and the markets of North America (Port of Los Angeles, 2020e). The rail networks are operated by Union Pacific Railroad (UP) and Burlington Northern Santa Fe Railway (BNSF), as illustrated in **Figure 4.15.**

In 2019, in terms of containerized cargo value, the port confirmed that its five main trading partners are China/Hong Kong, Japan, Vietnam, South Korea, and Taiwan, see **Figure 4.16**. While in the percentage of commercial value, its five main commercial routes are Northeast Asia (74%), Southeast Asia (19%), India Sub-continent (2%), Northern Europe (2%), and Mexico/Central America (1%). In addition, the port of Los Angeles and the neighboring port of Long Beach together comprise the San Pedro Bay port complex, which handles more containers per ship than any other port complex in the world (Port of Los Angeles, 2019a).

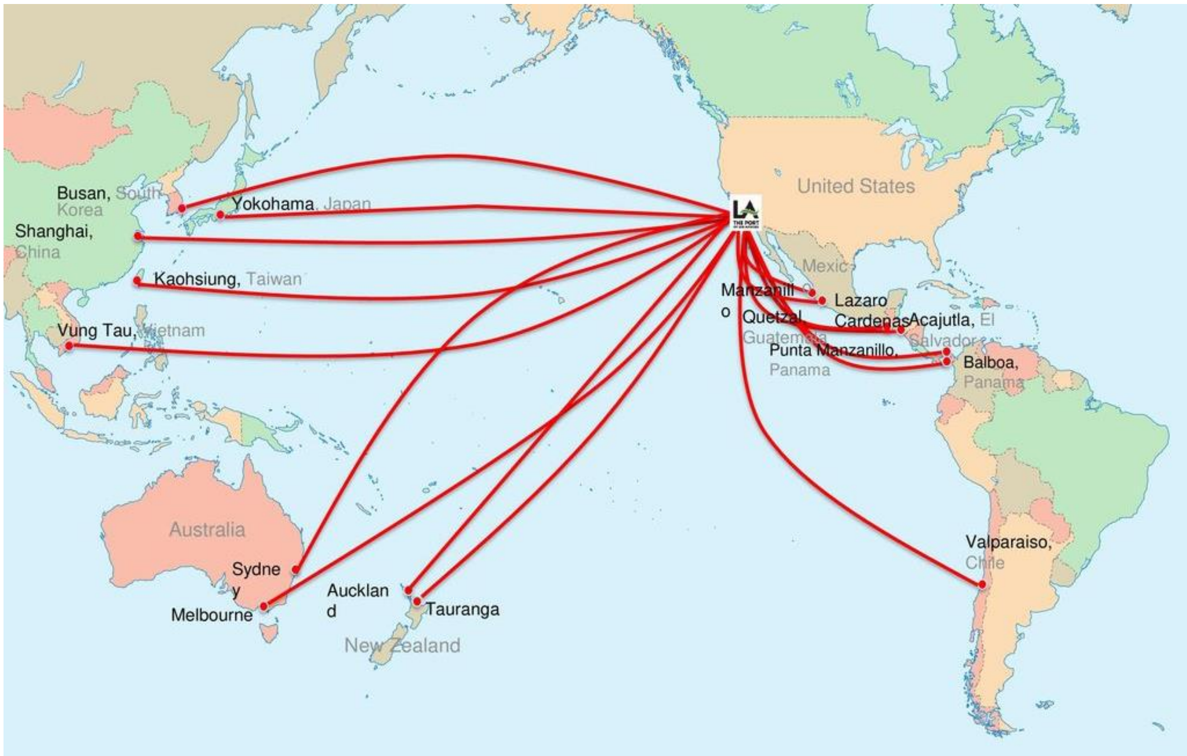

Figure 4.16 Foreland of the Port of Los Angeles

Source: Pierce, 2016.

4.6.4 Port of Long Beach

The port of Long Beach is the second busiest container port in North America, considered one of the main entrances for the traffic of imported merchandise from Asia, and a neighboring competitor to the port of Los Angeles (Port of Long Beach, 2020a). Furthermore, due to its large territorial size and installed capacity, Long Beach is a port capable of receiving ultra-large vessels, which has allowed it to formally work with 175 shipping lines and develop connections with 271 maritime ports in the rest of the world. Based on the statistics, in 2019 the port generated a total throughput of 7,632,032 TEUs (Port of Long Beach, 2020a), see **Figure 4.17.**

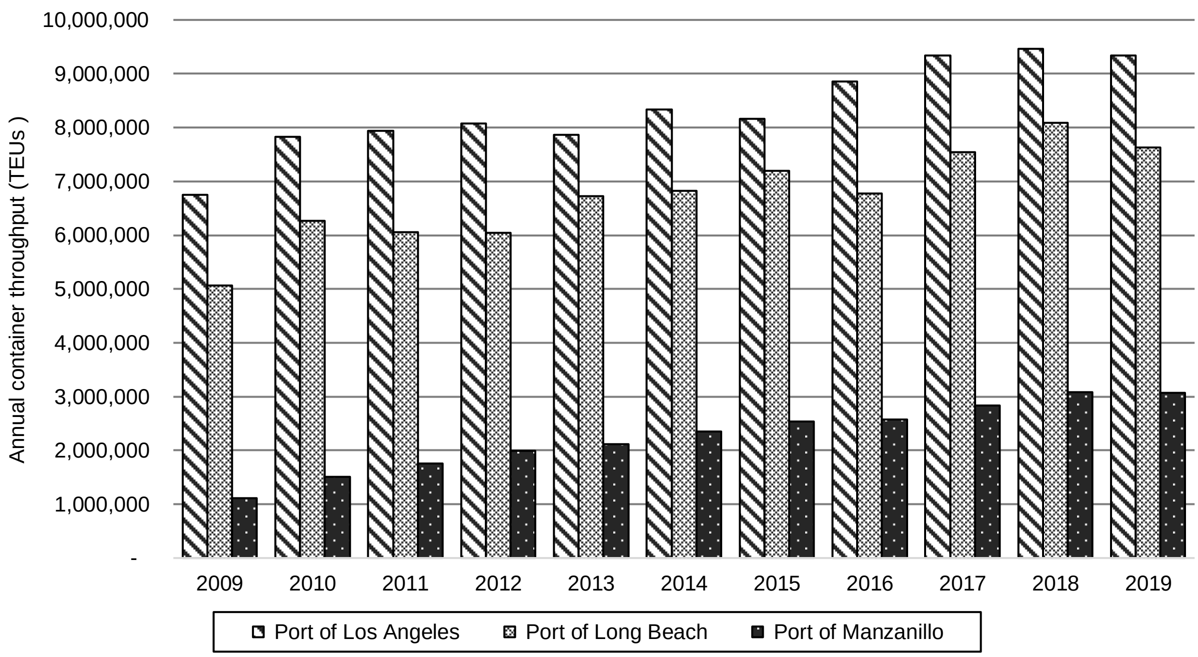

Figure 4.17 Comparison of the Total Container Throughput (2009 – 2019) of the Ports of Los Angeles, Long Beach, and Manzanillo

Source: Created by the author based on API Manzanillo, Port of Los Angeles, and Port of Long Beach Port Statistics, 2020.

The port of Long Beach is located less than three kilometers southwest of downtown Long Beach and 40 km south of downtown Los Angeles, as illustrated in **Figure 4.18**. Additionally, this port is governed by the City of Long Beach, which created the Long Beach Harbor Department with the goal of promoting, managing, and developing the port. The five members of the Board of Harbor Commissioners are solely responsible for establishing port policies (Port of Long Beach, 2020a).

Figure 4.18 Geographical Proximity between the Ports of Los Angeles and Long Beach
Source: Prohaska, 2016.

Regarding the cargo traffic capacity, the port has 22 specialized terminals for handling dry bulk, liquid bulk, general cargo, and containerized cargo. Thereby, the port area is integrated by six container terminals, six dry bulk terminals, six liquid bulk terminals, one automotive terminal, two general cargo terminals, and four facilities for inspection, storage, and repair (Port of Long Beach, 2020e).

The main imported products of the port are crude oil, electronic products, plastics, furniture, and clothing. Differently, its main exports are commodities such as petroleum coke, petroleum bulk, chemical products, wastepaper, and food. Despite the strong competition with Los Angeles for the attraction of Asian cargo, the two ports together represent the ninth busiest port complex worldwide, registering containerized cargo operations with commercial partners such as China, Vietnam, South Korea, Japan, Hong Kong, Taiwan, Italy, Thailand, Australia, and Malaysia (Port of Long Beach, 2020b).

In terms of hinterland connectivity, five of the port's six container terminals have rail access at the dock. Despite this, due to the high volume of containers handled per day, the port has as a strategic plan the construction of a new railway yard with the objective of improving traffic and increasing the use of the railway throughout the port, reducing travel by trucks and, consequently, congestion on the roads (Port of Long Beach, 2018). Similarly, the Intermodal Container Transfer Facility (ICTF) is a rail depot near the quay, serving multiple international shipping lines. The 233-acre facility is operated by the Union Pacific Railroad and handles 2,500 TEUs on average during peak days (Port of Long Beach, 2018).

On the other hand, The Alameda Corridor is a freight rail highway that connects the Port of Long Beach with the transcontinental rail network, located near downtown Los Angeles. The 32-kilometer-long corridor runs below street-level traffic, increasing efficiency and safety. The Alameda corridor has definitely contributed to cleaner port operations by eliminating thousands of daily truck trips between the port and rail yards in Los Angeles (Port of Long Beach, 2018), see **Figure 4.19.**

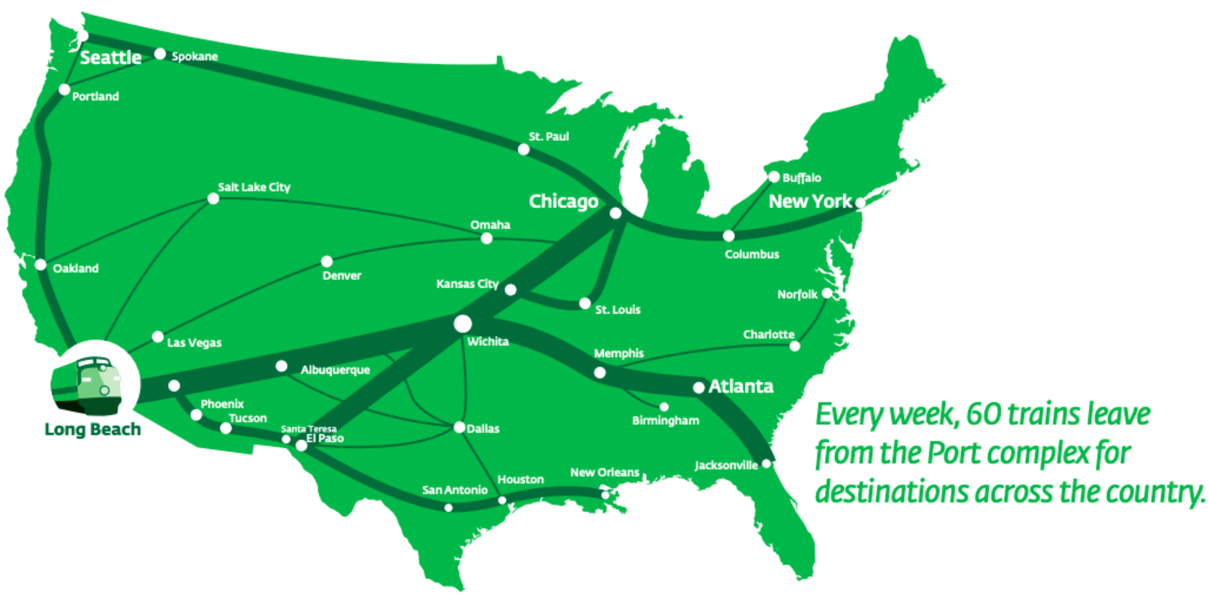

Figure 4.19 Rail Connectivity of the Port of Long Beach

Source: Port of Long Beach, 2018.

4.7 Conclusions of the Chapter

In conclusion, this comparative analysis allows the researcher to identify the most relevant characteristics of the four maritime ports, in conjunction with the competitive advantages that each one presents, in relation to the infrastructure conditions for competitiveness and their commercial strategies. It should be noted that the ports of Manzanillo and Lázaro Cárdenas have increased their commercial participation for containerized cargo traffic due to the high demand of the commercial routes of Asia and North America, similarly, this trend has been observed since 2012 when the ports of Manzanillo and Lázaro Cárdenas represented 70% of the total containerized cargo traffic in Mexico (Rubio Ceja, 2020).

On the other hand, as Notteboom et al. (2012) state, container ports serve as important nodes to facilitate the efficient flow of containerized cargo, with the function to serve as a gateway port that acts as an interface between the hinterland and deep-sea routings of containerized cargo, or as a transshipment port that acts as an interface for the interchange between deep-sea routings of containerized cargo (Notteboom and Yim Yap, 2012). Given the above, it is concluded that the port of Manzanillo is a strategic point for the transshipment of containers bound for Central and South America and the west coast of the United States and Canada. While, Lázaro Cárdenas has the vocation of being a commercial and industrial port, identifying itself as a strategic point for the traffic of mineral bulk and containers. Meanwhile, the ports of Los Angeles and Long Beach stand out as US ports that handle more containers than any other port in the Western Hemisphere, being the largest commercial gateway to North America. Considering the above, it is concluded that these two ports serve as gateway ports that acts as an interface between the hinterland and deep-sea routings of containerized cargo.

Last but not least, regarding the levels of competition, it is concluded that between the port of Manzanillo and Lázaro Cárdenas is observed an **inter-port competition at the operator level**, a competition between operators of both ports, mainly within the same traffic category, i.e. containers, and dry bulk. Differently, between the ports of Los Angeles, Long Beach, and Manzanillo an **inter-port competition on a port authority level** is identified, a competition between the ports where port authorities primarily pursue to increase the competitive position of their seaports by providing adequate infrastructure or attracting public investment, optimizing working conditions, and preventing monopoly activities.

5 Results and Interpretations

5.1 Introduction

This chapter is divided into two main sections, **section 5.2** corresponds to illustrating the results obtained in the SPA model and interpreting the findings in relation to the traffic flows of the four seaports within the range of ports in the Pacific Rim. It is important to remember that the focus of this study has been solely on container traffic, therefore, all the results presented below are in relation to total traffic and the category of container traffic. For the four seaports considered, four different categories of traffic are distinguished, i.e. containers, general cargo, dry bulk, and liquid bulk. The range is constituted by the seaports of Manzanillo, Lázaro Cárdenas, Los Angeles, and Long Beach.

In the figures shown in section 5.2, ports are abbreviated as follows: Manzanillo (M), Lázaro Cárdenas (LC), Los Angeles (LA), and Long Beach (LB). Furthermore, the categories of traffic are abbreviated as follows: containers (CON), general cargo (CG), dry bulk (DB), and liquid bulk (LB). All the findings presented in this section are based on secondary data collection within the eleven-year observation period (2007 – 2019). Thereby, by distinguishing them in three consecutive periods (i.e. 2007 – 2011, 2011 – 2015, and 2015 – 2019) and combining them in individual visual representations, interesting insights were obtained on the evolution of traffic flows. Lastly, the quantitative results obtained by the PPA, SSA, and PDA methods are presented in the **Appendix**.

On the other hand, **section 5.3** consists of illustrating the results obtained from Porter's diamond model applied at the national level for the two Mexican ports, i.e. Manzanillo and Lázaro Cárdenas, and at the regional level for the two ports of California, i.e. Los Angeles and Long Beach. Hereby, the main factors that drive or affect the competitiveness of each port within the containerized cargo industry would be identified and interpreted. Similarly, the factors that integrate Porter's diamond model will distinguish whether the Mexican port sector along with the port of Manzanillo in the context of the container industry have new opportunities to obtain international success and achieve greater competitiveness.

5.2 Strategic Position Analysis (SPA) Results

5.2.1 Comparative Traffic Structure

This section provides an overview of the size and composition of port traffic for the four most competitive container ports located in the Pacific Rim. **Figure 5.1** visualizes this information in relative terms based sequentially on “unweighted” traffic data. Moreover, **Figure 5.1** indicates the share of the different traffic categories in the ports’ commodity structure within the observation period 2007 – 2019. Thus, it illustrates the comparative traffic structure (average traffic figures) within the port range.

Los Angeles and Long Beach are dominant in the considered range with respect to traffic volume (metric tons). Similarly, **Figure 5.1** shows that none of the four ports are characterized by a well-diversified traffic structure. On the contrary, the ports of Los Angeles, Long Beach and Manzanillo are characterized by a high percentage of a particular traffic category, i.e. containers, while the port of Lázaro Cárdenas predominates in the dry bulk traffic. In addition, **Figure 5.1** identifies the category traffic of liquid bulk as dominated by the ports of Los Angeles and Long Beach. The following sub-sections will present illustrations based on “unweighted” traffic data; this means that the data computed in the SPA model corresponds to the metric tons published in the annual reports of each respective port.

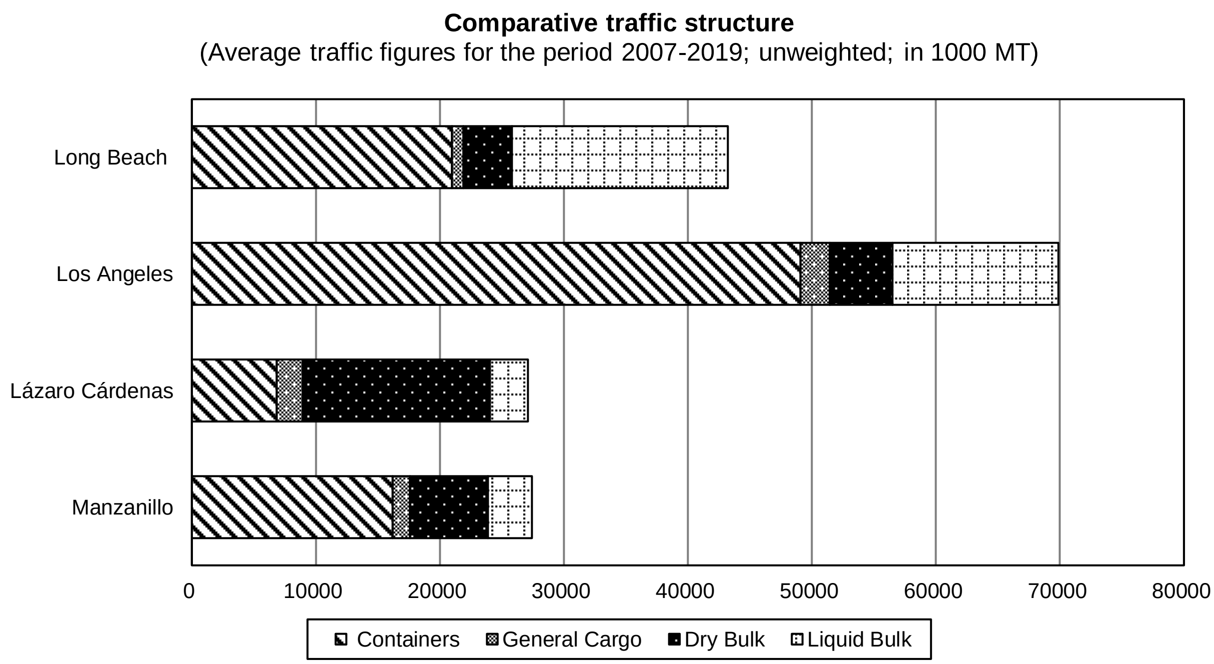

Figure 5.1 Comparative traffic structure in the port range (unweighted analysis)

Source: Created by the author based on port statistics, 2020.

5.2.2 Portfolio Analysis Applied to the Port Range

As described in **Chapter 3**, the main results of the PPA model are visualized by a series of figures, which indicate the different "levels" of the portfolio analysis. In the following diagrams to be observed, a bold horizontal line on the Y-axis and a bold vertical line on the X-axis are included. The latter represents the average market share, i.e. depending on the diagram, the market share in the range or in the individual port's traffic. While the bold horizontal line allows distinguishing between relatively fast or slow-growing ports or traffic categories, since this line represents the average annual growth rate of the port range or the traffic category in the period 2007 – 2019.

5.2.2.1 Portfolio of ports for total traffic (Level 1)

In **Figure 5.2**, the port range is considered as a portfolio of ports, i.e. the different ports are positioned in the growth-share matrix according to their average market share in the total port range and the average annual growth rate of their traffic volume in the observation period 2007 – 2019. It should be noted that no description of individual traffic categories is provided. This level 1 of the PPA is performed by the "unweighted" traffic data.

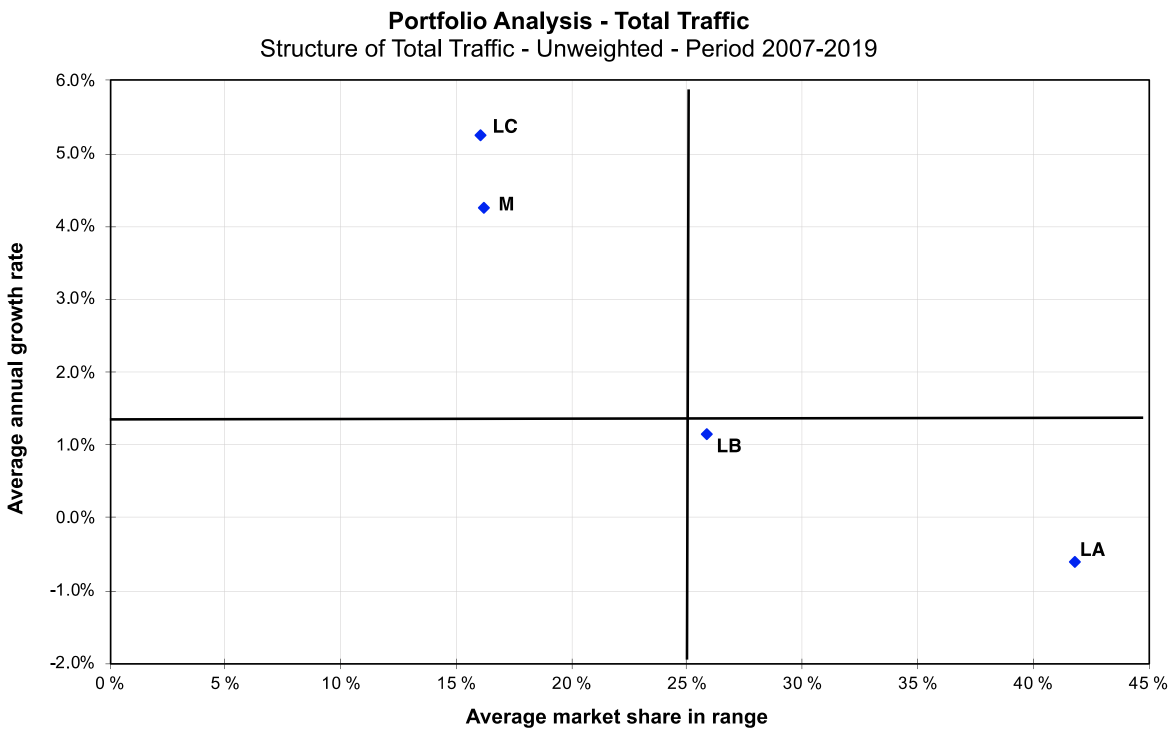

Figure 5.2 Portfolio of ports with their total traffic in the port range (unweighted analysis)

Source: Created by the author based on port statistics, 2020.

In this first level, under the "unweighted" analysis and the period 2007 – 2019, the average annual growth rate in the port range reached 1.39%, see **Figure 5.2**. The annual growth rate has been negative for the port of Los Angeles, while the ports of Manzanillo, Lázaro Cárdenas, and Long Beach show a positive annual growth rate. On the other hand, only the ports of Manzanillo and Lázaro Cárdenas are positioned as "High Potential". Although the ports of Los Angeles and Long Beach have a dominant position with a market share of 41.85% (LA) and 25.84% (LB), these ports grew at a slower rate than the range as a whole and, therefore, they can be considered a "Mature Leader" in the conventional BCG classification.

5.2.2.2 Portfolio of traffic categories for individual seaports (Level 2)

Figures 5.3, 5.4, 5.5, and **5.6** illustrate the PPA of the individual port traffic structure of the ports of Manzanillo, Lázaro Cárdenas, Los Angeles, and Long Beach for "unweighted" total traffic data. The four ports were selected for the visualization of this second level of the PPA since all the ports presented a good performance in terms of the variable of the container category (i.e. the main purpose of this multiple case study). However, the volume of traffic from individual seaports is considered as a portfolio of four categories of traffic, i.e. containers, general cargo, dry bulk, and liquid bulk. The relative participation of each category in the total traffic of the four ports (X-axis) is related to their respective growth rate (Y-axis).

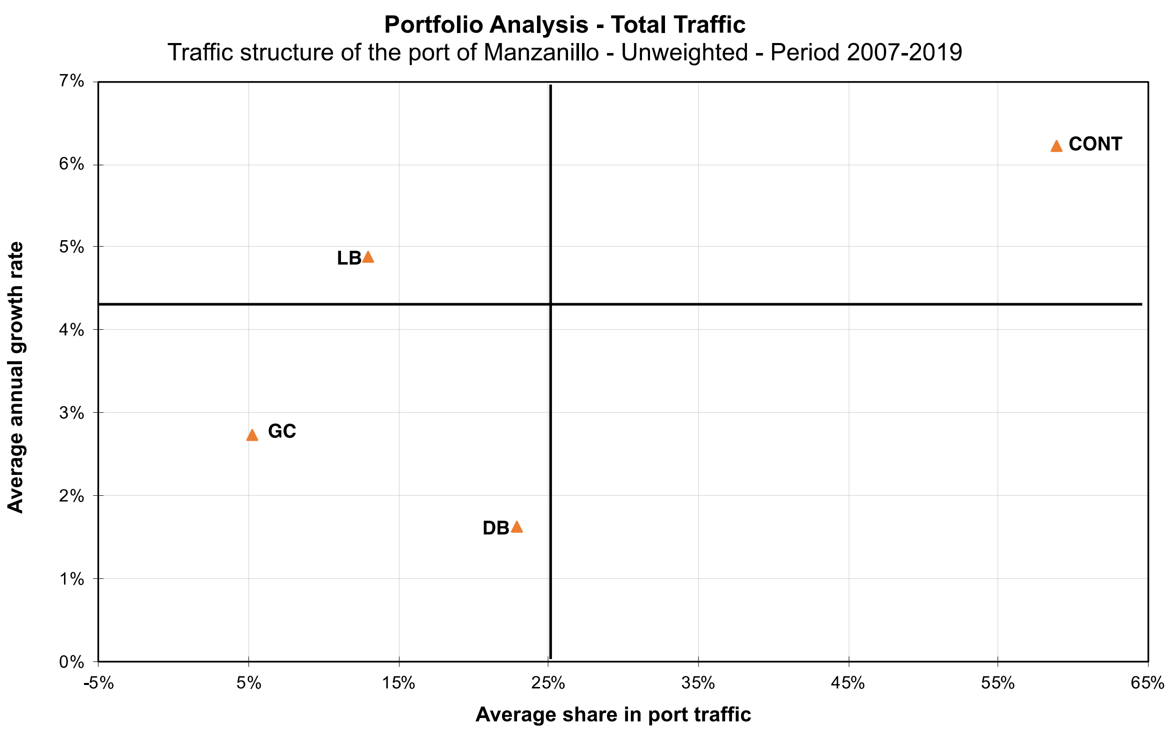

Figure 5.3 Traffic structure of the Port of Manzanillo (2007 – 2019)
Source: Created by the author based on port statistics, 2020.

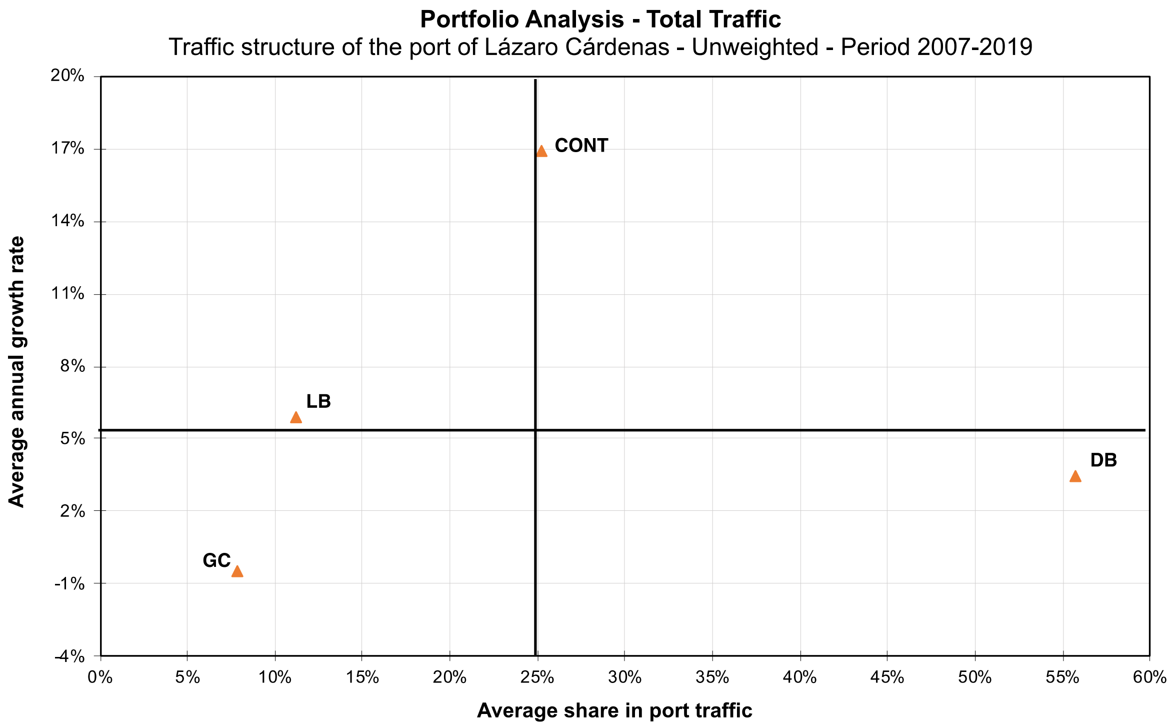

Figure 5.4 Traffic structure of the Port of Lázaro Cárdenas (2007 – 2019)

Source: Created by the author based on port statistics, 2020.

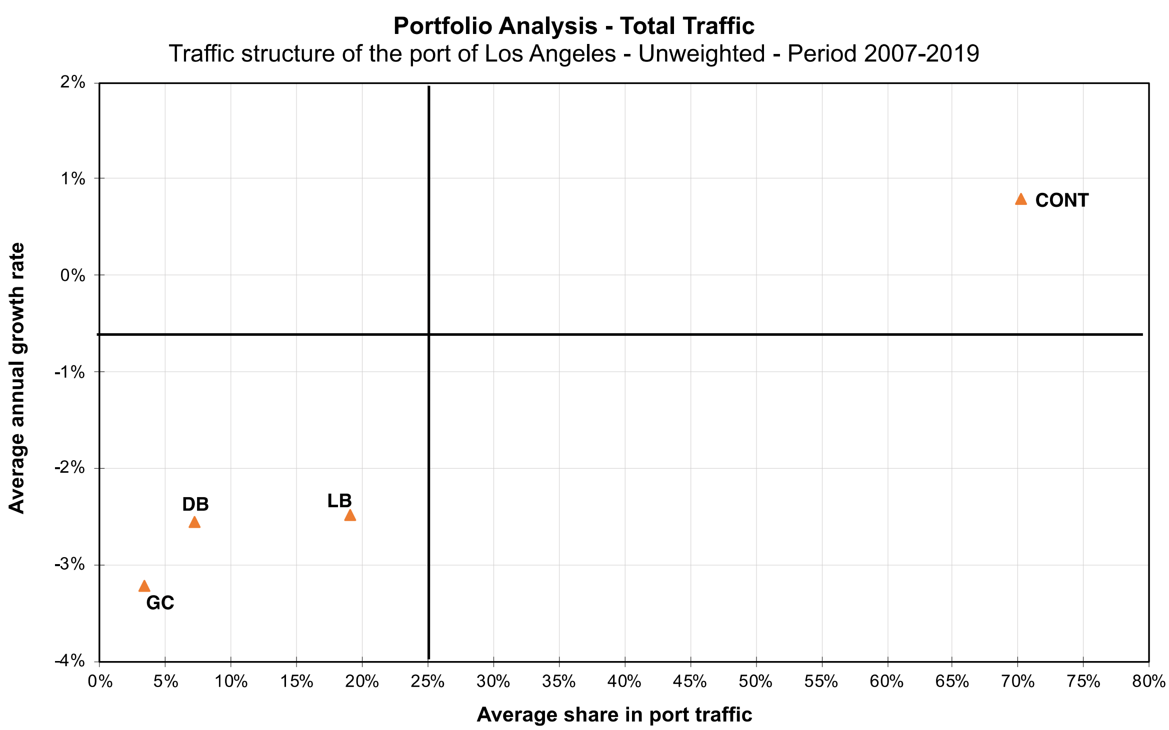

Figure 5.5 Traffic structure of the Port of Los Angeles (2007 – 2019)

Source: Created by the author based on port statistics, 2020.

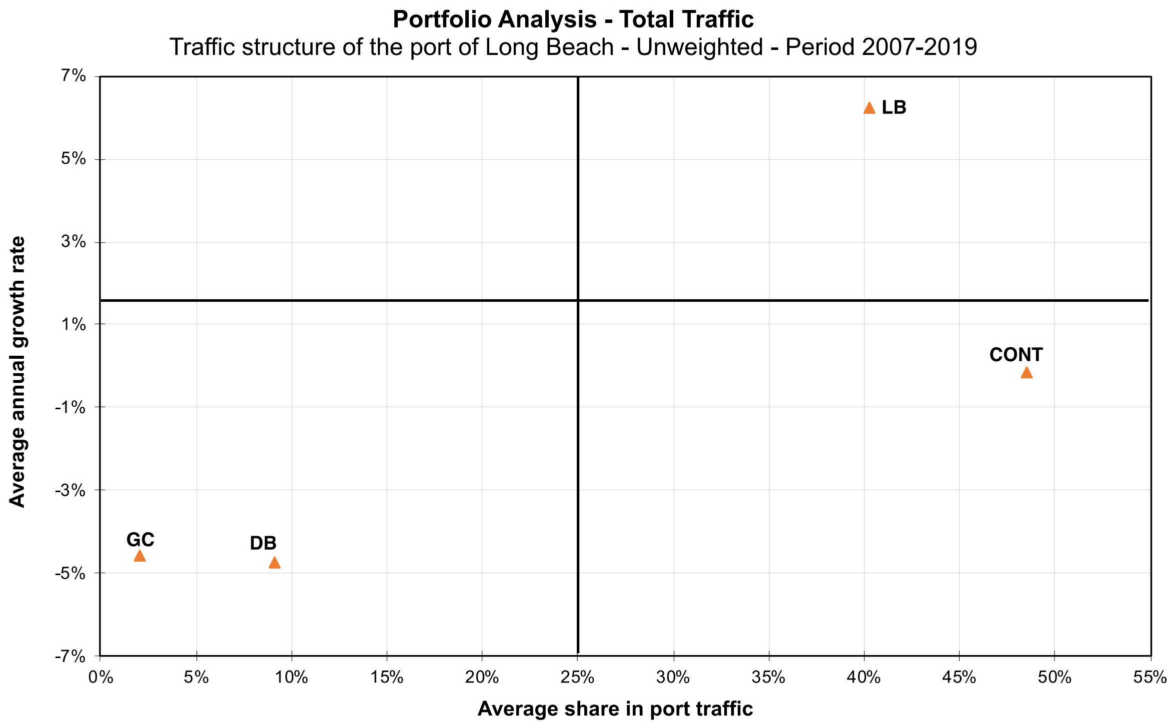

Figure 5.6 Traffic structure of the Port of Long Beach (2007 – 2019)

Source: Created by the author based on port statistics, 2020.

Figure 5.3 represents the total "unweighted" version of this type of portfolio for the port of Manzanillo during the 2007 – 2019 period. Manzanillo has clearly seen rapid growth for containers and bulk liquid traffic. An average annual growth rate of 5.73% has been registered for Manzanillo in the case of containers. Nevertheless, dry bulk seems to lose share in the port's domestic market, due to an average growth rate of 1.12% (the lowest in comparison with the rest of the categories). Within Manzanillo, the container traffic category positions itself as a "Star Performer", while liquid bulk traffic for the port of Manzanillo constitutes "High Potential". The general cargo traffic has a relatively lower share in port traffic, having a lower annual growth rate in comparison with the average (4.24%) and, therefore, can be classified as "Minor Performer".

The "unweighted" traffic structure for the port of Lázaro Cárdenas is represented in **Figure 5.4**, which shows some important differences in comparison with that of Manzanillo. Containers managed to position themselves as "Star Performer" for total traffic, with the highest average annual growth rate (16.90%). However, general cargo is the least important within Lázaro Cárdenas's traffic structure and is located in the "Minor Performer" quadrant, presenting a negative average annual growth rate of -0.44%. Liquid bulk traffic is "High Potential", while dry bulk traffic is the category with the highest average of market share (55.71%) but a low average annual growth rate (3.44%) compared to traffic of containers, positioning the dry bulk category as “Mature Leader” within the port.

Meanwhile, **Figure 5.5** represents the total “unweighted” version of this type of portfolio for the port of Los Angeles during the 2007 – 2019 period. Los Angeles has clearly seen steady growth for container traffic, with an average annual growth rate 0.80%. General cargo, however, seems to lose almost completely share in the port’s domestic market, due to a negative average growth rate of -3.22%. Within Los Angeles, no traffic category positions itself as a “High Potential”, while containers are the only category positioned in the “Star Performer” quadrant. The dry bulk and liquid bulk categories have the closest average market share percentage to the average, however, both categories along with the general cargo show a negative average annual growth rate, positioning themselves as “Minor Performer” within the port.

Last but not least, **Figure 5.6** corresponds to the total “unweighted” version of this level of the portfolio for the port of Long Beach. In this port, totally different evolution can be observed from the rest of the ports, this is mainly due to the fact that Long Beach is the only port where the container traffic category is not positioned in the “Star Performer” quadrant, but rather in “Mature Leader”, the main reason is due to its high average percentage of market share, but its average annual growth rate is negative (-0.15%). Differently, the liquid bulk traffic category is positioned as “Star Performer” within the port, along with an average annual growth rate of 6.25%. General cargo and dry bulk, nevertheless, appear to lose internal market share in the port, due to their negative average growth rate of -4.57% and -4.76%, positioning themselves as “Minor Performer” within the port.

5.2.2.3 Portfolio of ports for individual traffic category (Level 3)

The results of the third level of the PPA are graphically illustrated in **Figure 5.7.** The four seaports are now analyzed as a portfolio of ports for specific product groups. Here, the competitive position of individual ports in the range is evaluated by the traffic category. For the purpose and general focus of the study, the category of container traffic was selected for a more detailed description in this chapter.

Similarly, regards the behavior of the international market, the demand for containers is growing rapidly, consequently, it is a traffic category aggressively pursued by the majority of seaports in the range. Miles (1986) argues that portfolio analysis is interesting to identify and further investigate those areas where companies have the highest performance or potential return. He argues that companies should focus on those business units that can gain and maintain an advantage over competitors and that are valued by customers. In terms of the port sector, Manzanillo should focus its planning strategies especially on containers, given the favorable range position of this port in this category (Haezendonck, Verbeke and Coeck, 2006).

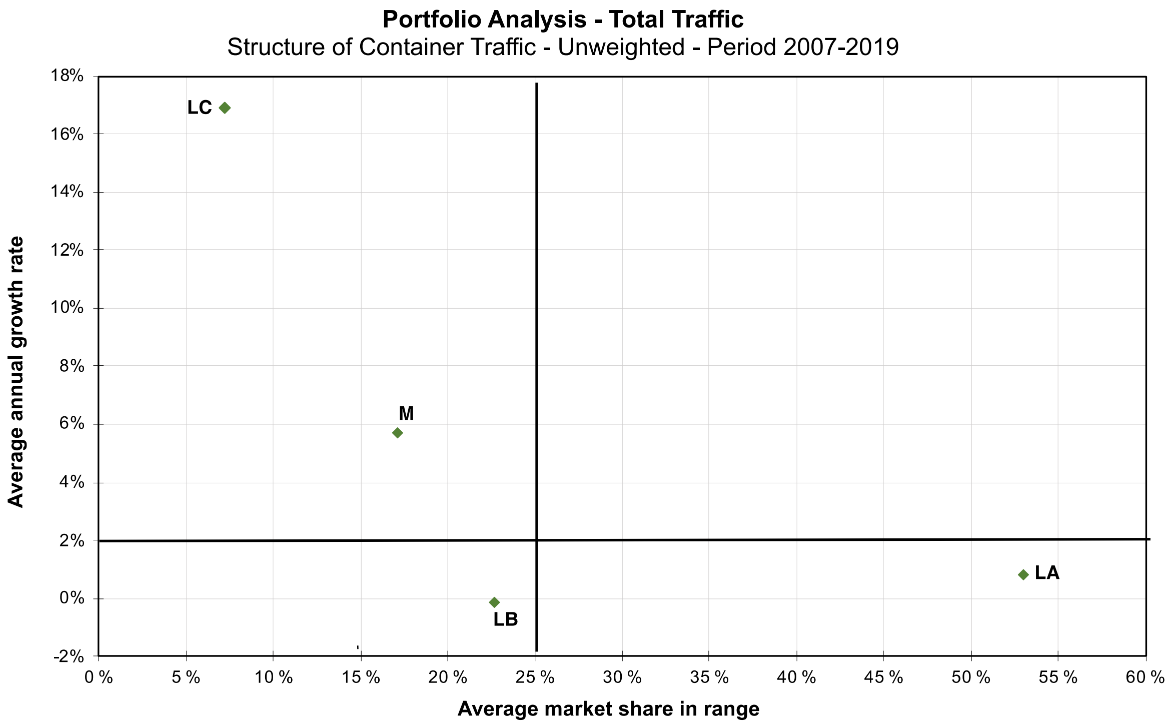

Figure 5.7 Structure of container traffic in the port range (2007 – 2019)

Source: Created by the author based on port statistics, 2020.

Figure 5.7 represents total container traffic, where the ports of Manzanillo and Lázaro Cárdenas have definitely positioned themselves as "High Potential". Nonetheless, its market share does not exceed the average position in the range (25%), while its growth rate does exceed the average position, i.e. a market share of 17.11% and an average annual growth rate of 5.73% for Manzanillo, and a market share of 7.23% and an average annual growth rate of 16.90% for Lázaro Cárdenas. Differently, Los Angeles still outperforms the other ports with respect to market share (70.23%), but it has grown slowly compared to average growth in the range and as a result, cannot be considered a “Star Performer”, but a “Mature Leader”. In the case of Long Beach, container traffic is of great importance, however, its average annual growth rate is negative (-0.15%), which has caused the port to position itself as a “Minor Performer”.

5.2.2.4 Portfolio of ports for individual traffic category, related to these category’s share in port traffic and share in the range (Level 4)

Lastly, the fourth level of the static approach of this portfolio analysis is illustrated in **Figure 5.8**. As mentioned in **Chapter 3**, the difference with the third level of PPA is that here the X-axis represents the share of a specific category within a port rather than the category’s share of the range. In other words, each category of traffic considered is examined in relation to the share of this category in seaports. For the purposes of the study, as in the third level, only one category of traffic was selected, i.e. containers, in order to present a more detailed description.

Similarly, since this level introduces an additional dimension to the analysis of the portfolio, whereby the representation of the ports is circular shape within a surface proportional to the absolute traffic volume of the port considered in the total range[13]. Likewise, the center of each circle represents the coordinates of the growth rate and the market share. Therefore, the bold vertical line now represents the average share of the relevant traffic category in all ports within the observation period 2007 – 2019, while the bold horizontal line reflects the average annual growth rate of this category traffic in range (Haezendonck, Verbeke and Coeck, 2006).

[13] The surfaces, referred to absolute “unweighted” traffic in metric tons, can even be compared between the two diagrams in level three of the static portfolio, as the process used to determine the areas is identical at both levels (Haezendonck, Verbeke and Coeck, 2006).

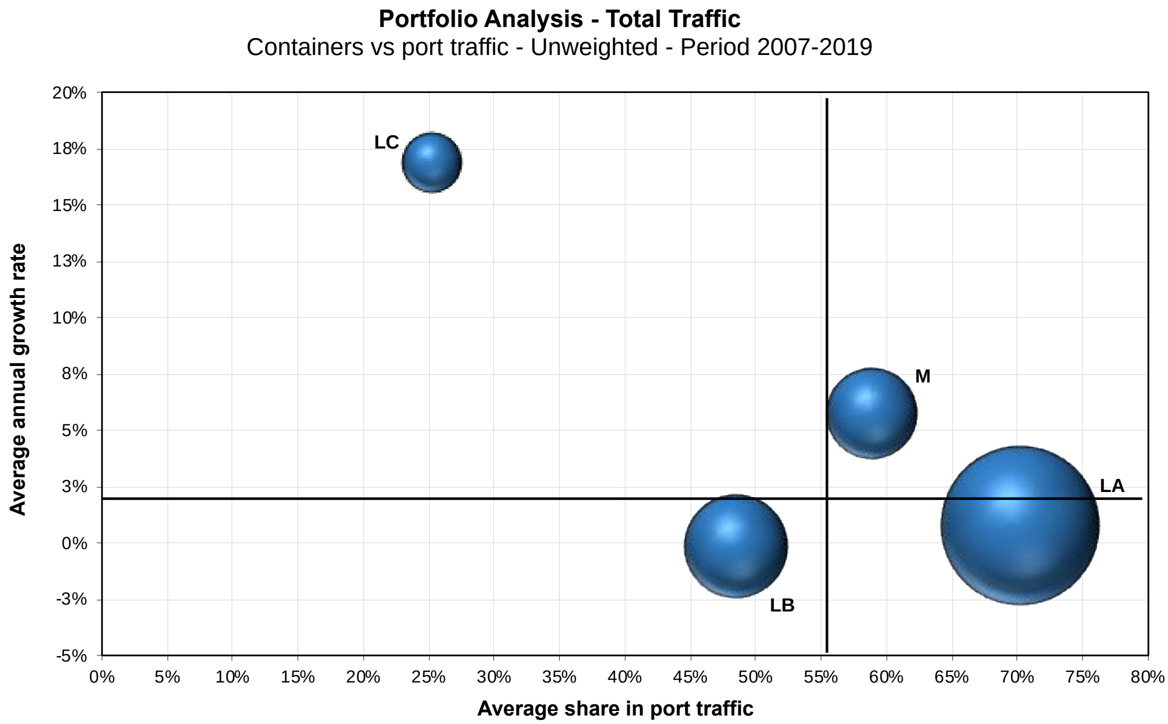

Figure 5.8 Analysis of total container traffic (versus total port traffic) of the port range (2007 – 2019)
Source: Created by the author based on port statistics, 2020.

In **Figure 5.8**, container traffic is visualized. In this scenario, one port can be considered as "Star Performer", namely Manzanillo, while Los Angeles is positioned between the quadrant of "Star Performer" and "Mature Leader". On the contrary, the port of Long Beach also has a relatively large proportion of containers in its port traffic, as well as range, but shows a below-average growth rate, which is why it is ranked as "Minor Performer". Undoubtedly, an increase in its annual average growth rate, the position of the port will benefit, positioning itself as "High Potential".

On the other hand, the port of Lázaro Cárdenas shows great potential in this category of traffic with a rate of average growth of 16.90%, higher than the average for the range. Although the participation in its own traffic structure is quite small, resulting in a position as "High Potential". The port of Manzanillo reveals a lot of potential in the field of the traffic of containers, with an average market share of 58.92% and an annual growth rate of 5.73%, higher than the average of the range (2%). Nevertheless, if the average annual growth rate of Los Angeles decreases in the next years, the port would position itself as a "Mature Leader".

5.2.2.5 Dynamic portfolio of ports

The dynamic version of the PPA is required to be able to compare various data series, related to different time periods. Hence, a dynamic portfolio analysis applies the portfolio technique multiple times and integrates the results in a diagram. The objective of dynamic analysis is to reveal the evolution within the observed period, in order to interpret the possibilities of future developments (Haezendonck, Verbeke and Coeck, 2006). In the following dynamic analyzes of the ports of Manzanillo, Lázaro Cardenas, Los Angeles, and Long Beach, three periods have been selected, i.e., 2007 – 2011 (first period), 2011 – 2015 (second period), and 2015 – 2019 (third period). These periods are linked by colored lines in chronological order, as shown in **Figure 5.9** and **Figure 5.10**. Thereby, **Figure 5.9** illustrates the dynamic positioning of the total traffic structure of the four seaports is represented, while **Figure 5.10** shows the dynamic positioning of the container traffic structure.

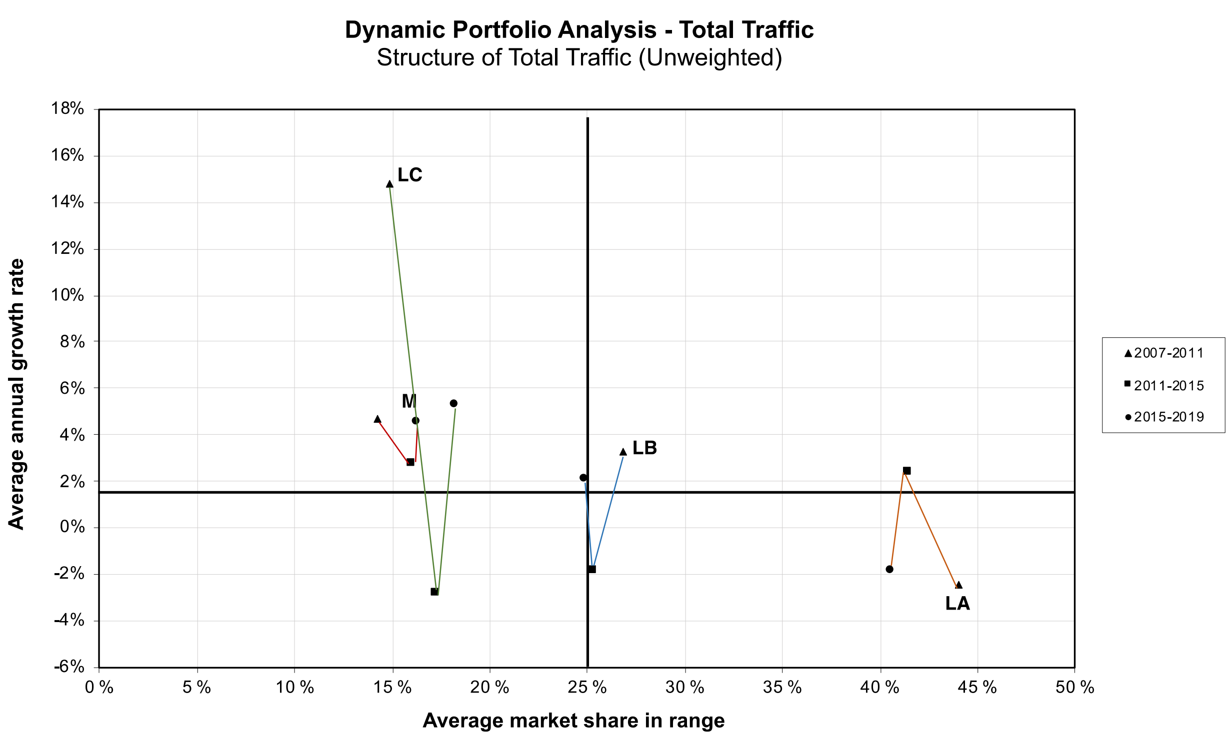

Figure 5.9 Dynamic analysis of the total traffic in the port range (2007 – 2019 in three time periods)

Source: Created by the author based on port statistics, 2020.

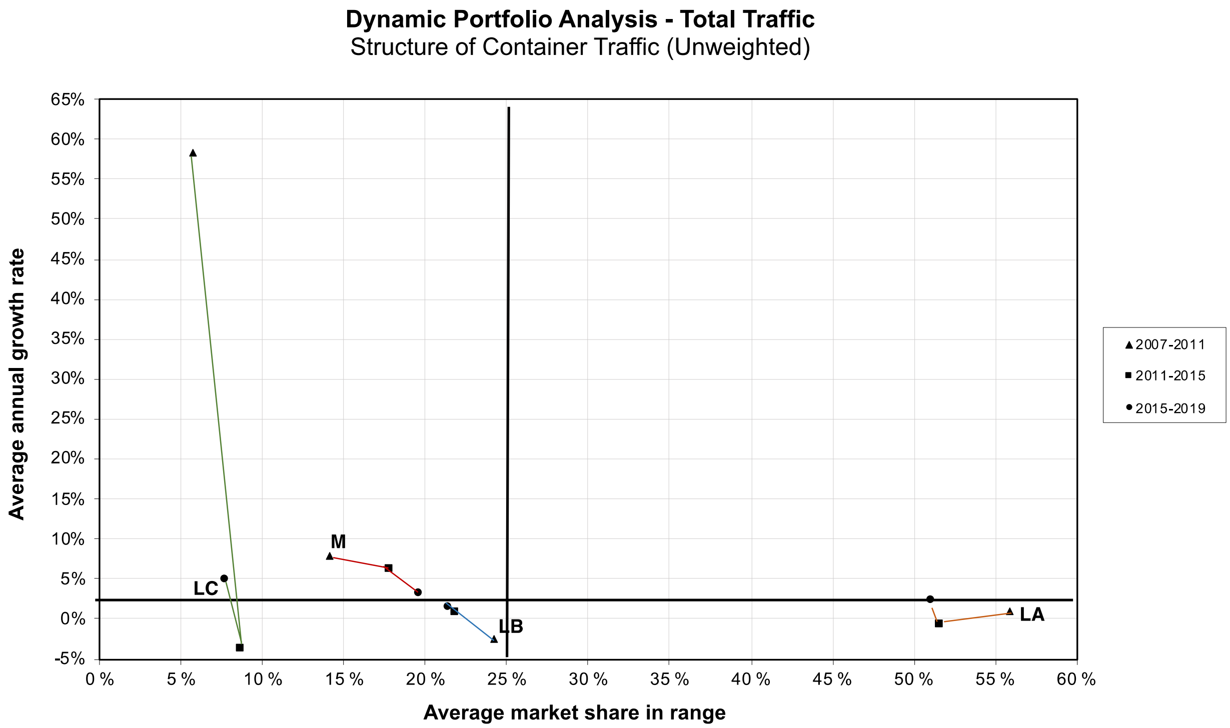

Figure 5.10 Dynamic analysis of the container traffic in the port range (2007 – 2019 in three time periods)

Source: Created by the author based on port statistics, 2020.

Figure 5.9 illustrates a dynamic analysis of the total traffic portfolio. The figure shows that Long Beach obtained the position as "Star Performer" in the first observation period (2007 – 2011), while Los Angeles obtained the same position in the second observation period (20011 – 2015), however in the third period (20015 – 2019), both ports lost their favorable position, positioning Los Angeles as "Mature Leader", and Long Beach as "High Potential". The port of Manzanillo maintained the same strategic position in the three observation periods, i.e. positioning itself as "High Potential", but without a doubt, each period has shown improvements, which indicates that in the future the port could achieve a position as "Star Performer". In the case of Lázaro Cárdenas, the port within the range has been balanced between the "Minor Performer" and "High Potential" quadrants, showing improvements in the third period (2015 – 2019).

Differently, **Figure 5.10** shows a dynamic analysis of the container traffic portfolio. Respect to containers traffic, none of the four seaports has managed to reach a "Star Performer" position. Los Angeles has lost market share (but still has a 52.98% market share in the range), while its growth rate has been decreasing and increasing, consequently, its position in the third period (2015 – 2019) is balanced between the limits of the quadrants "Mature Leader" and "Star

Performer". Manzanillo, which is widely considered as a container port, has been positioned itself as "High Potential" during the three observation periods, in spite of this, in the third period (2015 – 2019) its position looks risky, due to a decrease in its average annual growth rate could position it as "Minor Performer" in the future, but it is notorious that Manzanillo's market share has been increasing in all periods. The case of Long Beach is interesting to analyze, since in the third period (2015 – 2019) the port lost a percentage of its market share but managed to increase its average annual growth rate, indicating that in the future, the port could recover its position as "High Potential". Finally, Lázaro Cárdenas went from a "High Potential" to a "Minor Performer" in the second period (2011 – 2015) and managing to recover in the third period, getting a position as "High Potential", this port started with a high average annual growth rate, nonetheless, due to competition within the port range, its annual growth rate has decreased in the last two periods.

5.2.3 Shift-Share Analysis Applied to the Port Range

In this section, the SSA model is applied to analyze traffic flows within the ports of Manzanillo, Lázaro Cardenas, Los Angeles, and Long Beach for the period 2007 – 2019. Three periods are distinguished, i.e. 2007 – 2011, 2011 – 2015, and 2015 – 2019. The quantitative results of the SSA are presented in the **Appendix**. Likewise, a conventional SSA was performed on the total traffic volumes of each port. As a result, for each seaport, three different SSAs are included. All the tables show seven elements: (1) the observation period, (2) the absolute growth of registered traffic, (3) the annual growth during the observation period in percentage terms (4) the share-effect, (5) the commodity-shift, (6) competitive-shift, and (7) the total shift-effect (Haezendonck, Verbeke and Coeck, 2006). Thereby, this section will present and analyze the shared-effect of the selected seaports and the most interesting shift-effects, including the graphic illustrations, see **Figure 5.11**, **Figure 5.12**, and **Figure 5.13.**

5.2.3.1 Share-Effect

The share-effect indicates the estimated hypothetical growth of traffic in a port, assuming a constant market share. Given the above, in terms of total traffic volume, the four seaports in the range have been characterized by a positive share-effect in the three observation periods, thus obtain positive results indicates the good performance of the selected ports. It is important to note that the share-effect in the 2007 – 2011 period was the highest for all ports. While in the period 2011 – 2015 the share-effect was the lowest for the entire port range, which can be justified due to a substantial global decrease in traffic in the port range.

5.2.3.2 Shift-Effect

In **Chapter 3**, it was suggested to use a graphical representation of the shift-effect in order to facilitate the formulation of results and interpretations. In this way, **Figures 5.11**, **5.12**, and **5.13** represent the most important results of the SSA model. Similarly, they show the shift-effect of the port of Manzanillo, Lázaro Cárdenas, Los Angeles, and Long Beach with respect to their total “unweighted” traffic during the three time periods, i.e. 2007 – 2011, 2011 – 2015 and 2015 – 2019.

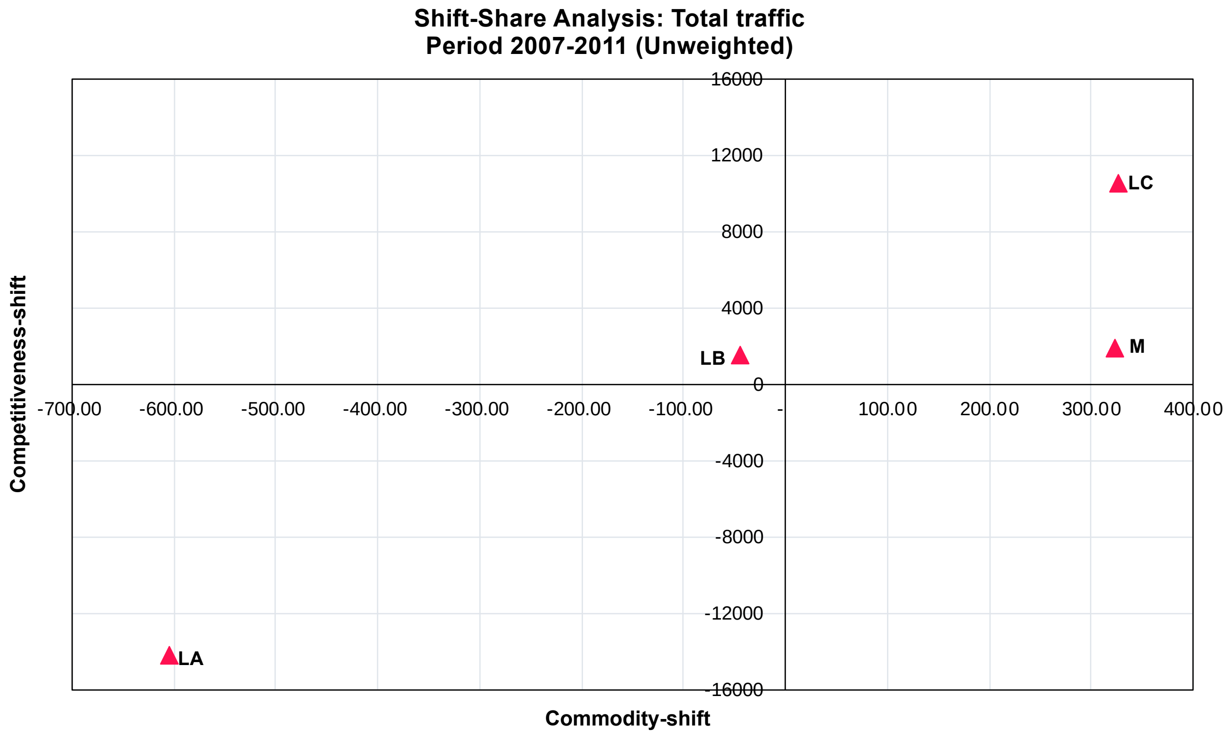

Figure 5.11 Shift-effect of total traffic in the port range (2007 – 2011)

Source: Created by the author based on port statistics, 2020.

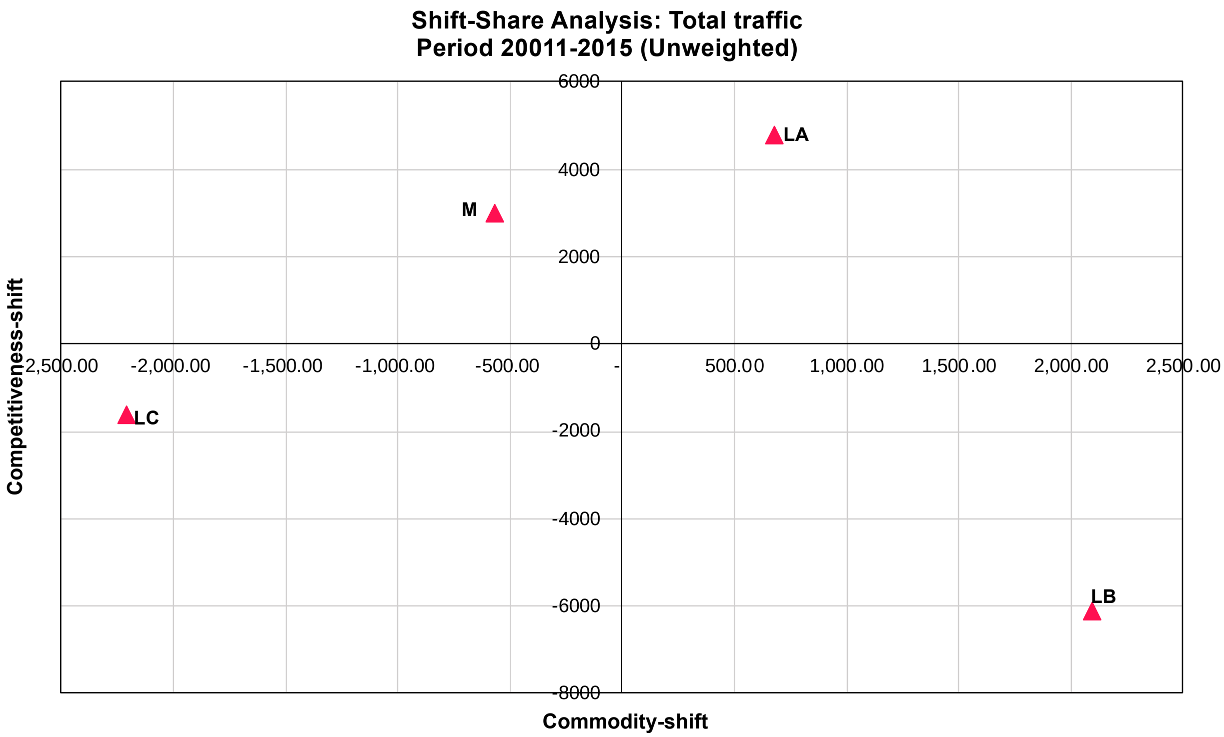

Figure 5.12 Shift-effect of total traffic in the port range (2011 – 2015)

Source: Created by the author based on port statistics, 2020.

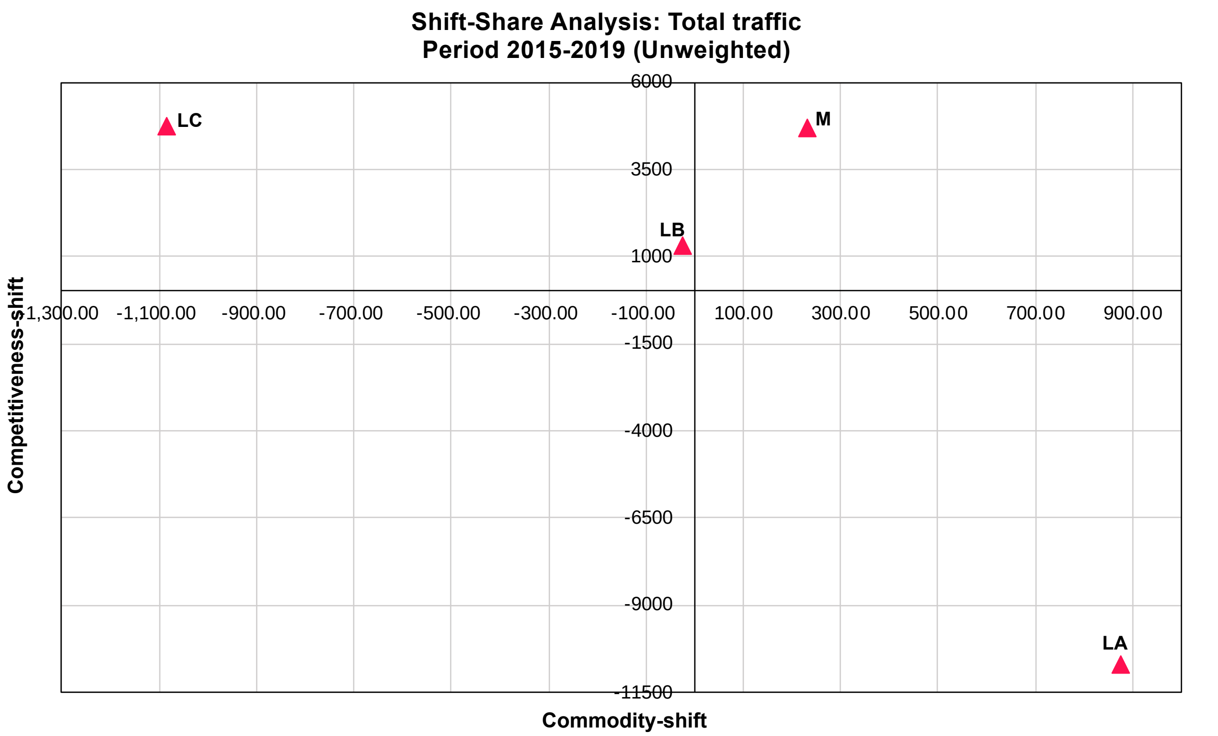

Figure 5.13 Shift-effect of total traffic in the port range (2015 – 2019)

Source: Created by the author based on port statistics, 2020.

As illustrated in **Figure 5.11** in the first period (2007 – 2011), only the ports of Manzanillo, Lázaro Cárdenas, and Long Beach registered a positive competitiveness-shift, in spite of this, for the case of Long Beach, the port was unfortunately overcompensated by a negative commodity-shift, resulting to a position in the "Joker" quadrant. On the contrary, the ports of Manzanillo and Lázaro Cárdenas were characterized by a very positive traffic structure, being the only ones recognized as "Envied Achiever" in the range for that period. The port of Los Angeles shown a combination of a negative traffic structure with a weakening competitive position, hence been classified as "Waning Idlers".

During the period 2011 – 2015, see **Figure 5.12**, the port of Los Angeles confirmed its "Envied Achiever" position, combining a positive competitiveness-shift and commodity-shift, however, Manzanillo had a negative commodity-shift, positioning itself as "Joker" within this time period. The port of Lázaro Cárdenas was radically transformed into a "Waning Idler", losing its favorable competitive position, along with a rather negative commodity-shift. On the other hand, the port of Long Beach had a positive commodity-shift, positioning itself as "Sleeping Beauty".

The latest period (2015 – 2019) considered, see **Figure 5.13**, shows some notable results regarding the competitive position and the commodity structure of seaports. Regarding the total shift, Manzanillo managed to regain its position as "Envied Achiever", characterized by a commodity-shift and competitiveness-shift quite positive compared to the previous period, indicating that it has a very favorable competitive position but still does not seem to be able to focus more on traffic categories, in order to present higher growth rates. In the same period, the port of Los Angeles lost its position as "Envied Achiever", registering an unfavorable competitiveness-shift but a positive commodity-shift, which led it to position itself as "Sleeping Beauty", losing its favorable competitive position.

Meanwhile, the ports of Lázaro Cárdenas and Long Beach were able to strengthen their competitive position to a great extent, with a favorable competitiveness-shift but a negative commodity-shift, therefore both ports were positioned as "Jokers". In spite of this, the behavior of Long Beach indicates the possibility of occupying the position as "Envied Achiever" under the condition of building a positive commodity structure.

5.2.4 Diversification Analysis Applied to the Port Range: Diversification Index

The diversification indices were calculated for the four ports considered in the range for the observation period 2007 – 2019, for total traffic. Given that the study distinguishes four categories of traffic (i.e. containers, general cargo, dry bulk, and liquid bulk), the minimum value of the index is 0.25, which indicates the highest possible level of diversification in terms of traffic volume. It should be noted that the diversification analyzes were performed on “unweighted” traffic data, in this case, a well-diversified traffic structure observed is based on absolute traffic volumes transshipped.

Table 2 Diversification Analysis Index

Year	Port of Manzanillo	Port of Lázaro Cárdenas	Port of Los Angeles	Port of Long Beach
2007	0.36	0.47	0.46	0.41
2008	0.38	0.38	0.54	0.39
2009	0.37	0.41	0.53	0.40
2010	0.38	0.40	0.54	0.40
2011	0.41	0.40	0.53	0.39
2012	0.43	0.40	0.55	0.38
2013	0.44	0.44	0.51	0.38
2014	0.46	0.40	0.52	0.39
2015	0.48	0.39	0.47	0.40
2016	0.44	0.37	0.57	0.44
2017	0.43	0.39	0.61	0.45
2018	0.43	0.37	0.64	0.46
2019	0.43	0.38	0.58	0.46

Source: Created by the author based on port statistics, 2020.

Taking into account the diversification indices of total “unweighted” traffic for 2019, the four ports do not show such a favorable diversification of port traffic. In 2019, the port of Manzanillo showed a diversification index of 0.43, Lázaro Cárdenas 0.38, Los Angeles 0.58, and Long Beach 0.46. Considering that the minimum value of the index is 0.25, it can be determined that the ports of Manzanillo, Los Angeles, and Long Beach do not show such a diversified traffic structure, on the contrary, they seem to be specialized in specific cargoes, as was already shown in the analysis of the PPA carried out in this chapter. Despite that, the diversification index of Lázaro Cárdenas seems to indicate that the port is diversifying into more than one category of traffic.

Manzanillo and Los Angeles can be considered as container ports, while Long Beach mainly specializes in containers and liquid bulk, differently, Lázaro Cárdenas specializes in dry bulk. It should be noted that all ports in the range show a fairly specialized “unweighted” traffic structure since the beginning of the observation period 2007 – 2019, their indices appear much closer to the maximum degree of specialization (index = 1), instead of the maximum possible diversification (index = 0.25). This observation is interesting because as described in **Chapter 4** of this study, the four selected ports were already recognized for having specialization in containers, therefore, at a certain point the results regarding the index diversification were to be expected.

Additionally, the evolution of diversification during the total volume within the observation period 2007 – 2019 shows interesting information, since as the years go by, the index of specialization in containers for Manzanillo shows continuous increases. On the other hand, as the years go by, the specialization index for Lázaro Cárdenas represents significant decreases, reducing its specialization in dry bulk traffic, and looking for the opportunity to increase its traffic in containers, maintaining strength in the traffic of both categories. This behavior was also reflected in the analysis of the PPA and SSA models.

5.3 Porter's Diamond Results

The purpose of carrying out a full execution of the SPA model (section 5.2) was to analyze the strategic positioning and determine the performance and evolution of the four selected ports within the four established traffic categories, in terms of market share, growth rate, and diversification. As a result, it was possible to identify the competitive position of the four ports under consideration, mainly with respect to containerized cargo. However, as mentioned in **Chapter 2**, the SPA model only measures and analyzes port competition, in other words, it only brings a general overview of the current situation of the analyzed ports, therefore it is essential to apply a second model, (i.e. a qualitative method), which analyzes the port competitiveness of each seaport, in order to understand the reason for this situation identified in the SPA model.

Given the above, in the following **section 5.3**, the results obtained from Porter's diamond model applied to each port will be illustrated, for which analysis and interpretation of the competitive advantages that each port currently present, together with their disadvantages (i.e. areas for improvement). It should be noted that in the following matrices, the sources that drive or affect the competitiveness of each seaport in the context of the container industry were illustrated in different colors.

Thereby, the **green color** represents the components that increase the competitiveness of the port (i.e. positive conditions that the port owns), the **orange color** shows the elements that drive the port's competitiveness but must be improved in a short-term period (i.e. positive factors with a tendency to be negative), the **red color** indicates the elements that affect the competitiveness of the port (i.e. factors that the port does not have and must be implemented or improved), last but not least, the **black color** points out the aspects that the port does not have or has in low quantity, but, it does not affect the competitiveness of the port in the container industry.

5.3.1 National Porter's diamond applied to the Port Sector of Manzanillo

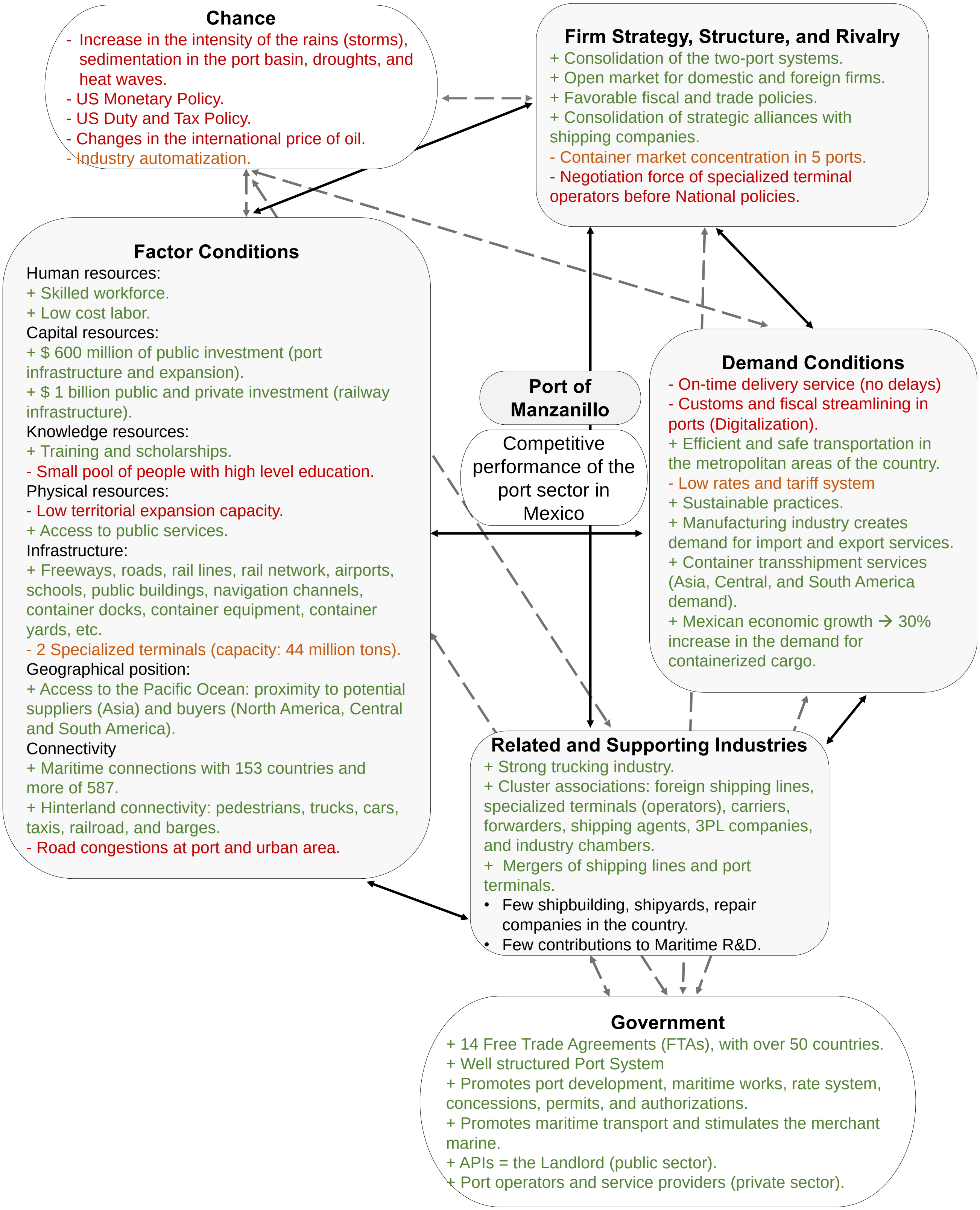

Figure 5.14 Porter's diamond of the Port of Manzanillo.
Source: Created by the author, 2020.

5.3.2 *Porter's diamond interpretation: Port of Manzanillo*

- **Factor conditions**

For the port of Manzanillo to be able to compete nationally and internationally in the port sector, particularly in the containerized cargo industry, seven factor conditions were identified, i.e. human resources, capital resources, knowledge resources, physical resources, infrastructure, geographic position, and connectivity. In Mexico, the port sector is distinguished by having a cheap[14] but qualified labor force to offer quality and efficient services (SCT, 2018). In 2018, the port of Manzanillo reported having generated 12 thousand direct jobs and 30 thousand indirect jobs only in port activities, making it one of the main economic activities of Colima. In terms of knowledge resources, in 2018, it was reported that the National Nautical Education System increased the student population to 1,766 students. Likewise, the Maritime Education Trust Fund (FIDENA) added to its study plan the master's degree in Administration of Shipping and Port Companies, in order for students and future workforce to acquire specific competence in the maritime, port, or logistics areas. Colima does not have public nautical institutions, but the local government promotes post-professional programs and training plans to attract and increase specialized professionals (SCT, 2018).

Differently, regards to capital resources, during the period 2017 – 2018, the Mexican government invested 600 million US dollars in expansion and modernization projects of the port of Manzanillo. In addition, a billion dollars were invested in public and rail infrastructure throughout the country, of which 800 million US dollars corresponded to public investment and 200 million US dollars to private investment (SCT, 2018). Manzanillo has access to public services, such as water systems, sewerage, sewage, public lighting, waste cleaning, public safety and public health. However, the port area has a very low capacity for territorial expansion, identifying it as a disadvantage. Manzanillo and its surroundings enjoy a good quality public infrastructure, with access to highways, railways, airports, schools, public buildings, navigation channels, container docks, port equipment, port yards, warehouses, and customs areas. In the meanwhile, the port's two specialized terminals have a total handling capacity of 44 million tons and 4.35 million TEUs (SCT, 2018).

[14] Minimum wage in Mexico is 123.22 Mexican pesos per hour (i.e. 5.61 US dollars per hour).

In relation to the geographical position, Mexico has access to two oceans, i.e. the Pacific and the Atlantic, and to two seas, i.e. the Caribbean and the Gulf of Mexico. It has more than 11 thousand kilometers of coastline and 102 seaports, in which 16 are administered by the Federal Government, concentrating 100% of the containerized cargo and 80% of the commercial cargo (SCT, 2018). The location of the port of Manzanillo gives it a strategic and competitive proximity to potential suppliers (Asia) and buyers (North, Central and South America). Last but not least, the port of Manzanillo has hinterland connectivity by sea, road and rail, despite this, a high traffic congestion is identified to enter and leave the port area and urban zones since trucks and vehicles must drive the entire city to access the port, causing delays. The disadvantage is urban saturation, which limits the possibilities for road expansion (Carranza, 2018).

- **Demand conditions**

According to API Manzanillo, in the long term, the growth of the Mexican economy is projected to be quite favorable, expecting an increment in the demand for container traffic, minerals, crude oil, and others. Manzanillo's domestic market consists mainly of iron ore traffic (i.e. dry bulk) and container transshipments. The exchange of goods from Southeast Asia, specifically from China, Japan, and South Korea, represent a high percentage of the total volume of containers handled in the port, thus being its main commercial partners (API Manzanillo, 2014d). Buyers' requirements are characterized by efficient port and customs operations, with low port fees, and on-time services. In the container market, it is observed that the port of Manzanillo lacks certain standards demanded by domestic and foreign consumers, reporting delays in administrative procedures and inspections, insufficient coordination between customs authorities, and road congestion, all of this affecting the competitiveness of the port (SCT, 2008c).

Despite these areas for improvement, Manzanillo is recognized for offering the lowest and most competitive port fees in Latin America. Nevertheless, in terms of tariffs for port infrastructure use, API Manzanillo together with the rest of the Mexican ports must adopt a new productivity rate scheme, in order to promote the arrival of certain vessels and cargo, such as container ships, Ro-Ro, bulk carriers, cruise ships, etc. (SCT, 2018). Respect to sustainability, the port does not generate a harmful impact on the environment or the community, distinguishing itself by the correct monitoring of environmental regulations (SCT, 2008c).

- **Related and supporting industries**

The Mexican port system has commercial relationships with foreign firms, such as shipping lines, carriers, port operators, freight forwarders, ship agents, etc. In spite of this, overland transportation is one of the strongest industries in the country, registering 1,099,371 trucks and 154,306 trucking companies (API Manzanillo, 2014d). Besides, Mexico has strong support in the port sector by national associations, organizations, and chambers, such as ANTP, COMCE, CANACAR, AMANAC, ATOP, and AMTI. Their main functions include legal advice, promotion of national and international trade, protection of the interests of members, dialogue with authorities, promotion of the harmonious and orderly development of the maritime industry. Regards the construction, modernization, and maintenance of vessels, Mexico is not considered specialized, nowadays, it only has been registered five builders and shipyards, five naval repair centers, six support groups for afloat units, and three general workshops. Additionally, the Sectorial Fund for Research and Development in Naval Sciences (FSIDCN) is the only institute in charge of R&D of the maritime sector (SCT, 2016).

- **Firm's strategy, structure, and rivalry**

The maritime sector in Mexico is not characterized by extreme competition or monopolistic activities between national ports. On the contrary, since 2018, efforts have been made to consolidate the port systems of the Gulf of Mexico and the Pacific Ocean, to strengthen ports as the strongest link in the logistics chains (SCT, 2018). Notwithstanding, the port system categorizes its maritime ports as commercial, industrial, tourist or fishing, differentiating them from one another. As a consequence, a concentration of the container market is observed in only five ports in the country, which has favored Manzanillo competitive position, classifying it as the main Mexican port in the container traffic of the Pacific coast (SCT, 2008c).

Meanwhile, the SCT assures that Mexico has an open market for national and foreign transport and logistics companies. Shipping line companies that work formally with Mexico have stood out for alliances and mergers with port terminals, promoting the development of better private infrastructure (SCT, 2016). As a result, the port industry has been oriented towards the growth of the private sector, characterized by having an attractive regulatory and commercial environment (SCT, 2018). In the case of Manzanillo, the port has stood out for being more competitive and attractive in container traffic compared to Lázaro Cárdenas, showing better links with multimodal transport, greater operating financial situations, and lower port fees. Additionally, each API has rights granted by national policies to negotiate promotional rates with different container terminal companies, in order to win concessions and obtain greater benefits (SCT, 2008c).

- **The government**

The government plays a favorable role in the port sector, directly benefiting the country's competitiveness within the containerized cargo industry. One of the main competitive advantages is the 14 Free Trade Agreements (FTAs) that allow Mexico to have commercial relations with more than 50 countries, and access to more than 60% of the world's gross domestic product (Cortés Pérez, 2016). The port sector is managed by the General Coordination of Ports and Merchant Marine[15] (CGPyMM), a federative entity in charge of promoting maritime transport and the merchant marine. The CGPyMM is made up of the General Direction of Ports[16] (authority in the country's ports responsible for port development, maritime works, tariff system, concessions, permits, and authorizations), the Merchant Navy Administration[17] (in charge of promoting maritime transport and stimulating the merchant marine), and the General Direction of Port and Administration Development of the General Ports Liaison and Mercantile Marine[18] (responsible for promoting the development of the national port system, promoting the efficiency, and profitability of the 16 APIs[19]) (Cortés Pérez, 2016). Among other competitive advantages, API acts as a landlord port authority, responsible for asset management and commercial relations, while all specialized infrastructure, port services, port terminals and innovative developments are controlled by the private sector (Cortés Pérez, 2016).

- **The chance**

Chances events that can affect Mexico's competitive position, especially to the port of Manzanillo in the context of the container industry, are events outside the control of the government, such as the increase in the intensity of rains (causing flooding in internal connections on highways and railways), increased sedimentation in the port basin (causing damage to infrastructure and port equipment). Likewise, the US Monetary Policy, the US Duty and Tax Policy, changes in the international price of oil, or even automation in port terminals (technological advances).

15 Coordinación General de Puertos y Marina Mercante.
16 Dirección General de Puertos.
17 Dirección General de Marina Mercante.
18 Dirección General de Fomento y Administración Portuaria.
19 Administración Portuaria Integral.

5.3.3 National Porter's diamond applied to the Port Sector of Lázaro Cárdenas

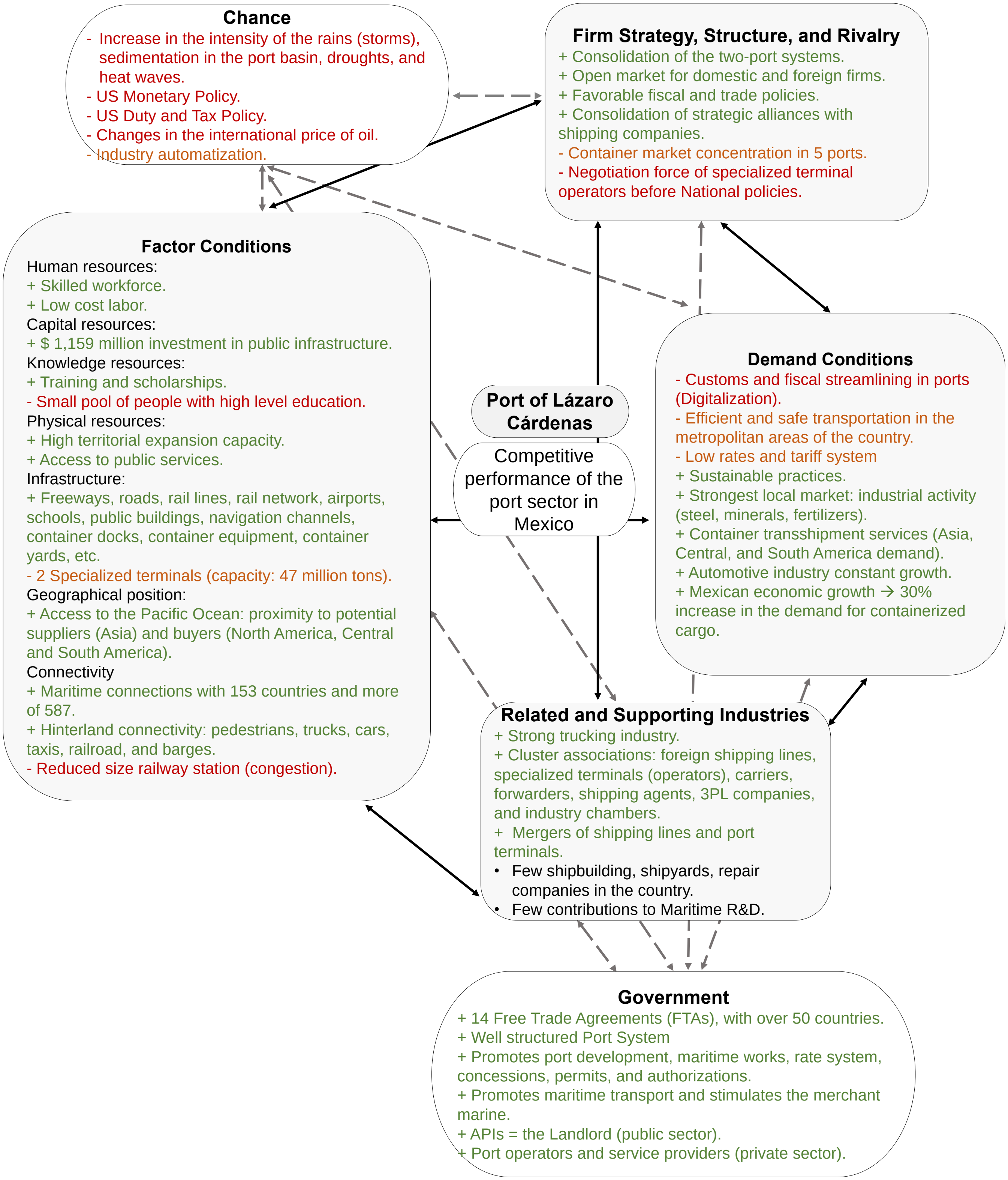

Figure 5.15 Porter's diamond of the Port of Lázaro Cárdenas.

Source: Created by the author, 2020.

5.3.4 *Porter's diamond interpretation: Port of Lázaro Cárdenas*

In the case of Lázaro Cárdenas, the elements that the port owns to compete in the port sector, especially in the container industry, are mostly the same as for the port of Manzanillo. The main reason is due to the fact that Porter's diamond model was implemented at the national level (i.e. Mexico), consequently, many competitive advantages identified for the port of Manzanillo also apply for the port of Lázaro Cárdenas, despite that, some differences were identified, which will be described below.

- **Factor conditions**

Mexico is characterized by having a cheap labor force compared to developed countries; nonetheless, this has not limited the port of Lázaro Cárdenas from having a trained and expert workforce to offer quality services. In 2018, the port generated 32 thousand direct and indirect jobs, identifying the maritime sector as one of the main sources of the Michoacán economy. Regarding knowledge resources, Lázaro Cárdenas does not have Mercantile Nautical institutions established in the state, but the local government is committed to promoting post-professional programs and training for high-level education (SCT, 2018).

In terms of capital resources, during the period 2014 – 2018, the Mexican government invested 1,159 million US dollars in expansion and modernization projects in the port of Lázaro Cárdenas and the urban area of the state of Michoacán. As a result, 75% of the local population benefited, modernizing roads, tunnels, bridges, rural areas, and equipment of specialized terminals in containers and dry bulk (SCT, 2018). Similarly, Lázaro Cárdenas has access to public services, such as water systems, sewerage, wastewater, public lighting, waste cleaning, public safety, and public health. Unlike Manzanillo, the port of Lázaro Cárdenas has a high capacity for territorial expansion. Lázaro Cárdenas joys good conditions of public infrastructure, such as highways, railways, airports, schools, public buildings, navigation channels, container docks, port equipment, and port yards. In the meantime, the port's two specialized terminals have a total handling capacity of 47 million tons (SCT, 2018).

The geographical location of the port Lázaro Cárdenas also allows it to have competitive advantages and proximity to potential suppliers (Asia) and buyers (North, Central, and South America). However, in terms of hinterland connectivity, the KCSM railway station 16 kilometers from the customs/exit of the port is small in size, which generates a high level of congestion and bottlenecks. The urban zones also present traffic conflicts with the railway crossing (Carranza, 2018).

- **Demand conditions**

Lázaro Cárdenas's domestic market is mainly made up of iron ore and sulfur traffic (i.e. dry bulk) and the handling of containers and general cargo. Additionally, the port is considered a logistics platform for the diversification of the country's foreign trade, generating increases in trade routes with Asia, North America, Central and South America. The port's domestic market demands high-quality, safe and low-cost services, nevertheless, the port fees in Lázaro Cárdenas are higher than in Manzanillo. Moreover, some areas of the state do not have sufficient road safety, which puts the distribution of high-value cargo at risk (API Lázaro Cárdenas, 2014).

Pursuant to API Lázaro Cárdenas, in the long term, the automotive and container industry is expected to show an increment, detecting these markets as an area of opportunity. For the reason that the Mexican economy has expectations of accelerated growth, the port forecasts a growth of 3.5% of GDP, which will increase the country's exports and commercial activities of the port (API Lázaro Cárdenas, 2014).

- **Related and supporting industries**

The national associations, organizations and chambers grant the same benefits to the port of Lázaro Cárdenas, in commercial, legal, and security aspects. The port has a large cluster of companies of the maritime sector, which strengthens the competitiveness of the port, companies such as truckers, shippers, carriers, terminal operators, engineers, construction firms, freight forwarders, equipment suppliers, ship agents, insurance agencies, logistics solution firms, and storage facilities (APILAC, 2016).

- **Firm's strategy, structure, and rivalry**

The Mexican port system has laws and regulations to avoid monopolistic practices, as a result, seaports present healthy competition in the handling of different cargoes (SCT, 2018). In spite of this, the volume handled by the ports of Manzanillo and Lázaro Cárdenas together represents 94.8% of the total container traffic on the Pacific coast (API Lázaro Cárdenas, 2014). On the other hand, the consolidation of the port systems of the Gulf of Mexico and the Pacific Ocean gives competitive advantages to the port of Lázaro Cárdenas, expecting growth in the volume of traffic cargo. Mexico offers a commercial environment with low entry barriers for national and international companies. Similarly, the consolidation of strategic alliances between shipping lines and port operators have increased the attraction of new and more foreign firm to the country (SCT, 2018).

- **The government**

The role of the government is the same for all ports in Mexico, which makes it possible to establish that the port of Lázaro Cárdenas enjoys the same advantages as Manzanillo. The Mexican government's vision is the strategic development of port infrastructure, with the objective of promoting better services and connectivity within and outside the country. Similarly, to increase the productivity and competitiveness of all the country's seaports. In order to achieve it, the Mexican government is committed to investing in infrastructure and logistics platforms, allowing the distribution of national goods at a lower cost (SCT, 2018).

- **The chance**

Climate change is one of the main aspects that affect the competitiveness of the port of Lázaro Cárdenas, it has been reported that the intensification of storms and hurricanes cause negative impacts on trade and damage to port infrastructure. Differently, a change in foreign direct investment in Mexico would affect the development of the port and transportation sector, some of the reasons would be caused by political changes in the United States. Additionally, the imposition of import tariffs by the United States are events that directly affect Mexico's trade, since almost 80% of Mexican exports are destined to North America. From another point of view, a trade war between the United States and China could generate negative effects in Mexico, for the simple reason of being two nations with a strong commercial exchange, causing instability between the economies.

5.3.5 *Regional Porter's diamond applied to the Port Sector of Los Angeles*

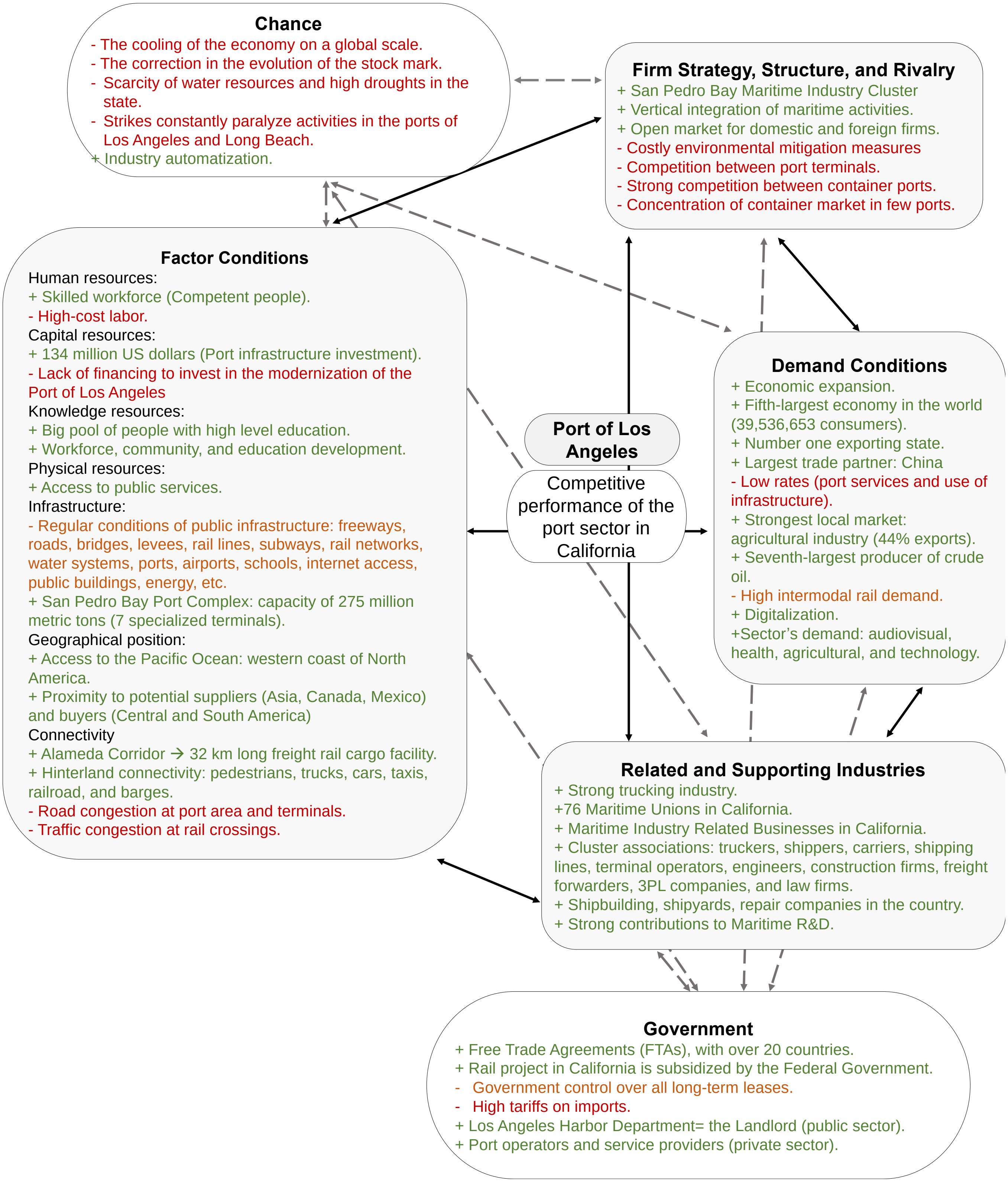

Figure 5.16 Porter's diamond of the Port of Los Angeles.

Source: Created by the author, 2020.

5.3.6 *Porter's diamond interpretation: Port of Los Angeles*

- **Factor conditions**

California along with the port of Los Angeles have quite important factor conditions, which have allowed them to compete and stand out in the port sector, particularly in the container segment. California is considered the fifth largest economy in the world, recognized for having a costly[20] but competent and specialized workforce. Nowadays, the port of Los Angeles has generated 150,000 jobs within the port area and 529,000 jobs in counties near the port, similarly, nationwide it has generated a total of 1.6 million jobs. Consequently, California has 1,767 labor unions, with around 2,504,000 members (Port of Los Angeles, 2019a).

In reference to capital resources, California has federal funding programs for the development and modernization of ports. Since 2009, the Transportation Investment Generating Economic Recovery (TIGER) program has invested 829 million US dollars for port infrastructure projects, of which 134 million US dollars were awarded to California ports. Because California handles 38% of the national volume of containers, urban public infrastructure requires constant maintenance and modernization, however, according to the American Society of Civil Engineers (ASCE) report, the California government does not have sufficient funds to perform the necessary maintenance on public and port infrastructure. At the moment, the Port of Los Angeles requires an investment of 2 billion US dollars (ASCE, 2019).

Similarly, the maritime sector is one of the economic sources of the state, thus being one of the industries with high knowledge resources. In California, about 38 educational institutions promote high-level education for specialization in ports, international business, and logistics, identifying this one of the competitive advantages of the port of Los Angeles. Moreover, California has access to public infrastructure and physical resources such as airports, ports, roads, highways, railways, bridges, tunnels, schools, water systems, wastewater, public lighting, energy, parks and recreational areas, telecommunications, etc. Nevertheless, due to the rapid growth of its population, California's infrastructure is reported to be in mediocre conditions and requires immediate attention. Pursuant to ASCE, mediocre conditions mean public infrastructure in regular conditions, showing signs of deterioration and deficiencies in functionality (ASCE, 2019).

[20] California minimum wage of 12.00 US dollars per hour.

Despite the downsides, the San Pedro Bay port complex (which includes the Los Angeles Long Beach ports) generates a tremendous economic impact, with a total handling capacity of 275 million metric tons (Port of Los Angeles, 2020a). One of the competitive advantages that has allowed it to be recognized as the largest commercial gateway in North America in terms of container volume is due to its geographic location. In other words, California enjoys great benefits as it is located on the edge of the Pacific Ocean on the western coast of North America, with strategic proximity to potential suppliers (Asia) and buyers (Canada, Mexico, Central, and South America) (Port of Los Angeles, 2019a).

Regarding the hinterland connectivity, the state has the necessary infrastructure to connect and distribute goods by rail, road, or sea. The Alameda Corridor is the long freight rail cargo facility, that connects the transcontinental rail lines near downtown Los Angeles, to the ports of Long Beach and Los Angeles. This intermodal railroad has improved the efficiency of containerized cargo transportation from the two ports to the national rail system, being recognized as one of California's most competitive advantages (Merk and Notteboom, 2015).

The appointment system in the specialized terminals of the port of Los Angeles is considered to be ineffective. According to Merk and Notteboom (2015), most terminal operators do not have effective operating strategies, i.e. in many cases, truckers do not have pick-up or delivery appointments, which generates bottlenecks and congestion inside and outside the port area. Similarly, the railway system also presents congestion due to the high demand for container traffic. On the other hand, Los Angeles is one of the ports with the most negative impact on the environment (Merk and Notteboom, 2015).

- **Demand conditions**

In accordance with the commercial and economic projections of Los Angeles, the total volume handled by the port will have high long-term growth, therefore, in 2030 a high and growing demand for containers, dry bulk, liquid bulk, and general cargo is projected. Despite this, according to the Port of Los Angeles Master Plan, the determinants that control the demand for cargo volumes depend on the individual requirements of each commercial route, in conjunction with the development of the global industry, thus forecasts have a tendency to change (Puerto de Los Angeles, 2018a).

Similarly, California has a notable economic expansion, positioning itself as the number one state exporter of agricultural products, crude oil, and manufactured products. Hence, the imports and exports through the port of Los Angeles will once again be driven by the growth in demand for end-use products, by Asia, Canada, and Mexico (Port of Los Angeles, 2018a). Consequently, containerized trade with China is projected to remain the largest and fastest-growing segment over the period 2020 – 2030. Containers from Southeast Asia will become the second-largest source of imports for California and the United States. While US exports to Japan will increase at a lower volume (Port of Los Angeles, 2018a).

Differently, regarding the price and quality of the services offered by the port of Los Angeles, it can be argued that they are not competitive enough in comparison to the Mexican ports. Most California's ports, especially Los Angeles and Long Beach, are known for having high intermodal rail fees, expensive port and infrastructure fees, high cargo handling fees, and expensive leasing fees. However, the Port Master Plan establishes that it has been projected that port fees will be more expensive than normal, this due to the automation of specialized container terminals and the high costs of the maritime intermodal transport system (Port of Los Angeles, 2018a).

- **Related and supporting industries**

California has a large number of businesses related to the maritime industry, which has directly benefited the competitiveness of the port of Los Angeles in the container market. In this way, the supply chain of the port of Los Angeles is made up of different types of entities, companies, resources, technology, and activities essential to offer quality services to the end consumer, among them are shipping lines, trucking companies, carriers, equipment suppliers, ship agents, legal services, insurance agencies, logistics companies, rail operators, terminal operators, engineers, and storage facilities (Port of Los Angeles, 2020d).

- **Firm's strategy, structure, and rivalry**

The ports of Los Angeles and Long Beach are classified as the two main gateways of containerized imports from Asia, propelling the local and national economy. Nevertheless, the container industry presents continuous and dynamic global competition, which has generated negative impacts on these two ports. Consequently, Los Angeles is currently facing strong competition from the East Coast and Gulf Coast ports (Nacht, Henry and Martin, 2019).

Despite the fact that the San Pedro Bay is a maritime industry cluster that promotes competitive and commercial advantages, the global rivalry has placed the Californian ports in an uncertain position. For the reason that the port of Los Angeles and Long Beach are subject to environmental regulations in order to reduce emissions, the cost of complying with these measures is quite high, rising the costs of handling goods through these ports. In some cases, terminal operators may not be able to absorb the costs, creating competitive pressures for participation in the container market (Nacht, Henry and Martin, 2019).

- **The government**

The United States government plays a critical role in the port sector. Among the competitive advantages, the various existing FTAs with 20 countries stand out. As a result, exports of goods from California to its trading partners have increased by 80% (Office of the United States Trade Representative, 2019). On the other hand, the Board of Harbor Commissioners plays the role of landlord port authority, being responsible for leasing properties to tenants who operate their own facilities and terminals (i.e. private sector). In spite of this, all long-term leases and any agreement of more than 3 years or more than 150,000 US dollars require approval from the Los Angeles City Council, which can make processes slow and difficult (Port of Los Angeles, 2018a).

- **The chance**

For the growth of international trade in California and the port of Los Angeles to present a positive long-term trajectory, it is necessary to consider the liberalization of world trade through mechanisms such as the World Trade Organization. Despite this, there are still tariff and non-tariff barriers by trade partners of the United States. These are some of the chance events that are believed to have positive or negative impacts on the port industry (Port of Los Angeles, 2018a). Besides, in the case of California, climate changes have caused negative impacts, such as the scarcity of water resources and high droughts, provoking fires in the state. Additionally, labor union strikes have constantly paralyzed activities at the ports of Los Angeles and Long Beach. In term of technology and innovative advances, it is considered that the port of Los Angeles has known how to adapt activities and machinery to automate its container terminals (Port of Los Angeles, 2018a).

5.3.7 Regional Porter's diamond applied to the Port Sector of Long Beach

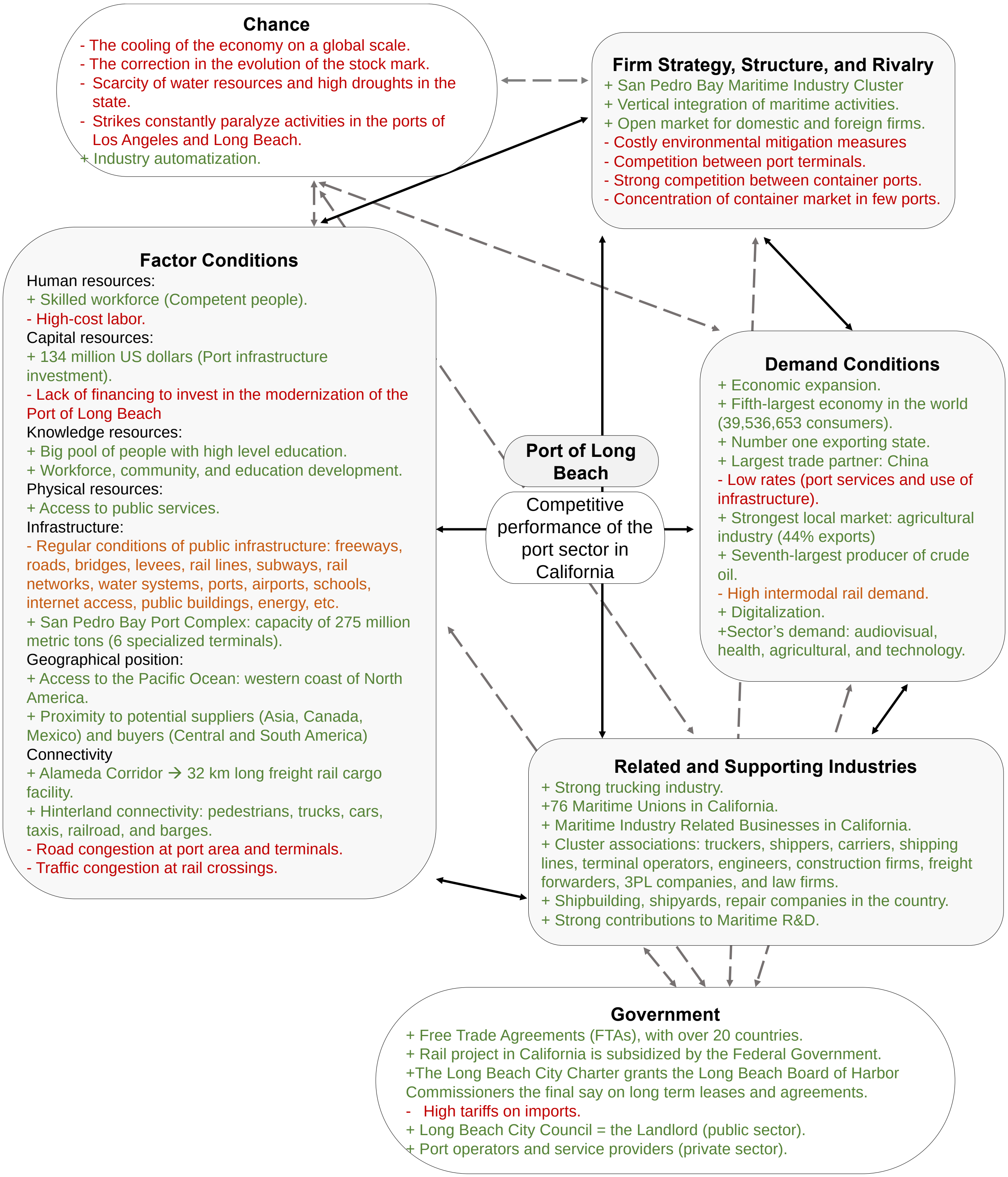

Figure 5.17 Porter's diamond of the Port of Long Beach.

Source: Created by the author, 2020.

5.3.8 *Porter's diamond interpretation: Port of Long Beach*

Practically the elements that drive or affect the competitiveness of the port of Long Beach in the port sector, mainly in the container industry, are mostly the same as for the port of Los Angeles. There are two reasons, firstly it is due to the great geographic proximity between these two ports, hence certain factors appear to be the same, and secondly, it is due to the fact that Porter's diamond model was implemented at a regional level (i.e. California). Despite the similarities, the forecasted demand for the port of Long Beach is slightly different than for Los Angeles, which will be described below.

- **Factor conditions**

The port of Long Beach workforce has fueled economic growth in the region. Similarly, since it is the second-busiest container seaport in the United States, port activity has generated 51,090 direct jobs. Port-related jobs have increased by 70% since 2004, mainly due to increased cargo volume, generating jobs such as dock workers, crane operators, maintenance workers, entrepreneurs, engineers, and technology specialists of the port information (Port of Long Beach, 2019). Under other conditions, the port's Community Assistance Program aims to reduce the impacts of the port activities in the city, by investing in projects to minimize impacts in relation to air, noise, water, and traffic (Port of Long Beach, 2020b).

Respect physical resources and infrastructure, the port of Long Beach points out that the rail network and intermodal facilities require public and private investment for expansion and modernization, allowing it to adapt to future volumes of intermodal cargo. Additionally, channels, turning basins, berths, and wharves also require extensions, reconfigurations, and modernization to ensure the safe operation of ultra-large container ships (Port of Long Beach, 2020b). Among the benefits of improving the quality of rail facilities is the reduction of traffic and truck congestion, increasing the speed of containerized cargo moving through rail facilities. The port of Long Beach states that the main reason for road congestion and bottlenecks is caused by the thousands of trucks that transit in and out of the port terminals. Improving the flow of truck traffic is a priority for this port, along with reducing emissions and negative impacts on the port's ecosystem and community (Port of Long Beach, 2020b).

♦ **Demand conditions**

In order to supply the growing demand for cargo traffic such as containers, liquid bulk, dry bulk, Ro-Ro, and general cargo, the port of Long Beach must ensure and guarantee that its existing specialized terminals offer the correct and efficient operations. Like Los Angeles, this port identifies that the increase in the US population and the growth of demand in the markets of Southeast Asia, exert competitive pressures, both in installed capacity, carriers, change of commercial routes, and low and competitive prices (Port of Long Beach, 2020b).

Additionally, the forecast for demand growth at the ports of Long Beach and Los Angeles represents a 4% annual growth rate in container traffic, with 98% of container throughput coming from international sources. Given the above, the port of Long Beach ensures that its container handling capacity is approximately 13.6 million TEUs, having enough installed capacity to meet the projected demand. However, the port indicates that it needs to expand the capacity of its container yards, to generate better performance and productivity (Port of Long Beach, 2020b).

♦ **Related and supporting industries**

The port of Long Beach notes that an industrial cluster is a geographic concentration of interconnected companies, suppliers, associations, and institutions in a particular field (i.e. port sector), sharing infrastructure, labor markets, and services, in order to gain competitive advantages. For this reason, Long Beach has constantly worked to expand its variety of commercial relationships with different national and foreign companies. However, the trucking industry has stood out from the rest, reporting 136,950 registered trucking companies in California (Fields and Hacegaba, 2013).

Furthermore, the port of Long Beach claims to have the capacity to handle containerized cargo or other types of cargo, under the support of commercial providers such as truckers, shippers, carriers, terminal operators, rail companies, shipping lines, ship agents, maritime labor unions, commercial chambers, freight forwarders, legal services, ship finance agents, etc. (Fields and Hacegaba, 2013).

♦ **Firm’s strategy, structure, and rivalry**

The port of Long Beach handles imports and exports from more than 150 countries, despite this, the ports located in the different countries of the Pacific Rim have stood out as new and potential competitors for this port. The factors behind this trend are due to the growth of world trade, the introduction of ultra-large container ships, and the same productivity of the port and its intermodal service providers (Port of Long Beach, 2020b). Strong competition with its neighbor, the port of Los Angeles, and the West Coast ports and even ports on the U.S. East and Gulf coasts, are actors that directly affect the future growth of cargo volumes through the port of Long Beach. The reality is that the port of Long Beach only handles 45% of the total cargo that is handled through the San Pedro Bay port complex. As a result, the port's participation in the container market varies every year, which makes it difficult to ensure a competitive position in terms of volumes (Port of Long Beach, 2020b). On the other hand, the port argues that future competition in the container market will come from foreign ports, which shows that since 2006 a large part of the containers is diverted to more efficient ports with a lower level of congestion (Port of Long Beach, 2020b).

- **The government**

The Long Beach General Plan is a policy document that determines the goals, policies, and directions the City must follow, implying that any decision will affect or benefit the port of Long Beach. Moreover, the General Plan is concerned with the good use of land, transportation, housing, conservation, noise, open space, and security (Port of Long Beach, 2020b). Additionally, Long Beach continuously participates in regional planning of the Southern California Association of Governments, the entity responsible for developing regional approaches to growth management, transportation solutions, and economic development (Port of Long Beach, 2020b). Differently, most of the land in the Long Beach Harbor District is owned by the port, while few hectares within the port area are privately owned or leased by the Federal Government. Despite this, the port does not directly operate the cargo handling facilities but is responsible for leasing the land to private companies dedicated to the movement of goods, terminal operations, tugboats, and distribution (Port of Long Beach, 2020b).

- **The chance**

Changes in the world economy and trade policy, technological advances, and automation developments are the main chance events that the port of Long Beach identifies as factors that could affect the port's competitiveness. Likewise, it remarks that the evolution of the size and capacity of container ships is a consequence of technological changes, forcing ports to increase installed capacity and expand port territory, actions that imply high investments and time (Port of Long Beach, 2020b).

6 Discussion of the Results

6.1 Introduction

This chapter is intended to present an in-depth discussion on Manzanillo's competitive position and competitiveness vis-à-vis its competitors, namely the ports of Lázaro Cárdenas, Los Angeles, and Long Beach. The SPA model analyzed the first competitive level proposed by Haezendonck (2001), i.e. it analyzed the **inter-port competition on a port authority level.** Thereby, the PPA, SSA, and PDA tools were used to analyze the competition between the four seaports mention above, where their port authorities primarily pursue to increase the competitive position of their seaports by providing adequate infrastructure or attracting public investment, optimizing working conditions, and preventing monopoly activities.

While Porter's diamond model analyzed two levels of competition proposed by Haezendonck (2001), i.e. an **inter-port competition on a port authority level** and an **inter-port competition at the commodity level** (categorized as the second level of competition), where port users from different seaports compete to increase their market share, i.e. to lead the traffic of containerized cargo.

6.2 SPA discussion: Port Competition

In **Chapter 5**, the SPA tool was carried out, providing indications of the general competitive position and evolution of the ports of Manzanillo, Lázaro Cárdenas, Los Angeles, and Long Beach, within the traffic categories of containers, general cargo, dry bulk, and liquid bulk. According to Haezendonck et al. (2006), the term "competitive" is relevant, since this instrument provides an evaluation of the comparative positioning of the four seaports. By integrating several tools within the same model, i.e. PPA, SSA, and PDA, it allows an integrative description of the competitive position of the individual ports, as well as the evolution of their position during the eleven years of the period of observation.

This section aims to discuss the competitive position of the port of Manzanillo within the container traffic category, vis-à-vis its three competitors. The author decided to focus specifically on Manzanillo since the main objective of this research is to identify the strategic position of this port. In general terms, the PPA results indicate that most of the time in the category of container traffic, the port of Manzanillo has been positioned as **"High Potential"**, which means that the port has a low market share but high growth rates. Hereby**, Manzanillo can be classified as an individual port with a high potential in the container industry.** In this sense, growth rates are an observable phenomenon over time, giving the probability that the market share will also grow, positioning the port as “Star Performer”. It can be stated, that the port of Manzanillo within the category of container traffic could reach high market share and high growth rates in the coming years.

More in detail, level 1 of the PPA verifies that the port of Manzanillo has a lower market share for total traffic compared to the big players, i.e. Los Angeles and Long Beach, despite that, its average annual growth rate is quite favorable (4.24%), which gives it the advantage of continuing to grow and increase its market share in the future. Following this, level 2 of the PPA confirms that within the four categories of traffic (i.e. container, general cargo, dry bulk, and liquid bulk), the containers are the category with the highest market share of the port, as well as the commodity with the highest average annual growth rate. Concluding that the **port of Manzanillo has positive commercial behavior and strategic position.**

Additionally, level 3 of the PPA indicates that **Manzanillo’s competitive position within total container traffic is favorable** compared to its competitors. Its average market share is close to the average (17.11%) and its average annual growth rate (5.73%) is fairly positive but lower than its national competitor, i.e. Lázaro Cárdenas (16.90%). Furthermore, Manzanillo’s growth potential is positive, but the strong competition with Los Angeles and Long Beach is present. However, given that level 4 of the PPA analyzes the share of containers within the port of Manzanillo rather than the category’s share of the range, on this occasion Manzanillo plays an important role worldwide, positioning itself as a **“Star Performer”**, this means that the port has a high market share and high growth rates in container traffic, which strongly **boosts its competitive position.** Therefore, it can be established that **containers are the most competitive traffic category for the port.** It is important to note that Manzanillo has an encouraging competitive position, but a lower volume of traffic compared to the ports of Los Angeles and Long Beach. Despite this, its participation in the **container market is 58.92% of the total traffic volume.**

The dynamic portfolio analysis showed the evolution of the four maritime ports within a period of eleven years observed. In terms of the total traffic of the four cargo categories, **Manzanillo presents a positive evolution, increasing its market share over the years**, nevertheless, the results illustrate that it remains to be a developing port, presenting the potential to achieve long-term sustainability. Similarly, compared to the ports of Los Angeles or Long Beach, **Manzanillo has not yet reached to stand out in the same level of global competition** as them, despite that, at the national level, Manzanillo distinguishes itself. Regarding container traffic, Manzanillo plays an important role globally, positioning itself once again as “High Potential”, i.e. with a small market share, but a positive average annual growth rate, boosting its competitive position.

On the other hand, taking into account the methodology described in **Chapter 3** and the results illustrated in **Chapter 5**, it is possible to state that during two observation periods of the SSA i.e. 2007 – 2011 and 2015 – 2019, the port of Manzanillo presented a positive commodity-shift, which reflects that **Manzanillo is specialized in the fastest growing traffic categories, i.e. container.** In like manner, the port has developed a **favorable traffic structure** during those two periods. Nonetheless, in the period 2011 – 2015, it presented a negative commodity-shift, which reflects an unfavorable traffic structure for this port. Despite that, during the three periods, Manzanillo presented a positive competitiveness-shift, which implies that the port did better than expected. **It can be argued, that Manzanillo outperformed its rivals in the traffic containers.** Hereby, it can be concluded that the port Manzanillo has an overall improvement in the port's market share in different traffic categories.

Last but not least, based on the diversification indices of the port of Manzanillo, it can be mentioned that **the port has a strong degree of concentration in containers**, but that does not take away the opportunity to diversify its portfolio in the other three categories, i.e. general cargo, dry bulk, and liquid bulk. Since Manzanillo is cataloged as the port container leader in the Pacific coast of Mexico, gives the justification that its **traffic structure is dominated by one specific traffic category, i.e. containers**. However, it is interesting to note that Los Angeles and Long Beach are also ports with a strong degree of concentration in containers, but surprisingly the port of Lázaro Cárdenas has a lower diversification index, which reflects the balance in volume among traffic categories.

6.3 Porter's diamond discussion: Port Competitiveness

As defined in **Chapter 2**, competition requires competitiveness, which means that, under conditions of global competition within the container market, ports must be competitive vis-à-vis their rivals. Therefore, as Goss (1990) asserts, the main economic function of a port is to benefit those whose trade passes through it. This means that for their proper operations, ports must have three fundamental elements: maritime access, good-handling capacity, and distributive capacity (Meersman, Van de Voorde and Vanelslander, 2010).

Likewise, as Porter (1990) points out, productivity is the main factor of international competitiveness, which consists merely of the skills of workers, the development of technologies, the production of quality products, and the reduction of costs (Porter, 1998, p. 5 – 7). When analyzing Porter's diamond at the national level, it is determined that **Manzanillo is a dynamic, functional, and productive port for handling containers** and other types of commodities, however, there are operational aspects that must be improved, such as road congestion in entry and exit from the port and urban areas, delays in administrative procedures and inspections, insufficient coordination between customs authorities, and territorial limits of port expansion. If these problems are not improved, the international competitiveness of the port will be drastically affected.

Additionally, Heaver (1995) argues that terminals are also the main aspects of a competitive strategy, i.e. port competition involves mainly competition for trades, with terminals as competing physical units, transport concerns and industrial companies as chain representatives of the respective trades (Notteboom and Yim Yap, 2012). Taking into account the above, it can be established that Manzanillo has sufficient companies and networks of suppliers and distributors that cooperate with the port industry and support it in international competition. Despite that, the **disadvantages prevail in operational terms and inefficient hinterland connectivity**. On the other hand, if the port of Manzanillo wants to face the growing demand for containers, it must also work on expansion, modernization, and maintenance projects of its container terminals and private infrastructure, since compared to its American competitors, Manzanillo only has two terminals capable of handling containers, while Los Angles and Long Beach together have 15 terminals.

The previous analysis allows the researcher to conclude that the competitive position of a port is determined by its competitive offer of services, connectivity, and infrastructure. While the competitiveness of the port is determined by the range of competitive advantages that the port acquires or creates over time (Haezendonck and Notteboom, 2002). Therefore, the author concludes that the competitive position of the port of Manzanillo is directly related to its market share, i.e. the strategic position that the port has acquired is through its containerized cargo flows and other commodities, in spite of this, increasing its competitiveness in the global market will allow to the port to improve its strategic position globally.

In other words, the factors that strengthen the competitiveness of the port of Manzanillo are mainly the factor conditions, the related and supporting industries, the firm’s strategy, structure, and rivalry, and the role of the government. While the elements of demand conditions, i.e. the requirements of buyers in terms of quality, price, and services in the container industry, have not yet been fully met since certain operational aspects show to be Manzanillo's competitive disadvantages.

Hereby, it is concluded that the competitive advantages that the port of Manzanillo has are mainly its geographical position on the Pacific coast, its rail network, its good quality of highways, its network of local and foreign suppliers, its two specialized terminals containers, and its safe social climate. To strengthen its competitiveness, it is necessary to solve or improve the operational problems mentioned above, therefore, the following section presents three strategies or recommendations that the researcher believes that API Manzanillo (i.e. the port authority) together with the terminal operators should address.

1. Streamline customs and tax procedures in the port of Manzanillo

The adoption of new information technologies will allow the exchange of information in real-time between the customs agents, prosecutors, and port operators involved in the handling and inspection of the containerized cargo in the port of Manzanillo (Cortés Pérez, 2016). Digitization strategies and initiatives allow better control and management of port information, which makes logistics processes more efficient. Similarly, digital solutions increase the added value of the port, through transparent, fast, efficient, and safe activities (Cortés Pérez, 2016). Thus, it can be stated that this strategy will reduce delays in administrative, customs, and inspection procedures. In addition, it will improve coordination between authorities and port users (i.e. truckers, shippers, terminal operators, shipping lines, etc.).

2. Modernization, expansion, and conservation of transport infrastructure

An essential aspect of being a competitive port is having a public and private infrastructure that generates the lowest production costs, as well as providing efficient and safe inland connectivity (Cortés Pérez, 2016). As identified in Porter's diamond model, Manzanillo presents road congestion at the entrance and exit of the port and urban areas. Therefore, because the port and the Mexican economy have expectations of high growth in international trade and container traffic, it is essential to solve this issue. In order for the port to offer time guarantees to its clients and efficient port services, the SCT and CGPyMM must develop and implement projects to modernize and expand public infrastructures inside and outside the port, such as roads, highways, in and out port gates, new transit routes, and bridges. Similarly, terminal operators must respond to the challenges of global competition, modernizing and expanding the installed capacity and yards of the two specialized container terminals (Cortés Pérez, 2016).

3. Tariff System

Lastly, as indicated by the SCT, Mexican ports must implement a new productivity rate scheme. The implementation of a new standardized rate system will allow API Manzanillo to establish promotional rates for the use of port infrastructure and port services, the purpose is to promote mainly the arrival of container ships, i.e. containerized cargo. Consequently, a tariff scheme will result in the establishment of rates according to the total costs, in the same way, it will allow the port to be more attractive for its clients and more competitive vis-à-vis its rivals (SCT, 2018).

To conclude this section, it is important to point out that global competition has generated changes in the way of participation of those who intervene in international logistics chains, i.e. seaports, port terminals, authorities, transport companies, etc. Hence, it is believed that the same dynamism of international competition has caused technological innovations, modernization in specialized infrastructure, increased specialization of the workforce, increment financial interest, alliances of service providers, and environmental and safety regulations. Maintaining the strategic position and competitiveness of the port of Manzanillo is a challenging task, which requires dedication and anticipation from API Manzanillo, the Mexican government, and all the port users involved (SCT, 2008b).

7 Conclusions

Port of Manzanillo is a fundamental piece in the economy and international trade of Mexico. Undoubtedly, the port has a world-class infrastructure in its specialized container terminals, enjoys a good quality of highways and rail networks, and is driven by a competent national and international network of suppliers, however, the key to success lies in the development and integration of all the services that can be used through it, as well as the efficiency in the connectivity and distribution of the goods, as a result, global players can identify Manzanillo as a competitive, functional, efficient, and safe gateway. Taking into account the above, through scientific literary reviews, interviews, secondary data collection, and the execution of both quantitative and qualitative methods (i.e. the SPA and Porter's diamond model), it was possible for the author to determine the positive competitive position in which the port of Manzanillo is currently set within the container industry, along with the factors that drive or affect its competitiveness.

The main **contribution** of this study was the strategic combination of primary and secondary data that allowed the researcher to develop and provide strategic recommendations to API Manzanillo (i.e. port authority) in order to achieve a higher level of competitiveness to the port of Manzanillo and Mexico within of the container industry. Certainly, evaluating and analyzing Manzanillo's competitive position allows us to understand its market share in the containerized industry, this being a good indicator to study the evolution of the port in a given period of time. However, the evaluation of Manzanillo's competitiveness makes it possible to determine the port's capacity to react to competitive threats from the external environment, i.e. from the ports of Lázaro Cárdenas, Los Angeles, and Long Beach. Once these key factors have been identified, the objective is to define strategies that help to maintain or increase the market share of the port of Manzanillo and consequently raise the level of competitiveness.

7.1 Answering Research Questions

This section aims to present the empirical findings of the research question and sub-questions presented in **Chapter 1**, all on solid foundations acquired during the literary review of **Chapter 2**, the collection of primary data (i.e. interviews), the collection of secondary data (i.e. annual reports, port statistics, master plans, journal articles, scientific literature, and books), and the execution of the SPA technique and Porter's diamond model.

Additionally, it is important to remember that the approach of this study has been **solely focused on container traffic,** therefore, all the answers and arguments are related to the competition and competitiveness of the port of Manzanillo in the context of the containerized cargo industry.

1. **Research question:** *What competitive determinants underly the competitive position of the port of Manzanillo in the container industry?*

In this study, during the observation period of eleven years (2007 – 2019), the port of Manzanillo stood out for being the most dynamic port on the Pacific Coast of Mexico within the container segment. Similarly, according to the results of the SPA, Manzanillo shows a positive competitive position in the container market, with a low market share, but a high annual growth rate. It also demonstrated its positive specialization and commercial increase in the containerized cargo category, together with a fairly high diversification index, which reaffirms its specialization in this traffic category.

Taking Notteboom and Yim Yap (2012) as reference, it is established that the determinants of competitiveness that have driven this strategic position of Manzanillo are mainly its proximity to the production and consumption centers of the Central and Bajío (western) regions of Mexico, the good conditions of the highways and rail network, its low production costs, its commercial power in carriers and shippers, its ability to satisfy current demand, its healthy competition within the port area, its ability to face the challenges posed by the new business logistics environment, strong participation of the private sector in container terminal operations, and the perception of the port as a key driver of the local and national economy.

The competitive position of the port of Manzanillo is also driven by regional factors (i.e. competitive advantages), such as its geographic location, its public and private infrastructure, government policies and its performance in the container segment compared to the rest of the Mexican ports. However, it is important to remember that the complexity of the port sector affects the way in which other port users perceive, interpret, measure, and imply these determinants of competitiveness (Notteboom and Yim Yap, 2012).

2. **Sub-research question**: In terms of containerized cargo traffic, which are the main competitors of the port of Manzanillo in the Pacific Rim?

In order to answer this first sub-question, three interviews were conducted with experts in the port sector of Mexico, i.e. three members of API Manzanillo supported this research. Similarly, to confirm the certainty of the findings, secondary data was collected and used, such as annual reports, port statistics, and port master plans. Thus, it is determined that the main container cargo competitor in Mexico is the port of Lázaro Cárdenas, located in the state of Michoacán 300 km away from Manzanillo, followed by two US ports located in the state of California, namely, the ports from Los Angeles and Long Beach. According to the interviews, what justifies the strong international competition between these ports, prevails merely in their installed capacity, a strong network of suppliers, influence on domestic demand, and the competition of import and export containers from Southeast Asia, mainly China, South Korea, and Japan.

3. **Sub-research question**: What have been the strategies of the Port Authority and the terminal operators that have prompted the port of Manzanillo to perform so well?

The interviews were the main source of information to answer this sub-question, along with the PMDP[21] 2015 – 2020 of Manzanillo. Hereby, it was concluded that the development plans by the Mexican Government are a key aspect of the port's success, the strong public and private investment in the Manzanillo port sector, the concessions with container terminals operated by international companies, the private infrastructure (world-class quality), the modernization of deep drafts, and the expansion of berths to receive large container ships have been the main strategies of API Manzanillo and its port operators. In addition, the interviewees stated that vertical integration between the different stakeholders has allowed the port to operate containerized cargo more efficiently.

4. **Sub-research question**: According to API Manzanillo, what type of port does Manzanillo want to become in the coming years?

Through interviews with members of the port of Manzanillo and the collection of secondary data, such as Government reports and port master plans, it is concluded that Manzanillo together with its stakeholders have the vision of being recognized as *"The leading Latin American **container port** in the Pacific Ocean, with world-class and sustainable infrastructure and operations, linking from Mexico the productive multimodal logistics chain between **America and Asia**."* (API Manzanillo, 2014d).

[21] Port Master Development Program 2015 – 2020 of the port of Manzanillo.

Likewise, the commercial projection and vision of the port of Manzanillo were confirmed with the results obtained from the SPA. As stated in **Chapter 5**, the port of Manzanillo is characterized by a high percentage of a particular traffic category, i.e. containers. Likewise, Manzanillo has clearly shown rapid growth for container traffic, with an average annual growth rate of 5.73% and a market share of 7.23% at level 3 of the PPA. Meanwhile, at level 4 of the PPA, Manzanillo has positioned itself as “Star Performer”, which means that the port in the container segment presents a high market share and high growth rate, however it is believed that long-term sustainability is not guaranteed in this position. The findings indicate that Manzanillo can be classified as an individual port with a high potential in the container industry, reaffirming the vision and ambition of this maritime port.

5. **Sub-research question**: What is the strategic competitive position of the port of Manzanillo in the container segment?

This question is solved through the results obtained by the full implementation of the SPA (composed of three analytical tools: PPA, SSA, and PDA) and is complemented with the collection of secondary data, such as annual reports, port statistics, and the PMDP 2015 – 2020 of Manzanillo. Given the above, it is concluded that the port of Manzanillo has a positive competitive position as “High Potential”, which means that the port has a low market share but high growth rates. Consequently, Manzanillo is classified as an individual port with high potential in the container industry. Likewise, its growth rates are an observable phenomenon over time, giving the probability that its market share will also increase, achieving a position in the future as “Star Performer”. In other words, the port of Manzanillo within the category of container traffic could achieve high market share and high growth rates in the coming years.

Moreover, during two observation periods in the SSA, i.e. 2007 – 2011 and 2015 – 2019, the port presented a positive competitiveness-shift and commodity-shift, which reflects that Manzanillo has a positive competitive position and is specializing in the fastest growing traffic, i.e. container. Therefore, it is concluded that the Manzanillo has an overall improvement in the port’s market share in different traffic categories but especially containers. Additionally, the annual port statistics of Manzanillo (i.e. secondary data) shows the evolution that the port has had in the container traffic, since during the eleven years of observation the port has experienced an important growth of volume, positioning itself as the leading port on the Pacific coast in Mexico.

6. **Sub-research question**: Does the port of Manzanillo have a strategy to diversify its cargo traffic portfolio? or Does it specialize in handling only one type of cargo? If so, what type of cargo?

The Product Diversification Analysis (PDA) was the main tool used to answer this sub-question, while the interviews were necessary to confirm the results obtained. Since the study distinguishes four categories of traffic (i.e. containers, general cargo, dry bulk and liquid bulk), the minimum value of the index is 0.25, which indicates the highest possible level of diversification in terms of traffic volume. Taking the above into account, Manzanillo's diversification indices[22] show that the port is specialized in a specific cargo, i.e. containers. Reaffirming the above, in 2019 the port presented a diversification index of 0.43, a value that is much closer to the maximum degree of specialization (index = 1) instead of a maximum possible diversification (index = 0.25). Therefore, Manzanillo's indices reflect a high degree of inequality, concluding that nowadays the port of Manzanillo is specialized in container traffic.

Similarly, the interviewees argue that the port has installed capacity to serve different markets, such as mineral bulk, agricultural bulk, general cargo, automobiles, oil derivatives products, natural gas, and containers, despite that, the same domestic and foreign market has forced it to specialize in containers. In addition, they also point out that this does not take away the possibility that the port may diversify its portfolio in the future.

7. **Sub-research question**: What are the competitive advantages of the port of Manzanillo that have allowed it to grow its merchandise traffic volumes annually, especially containerized cargo?

The secondary data described in **Chapter 4** and the results obtained from Porter's diamond model at the national level were the sources of information necessary to answer this question. Hence, it is concluded that the competitive advantages of the port of Manzanillo that have allowed it to annually increase its volumes of container traffic and its competitiveness are: its geographical position, good quality of highways, rail network, zone of influence[23], national and international network of suppliers, public and private infrastructure, two specialized container terminals, and its safe social climate.

22 Corresponding to the total "unweighted" traffic during the eleven years (2007 – 2019).
23 42.1% of Mexico's gross domestic product.

The privileged geographic location on the Pacific coast and the excellent conditions of the roads and railways connect the port with the central states and the Bajío regions of Mexico, which have fostered the dynamism of the Mexican economy and increased the traffic of containers (API Manzanillo, 2014b). Besides, the port of Manzanillo has expanded its trade routes and increased its cargo volume through commercial relationships with international shipping lines, truckers, carriers, port terminals, port operators, ship agents, freight forwarders, equipment suppliers, insurance agencies, etc.

On the other hand, within the 437 hectares of total area, the port has 14 private terminals and facilities for handling all types of cargo, of which two are dedicated solely to the handling of containers, allowing it to compete with other ports in the Pacific Rim. Thus, through the two container terminals (i.e. SSA México and Contecon Manzanillo) the port has a total throughput capacity of 4,350,000 TEUs per year (Inter-American Development Bank, 2015).

8. **Sub-research question**: What are the competitive advantages of Mexico in the global container industry?

To solve this last sub-research question, it was necessary to collect secondary data and executed Porter's diamond model at a national level. Hereby, the results determine that Mexico's competitive advantages in the container industry are mainly its geographical position with access to the Pacific and Atlantic oceans and the Caribbean, Cortés, and Gulf of Mexico seas, giving it strategic proximity to potential suppliers (Asia, Europe, Oceania) and buyers (North America, Central, and South America), its more than 11 thousand kilometers of coastline and 102 seaports, the restructuring of the national port system with the administration of API, its capital resources for investment in public infrastructure, its 14 FTAs with more than 50 countries, the consolidation of the port systems of the Gulf of Mexico and the Pacific coast, its low barriers to entry into the transportation industry, and an attractive regulatory and business environment.

7.2 Research Limitations

Regarding the empirical analysis carried out in this research, the author faced different limitations in this study, which are presented below:

- The primary data of this study were collected only through three interviews conducted with two active members and one inactive member of API Manzanillo (i.e. Port Authority), thereby, the analysis of the information only focused on the perspective of the port authority in relation to the performance, productivity, and competitiveness of the port without considering the points of view of the port operators or other port users (stakeholders). In addition, part of the limitation that arose during the interviews was the distance and time zone, therefore, all the interviews were conducted through digital tools (i.e. email and Skype), limiting the possibility to meet physically the operations and environment of the port. As a consequence, the primary data collection was based solely on the responses, points of view, and knowledge obtained by the three interviewees.

- The official websites of the two American ports (i.e. Los Angeles and Long Beach) do not publish the annual port statistics in metric tons, on the contrary, their statistical data are only represented in TEU and metric revenue tons (MRT). However, a revenue ton (RT) is a measure that is used for billing purposes, thus the MRT measure represents a combination of metric tons, cubic meters, and port revenue (Port of Los Angeles, 2019a), which is not compatible or comparable with the metric tonnage figures of the ports of Manzanillo and Lázaro Cárdenas. Since the author faced this limitation, she contacted the statistics departments of both ports, in order to request support. As a solution, the author collected these secondary data (i.e. port statistics) through a database of the American Government, known as the "U.S. Census Bureau", where all statistical and commercial data are compiled and published by the US Customs. Consequently, the port statistics for Los Angeles and Long Beach used to execute the SPA model correspond to those mentioned above.
- Last but not least, given that the ports of Manzanillo and Lázaro Cárdenas do not publish their port statistics specifying the volume corresponding to exports, imports. or transshipments, but only publish the total annual volume per year, the data entered in the SPA tool are only equivalent to the total annual traffic of each of the four ports. As a consequence, the results obtained represent the evolution of the four ports in terms of total traffic, without being able to carry out a more in-depth analysis in terms of import or export volumes. Fortunately, this limitation does not affect the reliability of the results, since the main objective of the study is to analyze in general terms the competitive position and commercial evolution of Manzanillo compared to its competitors.

7.3 Recommendation for Future Research

Despite the limitations faced, the author has done great effort to produce valid and reliable results. In this way, it is firmly believed that the limitations of the research and the final results obtained regarding the competitive position and competitiveness of the port of Manzanillo open up opportunities for future research. Therefore, below the researcher presents a number of recommendations:

- The observation period to be determined for the efficient use of the SPA method can be extended to 15 – 25 years, which will lead to more precise analysis.
- This study focused specifically on container traffic; nonetheless, other categories of traffic deserve attention for future research.
- Develop "weighting" coefficients for the ports of Mexico and the United States, in order to be able to properly use the concept of added value in comparative studies of the merchandise traffic of the ports to be analyzed.
- The same analysis of this research can be performed by focusing only on port actors, such as shipping lines, terminal operators, and ship agents. Or else, future research could carry out a combined analysis, considering the participation of port authorities and their stakeholders.

7.4 Final Conclusions

It is possible to state that this study took into account the important difference between the world's seaports, each differentiating itself by its roles, assets, functions and institutional organizations (Bichou and Gray, 2005). The author carried out an analytical research based on the main functions of container ports, followed by the correct definition of port competition and the levels of competition that can be identified within or outside the same seaport. Similarly, it was considered that the competitiveness of a port is determined by the range of competitive advantages that the port acquires or creates over time (Haezendonck and Notteboom, 2002).

Hereby, based on the reviewed scientific literature and the performance of quantitative and qualitative analyzes, this thesis has determined the strategic position of the port of Manzanillo (Mexico) in its competitive environment during the observation period of eleven years (2007 – 2019) vis-à-vis its main competitors located in the Pacific Rim, within the container segment. With solid and reliable results, it is concluded that Manzanillo has reached a positive competitive position as "High Potential" within the containerized cargo industry, presenting low market share but high growth rates. This port evolution is the result of the strategic and competitive planning of the Government of Mexico and API Manzanillo, whose long-term vision is to be recognized as a leading port in container traffic, mainly in trade with Asia.

In addition, this competitive position has been achieved through the continuous modernization and expansion of the port, investment in infrastructure outside and within the port, the development of road and rail networks, vertical integration between all the industries of the port sector, and growth of the Mexican Economy. Without a doubt, the port of Manzanillo is a fundamental piece in the shipping industry and the country's economy, therefore, the analysis of the aspects that promote or affect the competitiveness of the port is a basic task for its port authority and all the port users.

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Appendix

A. Port Statistics (2007 – 2019)

Table 3 Port Statistics of Manzanillo 2007 – 2019 (in 1,000 MT)

Port of Manzanillo					
	CONTAINER (CON)	**GENERAL CARGO (GC)**	**DRY BULK (DB)**	**LIQUID BULK (LB)**	**TOTAL**
Year	*(in 1,000 MT)*	*(in 1,000 MT)*	*(in 1,000 MT)*	*(in 1,000 MT)*	*(in 1,000 MT)*
2007	10,821	1,270	5,860	3,223	21,173
2008	11,739	1,254	6,268	3,022	22,284
2009	9,357	906	5,588	2,677	18,529
2010	12,017	1,501	5,627	3,055	22,200
2011	14,629	1,385	6,207	3,241	25,462
2012	16,152	1,307	7,293	2,534	27,286
2013	16,306	1,364	8,116	1,916	27,703
2014	18,001	1,601	6,195	2,700	28,496
2015	18,631	1,578	5,439	2,755	28,403
2016	18,831	1,382	5,925	4,305	30,444
2017	20,541	1,681	5,759	5,796	33,777
2018	22,028	1,646	6,711	5,667	36,053
2019	21,113	1,657	6,700	5,395	34,865

Source: API Manzanillo, 2020b.

Table 4 Port Statistics of Lázaro Cárdenas 2007 – 2019 (in 1,000 MT)

Port of Lazaro Cardenas					
	CONTAINER (CON)	**GENERAL CARGO (GC)**	**DRY BULK (DB)**	**LIQUID BULK (LB)**	**TOTAL**
Year	*(in 1,000 MT)*	*(in 1,000 MT)*	*(in 1,000 MT)*	*(in 1,000 MT)*	*(in 1,000 MT)*
2007	1,297	2,719	11,234	1,841	17,092
2008	3,181	2,974	11,030	2,610	19,795
2009	4,462	994	11,598	2,929	19,984
2010	6,651	1,577	15,796	3,805	27,829
2011	8,139	2,017	16,437	3,059	29,653
2012	9,938	1,569	16,202	2,963	30,672
2013	8,352	2,068	19,873	2,476	32,770
2014	7,002	2,311	16,029	2,847	28,189
2015	6,991	1,870	14,388	3,188	26,438
2016	7,770	1,770	14,052	3,495	27,086
2017	7,784	2,192	16,418	3,398	29,791
2018	8,810	2,858	16,204	3,314	31,185
2019	8,445	2,572	16,866	3,661	31,544

Source: API Lazaro Cardenas, 2020.

Table 5 Port Statistics of Los Angeles 2007 – 2019 (in 1,000 MT)

Port of Los Angeles					
	CONTAINER (CON)	**GENERAL CARGO (GC)**	**DRY BULK (DB)**	**LIQUID BULK (LB)**	**TOTAL**
Year	*(in 1,000 MT)*	*(in 1,000 MT)*	*(in 1,000 MT)*	*(in 1,000 MT)*	*(in 1,000 MT)*
2007	47,565	3,289	5,869	20,722	77,445
2008	47,813	3,229	4,781	12,032	67,855
2009	40,300	2,065	4,850	10,283	57,499
2010	45,551	2,489	4,993	11,025	64,059
2011	49,233	2,742	6,284	11,890	70,149
2012	48,028	2,671	6,017	9,799	66,516
2013	46,806	2,387	6,032	13,841	69,066
2014	49,913	2,227	6,379	14,245	72,764
2015	47,859	2,107	5,314	21,790	77,071
2016	51,264	1,992	3,783	13,581	70,620
2017	54,362	2,105	3,327	11,493	71,287
2018	56,979	1,873	4,382	9,438	72,672
2019	52,338	1,766	3,801	13,618	71,523

Source: USA Trade Census, 2020.

Table 6 Port Statistics of Long Beach 2007 – 2019 (in 1,000 MT)

Port of Long Beach					
	CONTAINER (CON)	**GENERAL CARGO (GC)**	**DRY BULK (DB)**	**LIQUID BULK (LB)**	**TOTAL**
Year	*(in 1,000 MT)*	*(in 1,000 MT)*	*(in 1,000 MT)*	*(in 1,000 MT)*	*(in 1,000 MT)*
2007	21,668	1,383	5,236	10,190	38,477
2008	21,539	1,193	5,036	15,509	43,277
2009	16,663	719	3,855	15,851	37,088
2010	20,296	1,020	4,351	17,416	43,084
2011	19,651	1,060	4,900	18,103	43,713
2012	18,877	1,131	5,063	19,549	44,621
2013	21,978	1,207	5,672	15,600	44,457
2014	21,847	838	5,272	15,955	43,911
2015	20,219	747	4,411	15,207	40,585
2016	21,714	666	2,569	16,132	41,082
2017	22,590	628	1,970	23,422	48,610
2018	24,409	494	1,508	22,258	48,668
2019	21,287	397	1,327	21,093	44,105

Source: USA Trade Census, 2020.

B. Annual Container Throughput

Table 7 Annual Container Throughput (TEUs) per Mexican Port (2014 – 2019)

	Port of Manzanillo	Port of Lázaro Cárdenas	Port of Veracruz	Port of Altamira	Port of Ensenada
Year	*in TEUs*	*in TEUs*	*in TEUs*	*in TEUs*	*in TEUs*
2014	2,355,149	996,654	847,400	575,000	139,932
2015	2,541,140	1,058,747	931,800	580,000	193,420
2016	2,578,822	1,115,452	965,300	628,000	191,708
2017	2,830,370	1,149,079	1,117,300	724,000	230,185
2018	3,078,513	1,314,798	1,176,300	745,000	272,587
2019	3,069,183	1,318,732	1,144,200	806,000	337,738

Source: API Manzanillo (2020b), API Lázaro Cárdenas (2020), API Veracruz (2019), API Altamira (2020), and API Ensenada (2019).

Table 8 Comparison of the Annual Container Throughput (2009 – 2019) of the Ports of Los Angeles, Long Beach, and Manzanillo

	Port of Los Angeles	Port of Long Beach	Port of Manzanillo
Year	*in TEUs*	*in TEUs*	*in TEUs*
2009	6,748,995	5,067,597	1,110,356
2010	7,831,902	6,263,499	1,511,378
2011	7,940,511	6,061,099	1,762,508
2012	8,077,714	6,045,655	1,992,176
2013	7,868,582	6,730,573	2,117,183
2014	8,340,066	6,820,805	2,355,149
2015	8,160,458	7,192,069	2,541,140
2016	8,856,783	6,775,171	2,578,822
2017	9,343,193	7,544,507	2,830,370
2018	9,458,749	8,091,023	3,078,513
2019	9,337,632	7,632,032	3,069,183

Source: Port of Los Angeles (2020b), Port of Long Beach (2020d), and API Manzanillo (2020b)

C. Average Market Shares and Average Annual Growth Rates of Seaports in the Pacific Rim Range (2007 – 2019)

(Calculations based on unweighted total traffic volumes and port statistics)

Table 9 Average Market Shares and Average Annual Growth Rates of the Port of Manzanillo

Port of Manzanillo					
	Traffic Categories (in 1000 metric tons)				
	Containers (CON)	**General Cargo (GC)**	**Dry Bulk (DB)**	**Liquid Bulk (LB)**	**Total**
Average traffic	16,167	1,425	6,284	3,561	27,436
% Share traffic categories	58.92%	5.20%	22.90%	12.98%	100.00%
Growth 2007 – 2019	95.11%	30.48%	14.34%	67.42%	64.67%
Average annual growth 2007 – 2019	5.73%	2.24%	1.12%	4.39%	4.24%
Growth 2007 – 2011	7.83%	2.19%	1.45%	0.14%	4.72%
Growth 2011 – 2015	6.23%	3.32%	-3.25%	-3.98%	2.77%
Growth 2015 – 2019	3.18%	1.23%	5.35%	18.30%	5.26%
Average market share 2007 – 2019	17.11%	21.27%	20.80%	9.37%	16.23%
Market share 2007 – 2011	14.13%	18.10%	20.42%	8.82%	14.28%
Market share 2011 – 2015	17.85%	21.23%	19.32%	7.17%	16.01%
Market share 2015 – 2019	19.68%	24.83%	21.70%	11.46%	18.23%

Source: Created by the author based on port statistics, 2020.

Table 10 Average Market Shares and Average Annual Growth Rates of the Port of Lázaro Cárdenas

Port of Lázaro Cárdenas					
	Traffic Categories (in 1000 metric tons)				
	Containers (CON)	**General Cargo (GC)**	**Dry Bulk (DB)**	**Liquid Bulk (LB)**	**Total**
Average traffic	6,832	2,115	15,087	3,045	27,079
% Share traffic categories	25.23%	7.81%	55.71%	11.25%	100.00%
Growth 2007 – 2019	551.25%	-5.42%	50.13%	98.82%	84.56%
Average annual growth 2007 – 2019	16.90%	-0.44%	3.44%	5.89%	5.24%
Growth 2007 – 2011	58.28%	-7.19%	9.98%	13.53%	14.77%
Growth 2011 – 2015	-3.73%	-1.88%	-3.27%	1.04%	-2.83%
Growth 2015 – 2019	4.84%	8.29%	4.05%	3.52%	4.51%

Average market share 2007 – 2019	7.23%	30.78%	49.72%	8.17%	16.07%
Market share 2007 – 2011	5.68%	27.79%	45.05%	8.28%	14.85%
Market share 2011 – 2015	8.64%	28.75%	48.30%	7.93%	17.22%
Market share 2015 – 2019	7.74%	35.03%	55.37%	8.19%	16.29%

Source: Created by the author based on port statistics, 2020.

Table 11 Average Market Shares and Average Annual Growth Rates of the Port of Los Angeles

Port of Los Angeles					
	Traffic Categories (in 1000 metric tons)				
	Containers (CON)	**General Cargo (GC)**	**Dry Bulk (DB)**	**Liquid Bulk (LB)**	**Total**
Average traffic	49,078	2,380	5,063	13,366	69,886
% Share traffic categories	70.23%	3.41%	7.24%	19.13%	100.00%
Growth 2007 – 2019	10.03%	-46.30%	-35.24%	-34.28%	-7.65%
Average annual growth 2007 – 2019	0.80%	-3.22%	-2.55%	-2.49%	-0.62%
Growth 2007 – 2011	0.87%	-4.44%	1.72%	-12.97%	-2.44%
Growth 2011 – 2015	-0.71%	-6.37%	-4.10%	16.35%	2.38%
Growth 2015 – 2019	2.26%	-4.32%	-8.04%	-11.09%	-1.85%
Average market share 2007 – 2019	52.98%	35.05%	16.64%	35.88%	41.85%
Market share 2007 – 2011	55.95%	39.05%	18.40%	38.05%	44.00%
Market share 2011 – 2015	51.62%	35.48%	17.60%	38.48%	41.44%
Market share 2015 – 2019	51.14%	30.89%	14.58%	33.46%	40.62%

Source: Created by the author based on port statistics, 2020.

Table 12 Average Market Shares and Average Annual Growth Rates of the Port of Long Beach

Port of Long Beach					
	Traffic Categories (in 1000 metric tons)				
	Containers (CON)	**General Cargo (GC)**	**Dry Bulk (DB)**	**Liquid Bulk (LB)**	**Total**
Average traffic	20,980	883	3,936	17,407	43,206
% Share traffic categories	48.56%	2.04%	9.11%	40.29%	100.00%
Growth 2007 – 2019	-1.76%	-71.25%	-74.65%	107.00%	14.63%
Average annual growth 2007 – 2019	-0.15%	-4.59%	-4.76%	6.25%	1.14%
Growth 2007 – 2011	-2.41%	-6.43%	-1.64%	15.45%	3.24%
Growth 2011 – 2015	0.72%	-8.36%	-2.59%	-4.26%	-1.84%
Growth 2015 – 2019	1.29%	-14.61%	-25.94%	8.52%	2.10%
Average market share 2007 – 2019	22.68%	12.90%	12.84%	46.58%	25.84%
Market share 2007 – 2011	24.24%	15.06%	16.13%	44.85%	26.87%
Market share 2011 – 2015	21.88%	14.54%	14.78%	46.43%	25.33%
Market share 2015 – 2019	21.44%	9.25%	8.34%	46.89%	24.87%

Source: Created by the author based on port statistics, 2020.

D. Shift-share analysis of seaports (2007 – 2019)

(Calculations based on unweighted maritime total traffic data and port statistics)

Table 13 Shift-share analysis of the Port of Manzanillo

Port of Manzanillo				
	Share-effect	**Commodity-shift**	**Competitiveness-shift**	**Total shift**
2007 – 2011	2,031.14	323.73	1,933.85	2,257.58
2011 – 2015	530.36	-567.33	2,978.26	2,410.93
2015 – 2019	1,570.99	231.84	4,659.38	4,891.22

Source: Created by the author based on port statistics, 2020.

Table 14 Shift-share analysis of the Port of Lázaro Cárdenas

Port of Lázaro Cárdenas				
	Share-effect	**Commodity-shift**	**Competitiveness-shift**	**Total shift**
2007 – 2011	1,639.62	326.15	10,595.77	10,921.92
2011 – 2015	617.67	-2,205.05	-1,627.86	-3,832.91
2015 – 2019	1,462.31	-1,084.90	4,729.07	3,644.17

Source: Created by the author based on port statistics, 2020.

Table 15 Shift-share analysis of the Port of Los Angeles

Port of Los Angeles				
	Share-effect	**Commodity-shift**	**Competitiveness-shift**	**Total shift**
2007 – 2011	7,429.34	-605.04	-14,119.97	-14,725.01
2011 – 2015	1,461.19	679.75	4,781.16	5,460.91
2015 – 2019	4,262.87	876.04	-10,686.89	-9,810.85

Source: Created by the author based on port statistics, 2020.

Table 16 Shift-share analysis of the Port of Long Beach

Port of Long Beach				
	Share-effect	**Commodity-shift**	**Competitiveness-shift**	**Total shift**
2007 – 2011	3,691.11	-44.84	1,590.35	1,545.51
2011 – 2015	910.54	2,092.64	-6,131.56	-4,038.93
2015 – 2019	2,244.79	-22.97	1,298.44	1,275.46

Source: Created by the author based on port statistics, 2020.

E. Diversification indices of seaports in the range (2007 – 2019)

(Calculations based on unweighted maritime total traffic data and port statistics)

Table 17 Diversification indices Port of Manzanillo and Lázaro Cárdenas

Port of Manzanillo			Port of Lázaro Cárdenas		
Year	INDEX	INDEX (base '80)	Year	INDEX	INDEX (base '80)
2007	0.36	100	2007	0.47	100
2008	0.38	104	2008	0.38	79
2009	0.37	101	2009	0.41	87
2010	0.38	104	2010	0.40	85
2011	0.41	112	2011	0.40	84
2012	0.43	119	2012	0.40	83
2013	0.44	121	2013	0.44	93
2014	0.46	126	2014	0.40	85
2015	0.48	132	2015	0.39	81
2016	0.44	121	2016	0.37	78
2017	0.43	118	2017	0.39	82
2018	0.43	119	2018	0.37	78
2019	0.43	118	2019	0.38	80

Source: Created by the author based on port statistics, 2020.

Table 18 Diversification indices Port of Los Angeles and Long Beach

Port of Los Angeles			Port of Long Beach		
Year	INDEX	INDEX (base '80)	Year	INDEX	INDEX (base '80)
2007	0.46	100	2007	0.41	100
2008	0.54	117	2008	0.39	96
2009	0.53	116	2009	0.40	97
2010	0.54	119	2010	0.40	97
2011	0.53	116	2011	0.39	95
2012	0.55	121	2012	0.38	94
2013	0.51	111	2013	0.38	94
2014	0.52	113	2014	0.39	97
2015	0.47	103	2015	0.40	98
2016	0.57	124	2016	0.44	108
2017	0.61	134	2017	0.45	111
2018	0.64	139	2018	0.46	113
2019	0.58	126	2019	0.46	114

Source: Created by the author based on port statistics, 2020.