DEPARTMENT OF ACCOUNTING AND FINANCE

PROFITABILITY ANALYSIS OF CONTAINER PORTS IN THE U.S.A: COMPARISON BETWEEN EAST & WEST COAST

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Dissertation

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Statement of Authenticity

I declare on my word of honour that the present thesis was written by me personally, and has neither been submitted nor approved as part of any other Masters Degree or Bachelor Degree, in Greece or abroad. The present thesis presents the results of my research along with my personal view on the topic. The references I used in writing the thesis, are quoted in their entirety, via giving full reference to the authors, including web sources.

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Περίληψη

Ο σκοπός της διπλωματικής εργασίας είναι να εξεταστεί η επίδραση της τοποθεσίας στην κερδοφορία ενός δείγματος λιμανιών των Ηνωμένων Πολιτειών της Αμερικής. Το δείγμα που χρησιμοποιήθηκε αποτελείται από οκτώ τυχαία επιλεγμένα λιμάνια, 4 από την Ανατολική Ακτή και 4 από την Δυτική Ακτή των Ηνωμένων Πολιτειών. Αρχικά γίνεται μια ιστορική αναφορά για τη δημιουργία των λιμανιών και των τερματικών σταθμών εμπορευματοκιβωτίων, με πρώτο το λιμάνι του Newark-Elizabeth στο Newark Bay. Ο ανταγωνισμός μεταξύ των λιμανιών και η ανάγκη για επικράτηση στην αγορά, οδήγησε τα λιμάνια σε μια συνεχή εξέλιξη των εγκαταστάσεων τους για να εξυπηρετούν όλο και περισσότερους πελάτες και να ανταποκρίνονται στις ανάγκες της σύγχρονης εποχής. Έτσι, βελτιώθηκε η αποδοτικότητα των υπηρεσιών, μειώθηκε το κόστος διαχείρισης φορτίου και ενσωματώθηκαν οι λιμενικές υπηρεσίες με άλλα στοιχεία του παγκόσμιου δικτύου διανομής αγαθών. Επίσης, δημιουργήθηκε ένα πρόσθετο έδαφος για τον ανταγωνισμό μεταξύ των λιμένων παγκοσμίως μέσω της μεταφοράς εμπορευματοκιβωτίων και της εμπορευματοποίησης των εμπορευμάτων η οποία έχει εξελιχθεί από τις μονάδες των 20 ποδιών σε μονάδες των 40 ποδιών και τα εμπορευματοκιβώτια ψυγείων για τη μεταφορά ευαίσθητων στη θερμότητα και ευπαθών προϊόντων. Ακολούθως, επήλθε η εξέλιξη στα σκάφη με την αύξηση του μεγέθους τους κατά είκοσι φορές μέσα σε εκατό χρόνια, στο λιμενικό εξοπλισμό, στην υποδομή μεταφοράς και τη διασύνδεση που θα μεταφέρει τα προϊόντα στον τελικό προορισμό (καταναλωτή). Τα παραπάνω είχαν ως αποτέλεσμα το ενδιαφέρον τον ερευνητών για αναλύσεις αποδοτικότητας εκ μέρους των λιμενεργατών και των λιμενικών χρηστών. Η αποτελεσματικότητα των λιμενικών επιχειρήσεων αποτελεί σημαντικό δείκτη της χρηματοπιστωτικής ανάπτυξης, δεδομένου ότι περισσότερο από το 80% το εμπόριο διεξάγεται τώρα μέσω θαλάσσιων μεταφορών, και αυτό δεν αναμένεται να μειωθεί στο προσεχές μέλλον και επηρεάζει την κερδοφορία των λιμένων η οποία αναλύεται μέσω της συγκεκριμένης έρευνας.

Η μεθοδολογία που εφαρμόστηκε για την εύρεση της επιρροής είναι το SCP Framework και η Chicago School. Στην πρώτη αναφέρεται πως καθοριστικό ρόλο, για την κερδοφορία μιας επιχείρησης, παίζει η γεωγραφική περιοχή και αν σε αυτή υπάρχει αυξημένη συγκέντρωση αγοράς (market concentration) και έχει αποδειχθεί με τις έρευνές των Πάν και Πόρτερ, οι οποίοι αναφέρουν πως η συγκέντρωση αγοράς σε μια περιοχή αποτελεί τον καθοριστικό παράγοντα για την αύξηση της κερδοφορίας των επιχειρήσεων. Επί πρόσθετα, αναφέρεται πως οι επιχειρήσεις που βρίσκονται στην ίδια περιοχή, ναι μεν ανταγωνίζονται

μεταξύ τους για το ποια θα προσελκύσει περισσότερους πελάτες επομένως θα έχει και μεγαλύτερη κερδοφορία, αλλά ανταγωνίζονται και ενωμένες ενάντια σε άλλες επιχειρήσεις που βρίσκονται σε διαφορετική περιοχή. Ένα άλλο σημείο που πρέπει να αναφέρουμε είναι ότι οι λιμένες που βρίσκονται στην ίδια γεωγραφική θέση, αντιμετωπίζουν την ίδια ομάδα πελατών με αποτέλεσμα πολλές επιχειρήσεις συνεργάζονται μεταξύ τους για να δημιουργήσουν στενότερες σχέσεις με τους πελάτες τους, προσφέροντας πιο ολοκληρωμένη εξυπηρέτηση και να επεκτείνουν τον κύκλο των εργασιών τους. Η σχολή του Σικάγο (Chicago School), επικρίνει το SCP Framework και υποστηρίζει πως οι επιχειρήσεις με υψηλό επίπεδο κερδοφορίας μπορούν να επιβιώσουν, οπότε η συγκέντρωση της αγοράς δεν βοηθά τις μικρότερες επιχειρήσεις με αποτέλεσμα να δίνει ένα κίνητρο για τις επιχειρήσεις να βελτιώσουν την αποτελεσματικότητά τους και δικαιολογεί αυτό τον ισχυρισμό με την ύπαρξη φραγμών εισόδου όταν το μερίδιο αγοράς και το κέρδος μια επιχείρησης δεν είναι αρκετό.

Ένα άλλο θεωρητικό επιχείρημα που μελετήθηκε στην συγκεκριμένη έρευνα είναι η επίδραση της γεωγραφικής περιοχής στην κερδοφορία, έρευνα των Lado-Sestayo, Otero-Gonzalez, Vivel-Bua και Martorell-Cunill, οι οποίοι θεωρούν πως η αντίθεση του SCP framework και της σχολής του Σικάγο. οφείλεται στην παράλειψη σχετικών μεταβλητών που αφορούν την αποδοτικότητα των επιχειρήσεων και παράγοντες που σχετίζονται με την τοποθεσία κάθε επιχείρησης . Το θεωρητικό μοντέλο που χρησιμοποιήθηκε σε αυτή την έρευνα εμπνέεται από την έρευνα του Ruben Lado-Setayo, του Luis Otero-Gonzalez, του Milagros Vivel-Bua, του Onofre Martorell-Cunill και του Cowling και του Waterson . Χρησιμοποιήθηκαν δυναμικά και μη δυναμικά μοντέλα για να ελεγχθεί η επιρροή που ασκείται στην κερδοφορία από διάφορους παράγοντες .

Το δυναμικό μοντέλο που χρησιμοποιήθηκε είναι η Γενικευμένη Μέθοδος Ροπών (GMM) είναι σε θέση να διορθώσει το αποτέλεσμα της ανάλυσης για μη ετερογένεια ενός δείγματος που δεν έχει παρατηρηθεί, παραλείποντας την μεροληψία των μεταβλητών, μετρώντας το σφάλμα και τα ενδογενή προβλήματα που παρατηρούνται συχνά στην εκτίμηση της ανάπτυξης**.** Τα μη δυναμικά μοντέλα που εκτελέστηκαν είναι οι παλινδρομήσεις OLS, Random Effects, Fixed Effects και Fixed Effect με AR(1) ως μέτρο προς την αξιολόγηση των αποτελεσμάτων του δυναμικού μοντέλου. Οι μεταβλητές που χρησιμοποιήθηκαν σε αυτή την έρευνα είναι οι ακόλουθες:

Ως ενδογενής – εξαρτημένη μεταβλητή χρησιμοποιήθηκε το μεικτό λειτουργικό κέρδος (gross operating profit) και εξετάζουμε την επίδραση σε αυτήν από τις εξωγενείς-ανεξάρτητες μεταβλητές.

Ως ανεξάρτητες μεταβλητές χρησιμοποιούνται η συγκέντρωση της αγοράς (herf), το μερίδιο αγοράς (market share) των εταιρειών το οποίο μετράται με το αριθμό των ετήσιων μονάδων εμπορευματοκιβωτίων 20-ποδών (TEU) που διακινούν συγκριτικά με τα συνολικά ετήσια TEUs που διακινήθηκαν στο σύνολο των Ηνωμένων Πολιτειών. Επίσης ως ανεξάρτητες μεταβλητές χρησιμοποιήθηκαν η αποτελεσματικότητα των περιουσιακών στοιχείων (Lntotas) και ο μέσος όρος του μεγέθους των λιμένων με βάση την διακίνηση εμπορευματοκιβωτίων, (az) και η αναλογία του χρέους προς τα συνολικά περιουσιακά στοιχεία (debt).

Κατά τη εκτέλεση των δυναμικών και μη δυναμικών μοντέλων, τα αποτελέσματα επιβεβαιώνουν την υπόθεση του πλαισίου SCP, καθώς η αποδοτικότητα των λιμανιών μεταφοράς εμπορευματοκιβωτίων εξαρτάται άμεσα από την περιφερειακή συγκέντρωση της αγοράς και το επίπεδο ζήτησης για μεταφορά εμπορευματοκιβωτίων, εκφρασμένο σε σχέση με τη συγκέντρωση του πληθυσμού γύρω από ένα λιμένα εμπορευματοκιβωτίων. Επιπλέον το επίπεδο της τοπικής ζήτησης και την προσπάθεια συσχέτισης της πυκνότητας πληθυσμού γύρω από τους λιμένες της Ανατολικής Ακτής, υποδηλώνουν πως η επιρροή τους υπερβαίνει την τοπική τους θέση και λειτουργούν ως κόμβοι μεταφοράς εξυπηρετώντας τους πελάτες σε πολύ μεγαλύτερο εύρος από τους ανταγωνιστές τους στην Δυτικής Ακτής. Τέλος, γίνεται αναφορά στην προοπτική για μελλοντική έρευνα επί του θέματος, διά της επέκτασης της έρευνας σε περισσότερα δείγματα, την ανάλυση περισσοτέρων μεταβλητών και την εξέταση σε σχέση με τα προϊόντα που διακινούνται από και κυρίως πρός τους λιμένες των Ηνωμένων Πολιτειών της Αμερικής, και την επίδραση της προέλευσής τους.

Abstract

This paper analyses the impact of market structure on the profitability of ports in a random sample of eight (8) container ports. It comprises four ports (4) on the East Coast, and four (4) on the West Coast of the USA, and examines their performance in the financial years between 2010-2016, using variables related with the effects of their region, the population in their vicinity, their financial performance, total assets, total debt, and other factors related to the efficiency and throughput of ports such as the total annual TEUs per port, compared to the total annual TEUs transported in the USA. The data is analysed to test the applicability of the SCP Framework and the Chicago School theories on market concentration, with respect to their effect on profit. The analysis results indicate that the profitability is dependent to the ports' region and as well as the market structure, the level of demand that is effectively dictated by the number, size and density of ports on the east and west coasts, and the debt ratio of the ports considered.

Keywords

- Profitability
- Container ports
- Market structure
- Impact of location
- Level of demand

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1 Introduction

1.1 Preface

Container port operations, is a field of international trade the origins of which date back to the Port of Newark-Elizabeth on Newark Bay, which is considered to be the world's first maritime container terminal, built as a small port on shallow tidal wetlands. Since then, the competition between the developing ports around the world, along with the evolution of production technologies and the tremendous gains in the productivity of ocean transport of that time, the container port sector has undergone an enormous development up to the point of reaching today's standards. Undoubtedly, the transition from the small ports of the turn of the past century to the enormous modern container terminals, was neither a fast, nor an easy process. Evolution of port operations, and the adoption of the ever-improving technology, have resulted in improved efficiency, lower cargo handling costs, and integration of port services with other components of the global goods distribution network[1]. All those brought more advanced operations models requiring more complex financial analyses to better understand the performance and potential of ports as businesses, by their present shareholders and potential lenders and investors.

1.2 Container Business Overview

Containerisation of goods and container transport created an additional ground for competition between ports worldwide. Container transport itself has evolved from the 20-foot units to 40-foot units and reefer containers for transporting heat sensitive and perishable goods. Vessels have practically increased in size to twentyfold their size 100 years ago, reducing the transport cost per unit to a fraction of its cost in the early container trade days, but at the same time, require upgrades in the port infrastructure to receive them, in the form of wider port basins and deeper berths to call at. Changes then continue to the port equipment, where the loading and unloading systems ports use, have evolved to complex logistics systems that ensure the maximum handling capacity, and the shortest possible vessel turn-around time at their berths, and extend way beyond the ports premises, to the transportation infrastructure and interconnectivity that will take products to their final destination, the end user/consumer. Container traffic in effect, is a logistic process that links

[1] Information from :
https://ppiaf.org/sites/ppiaf.org/files/documents/toolkits/Portoolkit/Toolkit/module2/index.html

the manufacture centres to the consumption centres from a global down to a local level, where a sensitive balance of time and cost, decide the allocation of the market share.

One outcome of this intense inter-port competition in the container port sector, is the increasing interest in efficiency analyses by port operators and port users[2].The efficiency of port operations is an important indicator of financial development since more than 80% of the global international trade is now conducted by way of maritime transportation, and this is not expected to decrease in the foreseeable future. Profitability of ports is definitely one of the most representative indicators of examining their efficiency, and the development of the last few decades in highly populated areas of the world, and the modern consumer-centric lifestyle, brought container ports at the pinnacle of the sector. Container terminals have now for long been a highly profitable and resilient business sector, and this attracts more and more investors towards buying millions of dollars' worth of their equity. There are more than a few ways to increase container ports' profitability, amongst which the cooperation of shipping companies with container terminal operators, the investment in infrastructure and technologies that increase throughput, and competition-permitting, price hikes aiming to balance higher costs and maintain margins[3]. However, where each port physically stands in the global web of product supply and demand, remains a deciding factor in its market share, and thus profitability. In this context, there do not appear to be records of previous studies focusing on the comparative advantage offered by location, in the container ports industry, and its impact towards a port's profitability which is where this dissertation intends to concentrate.

To analyse the influence of location in the profitability of container ports, location has to be considered in conjunction with its main determinants, such as the demand level, expansion opportunities, market structure etc[4]. So, the location of each port depends on more than one characteristics. The following paragraphs, intend to familiarise the reader with the background on the aforementioned characteristics.

[2]Cullinane, K. & Wang T. F., (2007)

[3] https://www.porttechnology.org/news/4_ways_ports_and_terminals_can_boost_profits

[4] Bull, 1994; Lundberg, Krishnamoorthy, & Stavenga, (1995).

1.3 Existing Literature

The Structure-Conduct-Performance Framework, introduced by economists Edward Chamberlin and Joan Robinson in 1933[5] and further developed by Joe S. Bain (1951)[6] and Leonard W. Weiss (1979)[7], suggests that there is a positive relationship between market concentration and profitability. But the Chicago School, considers that this positive relationship can be influenced by the size of each company and not of its behaviour. Two decades later, in 1999, Brian Davies[8] and Paul Downward advocated that positive relationship variables need to be considered under an SCP Framework, with their paper concentrating on the UK hotel sector. Also, in 2005, Pan[9] was the first to establish the necessity of the efficiency of hotels in his research about Taiwan hotel sector which is closely in line with the considerations of the Chicago School. In 2016 Lado-Sestayo, Otero-Gonzalez, Vivel-Bua and Martorell-Cunill [10] decided to use other factors on top of the efficiency and market concentration, amongst which the tourist destination (location) for the hotels in their research.

At first glance, the hotel sector appears to be irrelevant to the container ports sector. On closer examination however, one can notice that both businesses are accommodating incoming and outgoing customer flows, are both functionally limited by their space capacity and level of occupancy they achieve against that capacity, and their market share is dependent on their proximity to their traffic destination, and in some cases, the fact that they share a market pool with other such businesses, that can serve the same destination.

1.4 The present study

The study that will form the main body of this thesis therefore, will apply the general methodology used in the research of Lado-Sestayo, Otero-Gonzalez, Vivel-Bua and

[5] https://en.wikipedia.org/wiki/Structure%E2%80%93conduct%E2%80%93performance_paradigm

[6] John Bain (1951) – "Relation of profit rate to industry concentration: American manufacturing.

[7] Leonard W. Weiss (1974)- "The concentration -profits relationship and antitrust. In H.J. Goldschmid, H.M. Mann and J.F. Weston (Eds.), "Industrial concertation: The new learning." Boston, MA: Little, Brown.

[8] Brian Davies & Paul Downword (1999) "The Structure, Conduct, Performance paradigm as applied to the UK hotel industry" 26 page 294-311

[9] Pan C. (2005)" Market structure and profitability in the international tourist hotel industry." 26, page 845-850.

[10] Ruben Lado-Setayo, Luis Otero-Gonzalez, Milagros Vivel-Bua, Onofre Martorell-Cunill (2016) "Impact of location on profitability in the Spanish hotel sector." 52, page 405-415

Martorell-Cunill, onto the dataset of 8 US container ports, with the necessary tweaks to be adapted to the characteristics of container ports. The aim is to examine the profitability of container ports (rather than that of hotels), considering the location of ports as the main parameter, alongside the market concentration and efficiency.

1.4.1 Dataset

The sample of eight (8) container ports, comprises four ports (4) on the East Coast, and four (4) on the West Coast, and the data to be considered in the analysis cover the period between 2010 and 2016, using variables relating to the ports and their location. For ports, the data used comprise the level of their efficiency, market power (market share) and indebtedness level. In terms of their location, the data include the demand level, market structure, and entry barriers. On market structure, the intent is to study whether the theoretical proposals of the SCP and Chicago School are verified by the analysis in terms of their effect on profitability. Hence, the results of the sample will be compared, to examine if there is an impact by a location and the reason why, looking at the population concentration around each port.

Figure 1 Map of the eight (8) Container Port positions[11]

- Port of Seattle
- Port of Los Angeles
- Port of Long Beach
- Port of Oakland
- Port of Miami
- Port of New York & New Jersey
- Port of Everglades
- Port of Palm Beach

[11] Map created by https://www.mapcustomizer.com

The sample of eight (8) ports in the U.S.A.[12], was chosen randomly, with an equal number of ports selected from each coast on the dataset being the only criterion. The four (4) container ports from the East Coast are the Port of Miami, Port of New York & New Jersey, Port of Palm Beach and the Port of Everglades. Their four (4) counterparts from the West Coast are the Port of Los Angeles, Port of Long Beach, Port of Seattle, and the Port of Portland. Seven (7) of these ports are included in the list of Top 50 Water Ports in the U.S. and six (6) of them make it into the Top 30. The ports in the sample are multi-cargo ports, that comprise container terminals, roll on-roll off automobiles (Ro-Ro, Ro-Pax), liquid and dry bulk berths, breakbulk and specialized project cargo. Some offer additional facilities for their clients, such as airports, cruise ship terminals, conference centres, harbour marinas, fishing docks etc[13].

The thesis, will concentrate on the container terminals of each port, and exclude all their other functions. Normally, published financial reports, annual reports, masterplans and all associated data sources used to obtain the dataset for this study, are not limited to the container terminals, but include information about all operations and services offered by the ports. This is useful information in terms of establishing the size of the company, and their level of leverage. However, as the paper concentrates on container ports, the data will be filtered in a way that only the values pertaining to the container terminal operation and performance are used when it comes to the operating revenues and expenditure, and ports' throughput. Where more than one operators operate container terminals within the same port, their cumulative data reflecting the combined performance of the container sector in the particular port will be used in the analysis.

Another important parameter in this study, is the operating capacity of the examined terminals. This relates to the logistics activities, including loading/unloading, transport, storage, inventories etc. which leave many ways to describe the capacity each container terminal. The generally accepted measure, is via their throughput, i.e. the number of twenty-foot-equivalent units (TEU - standard container size) handled per period of time. The measure of capacity for this study will be TEUs/Annum, and all available troughput data will be converted to that. The capacity of a container port is not a fixed value, but rather a

[12] https://en.wikipedia.org/wiki/Container_terminal
[13] https://www.portseattle.org/About/Facilities/Pages/default.aspx

dynamic parameter, that evolves with the port. It changes with new equipment (faster cranes/tractors/stackers), investment in port infrastructure (deeper basins, longer quay walls, additional yard area, development in transportation connecting the port to the nearby cities etc.), maintenance dredging among other factors.

The impact of the location of a container port on its profitability, is addressed by the Structure-Conduct-Performance (SCP) paradigm, and Chicago School framework. This thesis will consider the effect of location on certain endogenous and exogenous variables, that are generally known to affect business profitability. It will also include comparisons of results for each location (East Coast vs West Coast) and conclude on these findings.

1.4.2 Significance of this Thesis

The results of the analysis that will comprise the main body of this thesis, are expected to be of significance in terms of understanding the parameters that affect the profitability of container ports, with particular interest in the importance of location. This information, may benefit a number of entities, such as the port authorities and operating companies, potential investors, creditors (in terms of making investment decisions), and the academia, in terms of pursuing future research on the topic.

Port Authority/Operators

This Thesis would help the key stakeholders (port authority/operators) in terms of understanding the potential of their asset, and thus forming their future development strategy, in the form of strategic partnerships or investment in infrastructure and equipment, to increase their asset's potential for higher market share and return of higher profits.

Investors

Investors can use this information as a key to assess the potential a particular container port offers, and evaluate the yield they can expect by buying equity in a new port expansion or upgrade project, or investing in a port operating company.

Academia

The academe could benefit in terms of being stimulated from the outcome of this study, performed at a small level with a limited sample, to further develop the concept on a larger data pool, beyond the US market, to weight the importance of location in other areas densely

populated with competing ports, or use the present model to analyse the impact of location on other fields of business.

Creditors

The creditors may benefit in terms of using the outcome of this analysis, to evaluate risk and make decisions on whether to finance container ports expansion or upgrade projects, to which extent, and under what terms, based on the projected opportunity for profitability and growth.

1.5 Objective

The objective of this dissertation is to perform a data analysis on the effects of location in profitability of container ports in the USA utilizing the general method of moments (GMM) method. Published data from the and annual reports and other financial statements of eight (8) ports in two various locations, in East and West Coast are used in this analysis, supplemented by statistical data on population and country-wide container traffic. The results of the analysis are evaluated to determine if, and to what extent, location affects the profitability of container ports and why.

1.6 Layout of the Report

Chapter 1 Introduction of the reader to the subject of the Thesis.

Chapter 2 Review of the existing background literature, based on the work of others on the analysis methods for the profitability, that will be subsequently used in this Thesis.

Chapter 3 The theory behind the analytical methods used in this Thesis for the profitability analysis of container terminals in the USA.

Chapter 4 Presentation of the dataset for the analyses of this Thesis, in terms of the dependent variables, explanatory variables and the hypotheses used to connect them.

Chapter 5 Presentation of the descriptive analysis performed, relative to the verification of the methodology used, and analysis of the results.

Chapter 6 Summary of the conclusions drawn from the computational work.

Chapter 7 The author's recommendations on future work.

Chapter 8 References.

2 Literature Review

The present chapter provides a review of the work already conducted on the impact of location on businesses' profitability, prior to the undertaking of this thesis. The author will concentrate on the work already performed by others, that constitutes the basis of this Thesis.

In the existing financial studies on ports, a port considered as either a single port system[14], or a system of two or more ports (and terminals), located in close proximity to each other, within a given area (effectively adjacent ports serving as gateways to the main metropolitan area). In terms of their financial development and business attitude, ports can be distinguished in two categories. The first one is the "optimistic"[15] approach, that threats the port as means to positively affect growth of the local economy, becoming a driving factor that attracts commerce effectively acting as a facilitator of economies of scale. The second, "pessimistic"[16] approach, is a model that treats the port as an answer to the existing trade demand beyond locality, attracting commerce that is not relevant to the local economy, but rather, act as gateways interconnecting with follow-on transportation infrastructure. These two categories, tie-in with the "dilemma" of whether ports facilitate economic growth, or simply respond to the existing economic development (Rietveld 1989). Up to the present time, several studies have attempted to measure the benefits related with ports on a local and national level. "Port studies started to have influence on people & on companies since the 1950s in the United States and elsewhere" (Hall 2003). Quite a few papers and case studies have the effect of ports activities on surrounding areas as their main theme. However, many writers of the current literature, focus on performance of a port treating it as a black box business entity, with only a small number of them drilling into the way ports operate in terms of considering their infrastructure, equipment, operations and transportation connectivity. The latter, is the link between the port itself as a business and its notable impact in terms of the economic development of its hinterlands, the welfare of the local society, and contribution of these towards the state economy.

To bring our focus back on the location and its effect on the profitability of container ports, it is important to fully understand the concept of profitability and how it affects the welfare

[14]http://www.businessdictionary.com/definition/profitability-ratios.html
[15] Theo Notteboom, Cecar Ducruet & Peter de Langer – "Ports in Proximity, Competition and Coordination among Adjacent Seaports" , Chapter 4, page 43-45
[16] Theo Notteboom, Cecar Ducruet & Peter de Langer – "Ports in Proximity, Competition and Coordination among Adjacent Seaports" , Chapter 4, page 43-45

of each company. Profitability is an indicator of a business' ability to yield a financial profit or gain. It is often measured using the price to earnings ratio[17] of business' gross (operating) profit (Revenues minus Cost of Goods)[2] . The Gross Operating Profit, is the margin by which the gross operating revenue exceeds the operating expenses (or rendering of services). The gross profit thus, will be used as an indicator of how much revenue the employed capital of a container port returns, taking into consideration the costs the container terminal incurs in the process of providing their services. In the case the container ports examined in the present thesis, the profitability will be calculated based on the General Accepted Accounting Principles (GAAP), a set of accounting principles, standards and procedures that companies use to compile their financial statements.

The impact of location and how it affects the profitability of container ports is a research topic that has not received as much attention as other topics, in terms of the number of publications it has been the subject of. As a result of that, the research for the present paper, had to be broader, and focus on literature on other industries, dealing with understanding the impact of location on profitability and the factors that affect it. Through this broader research, the author had the chance to identify sectors that although at first glance are not related to container ports, or the logistics of commerce in general, display notable similarity in the way their success is determined, or methodology-wise, are affected by very similar dependent variables, and can be analysed based on similar econometric models.

Understanding the determinant profitability is the key tool in the hands of managers, in their quest to develop an effective profitability strategy for their business[18]. First and foremost, a key factor affecting the profitability of businesses, and as such, container ports, is the market structure. Market structure is shown to affect[19] the profitability by influencing the competitive behaviour and strategies of firms. The relationship of market structure and profitability may be viewed theoretically from two different perspectives, both supporting a positive relationship between the two. Those perspectives have different theoretical background. The first, the Structure-Conduct-Performance (SCP)[20], developed by

[17] Theo Notteboom, Cecar Ducruet & Peter de Langer – "Ports in Proximity, Competition and Coordination among Adjacent Seaports" , Chapter 4, page 43-44
[18] L. J. Gitman and C. J. Zutter, Principles of Managerial Finance, 13thed., USA: Addison Wesle, 2012.
[19] Pandey M.I. (2015) " Capital Structure, Profitability and Market Structure: Evidence for Malaysia (2015)- page 79-81
[20] https://en.wikipedia.org/wiki/Structure–conduct–performance_paradigm

Manson[21] and Bain[22], is a starting point when analysing markets and industries, and is applicable to the fields of business management and control. The markets that display an increased concentration, create a situation in which there is space for firms to interact contriving to present a false perception of reality, aimed at deceiving third parties (shareholders, potential investors, lenders etc).[23] That misperception may give the wrong impression on the potential profitability of a business. Thus, a region displaying high market concentration, will have positive profitability results according to the research of Pan (2005)[24] and Porter (2008)[25]. As every other business, container ports, compete against each other, to each achieve the greatest profitability. In the same manner, businesses of a single sector in one region, will compete against businesses of the same nature in other regions. Another point to mention is that ports located in a same location, address the same pool of clients. Many businesses collaborate with each other to establish closer relationships with their clients, by offering a more integrated service, and expand their individual clientele. This way, they can in the long run grow their profitability. That practice is supported by Crouch (2011), Novelli, Schimtz & Spencer (2006) and Shaw & Williams (2009). This, powers the hypothesis of SCP framework, so it's a main advantage for a business to be in a region with high market concentration. It favours the local companies by increasing the gross profits and hence the profitability.

Furthermore, the Chicago School, questions the potential SCP framework and gives another view of market concentration. The last one can be estimated by corporation and the neediness to survive of business. Only the business with high level of profitability, can survive, so the market concentration does not help the smaller companies, and thus is in itself a motivation to businesses to improve on their efficiency. So, the efficiency of a port is a key factor that can help increase the profitability, and not to impede it. The Chicago School justify this theory with entry barriers. If a market has entry barriers, it favours collusions between the already established companies, that undermine the importance of efficiency towards their profitability and acquiring marketplace. Where there are no entry barriers, companies will behave more competitive to each other, and there will not be a

[21] Mason E.S. (1936) "Price and production policies of large-scale enterprise." American Economic Review,29- page 61-72
[22] John Bain (1951) – "Relation of profit rate to industry concentration: American manufacturing.
[23] Mason & Bain at their research, argues about that issue.
[24] Pan C. (2005)" Market structure and profitability in the international tourist hotel industry." 26, page 845-850.
[25] Porter M. (2008) 'The five competitive forces that shape strategy.' Harvard Business Review 86- page 78-93

rigidity in the market power, regardless the market structure. New, efficient companies, can easier penetrate a market, and claim a market share and profit. This potential disadvantage posed by entry barriers has been examined by several studies, such as those of Yang and Wong (2012), Capone and Boix (2008), Maulet (2006) and Micheal, to name a few.

Another theoretical consideration worth looking at, is about the impact of market structure on profitability which is not quite clear. In the research of Lado-Sestayo, Otero-Gonzalez, Vivel-Bua and Martorell-Cunill, it is suggested that this unclear situation, is due to the omissions of relevant variables addressing the efficiency of businesses and factors relating to the location of each business. After testing the relationship between the profitability and market concentration, Pan (2005) and Davies (1999) come to different results due to their different methods. Pan's research is written in line with the SCP theory, and analyses the hotel industry in Thailand, an industry with specific characteristics. On the other hand, Davies' work follows the methodology of the Chicago School and his findings are inconclusive, when it comes to market structure and profitability. Only Pan has positive results in his test of the relationship of efficiency and profitability, but these, cannot be applied to other sectors because his sample has characteristics which are not common to most industries. Pan has not considered individual characteristics of each industry which can affect positively its profitability.

Furthermore, it is not only the market concentration that can have an impact on profitability, but also other factors, such as the location. The location of a port can have an important impact on its finances. The concentration of high-capacity ports near one another can also affect their profitability. They all take advantage of the potential of the location, in terms of creating demand for the transportation of goods, but at the same time, the competition between them, leads to attractive rates, that in turn attract more container business, developing the area into a hub for the import/export of goods at a broader regional level. Thus, such ports increase their revenue based on the higher sales, rather than the margin per sale.

Profitability can also be affected by the buy-out of smaller ports from larger better-established ones, such as the Port of New York and New Jersey, and external factors, such

as the as Panama Canal expansion, which is expected to impact the market share balance between the West Coast and East Coast container ports, for imports to the United States.[26]

Many studies have also focused on global competition. In 2015, Lee, with his study on the impact of location on profitability, suggested that companies (his research is also focused on the hotel sector) compete on pricing, geographic distance, and quality of their services. His analysis is based on companies which cooperate with businesses of the same sector to gain mutual advantage compared to their competition (in effect they try to technically operate as a single business of larger size, gaining the associated advantage), and the fact that others, where such collusions prevail, avoid specific regions altogether, to not be exposed to such dominated markets. The importance of cooperation between competitive businesses, have also been considered in other studies, such as Enz, Camina and Lommano's research in 2009, which pointed out that demand will make competition very high among the local market because the businesses will have to be resilient to price competition and collusion.

In general, it is evident that the profitability of a business, is extremely sensitive to its environment, in the form of the locale, the competition and the market attitude between competitive firms, and container ports, are no exception to that. More so, because, a port is not a single entity business, but rather a live "ecosystem" of businesses, each sensitive to internal and external factors, and the complexity of this operation model, increases with the size of the port. The port authority, will have to strike deals and work together with operating companies, both in the container and other sectors (bulk, cruise, Ro-Ro), work with the land-transport interconnections, and as their size increases, may also involve the operation of retail areas, airports, and industrial districts, each involving up to hundreds of businesses, all under the port organization. This means, that their risks and opportunities for profit, are spread over more than one business sectors, all however, tied to the location of the port in the state, country and at a larger scale, the world. The present thesis will concentrate to container trade, one of the most conventional activities people tend to associate with ports, and try to interpret the behavior of this part of the business, in terms of its sensitivity to location, market concentration, market structure, size and leverage.

[26] Camil Martinez, Adams B. Steven , Martin Dresner (2016) ' East Coast vs. West Coast: The impact of the Panama Canal's expansion on the routing of Asian imports into the United States' page 274-276

3 Definition of the theoretical model and its econometric counterpart

The theoretical framework used in this paper is inspired by the research of Ruben Lado-Setayo, Luis Otero-Gonzalez, Milagros Vivel-Bua, Onofre Martorell-Cunill (2016), and the work of Cowling and Waterson (1976). In 1976, Cowling and Waterson's paper reported that the profitability of a business is dependent on the level of market concertation. The market concertation is a proxy of the market structure, in an oligopoly market with homogenous products. The present paper attempts to apply this model to the larger market of international transport. The attempt to implement the theoretical model of Ruben Lado-Setayo, Luis Otero-Gonzalez, Milagros Vivel-Bua, Onofre Martorell-Cunill, will be achieved through the following equation, which includes variables related to the level of market concertation:

$$\textbf{Profit Margin}_{ijt} = \lambda_i + T_t + X_{\iota t}\beta_1 + X_{Jt}\beta_2 + \varepsilon_{ijt}$$

The term λ represents the characteristics of a business, which have not been part of the observations, and therefore are not explained by other explanatory variables. The T variable represents the temporal effect, and subscript i represents the business itself (hotels in the original publication, and container ports in the present study), j is the destination (of the guests in the case of the hotels, and the transported goods in the case of containers), and t represents the time. Variables $X_{\iota t}$ and X_{Jt}, are explanatory variables related to each hotel (in the present sudy container port) and region respectively.

Previous empirical studies have established their model using the level of market concentration for each region, proposed by Pan (2005), as their explanatory variable. However, Davies (1999) proposed to include additional variables, such as the market power of each company, because they have a profound effect on profitability, and thus can offer the analyst better understanding in terms of the impact of location. In addition to that, the Chicago School, suggests that size of a business is equally important to market power in terms of measuring the profitability of a firm, as it can have a positive effect on profitability. The research of Ruben Lado-Setayo, Luis Otero-Gonzalez, Milagros Vivel-Bua, Onofre Martorell-Cunill (2016), tried to apply all the aforementioned parameters, including unobservable characteristics of a business that should be considered, such as the quality of management's decisions, the reputation of the business, to name a few.

The present paper, uses an econometric model in which the profitability of container ports is dependent on the level of market concentration, each container port's market power, the economies of scale achieved, the level of demand for each port, the average container port size (based on the current dataset sample) and the level of indebtedness of each.

The methodology used in this paper, is based on the analysis of a dynamic panel data model through the Generalized Method of Moments (GMM), which is capable to correct the outcome of the analysis for unobserved heterogeneity of a sample, omitted variable bias, measurement error, and endogeneity problems frequently observed in growth estimation. The main reason for using the GMM method is the fact that it combines in a system, the relevant regressions expressed in first-differences as well as in levels. These models are dynamic, because they include lags of the explained (dependent) variable (Arellano & Bond, 1991). The Arellano-Bond test, controls the unobservable heterogeneity and endogeneity problems. Further to that, these models can reduce the effects of multicollinearity and improve the efficiency of the estimates. Also there is a comparison later in this paper, between the GMM method and other estimators, like Pooled OLS, Random effects model, Fixed Effects model and Fixed Effects model AR(1), proposed by the research of Anderson and Hsiao (1982).

The econometric model in the present paper is defined for each variable as follows:

$$\textbf{Gross Profit Margini}_{jt} = \textbf{GrossProfit Margin}_{ij(t-1)}\rho + \lambda_i + T_t + X_{\iota t}\beta 1 + X_{Jt}\beta 2 + \varepsilon_{ijt}$$

The term Gross Profit $\text{Margin}_{ij}(t\text{-}1)\rho$, represents the gross profit margin of a company (container port in this case), lagged by one period. λ represents the individual container port characteristics, which are not part of the observations, therefore not explained by the other explanatory variables. The T variable represents the temporal effect and subscript i represents the individual container ports, j is the goods destination and the t, represents the time period. Also, the variable $X\iota t$ represents the explanatory variable related to each container port and XJt is the explanatory variable related to the port's region. Ports are large organisations, with valuable real estate, that can create revenue from sources, beyond their container and commodities traffic operations. These include the leasing out of land, infrastructure, the receipt of state grants, compensation from concessions, and royalties from interconnecting transportation systems. The same applies to their expenditure, with capital investment, land purchase etc, can also have a significant effect on their indicated profitability. As revenue/expenditure from such sources tends to be inconsistent from one

financial period to the next, thus distorting the picture of their performance, only revenues and costs related to their operations will be used in calculating profitability (operating revenue, operating expenses).

4 Definition of dataset

The analysis of profitability of container ports in the USA, was carried out taking into consideration the key parameters presented here below.

4.1 Population of The Study

The population of the study comprised 8 publicity listed container ports in U.S.A, looking into their published financial data in the years 2010 to 2016 inclusive. The sample used in the analysis, was divided into two main groups, based on their geographic location on the East and the West Coast respectively. The former are the Port of Everglades, Port of New York & New Jersey, Port of Palm Beach and Port of Miami, and the latter are the Port of Seattle, Port of Long Beach, Port of Los Angeles and Port of Portland. The annual reports of these ports include financial figures such as their revenue, assets, liabilities, operating costs. In addition to these, for the purpose of this study, additional parameters are required, such as the port's throughput, and total handling capacity of the port for each year within the time range looked at in the study. Acquiring an adequate set of data to perform this analysis proved to be a challenge, as certain ports do not publish annual reports, or when they do, they do not provide the information required for the full time-series range this thesis is looking at. This has been a limiting factor in the number of container ports that could be included in the analysis. The lowest number of available observations comes from the East Coast, with the West Coast ports disseminating slightly more information. The analysis for this study was performed on a total of 36 observations.

4.2 Dependent Variable

The dependent variable used in the analysis of profitability, is the gross operating profit, i.e. the part of the revenues that is left over, after the total cost incurred by the port in providing its services is paid.[27] In the paper of Lado-Sestayo, Otero-Gonzalez, Vivel-Bua and Martorell-Cunill, on the impact of location in the profitability of Spanish hotels, the Net Profit Margin is used as the measure of profitability. In the present study, the Gross Operating Profit will be used instead, as the financial reports used are written according to the Generally Accepted Accounting Principles (GAAP). The key difference between the Gross Profit figures used in this thesis and the Net Profit figures, is the fact that the latter

[27] Ruben Lado-Setayo, Luis Otero-Gonzalez, Milagros Vivel-Bua, Onofre Martorell-Cunill (2016) "Impact of location on profitability in the Spanish hotel sector." 52, page 408

uses the net operating profit, also known as earnings before interest and tax (EBIT)[28], at the numerator, while in our case, to be GAAP compliant, the following expression will be used:

$$\textbf{Gross Operating Profit=(Operating Revenues-Operating Expenses)}_{it}$$

Subscript i, represents each container port in the sample and t, the year the observation corresponds to. The Operating Revenues minus the Operating Expences, which allows for the direct costs of raw direct costs and labour involved in providing the services, represents the container port's gross income from providing their services, moving containerised cargo, and it is the starting point for the determination of the amount of tax the business will be called to pay for the financial year in question.

4.3 Independent variables and hypotheses

4.3.1 Market Structure

Concentration (HHI): There a plethora of options to measure the level of market concentration[29]. The research of "Impact of location in profitability of Spanish hotel sector" and other previous studies have used synthetic indices, as well as the concentration ratio, the entropy index and the Herfindahl Index[30]. The Herfindahl -Hirschman Index (HHI)[31] measures the size of firms in relation to the industry and an indicator of the amount of competition among them. This method is chosen as the means to measure the level of market concertation, because of its connection with the market share. HHI is calculated by squaring[32] the market share (SHARE) of each firm competing in the particular market. Furthermore, it provides feedback for the entire sample used, and not only for the companies with the largest market share[33]. Another one of the strengths of this method, is that it can be comparable between different markets. Finally, this Index is used to measure concertation in an industry, that helps the analyst determine if the particular industry should be considered to be competitive market, or close to be a monopoly. Many previous studies

[28] https://www.investopedia.com/terms/g/grossmargin.asp
[29] Harber S, & Reichel A. (2005) Identifying performance measures of small ventures. The case of tourism industry. Journal o Small Business Management, 43, page 257-286
[30] Marco- Lajara, B. Garcia- Lillo, F. Sabater- Sempere, V. , & Ubeda-Garcia , M (2011). Impacto del territorio en la rentabilidad de los hotels vacacionales espanoles. Un analisis comparative de las principales Comunidades Autonomas y puntos turisticos de la costa nediterranea y archipielagos canario y balera. Revista de Analis Turistico 12- page 70-78
[31] https://en.wikipedia.org/wiki/Herfindahl_index
[32] https://www.investopedia.com/terms/h/hhi.asp
[33] Adelman, M.A. (1969) "Comment on the "H" concentration measure as a numbers equivalent". Review of Economics and Statistics, 51-page 99-101

such as the SCP framework, have used HHI as an indicator of the level of market concentration. HHI will be calculated based on the following equation:

$$\mathbf{HHI = \Sigma(s^2)^i_t}$$

$\Sigma(s^2)^i_t$, denotes the sum of the squared market shares of i container ports within the time period t. This index assumes values between 0 and 1, denoting low and maximum concentration, and on its yielded value, the first hypothesis is formed:

H1: "*There is a positive relationship between market concentration and profitability."*

4.3.2 Market Power

Market Share (SHARE) refers to a company's relative ability to manipulate the price of an item in the marketplace by manipulating the level of supply, demand or both[34]. To calculate the ability of a company to affect the decisions of their competitors, it is important to consider the elasticity that the demand presents.[35] In the case of container ports in the USA, their market power was not a readily available (at least in the databases the author was able to access), but the positive relationship between market power and market share should be able to rectify this lack of information. In the present study, the HHI will be used to examine the level of concentration of the region each container ports operates out of, and will be calculated based on the square o the sum of the market shares of the container ports in the sample data. In lack of specific data on the total revenue of the container port business in the US, the market share, will be calculated as the proportion of each port's throughput (TEUs/annum) over the total container traffic recorded in the US in the calendar year considered. Taking advantage of the proxy between the market share and market power, the second hypothesis of the study will be:

H2: "*There is a positive relationship between market share and profitability."*

4.3.3 Efficiency

Economies of scale[36] (LnTOTAS) is the cost advantage that comes as a result of increased production in the case of a product in the manufacturing industry, or in the case of container ports, throughput. The effect of economies of scale on the profitability of a firm, are measured to account the impact of the greater efficiency that is usually achieved by larger

[34] https://www.investopedia.com/terms/m/market-power.asp
[35] Bresnahan, T. (1989) "Empirical studies of industries with market power." In R. Schmalensee & R. Willig (Eds.), Handbook of industrial organization - page 1011-1057.
[36] https://www.investopedia.com/terms/e/economiesofscale.asp

companies. This can either be measured in terms of throughput or revenue. As the essence in this case is the size of the port as a company, its total assets value will be used to denote size in the present study. This is applicable, as the size variation of our sample container ports in terms of throughput and revenue is significant. The model shall therefore consider the natural logarithm of size for each container port[37] based on the following expression:

Ln(Total Assets)

The resulting hypothesis to be tested is thus:

H2: "*There is a positive relationship between the size of assets and profitability."*

4.3.4 Average Size

The Average Size (AZ) is used as a proxy of potential barriers to entry. The average size of container ports as businesses in the deferent regions, is significant in terms of the level of business a port needs to be able to achieve, to penetrate the container ports market. To estimate the average size, data from the financial reports of our sample ports will be used. To calculate average size of a container port, the study uses the total throughput of the USA container port sector in Twenty-Foot Equivalent Units (often TEU or teu)[38], over the number of container ports in the country. "TEU" is the standard unit used for describing a ship's cargo carrying capacity, or a shipping terminal's cargo handling capacity[39]. Our sample of 8 container ports in two different US regions (4 in each region), is using TEU to define the capacity of each.

With the above in mind, the average size for a container port of the present sample, is hence estimated as follows:

Average Size_{it}=Total USA Throughput_t/ Total Number of Ports in the USA

A positive relationship is expected between the average size of ports in each of the two geographical locations examined, and their profitability, in line with the Chicago School approach.

[37] Landes W. M., & Posner R. A. (1981). "Market Power in antitrust cases." Harvard Law Review 94- page 937-996
[38] https://en.wikipedia.org/wiki/Twenty-foot_equivalent_unit
[39] http://www.businessdictionary.com/definition/twenty-foot-equivalent-unit-TEU.html

4.3.5 Demand Level

The Level of Demand (LOD) can be calculated based on the occupancy around each port. As containerised goods are mostly consumer goods, a relationship is expected to be present, between the population around each container port, and the port's profitability. In the same way it takes people to assemble and produce goods to be traded, it takes people to buy consume imported goods. Both, constitute the basis of the business container ports get. This is expected to be most notable around metropolitan areas, where the industry and consumption is booming. To consider this parameter, a measurement of the population at a radius of 100 km (≈60 miles) around each port has been obtained, to be converted to a ratio between the TEUs moved by each port per 1000 residents.

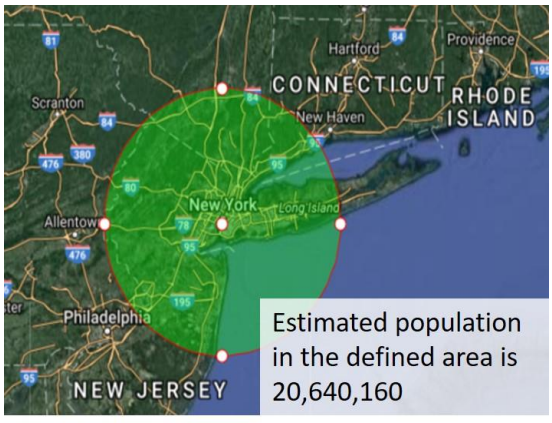
To determine the level of demand around each container port of the sample on each of the two locations (East Coast – West Coast), the population concentration is calculated based on the following expression:

$$\mathbf{OCU_{it} = Throughput_{it} / Population_i}$$

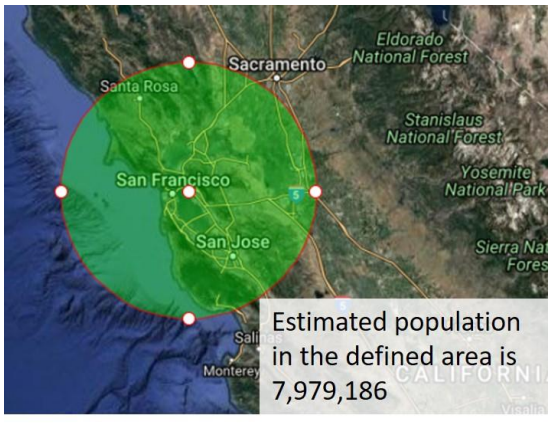
A positive relationship is expected between the level of demand and profitability. The population in the areas of influence of each port, has been determined using free map tools (https://www.freemaptools.com/). The area of influence around each port, has been arbitrarily set at a radius of 100 km (60 miles) from each port.

Figure 2: Population concentration around ports in the sample data

Port of New York and New Jersey:



Port of Oakland:

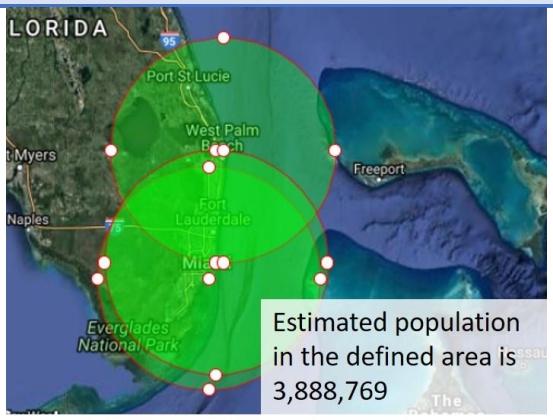


Port of Seattle: 	Population at a range of 100 km (60 miles) from each port in the sample data. Data obtained from free map tools (https://www.freemaptools.com/).

Where two or more ports are in such close proximity that their 100 km radius influence areas overlap or coincide, population figures for each port, were calculated based on the proportion of the annual throughput of each over the total throughput in the area.

Figure 3: Population concentration around Florida Ports

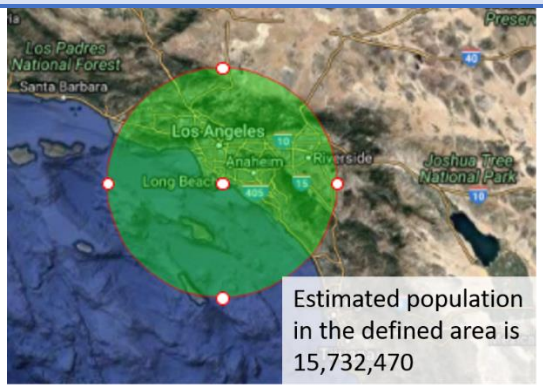
Population in Florida, total within 100 km from Ports of Everglade, Miami, Palm Beach: 3,888,769



YEAR	TEU					POPULATION		
	Everglades	Palm Beach	Miami	SUM		Everglades	Palm Beach	Miami
2010	793,227	206,585	847,000	1,846,812		1,670,271	434,999	1,783,499
2011	880,641	206,537	907,000	1,994,178		1,717,304	402,760	1,768,705
2012	888,641	223,463	909,000	2,021,104	$TEU_{it}/sum(TEU_{it})$ x Population →	1,709,818	429,961	1,748,990
2013	927,572	248,211	901,000	2,076,783		1,736,875	464,774	1,687,119
2014	1,013,344	257,252	877,000	2,147,596		1,834,917	465,820	1,588,032
2015	1,060,507	265,245	1,008,000	2,333,752		1,767,140	441,982	1,679,647
2016	1,037,226	260,324	1,028,000	2,325,550		1,734,442	435,312	1,719,015

Figure 4: Population concentration around Los Angeles Ports

Population in Florida, total within 100 km from Ports of Los Angeles and Long Beach:	15,732,470



YEAR	TEU				POPULATION	
	Los Angeles	Long Beach	SUM		Los Angeles	Long Beach
2010	7,228,000	5,936,000	13,164,000		8,638,278	7,094,192
2011	7,935,000	6,299,000	14,234,000		8,770,349	6,962,121
2012	8,186,000	5,857,000	14,043,000		9,170,832	6,561,638
2013	7,777,000	6,648,000	14,425,000	$TEU_{it}/sum(TEU_{it})$ x Population →	8,481,901	7,250,569
2014	8,210,000	6,818,000	15,028,000		8,594,862	7,137,608
2015	8,192,000	7,088,000	15,280,000		8,434,581	7,297,889
2016	8,388,000	6,946,000	15,334,000		8,605,971	7,126,499

4.3.6 Indebtedness

The level of Indebtedness (Debt) is a financial ratio that measures the extent of a company's leverage. It addresses need for investigation of the degree of pressure that debt can have on crucial strategic decisions made by a company in terms of adopting different levels of risk. Container ports are no exception to this, and thus, the level of Indebtedness is calculated for each port of the sample as follows:

$$\textbf{Level of Indebtedness}_{it} = \textbf{Debt}_{it}/\textbf{Total Assets}_{it}$$

$Debt_{it}$ denotes the long-term debt plus short-term debt, and the denominator represents the port's total assets.

The following table presents a summary of the variables and their respective units of measurement, and their expected relationship with profitability which is used in the regression calculation.

5 Descriptive Analysis

The variables used in this paper, the hypotheses that were examined, and the individual variables used to draw conclusions on the profitability of container ports, are summarised in Table 1. A summary of the results of the STATA analysis, is presented in Table 2.

Table 1:Definition of variables and expected relationship with profitability[40]

Variable	**Measurement**	**Measurement Unit**	**Definition**	**Expected Relationship**
		Dependent Variable		
Profitability	Gross Operating Profit	($M)	Operating Revenues-Operating Expenses	-
		Independent Variables		
Concertation	Herfindahl Index (HERF)	Ln (index)	Ln (herf)	+ (H1)
Market Power	Market Share (SHARE)	%	Port annual TEUS/ US total annual TEUs	+(H2)
Economies of Scale	Asset Size (AZ)	Ln (assets)	Ln (total assets in $)	+(H3)
Average Size	Average Ports Size	Ratio (Number of TEU's)	Number of annual TEU's/ Number of total TEU's	+
Demand Level	Level of Demand (Lod)	%	TEU's per 1000 population in each port's assumed influence area	+
Indebtedness	Debt Level (Debt)	%	Total Dept/ Total Assets	+/-

Table 2: Descriptive Statistics of the variables used in the analysis[41]

		Gross Operating Profit ($M)	**Herfindahl-Hirschman Index HHI**	**Ln(HHI)**	**Container Market Share (%)**	**Port Total Assets ($M)**	**Ln(Total Assets)**	**Average Port Size (TEU)**	**Level of Demand (TEU per 1000 pop.)**	**Total Debt over Total Assets (%)**
Year	**Variable:**	**gop**	**Herf**	**lnherf**	**share**	**Totas**	**lntotas**	**az**	**lod**	**debt**
2010	Mean	70.517	0.0143	-5.758	9.16%	5962.326	7.699	443,767	573	44.10%
	Std. Dev	63.965	0.0196	2.389	8.22%	9757.886	1.625	0	236	17.45%
2011	Mean	77.782	0.0296	-5.052	9.40%	6553.117	7.731	461,206	612	43.50%
	Std. Dev	69.006	0.0413	2.405	8.61%	11257.794	1.660	0	264	17.92%
2012	Mean	78.305	0.0456	-4.633	9.57%	6972.865	7.761	468,126	612	41.96%
	Std. Dev	70.291	0.0630	2.414	8.84%	12364.654	1.665	0	250	18.35%
2013	Mean	79.598	0.0607	-4.356	9.25%	7231.590	7.823	485,700	612	41.55%
	Std. Dev	65.505	0.0828	2.407	8.62%	12754.236	1.648	0	269	20.74%
2014	Mean	80.184	0.0758	-4.147	9.16%	7744.013	7.880	505,183	625	41.11%
	Std. Dev	68.458	0.1031	2.406	8.77%	13843.814	1.650	0	287	21.54%

[40] This table presents the variables used in the empirical analysis
[41] Calculated and generated through STATA

Year	Variable:	Gross Operating Profit ($M) gop	Herfindahl-Hirschman Index HHI Herf	Ln(HHI) lnherf	Container Market Share (%) share	Port Total Assets ($M) Totas	Ln(Total Assets) lntotas	Average Port Size (TEU) az	Level of Demand (TEU per 1000 pop.) lod	Total Debt over Total Assets (%) debt
2015	Mean	93.632	0.0921	-3.959	9.59%	8219.506	7.918	502,330	650	40.26%
	Std. Dev	81.896	0.1244	2.405	9.06%	14776.158	1.670	0	275	21.59%
2016	Mean	102.142	0.1084	-3.763	9.97%	8327.951	7.923	514,146	708	39.43%
	Std. Dev	79.308	0.1446	2.395	8.51%	15093.691	1.670	0	233	23.29%
Total	Mean	83.166	0.06095	-4.524	9.44%	7287.338	7.819	482,923	627	41.70%
	Std. Dev	68.225	0.09288	2.359	8.18%	12257.585	1.565	24,356	248	19.16%

As an aid in interpreting the tabulated data of Table 2, the tabulated data that test the three main hypotheses, were converted to line charts. The mean annual gross operating profit for each calendar year between 2010 and 2016, was converted to a line chart, and the standard deviation value was added, and subtracted from the mean value, and plotted in dashed and dash-dot lines, to reflect a band of possible values. The same is applied to the mean and standard deviation of the independent variable in each case.

The trend identified between the profitability and the market share of the sample of ports used in this study, is presented in Figure 5.

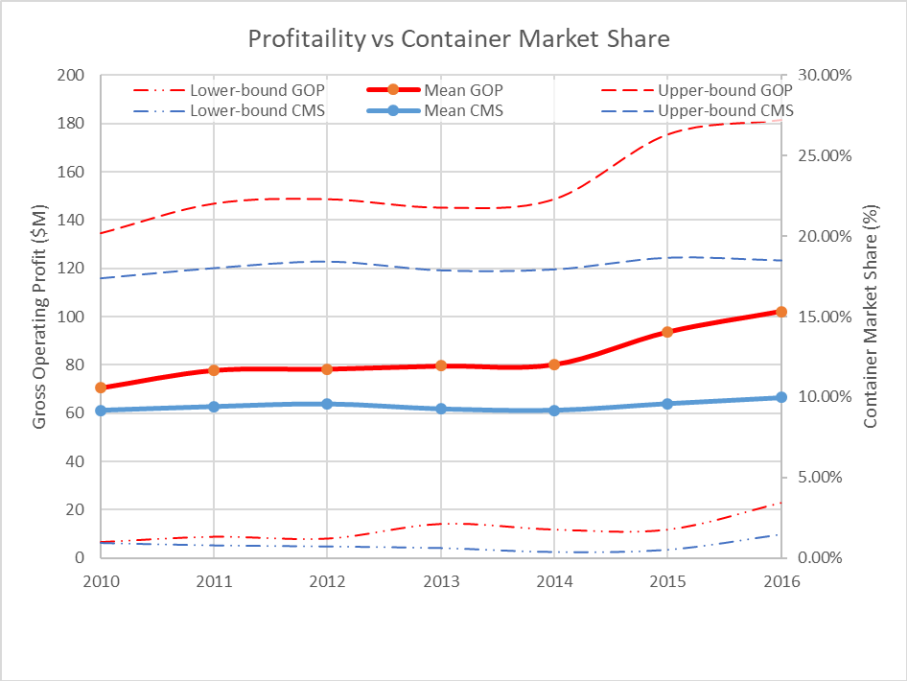


Figure 5: Trend between the Gross Operating Profit and Ports' Market Share

The trend appears to corroborate the initial hypothesis, that there is a positive relationship between the market share and profitability in the container ports sector. It can be seen that

there is a constant increase in profit over the years covered in the study, stimulated by increases in the market share of the ports in our data sample. It is worth noting, that small increases in the market share from one year to the next, appear to spike a steeper rise in gross operating profits, whilst small reductions (2012-2014) do not appear to result to profit losses, but rather to slow the rate of growth down.

The trend between the profitability of container ports and the market concentration, expressed via the Herfindahl-Hirschman Index (HHI), is presented in Figure 6 below.

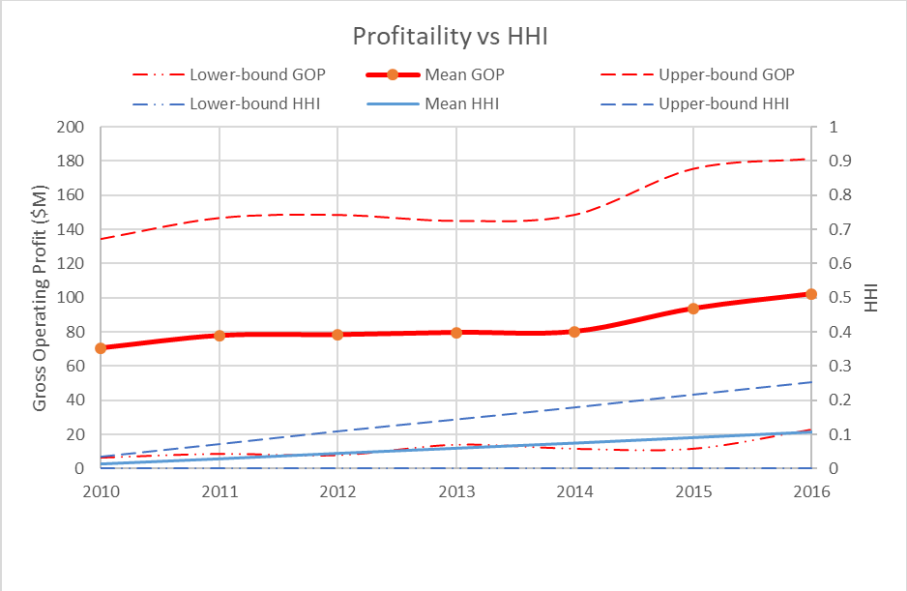


Figure 6: Trend between the Gross Operating Profit and HHI

Based on the potted analysis results, the market concentration generally appears to follow the profit growth pattern, and thus there is a positive relationship between the two. Despite the continuous annual growth, the market concentration remains at the low end of the HHI range, thus suggesting that the container ports business overall is a competitive business, without signs of monopolies or unusual collusions. This is also corroborated by the trend between the gross operating profit and the ln(HHI) presented in Figure 7, that was plotted to normalise the index, as the lower bound values of HHI violated the 0-value boundary.

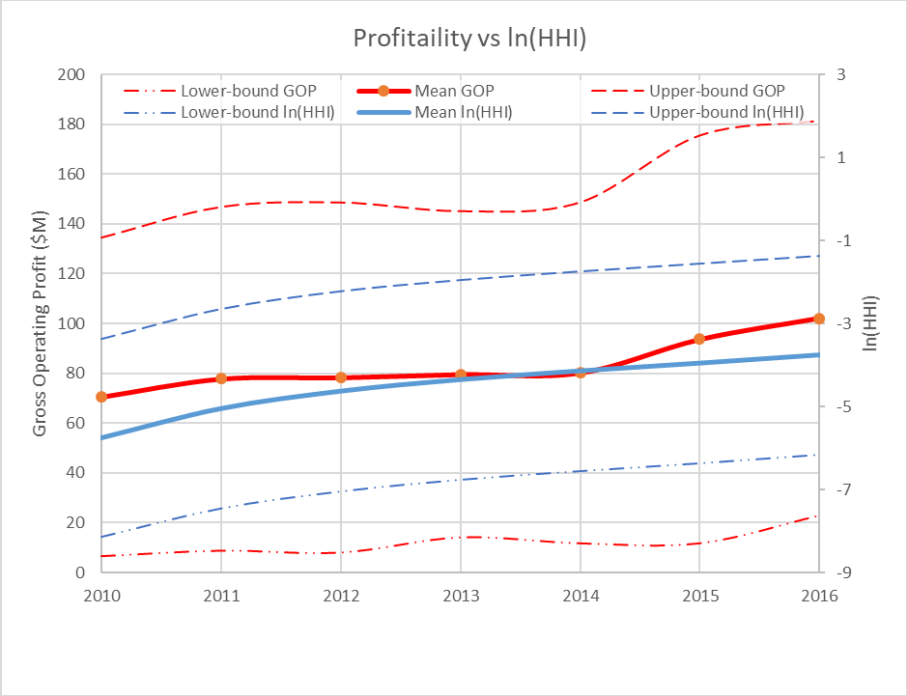


Figure 7: Trend between the Gross Operating Profit and ln(HHI)

The trend between the gross operating profit of container ports and the ports' size, expressed in terms of their total assets, is presented in Figure 8 below. Since the lower bound curve for the total assets contained negative values, a second chart was plotted for ln(Total Assets) and presented in Figure 9, to ascertain that the pattern is valid.

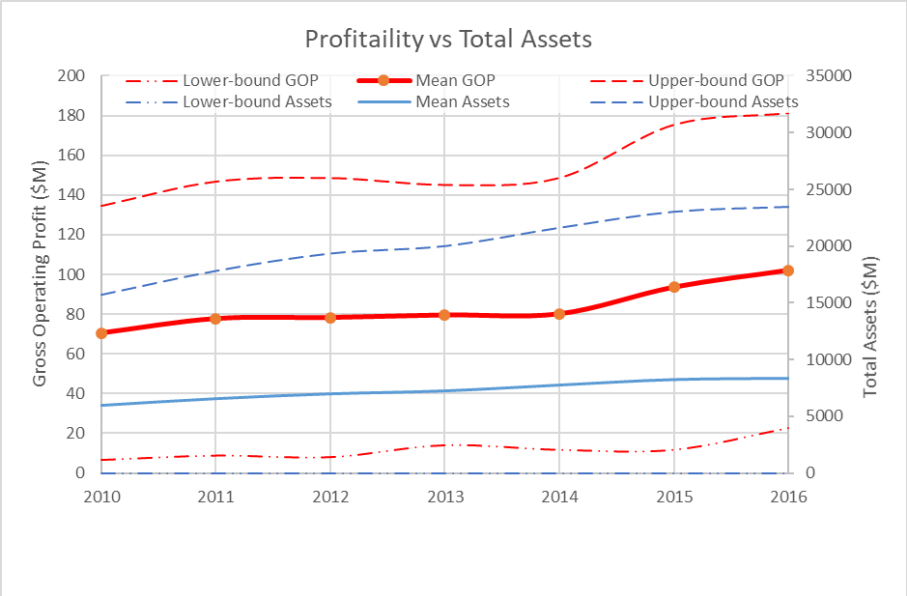


Figure 8: Trend between the Gross Operating Profit and Total Assets

Based on the aforementioned charts, there is a positive relationship between the gross operating profit of container ports, and the size of the ports in terms of their total assets. As one would expect, it is generally the case that a company that grows its revenue annually, increases the value of its assets with time, and vice versa.

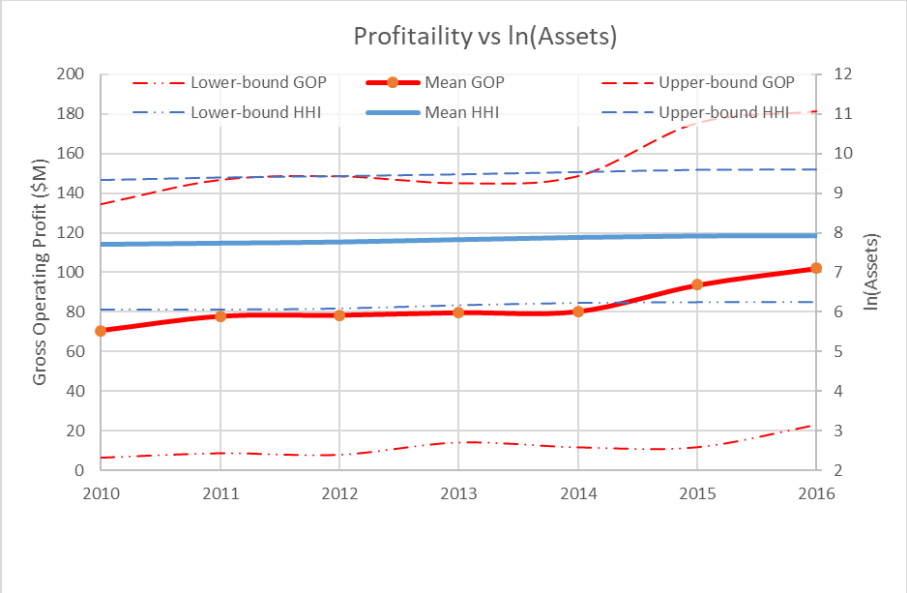


Figure 9: Trend between the Gross Operating Profit and ln(Total Assets)

What is also evident, is that the growth in total assets, generally tied with strategic investments, follows a much steadier rate of increase with time, and is not sensitive to the annual fluctuations in the amount of growth in operating profits.

In terms of considering the impact of location to the gross profitability, the information presented in Figure 10, demonstrates that on the West Coast, container traffic per capita, based on the assumed area of influence of each port at a radius of 100km, is significantly higher than the one encountered on the East Coast ports of the sample data. Generally, higher local demand for container transport, has a positive relationship with the gross operating revenue for the ports in our sample, with the exception of the Port of New York. Despite the Port of New York being near an extremely densely populated area, does not appear to attract proportionally high demand for container traffic per capita. This may be attributed to the fact that there are at least 4 sizeable relatively proxy container ports (Philadelphia, Chester, Wilmington, Baltimore), and is thus subject to a high level of competition for international trade. This may also partly justify the fact that despite its high throughput, it does not generate high enough profit compared to the large West Coast Ports, as it is the container port operating with a relatively low gross profit margin.

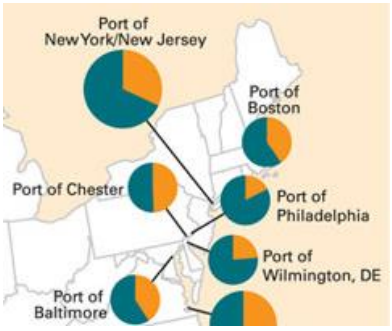


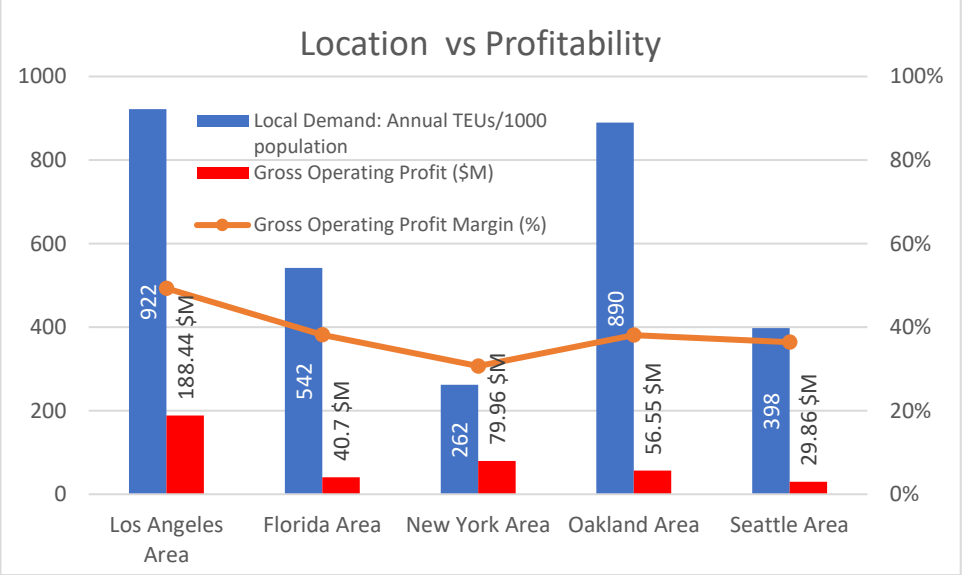
Image takenfrom San Onfore Powerplant Website

Profit margins for the ports in the sample are presented in Table 3. It is evident that ports on the West Coast generally operate at higher profit margins that ports on the East Coast. Table 1

Table 3: West Coast vs East Coast Ports Profit Margin

Ports		Operating Profit ($M)	Operating Revenues ($M)	Profit Margin (%)
WEST COAST	Port of Long Beach	174.26	345.74	50.40%
	Port of Los Angeles	205.40	414.55	49.55%
	Port of Seattle	29.86	76.06	39.26%
	Port of Oakland	56.55	148.63	38.04%
EAST COAST	Port of Everglades	65.37	146.10	44.75%
	Port of Miami	53.16	118.87	44.72%
	Port of New York & New Jersey	79.96	255.85	31.25%
	Port of Palm Beach	3.56	14.46	24.60%

This higher profitability, may be attributed to the fact that West Coast Ports are known to generally offer higher tariffs for the handling of containers compared to the East Coast ports, taking advantage of their proximity to the South-East Asian export hubs. Generally, in the remaining ports of the sample, there appears to be a positive relationship between local demand, operating profit, and profit margin.



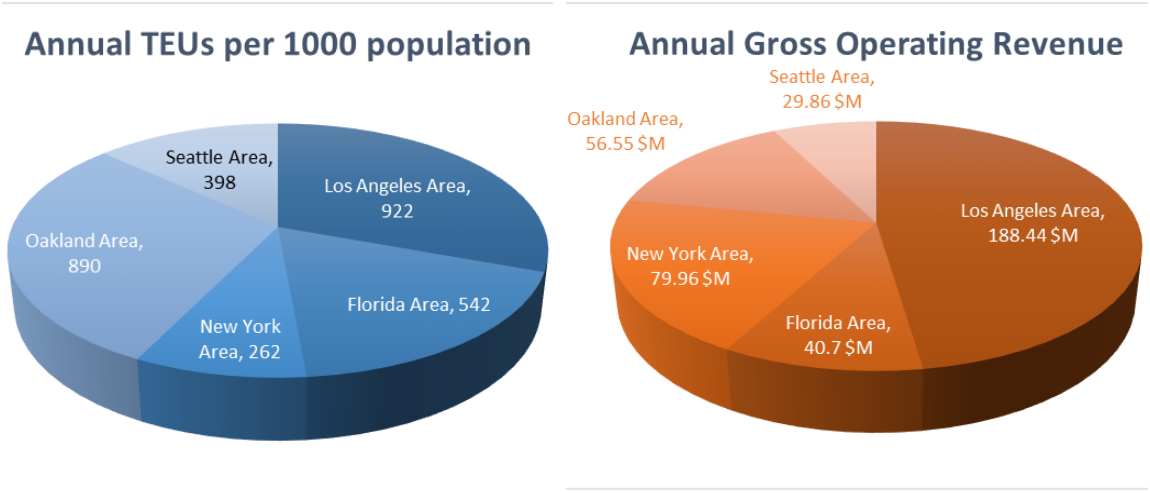


Figure 10: Location impact on Profitability

To summarise this chapter, a qualitative assessment of the results of the analysis, suggests that all three hypotheses that the model for this study focused on are valid, and that there is indeed a positive relationship between a container port's operating profit, and a good market share, a relatively open market where the rules of competition work, and finally a sizable organisation. In terms of the impact of location on the port's profitability, with the Exception of New York, there appears to be appositive relationship between profitability, and the local demand for container transport.

Table 4 presents the computational results of the dynamic panel data model, using the General Method of Moments (GMM). The model includes all the variables considered and all available observations in the sample data.

The main group of variables used in the model is the ports_dum, and the time series considered is expressed by the variable years_dun. Data, were sorted in alphabetical order in terms of the port they refer to, and index numbered, to achieve a "strongly balanced" dataset. The gross operating profit was used as the dependent variable, which is also considered with a 1-year lag in the analysis, for the method to correlate the independent variables with the previous year's value of the dependent variable, and considers it against their data.

Table 4: GMM Estimates of profitability for US Container Ports

Dynamic panel-data estimation, two-step system GMM						
Group variable: ports_dum				Number of obs		48
Time variable: year_dum				Number of groups		8
Number of instruments = 47				Obs per group	min	6
Wald chi²(7) = 55.40					avg	6
Prob > chi² = 0.000					max	6
Gos	Coef.	Corrected Std. Err.	Z	P>z	[95% Conf.	Interval]
Gos L1.	0.455	0.9381	0.48	0.630	-1.387246	2.290034
lnherf	63.08922	135.2796	0.47	0.641	-202.0538	328.2323
share	-1424.184	3932.849	-0.36	0.717	-9132.426	6284.057
lntotas	213.3693	187.6307	1.14	0.255	-154.3802	581.1187
Az	-1.301597	1.963096	-0.66	0.507	-5.149193	2.546
Lod	.4094079	.653531	0.63	0.531	-.8714894	1.690305
debt	1745.312	2661.68	0.66	0.512	-3471.485	6962.109
_cons	-1560.2	1350.115	-1.16	0.248	-4206.377	1085.977
Arellano-Bond test for AR(1) in first differences:				z = 0.08 Pr > z = 0.939		
Arellano-Bond test for AR(2) in first differences:				z = 0.68 Pr > z = 0.499		
Sargan test of overid. restrictions:			chi²(39) = 47.68 Prob > chi² = 0.160			
Hansen test of overid. restrictions:			chi²(39) = 0.00 Prob > chi² = 1.000			

The results obtained indicate that there is a strong relationship between the profitability of a container port, and the level of market concentration, which corroborates with SCP framework.

The results of the analysis also indicate that there is a negative relationship between market share and gross profit. This is not a reasonable outcome, as one would expect that the increase of a company's market share would increase its profitability. This unexpected

outcome, can be attributed to the nature of the dataset, and the way ports report their financial performance. Smaller ports, do not publish a breakdown of their revenue to their different activities, and limit the information they disseminate to the revenue gained and expenditure incurred by their maritime activities (vs airport, retail, etc.), which despite container handling being their principal activity, may include others such as cruise, bulk, fishing etc. This results to showing misleadingly high profits per container handled, once this revenue is considered against the number of TEUs they handle annually in the analysis, compared to that achieved by larger ports that publish their container revenue and expenditure. This is an obvious impediment to the accuracy of the analysis, however, one that had to be accepted in the process of this work, as the exclusion of smaller ports from the sample would distort the market characteristics, and the inclusion of the gross maritime activities profits for larger ports, would detach the study from the container sector, and into an area involving a dozen of different activity groups, for which it would be difficult to identify a market structure. Generally, the inconsistency in the way US ports report their financial data, has been one of the great challenges in developing this study.

The analysis, shows that the efficiency of assets has a notably positive relationship (213.6993 coeff, & t-test 1.14) with the ports' profitability, which confirms the Chicago School hypothesis, and the benefit of its inclusion in the SCP Framework.

In terms of the variables related to the ports' location, there is a positive relationship (40.94% coeff., & t-test 0.63) between profitability and the level of demand generated at the location of the port. This is in agreement with the general perception, as ports near large metropolis the likes of Los Angeles and New York, benefit from transporting the production of the cities' high population, and most importantly cater for the higher consumption demands the high population and urban lifestyle entails.

The model, also shows a negative relationship between the size of a port and its profitability. This can partly be attributed to the paradox explained previously on the market share. In the case of larger ports, only the container sector income is considered, and then compared against the port's size in terms of its total assets, it appears to yield lower profit with respect to its asset-based size, compared to a smaller port. This however is not the case, as container handling is only one of the earning activities of larger ports, with a long list of others contributing to its total annual revenue (airports, dry bulk, break bulk, cruise, liquid bulk,

fishing, commercial spaces, real estate, etc.), not part of the present study. This fact waives the present suggestion of the model.

The model also shows a positive relationship between the debt ratio (Total Debt vs Total Assets) and profitability. One would initially expect the opposite; however, the nature of the port business and operations is such, that demands high capital investment to increase profitability (deeper and longer berths, new, larger and more efficient cranes, automated yard equipment). In that sense, it is reasonable that ports that have recently done such upgrades and incurred the debt burden to finance them, presently enjoy higher revenues and profitability compared to the ones that haven't, and the fact that the service life of such upgrades are in the order of 30-50 years, means that there is a long period of time ahead, before this expansion-upgrade debt is offset.

The Wald-Chi^2 test, examines the overall significance of the model. It is used to test the hypothesis at least one of the predictor's regression coefficients is not equal to zero. In our case, the Chi^2 distribution has 7 degrees of freedom, defined by the 7 predictors in the model. The Prob>Chi^2 test, denotes the probability of getting a Wald test statistic, i.e. the probability of obtaining the Chi^2 statistic (55.40) if there is in fact no effect of the predictor variables. This p-value, is compared to a specific alpha level, signifying the willingness to accept a type 1 error, which is typically set at 0.01 or 0.05. A small p-value, lower than $1x10^{-4}$, indicates that one of the regression coefficients in the model is not equal to zero. This Chi^2 parameter, is used to test the null hypothesis induced by the Chi^2 7 degrees of freedom.

Finally, there are two specification tests used in the GMM analysis. The Sargan/Hansen test of over-identifying restrictions that test the overall validity of the instrumental variables and the null-hypothesis, is that all the instrumental variables as a group are in fact exogenous variables. The second test, examines the null-hypothesis that an error term AR(1), is not serially correlated at second order AR(2). The present analysis satisfies all but the Hansen test. This is expected, as the data sample we use is relatively small, as noted by Gujarati in 2003[42].

The dynamic model shall be compared to non-dynamic models, to test the robustness of the obtained results. 4 types of non-dynamic models were used, to test the validity of the

[42] Gujarati D, Basic Econometrics, McGraw Hill (2003)

analysis results, the OLS regression (Table 5), Random Effects GLS Regression (Table 6), Fixed Effects Regression (

Table 7), and finally, the AR(1) test in Table 8.

Table 5:Panel data estimated by ordinary least squares (OLS)

OLS regression						
				Number of obs =	56	
Source	SS	df	MS	F(6,49)= 86.01		
Model	233809.222	6	38521.750	Prob>F=0.0000		
Residual	22199.8981	49	507.727	R-squared=0.9133		
Total	256009.12	55	4654.711	Adj R-squared= 0.9027		
				Root MSE = 21.285		
Gros	Coef.	Std. Err	t.	P>t	[95% Conf.	Interval]
lnherf	32.74707	8.082161	4.05	0.000	16.50536	48.98878
share	465.6614	109.9953	4.23	0.000	244.6175	686.7053
lntotas	-39.07438	8.705549	-4.49	0.000	-56.56884	-21.57993
Az	-0.3159496	0.1883243	-1.68	0.100	-0.68506	0.0531593
Lod	-0.044433	0.0301219	-1.19	0.241	-0.11964	0.0307718
debt	23.49822	17.90502	1.31	0.196	-12.48326	59.4797
_cons	663.5425	261.2014	2.54	0.014	138.6386	1188.446
chi2(6)=	12.51					
Prob> chi2=	0.0515					

All dynamic and non-dynamic models, were performed at 95% level, i.e., 95% confidence intervals for the coefficients.

The data in Table 5suggest that out of the variables considered, it is the debt ratio that has the highest effect on profitability. In all 4 non-dynamic methods, the debt ratio variable displays the higher correlation with profitability, with the t-test values ranging between 0.66 and 1.31. This is expected, as container ports' increase in capacity and revenue, is the result of high capital investment in infrastructure and equipment, which in turn is responsible for the debt build-up. Higher debt levels in ports, usually suggest that they have recently invested in infrastructure, and thus are now achieving higher throughputs.

Table 6: Panel data estimated by GLS regression

Random-effects GLS regression						
Group variable: ports_dum			Number of groups = 8			
R-sq:			Obs per group:			
within = 0.2187			min =	7.0		
between = 0.9705			avg =	7.0		
overall = 0.9133			max =	7.0		
corr(u_i, X) = 0 (assumed)			Wald chi2(6) = 516.07			
			Prob > chi2 = 0.000			
gros	Coef.	Std. Err.	Z	P>z	[95% Conf.	Interval]
lnherf	32.40707	8.082161	4.05	0.000	16.90633	48.58781
share	465.6614	109.9953	4.23	0.000	250.0745	681.2483
lntotas	-39.07438	8.705549	-4.49	0.000	-56.13695	-22.01182
az	-0.3159496	0.1883243	-1.68	0.093	-0.6850585	0.0531593
lod	-0.044433	0.0301219	-1.48	0.140	-0.1034708	0.0146048
debt	23.49822	21.45027	1.10	0.273	-18.54354	65.53998
_cons	663.5425	197.8675	3.35	0.001	275.7292	1051.356
sigma_u	0					
sigma_e	15.440525					
rho	0	(fraction of variance due to u_i)				

3/5 methods considered (GMM, Fixed Effects, and AR(1)) suggest that there is a positive relationship between the level of demand, and port's profitability. This is a reasonable suggestion, as with the exception of the Port of New York, which faces competition from sizeable ports in its vicinity on the east coast, container ports located close to areas of high population concentration, tend to be more profitable than other, peripheral ports.

Table 7: Data panel estimated by Fixed-effects regression

Fixed-effects (within) regression						
					Number of obs = 56	
Group variable: ports_dum					Number of groups = 8	
R-sq:					Obs per group:	
	within = 0.4736				min = 7.0	
	between = 0.7042				avg = 7.0	
	overall = 0.6865				max = 7.0	
					F(6,42) = 6.300	
corr(u_i, Xb) = -0.2214					Prob > F = 0.0001	
gop	Coef.	Std. Err.	T	P>t	[95% Conf.	Interval]
lnherf	-0.6110424	12.88392	-0.05	0.962	-26.61185	25.38977
share	590.5777	345.8085	1.71	0.095	-107.292	1288.447
lntotas	12.30577	46.51871	0.26	0.793	-81.57279	106.1843
az	0.2524734	0.35632	0.71	0.483	-0.4666095	0.9715563
lod	0.0598347	0.0528823	1.13	0.264	-0.0468862	0.1665555
debt	79.0682	96.23829	0.82	0.416	-115.1485	273.2849
_cons	-264.0196	356.9059	-0.74	0.463	-983.6793	455.6402
sigma_u	38.826068					
sigma_e	15.440525					
rho	0.863	(fraction of variance due to u_i)				
F test that all u_i=0: F(7, 42) = 7.30						
Prob > F = 0.0000						

In terms of the market concentration, with the exception of the Fixed Effects Regression, all methods used indicate a positive relationship between profitability and the ln(HERF).

Table 8: Data panel estimated by linear regression AR(1)

FE (within) regression with AR(1) disturbances						
					Number of obs = 48	
Group variable: ports_dum					Number of groups = 8	
R-sq:					Obs per group:	
	within= 0.4018				min = 7.0	
	between = 0.9437				avg = 7.0	
	overall = 0.9034				max = 7.0	
					Wald chi2(7) = 225.25	
	corr(u_i, Xb) = 0 (assumed)				Prob > chi2 = 0.000	
gros	Coef	Std. Err.	T	P>t	[95% Conf. Interval]	
lnherf	14.80937	8.499888	1.74	0.081	-1.850109	31.46884
share	646.7711	142.4805	4.54	0.000	367.5143	926.0278
lntotas	-21.98319	10.07074	-2.18	0.029	-41.72148	-2.244891
az	-0.0054834	0.1936501	-0.03	0.977	-0.3850307	0.374064
lod	0.0169947	0.0330654	0.51	0.607	-0.0478123	0.0818017
debt	34.13598	31.68944	1.08	0.281	-27.97418	96.24615
_cons	239.0491	203.8887	1.17	0.241	-160.5654	638.6636
rho_ar = 0.17382719 (estimated autocorrelation coefficient)						
sigma_u = 9.5665867						
sigma_e = 16.78955						
rho_fov = 0.38506393 (fraction of variance due to u_i)						

The analyses performed, do not provide a clear answer in terms of the port average size, and the natural logarithm of total assets. The dynamic model suggests that the average size has a negative relationship with profitability (t-test -0.66), which is also corroborated by the Random Effects Regression, the Fixed Effects Regression, and the Fixed Effects AR(1), where the t-test results were noted to be -1.68, -1.68, -0.03. This is an anomaly in the analysis, as the average size is related to the number of TEUs handled by ports annually, and thus, the models suggest that the more TEUs a port handles, the least profitable it is. The reason for this anomaly, has been explained and elaborated upon in earlier sections of the report, and is related with the way smaller ports report their financial performance. This is therefore a clear distortion of the analysis results, and a hypothesis to revisit should more reliable data become available. This, also affects the reported relationship between the profitability and the natural logarithm of total assets, as once again, smaller ports fictitiously appear to yield higher profits than larger ports.

6 Conclusion

The present paper has studied the effect of location on the profitability of container ports in the USA, trough the market structure (in line with the content of the SCP Framework and the Chicago School), the level of demand for container transport in conjunction with the population in the area around each port, and the market entry criteria, via the average size of ports.

The results, confirm the hypothesis of the SCP framework, as the profitability of container ports is directly dependent on the regional market concentration, and the level of demand for container transport, expressed in relation to the population concentration around a container port. It is evident that container ports on the West Coast, where there are fewer, larger ports operating around metropolitan cities, generate higher profits compared to the East Coast, where the large number of ports and the fact that they are spaced close to each other, appear to have an unfavourable effect to their profitability. In effect, the West Coast market, with a smaller number of larger ports, appears to operate to an advantage compared to the weaker and more competitive market structure of the east coast.

Table 9: West Coast vs East Coast Summary

East vs West Coast (mean)						
	Gross Operating Profit ($M)	Herf	Assets ($M)	lod	Debt Ratio (%)	Throughput TEU/Annum
East Coast	50.51	0.024	10180.29	471.75	47.12	1,876,478
West Coast	115.82	0.097	4394.39	782.82	36.28	4,603,457

In terms of the level of local demand, and the attempt to relate the population density around ports, considering an area of influence of 100-km radius around each port, the fact that West Coast ports, appear to handle significantly larger amount of TEUs per 1000 residents in their "influence area" compared to the East Coast ports, suggests that their influence in fact exceeds their locale, and they operate as transportation hubs, serving clients at a much higher range than their East Coast competitors.

The study also noted, that container ports with higher debt levels, tend to be more profitable. Despite the oxymoron, this is a reasonable suggestion, as improvements in the efficiency and throughput of container ports, comes because of infrastructure and equipment upgrades, that entail a large capital cost, which in turn ports need to finance through undertaking debt. The long serviceable life of such upgrades (in the order of 30-50 years), means that the debt

for these upgrades will be appearing in their financial reports for a long time. It is thus the ports that have undertaken the debt and performed these upgrades, that are currently the most efficient and profitable.

7 Future Work

The author feels that there is a good potential for further research to be undertaken on the US container ports sector.

The main focus of any further work, should be in the field of expanding the dataset and acquiring more reliable data to improve and enhance the dataset, the nature of which has been the greatest challenge in the current work. Once this is possible, a larger number of smaller ports should be included in the sample, to mitigate the effect of inconsistencies in terms of the breakdown of their revenue and expenditure in their financial reporting. The hypothesis of the present thesis should then be revisited and the analysis outcome re-evaluated.

As a further step, the author would attempt to examine further variables, such as the breakdown of container traffic and revenue into import and export, tying the financial performance of the US container sector with the country's production and consumption.

Last, the author finds interest into the hypothesis of correlating the increased revenue of ports on the West Coast ports compared to those on the East Coast, with its proximity to the producing regions of China and the South-East Asia.

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