NORTH AMERICAN CARGO: A STUDY OF WEST COAST CONTAINER PORT INEQUITY AND THE UNDERLYING REASONS

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Arts in Geography

By

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I would like to express my thanks and gratitude to the professors, staff, and family who stood by me during a long and personal journey. Although the journey took many twists, turns, and an unexpected time length, without the support of all the fine individuals who have helped me I would still be lost. Drs. Sun, Davidson, and Craine were of great support. Dr. Steve Graves was an amazing advisor, teacher and friend through this whole process. Most especially I need to thank my wife Michelle who kept pushing me even when I thought all was lost. Thank you everyone.
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ABSTRACT

NORTH AMERICAN CARGO: A STUDY OF WEST COAST CONTAINER PORT INEQUITY AND THE UNDERLYING REASONS

By

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Master of Arts in Geography

Containerization of ship bound cargo proved to be one of the most important, yet often overlooked, developments in the post-WWII economic boom. It provided for safe, secure, and efficient ocean transportation while decreasing overall costs. This development has led to changes in how goods move across the plant, and to the economic fortunes of ports of embarkation and delivery. These fortunes, however, were not equal. The high growth centers of Southern California grew exponentially while other ports on the North American West Coast grew more evenly. This thesis explores that inequality and many of the contributing factors. The research begins by measuring the difference in terms of Mathematical inequality using the Gini Coefficient. This coefficient measures inequality by examining the ratio of the area between the line of equality and the Lorenz curve. Many of the external contributing factors are also examined. Factors such as population, geographic distance, infrastructure, fuel costs, and legal hurdles are examined. The future of these ports and their growth is examined as well. Changing trade patterns, shipping requirements, and political maneuvering have all contributed to shift some of the cargo burden away from California and to Canada. Change also is on the horizon with competition from an enlarged Panama Canal. The research concludes that even in the shifting global economic landscape California, and especially Los Angeles, still has many factors that make its ports necessary and desirable.
Chapter 1

Introduction

"Whosoever commands the sea commands trade; whosoever commands the trade of the world commands the riches of the world, and consequently the world itself". Sir Walter Raleigh (c1610).

1.1 Overview

International trade plays loudly in our modern lives, and yet most Americans know little of the complexities involved in the movement of goods in today’s globalized economic environment. Along with wide ranging declines in the cost of production, innovations in trans-global shipping have created conditions where shipping a product from Hong Kong to Los Angeles may actually be cheaper than moving a product from St. Louis to Los Angeles. When combined with the generally lower cost of international production, Americans are now in a period where prices of many goods have failed to rise along with the standard rate of inflation. This coupled with Americans’ rising average personal income, has created the situation where goods have actually become cheaper in “inflation-adjusted” dollars. Some goods, such as children’s toys, have actually fallen in absolute pricing since the mid 1970’s. These impacts have not only transformed the way Americans shop, but have transformed the American manufacturing landscape. Some may argue that the dramatic increase in transportation efficiency hastened the decline of the American manufacturing economy. Efficiency, however, is a constant challenge to maintain and it is important to understand that there are geographic and economic concerns in this equation.

The vast bulk of the products that Americans buy come into the country on container ships that need to be efficiently loaded and unloaded at container ports around the
country. Efficiency of freight movement is a significant component in the economics of a container port, as well as that port’s position in connecting the world to locations around the country (Cullinane et al, 2002). This efficiency has many sub-components to it and there is no easy way to properly discuss each of them and their impacts in a thorough manner in this paper. There are also many geographic, legal, and political elements to explore and properly understand in order to adequately assess their impacts on the movements of goods from across the globe. However, it is possible to look at several ports along the west coast of the United States and Canada and not only assess each of these on an efficient and desirability scale, but to look at their geographic placement and attempt to determine which one may be the most advantageous to shippers and buyers. Understanding that the role of the container port industry within the global supply chain is a function of the other entity’s demands and their relative bargaining power helps to lay the foundation for this study (Wang & Cullinane, 2006).

1.2 Research Directions and Thesis Layout

The goal of this thesis is two-fold. The first goal is to explain the distribution of freight shipments along the seven west coast ports chosen for this study. The goal is to identify and describe the inequalities in the distribution of freight coming into these ports. Since the North American west coast has fewer ports than the east coast, it might be easy to simply surmise that there should be some inequality, especially when considering the inequality in the distribution of population. The second goal of this thesis is to explain any inequality that may exist. (Valentine and Gray, 2002) The focus here is on the factors, both geographic and non-geographic. The paper does not simply describe linear
geography of the ports, but it also analyzes economic and urban geographic considerations as well. Since the vast bulk of cargo coming into the American west coast originates in East Asia, the geographic, political and economic ties between the two areas play important roles in determining which shipments go to which ports.

1.3 Hypothesis

This paper evaluates the logistical factors influencing port intermodal efficiency, and the desirability of the ports on the American west coast. It accounts for the external factors, which play a role in enhancing or devaluing the natural geographic advantages of one port in comparison to another. Since speed and intermodal movement are the most important factors for a container port (in relation to the shippers point of view), any perceived geographic benefits to a port may or may not be realized for the shipper. The main point is to understand is how economic, political, and simple spatial geographies play a key role in the desirability and competitiveness of one particular port in comparison to the others along the American west coast.

This paper has two main arguments. The first is that certain regulatory, environmental, and logistical factors have decreased the appeal of the largest port complex in Los Angeles and Long Beach, California. The second argument is that newer, efficient, and “greener” ports in Canada have taken advantage of their geographical benefits to take business away from U.S. Ports. Not only have they had an effect on California’s container traffic volume, they have come to dominate the entire shipping patterns of the Pacific Northwest.
Chapter 2

Review of Literature

2.1 Trade and Geography

There is a significant body of work in the field of transportation geography. It encompasses all aspects of moving people and objects to various places. Within this body of work, trade and shipping routes have been studied and analyzed by geographers around the world. Unfortunately, there has been very little work done on mitigating factors for the American west coast. Studies have been conducted using European and Asian markets, but little has been done for The U.S. The international literature is scant when the focus is on the Pacific Northwest. This study provides an important starting point for further research into these regions.

International trade is a complex and rich topic that does not easily fall into one discipline. Economists have studied the market forces that pull and push on the strings of trade. Geographers have tried to understand the factors tying global trade networks together. The evolving nature of the United States as a consumer nation, as opposed to a producer one, has created an environment where this overlooked sub-division of geography plays a greater role in Americans' daily lives. Geographers have generally focused on many different aspects moving people, freight, and information. Transportation geography grew out of the earlier disciple of economic geography and, according to Hoover (1948), has been a key factor behind the economic representations of geographic space, especially in terms of the location of economic activities and the monetary costs of distance.
Transportation studies have generally focused on land-based, people-oriented movement. From the simple models of spatial movement to a greater understanding of the “distribution of natural hazards and physical land constraints for development” (Vold 1982) the major focus has been on movement over land. There has also been a strong component of economic and transportation geography focused on water-based goods movement. The study of maritime transportation has evolved from simply tracking the flow of goods to attempts to understand the causality behind the factors of trade. This understanding of concepts and causality has helped create metrics in which to measure productivity and capacity in network in transportation networks in general (Ohm et al., 1992).

With the intense scrutiny of the airline industry following the September 11, 2001 terrorist attack, the lack of oversight at container port facilities became a concern to many security experts and transportation geographers. Investigators and geographers have historically researched the concerns to energy infrastructures around ports and gas facilities (Harrison 1974) while understanding the modern changes in cargo monitoring at ports (Shenon 2003). Developing policy in the face of both economic realities and governmental concerns (Boholm and Lofstedt 2004) are challenges ideally suited for transportation geography.

Transportation geography has moved out of the traditional realm of models and theory relating to urban design, to a place in both economic theory and GIS applications. Price theory and relationships of cost and distance were important factors in much of the early research as modern transportation geography developed. This research still centers on truck freight, especially in its relationships to the costs tied to CBD freight flow.
Along with these nodal models, the timing of freight movement has also been under investigation. Studies done concerning peak and off-peak transportation costs (Morris and Kornhauser 2000) have important implications in the movement of ocean cargo to inter-modal vehicles. Since most American freight is not destined for the urban areas around port facilities, this research plays a role in understanding the importance of the port facility itself, and the efficiency of its intermodal capacity.

GIS specialists continue to find ways to incorporate their skills into transportation geography. GIS research has been more focused on post intermodal transfer movement than on tracking much of the movement of ships between ports. Most recently, many researchers have looked at transportation as a cause and effect scenario. They have looked at everything from flow models to noise models (Hamed and Effat 2006). GIS researchers have also worked with the federal government in developing improved traffic routing and flow (Funderburg 2004). Planners are also using GIS to theorize, and plan for, a better inland intermodal facility (Tioga Group, 2006). This type of facility would be a rail “port” where intermodal cargo transport could be organized and efficiently moved with little impact on human communities. While both economic interests and GIS-based infrastructure studies have become mainstays of transportation geography, issues concerning national security have continued to push the discipline into new areas.

2.2 Clustering and Global Value Chains

The greatest number of scholars and experts looking at maritime transportation are economists and economic geographers. In particular, Paul Krugman has brought
geographic way of looking at economics and trade back into the forefront. The 2008 Nobel Prize winner was an early proponent and developer of “New Trade Theory.” (Krugman & Obstfeld, 2005) Krugman is an economist, but these theories have had far reaching effects on economic geographers. These researchers main focus is on foreign markets and economic protections for developing markets. Since developing markets tend to begin as closed markets, protectionism allows these markets to reach world-class level at home while aggressively pursuing foreign markets. (Krugman, 1984)

Understanding how foreign firms develop their business models allows geographers and economists to look at the trade patterns within a country to ascertain how they develop the geographic and economic linkages to businesses and product distribution. One of the more popular concepts being explored and discussed is economic clustering. The leading proponent of economic clustering has been Michael Porter. Clustering is an economist’s way of understanding geographic connections of businesses and suppliers within a certain industry. Businesses compete with and enhance each other in a sort of synergy (Porter, 2000). Although clustering is popular with many economists and geographers, it remains controversial.

Researchers have argued whether clusters are useful as a form of market organization (Maskell and Lorenzen, 2004), while others have argued whether a cluster is anything new. Some see the concepts of clustering as just a simple agglomeration of space and a form of geographic convenience (Gordon and McCann, 2000). A critical concern is that clustering serves as a sort of economic policy panacea (Martin and Sunley, 2003). This critique seems to charge that using or understanding the geography of space doesn’t accurately explain how or why similar businesses tend to group. While it
is true that there are many complex factors in understanding the spatial concentration of economic output, it would be somewhat dismissive for researchers to continue to ignore the geographic connections.

The other economic and geographic area generating a considerable amount of attention is the Global Value Chain. Whereas an economic value chain is simply moving goods as efficiently and as cost effectively through a chain of distribution as possible, thereby gaining value with each step along the way, the Global Value Chain adds an international aspect to the notion (Gereffi, Humphrey, and Sturgeon, 2005). International businesses must take into account the myriad of foreign costs in the political, regulatory, and cultural arenas. Some economists argue that the Global Value Chain can be used to upgrade the governance level of existing economic clusters (Humphrey, and Schmitz, 2002). Other economist and geographers remain skeptical. Economic geographers have argued that there is a danger in ignoring the aspects of cultural shifts when analyzing clustering and Global Value Chains. They argue there is a genuine concern that economic geography itself could be compromised (Rodríguez-Pose, 2001). All of these studies generally focus on some sort of manufacturing industry. There is a growing body of research investigating the pseudo-service sector of international trade and the business complex surrounding water and airfreight ports.

2.3 Maritime Logistics

Application of these theories to waterborne trade has been ignored over the years. Most geographers have been interested in land-based movement and specifically in freeway transportation. This makes sense since this is the one mode of transportation
most people in Westernized countries pay particular attention to. The movement of goods on the freeway, or lack thereof, can have a profound effect on the cost of goods and transportation capacity as a whole (Ortiz et al, 2007). This is a product of an older economic order, when US manufacturers supplied the US demand more fully. This is also the one mode where there is the most contention and the most funding.

Waterborne logistics has not been the subject of much research, although spatial theory has been developed with respect to transportation costs and trade areas (Hesse and Rodrigue, 2004). Some research has begun to combine economic network studies with river based maritime transit (Notteboom and Konings, 2004). Most research, however, is based on the linear patterns of exchange. This is a context rooted in the urban models of Burgess (1925) and the like since these studies were closely connected with the exchange of goods. Geographers now pay more attention to related subjects, such as the emergence of global production networks, structural changes in retail, and the commodification of modern consumption (Rodrigue, 2003) These processes are highly dependent on the efficient transfer of information, finance, and physical goods. This thesis is focused on the efficient movement of goods. If there has been an overall lack of research in American maritime logistics, then there has been even less research done on American container ports and deterministic factors. With a few exceptions, the freight sector as a whole appears to be neglected in contemporary research (Hesse and Rodrigue, 2004).

Current research has focused mostly on Europe and Asia. The work has sometimes been strictly a statistical interpretation, and at other times has been heavily based on surveys sent to shippers and shipping lines. Within the current maritime literature, the most common focus has been on the physical placement and setup of the
ships’ berths and their size in comparison to serviced shipping routes (Imai et. al, 2008). This type of research tends to be highly mathematical in nature, and lends itself to using varied statistical outputs such as a Gini coefficient. Of course there is contention as to whether the Gini coefficient can be used as a source for better understanding these spatial dynamics (Notteboom, 2006). Irrespective of the methodology, the research seems to be centered away from North America (Wang and Cullinane, 2006) and highly quantitative in nature.

There are very few studies based on the factors that can affect the desirability or the tendencies to employ of a specific container port. As with the general research on container ports, the existing studies have been on Europe, Asia, or Africa. The information provided is quite helpful. In 1985, Slack surveyed port end users and freight forwarders who were focused on trans-Atlantic container trade. He concentrated his research on the criteria used to determine destination ports in the American Midwest and Europe. In 1988, Bird also conducted his study based on criteria of European freight forwarders. The most important factor he found during his study was time. Time became “of the essence” as the saying goes. Tongzon (1995, 2002) twice confirmed that ‘time’ is of essence in freight forwarding. He further explains that the efficiency of the port operations was the paramount factor. Other economists such as Branch (1986), Willingale (1984) and Murphy et al (1991, 1992) either attempted to list or to explore the factors by which the shippers and freight-forwarders based their destination choice, when there was an option. With all of these studies, the routes were European - American trade routes. Ugboma et al (2006) took a different approach, by looking at African ports and studying the factors of competition. In all of the previous studies, the American West
Coast container ports were either not studied or were minimally studied. This leaves a research gap for the geographers to examine. With the volume of trade between North American and East Asia continuing to rise, port competition is bound to increase.

2.4 Filling the Gap

This thesis fills an important gap by analyzing container ports on the West Coast of North America. Particularities of North American local markets and containerized ports have been underrepresented by research in general. Research focus in this region is strongly based on physical structures and the cost of distance (Guy and Urli, 2006). These factors do play an important role in this study. This thesis further combines these factors with the political and regulatory environments, which is rarely done. Factoring of the local market and “port area economic cluster” is rarely found in current research. As mentioned there is plenty of research about clustering and agglomeration, but this is rarely done in the context of cities and container ports.

The West Coast container ports and their complexes have been studied, but few if any studies exist that look specifically at issues relating to deterministic factors and freight distribution. This thesis builds upon existing studies that analyze the movement of Asian goods moving to ports of entry, landside intermodal movement, and transportation channels. This study should serve as a starting point for continued work that can further attempt to dissect urban container port economic complexes and how general geographic conditions can affect the flow of freight in a global commodity chain. This thesis can also lay the foundation for further investigation into changes in the volume flow of freight to Canada in relation to the United States.
Chapter 3

Background of Containerization

3.1 Why Containerized Shipping

In the 1954 film *On the Waterfront*, Marlon Brando plays a tough waterfront dockworker named Terry Malloy. While the movie spins a tale about organized crime and corruption, it also shows the life of dockworkers in the 1950’s. The movie, ironically, was released a year before an event that would transform the international cargo business. In 1955, the first plans were laid down for shipment of cargo containers that were capable of multi-modal transport (Levinson, 2006). New dynamics governing both manufacturing and international trade would also be ushered in with this containerization. The shape, efficiency, and control of ship-based cargo would change forever.

Before 1955, the loading and unloading of steamships was done in a piece-by-piece manner, with dozens of laborers. Merchandise was brought to the docks in a state known as breakbulk. Merchandise was packed, either in groups or individually, in a wooden box or barrel. (Figure 3.1) Grains, powders, and coffee were stored in 90-pound burlap sacks. Fruits and other plants, such as bananas, were loaded while still attached to branches or stems. None of these products were of a standard size or dimension or weight (Cudahy, 2006). All cargo was loaded or unloaded by hand or with the help of a gantry crane that would lift cargo out or out of the hold from the dock. The movie image of a cargo net loaded with a variety of boxes being lifted in and out of the hold was the actual way goods were moved on and off ships.

Every piece that was loaded or unloaded was stored in the large warehouses along the old waterfront. (Figure 3.2) International shipments had to sit in storage for customs
clearance and national shipments still needed approval from the port manager before being re-loaded onto a train or truck (McPhee, 1990). Each piece was loaded or unloaded by a longshoreman, also known as a stevedore. These workers lived by the waterfront, and showed up each day hoping to be picked by a dock manager to move goods on and off the different transport modes, and in and out of the warehouse (Levinson, 2006).

Every sack, every crate, every barrel was moved by men working in a crew. Due to the erratic and unpredictable nature of the loading process, suppliers did not have a reliable schedule with which to plan for shipment. This meant that freight was delivered to the warehouses days or weeks before it would be loaded onto a ship. Goods were often broken or stolen before they had a chance to make it onto the ship. Weather delays and damage also meant reduced windows of time in which longshoremen could carry out operations (Kendall and Buckley, 2001). This was an expensive way to move goods. In a famous anecdote a shipper once claimed that it cost more to move the cargo a couple hundred feet from the storage house to the ship than it cost to ship it around the world once on the boat (Levinson, 2006). Needless to say, this system was inefficient, expensive, and ripe for corruption and theft, a sort of short haul penalty.
Figure 3.1: Stevedores

Figure 3.2: Waterfront Warehouse 1957
Since the average load time was between 2 and 4 days, sailors had a lot of paid down time. It also meant that the ship was out of service while it was being unloaded. The fact that the ships were losing money when they were not in service was another reason why the shipping lines were looking for ways to speed the process along (Skulich, 2007). Between the loss of time and money in the loading / unloading process and the high number of damaged and stolen goods, the breakbulk method meant that some shipments were a complete loss of income for the shippers or consignee.

For shorter, intra-coastal shipments, shippers had the option of what is known as roll-on / roll-off, or Ro-Ro (Cudahy, 2006). This was the process where tractor trailer drivers roll their rig onto the ship, unhitch their trailer, and then drive off the ship. The trailer was then secured and another trailer driven up next to it. Upon arrival at the next port, different drivers pull their bob-tail rigs the ship, attach to the trailers, and drive them off. Ro-Ro solved the problems of long storage and theft, as the trailers can be locked, but it was still inefficient, since space had to be left on the ships to accommodate the trucks driving on and off. (Levinson, 2006) The trailers could not be stacked, and transfers to a train required either a very powerful crane, or trucks to drive the trailer onto a railroad flatbed car.

In the 1950’s, the Interstate Commerce Commission (ICC) was the regulatory body with a say over everything that was involved in surface transportation. As a regulatory arm of the government, the ICC was responsible for breaking and limiting the power of railroads in the late 1800’s. By 1955, however, government was slowly moving toward de-regulation and fostering an increase in competition. Although progress was slow, the ICC would play a key role in the development of container shipping.
Malcom McLean owned a trucking company known as McLean trucking. In 1955 Mr. McLean purchased the Waterman Steamship Company along with its subsidiaries the Pan-Atlantic Steamship Company, and Gulf Florida Terminal Company. Technically this was an illegal purchase at the time (Levinson, 2006). According to the ICC, ownership in both maritime transportation and surface transportation by one entity was forbidden. McLean, however, was at the proverbial “right place and right time.” Railroads and competing shippers complained to the ICC that this arrangement gave McLean too great an advantage and that the ICC needed to step in and prevent this merger. Although an ICC examiner agreed with the railroads, the ICC commission sided with McLean and a new era of ocean freight movement could begin.

Malcom McLean did not invent the idea of cargo shipping. Metal cargo boxes had been used since the 1920’s. Seatrain lines actually built ships specifically to hold railroad boxcars back in 1929. The revolution of Malcom McLean, and in fact the revolution of container shipping, was creating a completely new form of container, and the interchangeability and intermodality of it. McLean’s team designed the container to be able to stacked, to fit easily into and out of special trucks, and railroad chasses, and, most importantly, to remain sealed throughout the voyage. This last element cut international customs time to a minimum and reduced the theft that plagued the old breakbulk system.

In April of 1956, McLean’s vision became reality as cranes lifted standardized metal boxes to a ship known as the Ideal-X (Levinson, 2006). Less than a week later the cargo was being taken off in Houston, Texas and loaded onto railroad flatbed cars for national distribution. The container ship service had begun.
3.2 Standardizing Containers

This new style of shipping had many proponents as well and opponents. These interests came from both governmental and corporate sides. McLean’s initial success brought a slew of competitors, both domestic and foreign. McLean’s containers were “standardized” only for his ships, his trucks, and the railroad flatbed standard. Other companies sought to do the same thing. This led to an early problem of containers not being cross-standardized. In order to realize an efficient movement of these containers, some accepted standard had to be agreed on.

Since the competing companies were using differing container sizes, containerization did not dramatically reduce the cost of shipping. The United States Maritime Administration, or Marad, stepped in to solve the domestic issue. Through a series of committees, the commission settled on only a few lengths and only one width and height. Though several shippers complained, the premise was simple. Shipping lines could, in theory, build a ship to accommodate any size container that they wished. However, if it were not of the standard measurements, then federal insurance for the ship would be withheld. After this ruling, all new ships were built to accommodate the standardized containers.

The standard set by Marad, and finalized in 1959, was a container box that was 8 feet high, 8 feet wide, and either 20 or 40 feet long. After several shippers complained to Congress and, after further a review, lengths of 10 feet and 30 feet were added, but the 8 x 8 width and height stayed the same (Kendall and Buckley, 2001). European and Asian standardization proved easier, as governments over there were more heavy-handed in the industry than the U.S. government was. By 1965 the consensus of length and height had
begun to erode once again, but the width of 8 feet has stuck. This consistent width gives
shipbuilders a measure of predictability. Today, the most common measurement for
containers to have are 8’ x 8’ x 40’ or 8’ x 8’ x 20’. From this base measurement a
standard unit of goods moved was formulated. This unit of measurement is based on the
20-foot long container. It is known as a Twenty Foot Equivalent Unit or TEU for short.
Additional standards have been adopted over the subsequent decades.

Further innovations have made the width and height of the containers more fluid. All
containers have reinforced square steel corner posts and rails, with each of the eight edge
corners fitted with an eyepiece that has multiple uses (Figure 3.4). Settling on the
specifications of the corner piece and the couplings took time and many international
committees, but in 1965 the ISO standard was settled (Cudahy, 2006). These corner
pieces and couplings are part of the genius that pushed the inter-modal container concept
to the point that it has become essentially the only way that most manufactured products
are shipped. The subsequent ISO standardizations continued tweaking the design, not
overhauling the design. The standardization of these fittings allows for a container to be
secured to ship rails, railroad flatbed cars, semi-trailer flatbeds, and to each other for
stacking
Figure 3.3: Container Markings
Figure 3.4: Corner Brackets

Source: www.abccontainers.co.uk
3.3 Economics and Benefits of Containerization

From the earliest days, containerization provided many benefits to shippers. Sealed containers reduced theft, reduced customs time, reduced damage to goods, reduced packing costs, and were less subject to weather delays. Shippers quickly recognized many other benefits as a distinct advantage of doing business in this new manner. One of these benefits has led to an entirely new field in the shipping industry.

Prior to containerization, carriers were responsible for stowing and stripping the goods from the hold of the ship. They contracted with local dockworkers unions, and bore the insurance cost of theft and damage. With containerization, this responsibility was transferred to the shippers and their consignees. Carriers were now only responsible for an inspection of the container itself, not for the cargo contained within. Shippers and consignees now began to have fewer relations with the carriers, and the carriers knew little about what cargo they were carrying (Levinson, 2006). Shipping logs were maintained, but since the containers were locked and sealed the carrier had no personal verification of what was actually in the container. With the decreasing communication between the shippers, consignees, and carriers, the freight forwarding business began to develop. Freight forwarders are space brokers. They look for available space across a wide variety of carriers and ships between pre-determined ports of call. They then broker the space between the aforementioned parties and charge a nominal brokerage fee (Kendall and Buckley, 2001). This has further reduced the carrier’s contact with the consignees and further reduced their own liability and variable costs.

Marine terminals and terminal operations are enhanced by containerization. Containerization is a time saver. In a time sensitive industry such as shipping and freight
movement, time lost equates to money lost. Containerization meant that cargo is now brought to the ship in boxes that are loaded directly into the ship. This dramatically shortens the stay for ships in port. While this benefits carriers since they only make money when ships are sailing, the decreased turnaround time also benefits container ports.

Ports charge a series of fees to every ship that enters and leaves. Cities, states, and port authorities as well as the federal government set these fees. The more ships move in and out of a port, the more fees can be collected. Terminals are now have round the clock utilization and are little hampered by foul weather. This shortened stay has resulted in faster delivery of goods, meaning faster payments to shippers, carriers, and container ports.

One of the most significant economic changes to the shipping industry involves dock workers. There are no more Terry Malloys. The modern container terminal requires fewer stevedores, checkers, and crew bosses. The dockworkers that are employed today are highly trained and technically proficient with heavy machinery, automated transport systems, and the basics of shipping logistics. (Figure 3.5) Their total numbers have been dramatically reduced from the 1950’s. The initial response to containerization by dockworkers was very unfavorable. Strikes were common, but as the numbers thinned and the work became more technical, wages rose dramatically. Today’s dockworkers can earn over $100 per hour (U.S. Department of Labor, 2008), depending on their job, and are covered by a full range of benefits. Individual costs may be high, but the overall industry wide savings in man-hour wages has been dramatic.
Figure 5: Specialized Gantry Crane

Figure 6: Double Stacked Flatbed Car
3.4 Containerization and Intermodality

While containerization was able to solve issues relating to theft and accounting, the massive potential for this style of shipping could only be capitalized by streamlining the entire transportation process. The container was designed from the beginning to be “intermodal.” Intermodal containers can be moved from ships, to trains, and to trucks with no additional modifications to the container. The fittings on the container perfectly fit into couplings on a trailer bed, flatcar bed, (Figure 3.6) or into a ship’s hold. Every one of these transportation modes has been specially designed around the container. Specialized cranes and loaders have also been designed specifically for moving ocean containers between each transport mode.

Intermodal transportation has given shippers the ability to find and utilize the fastest, most cost efficient routes to move their goods while also have the options of re-routing the shipments and using a variety of carriers. Carriers now have the option of sub-contracting with differing lines, thus eliminating the need for a vertical organization. This has also been a boon to freight forwarders. A forwarder can contract with one trucking company in Europe and another in the United States, all the while using a third company as the ocean carrier, and even a railroad intermediary if necessary. This combination has allowed forwarders to move with a greater degree of speed in case of delays, errors, or accidents. Intermodality has also spurred competition and thus, lowered prices.

Intermodality has, however, created some obstacles in the transportation matrix. These obstacles are the center of this research project. As will be discussed, containerization has sped up the rate of globalization and spurred the demand for inexpensively produced foreign goods. The basic transportation infrastructure has, so far,
proved capable of keeping up with demands. Railroad freight lines work to capacity, and continue to add volume every year. Highways near ports are congested to the maximum with tractor trailers competing with commuters for shrinking highway space. The port facilities themselves process a limited number of containers each day, even with 24-hour cycles. As a result, ships are waiting longer in port queue lines in order to deliver their cargo. Intermodality has led to such an increase in international trade that ports have become overwhelmed by the very trade their efficiency promoted, potentially collapsing the system. A classic case of diseconomy of scale has been reached at numerous American ports.

3.5 Intermodality and Globalization

New container ships are expensive. An old breakbulk ship was simply a boat with a big empty hold below deck; a container ship is highly specialized. This specialization presented a unique opportunity cost for shippers. They spend an increasingly larger sum of money to build each new ship, but each ship can do 10, 20, even 100 times more trips in a similar span of time than the old breakbulk ships. Financing this cost required alliances between, ship builders, bankers and even governments (Cudahy, 2006). Small shipping lines could no longer compete and were absorbed into ever growing multi-national conglomerates. Newer shipping companies are able to use their foreign subsidiaries as leverage for foreign investment. This mix laid the foundation for today’s globalized world.
Figure 3.7 Columbo Express showing the increased capacity of modern container ships
The ability to transport thousands of containers, along with the ability to reroute shipments has significantly lowered freight costs. Dramatically reduced freight rates, along with a period of historically low prices for ship diesel fuel (known as bunker), has allowed companies to comfortably source product from anywhere in the world (Johnston, 2008). Companies were able to parlay the lowered costs of production, along with near negligible freight prices, to consistently reduce or hold steady prices on the most desired goods. An example is blue jeans. The production technology has not changed for many years, yet prices have remained stable or dropped over the past several decades, especially once inflation is factored into the equation. Pants, which were traditionally made in the southeastern United States, were first sourced to Mexico and then later to East Asia. With each move the cost of production was dramatically lowered, while the transportation costs remained extremely low (Dupin, 2009). Companies were able to pass some savings on to their customers, and take the remainder as increased profit. This example has been repeated countless times with hundreds of different products. One can argue that containerization of freight and efficiency of movement have been keys to the increasingly globalized world we live in.

3.6 Issues and Port Terminals

Terminal efficiency has become the main bargaining chip for shippers and forwarders when dealing with ports. Ports are immovable. They cannot readily move their operations to a new geographic locale. Shippers and forwarders, however, have the ability to choose which ports they utilize. Some of their choices are made on simple
geographic logic based on distance and the special needs of the cargo. Most decisions are based on cost and efficiency.

The spatially fixed ports play a crucial role in the geographic systems surrounding them. Anything that has an effect on a port will have a ripple effect on the local economies, politics and culture. Conversely, those same political and economic forces can have a powerful impact on the development of shipping in a port (Roskar, E. & Svetak, J, 2007). With containerization, and the ever-growing size of ships, American west coast ports (Figure 3.8) grew in a dramatic fashion. The port complex of Los Angeles / Long Beach is the largest port complex in North America and has been for many years. This rapid growth was due to several factors. These factors, and the economic power of the ports, have shaped local, state, and national interests.

These interests include government bodies, unions, environmental groups, homeowners association, chambers of commerce, and many other stakeholder groups. With each of these groups wanting a say in the port operations, several contentious factions and battles have emerged. It is safe to say that many of these groups have contributed to conditions that have forced strikes and slow-downs, and placed logistical hurdles in the way of efficient intermodal operation. Until recently, the primary factor in port choice, for shippers, has been the sheer volume of cargo that could physically be handled (Roskar, E. & Svetak, J, 2007). Shippers, forwarders, and geographers need to look at other factors and impediments when understanding ports, whether it be for freight rate computation or to have a better understanding of a region’s geographic advantages and disadvantages in the industry.
Figure 3.8: West Coast Ports used in the Study
Chapter 4
Methodology

4.1 Gini Coefficient

The evolution of container shipping and container technology has played significant roles in the rapid changes to global trade and in the national roles of producers and importers. The freight containers and their ships, however, are only two factors in the equation of rapid and efficient freight movement. Intermodal freight transfers have become the most common way to rapidly distribute freight containers. Without the ability to make intermodal transfers in a timely manner, the advances of container shipping are lost. Intermodal efficiency, combined with factors such as governmental regulations and fuel costs, are important in understanding the preference of one port versus another in relation to shippers and forwarders.

Measuring these factors of desirability and efficiency in port choice is not easy. When attempting to do so, researchers need to understand the key factors that shippers, forwarders, and customers are looking for. One way to do this is simply survey shippers and forwarders to gauge what are the most important factors in their decision. The surveys can either be face-to-face interviews or done through the mail. Either way, this can be a tedious or time consuming effort requiring valuable time away from the shipper’s busy schedules. Another method can be to search for pieces of relevant data in shipping trade journals and business journals. This can provide important raw data that can be further included in any models. A third way would be to use a statistical measurement to better understand any concentration or inequalities in the volumetric amount of freight moved when comparing ports. For this project, a combination of the
above methods is used, providing a qualitative as well as quantitative output. These combined methods showed clear patterns in the movement of freight and in the importance of geographic linkages.

The first component is the statistical component. The Gini Coefficient was used to gauge the concentrations of freight tonnage along west coast ports. As has been noted, this coefficient does not necessarily compensate for other determinants in volume shifts between the ports (Notteboom, 2006), but it helps place any inequalities in a spatial context. The Gini coefficient was developed by, and named after, Italian statistician Corrado Gini. He conceived of the measurement as a way to understand the degree of concentration/inequality in income distribution. It has many uses, and many criticisms, outside of income distribution. Notteboom, (2006) used the Gini coefficient to examine in equalities in European seaport systems. This paper repeats a portion of Notteboom’s study, but focuses instead on the West Coast ports in North America. Notteboom used the following simplified Gini formula that is employed for this experiment.

\[ G = 1 - \sum_{i=0}^{N} \frac{(\sigma Y_{i-1} + \sigma Y_i)(\sigma X_{i-1} + \sigma X_i)}{\sigma X_i + \sigma Y_i} \]

(Noteboom, 2006)

The Gini Coefficient is based on the Lorenz Curve. The Lorenz curve is the difference in a curve between what would be considered a uniform distribution, and what the actual distribution is. A perfectly even diagonal line would represent complete uniformity. The greater the deviation in the curve of actual distribution, the greater the inequality in the distribution. Notteboom used this coefficient at least twice in researching European ports (2006, 1997). The Gini Coefficient was also used to measure US general cargo port system (Kuby and Reid, 1992), and the US container port system.
(Hayuth, 1988; McCalla, 1999; Lago et al., 2001). Noteboom also points out that there is a dissimilarity index, which is the sum of the deviations between the Lorenz curve and the equality line (2006). This can be written as:

\[ G = 0.5 \sum_{i=1}^{N} |X_i - Y_i| \]  

(Noteboom, 2006)

The Gini coefficient is used in this paper to show the relative inequality amongst west coast ports over the past decade. In the coefficient, if the distribution along the west coast were perfectly equal the scores would equal zero. The greater the inequality in a particular year, the closer to one the score is. The Gini coefficient is used to identify statistically quantifiable changes to the percentages, not the raw numbers, of volume flowing into individual ports, and to the west coast over time.

This thesis also analyzes factors that may not easily fit into a mathematical model. These are factors that can have serious effects on the cost of shipping and the efficiency of freight movement. Obtaining this information took several forms. The first was a survey of existing studies in academic journals. Port attractiveness was studied using Likert style questionnaires (Ng & Yu, 2006), port service distribution models were examined (Fremont, 2007), and alternative port allocation studies (Leachman, 2008) provided some important academic examples to understand. One factor that plays a significant role in shipping today is the price of bunker fuel. Pierre Cariou and Francois Wolff looked at European bunker fuel adjustments and called for justified rate or a rate restoration (2006). For the most current information additional sources were surveyed. Shipping and logistics trade journals provide excellent data, as does the United States Harmonized Tariff Schedule.
4.2 Mitigating Factors

Based on the trade literature and other published research, a list of the key factors and concerns of shippers, forwarders, port authorities and other stakeholders was developed. Interviews with freight forwarders and their representatives provided insight into some of the current conditions facing the industry. The interviews helped clarify certain issues relating to container space allocation, and factors affecting the freight movement process. Among the issues considered were:

1. Geographic proximity between west coast ports and worldwide export zones
2. Intermodal transfer issues (particularly delays due to congestion)
3. Congestion delays in berthing of ships
4. Environmental and governmental regulations (as an efficiency variable)
5. Differences in fees and tariffs
6. Fuel prices (as both an economic and environmental concern)
7. Availability of space for export freight (empty containers leaving the port)
8. Physical limitations to passage (bridge clearance issues)

Many of these factors are interrelated but each of these issues, as a whole, can be analyzed on an individual basis. For some of the factors, it is easy to apply a rank score, while others need to be understood as unique variables. These variables are distinctive to each port and cannot be used in any sort of competitive model, but in some cases they proved to be significant considerations for the industry. Each of these factors plays a role
in whether or not a particular port is a better option compared to the competition. In the cases where a rank score was administered (such as in transfer delays, or berth size), a range of 1 – 5 is assigned. A score of 5 is assigned to most favorable conditions supporting that port. Alternatively, a score of 1 is most unfavorable. Due to the ever-changing nature of trade, a multi-year tally is applied. Average costs, delay times, fuel charges, fees, tariffs, and ship availability are highly variable and an average score proves most reliable. Unique issues such as infrastructure limitation and governmental policies also play a key role in understanding the competitive nature of ports.

Trade literature aided in the analysis of issues from an industry-wide point of view. Interviews with representatives, either brokers or managers, of several companies in the greater Los Angeles area, in tandem with the trade publications and governmental data, provided significant insight as well. This inside information helps to understand the choices that shippers and forwarders make, as well as which ports might have a significant geographic advantage. These advantages are not only physical in scope. Factors such as location and proximity were important, but human geographic factors such as politics and economic clustering play a role in understanding which factors affect freight movement.

In conclusion, this approach proved quite effective as a strategy for understanding the issues confronting freight logistics. This methodology represents a deviation from typical research strategies. Economic and transportation geographers often use one of the methods employed but few, have used all three at once. Very little current research has specifically focused on the North American west coast. As such, this methodology yields insight into some of the behaviors that elude analysis by standard economic approaches.
5.1 An Introduction

This chapter was largely a discussion of the most common factors in determining port attractiveness to a shipper. The nature and complexity of shipping and logistics was briefly covered here, along with some key geographic concepts. The chapter begins with an explanation of the Gini coefficient and the numbers behind them. This was followed by general information concerning factors in shipping and how each factor applied to the individual ports. The information on fuel, geographic distance, intermodal delay times, and general infrastructure were weighted similarly to other studies that have been conducted in both academia and in the shipping industry. These weighted outputs were applied to the west coast ports and a general pattern of desirability emerged.

5.2 Gini Coefficient and Freight Volume

The Gini coefficient was a statistical measurement. This paper applies the statistical measurement to the raw volume numbers and quantifies inequalities in the delivery of freight to specific ports. The container ports of study were Los Angeles, California; Long Beach, California; Oakland, California; Seattle, Washington; Tacoma, Washington, Vancouver, British Columbia; and Price Rupert, British Columbia. These ports, with the exception of Prince Rupert, made up the bulk of all shipments to the west coast of North America for at least the past 12 years (Marad, 2008). There were several other smaller ports such as San Diego, California and Portland Oregon which were
regionally important, but do not significantly contribute to international movement of freight. Prince Rupert was included in the study due to the large amount of funding it receives from the Canadian government and from shipping lines, as well as its explosive growth recently.

For shippers and forwarders there was no absolute difference in the basic ability of a port to load or unload cargo. This means was that any port was a potential gateway into the North American interior. The Port of New York was as good a potential gateway for European goods headed to Los Angeles as the Port of Los Angeles was for Chinese goods headed to New York. There was a volume difference in what was received at these ports. Over the past twelve years there has been consistent growth in all volume on the west coast of North America, but growth has favored the ports of Los Angeles and Long Beach (Figure 5.1).

In 1997 most ports were similar in volume, but by 2007 Southern California ports had eclipsed their competition. Figure 5.2 shows the numerical data for the line graphs. The numbers show that there was an inequality in the volume of trade coming in to the ports. Los Angeles and Long Beach clearly were at one level while the other ports had somewhat similar yearly volumes. Within that grouping were the two ports from Washington, one from lower British Columbia, and another from California. Including the port of Oakland into the equation, California’s dominance showed an even greater inequality in the distribution of freight to the four states/provinces of the west coast container trade zone.
Figure 5.1

Study Werea TEU’s per year 1997 - 2008
### NORTH AMERICA: CONTAINER PORT TRAFFIC IN TEUs

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<td>9.8</td>
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<td>VANC%</td>
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<td>7.9</td>
<td>9.0</td>
<td>10.2</td>
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<td>9.3</td>
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<td>0.1</td>
<td>0.8</td>
<td>0.1</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Figure 5.2
5.3 Individual Factors

The conditions in which a container port operates have dramatically changed over the past twenty years. Industry researchers have gone back and consistently reviewed the changes affecting the industry. Groups that, until recently, would have had no apparent interest in port operations became important factors in the how a port functions. At the same, time various other externalities shaped the dynamics of port operations. Logistics experts developed several determinants of competitiveness (Tongzon, 2007) based on available literature, and others used direct questionnaires. Koi Yu Ng distributed questionnaires to the executives of the top 30 worldwide shippers. These shippers represented about 80% of market share (Alphaliner, 2005), thus showing that their answers were truly industry concerns. Shipping issues change and other sources, such as industry trade journals, provided more current information. However researchers chose to frame their study, several factors kept reappearing. This paper chose to use the top eight that were most often factors that appeared in other studies.

1. Efficiency of intermodal movement and delay time
2. Infrastructure and accessibility
3. Geographic location and proximity to embarkation ports
4. Fuel charges
5. Port fees and costs
6. Regulatory issues and political issues
7. Security and customs issues
8. Local Urban market
These eight issues were often intertwined and it was often difficult to separate them. Analyzing the factors from a simple geographic perspective made sense for a couple of problematic issues. If fuel charges were important, and they were, then the shortest shipping route makes the most sense since it burns the least fuel. If customer base were important then the largest metropolitan area would be the best choice, since customers were already there. There were many other issues that were important and may seem to have little to do with geography, but were directly tied to geography. An explanation of each issue shows the relevance to the shipping industry.

**Efficiency of Intermodal Movement**

As discussed in the background, the ability to move a container from ship to train to truck in either direction is known as intermodal movement. This is the competitive advantage of containerized shipping. However, if there was a breakdown in that movement then most of the advantages disappear. In the shipping world, time was always of the essence. Ships and their companies would only make money when they were moving goods. Delays can begin with simple port congestion. When there were too many ships headed to a single port the shipping lanes would become so congested that a container ship might wait a week or more before it could even berth (Schwaster, 2008).

Once a ship berthed and could be loaded or unloaded, then the primary concern shifted to the movement of containers. Once off the ships, the containers must be efficiently moved to either a train or truck. Any delay in the next modal movement, either due to highway congestion or rail back up further eroded efficiency. This efficiency breakdown has, in the past, been particularly acute in the San Pedro port complex of Los
Angeles / Long Beach. The result was a softening of the entire U.S. west coast and a movement to alternative ports which were more efficient and allowed companies to make money (Shwaster, 2008). As with each of the following criteria the study ports were given a numerical score based on factors that affect each port. The numerical ranking represents the following:

1. Low Efficiency: Many delays and difficulty with intermodal movement
2. Low to moderate efficiency: No major work stoppage issues but there were some congestion issues
3. Moderate efficiency: Good movement and flow but there were some needs, especially with offload speed
4. Moderate to high efficiency: Few issues with movement of goods, no real congestion issues
5. High efficiency: Only minor issues or none at all, a truly streamlined operation

**Infrastructure and Accessibility**

Part of the efficiency equation from above was that a port must have the physical infrastructure to handle newer and larger ships. The increased size of the newer ships made them unable to navigate the Panama Canal’s 100 year old locks. These ships were known as Panamax. The inability of cargo to move through the canal contributed to the growth of ports along the American west coast. (Kulwasch 2008) The number of ports that could handle the newer ships began to shrink to the point that the largest ships could only berth at the largest west coast ports. Smaller regional ports served as a way to take
unique cargo or to take stress off the largest ports, but they could not handle the newer ships. (Johnson 2008) For the largest of ports, infrastructure issues included depth of shipping lanes, size of docking quays, size and capacity of cranes, number of cranes, number of rail lines, and truck traffic capacity. There were also unique issues for each port, such as bridges and bridge clearance. For example, some ships were stacked so high that they could not safely make clearance under the Vincent Thomas Bridge in the San Pedro port facility. Ports may be able to move goods rapidly, but if they could not handle the ships they were essentially useless to companies using large ships. The assigned numerical ranking represents a port’s ability to handle larger ship sizes:

1. Low: Old and outdated port facilities with numerous limiting issues such as frequent harbor silt-up and limited intermodal access
2. Low to Moderate: Better facilities but several issues such as dock size and channel depth limit ships ability to use the port
3. Moderate: Newer facilities and good intermodal access but issues such as bridge clearance may continue to be limiting factors
4. Moderate to High: Few issues and good intermodal facilities. Good deep water access
5. High: New facilities with deep-water access and no structural issues. Easy intermodal movement

**Geographic Proximity**

For an industry such as shipping, geographic proximity would seem simple enough as to be a given. Political concerns and intra-business of practices, however,
undermine the importance of simple distance. With nearly everything imaginable being placed on a ship, including live animals, sometimes proximity trumped initial cost. Freight must arrive before it dies or spoils, so the quickest was chosen, regardless of cost. In this study, the small regional port of Prince Rupert, British Columbia was included because it was the closest North American port to China that remained ice-free all winter. Figure 5.3 illustrates the 1000 mile advantage that Price Rupert provided shippers over Los Angeles (Price Rupert Port Authority, 2008). Shippers found that such distance savings, often translated into both time and money savings. The rankings were based on the distance, in nautical miles, from the port of Shanghai to the study ports:

1. Furthest port(s) – longest transit time
2. Next Furthest
3. Middle Distance – average transit time
4. Next Closest
5. Closest Port(s) – shortest transit time

**Fuel Costs**

The shipping industry was just as sensitive to the price of fuel as any American motorist was. Perhaps shippers were even more sensitive. Ships run on a type of fuel known as bunker. Bunker fuel derived its name from the old fuel storage facilities that were the coalbunkers for early steam ships. This term was still used in modern times even though the fuel was a type of petroleum distillate. Bunker fuel is a thick gelatinous residue left after distillation removes products such as kerosene, gasoline, and diesel. This fuel is high in sulfur and heavy metals, making it highly polluting. Bunker is very
cheap since it’s mostly a residue that would have been discarded in any other circumstance. Modern environmental legislation made significant changes to the fuel composition, cost, and requirements.

While the cost of bunker naturally rose with the price of oil, there were increasing demands to switch to more expensive low sulfur and sulfur free fuels. The proposed alternatives were, for the most part, marine diesel oil and marine gas oil, or MDO & MGO for short. California demanded that ships burn this new fuel as they approached the coast and while waiting for a berth (Johnston, 2008). This added significant cost to the shipment of freight and began to erode the shipper’s profit. Figure 5.4 shows that in 2008 fuel costs were up to 50% of the operating costs. This led to a standard 50% fuel surcharge being added to the billing costs (Heaney and Johnson 2008). Shippers had to pass the costs on to their clients, which in turn was likely passed on to consumers.
Figure 5.3  Distances Across the Pacific  Courtesy; Prince Rupert Port Authority
The ranking a container port based on fuel costs primarily focused on how distance and regulatory environment had a greater effect on the intermodal carriers. For the ranking, the distance traveled carried more weight with a percentage given to any specific bunker requirements. The rankings were:

1. Greater distance coupled with extensive regulatory issues
2. Lesser distance but extensive regulatory issues
3. Average distance and less impact from regulatory issues
4. Greater distance but minor regulatory issues
5. Lesser distance and minor regulatory issues
Port Fees and Costs

The fees and costs of doing business at the different ports were regulated by different government entities. There was a harmonized tariff schedule set by both the United States and Canadian governments, but ports were free to add on other expenses as a cost of doing business. There were costs for harbormasters, harbor pilots, tugs, fire and security fees and a host of docking fees. These may include electricity and water that were surface supplied as well as any environmental needs such as bilge draining or emptying of marine heads. Each of these fees varies by port and by the municipalities, which control them. Fees were generally higher in larger urban ports. While these fees were not particularly steep on their own, the cumulative effect of them can become quite expensive.

One particular fee was the harbor pilot’s fee. In the United States, it was the law that local harbor pilots must bring the ship into dock. These pilots were local sailors with an in-depth knowledge of the waterways and any issues in them. This helped to ensure that the ship remained safe while in harbor, but the costs varied by location. In general fees and costs were similar, but the local variations had an effect on the overall cost of shipping. The numerical index was as follows:

1. High costs & fees
2. Moderately high costs & fees
3. Average costs & fees
4. Lower than average costs & fees
5. Relatively low costs & fees
Regulatory and Political Issues

Possibly the most volatile component of container ship operations were the political and regulatory issues. Regulatory involvement fell into two general categories: oversight of the vessels and transport modes and the protection of the environment (Kendall and Buckley, 2001). Increasingly, security issues were moving from general safety regulation to becoming a third general category. For this study security issues were given a category to themselves. The national regulatory environments of both the United States and Canada were similar in scope and there was little difference as to how freight was marked, moved, or stored. Both countries had similar labor laws and were served by the same trade unions (Eskew 2007). The clearest differences between the governments were in security issues. The US tightened export-filing laws to stop illicit exports to unauthorized users and determine any violations of export control laws (Kulwash, 2008). This was, in a post-9/11 era, mainly to prevent technology and natural resources from falling into the wrong hands. This added several layers of paperwork and filing, along with an increased chance of fines (Heaney 2008). Other than security and filing regulations, environmental regulations became the premier, non-security, issue facing ports.

Environmental regulations played a significant role in cost of goods shipped to ports. California had the strictest set of rules concerning air quality of any of the West Coast states or provinces. This was not just a California issue though. Port authorities throughout the US adopted a rather aggressive stance on port pollution. This was in response to highly critical environmentalists asserting that container ports were prime polluters (Shwaster, 2008). For a shipper or forwarder, the increased changes to
environmental laws brought increase in costs. Canadian ports, which were once seen as more stringent, now appeared more appealing since they already had a greener infrastructure and less ambiguity in laws and fees. For the study, the ports were given a score based on how recent policies and regulations have impacted the speed and/or cost of doing business with that port.

1. High amount of recent interference and an unfriendly regulatory environment
2. Consistent challenges from local governments although to a lesser degree
3. Strict laws, but ones that have been in existence for a while, less hassle over environmental issues
4. Laws in place do not change frequently, a business-friendly environment with little local friction
5. Port facilities welcomed by the local government, laws were protective but not disruptive nor overtly expensive

**Security and Customs Issues**

Security issues have been prominent since the days of breakbulk cargo shipping. Most early concerns were for the safety of the cargo. Cargo theft was the greatest concern for shippers. While cargo theft was still an issue, security concerns have turned to focusing on what was being brought into the country.

Following the September 11 terrorist attacks, the US government placed special focus on goods entering through US ports. The Container Security Initiative (CSI) mandates that all goods headed into the US be inspected before leaving their departure port (US Customs and Border Protection, 2009). This initially caused friction between the
US and many of its trading partners. Although modifications to the initial initiative have been made, it was still an issue that has an effect on choosing a Canadian port over an American one.

Canadian Ports required high amounts of security; it’s just that with less of an emphasis extending the customs zone to export countries the financial and regulatory burden was lessened. As mentioned earlier, cargo theft still remained a problem. In a period of global economic softening, thefts were generally expected to increase (MGVI, 2008). Theft and piracy was adding up to become a substantial portion of operating losses and was eroding the profitability of companies in a time where margins had become extremely narrow. Although there was no complete record of theft, the costs were rising into the several billions of dollars US (Eskew, 2007). When ranking ports, the national climate toward regulations and the freight security issues were taken into account.

1. Low: Many security issues and a burdensome amount of paperwork
2. Medium Low: Localized security issues lessened but still an excessive amount of filing required
3. Medium: Local security was strong and theft was low but there were still filing and customs issues
4. Medium High: Good local security and theft control, lessened customs and filing issues
5. High: Good local security with negligible amount of theft coupled with a streamlined regulatory environment
Localized Urban Market

Urban markets were the traditional driving force in shipping. Ports were located in urban areas to take advantage of the built-in customer base as well as the labor and manufacturing bases. While this was still true, changes to transit routes along with the enormous increases in efficiency brought about by intermodal containerization have theoretically lessened the initial importance of urban areas. Urban areas still play strong roles in shipping, due to the importance of clusters.

Clusters were geographic concentrations of companies and industries that were interconnected and associated in a particular field (Porter, 2000). These companies competed with each other but also provided assistance and basic raw materials to each other. Clustering of labor, infrastructure, intelligence capital, and associated systems were often found in urban environments and presented a boon to shippers in various ways. Urban areas provided the sellers and purchasers of freight and can be a strong source of income since the cost of distance was greatly reduced. Rural areas do have advantages such as a more dedicated workforce, since there were likely fewer employment options, and easier relations with local governments, but urban areas have more advantages to make them attractive. The index score was based on the metro population of the urbanized areas around the study ports from the U.S. and Canadian censuses.

1. Less than 50,000
2. 50,000 – 500,000
3. 500,000 – 5 million
4. 5 million – 10 million
5. Greater than 10 million
5.4 Conclusions

While much of the information for ranking the ports was found in academic and trade journals, none of these sources was a solid substitute for meeting with people who work in the industry. Interviews with sales representatives, administrators, and a couple of executives from importers and freight forwarders in Los Angeles were conducted. The interviews were in a more casual manner than just a simple survey. The focus was other underlying issues that play into the shipping lines used, or the ports that were used. The questions were open ended in order to gain greater feedback and not to limit the responses in any way. Any geographic preferences and any factors that fit into current economic geography trends were noted, especially clustering. Once again the goal was to find indications of preferences and any pressing issues in the industry.

This concludes the section on the data and criteria for the rankings of the ports. The following chapter analyzes and explains the specific data unique to each port as well as taking into account the interview responses. Gini coefficients were charted, tabled, and the inequalities explained. Total scores from each phase of the research were summed and each port was assigned a ranking based on the above factors. Current issues facing each port were also addressed.
Chapter 6

Results

6.1 Results of the Gini Test

As explained in chapter four, a Gini Coefficient test was done to test any inequality in the shipping patterns along West Coast ports. To recall, the Gini Coefficient, based on the Lorenz Curve, is the difference between what would be considered a uniform distribution, and the actual distribution. This test was similar to a one conducted by Theo Notteboom. In Notteboom’s (2006) study of ports and port ranges, the inequality rate was less than 40%. This was a study of relatively close and smaller European container ports and port ranges. Conversely, in North America the equity dropped to as low as 15%, with an emphasis on the dominant ports in California. (Notteboom, 2006 pg 101) My analysis returned similar West Coast results using only the raw numbers, but also revealed some interesting trends and patterns. The Gini tests show, as expected, significant inequality among the west coast port system as a whole. Changes to freight fluctuations in either Puget Sound ports, Canadian ports, or to the port of Oakland had a negligible effect when the dominant port complex of Los Angeles/Long Beach is included in the equation. This numerical inequality among the entire West Coast, as expressed using the Gini Coefficient, was based on total west coast tonnage is shown on table 6.1. The table shows a year by year tracking of Gini scores and includes all of the west coast ports used in the study. The port of Prince Rupert in British Columbia was not in use as a container port till 2007 and had no significant volume till 2008.
<table>
<thead>
<tr>
<th>Year</th>
<th>Gini Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>0.386</td>
</tr>
<tr>
<td>1998</td>
<td>0.404</td>
</tr>
<tr>
<td>1999</td>
<td>0.398</td>
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<td>2000</td>
<td>0.411</td>
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<td>2001</td>
<td>0.427</td>
</tr>
<tr>
<td>2002</td>
<td>0.423</td>
</tr>
<tr>
<td>2003</td>
<td>0.436</td>
</tr>
<tr>
<td>2004</td>
<td>0.427</td>
</tr>
<tr>
<td>2005</td>
<td>0.415</td>
</tr>
<tr>
<td>2006</td>
<td>0.425</td>
</tr>
<tr>
<td>2007</td>
<td>0.424</td>
</tr>
<tr>
<td>2008</td>
<td>0.416</td>
</tr>
</tbody>
</table>

Table 6.1

No year approaches complete uniform distribution score of 0. Also, no score is a 1, which would mean singular distribution. The twelve years overall score of the study ports was 0.411. This shows that for the past dozen years there has been a generally unequal distribution in the number of TEUs coming into the ports. Figure 6.2 shows a stylized Lorenz curve in comparison to an equal distribution for the five-year range of 2004 - 2008. Figure 6.3 shows the Gini score and curves for the calendar year of 2008. The score was somewhat lower than the five-year average, although only slightly.

This initially seems odd accounting for the overall drop in TEUs coming into Los Angeles and Long Beach and the growth of Vancouver and Prince Rupert. However, both Seattle and Tacoma experienced significant drops in volume to push the distribution back in favor of Southern California. Still, looking at the range of scores and knowing the importance of San Pedro ports, the fact that the coefficient is slightly closer to 0 than 1 is somewhat surprising and shows that there is less inequality than initially assumed when looking at raw numbers.
This statistically proves what seems somewhat obvious to anyone with basic observation skills; that there is a preference by shippers and consignees to ship freight to the Los Angeles/Long Beach area. The preference does not appear to be as strong as first assumed, but the Los Angeles complex moves the most cargo in North America. Previous work that focused on this topic basically left the research alone at this point, which is not doing much more than simply proving the obvious. A secondary test was needed. For this test, the California ports were removed and the focus was placed solely on Puget Sound and Canadian ports. The goal was to see if there was a more even distribution pattern and if that pattern had fluctuated over time.

These tests proved much more remarkable, and, in the face of the changes going on in the Northwest region somewhat disturbing. Figure 6.5 illustrates the results for the year 2008 and figure 6.6 displays the information for the 11-year range of 1997–2007. For the second chart, the port of Prince Rupert is not included. As mentioned, Prince Rupert first came online in 2007 and its volume was so low as to be negligible. Chart 6.4 shows the change in the dominant Northwest port over the 12-year span. Combining this information with the Gini Charts shows a somewhat interesting pattern.

<table>
<thead>
<tr>
<th>Year</th>
<th>Dominant Northwest Port</th>
<th>Percentage of Total Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>Seattle</td>
<td>44%</td>
</tr>
<tr>
<td>2000</td>
<td>Seattle</td>
<td>37%</td>
</tr>
<tr>
<td>2004</td>
<td>Tacoma</td>
<td>33 1/3%</td>
</tr>
<tr>
<td>2008</td>
<td>Vancouver BC</td>
<td>40%</td>
</tr>
</tbody>
</table>

Chart 6.4
Seattle, Tacoma, and Vancouver 1997 - 2007

Gini Coefficient 0.026

Figure 6.6
The results of the 2008 test show that there is little inequality in the northwest ports area. If the pattern holds in comparison to the 11 years prior, then the level of inequality, as a whole, should continue to decrease. An examination of the 11 year differential shows an almost perfect distribution between the three major Northwest ports. This is somewhat deceiving. As the table 6.4 shows the shift is headed toward Canada. Vancouver, BC has become the most dominant port in the Northwest and, without the San Pedro complex, would be the largest port on the North American west coast. Every indication seems to be the Canadian Ports will continue to grow. Prince Rupert experienced a nearly 1500% growth in volume between 2007 and 2009 (Prince Rupert Port Authority, 2009). Nothing seems to indicate shrinkage in business in the near future. Some of this may be due to patterns in businesses, and other factors could be due to tougher regulations in the United States or rising fuel prices forcing shippers to use the shortest routes.

Canadian ports maintained a steady growth rate, even in years where overall west coast volume fell. The growth of Canadian ports coincides with the sharp drop in freight at the ports of Seattle and Tacoma. Southern Californian ports saw some reduction in volume of 21% between 2007 and 2009. Port-specific individual factors must be part of the equation in understanding the geographic influences of container ports and how they affect trans-pacific freight movement.

6.2 Results of the Individual Factors

Container ports have a variety of factors that affect the movement of freight containers, by disrupting or speeding up the movement of containers. The seven study ports were compared against each other in the eight categories detailed in chapter 5.
These characteristics were based on information and studies from trade journals, academic journals, and personal interviews with industry stakeholders. Chart 6.7 shows the scores assigned to each port in the categories. Each port’s individual factors are further explained as follows.

*Los Angeles / Long Beach* – The largest container port complex in North America has several constraints to the basic movement of freight, and a political environment that is often confrontational. Since Los Angeles and Long Beach are the largest ports, they have the most traffic competing for limited use. This is a scenario that mirrors the highways around the LA basin that service the ports. A 2002 port shutdown created a logjam of unserviced ships and cost the American economy $1.94 billion per day. (Hall, 2004) More recent delays in implementing new intermodal payment systems have meant delays ranging from hours to days, and the federal government is now getting involved (Dupin, 2008). When freight is moving efficiently, then the supply of goods coming through Los Angeles and Long Beach can be easily transshipped, but this seems to be the exception rather than the rule.

Local political considerations also affect shipping to the San Pedro ports. The 24 hour nature of shipping and ports has created hostilities between local governments and port operations. The city of Compton fought a protracted legal battle with the ports that eventually led to the Alameda Train Corridor (Haynes, 2002). This project moved train tracks to a below grade thoroughfare at considerable expense. Some of this cost was passed directly on to the ports and their customers. Clean air and water fees and
<table>
<thead>
<tr>
<th>Condition</th>
<th>Los Angeles</th>
<th>Long Beach</th>
<th>Oakland</th>
<th>Seattle</th>
<th>Tacoma</th>
<th>Vancouver</th>
<th>Prince Rupert</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency of intermodal movement and delay time</td>
<td>1.50</td>
<td>1.50</td>
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<td>5.00</td>
<td>4.00</td>
<td>4.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Infrastructure and accessibility</td>
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<td>3.00</td>
<td>4.00</td>
<td>3.00</td>
<td>4.00</td>
<td>3.00</td>
</tr>
<tr>
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<td>5.00</td>
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<td>4.80</td>
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<tr>
<td>Security and customs issues</td>
<td>3.00</td>
<td>3.00</td>
<td>4.00</td>
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<td>4.50</td>
<td>5.00</td>
</tr>
<tr>
<td>Local Urban Market</td>
<td>5.00</td>
<td>5.00</td>
<td>4.00</td>
<td>4.00</td>
<td>3.80</td>
<td>4.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

2.91  2.97  3.31  4.22  3.76  4.32  4.10

Figure 6.7
additional regulations add cost to shipments coming into the ports, and the fuel requirements can be somewhat burdensome.

With the ever-rising cost of bunker fuel, any additional delays or specialty fuel requirements add cost and inconvenience to shippers. As of July 1st 2009, all commercial vessels were required to use ultra-low Marine Diesel Oil (MDO) within 24 miles of the California coast (Brukner-Menchelli, 2008). The reasoning for this rule is that the South Bay part of Los Angeles County has a severe pollution problem and ship exhaust is, generally, unscrubbed. Air and water considerations play an important role in limiting the types of fuel used close to shore. With the price of MDO at over $530 per ton in early summer 2008 (Bunkerword, 2008), this presents an expensive requirement for shipping to California. Even with a drop in fuel prices, MDO is generally twice as expensive as bunker. Currently no other state or province has this requirement, though Washington is examining a similar policy. It is important to remember that a large ship can burn 60 – 80 tons of fuel per day (Kendall and Buckley, 2001). A 16-day trans-pacific voyage needs 960 to 1280 tons of fuel. At an average price of $300 per ton (Bunkerworld, 2008) this adds up to between $288,000 and $384,000 per ship, per voyage. If ships must carry their regular fuel as well as MDO when heading to California, this presents an added expense. Now, a new clean air regulation for trucks has shippers and truckers angry with local governments (Nall and Mongelluzzo, 2008). The regulations mean increased expenditures in order to just do business at the port. Every added expense eventually gets passed to the shipper or consignee and eventually the customer, making the ports a less attractive option.
The ports of Los Angeles and Long Beach are geographically further from China and Japan than other ports in the study. They are over 700 nautical miles further than Puget Sound or Canadian ports. This translates into one or two extra days at sea and the associated fuel costs. While transit time is generally a minor negative, combined with the rising fuel costs and regulatory issues and intermodal delays, the simple geographic distance is one more hurdle that the ports must overcome.

The Greater Los Angeles metro area has 17.6 million people according to the US Census. This makes it the second largest urban area in the US behind New York City. This fact combined with the realization that China has become the number two trading partner with the US (Canada is still number one), puts the San Pedro complex in a favorable position. Los Angeles and Orange counties contain a network of shippers, forwarders, business offices, transportation couriers, warehouses, manufacturers, and investors in the area. The adjacent San Bernadino County houses significant warehousing and transportation facilities as well. The port complex and its surrounding business districts tend to function as an economic cluster. A business cluster is a concentration of business and interests into a specific geographic region (Porter, 1990). The geographic region includes six counties, which make up the conceptual region of Southern California. Clusters generally increase productivity allowing companies to compete both nationally and globally. These clusters are sometimes seen as an agglomeration of business space. The economic areas between Los Angeles International Airport and San Pedro contain a multitude of companies whose business is often solely dependent on the port complex. (Dupin 2008) The agglomeration of transportation business combined with an extensive, if flawed, transportation network, and a built in urban base of shippers and
consignees creates a highly favorable urban market condition. Twenty million potential customers in the greater metro area is also another draw.

**Oakland** – The oldest container port on the west coast, Oakland is also the third largest port in the state of California in terms of container volume and generally is equivalent to Seattle in west coast volume. Oakland is situated across the east side of San Francisco Bay at the end of railroad lines. Oakland suffers from many of the same disadvantages as the San Pedro port complex, but also has several advantages. Delays at the port of Oakland have generally been shorter than those at Los Angeles and Long Beach. Intermodal efficiency also seems to be somewhat expedited based on the companies which move through there.

Oakland handles less overall cargo volume than its San Pedro competitors, yet has comparable facilities. Oakland has 31 super post-panamax cranes (Port of Oakland 2009) in comparison to Los Angeles’ 59 cranes (Port of Los Angeles, 2009). While LA has more cranes, the cranes at Oakland have a better chance of handling the largest ships since the port is not as crowded as LA. The biggest access problem facing Oakland is the sometimes limited navigability of San Francisco Bay. Consistent dredging is required to keep access available, since San Francisco Bay is generally shallow and the port lands were originally a swampy estuary. This accessibility factor is a major issue considering the size of most modern ships and can be a limiting factor in shipping goods into Oakland.

Air quality and fuel requirements mirror those in Los Angeles. A truck replacement program similar to the ones being run in San Pedro has also generated plenty
of controversy. The costs of upgrading privately owned tractor trailers to newer, cleaner burning models would have the effect of halving the annual salary of owner operators who service the port (Consumer Federation of California, 2008). Local public outcry over a recent fuel spill has also led to further scrutiny of port operations. However, considering these factors, one political bright spot for Oakland is in the improvement of intermodal transportation networks. Sitting on the opposite side of San Francisco Bay, freight does not have to cross the Bay Bridge, a potentially devastating logjam. Moreover, four freeways and two trunk railroad lines service the Port of Oakland. Investment by the state of California in grade separation projects along with highway and railroad pass improvements will mean freight can be moved out of the Bay area in an expeditious manner.

Overall Oakland scored well among interviewees. Its limitations are mostly due to its size and site factors. However, Oakland serves to bring in most of the freight in Northern California and parts of the Great Basin region (Port of Oakland, 2009). Servicing the Silicon Valley computer companies has allowed Oakland to capture a growing market of high-tech imports and exports. Depending on backups in Los Angeles, Oakland can be a strong niche port as well as hub port for shippers and forwarders. At one time Oakland handled more volume than the southland ports, so the potential exists for it to continue as an attractive option.

Seattle / Tacoma – While the Puget Sound ports are separated by about 30 miles of water, they generally received similar ratings from shippers and in previous studies. Newer
facilities in Seattle may be a factor in recent growth, but as a whole these ports are very similar.

Northwest ports are in a unique position. Being closer to East Asian container ports, they have the potential to offer cost saving shorter routes. With a 1 to 2 day shorter route, the savings in fuel and turnaround time can mean a greater profit margin per shipment. The Seattle / Tacoma metro area has a smaller population and less congestion in the port areas. Recent improvement plans include a multi-million dollar upgrade to the intermodal yards. Seattle and Tacoma both sit on a forked terminus of the BNSF northern rail routes. Seattle’s freight tunnel and Tacoma’s wide, at grade, right of way means that intermodal transfer congestion is minimized (Port of Tacoma, 2008). Both ports are also moving rapidly toward being smart terminals that make use of computers to customize terminal management systems and organize movement between trains and trucks (Kulisch, 2008).

Seattle and Tacoma are also making changes to bunker emissions standards. This is a global movement, but in the Northwest the action seems to more in harmony with business leaders than the policies in California. The Northwest suffers from less airborne pollution problems then both Northern and Southern California port regions. Still, these ports had pledged a reduction in sulfur by 30ppm by 2010 (Puget Sound Maritime Forum, 2007). The ports have also instituted a low sulfur fuel requirement, as did California, but only require the change while at anchor or in berth. Port of Seattle also has made substantial improvements in getting city power to the ships while at berth so they do not have their generators running (Herbert Engineering, 2009). This helps mediate costs of berth time and additional bunker expenses. This correlates into an increased
profit per ship. Port of Seattle has also implemented several computerized tracking systems to expedite berth time. Efficient movement of containers is the goal for forwarders and consistent and quick turnaround of ships is the goal of shippers. Puget Sound ports are in the position to do that with minimal cost, delay, or political intrusion.

As urban centers go, the Seattle/ Tacoma Metro area has played the dominant northwest role for much of the past century. Situated near the southern end of Puget Sound, the metro area is protected by the Olympic Peninsula and has a generally mild climate. A metro area of over 3 million, its local urban market supplies many businesses, which both import and export goods through the ports. Technological innovations such as the World Wide Web and the microcomputer powered by Windows operating systems have reformed the image of Puget Sound from an industrial base into a tertiary technopole. Seattle and Tacoma have, however, seen their northwest standing slip in recent years. Competition from Vancouver, British Columbia has eroded the economic and cultural hegemony that Seattle once enjoyed. The area is not known as a major containerized export zone. As most shippers would rather send their ships back to Asia as full as possible, the lack of a large export business presented some challenges. Puget Sound ports do maintain a smaller economic cluster and have the infrastructure to remain a popular choice especially for security sensitive materials whose destination is the northern United States.

_Vancouver, British Columbia_ – Situated in the protective veil of the Southern Inside Passage, across from Vancouver Island, this southwestern Canadian city has grown to become one of the most important cities on the Pacific Rim. With a large influx of ethnic
Chinese, prior to the 1997 Hong Kong handover, the businesses and economic conditions for an explosion in trans-Pacific trade were set. As seen in chart 6.7 Vancouver has moved up to become the largest northwest container port in terms of TEUs (see figure 6.7). A combination of factors, have enhanced the attractiveness of Canadian ports such as Vancouver.

Distance wise, Vancouver is more than 700 nautical miles closer to Shanghai China than Los Angeles / Long Beach (see figure 5.4). This translates into 28 to 30 fewer hours of travel time which translates to anywhere from 1 to 3 days depending on hours of travel per day. This is about a savings of to $36,000 U.S. based on a $300 per ton price and up to 120 metric tons of fuel saved. The cumulative effect of this can lead to enormous savings over a year’s time. The shorter distance also means that a ship has the potential to have more crossings per year based on the number of days saved and the intermodal transition time.

Vancouver has several physical advantages favoring it, or at least making it comparable physically to other Northwest ports. A deep water port, there are plans to maintain dredging at the main wharf area to 16 meters (52 feet) which is comparable to the 51 foot depth at the port of Seattle and the 50 foot depth at Tacoma (Port of Metro Vancouver, 2009) The sheer size of the Vancouver port complex dwarfs its neighbors. According to the Vancouver Port Authority, the port has 28 major marine cargo terminals and three Class 1 railroads along with no air or water draft restrictions. The Port of Seattle by comparison has 1 major railroad trunk line, 10 cargo terminals, and some water draft restrictions at certain terminals. (Port of Seattle, 2009) Port of Tacoma has 11 berths, 22 cranes and no water draft restrictions (Port of Tacoma, 2009). These factors
help to provide a favorable option in choosing Vancouver, based on total number of ships that can be processed simultaneously.

Canada is in a different situation than the United States. Whereas the US has Los Angeles, San Francisco, and Seattle competing with each other in business, social, and cultural development, Vancouver is Canada’s only large west Coast city. There are other smaller cities such as Victoria, but Vancouver is the business and social capitol of British Columbia even if it is not the political capitol. According to the Canadian government, Vancouver has a metro population of 2.5 million, slightly smaller than Seattle’s metro area and a fraction of metro LA’s. Vancouver has a substantial ethnic Chinese population and an ever-increasing connection with Mainland Chinese companies. The economic clustering around the port combined with the relational governance of many companies to Chinese companies. It is not unusual to have Vancouver shipping and forwarding companies creating mutual alliance with companies in China based on personal and familial relationships. This economic environment combines with the ready built primate market to create an urban environment favorable to pan pacific shipping. Canadian National railroad (CN), which has its western terminus at the port facility, also owns the major trunk line in the central United States formerly owned by Illinois Central (Canadian National, 2009). This rail line, which passes through Chicago and ends in New Orleans, creates an easy opening to the United States from the Port of Vancouver. This advantage can dramatically reduce transportation time and save money. Vancouver has used the hyper-important factor of urban markets to become the new dominant Northwest port facility. Additionally, government subsidies of rail and port operations create an
environment where the burden is passed on federally instead of privately. This creates a significant advantage in implementing the latest technology.

*Prince Rupert, British Columbia* – The last container port in the study was the oddest and the most exciting to look at. Prince Rupert is located at 54° north near the border between Alaska and Canada. The port opened in late 2007 and transferred 16,800 TEUs in its first few months of operation. In 2009 it moved 265,000 TEUs, nearly a 1500% increase in volume (Price Rupert Port Authority, 2010). Prince Rupert has signed contracts with the China Overseas Shipping Company (COSCO) and embarked on a massive building project.

There are several geographic reasons that make this remote part of Canada an attractive site. Infrastructure wise, Prince Rupert is very small. Currently it is a 60-acre facility with one wharf and three cranes. Its major natural geographic factor is a 60-foot natural water draft. This depth can easily handle the largest container ships in the world that have drafts approaching 48 feet. Another natural geographic plus is its location. Prince Rupert is the furthest northern port that remains ice-free throughout the year. This puts it on the closest great circle route from Shanghai China. This fact means that Prince Rupert is nearly 1200 nautical miles closer to China than Los Angeles. This means that Price Rupert is nearly three days’ cruising closer than Los Angeles, and that assumes non-stop constant speeds.

What Prince Rupert lacks is facility and capacity. It can only currently handle a maximum of 500,000 TEUs per year. This would be a substantial amount of business for such a small port, but the Canadian government has plans to enlarge the current facility to
handle over 2 million TEU’s within 10 years and there is talk of further expansion to 4 million TEUs in the future. This would put it in direct competition with the San Pedro ports, thousands of miles to the south. The aforementioned CN trunk line to Chicago plays an important role here as well. Between the rail terminus at the port and the plains of central Canada, the rail lines cross the lowest grade in the Canadian Rockies, Yellowhead Pass, at only 225 feet in elevation. This means that a short mountain passage combined with rail trunk line ownership, and shorter sea routes, cargo can move from Prince Rupert to Chicago in only 100 hours. At barely 3.5 days this is less than the sailing time from Shanghai to Los Angeles (Canadian National, 2009).

Prince Rupert’s greatest liability is its urban market. Barely 13,000 people live in the area. Many are Native Canadians and work in industries that either support the port or work for the port itself. This has led to strong feelings of loyalty to the port, and during a recent work stoppage at other ports, the Prince Rupert workers stayed on working to keep the port flowing. This has also meant that the port has faced little opposition in growing and is actually encouraged by locals to grow. So while Prince Rupert is a small port, there is no reason to doubt that factors favor its growth and appeal. While doubtful it could ever challenge the San Pedro ports, Prince Rupert definitely has the potential to draw an increasing volume away from its competition. All Canadian ports will have trouble when it comes to security-sensitive cargo, but when time-sensitive cargo and efficiency issues are key concerns, these ports have the characteristics to challenge and change the inequality of freight distribution on the west coast.

For ports in the study, the base cost to ship a 40-foot container from Shanghai ranged from $1500 to $4500 per container. The different price points were based on the
type of cargo being shipped. During a recent fuel price surge 2008, these costs rose to nearly $8,000 per container. Therefore, a shipper or freight forwarder needs several options when choosing a port. While transshipped containers leaving the Port of Los Angeles can be by tractor trailer or train, nearly all the cargo transshipped from Prince Rupert is by rail. The costs of additional transportation after being transferred off the ship also need to be considered. According to Canadian National, a box car full of men’s clothing costs ~$6400 to transport from Prince Rupert to Chicago. The cost of fuel and drivers alone would add up to more than this transporting via tractor trailer from Los Angeles to Chicago. Los Angeles, however, seems to be poised to remain the top choice due to the abundance of rail and highway trunk lines combined with the purchasing power of a large population. Certain shippers might find different ports attractive, especially for time-sensitive cargo or if fuel price fluctuations dictate shorter shipment times. However, based on the current situation, Los Angeles’ strong intermodal transshipment factors remain powerful reasons to use southland ports.
Chapter 7
Conclusions

The goal of the project was to analyze patterns of transoceanic shipping and to elucidate the reasons for the dominance of the Los Angeles port complex. The results of the study proved to be both exciting and complex. The Los Angeles-Long Beach complex is the largest port complex on the West Coast. However, the changing nature of global trade, local governmental issues, and the expansion of the Panama Canal present new challenges to the San Pedro hegemony. Analyzing freight shipments moved beyond simple distance geography and pulled in several other sub-disciplines within the field. Although the approach supported much of my initial hypothesis, it forced a deeper examination and opened opportunities for further research.

The initial finding of the thesis was that the regulatory climate, environmental regulations, and freight volume factors have played a role in decreasing the desirability of the Los Angeles Complex. The results from the interviews with companies such as Universal Cargo Management seem to confirm this view. Shippers, consignees, and forwarders were consistently unhappy with the ever changing regulatory environment as is common to most businesses. Most of these regulations meant more expenses that would have to be passed on to consumers and the potential for revenue loss. The raw numbers also would seem to back the hypothesis. From fiscal year ending on June 30, 2006 to the year ending June 30, 2009 the total volume of cargo decreased from 8.5 million TEUs to 6.7 million TEUs. A global recession has hurt overall world trade, and this plays a role in the decrease, but the Port of Metro Vancouver BC has seen total TEUs rise from 1.5 million to nearly 2.2 million in the same general time frame. In fact, 2008
represented a high point for Vancouver with 2.5 million TEUs. Though this was one third of Los Angeles’ 7.7 million, those numbers represent a 10% loss for Los Angeles from its 2006 high as compared to a 60% growth for Vancouver BC.

The factor that proved hardest to ignore is a metro population of over 18 million people in the Los Angeles area, and over 24 million within a two hour radius. While the first part of the hypothesis focused on decreasing desirability of shipping here, the purchasing power of the region combined with the general west coast proximity to manufacturing centers in China (and the local business connections to China) appear to outweigh the negatives that hamper the efficiency and cost of doing business at Los Angeles ports. Sellers want and need buyers, businesses need specialized merchant and wholesale groups, and buyers want inexpensive products. The South Bay business clusters that support freight movement have yet to be replicated to such a degree in other metro areas (although Vancouver is catching up). Southern California’s large population is purchase hungry, and price savvy. This makes Los Angeles the premier market in America. New York may be bigger, but the modern American trends seem, to a greater degree, to emerge from Los Angeles and Hollywood rather than from Madison Avenue. Los Angeles also has another factor in its favor - it is a larger exporter. Much of the recycled material that finds its way to Asia to be remanufactured is shipped out of the ports of Los Angeles and Long Beach.

If there is anything that will continue to erode at the dominance of Los Angeles/Long beach, it will be changes taking place in the Pacific Northwest. As highlighted in the previous chapters, Prince Rupert, Vancouver, and even Seattle are closer to China geographically, and to a growing degree, culturally. This has, and will continue to have
an effect on shippers that are sensitive to fuel costs and to time constraints. As mentioned, a shipment can go from Shanghai to Chicago via Prince Rupert in less time that it would take to sail to the Ports of Los Angeles. While interviewing freight forwarders, it was striking how many are beginning to utilize these Northwest options to a greater degree, especially with narrower profit margins. As companies seek to be greener, either by choice or by regulation, these ports are in better standing.

Los Angeles is going through some tough growing pains to make the port as green as possible. While this is an important process for both air and water quality in Southern California, it has made life hard on some businesses. Restrictions on trucks entering the port facilities have the continued potential to slow down intermodal movements. Fuel regulations continue to add to the fuel surcharge for California bound ports. It is possible that newer trucks will be more fuel efficient and that will offset their increased pricing, but this will take time, and further research, to prove. Cash strapped local governments have continued to add fees and taxes on to various businesses in an effort to raise revenue. Port fees, pilot fees, and security fees have continued to rise. This is all in addition to additional federal anti-terrorist legislations that, while necessary, are not cheap. Canada, which had been traditionally more regulated, already had many of these changes in place, and has more government subsidies for transportation. With government subsidies to Canadian National Rail, and to various port authorities, Canadian ports are less likely to be subject to wild swings in labor, fees, and regulations. They also do not have as many overlapping layers of security. The process is streamlined and clearly defined with less competition between bureaucracies. This boon to Canada has affected American ports, although mostly to Seattle and Tacoma.
Discovering the Northwest pattern changes proved to be the most interesting and exciting aspect of the study. Very little academic research had been done on the changing patterns of Pacific Northwest shipping. For years Tacoma had been the premier port. As Seattle grew and modernized its facilities it became the most active port in the Northwest. Vancouver’s growth has been nothing short of meteoric, while Seattle and Tacoma have been somewhat stagnant, and have lost cargo share over the past 6 years. Forwarders cited the ease of Vancouver and Prince Rupert, especially for cargo to be trans-shipped further east, and were sometimes concerned with some issues at Washington ports. While overall Seattle was well regarded, and was very important to shippers, it was seen as more of a regional destination for cargo that was staying in that area.

In examining the ports in this study many other aspects were left missing. Further research could yield more unique regional patterns, or the study could be replicated using different geographic areas of North America. Smaller ports such as Portland, Oregon, San Diego, Gray’s Harbor Washington, and Port Hueneme, California have niche cargo types and capacities. Further research should be done to understand how each of the affect the larger, nearby ports. Further research could also be done concerning the economic clusters around each port and if they are maximizing their benefits of port proximity. The field of transportation geography leaves many opportunities available.

In conclusion, the study proved that place matters. This is a simple geography concept, but one that means so much in a globalized world. While Los Angeles has many factors working against it in the containerized shipping industry, its size and cultural significance are enough to overcome the negatives. Vancouver B.C. has often been called the Hollywood of Canada. While it may have a strong movie industry, its
containerized shipping industry is proving to be very strong as well. Closer to China, it has eroded some of Los Angeles’ business and dominated the Pacific Northwest. Vancouver may never completely overtake the Los Angeles complex, but it is a major factor in trans-Pacific shipping for the long term. This study showed that as the world gets proverbially smaller and international connections more intimate, geographers continue to provide the insight into patterns and connections throughout the world.
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