

I

Introduction

COPYRIGHTED MATERIAL

General Introduction

Wayne K. Talley

This chapter provides a general introduction to the contents of the book. Specifically, a two-paragraph synopsis of each of the chapters, 2 through 34, is provided.

In **Chapter 2** the evolution of maritime economics as a field of study is discussed. Maritime economics as an explicit field of study is less than fifty years old. Before 1960 there were publications on the subject, but they did not have a separate identity. The field has evolved from the study of the history of shipping, e.g., trade-offs among alternate ship designs, contractual arrangements for shipping and trade, and managing port infrastructure and services to efficiently serve the needs of trade.

Research in maritime economics has become more complex and its quantity and quality are higher than ever. Improved availability of data, methods to analyze these data and theories have contributed to this growth. University programs in maritime studies worldwide have been established and a greater number of journals are publishing research in maritime economics.

An historical perspective of shipping – evolving worldwide from primitive to developed societies – is presented in **Chapter 3**. The ancient cultures of Egypt, Greece, Mesopotamia and Rome were involved in the early stages of the development of shipping. Shipping is the oldest mode of transportation for moving large quantities of cargo.

The business of shipping has been impacted over time by a number of factors: (1) geopolitical factors that affect the demand for transportation, (2) development of maritime technology, (3) development of ship types to transport certain types of cargoes, e.g., such bulk cargoes as oil, ore and grains, and (4) intra-modal (among shipping companies) competition and intermodal (e.g., from land routes to and from ports by railways and trucks) competition. Without shipping the development of the modern industrialized world would have been impossible.

Chapter 4 considers commodity trade flows in shipping. The commodity-trade

classification system of the United Nations includes one hundred major categories of commodities, each containing several sub-categories. Given this granularity of information, the chapter restricts itself to providing an overview of the major worldwide commodity trade flows – the main export and import flows in recent years, in the context of the underlying factors driving each commodity. The chapter is divided into two main sections – major bulk commodities, and general cargo and containerized trade flows.

A slowdown in world trade followed the financial crisis in 2008. The majority of trade flows are still growing, but at a slower pace; other flows have contracted. What does the future hold? Will the rate of worldwide oil depletion result in prohibitive energy prices for shipping, thus leading to a further slowdown? Will natural gas suffice as a bridge fuel?

Chapter 5 describes a maritime carrier from a microeconomic theory perspective. A maritime carrier is a firm that provides for-hire transportation service by transporting goods and/or individuals in vessels over a waterway from one location to another. Maritime carriers are described by the type of vessel utilized – for example, ferry and cruise lines use ferry and cruise vessels respectively – and by the type of cargo transported – for example, LNG and container carriers transport liquefied natural gas and containers respectively.

If the amount of transportation service provided by a maritime carrier is the maximum amount that can be provided given the resources at the carrier's disposal and the amounts of cargo (numbers of passengers) provided by shippers (individuals) to be transported, then the relationship may be described as the maritime carrier's pro-

duction function in the provision of transportation service. If so, the maritime carrier is technically efficient. A maritime carrier's operating options are the means by which it can vary the quality of its service. A maritime carrier is cost-efficient if it minimizes cost in provision of its technically efficient services. The demand by passengers and shippers for maritime transportation services is a derived demand.

Maritime freight markets in which cargo is transported by water are discussed in **Chapter 6**. These markets tend to be cyclical in nature because of the volatility in both the demand for and the supply of world shipping services. Variations in service demand reflect world economic activity and global trade and tend to be short-term in nature, while variations in service supply tend to be long-term in nature. Beyond vessel speed adjustments and lay-ups, adjustments in service supply tend to take longer. When shipbuilding capacity is scarce, it may take three to four years after a contract is signed for a new vessel to be built. Thus, prices for shipping services may fluctuate greatly because of adjustments to differences in demand and supply for these services, which results in volatile maritime freight markets.

Maritime freight markets are dominated by east-west trade flows. This dominance has been strengthened by the importance of Asia and the increasing importance of inter-regional Asian trades. The fragmentation of geographical production processes has added intermediary products to these trade flows, especially since many of the production processes are outsourced to emerging markets in Asia and transition economies in Eastern Europe.

Chapter 7 discusses intermodalism and new trade flows. Intermodalism is the trans-

portation of freight in an intermodal container or vehicle, using two or more modes of transportation. Before the 1950s, freight was packed in boxes, barrels and bags for transport by two or more modes from origin to destination. In the 1950s the introduction of containers provided for a more efficient intermodal transportation system, which, in turn, stimulated a significant growth in world trade – because of the lower rates and reduction in delivery times that ocean container transportation brought. Intermodal container transportation has also impacted trade routes; for example, rather than seaborne trade from Asia arriving at the US East Coast via the Panama Canal, an alternative land route to this all-water route came into being in April 1984, when container ships began calling at ports along the US West Coast to unload their containers for placement on double-stack trains for transport to the East Coast (a landbridge service).

Data for new trade (cargo) flows into the US from foreign ports without a history of flows to the US are also analyzed. The analysis suggests that new trade flows are greater for exporting foreign countries which have relatively large amounts of hinterland transport infrastructure and whose foreign ports handle container cargoes. Further, the more developed a foreign port is from an intermodal perspective in providing new trade flows to the US, the greater the likelihood that it will grow and the smaller the likelihood that it will fail.

Chapter 8 discusses the evolution of the cruise industry – water carriers that provide transportation, leisure and tourism services. In the early days of the industry it was often stated that passengers aboard cruise vessels were either just married or nearly dead. However, this is no longer true. Cruise pas-

sengers now are of all ages. Cruise lines seek to tailor their services to accommodate the wishes of their customers.

Some old markets of cruise lines have reached saturation, e.g., the Alaska market. New markets in the Far East, the Middle East and Australia are experiencing explosive growth in new cruise business. Expedition tourism, targeting the affluent passenger, will continue to gain popularity. Remote destinations unspoiled by mass tourism that feature secluded and out-of-the-way places, such as Antarctica and the many historic islands dotting the Pacific Ocean, are drawing cruise passengers. The inland-waterway cruise market in Europe is another growing market and is expected to experience double-digit growth in coming years. Small river-cruise vessels offer amenities far surpassing those of the average hotel and restaurant associated with typical bus tours.

Chapter 9 describes the world's ferry passenger markets and identifies the main characteristics of these markets. The world's ferry industry transports almost as many passengers each year as the world's airline industry. The services demanded by ferry passengers range from pure transportation to entertainment and sightseeing. From a supply perspective, ferry operators have a wide range of technologies from which to choose.

There are a few ferry companies that provide ferry services far outside of their home region, but no ferry company provides global ferry services. The establishment of new ferry routes tends to be difficult, since access to marine terminals at the end points of these routes must be obtained. Ferry routes face limited intra-modal competition, something which is evident from the fact that only a very few

ferry routes in the world have more than two competitors. The majority of ferry routes are served by only one ferry company. In addition to passengers, ferries worldwide transport millions of cars and trailers each year.

Chapter 10 discusses the world dry bulk shipping industry. In 2009 its fleet of ships had the largest carrying capacity of any shipping industry fleet, surpassing the tanker industry fleet. The dry bulk shipping market has experienced volatility over time. Sources of the volatility include external influences (such as changes in the economic geography of bulk trades and in the state of the world economy) and inherent dynamics (such as inter-firm competition and changes in the distribution of maritime activity among countries). The volatility in the market had reached new heights by late 2008. The magnitude of the decline in the market was historic.

The chapter also focuses on the changing dynamics of the dry bulk shipping industry over time and the adaptation of the industry to globalized conditions. Shifts in geographical patterns, fleet characteristics and market traits are discussed. In the twenty-first century, the market transformation of the dry bulk shipping industry will be affected by economic geography and the mechanics of shipping markets.

Chapter 11 presents a discussion of the world liquid bulk shipping industry. Liquid bulk cargo is bulk cargo that is transported in tanks, into and out of which the cargo is pumped. The largest amounts of liquid bulk cargoes shipped are crude oil and oil products. Other categories of liquid bulk cargoes, for which the amounts shipped are much smaller, include: liquefied gas (LNG and LPG), vegetable oil and liquid chemicals. The liquid bulk shipping industry is vital for

the transportation of oil and its products from a limited number of oil-producing countries to the rest of the world.

Liquid bulk cargoes represent one-third of the total volume of maritime cargoes. Although oil is transported over land by vast pipeline, specialized truck and specialized rail networks, the amount transported is small in relation to the amount transported by tanker vessels. The liquid bulk shipping industry has drawn worldwide attention for its vessel oil spills and potential spills. In order to reduce oil spills from tanker vessel accidents, many countries in the world are now requiring that by 2012 or 2015 tanker vessels must be double-hulled in order to enter their waters.

Chapter 12 provides a comprehensive overview of current issues in the container shipping industry. Topics include market growth, the changing geography in container shipments, capacity management, the pricing problem in the container shipping industry, the search for scale and scope operations by container shipping lines, and evolving networks over which container shipping lines operate. Container ships transport a limited range of standardized containers: the twenty-foot equivalent unit (TEU) and the forty-foot equivalent unit (FEU). Slightly diverging container units include 45-foot containers, high-cube containers, and tank and open-top containers.

The advantages and cost savings from container shipping include faster vessel turnaround times in ports, a reduction in cargo damages and the associated insurance fees, and integration with inland transportation modes, e.g., truck, barge and rail. With the advent of container shipping, globalization of intermodal transportation was established. Container shipping has been

instrumental in reshaping global supply chains, allowing multinationals to reshape their global sourcing strategies and develop global production networks. New supply chain practices, in turn, have placed stricter requirements on container shipping lines with respect to frequency, reliability and global coverage of service. Before 2009, container shipping lines operated in a market characterized by moderate to strong growth. Asian economies represent an ever-increasing share of global container volumes.

Chapter 13 discusses business models and strategies for shipping. The shipping industry market is complex, dynamic and risky, which is attributable to its being fixed-asset-intensive, having assets with long lifetimes and being exposed to volatile global flows in cargo and energy prices. Recent events, such as the significant decline in world trade, the dramatic decline in ship prices and the lack of available capital for the purchase of new ships, have accentuated the complex, dynamic and risky aspects of the shipping industry market. Emergent business models and strategies that may be beneficial to the shipping industry are presented in this chapter.

The chapter reviews industry forces that are forcing changes in the business models and strategies of the shipping industry. Shipping business models and their relationships to shipping strategies are discussed. Four shipping industry business model archetypes that, taken together, capture the shipping industry are presented, as are competitive and cooperative strategies within these business model archetypes. The way changes in business models shape the transformation of the shipping industry and, in turn, shipping industry strategies is analyzed. Shipping industry strategies are tied

to the broader strategic management literature.

Chapter 14 provides an overview of the primary international institutions and regulations for ensuring safe, clean and level-competing operating environments for international shipping. The concept of the freedom of the seas dates from the seventeenth century, when national shipping rights were restricted to a stated number of miles from a country's coast. This freedom was established by the United Nations at the end of World War II via its Conference on the Law of the Sea. There have been three significant international conferences since the end of World War II that have shaped legal concerns associated with the sea.

The 1982 United Nations Convention on the Law of the Sea established internal, territorial and archipelagic water limits, defined contiguous and exclusive economic zones, and described the legal regime governing the international navigation of the high seas. Areas of importance to international shipping are the right of innocent passage in territorial seas, criminal and civil jurisdiction on board ships and in relation to ships in territorial seas, rights of passage through straits used for international navigation, and freedom of the high seas. International shipping regulations have primarily been developed under the aegis of the United Nations International Maritime Organization (IMO). The responsibility of a flag state is to ensure that ships flying its flag are surveyed by a qualified surveyor and have on board appropriate charts and navigation equipment, and qualified masters and officers.

The shipping industry has been subject over the last thirty years to various forms of corporate tax systems imposed by international governments. **Chapter 15** analyzes

the economic justification for a shipping corporate tax and its implications for the liquidity of the industry and its future investment decisions. The type of shipping corporate tax that has increasingly been adopted by countries (and more recently by European countries) is the tonnage tax.

The consensus is that fiscal policies such as a shipping corporate tax that are directed at the shipping industry should consider their opportunity cost to the countries imposing the policies and to the shipping industry itself. The shipping industry has some unique features: (1) ships are mobile assets; (2) ships may be registered anywhere in the world; (3) the shipowner (or the shipowner's representative) is free to choose among available registers, so that the level of ship taxation has become a determinant of register choice; and (4) a ship may be registered under a national flag or a flag of convenience (or an open register).

Chapter 16 explores the market for seafarers and its specific characteristics. The chapter's primary focus is on the supply of seafarers – their number, recruitment, retention, mobility and migration. Seafarers play a vital role in the water transportation of international trade. Numerous seafarer skills are required. Seafaring is one of the world's oldest professions. It is undergoing considerable change from a technological perspective.

The international seafaring labor force is segmented according to specific skills and educational levels, which provides an opportunity for seafarer labor discrimination. Specifically, this means that shipowners can segment seafarers by wage and working conditions. However, such discrimination has been tempered by the regulation of seafarer working conditions and by such organizations as the International Labour

Organization (ILO) and the International Transport Workers' Federation (ITF). The efforts of these organizations have resulted in significant improvements in the working conditions of seafarers.

Chapter 17 discusses vessel accidents – unintended happenings that may or may not result in damage to the vessel. The likelihood of a vessel sustaining damage in an accident is the product of two probabilities: (1) the probability of involvement in an accident (event probability) and (2) the probability of vessel damage given that an accident has occurred (damage conditional probability). The severity of vessel accidents varies from the loss of the vessel to an absence of vessel damage.

This chapter also uses data from a US Coast Guard vessel accident database for 2001–8 to analyze the determinants of vessel damage severity in individual cargo vessels. Four types of vessel (freight barge, freight ship, tank barge and tanker) are considered in the investigation. The empirical results suggest that freight barge accidents have the highest probability of incurring vessel damage and total losses. Freight ships are expected to incur less vessel accident damage than freight barges, tank barges and tankers. Accidents at nighttime and involving older vessels are associated with greater vessel damage. Accidents involving larger vessels, occurring in spring or involving vessels with steel hulls are expected to result in less vessel damage than their alternatives. The policy implications of the results are that relevant vessel safety regulations should be modified or designed to improve the safety of freight barges, older vessels and nighttime navigation.

Chapter 18 discusses the historical and geographical development of piracy in shipping. Contentious issues in defining piracy,

recent changes in the geography and moduli of piracy, and how poverty and political instability have been root causes of piracy are also discussed. Piracy is a land-based economic and socio-political problem that manifests itself at sea.

Ship piracy has posed a threat to trade and shipping for millennia. Ancient accounts show piracy flourishing in the Eastern Mediterranean as early as four thousand years ago. In the 1970s, less than a century after its apparent demise, a number of attacks ushered in modern piracy. In 2009, a total of 406 piracy and armed robbery incidents were reported worldwide, a 40 percent increase on 2008. Within the last twelve years the sophistication and organization of attacks have increased and patterns and trends in location and armed robbery against ships worldwide have shifted. Today, piracy attacks against ships in the waters off Somalia, followed by demands for ransoms of millions of US dollars, have become common. In 2009 piracy attacks off Somalia represented 53 percent of all such attacks reported worldwide.

Chapter 19 discusses the economics of ships – a broad subject area that encompasses, for example, ship design, shipping network design, ship markets, ship safety, ship security, and impacts of ships on the environment. The chapter focuses on selected aspects of the economics of ships and highlights a few related issues that are important today. Two important criteria governing the economics of ships are concerned with how to (1) optimize the economic performance of a ship and (2) incorporate risk into decision making in respect of the economics of ships. Incorporating risk into decision-making models should be of significant benefit

to shipowners in their decision-making practices.

Ship costs may be categorized as capital costs, crew expenses, vessel expenses, cargo expenses, terminal handling charges, port charges and administrative expenses. An important decision variable in optimizing ship economic performance is ship speed. Ship speed is important in that it is the main determinant of fuel costs, a significant component of vessel expenses. Given the high degree of uncertainty in ship economic performance, ship risk management has become an important dimension of the economics of ships. Ship risk management addresses events that can influence expected ship cash flows.

A discussion of the US equity capital markets as a source of finance for shipping companies – that is, for financing the acquisition of newly built vessels and the sale and purchase of second-hand vessels – is found in **Chapter 20**. The shipping industry is one of the world's most capital-intensive industries, utilizing a wide array of capital sources for its finance. In addition to equity finance, shipping companies use mezzanine finance and debt finance. Sources of equity finance include the owner's private equity, the company's retained earnings, and public and private equity offerings. The main types of mezzanine finance include preference shares, warrants and convertibles. The types of debt finance utilized by shipping companies include bank loans, export finance, bond issues, public or private placements, and leasing.

The chapter presents an overview of the US equity capital markets for shipping, possible reasons for public listing by shipping companies, and the advantages and disadvantages of such a decision. Also, an overview of trends in the issuance of shipping

stocks in the US for the period 1987–2010 is provided. In addition, factors that may affect the pricing and long-run performance of shipping and key issues for investors and shipping companies in the US equity capital markets are discussed.

Chapter 21 highlights the US high-yield bond market as a source of debt finance for shipping companies. The anatomy of the US shipping high-yield bond market and the market's advantages and disadvantages are discussed. Further, the importance of credit ratings, the pricing of shipping high-yield bonds and the probability of their default are presented.

The US high-yield bond market commenced in 1992 and in 1998/99 a number of shipping companies defaulted on their bonds, resulting in a sharp decline in volume activity for the next couple of years. However, the re-emergence of the US high-yield bond market that began in 2009 continues today. This market has become important to shipping companies as an alternative source of finance. Some of the advantages of the US high-yield market include a longer repayment horizon and the less strict covenants that a high-yield bond issue may entail. Investment banks have played an important role in the recent issuance of high-yield shipping bonds. While the 2009 statistics for syndicated bank finance show a substantial decrease in the overall annual volume of shipping syndicated loans, bank finance is expected to remain a major source of capital for shipping companies.

In **Chapter 22** the volatility in the prices of ships is discussed. Such volatility has long been a concern for shipping companies, shipyards and banks, because short-run fluctuations in ship prices have a significant impact on the profitability and viability of

these enterprises. Also, a reduction in the value of a ship may affect the shipowner's creditworthiness and thus his ability to service the debt obligations of the ship.

This chapter also examines the possibility of hedging ship price risk using forward freight agreements (FFAs). Specifically, a data set of dry bulk ship values and forward freight agreements for the same type of vessel is used to investigate the effectiveness of FFAs in hedging ship values. The results indicate that FFAs are indeed very effective for hedging ship price risk. For the Capesize ship market, the results indicate that hedging 85 percent of the value of a ship using FFA contracts would reduce the variability of one's hedging position by as much as 86.5 percent.

Chapter 23 discusses marine insurance – an efficient means of protecting investments in ships and their cargoes. A form of marine insurance that is used today was well established in Europe by the fourteenth century, the earliest known policy being issued in Genoa in 1347. Relatively sophisticated insurance markets – places where one could find many insurance underwriters and supporting services – were found in a number of North European cities (including Antwerp, Amsterdam, Hamburg and London) in the seventeenth century.

Ship- and cargo owners (or their advisors) should read the clauses of marine insurance policies carefully in order to understand what is covered or excluded under these policies. Some policies are more comprehensive than others. When selecting an insurance policy, the insured should also have a good understanding of the insurance laws in the jurisdiction of the underwriting association. However, the major clauses of marine insurance policies have been converging, and the differences in insurance

coverage have become more subtle over time. Marine insurance may eventually become uniform worldwide, offering universally accepted coverage for both hull and cargo insurance.

Chapter 24 presents a microeconomic theory of the port. A port is a place where cargoes and passengers are transferred to and from vessels and to and from shores and waterways. Ports are also nodes in transportation networks and thus are used by transportation carriers in the provision of transportation services. A port provides interchange services: for example, received cargoes and passengers are passed through to departing vessels and vehicles. The users of port services include shippers, passengers and transportation carriers, i.e., maritime and surface carriers (railroad and truck). The primary port service provider is the port (or terminal) operator.

Port production functions relate the maximum amounts of interchange services that ports can provide, given the amounts of resources utilized and the amounts of cargo and the numbers of passengers, vessels and vehicles received by the port. A port's operating options are the means by which it can differentiate the quality of its interchange services. A port's resource function for a given resource relates the minimum amount of the resource to be employed by the port to the levels of its operating options and the amounts of cargo and numbers of passengers, vessels and vehicles received. The long-run total cost function for a multi-service port relates the minimum costs incurred by the port over the long run to the resource prices paid by the port, the levels of freight, passenger, vessel and vehicle interchange services provided by the port, and the amounts of cargo and numbers of passengers, vessels and

vehicles received by the port. Shippers, passengers and carriers incur two prices for port interchange service: shippers and passengers incur a money price that is charged by the port for the service and a time price related to their cargoes and themselves while in port.

Chapter 25 discusses recent developments in port governance. The globalization of production and distribution, changing forms of cargo transportation and technological breakthroughs ended a long period of stable, state-controlled (government) port governance in most countries. Although government ownership of ports remains firmly entrenched in many countries, private management in the provision of port services has also been widely adopted. Port corporatization continues to be an acceptable governance option.

Under port reform, ports have incurred difficulty in addressing issues with their hinterlands, such as congestion and infrastructure investment beyond the traditional boundaries of the port. In some cases, this has spurred interest in broader and more community-based governance models. A study of major international ports reveals the involvement of private interests in port terminal operations, a movement toward more effective and efficient management of ports, a trend for port authorities to go beyond their traditional functions, and recognition of the economic influences on ports.

Chapter 26 focuses on the socioeconomic aspects of port labor and the regulation of the port labor market that has been contested in ports worldwide. Conflicts on the waterfront have shaped the historical development of the port labor workforce. It is no coincidence that ports with the most effective forms of labor market regulation also

have the lowest strike incidence. The transition from port casualism to containerization to commercialization has been marked by port labor conflict and dissension among port management, labor, government and third parties (e.g. local communities, direct customers and wider business interests) affected by port activities.

The chapter describes how employment agreements negotiated under port technological advancements of containerization have transformed the casual system of port labor employment. Some ports have adapted their labor market far more effectively than others to the challenges of containerization and the modern-day demands of the port customer. However, conflicts between port labor (and its trade unions) and port management still remain. Port management seeks to minimize labor conflicts in order to avoid disruption to shipping and to various value-added services that it provides to its customers.

Chapter 27 discusses competition among and the competitiveness of container ports. Definitions of and approaches to the analysis of container port competition and competitiveness are presented. Container ports are in a better position to compete with neighboring container ports if they have modern infrastructures supported by competitive and reliable transportation services and serve as collection and distribution points for hinterlands that extend far beyond their traditional boundaries. Ports that lose ship calls will experience a decline in connectivity, choice of service providers and container throughput. The negative impact will also affect other ports that have complementary services with the port.

A methodology is presented for analyzing inter-container port competition and competitiveness of container ports along

the Malacca Strait, the Pearl River Delta and the Antwerp–Hamburg range. It is demonstrated that the configuration of container shipping line services has a direct effect on inter-container port competition. The decision by a container shipping line to switch port calls from one port to another can lead to significant economic and commercial ramifications for both ports. Container ports that are less flexible in accommodating the needs of shipping lines may be circumvented, while ports that are able to accommodate, complement and add value to the port calls of container shipping lines will be preferred.

Chapter 28 discusses port performance. Significant gains in productivity by ocean transportation over recent decades have left ports as the last remaining component for improving the efficiency of maritime logistics chains. Since improvements in the efficiency of a country's ports are likely to reduce its export cargo prices, thereby making the country's export products more competitive in global markets, governments are increasingly recognizing the importance of improving the efficiency of their ports for the economic well-being of their countries. In many parts of the world, governments have taken action, either direct or indirect, to improve port performance, for example by installing labor-saving cargo-handling equipment, promoting improvements in port labor productivity, simplifying customs procedures, promoting greater use of information technology and commercializing port management.

The literature suggests that private sector participation in port operations enhances port performance and thus port productivity. This chapter extends the literature by investigating the impact of private sector participation on the operations of ports in

the Eastern Mediterranean region, with particular emphasis on the ports of Turkey. Turkey has recently adopted a policy of partial port devolution, including some privatization. The results of the investigation suggest that Turkey's private container port sector is outperforming its public container port sector in terms of efficiency in the provision of services to customers, thereby providing some justification for Turkey seeking to apply port privatization to its remaining public container ports.

Chapter 29 discusses port choice by shipping lines and shippers as well as the effects of logistics and supply chain management decisions on port choice. Port choice by shipping lines is critical to determining whether shipping lines can realize their operational, service and financial performance goals. A key issue is how the different structural characteristics of shipping lines affect their port choice decisions. For the ports themselves, their selection by shipping lines and shippers directly impacts their performance and viability. Where intense port competition exists and in order to have sustainable port competitiveness, it is important for port managers to have a thorough understanding of the factors that influence the selection of their ports by shipping lines and shippers.

Ports play an important role in facilitating the logistics and supply chain management objectives of their shipping line and shipper users. In order to do so, ports must evolve beyond their traditional functions of moving cargo to and from ships, trucks and railcars to become links in global logistics chains. Some shipping lines are more logistics- and supply chain management-oriented than others, for example those that have invested in their own port terminals, thereby requiring knowledge of how ports play a

nodal role in supply chain management. With the gradual abolition of the conference system, shipping lines have come to realize that their competitiveness largely depends on creating customer value, and port choice has become critical in this respect.

Chapter 30 presents a framework for making port investment and finance decisions. The most effective port investment option requires a port's cargo transfer process to be considered as a set of interdependent links. An efficiency improvement in each link is then considered, and hence the efficiency of the total transfer process is enhanced. Furthermore, all links should be modified to obtain a chain of mutually balanced link capacities so that problems related to port capacity bottlenecks are minimized. The selected investment option may address capacity expansion, improved services, and demand management measures leading to an improved utilization of existing facilities (or combinations of these).

A distinction should be made between public and private interests in making port investment decisions. Evaluating port investment from a public perspective requires that all related costs and benefits (direct and indirect) be considered in determining the optimum port investment decision. In contrast, the private perspective focuses on port competition and port hinterland connectivity in making port investment decisions.

Chapter 31 discusses port clusters. A port cluster is a spatially concentrated group of firms of related industries for which one firm is a port; these firms are linked through vertical and horizontal relationships. The chapter discusses the relevance of applying the cluster concept to ports, as well as the port cluster concept as a tool for analyzing

the impact of port cooperation and changing port governance structures on ports located in geographical proximity. Central to the port cluster concept is the recognition that interdependent firms cluster together in port regions for purposes of coordination and resource sharing. The port cluster concept has been applied by the Chinese government in port planning and the Korean Maritime Institute in developing logistics clusters.

Analyzing ports from the perspective of port clusters provides (1) new insights into determinants of port competitiveness, (2) additional measures of port performance, (3) insights into the role of the port in promoting activities among interdependent firms in its region, and (4) an alternative framework to that of port governance for describing the role of port authorities. A dominant firm such as a port authority may have a strong influence on the performance of a cluster. In many port clusters, the port authority or a terminal operator plays a crucial role in the success of the port cluster.

Chapter 32 presents a discussion of port state control (PSC) – a regime of unannounced safety inspections on board foreign ships in ports or marine terminals by designated PSC authorities for the purpose of verifying the adherence of ships to international regulations related to ship manning, equipment, maintenance and operations. These regulations are found in the 1974 International Convention for the Safety of Life at Sea, the 1978 International Convention on Standards of Training, Certification and Watch Keeping for Seafarers, the 1973 International Convention for the Prevention of Pollution from Ships, the 1966 International Convention on Load Lines, the 1969 International Convention on Tonnage Measurement of Ships, the 1972 Conven-

tion on the International Regulations for Preventing Collisions at Sea and the 1976 Merchant Shipping Convention.

PSC inspections provide information about factors such as vessel age, vessel type, classification society and vessel flag, which may predict the likelihood that a vessel will be found to be substandard. These factors are reflected in the target factors used by PSC regional memoranda of understanding (MoUs). This chapter describes these target factors and how vessel deficiencies detected during PSC inspections are corrected or recur over time. A data set of 42,071 vessels/inspections carried out from 2002 to 2009 by 18 state members of the Indian Ocean MoU (IO-MoU) is used to determine factors that increase the likelihood of detecting vessel deficiencies in PSC inspections and the persistence of vessel deficiencies in subsequent PSC inspections over time.

Chapter 33 is concerned with port security and counter-terrorism activities within the port's domain that protect port facilities and coordinate security activities between the port and its users. It discusses the International Maritime Organization's International Ship and Port Facility Security (ISPS) Code, the major international port security regulatory code, and examines the challenges faced by ports in the implementation of this Code. For the latter, cases studies of port security at Hong Kong in Asia and Piraeus in Europe are used.

In Hong Kong, port security is not widely regarded as an important port issue, as revealed by the fact that port security managers hold junior positions. The core rationale of port security compliance by major stakeholders of the Port of Hong Kong appears to be one of avoiding potential economic consequences from non-compliance (e.g., losing US trade). In contrast, the Port

of Piraeus has a strong security culture. It has implemented a stricter form of the ISPS Code, and cooperates with other ports on port security know-how and good practice.

Chapter 34 addresses the effects of port security activities on the quality of port interchange services. Specifically, it addresses the question: Can improvements in the quality of port security service increase the quality of port interchange services? Although it is generally agreed that improvements in the quality of port security service such as one-hundred percent scanning can have a negative effect on the quality of port interchange services (for example by increasing port congestion), the question of a positive effect has not been investigated heretofore in the literature.

Data for investigating whether improvements in the quality of port security

service can improve the quality of port interchange services were obtained from an e-questionnaire that was e-mailed to a database of container port operators. In the questionnaire, respondents were asked whether increases (or improvements) in container port security service would have a positive effect on the quality of container port interchange services. The results of the empirical analysis suggest that increases in the quality of port security service, via increases in the amount of throughput that is inspected and more frequent security inspection of entrance gates, departure gates and storage yards, will result in an improvement (i.e., a decrease) in port cargo theft. These results provide evidence that improvements in the quality of container port security service can result in improvements in the quality of container port interchange service.