

Measuring the Impacts of Increased Security
on
Ports and Shipping in the Caribbean Basin

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ABSTRACT

Measuring the Impacts of Increased Security
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The events of September 11th, 2001 brought into sharp focus the vulnerability of maritime trade and transport to threats of terrorism. The adoption and implementation of the IMO's (International Maritime Organization) ISPS (International Ship and Port Facility Security) Code by the world's ports and shipping industry was anticipated as a source of unavoidable high costs and a potential source of disruption to global supply chains. Developing countries, in particular, seemed to be at risk of being shut out of the world and American markets. This thesis first asks whether security can be considered as a variable in a measurement of port productivity. Second, it investigates the effects of ISPS and augmented security on ports within the Caribbean Basin. Findings show that new security initiatives have had some positive impacts on these ports. Controlling access and improving surveillance has had a direct impact on theft. Providing training and heightening awareness of security has promoted good relationships between the shipping lines and the ports. However, if one equates efficiency with reduced costs then the increased number of security employees at all ports would appear to be a reduction in efficiency. In conclusion the imperative to remain competitive and in a network that includes the U.S. has promoted the adoption and enforcement of security with a limited number of the 'anticipated' disruptions.

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Chapter 1 Introduction

One of the first books addressing the international law of the sea, *Mare Liberum*, was published in 1609 by Grotius (Anand, 1987). Grotius' purpose in writing this book was to refute Portugal's exclusive claim to access to trade with the 'Indies' and navigation upon those seas. Grotius (2004) claimed that unlike land, possession of the sea was not possible and as such, there could be no jurisdiction over countries trading freely or prevention over the right of navigation. Furthermore as the sea is "common to all and proper to none" fishing on the sea could not be prohibited by any one country (Grotius, 2004).

Although Grotius stated that those things that are in common use must be preserved, he and those of his time were under the impression that the sea was so large and bountiful that it was not a resource that could be depleted or harmed by trade, fishing or by navigation through it. As time passed, international law of the sea has broadened beyond the idea of unmolested passage and freedom of navigation on the high seas to include such subjects as: the width of the territorial sea, the contiguous zone, the high seas, the continental shelf, fishing and the conservation of living resources (Jessup, 1959). It has done so most successfully in the 20th century through international institutions such as the League of Nations and later on the United Nations. The United Nations Conference on the Law of the Sea in Geneva 1958 ultimately resulted in the 1982 UN Convention on the Law of the Sea, which was considered to be the "legal framework for almost all future activities at sea" (Johnston, 1985, p.2).

In the twenty-first century, a post 9-11 world, when nearly eighty percent of the world's goods are carried by sea, the idea of *mare liberum* can be equated with a sea that

is not secure. A dichotomy exists between the desire for the quick and efficient movement of maritime trade through the reduction of trade barriers and the need for secure movement and restrictive access. The ISPS (International Ship and Port Facility Security) Code is one response to the concerns about the perceived vulnerability of maritime transportation to acts of terrorism. The ISPS Code was developed by the IMO's Maritime Safety Committee and the Maritime Security Working group sub-committee (IMO, 2003). This Code is an amendment to the existing convention Safety of Life at Sea (SOLAS). As such, all governments that signed onto the original convention are expected to ratify and adopt the ISPS Code. The goal of ISPS is the detection and deterrence of threats to ships and ports.

The ISPS code is not the only maritime security response to threats of terrorism. Many international organizations such as the International Labour Organization (ILO) and the World Customs Organization (WCO) have also produced initiatives to improve the security of maritime transportation. Nations too have reviewed their own policies with regard to national security and have set forth new Transportation, Immigration and Security policies since September 11, 2001.

The international approach to maritime security (the ISPS Code) allows for a certain degree of flexibility within the superimposed structure of the Code. Through the IMO, security at the global level will be improved through a heightened awareness of risk, improvements to infrastructure, improvements to information flow and international co-operation, and standard protocols for the interface between ships and ports (IMO, 2003). The flexibility (or margin for interpretation) associated with this approach permits contracting governments to retain autonomous decision-making authority. The resulting

costs of ISPS implementation are specific to the security needs of the contracting governments.

The United States has gone the furthest in the creation of programmes and legislation to protect both its own borders and container cargo. These initiatives range from mandatory and exclusive (the Container Security Initiative -CSI) to voluntary and inclusive (Customs Trade Partnership Against Terrorism- C-TPAT). The implicit understanding with the voluntary programs is that the risk of non-participation will eventually lead to exclusion from trade with the U.S. (Banomyong, 2005). C-TPAT is a voluntary program designed to secure the entire supply chain as well as increase border security. CSI is a bilateral program that aims to target high-risk cargo before it arrives at U.S. ports and the 24-Hour-Rule is unilateral and requires a complete manifest to be provided twenty-four hours prior to U.S. destined cargo being loaded at a foreign port. Whereas the scope of ISPS is limited to ships, ports and the manner in which the two connect, U.S. initiatives have a much broader scope addressing the integrity of the traded goods from their origin to their final destination.

Global maritime security is about the protection of lives, infrastructure and international trade (Walkenhorst & Dihel, 2002). The rapid integration of maritime security regulations at the national and international level has placed global pressures on countries, private and public ports and companies to conform. As the world moves towards an increased state of security the challenge for the international maritime transportation system will be to find a balance between the desire for unrestrained movement (freedom of the sea), and the limitations that the need for secure movement puts upon them. Security must now be incorporated into this system, however only its

seamless inclusion will maintain the efficiency gains of new technology, improved data and information systems and the training of all actors. Anticipation of delays in the global movement of goods as national and international regulations come into effect has pushed industry and governments to develop and adopt measures to counter the possibly adverse effects of increased security. Methods for reducing or eliminating potential delays include risk analysis, pre-screening, non-intrusive x-rays and international compliance.

Prior to the implementation of ISPS, academic, commercial and international organizational literature predicted that adopting and enforcing new security measures would have a negative impact on port efficiency and productivity. While some sources pointed to the potential long-term efficiency gains of streamlined documentation for example, some authors were concerned with the potential for security to increasingly become a major source of shipping delays (Banomyong, 2005). Local shipping delays specifically impact a port's efficiency. Generally, other authors are mindful of the inverse relationship between efficiency and costs and recognize the importance of achieving high levels of both security and efficiency at costs that can be managed and controlled (Kwek & Goswami, 2004). For example, fearful of a change in productivity at the Port of Charleston, the South Carolina State Ports Authority levied a surcharge on carriers to ensure appropriate funding for increased security (Containerisation International Online [CI-Online], April 1, 2004). Still others report that some security initiatives have the potential to cause distortions in competition between ports as well as create efficiency and trade problems (Stasinopoulos, 2003; OECD, 2003). Fear of security creating a hierarchy or a black list of ports, with developing countries losing out by removal from liner services is expressed by Banomyong (2005) and CI-Online (May 1, 2004).

The purpose of this thesis is to test the hypothesis: is security a factor of port productivity? Furthermore, this research investigates what the effects of augmented security have been on ports within the Caribbean Basin. It is proposed that security is a factor of port productivity and that the least developed nations of the Caribbean basin will show an inverse relationship between security and productivity. Chapter Two presents a review of port productivity and efficiency literature and port security literature. The geography of the Caribbean, development issues and regional port and shipping trends are addressed in the second chapter. Chapter Three presents the research methodology. Two surveys were distributed, the first to port authorities and the second to shipping lines. Interviews conducted in the Caribbean contribute to both the survey results. The analysis of the survey results and a discussion of the results follow in Chapter Four. In Chapter Five, a number of conclusions are discussed. In this region, as new security procedures are adopted and implemented, improvements to port productivity are observed. However, improvements to productivity like improvements to security are neither uniform across all ports, nor are they easily quantifiable. There tend to be indirect, as well as direct impacts due to heightened security and these impacts are generally positive for the port, the port community and the port's productivity.

Chapter 2 Literature Review

2.1 Introduction

The research goal of this thesis is demonstrate that security is a factor of port productivity and as such, the least developed nations of the Caribbean basin will show an inverse relationship between security and productivity. In order to do so, this literature review addresses the subjects of port productivity and its measurement and maritime security. The geographic region of the Caribbean basin is also presented in this chapter. These major elements: productivity, security and the region will provide a framework for the analysis in subsequent chapters.

2.2 General Overview: The shipping industry, competition and port productivity

One of the most important characteristics of the shipping industry has been its international nature. The growth in world trade after the Second World War was particularly important in developing this international character, and the more recent creation of a global marketplace within the last twenty years has transformed the industry still further. Several trends are evident in this rapidly expanding global industry, including technological advances and global shifts in the spatial organization of the production of goods and services. Containerization is one example of a technological response to the increase in cargo throughput. McCalla (2004) notes that we are only now re-assessing long established models of port development due to the “dramatic effects” that containerization has had upon existing port infrastructure and the decision-making with regard to new investments both in technology and infrastructure. The way in which

the Far East has become a spectacular generator of cargo, specifically container cargo (Robinson, 1998), is an example of the changes in the location of production as well as the means of production.

Notteboom & Winkelmanns (2001) characterise the transformation in the global market (as it pertains to the shipping industry) as a shift in focus from growth strategies that are dependent on economies of scale towards strategies described as economies of scope. Scale economies refer to cost-cutting techniques to increase the scale of production and are still evident in continually increasing ship sizes, mergers and alliances that create much larger companies and networks, and physically larger terminals. Economies of scope, on the other hand, require organizations to participate in flexible multi-firm networks; operate in high-risk environments; and to take advantage of outsourcing in order to be competitive (Notteboom & Winkelmanns, 2001).

Changes in the shipping industry have meant great changes for the ports serving them. Ports have historically been the responsibility of national governments because they are inextricably tied to national economic and trade policy. Port competition, which had not been the driving force behind a port's location and purpose in the past, has become much more so today. There has been a general retreat from direct state involvement and control in the management and operation of ports. Some governments have chosen port privatization as one strategy to improve a port's efficiency and performance (Cullinane & Song, 2002). Other governments have encouraged the private development of new ports within a region (Robinson, 1998).

Shipping lines have long recognized the port as the source of their landside inefficiencies which they have historically had little control over and have placed

pressure on ports to provide dedicated terminals, increased water depths to support ever-increasing ship hull size and advanced intermodal connections. Cariou (2000) explains that diseconomies of scale in ports are one factor that explains the growth in ship size, as this is one area in which shipping lines could control their costs. Increasing ship size has a major impact on the type of routes and services the shipping lines can offer as well as their technical requirements at port. Thus private corporations as well as public bodies in a highly competitive environment and struggling to achieve a competitive advantage look to efficiency measurement as one method of protecting the large investments associated with modern ports.

As ports move beyond their roles as important land/sea interfaces to become major nodes in integrated logistics networks and a worldwide system of trade, they must become efficient links in the global supply chain. In order to meet the demands of competition, container ports must make huge capital investments in equipment, infrastructure, and technology as well as in effective management structures. As ports provide different services to different clientele, an overall measure of performance that reflects this diversity must be arrived at rather than one that is simply an indicator of one aspect of a port's many functions.

The literature demonstrates that there is no one standard method to determine port efficiency, nor is there one standard terminology to describe port performance. De Monie stated in 1987 that the reason for the absence of a standard method or terminology results from the absence of reliable data, the large number of variables, the influence of local factors and the different interpretations of the same results by different interest groups.

2.3 Port Productivity and Efficiency Measurement

2.3.1 Parameters of Port Performance

The diverse nature of a port's activities presents a challenge when evaluating productivity and efficiency. Evaluation results can be interpreted differently depending upon who is measuring (a bureaucrat, industry publications, or an academic), the method used and which factors of production are observed. This is further complicated by a lack of agreement on the basic terminology of *productivity* and *efficiency*.

Economic literature refers to three types of efficiency: technical, allocative and economic. Technical efficiency requires input and output data because it measures the optimum use of inputs necessary in achieving its outputs and it is represented by the production possibility frontier (Cullinane, 2002; Coto-Millán, 1999). Allocative efficiency takes into account the optimal use of inputs based on price (Coto-Millán, 1999). Economic efficiency is explained as the combination of allocative and technical efficiency (ibid.). Valentine & Gray (2002) and Bonilla, Medal, Casaus & Sala (2002) define efficiency according to the technical and allocative efficiency definitions above. Talley's 1994 definition of efficiency is an allocative one that is concerned with the best use of resources. For Tongzon (2002, p.4), efficiency refers to the "speed and reliability of port services" and in his study, ship turnaround time, freight rates and cargo dwelling time serve as indicators of efficiency.

Furthermore, Roll & Hayuth (1993) argue that a port's efficiency is not explained by simple inputs and outputs alone. They argue that one must consider the level of technology in place, the type of ownership, the level of cooperation between shipping and handling services and the way factors such as these impact upon a port's operation (ibid).

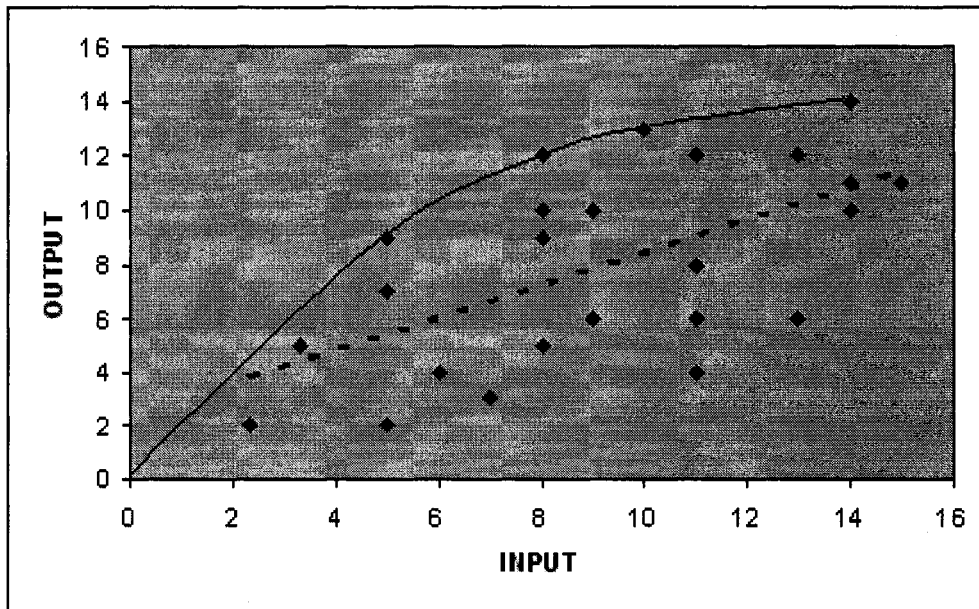
Wang, Song & Cullinane (2002) state that performance measurement terminology has been misused and continues to create confusion. These authors state that productivity (and not efficiency) is the ratio of output(s) to input(s), whereas efficiency is defined as “relative productivity over time and space” (p.4). If a good or service costs more to produce than what it sells for then it is said to be ‘unproductive’. Only measuring production over time will tell us if the most output is being produced from a given input and if a given output is being produced from the least input (Stretton, 2000). Therefore, comparison of one port’s productivity over time or of many ports productivity with each other will give us a measure of efficiency.

2.3.1.1 Methods

The early literature, (referring to the academic literature of the 1990s), had failed to recognize the need for an “analytically consistent approach to efficiency measurement” (Estache, Gonzalez & Trujillo, 2001, p.5). This literature sought *indicators* of port productivity rather than formal measures. For example, Talley’s 1994 research set out to demonstrate a methodology for choosing an indicator that would represent economic rather than engineering optimum throughput. Talley used port throughput per profit dollar as a port performance indicator. This ‘failure’ referred to by Estache et al. (2001) is partly due to the inconsistency and type of data that is commonly available to researchers through annual reports or industry publications. Cullinane (2002) adds that despite the universal standard of the shipping container, achieving a reliable measurement of productivity is difficult because there is no one method for counting the number of container moves and the motivation for determining a port’s productivity changes with the actor coordinating the measurement.

A second generation of literature on port performance attempts to address the lack of formal measures using parametric and non-parametric frontier models. A major difference between these two types of models relates to the population distribution and whether it is random (stochastic) or deterministic. Data Envelopment Analysis (DEA) is a non-parametric frontier model well suited to measuring relative port productivity because sample sizes are generally small and not random.

Figure 2-1: Comparison of DEA and Regression



Source: after Charnes, Cooper, Lewin & Seiford (1994).

DEA was originally developed in 1978 by Charnes, Cooper and Rhodes as a tool for conducting technical-efficiency analysis of decision-making units (DMUs) in the public sector (Cooper, Seiford & Tone, 2000). Cooper et al. (2000, pp.4-6) explain that DEA analysis measures 'relative' efficiency by looking at individual observations as opposed to "the focus on the averages and estimation of parameters that are associated with single-optimization statistical approaches". This difference is represented in Figure

2-1, where the solid line represents the DEA efficient frontier and the dotted line represents the parametric approach of a single regression line running through the data.

DEA allows the researcher to measure the total performance of a container terminal and not just one sector. It also allows for the comparison of a group of ports within a range. The information gained from this type of measure allows the operator of an inefficient terminal the opportunity to understand how they might make improvements to their productivity.

Wang, Song and Cullinane (2002) provide a number of cautions when using DEA. They advise comparison amongst ports with the same production functions and encourage the terminal as the appropriate scale of evaluation. Unless the range of ports being compared use the same currency (the Spanish port study by Martinez-Budria, Diaz-Armas, Navarro-Ibanez & Ravelo-Mesa (1999) being an example) or have the same pricing schemes, these authors advise the measurement of technical efficiency over allocative efficiency.

2.3.1.2. Variables

DEA analysis identifies input and output variables. Throughput, whether it is a measure of container, cargo or total throughput best describes the purpose of a port as well as its level of activity (Martinez-Budria, 1999). Throughput is the most commonly used output variable (Roll & Hayuth, 1993; Martinez-Budria et al., 1999; Valentine & Gray, 2002; Wang et al., 2002). Other output variables used include revenue received from the rental of port facilities (Martinez-Budria, 1999) and ship calls and user satisfaction (Roll & Hayuth, 1993). User satisfaction could be considered more important in a competitive environment and less relevant for islands with only one international

port. The variable *ship calls* poses problems because generally there has been a decline in ship calls while the size of ships have grown. Ship calls have also diminished through mergers and amalgamations of shipping lines.

Input variables for DEA analysis are varied. Early analysis by Roll & Hayuth (1993) uses annual measures of manpower, capital investment and cargo uniformity as inputs. Martinez-Budria et al. (1999) use labour expenses, depreciation charges and other expenditures. Studies that are more recent look at berth length (Valentine & Gray, 2002) and number of stevedores (Wang et al., 2002).

Many non-DEA methods of productivity analysis rely on measurements of time such as hourly container load rates, turn around time, waiting time and delay times (Sanchez, Hoffmann, Micco, Pizzolitto, Sgut & Wilmsmeier, 2003; Tongzon, 1994). Other variables include vessel size and average number of containers per vessel (ibid). Tongzon (1995) uses a method of grouping similar ports to evaluate their efficiency. Variables in that study include the number of: TEUs, ship calls, TEU per ship visit, gantry cranes and berths. Port infrastructure and equipment figure importantly in productivity measures regardless of the method used.

2.3.1.3 Findings

Although the quantity of studies done to measure port efficiency is not vast, Estache et al. (2001) state that the majority of studies rely on data that is commonly available; therefore, the selection of ports is often limited to the best performing or top global ports and that DEA is used as often as stochastic frontiers. As many governments look to privatisation of ports, we see a number of studies looking at the effects of ownership structure on efficiency (Valentine & Gray, 2002; Cullinane & Song, 2003; Liu

(1995) and Cullinane et al., (2002) are cited by Cullinane, 2002, pp.824-825). Other studies set out to determine if port or terminal size and function impacts upon efficiency (Martinez-Budria et al., 1999; Coto-Millán, 1999; Tongzon, 2001). A third direction for efficiency studies is that of Sanchez et al. (2003). This group uses Principal Component Analysis (PCA) to determine the effects of port efficiency on maritime transportation costs.

Sanchez et al. (2003) found that small changes in port costs and productivity can determine whether a port is able to be competitive in the global market. They found this to be particularly true for low-value exports in Latin American ports. They also determined that port efficiency has the same elasticity as that of distance (ibid.).

A study of Spanish ports by Martinez-Budria et al. (1999) in which the ports were classified based on their complexity found that the three classes of ports displayed particular characteristics relating to efficiency. Ports of higher complexity were found to have higher comparative efficiency levels and that the ports with the greatest inefficiencies were due to excess capacity. Tongzon's (2001) study adds that size and function alone are not the primary determinants of efficiency.

Valentine & Gray (2001) found that efficiency is not significantly influenced by ownership structure in their analysis of thirty-one container ports. This however, is in contrast to Cullinane & Song's findings that the degree of private sector involvement is related to productive efficiency (as cited by Cullinane, 2002).

2.3.2 Conclusion

Absent from the literature is the role that security may play on a port's productivity through the improvement or standardisation of paperwork. The relationship between customs-related screening and inspections and port procedures is also not addressed. While one study measured the effect of corruption on port productivity (Clark, Dollar & Micco, 2001), none have measured the effects of security.

The broad range of factors considered in performance measurement (as seen in the variety of variables chosen to measure productivity) could include security. The highly competitive environment for ports places great pressure to conform to heightened security. Security can be seen to have a direct influence on many of the inputs in a port environment. For example, delays might be incurred and waiting times increased due to the screening of more containers or delays might decrease because of more employees or new investments in technology. New security fees might have the effect of deterring ship calls. The lack of investment in technology and commitment to the ISPS code can result in a nation's ports incurring a non-compliant status and resulting in fewer ship calls and the penalization of that nation's fleet when calling at foreign ports.

Capital investments for security have tended to fall into the following categories: access control, physical enhancements, surveillance and communication¹. Port productivity (the ratio of outputs to inputs) could be measured as a ratio of ship calls (or throughput or delays) to investments in security.

¹ These categories come from a US Dept. of Homeland Security-Transportation Security Administration document entitled: *Port Security Grant Program Round 3*

2.4 Maritime Security and Trade

2.4.1 Introduction

The term *safety* broadly refers to a state of being free from “hurt, injury, danger, or risk” (Random House, 1993, p.1690). Within a maritime context, safety refers to rules or devices that are designed to avert injury, danger or the loss of life at sea. The creation of the IMO was based upon the premise that regulations created by international institutions and adopted by shipping nations can be the most effective way to promote safety, protect human life and prevent marine pollution (www.imo.org). *Security*, like *safety*, refers broadly to freedom from “danger, risk...care, anxiety, or doubt” and more specifically refers to the “protection, defense, and precautions taken to guard against attack, sabotage, espionage, etc.”(Random House, 1993, p.1731). Security then, can be seen as a subset of safety (Alderton, 2002).

Maritime trade has a history of vulnerability to acts of piracy, smuggling of persons and cargo, hijacking and the movement of hazardous goods. September 11th, however, brought into focus just how vulnerable the maritime sector is to potential threats of terrorism. The vulnerability of maritime trade is due in part to the total volume of goods that travel by ship as well as the open and international nature of this industry (OECD, 2003). The ‘open’ nature of the shipping industry refers to historically few limits to access and is not meant to imply ‘transparency’. The opacity of true ownership has long been an area of contention within shipping circles as well as in research and it is considered to contribute to the vulnerability of this industry.

In the year 2001 approximately eighty percent of world trade by volume was shipped (OECD, 2003). The disruption of trade or the potential to disrupt trade, therefore,

has major global consequences. The events of September 11, 2001 have forced an emphasis on the prediction and prevention of actions designed to have a violent impact upon lives, infrastructure and international trade. Terrorism expands the scope of illegal activities taking place on board vessels such that the ship, its contents, crew and owner may be seen as the pawns of terrorist activity where previously the complicity of the ship-owner or crew had been required, as in the case of smuggling (Alderton, 2002).

A nation's domestic maritime security plan encompasses the protection and defense of its marine transport system and its maritime borders. A domestic security plan is an expression of a nation's sovereignty (Singh, 2003). The U.S. security plan differs from most nations because it "projects its power beyond its shores" (Flynn, Carnegie Council, 2005). It does so through extra-territorial bilateral agreements such as the Container Security Initiative (CSI) and by its unilateral Advance Manifest regulations. Some authors express concerns over U.S. policies of unilateralism particularly at a time when terrorism has the potential to threaten regional co-operation and the work being done by international institutions (Singh, 2003; Stasinopoulos, 2003).

The U.S. passed its Maritime Transportation Security Act (MTSA) in November 2002. This act includes measures that go beyond the scope of the ISPS Code. Some of these measures include; seafarer identification papers and the development of a system of foreign port security assessments (OECD, 2003). The MTSA also allows the U.S. to refuse access to ships arriving from 'unsafe' world ports (OECD, 2003). The United States Coast Guard (USCG) now requires 96-hour advance notice of the arrival of a vessel and U.S. Customs now requires the manifest for all containers 24 hours prior to

their being loaded on board and destined to or through the U.S.. The 24-hour rule went into effect on February 2, 2003.

Short (2003) suggests that in the immediate response to maritime vulnerability, the U.S. was able to pass and act on legislation much faster than an institution represented by many countries and operating in a multilateral framework. Therefore, those in the position of trading with the U.S. were forced to proceed according to U.S. rules rather than wait for the implementation of international rules. Acting in accordance with U.S. requirements might have been seen as the most effective way for companies to make up for any efficiency losses.

Bichou (2004, p.328) argues that it is no longer possible to distance domestic security from global security because activities previously considered domestic problems are now seen as linked to the “financial, operational, and organizational structures of international terrorism”. The move from national (domestic) to international (global) is argued by some to be the appropriate approach to maritime security. Security at the international level is designed to address chronic problems affecting international trade such as money laundering, ownership, piracy and organized crime, rather than the more strictly defined terrorism (Stasinopoulos, 2003). Within an institution such as the IMO, there is a participatory and consultative process (van der Kluit, 2002). IMO regulations are supported in the international arena because they promote awareness of security and develop risk analysis skills while at the same time allowing for ships and port facilities to adopt security measures that are appropriate to their own particular situations (van der Kluit, 2002). At the international level, security must consider open seas, major shipping lanes, and it must include all actors: governments, shipping and port industries.

2.4.2 The Security Risks of Maritime Trade

The OECD (2003) states that the international maritime system of trade presents itself as excellent target for terrorism on many fronts. Firstly, the maritime labour force is highly diverse internationally and workers as well as goods have traditionally been able to move around the world with very little scrutiny. Within this system, there are thousands of intermediaries and many participants such as ships owners who are able to hide their identities thus allowing the system to function on a less than legitimate level. Many ship registries also function below international standards for safety. Lastly and quite simply, the international maritime system of trade is considered a target for terrorism because the world is completely reliant upon it (OECD, 2003). Short (2003) adds that the transportation sector presents itself as a target due to its accessibility, the large volume of people involved in its function, the ability to attract media attention and public fear and because it is often directly linked to national symbols. More specifically, ports are targets because they present the opportunity to affect large populations as they are historically proximate to large urban centres and are linked to cruise ports (Bichou, 2004). A direct attack on a large port or on specific types of cargo (oil and gas) or on specific locations (the Straits of Malacca or Gibraltar or the Panama or Suez Canal) would have economic costs worldwide (ibid.).

Short (2003) argues that the intense scrutiny that ports face in terms of new security regulations would be better directed higher up the supply chain. Bichou (2004, p.323), on the other hand, states that the port is perfectly situated at the centre of the many “institutions, functions, assets, processes and flow-type elements” involved in shipping to provide a cohesive framework to global maritime security measures. Unlike

shippers, Short (2003) states that ports and carriers need not have knowledge of the contents being shipped only the ability to maintain that the integrity of the shipment is respected by all the actors involved.

Containers are now identified as a security risk because of the number of containers [(303,108,850 TEUs² in 2003) (CI Yearbook, 2005)] moving about the globe, because the method for moving containers is corruptible and because of the potential for a container to contain a weapon of mass destruction (OECD, 2003). Previously the container had been viewed as a technological improvement to the “security and safety of the cargo” because it limited the breakage of goods and reduced opportunities for theft (Slack, 1998, p.265). The container, which is designed to conceal its contents from the naked eye, is presently seen as highly suspect, warranting special initiatives such as tamper-proof seals and CSI, to reduce the risks now associated with it. Before September 11th, only two percent of containers were inspected (OECD, 2003).

2.4.3 The Costs of Maritime Security

Increased costs resulting from security initiatives are expected to have the greatest impact on “transport, handling, insurance and customs” (Walkenhorst & Dihel, 2002, p.11). With the knowledge that security will change the cost of global trade, the promotion of compliance to the security initiatives is accomplished through a ‘carrot and stick’ approach. On the one hand, it is suggested that non-compliance with security will mean exclusion from the U.S. market as well as fines of up to \$25,000 (Botelho, 2004). The threat of non-participation in CSI and C-TPAT is that containers and the stakeholders in supply chains could face sharper scrutiny and “delays when shipping to

² TEU (Twenty foot Equivalent Unit) is the unit of measurement for container activity and refers to the dimensions of the container (Slack, 1998, p.265).

the U.S.” (OECD, 2003, p.54). Smaller ports and shippers have expressed the concern that their shipments will be penalized because of non-participation.

On the other hand investments in security are promoted because of the potential to benefit trade by reducing delays, speeding up the processing time of documents, decreasing theft and decreasing payroll due to improvements in technology (OECD, 2003). The OECD (2003) estimated the costs of implementing ISPS for port facilities at approximately the same cost of implementation for ship operators (1,279 million \$U.S. initially and 730 million \$U.S. annually) or greater. It is expected that these costs will result in higher trading costs. Higher transport and trading costs, could lead to lower volumes traded (imports and exports) (Walkenhorst & Dihel, 2002; Short, 2003). Delays at borders, sea and airports can also affect perishable products and the ‘just in time’ supply chain leading to further disruptions within production lines (Walkenhorst & Dihel, 2002). The events of September 11th caused American companies to increase their inventories because of their concerns over the possibility of future disruptions to trade causing a shift away from ‘just in time’ logistics towards ‘just in case’ warehousing (OECD, 2003). Walkenhorst & Dihel (2002) predict that a one percent *ad valorem* increase in trade costs will result in global welfare losses of \$75 billion and that these losses will heavily impact on the middle-income developing countries.

2.4.4 Security as a Variable in a Port Productivity Measurement

The literature that investigates the risks associated with global economic terrorism and the responses designed to meet the risks demonstrates an extreme sensitivity to the effect that a heightened security environment will have upon the efficiency and productivity of ports and shipping. The long-term goal of many international security initiatives appears to be the standardisation of security as an integral aspect of operations within the shipping industry. Education and awareness of risks along with investments in infrastructure and technology to prevent 'incidents' could be previewed as standard operating procedure in years to come. This of course would have the effect of removing security as an element of competition. Attempts to regulate or to create a level playing field by international organizations are in direct opposition to the idea of competitive advantage (Barton, 1999).

The highly competitive environment for ports will place pressure to conform to increased security. Security at first glance would seem to have the effect of creating inefficiencies. It is suggested that some of the effects of an increase in security could include: larger workforces, delays to berthing, a greater number of inspections, adoption of new technology for the transmission of information and the tracking of vessels as well as for inspection and detection, less corruption and theft, changes to ship calls and route changes. Security may have the capacity to diminish a port's efficiency because it is cost prohibitive or because improvements to technology, which are usually synonymous with reductions in manpower, have been offset by the increase in port security forces to meet compliance standards. Alternatively, security has the capacity to improve a port's efficiency through improved data management, reduction of petty theft and corruption,

and improvements to infrastructure. Banomyong (2005, p.5) states, “only a uniform level of security in all ports will reduce the risk of disruption to global supply chains”. Not all ports can afford to operate as CSI ports and the preferential status of CSI ports could have the effect of routing even more cargo through these ports.

These dramatic changes to the maritime security environment, the identified risks and the subsequent responses have resulted in significant costs to government, ports, transporters and the final user. IMO and U.S. responses demonstrate a desire to manage the direction that heightened security will take.

Using Wang et al.’s (2002) measure of productivity (the ratio of outputs to inputs), security becomes addressable within the ISPS context, as a measure of port productivity. Production outputs related to security are changes in throughput, changes in the number of ship calls and increased delays. Security-related production inputs include: expenditures on training, technology, infrastructure and changes in manpower and changes in the number of vessel inspections. Are increased costs a red flag for production inefficiencies?

2.5 The Caribbean Basin

2.5.1 Geography of the Caribbean Basin

The study area includes the island and continental nations of the Caribbean Sea and the Gulf of Mexico (Figure 2-2). There are thirty-three countries bordering these bodies of water, twenty-three of which are small island nations. With the exception of the United States of America, most of the mainland countries are developing, such as

Mexico, Venezuela and Columbia. Ten of the United Nation's Conference on Trade and Development's (UNCTAD) twenty-nine small island developing states (SIDS) are found in the study region.

Figure 2-2: Map of the Study Area: Caribbean Basin



Source: Natural Resources Canada

The Caribbean Basin is at the centre of North South traffic for the Americas as well as being at the crossroads of East West commerce due to the Panama Canal. In spite of this strategic location, this region has been characterised as being “on the margins of international trade” (McCalla et al., 2005, p.247). The reason for this may be that many of these ports, transshipment ports included, are not significant generators of cargo (Frankel, 2002). However, as many of the countries are island nations and the great part of their exports and imports are transported by sea, the role of the port and maritime services are essential (World Bank, 2005).

One of the most important port developments in this region is the growth in transshipment traffic resulting in Caribbean ports being well connected at the global level of service (McCalla et al., 2005). The Caribbean is identified by Frankel (2002) as having a different approach to transshipment due to low volumes of cargo generated from the region and very long feeders that supply local ports. Transshipment is also complicated in this area by passage through the Panama Canal and by the local restrictions of cabotage³. Furthermore, transshipment differs in this area in that it is completely intramodal and with very little intermodal activity (Frankel, 2002).

2.5.2 Development Issues

Many of the countries in the Caribbean basin face development problems. In this region, Haiti is considered as a least developed country (LDC): one that is less likely than other countries to move beyond a state of poverty (www.unctad.org). Geography plays an important role in defining LDCs. The small island developing states (SIDS) in the basin are nations that are at a high risk of being marginalized in the global market because of their small size, their remoteness (or high transport costs) and because they are extremely vulnerable to natural and economic disasters beyond their control (Briguglio, 1995).

The disadvantages of these countries related to size are manifested in a reliance on imports due to limited natural resources, organizations that are monopolistic or oligopolistic because of the lack of domestic competition, and public administrations that have a small pool of skilled manpower (Briguglio, 1995). The location of SIDS often

³ Cabotage refers to the movement of goods between two terminals of the same country (Rodrigue, 2006). It is common for nations to place restrictions upon such transportation. The merits of restricting cabotage to nationally flagged vessels thereby providing for employment of a national merchant marine and related ship-building industries are debated by those who posit that cabotage increases shipping costs and inefficiencies (Sanchez & Wilmsmeier, 2005).

results in higher transport charges and even exclusion from major shipping routes creating uncertainty in supplies thereby increasing production costs. The 2004 and 2005 hurricane seasons demonstrated the vulnerability of these nations and the Basin in general to natural disasters.

Table 2-1: GDP for Caribbean Basin Countries

Caribbean Basin Countries	GDP/Capita	Year
Antigua & Barbuda	\$11,000	2002
Aruba, Netherlands Antilles	\$28,200	2002
Bahamas	\$18,800	2005
Barbados	\$17,300	2005
Belize	\$6,800	2005
British Virgin Islands	\$38,500	2004
Cayman Islands	\$33,200	2004
Columbia	\$7,100	2005
Costa Rica	\$10,000	2005
Cuba	\$3,300	2005
Dominica	\$5,500	2003
Dominican Republic	\$6,500	2005
Grenada	\$5,000	2002
Guadeloupe	\$7,900	2003
Guatemala	\$4,300	2005
Haiti	\$1,600	2005
Honduras	\$2,900	2005
Jamaica	\$4,300	2005
Martinique	\$14,400	2003
Mexico	\$10,000	2005
Montserrat	\$3,400	2002
Netherlands Antilles	\$11,400	2003
Panama	\$7,300	2005
Puerto Rico	\$18,500	2005
Saint Lucia	\$5,400	2002
St. Kitts and Nevis	\$8,800	2002
St. Vincent and the Grenadines	\$2,900	2002
Trinidad and Tobago	\$12,700	2005
Turks and Caicos Islands	\$11,500	2002
U.S. Virgin Islands	\$17,200	2002
USA Mainland	\$41,800	2005
Venezuela	\$6,400	2005

Source: www.cia.gov

Developing countries are particularly vulnerable to increases in transport and trading costs that improvements to security will incur (World Bank, 2004). Their vulnerabilities also stem from their dependence on out-dated infrastructure and technology. One UNCTAD report (2001, p.3) states that it is not uncommon in developing countries for cargo to be delayed or blocked due to “missing or insufficient information”. The report continues saying that the limited revenue base of ports in developing countries prevents expenditures on necessary information systems.

2.6 Conclusion

Although measuring productivity has become an important topic, the literature review has shown that over the last twenty years of port productivity and efficiency measurement there has been very little consistency in the methodology, study region, and variables measured. The relatively few studies that have been undertaken (as compared with airport efficiency for example) emphasize the need for a more thorough investigation. With an adequate sample size and consistent input and output variables DEA has proven to be a valuable method for measuring relative productivity that could be applicable to the study region.

The academic literature on maritime security is relatively weak. In both the commercial (shipping) and academic literature the focus has been on describing the security measures and suggesting that there may be impacts. So far there has been little analytical and empirical assessments. Given these lacunae, this study is timely and may help to fill the gap in our understanding of how enhanced security affects port and shipping activity in a specific region – in this case the Caribbean basin.

Chapter 3 Methodology

3.1 Introduction

Based upon the academic literature reviewed in chapter two, the following general hypothesis is proposed:

G1: Security is a factor of port productivity

O2: It is expected that ports in the least developed Caribbean nations will demonstrate an inverse relationship between security and productivity.

Ho: There is no relationship between security and productivity

In order to address this hypothesis a multi-pronged approach, involving both quantitative and qualitative methods has been pursued.

This type of approach provides an opportunity to test findings derived from different methods. Triangulation occurs when findings from differing methods and sources concur. The advantage for the researcher is that multiple corroborations improve the validity of the measurement and provide a multi-faceted explanation of the phenomena. Non-corroborative findings also help to provide an explanation of the bias of the method or source.

3.2 Data Collection

The first phase of data collection was an analysis of primary and secondary sources. Primary sources included IMO, Department of Homeland Security, U.S. Coast Guard, UNCTAD (and the Latin American ECLAC), the U.S. Department of Transportation websites as well as shipping related websites such as Containerisation International Online, and Lloyd's Register Fairplay. Secondary sources included trade

newspapers and academic articles. These sources serve to establish a background of information about the institutions addressing the security issue and the organizations in the process of applying higher levels and standards of security.

The relevant literature defines the many factors that have been considered over time to measure port productivity and efficiency. It suggests that investments in security, like capital investments, can be seen as inputs (independent variables). Dependent variables, such as cargo throughput or revenue can be seen as port outputs. These measures (inputs and outputs) can then be used to evaluate a port's productivity.

Data Envelopment Analysis (DEA) is one method of measuring a port's productivity and relative efficiency. This technique has been widely used to measure port performance (Bonilla et al., 2002; Tongzon, 2001; Martinez-Budria et al., 1999). In order to apply DEA, port input and output data are required. The literature suggests that input data includes such factors as: manpower; the number of cranes, container berths; delay time; and terminal area. When security is viewed as one of a port's inputs, increases in security can be measured by the following factors: number of employees added due to security, investments in port improvements and training to meet compliance with ISPS, and the cost of hiring a third party to achieve compliance. These factors are examples of inputs at ports today in order to achieve a secure environment.

In order to answer the research questions two separate surveys were undertaken. A Port Survey was designed to collect the data necessary for the application of DEA with the goal of determining the relative efficiency and port productivity of the ports in this region. The purpose of a Shipping Line Survey was threefold. The first goal was to follow a survey by Tongzon (2002) that evaluated determinants of port choice with the

addition of the factor of security. The second purpose was to determine whether the shipping lines have made changes to their services that might impact on port traffic. The final purpose was to confirm or disprove the predicted impacts as suggested in the shipping media.

Due to the number of ports in the region, it was determined that a questionnaire would be an effective method for obtaining the input and output data required or to supplement any missing data acquired from the primary and secondary sources.

3.2.1 The Port Survey

To determine the sample for the Port Survey a database was created from the following sources:

- IMO (<http://www2.imo.org/ISPSCode/ISPSInformation.aspx>)
- ECLAC (<http://www.eclac.cl/transporte/perfil/indexe.html>)
- Containerization International Online (www.ci-online.co.uk)
- Lloyd's Register Fairplay (www.portguide.com)

The data from the IMO provided the number of facilities that due to their international nature required compliance with the ISPS code. At the time the data was sourced (September 2004), the IMO listed 23 non-compliant ports or facilities on seven different islands (or nations) within the Caribbean. ECLAC's website provided a history of tonnage and TEUs moved through the ports and in some cases a website linked to the ports themselves. CI-Online's website provided TEUs as well as a worldwide port ranking. The Fairplay site provided information on the type of facilities at each port; whether it was container traffic, passenger traffic, break bulk, multi-purpose, ro-ro, dry bulk, gas or liquid. It was decided not to focus on liquid or gas ports and facilities.

Emphasis was placed on the ports offering the following services: container, passenger, break bulk and ro-ro.

The ports were then categorized by the number of different types of traffic they experience. A port offering three or four of the four services would be selected for a survey. Ports were excluded from the survey if: they provided none of these services; they provided only one or two services and they were already compliant; or if there was a historical pattern of insufficient data for the port. Exceptions to these rules were made if good traffic data existed for a port with only one or two types of facilities; the port is considered a transshipment port even though it serves only one or two types of cargo or if there would be no representative from that island/country without the port in question. It is for this last reason that the survey demanded a breakdown of traffic information from the port- to supplement the missing traffic data from multiple sources).

Section A of the survey asks for identifying information. (See Appendix A for an English copy). Section B of the survey was designed to retrieve information on expenditures related to security (a: training and b: physical enhancements, access control, surveillance and communication) and to determine whether the United States is a trading partner for the port in question. The breakdown for b expenses was developed from U.S. Department of Homeland Security's Transportation Security Administration (TSA) categories. (The TSA used these categories when disbursing port security grants for improvements.) The expenditures section of the survey (Section B) relates to financial inputs a port must make to improve security.

Section C asks the port for its history on the number of vessel inspections conducted yearly as well as the average delay times to berthing for the years 2000-2004.

This section also inquires about any incidences of non-compliance with ISPS as well as the particulars (the port or flag states). Section D asks for traffic information from the port. The traffic experienced by a port, either in numbers of ships or the amount of cargo a port moves, can be considered an output of productivity.

3.2.2 The Shipping Line Survey

The purpose of this survey was to describe any changes that shipping lines experienced due to the ISPS compliance of the ports in this region.

The survey requested contact information in Section A. Section B asked the shippers to rank a number of factors they consider when choosing a port and whether or not their satisfaction with port services had changed since the implementation of new security initiatives. Section C asked the shipping lines if there were any changes to routes or services due to security initiatives. The last section (D) inquires about new costs related to security.

The mode of delivery was via email and fax based upon a list of shipping lines. CI-Online was the source of the list of shipping companies. As these companies all have websites, their contact information was available through the Internet

3.2.3 Interviews

Five island nations were chosen for visits. The islands were chosen because they had not returned the surveys and because it was hypothesized that these ports would be hit hardest from increased security. Interviews were conducted with officials at four of the five island ports (Basseterre, St. Kitts; Castries, St. Lucia; Jarry, Guadeloupe; and St.

John's Antigua). Ten representatives from a number of different shipping lines were interviewed in Bridgetown Barbados; Castries, St. Lucia; and Jarry, Guadeloupe.

Figure 3-1: Ports Surveyed in Study Area



Source: Natural Resources Canada

3.3 Sample

The population of this study includes all world ports that serve passenger ships and cargo ships (of 500 gross tonnage and up) on international voyages. This criterion is described in the ISPS code (IMO, 2003). This case study includes the ports in the geographic region of the Caribbean basin. This region is characterized by a tremendous range of ports. There are very large transshipment ports involved in the global movement of cargo and very small ports that concentrate on local trade. A stratified proportionate sample was developed based upon the following classification: container traffic, passenger traffic, ISPS compliance, and representativeness of all island nations.

Sixty-five ports in the Caribbean basin were mailed the Port Survey in November of 2004 (See Figure 3-1). Ports received this survey in their official language: Spanish and French translations were made. Follow-up for non-responsive ports occurred on January 31, 2005 when eleven emails were sent out to ports with listed email addresses. A second follow-up email or fax was conducted on February 23 and 24th, 2005. Eleven responses were received by post, email and fax. To this number were added the responses obtained by interviews with four port authorities in June 2005. The total response rate for the Port Survey was twenty-three percent.

The second survey, geared to shipping lines, was also translated into Spanish and French. (See Appendix B for the English version). The Shipping Line survey went out to thirty-two shipping line representatives by email and fax. Emails and faxes were sent out on May 5, 2005. Two replies were received by Internet and one by fax. In addition, four lines were interviewed in Bridgetown Barbados on June 8th and 9th, 2005. Three interviews were conducted in Jarry, Guadeloupe on June 13th and 14th. A fourth interview with a representative from Maersk in Guadeloupe was conducted by telephone from Montreal on June 1, 2005. Two interviews were conducted in Castries, St. Lucia on June 17th, 2005. The response rate for the Shipping Line Survey was forty percent.

3.4 Measurement

This research had planned to measure relative productivity of the region's ports using (variables specific to security with) Data Envelopment Analysis. While the total response rate for the port surveys allowed for this analysis, not all ports supplied all the necessary data in a consistent format. For example, Kingstown, St. Vincent provided no information as to manpower which can be used as an input (either number of workers or

the costs of training). Yet this port did provide all the required output data. Fort de France, Martinique provided ship call data but nothing for cargo and container throughput. Methods for counting ship calls also differed across the ports of this region. Many ports separate commercial ships from cruise ships and military or coast guard vessels in their statistics, others do not. Gulfport stated that screening equipment is an expense of U.S. Customs unlike in the Caribbean nations where this is a port expenditure. There is also the distinction between ship arrivals and departures and the total of the two. The incompleteness of the data set made it impossible to employ DEA. In its place descriptive statistics were used to analyze the data from both the surveys and the interviews. Correlations between variables were tested with Spearman's Rho. Notes from interviews were analyzed in terms of two general themes: local port productivity and the local impacts of compliance with international security.

Chapter 4 Results and Discussion

4.1 Introduction

This chapter presents the results from the surveys and interviews. The port survey results are presented first followed by the results from the shipping lines survey. Each section is followed by a discussion of the results. One of the greatest challenges for small islands is the imbalance created by the local reliance on cruise ship revenue and the access to these same ports to meet regional import and export needs. This challenge has an impact upon port congestion, efficiency and security.

4.2 Traffic Information

Non-compliance with the ISPS code or a port struggling with its implementation may result in changes in services and ports being cut out of networks temporarily or permanently. McCalla (2003, p.2) states that in order for ports to do well they need to be 'well-connected' because this allows them to increase throughput and to expand their import and export volumes. McCalla found that the number of services a port receives explains over eighty percent of the port's variation in throughput. He also suggests that the greater the number of links that small Caribbean islands have to hub ports the more likely these island ports will benefit from increased throughput.

This research uses ship calls as an indicator of connectedness. This measure is not without limitations however. Mergers and amalgamations, for example, have meant a reduction in the number of ship calls but have increased the size and capacity of ships on the remaining services. It is not uncommon to see a reduction in ship calls at the same time as an increase in TEUs.

Port traffic is displayed in Tables 4-1 and 4-2 for the ports who replied to the survey. Table 4-1 shows annual container throughput (measured in TEU). Traffic for the year 2005 has been supplemented from online sources (CI-Online, AAPA and ECLAC), the Containerisation International Yearbook 2006 and individual port websites, where available. Table 4-2 provides the number of annual ship calls.

Both the continental ports and the island ports demonstrate relatively stable traffic figures over the years surveyed. Three ports: Tuxpan, Jarry and Gulfport are the exception. Tuxpan, Mexico demonstrates diminishing traffic both in terms of the number of ship calls and TEU. The sudden drop in 2004 (2 TEU) is not explained by the respondent. The Mexican government has shown an interest in promoting Tuxpan as an alternative to Veracruz where there have been congestion problems (CI, 2005b, p.37). Although Tuxpan is located closer to Mexico City, heavy investments in roads are needed to make this port a viable alternative. Jarry, Guadeloupe had nearly two hundred fewer ship calls in 2004 that can be attributed to the striking dockworkers in that calendar year (Interview with Port Commandant). Gulfport, Mississippi shows a significant decrease in TEU after the year 2000, yet there has been an increase in ship calls. While TEU does increase in the three subsequent years, it never reaches the 2000 value. Port Point Lisas and Cartagena are also exceptions, although these ports show growth. Port Point Lisas has been promoting a growth strategy in the area of container transshipment (www.plipdeco.com). Port Point Lisas was chosen by Maersk to be a local hub. Cartagena has also seen growth in traffic because of its role as a hub port and strategic location with respect to the Panama Canal.

Table 4-1: TEU throughput from 2000 to 2005

Terminal Name	2000	2001	2002	2003	2004	2005
Gulfport, USA	414426	141102	154466	199878	213108	187384
Mobile, USA	18735	21059	18604	26302	37375	42443
Progreso, Mexico	59192	60293	59140	60369	68200	71837
Tuxpan, Mexico	104	341	286	101	2	15
Maracaibo, Venezuela	0	66336	31352	23886	28889	27404
Cartagena, Columbia	319937	446187	433322	455331	468864	549860
Basseterre, St. Kitts	5190	5576	6240	5528	5641	NA
Deepwater Harbour, Antigua	NA	NA	NA	11921	12448	NA
Kingstown, St. Vincent	9155	9201	10620	11700	13025	NA
Vieux Fort, St. Lucia	18987	16180	14984	14941	18981	15292
Castries, St. Lucia	27050	23208	23003	22792	24956	29665
Jarry, Guadeloupe	121756	119560	106129	108066	106213	NA
Fort de France, Martinique	140062	140034	146771	142110	NA	NA
Port Point Lisas, Trinidad	65447	81602	95058	98363	131750	NA

Source: Questionnaires, Interviews, CI Online, CI Yearbook 2006, ECLAC, AAPA Online and individual websites

Table 4-2: Ship Calls from 2000 to 2004

Terminal Name	2000	2001	2002	2003	2004
Gulfport, USA	385	400	526	458	425
Progreso, Mexico	838	829	835	847	810
Tuxpan, Mexico	189	138	161	108	113
Maracaibo, Venezuela	544	595	416	302	328
Cartagena, Columbia	1081	1372	1264	1275	1200
Basseterre, St. Kitts	750	610	579	555	545
Deepwater Harbour, Antigua	NA	NA	NA	273	261
Kingstown, St. Vincent	943	902	847	892	900
Vieux Fort, St. Lucia	559	451	312	423	429
Castries, St. Lucia	1431	1404	1093	1203	1351
Jarry, Guadeloupe	NA	NA	NA	2285	2096
Port Point Lisas, Trinidad	677	890	918	725	850

Source: Questionnaires and Interviews

4.3 Port Survey Results

4.3.1 Survey Introduction

At the start of this research, data collected from the International Maritime Organization indicated that of the thirty-one countries in the Caribbean basin, seven islands or nations had ports and/or facilities that were not compliant with the ISPS Code by the July 1, 2004 deadline. All of the ports responding to this survey or the interviews were compliant on or before the July 1, 2004 deadline. At the writing of this thesis, there

remain nine facilities or ports with a non-compliant status in three countries, and no data available for the five facilities or ports in Cuba, Nicaragua and Costa Rica (Table 4-3).

Table 4-3: Present Status of July 1, 2004 Non-Compliant Ports or Facilities

Port and Port Facility	Country	IMO Member since:	Subsequent date of Compliance
Santiago de Cuba	Cuba	1966	No data available
Point-a-Pitre (apportement sucrier)	Guadeloupe		Sept. 7, 2004
Point-a-Pitre (Duty free zone)	Guadeloupe		Sept. 7, 2004
Point-a-Pitre (poste cerealier)	Guadeloupe		Sept. 7, 2004
Point-a-Pitre (poste sucrier)	Guadeloupe		Sept. 7, 2004
Point-a-Pitre (Terminal Bulk/Petrolier)	Guadeloupe		Sept. 7, 2004
Point-a-Pitre (terminal conteneurs- zone de manutention et de depot)	Guadeloupe		Sept. 7, 2004
Point-a-Pitre (Terminal Petrolier)	Guadeloupe		Sept. 7, 2004
Cap Haitien	Haiti	1953	Not Compliant
Ciment du Sud	Haiti	1953	Not Compliant
Gonaives	Haiti	1953	Not Compliant
Jacmel	Haiti	1953	Not Compliant
St Marc	Haiti	1953	Not Compliant
Fort-de-France (Sea Line SARA Cohé)	Martinique		Not Compliant
Fort-de-France (secteur est)	Martinique		Not Compliant
Puerto Limon	Costa Rica	1981	No data available
Puerto Moin	Costa Rica	1981	No data available
Blue Fields	Nicaragua	1982	No data available
Puerto Cabezas	Nicaragua	1982	No data available
Carupano (puertos de sucre)	Venezuela		Sept. 14, 2005
Cumarebo (cementos caribe)	Venezuela		Not Compliant
La Ceiba Cargo General	Venezuela		July 6, 2004
Macuro cement vencemos	Venezuela		Not Compliant

Source: www.imo.org sourced: August 9, 2004 and March 21, 2006

Thirteen of fourteen ports that responded to the survey stated that they have cargo destined for the United States. In addition to ISPS compliance, trade with the U.S. requires the transmission of a clear and detailed manifest for each container to U.S. Customs prior to its placement on board. The implication for all ports participating in U.S. trade is that the manifest and the goods must be physically available forty-eight

hours prior to sailing, should U.S. Customs question or reject the cargo. The only port to state that there is no cargo bound for U.S. ports was Basseterre, St. Kitts. However, if cargo originates in Basseterre and arrives in the U.S. via another port Basseterre is still under U.S. Customs' requirement to report the contents of the container. Basseterre does receive international cruise ships enroute to or from the U.S. destinations. While it does have separate facilities for international cruise ships if more than two cruise ships call, the third ship will be redirected to the cargo port. This is common in the small island ports and will be discussed in detail in a later section.

In order to complete their port facility security assessments ports and ships had the option of hiring a Recognized Security Organization (RSO). Eight of the ports surveyed employed an RSO and five ports conducted their surveys in-house. The RSOs employed were: *U.S. Risk*, *Sécurité sans frontière*, *Guaritico III*, *Fideicomiso de Escuelas Nauticas*, *Société Optime*, and three ports used *Seasecure*. The one time cost for hiring an RSO ranged from \$50,000 U.S. to \$2,334,252 U.S. Of the eight ports who used an RSO to conduct their security assessments, only two ports (Progreso and Point à Pitre) have maintained the RSO for ongoing work.

4.3.2 Discussion

Contracting governments are allowed to determine for themselves whether a port or facility meets the criteria necessary for compliance with ISPS. The list of non-compliant ports (Table 4-3) suggests that cement facilities in (Venezuela and Haiti) and other sectors of a port (Martinique) can be separated or excluded from ISPS. Haiti's non-compliant status may also be a result of political upheaval. Costs may be a determining factor when ports exclude facilities from international trade.

The manner in which ISPS is implemented at a cargo facility will differ from that of a cruise facility. Cruise berths require baggage and passenger screening equipment whereas cargo berths require cargo and employee or visitor identification systems. Both types of facilities require controlled and restrictive access as well as training drills for port personnel. Cargo ports must be continuously monitored. Cruise ports have a seasonal need for surveillance and may (as in the case of Basseterre) or may not (as in St. John's Antigua) be cordoned off from public use when cruise ships are not at berths. Deepwater Harbour Antigua is an example of a cargo port that restricts movements of passengers using gates and fencing. Passenger areas are well defined. Basseterre's cargo facility on the other hand is an open area without well-defined spaces or differentiated traffic routes for passengers and cargo. Caribbean cruise destinations where cargo facilities must accommodate cruise ships are examples of multi-purpose ports requiring multi-purpose security. For small islands, this elevates costs considerably.

The use of an RSO to conduct a port security risk assessment is a reflection of local capacity. Castries, St. Lucia stands out as a port involved in improving local capacity through training and partnerships with other Caribbean nations. Basseterre is an example where local personnel preferred to conduct their own risk assessment but government insisted on the use of an RSO with the help of a World Bank loan. It was also suggested that the RSO advised the port to purchase and implement security measures beyond the level of risk.

The USCG monitors the performance of RSOs for their security performance, in the same way that they monitor flag state performance when determining which vessels will be subject to more safety inspections. Ports must be prudent when purchasing the

services of third parties. Half of the RSOs employed by Caribbean respondents were American.

4.3.3 Manpower

Manpower increased at eleven of the twelve ports (that responded) due to security. Maracaibo, Venezuela is the port of exception with no increase in workforce. No explanation was given. The net number of workers added due to security ranges from three in Tuxpan and Vieux Fort to thirty-four in Castries. (The figure for Castries represents the increase for the dedicated security officers working at both the air and seaports and their total number of employees listed is a total of only the security force and not the total of port employees).

Table 4-4: **Manpower**

Port	Total Number of Employees	Net # Added	Proportion of new employees in workforce
Tuxpan	602	3	0.50%
Vieux Fort	14	3	21.43%
Gulfport	200	4	2.00%
Progreso	2000	5	0.25%
Fort de France	350	6	1.71%
Jarry	550	7	1.27%
Basseterre	380	15	3.95%
Castries	340	34	10.00%

The port with the fewest employees is Vieux Fort, operating with fourteen employees, where an increase of three employees for security represents 21.43% of the workforce. The Port of Progreso has the largest number of employees in the sample (two thousand) and hired five new employees for security representing 0.25% of the total workforce.

Table 4-5: Costs of training per Employee

Port	Total Number of Employees	Total Costs of Training	Costs of training per employee
Progreso	2000	\$13,500.00	\$6.73
Fort de France	350	\$14,228.36	\$39.97
Castries	340	\$29,959.69	\$80.11
Tuxpan	602	\$50,513.76	\$83.49
Maracaibo	170	\$15,639.53	\$92.00
Gulfport	200	\$20,000.00	\$98.04
Cartagena	300	\$90,000.00	\$441.18
Vieux Fort	14	\$44,939.53	\$2,643.50

The costs of training per employee (Table 4-5) assume that in an atmosphere of increased security all employees will require a minimal amount of formal and informal training. This training might include initial familiarization to new rules and technology, understanding of threat and response, the participation in national or regional training sessions and practice through planned drills. The Port of Castries, St. Lucia provides three levels of training. There is a senior management capacity-building seminar and a ‘train the trainers’ course, both of which were held in Antigua. For the security personnel there is ‘operatives training’ which is held in St. Lucia three to four times a year.

The survey asked ports to separate their costs for training between one-time training to meet compliance and yearly training in future years. (Some of these figures are estimates and foreign currencies have been converted to U.S. dollars). There are three different approaches to this response (n=7). Cartagena and Vieux Fort estimate their yearly costs of training to be double their initial costs of training. Maracaibo anticipates a fifty percent increase for yearly costs of training. Gulfport anticipates yearly training to be equal in value to initial training costs. The remainder of the ports project their yearly costs to be between twenty-five and fifty percent less than their initial costs for training.

Table 4-6: Initial and Annual Training Costs

Terminal Name	Initial Training Costs	Annual Training Costs
Fort de France	\$1,636.89 *	\$12,591.47
Maracaibo	\$6,255.81	\$9,383.72
Tuxpan	\$7,663.18	\$42,850.58
Progresso	\$9,000.00	\$4,500.00
Gulfport	\$10,000.00	\$10,000.00
Vieux Fort	\$14,979.84	\$29,959.69
Cartagena	\$30,000.00	\$60,000.00

* This amount is for training the PFSO at Fort de France

4.3.4 Discussion

Increasing manpower is not generally seen to be an effective way of improving efficiency and productivity. A New York Times article reporting on a study commissioned by the New York Shipping Association states that although the ports of New York and New Jersey handled more cargo between 2000 and 2004 (an increase of 27%) the increase in number of jobs at the cargo terminals (29%) had the effect of eroding productivity gains (McGeehan, 2005).

This research shows that for the most part the increases in workforces has remained small and only in one case, (Vieux Fort) does security become a significant percentage of the workforce and the costs of training have the appearance of being burdensome. Training costs appear to be reasonable given the size of the ports.

The IMO has conducted security-related seminars globally and within the Caribbean. For the year 2004, the IMO hosted a 'Needs Assessment Seminar' in which St. Kitts and Nevis participated, a national training course for the Implementation of ISPS in St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines and Trinidad and Tobago, and a sub-regional course for Port Facility Security Officers in Nicaragua (IMO web document, 2004, pp.46-49). Costa Rica, the Dominican Republic, El Salvador,

Honduras and Guatemala attended. The train the trainer programme is funded by the IMO Global Programme on Maritime Security and participants (nominated by their government) are responsible for travel and accommodation costs (<http://www.imo.org/home.asp>).

4.3.5 Improvements

Ports were asked to indicate how much money they spent on different types of improvements. The categories of improvements are based upon the Department of Homeland Security's Transportation Security Administration categories: physical enhancements; access control; surveillance and communication. U.S. ports are familiar with these categories because they have been applying for and receiving federal grants for such improvements. The range of total costs of improvements provided by the ports surveyed was \$6,440,569 U.S., with Maracaibo spending \$59,430 U.S. and the Port of Mobile Alabama spending \$6,500,000 U.S. The average expenditure is \$1,529,861. The median expenditure is \$641,389. There is a substantial positive correlation between the size of the total terminal area of the ports and the amount spent on improvements. An increase in terminal area explains seventy seven percent of the increase in improvement costs.

Spending nearly two million dollars and more, are the two American ports and two of the smaller island ports. While it is expected to see the American ports investing in improvements, Progreso Mexico stands out from all other non-U.S. ports because its improvements match the U.S. categories. For the smaller island ports, there is a focus on improvements in identification and fencing, two areas well within their capacity and associated with ISPS rather than U.S. requirements. Some islands have invested in

surveillance: lighting and closed circuit television (which can be seen as new tools for these ports) and making fewer investments in communication systems that require up to date computer technology and continual upgrades. Cartagena, Columbia stands out because “drugs, theft and stowaways had obligated them (prior to ISPS) to install systems that control access, barriers/fencing, electronic detection systems, the hiring of security personnel and dogs specializing in the detection of substances” (survey).

Table 4-7: Improvements Costs

Terminal Name	Total Costs of Improvements	Total Terminal Area (metres²)
Mobile, Alabama	\$6,500,000.00	16187200
Vieux Fort, St. Lucia	\$2,491,448.86	50000
Gulfport, Mississippi	\$2,435,000.00	52000
Deepwater Harbour, Antigua	\$1,947,379.84	30000
Progreso, Mexico	\$955,400.00	180000
Fort de France, Martinique	\$327,378.29	230000
Kingstown, St. Vincent	\$277,391.90	Not available
Tuxpan, Mexico	\$203,822.83	4000
Port Point Lisas, Trinidad	\$101,364.30	20000
Maracaibo, Venezuela	\$59,430.23	1000

Sources: Surveys, CI Yearbook 2005 and Alabama State Port Authority

Ports were asked to provide details as to the type of communication and/or detection/inspection equipment that is lacking at their port as well as the type of equipment that was introduced. The responses to these questions underlie the split focus of port security as it applies to the cargo port and the cruise port. Walk-through metal detectors and handheld scanners are important tools at the cruise port. Many islands have acquired portable tools such as handheld metal detectors/scanners and baggage screening equipment and walk-through metal detectors that are essential to avoid delays with the passenger cruise industry. The equipment lacking in the islands relates to cargo screening devices and to high tech tools such as computers and passenger tracking computer

systems as well as vehicles dedicated to port patrol. The mainland ports indicate that they have what they need to meet compliance with minor exceptions such as the walk through metal detectors and handheld x-ray equipment for Maracaibo and explosives detection equipment for Progreso.

4.3.6 Discussion

Many Caribbean ports are extremely reliant upon the international cruise ship industry. The financial importance of the tourist industry cannot be underestimated. In order to attract vessel calls efforts must be placed upon the implementation of proper security measures for the cruise ships and their passengers. The need to duplicate security measures at cargo facilities that are not always contiguous to cruise berths poses manpower and equipment problems. Manpower and equipment must be either highly mobile or in sufficient quantity to serve all facilities during cruise ship season.

4.3.7 Port Charges

There is a wide range of responses to cost recovery of security. Ports that have begun charging fees for security include Gulfport, Fort de France, Tuxpan and Progreso. The Gulf Port Association was expected to standardize wharfage and dockage fees across all Gulf Ports to cover the additional costs of security. The dockage is a flat 5% increase with a \$2.00 increase per loaded container, a \$0.02 per ton on bulk cargo and \$0.10 per ton on break bulk cargo (Gulfport survey). In Fort de France, Martinique the Chamber of Commerce and Industry pays the port charges rather than passing them on to the shipping lines. Tuxpan charges \$120 (\$10.82 U.S.) per container handled. While Tuxpan states that they do not handle containers unless there exists a method of recovery for security,

they only handled two TEU in 2004. Progreso charges \$10 U.S. per container to the shipping lines.

Cartagena, Columbia did not have to increase costs to meet ISPS. They had previously made investments in security but had not passed on the costs to the users. Maracaibo, Venezuela stated that although they did not increase any fees they would be undertaking a study to determine whether or not they need to increase tariffs and if so by how much. In Vieux Fort and Castries, St. Lucia, there are no cargo charges for security to the shipping lines. However, Castries does recover costs from the identification badges they issue to shipping lines personnel. Castries has also instituted a departure tax to Martinique. The Port Authority at Deepwater Harbour, Antigua had proposed security charges (a head tax for cruise ships and a cargo fee) but the opposition raised by the shipping association forced them to shelve the plan. In Guadeloupe, the tonnage tax was being discussed but had not been finalized at the time of the interview. Generally, cruise lines and shipping lines have expressed their dissatisfaction with fees in small islands, and have forced the ports (government) to absorb the costs. No answers were provided by Kingstown SVG, or for Point Lisas.

4.3.8 Discussion

Many of the smaller Caribbean island ports have had to absorb security costs without applying a surcharge to recoup their expenses. Application of the code is costly and can be expected to have a long-term impact on the ports as ISPS related costs are ongoing. Compliance with ISPS incurs both capital and operating costs for ports and vessels. The problem of what to charge and who to charge new security fees to arose prior to implementation of the code and remains an issue.

Governments are unable or reluctant to pay for all the necessary security improvements with public funds (CI, 2004b; ASPA statement⁴). The public statement made by the ASPA (Alabama State Port Authority) expresses the opinion that port security in the United States goes beyond the responsibility of individual ports and is the combined responsibility of numerous federal agencies such as the Federal Bureau of Investigation (FBI), Immigration and Naturalization Service (INS), U.S. Customs Service and USCG and that the costs should be shared.

Differentiation of fees within a region is seen as a competitive tool. Brazil's ports, in September 2004, are an example of this (CI, 2004d). Different terminal operators at the port of Santos had been charging a variety of security surcharges to cover the costs of compliance. One operator was charging a \$7 U.S. per container fee on export containers only. Another was charging a percentage upon the value of the freight on board and a third operator had a \$9.88 U.S. per container fee on import and export containers. This has not been observed at the Caribbean islands visited, where it has been the port authority or government that has absorbed the costs of compliance and rarely the shipper.

Global terminal operators such as Hutchison Port Holdings (HPH) and P&O Ports have also instituted fees without divulging the costs associated with increased security (CI, 2004b; CI, 2004c). HPH fees are levied upon ocean carriers in Rotterdam and shippers elsewhere. Shippers object to the fees because they have no contract with terminal operators and the carriers object to a fee that is not transparent (CI, 2004c).

⁴ This statement was received as a response to the survey issued to the Port of Mobile, Alabama.

4.3.9 Security-related Activity – Vessel Inspections and Berthing Delays

The data on vessel inspections was for the most part outside the purview of the respondent of the survey. The survey targeted the Port Facility Security Officers. The information about vessel inspections is more likely to be held by Customs. However there were some responses. As for berthing delays, ports are naturally reluctant to divulge this information.

Point Lisas reported vessel inspections only for the year 2004 of which there were four hundred and eleven. Three ships (from Panama, Venezuela and Grenada) were found to be non-compliant. Point Lisas was the only respondent to report berthing delays. The reason given was non-compliance.

Vieux Fort, St. Lucia, and Tuxpan Mexico and Gulfport Mississippi reported that all ships arriving after July 1, 2004 were compliant and arriving from compliant ports. Progreso Mexico counted six non-compliant ships from Cuba, Panama and Cyprus and no ship arrived from a non-compliant port. Maracaibo and Cartagena also reported non-compliant ships.

4.3.10 Discussion

Immediately following the July 1, 2004 implementation date, many vessels and ports had not had their security plans formally approved (CI, 2004a). While this had the appearance of being a threat to trade, it seems that application of the code by national authorities was 'flexible' during this period such that non-compliant ships were not delayed excessively. Acquiring accurate information about delays associated with security is difficult. Ports are reluctant to divulge or publish information about berthing delays lest it divert traffic.

When ports (countries) participate in regional agreements, it becomes easier to access information regarding the number of vessels inspected and the reasons for inspection because most regional agreements openly publish this data on the Internet. Regional agreements on matters of vessel safety or security tend to be a transparent device for investigating which countries are following security procedures and which countries (or flag state administrations) are failing security audits and why.

Port State Control (PSC) is a method of inspection carried out by national governments to ensure that visiting vessels are compliant with international maritime conventions (Caribbean MOU website). One of the main goals of this type of program is to seek out substandard ships that put people's lives in danger and pose environmental risks. Port State Control is often conducted as a regional program where countries sharing common waters work together under a Memorandum of Understanding (MOU). Countries agree on the number of inspections they intend to carry out and the criteria that determine which vessels shall be inspected. Information between the countries is shared. There are two MOUs in the Caribbean region: the Viña del Mar Agreement Latin American Region and the Caribbean MOU. Neither has adopted ISPS as a convention that it enforces; however, Viña del Mar has conducted 'concentrated inspection campaigns' that have searched for ISPS deficiencies (http://200.45.69.62/index_i.htm). Regional agreements have the advantage of being transparent and available as a public source. Table 4-8 shows that of the five port states conducting inspections, three found ships with security deficiencies although none of the deficiencies required detention. It is not possible to tell what type of delays might be associated with deficiencies. We are not informed of the flag state of the vessels with security deficiencies.

The United States is a country that has incorporated ISPS into its PSC regime. When the USCG conducts inspections, it now does so on both safety and security grounds. USCG statistics are presented in a public forum, the Internet. They provide more information than Viña del Mar and the Caribbean MOU, such as which port conducted the inspection, what RSO was employed, and which flag state administrations will be targeted for greater inspections based upon past poor performances. Unfortunately, the USCG is not providing information as to the security deficiencies they find. It considers this information to be of a sensitive nature and does not provide it over the Internet. Presently SOLAS vessels arriving at the U.S. from St. Vincent and the Grenadines (as well as Russia and Cambodia) are at risk of more inspections by the USCG.

Table 4-8: Security-related deficiencies of a Concentrated Inspection Campaign

Port State	Ships with Deficiency (Security)	Number of Deficiencies	Type of Deficiency	Detentions (Security)
Argentina	4	4	1 Access Control 3 Falta RSC	NO
Brazil	0	0	-----	NO
Chile	3	4	2 Access Control 1 No Drills 1 Lack of CSR	NO
Colombia	4	5	1 Lack of ISSC 3 Lack of CSR 1 No Drills	NO
Mexico	0	0	-----	NO
Total	11	13		

Source: Latin American Agreement on Port State Control of Vessels
http://200.45.69.62/index_i.htm Campaign conducted from (11-1-2004 to 2-1-2005)

Table 4-9: United States Coast Guard Security Actions Taken in April 2006

Ship Name	Flag	Port	Action Taken	Deficiencies	Recognized Security Organization	Class	Ship Management (Owner, Operator, Manager)
ALICANTE CARRIER Refrigerated Cargo Carrier	Bahamas	Tampa, Florida	Detention 04/04/2006	The specific deficiency information is considered Sensitive Security Information (SSI) and therefore is not releasable via internet	Det Norske Veritas	Lloyd's Register of Shipping	Norbulk Shipping UK, Ltd.

Source: USCG List of ISPS/MTSA Major Control Actions April 2006
<http://www.uscg.mil/hq/g-m/pscweb/detentionSecurity.htm>

4.3.11 Correlation of Port Survey Variables

The data collected was originally distinguished as input and output variables of port production. Expenditures on training and improvements related to security are considered as port inputs, that is, necessary requirements of the production process. Manpower, and manpower increases to meet ISPS compliance are also considered port inputs. Port traffic and ship calls are measures of a port's output. Even though DEA was not possible, it is still hypothesized that a relationship exists between investments made in security (inputs) and a port's productivity (traffic outputs). The direction of the relationship seems questionable. Will investments in security increase the port's traffic or does good traffic promote better investments in security? Larger ports, with steady or growing traffic seem likely to develop a security strategy that would prevent the loss of any traffic and even attract traffic by establishing a level of excellence with regard to security. Thus, the relationship might move in both directions where traffic influences security and vice versa. Smaller ports, on the other hand, have less leverage over their traffic volumes and would see compliance with ISPS as a necessity without the

opportunity to improve traffic. Non-compliance with ISPS is a strategy for traffic reduction.

Correlations are made between a number of variables. The percent change in throughput is measured against the total costs of improvements and the total costs of training. Percent change in throughput is the difference in TEU traffic between years 2004 which is the ISPS implementation year and 2001, as a percentage of change from the base year. Correlation is also measured between the percent change in ship calls (for the same years) and the total costs of improvements and total costs of training.

A nonparametric test (Spearman’s Rho) was chosen to analyse the relationship between the variables. A parametric assumption about the population sample of responding ports was determined not to be normal. One correlation, the change in ship calls and the total costs of improvements was found to be significant at the 0.05 level. All other correlations were found to be insignificant. Table 4-10 shows the combination of variables tested for correlation.

Table 4-10: Variables tested for correlation using Spearman’s Rho

Output Variable	Input Variable	Results
Change in Ship Calls 2001-2004	Total Costs of Improvements	Rho= 0.75 *
Change in Ship Calls 2001-2004	Proportion of new employees in workforce	Rho= -1.4 **
Change in Ship Calls 2001-2004	Initial Training Costs	Rho= 0.04 **
Change in Ship Calls 2001-2004	Annual Training Costs	Rho= -0.31 **
Change in Ship Calls 2001-2004	Total Training Costs	Rho= 0.29 **
Change in TEU 2001-2004	Total Costs of Improvements	Rho= 0.41 **
Change in TEU 2001-2004	Proportion of new employees in workforce	Rho= 0.11 **
Change in TEU 2000-2004	Initial Training Costs	Rho= 0.47 **
Change in TEU 2000-2004	Annual Training Costs	Rho= 0.15 **
Change in TEU 2000-2004	Total Training Costs	Rho= 0.11 **

* Is a significant correlation

** Is not a significant correlation

4.3.12 Discussion

The statistically significant relationship between the change in a port's throughput (measured in ship calls) and expenditures made on security improvements suggests that security does play a part in the production functions of a port. A critical approach is needed when trying to understand this association between throughput and security however. Changes in throughput are also explained by many other factors. For example, Port Point Lisas has seen recent heavy investments in order to develop this port as a transshipment port. Port investments in technology and in improvements such as dredging to deepen waters to accept larger ships will influence changes in throughput. Transshipment ports move more containers and have higher TEUs than other ports because the containers are double-counted. Such is the difference between Vieux Fort and Castries, St. Lucia. Vieux Fort is the island's transshipment port (Frankel, 2002; World Bank, 2005).

Technological improvements are one way to improve productivity but not all of the improvements associated with ISPS are this type. Many improvements at the cargo ports involve fencing and lighting, which prevent unwanted access, and limit authorized access. These physical improvements have had a great impact upon decreasing local theft. Many cargo ports are using closed circuit television for monitoring their sites, which is not a recent type of technology. Cruise ports are more likely to have higher technology, in the form of portable scanners and detectors.

For the most part, these results show that spending on compliance with ISPS has not had a significant effect upon a port's throughput. Many of these ports are not big traffic generators and the general stability of traffic numbers while complying with new security

regulations demonstrates that if there are impacts to compliance they are not being observed at the traffic level. The implementation of increased security incurs great costs for infrastructure, technology and manpower and although these factors can be considered like factors of production, they are less directly related to port outputs than expected. On the contrary, non-compliance or over-compliance (the inspection of every container) could be expected to have a more significant impact on port throughput than compliance has. Haiti is an example of an island nation with many non-compliant ports. Although a lack of data makes it impossible to verify, it may be assumed that participation in global trade must be extremely limited at the present time.

4.4 Shipping Line Survey Results

4.4.1 Port Factors influencing Shipping Line Satisfaction

Tongzon (2002) identified factors that may influence a port user's choice of ports. They were: efficiency, shipping frequency, adequate infrastructure, location, port charges, quick response to port users' needs and reputation for cargo damage. Most of these factors were used in this study. However, *shipping frequency* was replaced with the category *cargo volume* and the factor *security* was added.

Shipping lines were asked to rank these factors in order of importance. Of the three responses returned by e-mail or fax, it was noted that the factors were not ranked clearly one to eight. The received information was discarded and a decision was made when interviewing the shipping lines to have them discuss the factors with reference to the local port. For the purpose of the interview, the factor *location* was considered

redundant and was excluded. An additional factor *congestion* was included. Table 4-11 identifies the shipping lines interviewed and the port they refer to in their interview.

Table 4-11: Shipping Lines Responses

Company	Shipping Line Represented	Port
Anthony Veder	Hapag Lloyd	Aruba
Intermarine LLC		New Orleans
Dole Ocean Cargo Express		San José, Costa Rica
CAGEMA*		Castries, St. Lucia
Minville & Chastenet*	P&O Nedlloyd	Castries, St. Lucia
Maersk**		Jarry, Guadeloupe
Marfret*		Jarry, Guadeloupe
CMA CGM*		Jarry, Guadeloupe
Booth Steam Ship*	Crowley	Bridgetown, Barbados
International Cargo Systems*	ZIM	Bridgetown, Barbados
Goddards*	Tropical	Bridgetown, Barbados
Dacosta Mannings*	Hamburg Sud, P&O, Bernuth, NYK	Bridgetown, Barbados
<ul style="list-style-type: none"> • One interview in Guadeloupe was given in confidence • * Interview was conducted in person • ** Telephone interview 		

4.4.1.1 Congestion

In the islands, priority is given to cruise ships over regular cargo ships. The cruise season is mid October to mid April and has an impact on all the ports visited with the exception of Jarry, Guadeloupe. Cruise ships can force cargo ships to wait until after 16:00h when the cruise ships depart to dock. In this way the cargo ships may have to pay overtime rates to the dockers. Minville & Chastenet report that the banana boat, as well as cruise ships takes priority in St. Lucia. Cruise ships moving through the mouth of the bay at the Port of Castries even have the ability to delay landing and take-off at the Castries airport because of airport security precautions. CAGEMA stated that congestion at the Port of Castries is not a problem because the number of vessels had actually diminished due to company amalgamations. Booth Steamship in Barbados said that when

the cruise ships are in port they often re-route their services to call at Bridgetown at a different time.

4.4.1.2 Security

In Castries, St. Lucia, CAGEMA said that the level of strictness had improved due to security. The Minville & Chastenet agent remarked that prior to ISPS identification badges had been used at the port but access to the docks was less restricted. After ISPS, access decreased and a police check became a requirement prior to being issued a port pass. Presently, everyone who has a port pass must have watched a 15-minute security awareness video.

In Bridgetown, security at the port was very important to the shipping agent Booth Steamship because the U.S. rules consider the ship's last ten ports of call. The Zim representative felt that the restrictions to access (such as fencing and separation of parking from the docking areas) has been an improvement for the port and has helped the port to function better. It was also felt in Bridgetown that the port had been improving prior to the deadline of July 2004. Dacosta Mannings felt that some functions were harder to accomplish due to stricter rules. Goddards felt that the security at Bridgetown was very good especially in comparison to neighbouring islands and that the port had a good reputation in this respect.

At Jarry, Guadeloupe it was noted that there is always a problem with stowaways (from Dominica and Haiti). This is something that ISPS should have limited if it is diligently respected by these countries, however Haiti's ports are still showing non-compliant status (Table 4-3). One agent ironically noted that it was harder for him to board ships but apparently just as easy for stowaways. It was also noted that the approach

by sea has not received due diligence and still presents a security risk for this port. While improved security has been able to physically restrict access to docks and ships, fishing boats and small pleasure craft seem to be one method of breaching port security from the surrounding water routes.

4.4.1.3 Efficiency

With the exception of Jarry, which CMA CGM did not feel was working at full capacity and a complaint about frequent equipment breakdowns in Castries, most shipping lines felt their ports' efficiency was satisfactory but that there is always room for improvement. Port efficiency will always be reduced when cargo berths must be shared with cruise ships during the tourist season.

Castries, St. Lucia and Bridgetown Barbados had won the Caribbean Shipping Association Port of the Year Award. CAGEMA felt that the turnaround time is very quick in Castries. Booth Steamship said that there was a temporary problem at Bridgetown that is impacting on efficiency because of the introduction of a DOS based computer program brought in by Customs.

4.4.1.4 Port Charges

Port charges are generally levied on a cargo basis or on a ship basis. Ship charges include port navigation fees, berthage, berth hire, harbour dues and tonnage fees while cargo charges cover stevedoring or terminal handling fees (Tongzon, 2002). Shippers can also be responsible for moorage, electricity, water and garbage fees (ibid). Shippers are highly sensitive to increases in port charges. A great deal of uncertainty was expressed over the possibility of Jarry raising their port charges. No decision seemed to have been

taken at the time of interview and all agents expressed different levels of information as to whether or not the port would raise fees.

Knowing that port charges have an impact on traffic, the CMA CGM representative stated that the port of Jarry had conducted a study on charges and found that they are the least expensive port of their type and that they are “plus fiable et moins cher pour le transbordement” (CMA CGM interview).

4.4.1.5 Satisfaction with Port Services

All three surveys returned indicated that their satisfaction with port services remained unchanged due to either ISPS or U.S. security initiatives. The greatest changes noted by the shipping agents interviewed were the impacts that security had on access to the ports (ISPS) and on documentation (U.S. and customs). The ISPS code calls for controlled access to the port facility, the monitoring of the facility including anchoring, berthing and restricted areas as well as the supervision of cargo handling (IMO, 2003, Part A, section 14). Changes to security have had the effect of improving the flow of documentation and the manner of its transmission.

4.4.1.5.1 Access

Reduced access has been accomplished through the issuance of port passes; the delimitation of perimeters with fencing and in some cases (St. Lucia) the assignment of a port agent to the shipping lines. Passes are linked to the computer system for better control. Tighter background checks are being conducted on port personnel. Pilferage of shipments has been reduced through reduced access and greater surveillance, which pleases the shipping agents. One ship agent (confidential interview) in Guadeloupe felt that the port had become less efficient with ISPS compliance. This agent argued that the

greater restrictions (to access) made his work harder to do and that the U.S. and international measures would have the effect of increasing shipping costs worldwide. Increased shipping costs would reduce imports to the U.S. which was something he believed the U.S. wanted. This was an opinion not shared by other respondents.

4.4.1.5.2 Documentation

Exporters in Barbados had been able to meet the U.S. deadlines required for the 24-hour rule (Booth Steamship Interview). Other agents in Barbados stated that the port had taken a proactive approach to security prior to the ISPS deadline and this meant that the deadline of July 2004 was more easily achieved for all interested parties (Goddards interview). The Dacosta Mannings interview brought to light the expenses related to incorrect document filing for customs. Customs at Bridgetown Barbados had charged \$10 U.S. for amending the manifest but this had now risen to \$100 U.S. and the port authority is also charging for corrections that require re-filing of manifests. Another local problem with documentation was the new computer program for Customs data.

4.4.1.6 Discussion

Port efficiency is compromised and port congestion is increased when cargo ports in this region must share berth space with cruise ships. The pre-empting of cargo space and functions has secondary impacts on security that have a greater effect on port business than shipping line business. (These impacts were discussed earlier in reference to the port survey results).

4.4.2 Security-related Changes

4.4.2.1 Schedule and Route Changes

All but one of the agents interviewed and surveyed stated that it had not been necessary to remove ports from routes. The representative from CMA CGM in Guadeloupe stated that the pressure to comply with the U.S. rules has made liaising with U.S. ports more difficult and weighed in the decision to eliminate ports. This decision coincides with the amount of containers generated at these ports. CMA CGM noted that Puerto Rico had been temporarily eliminated from its routes (for approximately six to eight months) and that some routings were changed (U.S. Virgin Islands) in order provide the required advance notice. The trading patterns of the French West Indies are different from the other Caribbean nations. Exports are largely aimed at the European market (Port interview Guadeloupe). Cruise ships, however, have routings quite unlike cargo ships.

The Goddards agent in Bridgetown Barbados stated that close intra-Caribbean traffic had not been taken into account when the 24-hour rule was developed. Short sailing times in the region mean that notification between the islands does not adhere to this rule although it is strictly observed when the U.S. is on the route. Booth Steamship stated that security was of great importance to them because the U.S. rules consider the ten previous ports of call.

The representative for Anthony Veder stated that both schedule and route changes were permanently made on their New Caribbean Services Route in January 2004 (Veder survey). The BRS Alphaliner website states that the change made on this service was the

replacement of Rio Haina with Caucedo in December 2003. Caucedo is the new privately owned DP World Terminals transshipment hub in the Dominican Republic.

“In a move that has horrified the shipping industry in the Dominican Republic (DR), the president has approved 100% inspection on all export and import containers, including empties. This has already been implemented in some areas, and will be deployed more widely as screening machines arrive. Import consignees and DR exporters have to pay U.S.\$95 for each container to be screened. A shipping agent in the DR said that the export market was very competitive, so any cost would have adverse effects on the DR's economy - which is already weakened. Importers will also have to pay more. Carriers are also affected, as each empty container will be screened at a cost of \$14. However, once the dray to the machine is factored in, one agent estimated that the actual fee paid by the carrier could be between \$30 and \$40 per box.”

(CI-Online, December 1, 2003)

What is not known is whether the switch to a privately run port would reduce costs associated with inspection. Rio Haina was also described as a problem port by the CMA CGM representative who noted that the inspection on one container of t-shirts from Pakistan requiring 70 shiftings.

4.4.2.2 Delays to berthing and Increased Vessel Inspections

Dole Ocean Cargo Express is the only company to have experienced delays to berthing due to security (n=13). Five of the thirteen companies who responded said that they had experienced increased vessel inspections due to security. One company qualified

this response saying that the increased inspections occurred at the beginning of the implementation of the new rules and tapered off.

4.4.2.3 Discussion

Very few permanent changes occurred and shipping lines have generally responded well to the changes of increased security at their local ports. Problems experienced at the onset of implementation seemed to be worked out quickly by all parties (governments, ports and the shipping lines). A return to normal activity after initial adjustments indicates that changes have been incorporated into operating procedures.

4.4.3 Security-related Fees

4.4.3.1 Shipping line security fees

Most of the shipping lines interviewed were in fact agents for the larger lines. As such, the agents are not charging fees to the clients but the larger lines do charge. Maersk, CAGEMA, and Hapag-Lloyd have a \$6U.S. per container fee, while CMA CGM has a 5-euro per container fee. Dole Ocean Cargo has an average fee of \$106 Costa Rican colones per forty-foot container. (This is approximately 20 cents U.S.). P&O Nedlloyd (which is represented by Minville & Chastenet) charges \$6U.S. per container (UNCTAD, 2005). Intermarine state they have a surcharge per ton on break-bulk cargo and a per unit charge on containers without stating what the exact fees are.

4.4.3.2 Port Security Fees

Fort de France, Martinique is not charging fees relating to security (Marfret interview) and neither are the ports in Aruba (Veder survey). International Cargo Systems stated that Bridgetown Port would not be recovering security costs through a fee. The PFSO at Castries, St. Lucia stated that recovery of costs was occurring. For example, ship agents were required to pay for their port passes. The representative from Dole Ocean Cargo states that the fees at ports have risen incrementally without separating the security costs. French mainland ports can range from eight to nine point four Euros per container (www.hapag-lloyd.com). At the time of interview, the Port of Jarry stated that a new fee on tonnage would be instituted, this is corroborated by CMA CGM who has an employee sitting on the port's board of directors, but it was not common knowledge.

4.4.3.3 Discussion

As stated in an earlier section, the problem of who to charge for security and how much continued to be a problem one year after implementation of ISPS. Ports and ships have real costs of compliance (from conducting the risk assessment analysis to following through on implementing training and physical improvements). Shippers have had to make changes to their operating procedures (such as the manner in which they document cargo and transmit it as well as they way they interface with ships at port). Shippers are sensitive to increased security fees from the ocean liners and the ports.

Improving and increasing security has direct measurable and indirect impacts upon the port community. Physical improvements such as fencing, lighting and video monitoring have had the effect of changing access to port areas and vessels. It also has

the effect of controlling movement within the port areas thereby allowing better management of people and activities. While serving as deterrents to terrorism, we see that the local effect is to curb pilferage and to prevent unwanted persons in restricted areas. The training of port personnel to recognize risks and threats improves local capacity. Incorporating new technology into standard business practice puts small ports on equal footing with neighbouring larger ports. The positive impacts associated with heightened security were not the expected results of this research.

Chapter 5 Conclusion

The adoption and implementation of the ISPS Code has been difficult and expensive for ports and shipping lines. The short time between the creation of the code in December 2002 and its implementation on July 1, 2004 as well as the financial burden of the code questioned the capacity of the world's largest and smallest ports to conform.

The purpose of this research was to demonstrate that security is a factor of port productivity, meaning that changes to security will have a measurable impact on a port's productivity and efficiency. Furthermore, it was expected that the least developed countries of the Caribbean basin would demonstrate a inverse relationship between security and productivity. An inverse relationship was hypothesized because security is equated with high costs and high costs generally represent a less efficient system.

This research has been unable to quantify security as an element of port productivity. Had the data been available and consistent across all responding ports, DEA would have been used to measure relative port productivity within the region. Unfortunately this was not the case, as responses were too variable and inconsistent to be submitted to a DEA analysis.

However, on-site interviews with shipping lines and port authorities and returned surveys have demonstrated the following four general findings about increased security in this region. First, security has been implemented such that: physical improvements have been made, personnel have been hired and trained and procedures such as access and documentation have been changed. Second, security is generally regarded to have improved port productivity and often in ways that this research had not set out to measure (i.e. the incidence of theft). Third, the cost of adopting and implementing security has not

translated into detectable deficits (as defined by this research) in changes to ship calls and TEU for the port. Port traffic generally has been stable throughout the period studied. Finally, security has been taken very seriously by all parties and it is considered by most respondents to have an effect upon port productivity. Most respondents felt that port productivity was improved by increases in security.

The research hypothesis holds true, security is a factor of port productivity. The secondary hypothesis is false. Security and port productivity are not in an inverse relationship. Alternately, they demonstrate a positive relationship. The region analysed, with so many nations of a 'developing' or 'least developed' status have for the most part been able to adopt and implement costly security initiatives without decreases in productivity.

The role that Customs plays is very important and under-researched in terms of efficiency. This area of research might provide more answers as to the number of inspections conducted at ports, and the way in which Customs has adopted new technology and procedures to conform to security requirements. Customs, unlike port authorities are the body with the information as to contents of shipments and this places Customs in the position of ensuring the integrity of the contents. Port management, on the other hand, often take the approach that they are strictly in the business of assuring the integrity of the goods moving from one mode to another as well as ensuring that the facilities meet acceptable standards.

One of the greatest challenges for small islands is the imbalance created by the local reliance on cruise ship revenue and the access to these same ports to meet regional import and export needs. It is common to see ports in the islands offering cargo berths to

cruise ships in high tourist season. Normally, risk analysis for the two different types of ports would produce different results and different needs in terms of manpower, training, physical improvements and equipment. Many island ports however are in the position where they must apply cruise ship standards of security in their cargo ports.

The investments necessary to become ISPS compliant are just one type of port expenditure. The large ports that function in a more competitive environment must also make investments in infrastructure for improvements, dredging to maintain the ever-larger ships in order to keep and improve their positions. Many ports face huge expenditures after hurricane season to rebuild. Many different expenditures, of which security is only one type, help to explain port throughput.

In conclusion, while security has been and continues to be an ongoing expense, its implementation has been successful in the Caribbean region and it has even been shown to improve local port productivity.

Appendix A: Survey for Port Authorities and Operators

A	<i>Section A: Port Identification</i>
	UNCTAD Code:
	Terminal Name:
	Address:
	City:
	Province:
	Country:
	Zip/Postal Code:
	Telephone:
	Fax:
	Email:
	Name of Contact:
	Port Authority:
B	<i>Section B: Security Information</i>
1	Date of compliance with ISPS code:
2	Is the United States a destination for cargo originating at this port? YES NO
3a	Did this port/facility contract a recognized security organization (RSO) to complete a port facility security assessment? YES NO
3b	Name of RSO
3c	Costs of hiring a RSO (Onetime)
3d	Does this port/facility maintain a RSO for ongoing security-related work? YES NO
3e	Costs of RSO (Annual)
4a	Has the port/facility increased manpower related to security improvements? YES NO
4b1	If Yes, what is the net number of workers added?
4b2	What is the total number of workers at the port/facility?
5a	What were the costs of training in order to meet compliance of ISPS code? (Onetime)
5b	What are the expected ongoing costs related to training? (Yearly)

6a	What are the cost and type of improvements the port/facility has required?		
		Capital Cost (Initial + Anticipated)	Operating Cost (Yearly, Non-labour)
	Access Control:		
	Identification systems		
	Access Gates		
	Physical Enhancements:		
	Physical Barriers		
	Fencing		
	Screening/Detection Equipment		
	Surveillance:		
	Cameras		
	Closed Circuit Television		
	Lighting		
	Communications:		
	Communications System		
	Command and Control		
	Computer System		
6b	What communication and/or detection/inspection equipment is lacking?		
6c	What communication and detection/inspection equipment has been introduced?		
7	What are the port charges related to security? Who is charged?		
C	<i>Section C: Security-related Activity</i>		
1	Number of Vessel Inspections	2000	
		2001	
		2002	
		2003	
		2004	
2a	Number of non-compliant ships that have arrived since July 1, 2004: What is the flag state of these ships?		
2b	Number of compliant ships arriving from non-compliant ports: Which port?		
3a	Average delays to berthing for non-compliant vessels (in hours)		
		July 2004	
	As compared to berthing delays in previous years:	July 2003	
		July 2002	
		July 2001	
		July 2000	

3b	Reasons for berthing delays as of July 2004:			
	Cargo documentation problems		YES	NO
	Ship lacks proper documentation/certification		YES	NO
	Ship is arriving from a non-compliant/or a port with elevated security		YES	NO
	Information transmission difficulties		YES	NO
	Other reasons, please describe:			
<i>D Section D: Traffic Information</i>				
1a	Cargo Breakdown	Container	2000	TEU
		General Cargo	2000	tons
		Bulk Cargo	2000	tons
		Total Cargo	2000	tons
1b	Cargo Breakdown	Container	2001	TEU
		General Cargo	2001	tons
		Bulk Cargo	2001	tons
		Total Cargo	2001	tons
1c	Cargo Breakdown	Container	2002	TEU
		General Cargo	2002	tons
		Bulk Cargo	2002	tons
		Total Cargo	2002	tons
1d	Cargo Breakdown	Container	2003	TEU
		General Cargo	2003	tons
		Bulk Cargo	2003	tons
		Total Cargo	2003	tons
1e	Cargo Breakdown	Container- Estimate	2004	TEU
		General Cargo- Estimate	2004	tons
		Bulk Cargo- Estimate	2004	tons
		Total Cargo- Estimate	2004	tons
2a	Ship Calls	2000		
2b	Ship Calls	2001		
2c	Ship Calls	2002		
2d	Ship Calls	2003		
2e	Ship Calls	Estimate 2004		
Yes, I would like to receive a copy of the results when the research is completed.				

Appendix B: Survey for Shipping Lines

A Section A: Company Profile

Company Name:
Address:
City:
Province:
Country:
Zip/Postal Code:
Telephone:
Fax:
Email:
Name of Contact:

B Section B: Information about Ports

1 Please rank the Following Factors when Choosing a Port in the Caribbean:
[1-8, 1 being the most important and 8 being the least important

- Location
- Reputation for Cargo Damage
- Security
- Efficiency
- Port Charges
- Cargo Volume
- Adequate Infrastructure
- Quick response to your needs

2 Has your satisfaction with ports services (in the Caribbean) changed since the implementation of ISPS code, July 1, 2004?

- Increased
- Unchanged
- Decreased

3 Has your satisfaction with ports services (in the Caribbean) changed since the implementation of US security initiatives?

- Increased
- Unchanged
- Decreased

C *Section C: Security-related Changes*

1 Have recent changes (such as the ISPS code or any of the US initiatives) caused your company to remove ports from routings in the Caribbean?
If yes, please list the ports you are no longer serving: _____

2 Have recent changes (such as the ISPS code or any of the US initiatives) caused your company to change:

Schedules in the Caribbean Basin? Yes ___ No ___
i) Is this a permanent change? Yes ___ No ___
(if yes please list the changes on the adjoining page)
ii) If temporary, what was the start date of the change?
iii) If temporary, what is the expected stop date of the change?

3 Have recent changes (such as the ISPS code or any of the US initiatives) caused your company to change:

Routes in the Caribbean Basin? Yes ___ No ___
i) Is this a permanent change? Yes ___ No ___
(if yes please list the changes on the adjoining page)
ii) If temporary, what was the start date of the change?
iii) If temporary, what is the expected stop date of the change?

D *Section D: Security-related Costs or Charges*

1 What is the range of security-related port fees your company has been charged by the ports?
Lowest Fee _____ Please indicate the currency and the port
Highest Fee _____ Please indicate the currency and the port

2 Which ports are not charging fees?

3 What are the security fees that you charge your clients?

4 Have your vessels or cargo been affected by:
Increased vessel inspections due to security? Yes ___ No ___
Delays to berthing due to security? Yes ___ No ___

Yes, I would like to receive a copy of the results when the research is completed.

Appendix C: List of Abbreviations

AAPA	American Association of Port Authorities
ASPA	Alabama State Port Authority
CI	Containerisation International (online, magazine or yearbook)
CIA	Central Intelligence Agency
CSI	Container Security Initiative
C-TPAT	Customs Trade Partnership against Terrorism
DEA	Data Envelopment Analysis
DMU	Decision-Making Unit
ECLAC	Economic Commission for Latin America and the Caribbean
FBI	Federal Bureau of Investigation
GDP	Gross Domestic Product
HPH	Hutchison Port Holdings
ILO	International Labour Organization
IMO	International Maritime Organization
INS	Immigration and Naturalization Service
ISPS	International Ship and Port Facility Security (Code)
LDC	Least Developed Country
MOU	Memorandum of Understanding
MTSA	Maritime Transportation Security Act
OECD	Organization for Economic Co-operation and Development
PCA	Principal Component Analysis

PFSO	Port Facility Security Officer
PSC	Port State Control
RSO	Recognized Security Organization
SIDS	Small Island Developing States
SOLAS	Safety of Life at Sea
TEU	Twenty-foot Equivalent Unit
TSA	Transportation Security Administration (Department of Homeland Security)
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
US	United States
USCG	United States Coast Guard
WCO	World Customs Organisation

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