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Computer assisted economic modelling for establishing value based tariffs.

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COMPUTER ASSISTED ECONOMIC MODELING FOR ESTABLISHING VALUE BASED TARIFFS

By

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In

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DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

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ABSTRACT

Title of Dissertation: **Computer Assisted Economic Modeling For Establishing Value-Based Tariffs.**

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This dissertation examines the topic of port pricing and in particular develops and proposes a computer based model to assist ports wishing to adopt a value based wharfage tariff for cargoes transported in containers and as break-bulk.

The proliferation of various types of ownership of ports around the world means that numerous and varied approaches are taken to address the issue of pricing for the services and facilities provided in ports. As a consequence, UNCTAD has proposed an approach called the Cost-Performance-Value approach which seeks to enable ports to accurately develop tariffs for their various facilities and services irrespective of the overall type of ownership of the port.

By focusing on the value aspect of this approach, the analysis conducted within this dissertation differentiates and identifies the value afforded to consignees of cargo transported in containers and in so doing develops a computer based model that gives a range within which a port may establish the wharfage tariff for the type of cargo trade. The CIF value of the cargoes is used as a proxy or measurement of the level of value afforded to individual users of the port. The lower end of the range allows ports to recover the annual depreciation expense of the berths whilst the upper end allows for a maximization of revenues.

In analyzing and developing the computer model, statistics and data collected from the Saint Lucia Air and Sea Ports Authority which operates Port Castries in the island of St. Lucia, located in the Eastern Caribbean, is used.

KEYWORDS: Port pricing, Value-based tariff, Cost-Performance-Value Strategy (CPV), Wharfage, Tariff.

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LIST OF ABBREVIATIONS

CIF	Cost Insurance Freight
CPV	Cost-Performance-Value Strategy
EC	Eastern Caribbean
ECD	Eastern Caribbean Dollars
FCL	Full Container Load
FLT	Forklift Truck
GDP	Gross Domestic Product
GNP	Gross National Product
GRT	Gross Registered Tonnage
ISO	International Organisation for Standardization
LCL	Less than Container Load
LOA	Length Overall
MSOC	Marginal Social Opportunity Cost
SLASPA	Saint Lucia Air and Sea Ports Authority
SLMTL	Saint Lucia Marine Terminals Limited
TEU	Twenty Foot Equivalent Unit
UNCTAD	United Nations Conference on Trade and Development
USD	United States Dollars

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INTRODUCTION

1.1 The Concept Of Logistics And Supply Chain Management

In recent times the advent of Globalisation has had a profound impact on all aspects of trade and transportation. Goods are no longer necessarily produced in one place but instead may consist of many individually manufactured components from various parts of the globe. Consequently, manufacturers are now increasingly utilizing the concept of Logistics Management to better manage the global scope of their businesses. As defined by the Council of Logistics Management, *logistics management* is

> *the process of planning, implementing and controlling, the efficient, effective flow and storage of goods, services, and related information from point of origin to point of consumption for the purpose of conforming to customer requirements. (Lambert, Stock & Ellram 1998,3)*

Rather then viewing the manufacturing process as comprising separate and distinct components, modern managers must now take heed of what is termed the supply chain. This chain follows closely the definition of logistics management described above, the aim of which is to provide the customer with value.

As stated by Bergmann & Rawlings (1998), transport is a critical component of supply chain management since it creates value by providing time and place utility, ensuring that products are available when and where requested by customers. This means that transport within the supply chain encompasses all modes of sea, air and land transportation systems. Consequently, integration of transport into the supply chain management allows managers to focus and make decisions on total supply chain costs rather than on incremental cost movements for individual functional areas. (Bergmann & Rawlings 1998).

1.2 Role Of Ports Within The Supply And Transport Chain

Given the shift in focus to that of an integrated supply chain, ports now represent critical nodal points within that chain since the bulk of world trade is transported via the sea. The importance of ports within the supply chain can easily be illustrated if one understands that a minimum of two ports is required for the effective operation of a sea transport activity. Consequently, high levels of inefficiency or exorbitant port tariffs can impact negatively on the various supply chains both in terms of actual cost and time. Alternatively, efficient and fairly priced ports can improve the supply chain.

In recent times, faced with increased competition from other ports and forms of transportation, ports have responded by attempting to provide added value to their customers. In adopting such strategies, ports (knowingly or unknowingly) have further integrated themselves into the transport and supply chains. No longer are ports simply nodes for the exchange of cargo from ships to other forms of transport. Instead they play an increasing role of processing/refining cargo within the port compounds prior to onward delivery. Additionally, ports provide logistical solutions by acting as major distribution centres for multinational companies serving varied regions. A classic example of this can be seen at the Port of Copenhagen, which acts as a major regional distribution centre for both UNICEF and Sony Co. Numerous other examples abound around the world.

Whilst ports have been slow to view themselves as part of the supply chain they nevertheless have made significant strides towards reduction of delays and the improvement of port operating systems. Increasing levels of competition amongst ports coupled with technological advancements in shipping have in part caused these changes and have resulted in increasing the value added to the port users. Aside from the improvements in technology and port operating systems, ports have begun to take a closer look at their pricing systems and its impact on the supply chain.

1.3 Port Pricing

In seeking to provide services to its varied users ports incur costs that have to be recovered in one form or another. However, the issue of its recovery is one that has produced much debate over the years because of the varied forms of ownership of ports around the world. Based on the various forms of ownership, the services provided by the ports have been viewed at one extreme, as serving the general public economic interest whose costs should be paid through taxation and at the other extreme as a purely commercial venture which needs to recover its costs from the users of its services and facilities (Strandenes & Marlow 2000). An overview of this debate will be provided in chapter 2.

Emanating from this debate and with the increasing trend towards commercially oriented ports, agencies such as UNCTAD have attempted to provide ports with a method of cost recovery and pricing strategy suitable to varied forms of port ownership. First proposed in 1975, UNCTAD advised ports to develop tariffs for their services based on three elements: a) costs, to recover expenses incurred by the port in providing services and facilities; b) utilization, to promote the better use of port assets; and c) prices structured on what the traffic can bear (UNCTAD 1995). This approach is known as the Cost-Performance-Value approach. They argued that use of this approach would not only allow for adequate recovery of the costs incurred in the delivery of the port services but at the same time allow ports to use pricing as a main tool to achieve their operational, financial and marketing objectives.

1.3.1 Cost-Performance-Value Strategy

The cost-performance-value strategy uses a mix of strategies to ensure that each individual tariff price is suitable to their respective market condition and in keeping with the individual objectives of the port organisation. Utilization of this strategy ensures that the appropriate pricing strategy is adopted for each tariff item. In addition the CPV pricing strategy attempts to provide the port and its users with the best value within the transport chain. A detailed breakdown of the value chain of a

port is provided in Appendix A. Each component of the strategy is tailored to suit the individual objectives of the port body as described in the chart below:

Pricing Strategy	Objectives
Cost	• Revenues sufficient to maintain the quality of service • Revenues to fund new business activities • Prices to reflect costs and provide cost mechanism
Performance	• Prices high enough to encourage efficient use of service
Value	• Prices low enough to compete for new cargoes • Prices not so high as to discourage growth of captive cargoes • Prices high enough to capture profit from those who benefit most from port services

Adapted from UNCTAD. (April 1999).

1.4 Problem Identification

Whilst Ports readily adapt the cost and performance components of the CPV pricing strategy, the value-based component presents a unique challenge. As proposed by UNCTAD the value-based pricing strategy can be applied to differentiated cargoes through broad definitions such as general cargo including break-bulk and containerised cargo, dry and liquid bulk cargoes. However, the substitution effect as evidenced by global movements away from trade in break-bulk cargo for containerised cargo will cause a rethinking of the value-based component of the CPV pricing strategy as it is applied to cargo.

Ports facing this situation (i.e substitution effect) may no longer be able to determine the differences in the value of benefits accruing to customers of break bulk cargo as opposed to containerised cargo. As the substitution effect becomes more acute, the

very premise of the value-based tariff will be eroded since original break bulk cargo would now all be transported as LCL containers. In this situation, ports are seeking to implement a value based tariff system for cargo dues / wharfage would need to differentiate those cargo owners who stand to benefit the most from the use of the port services. However, since the port's break bulk cargo traffic has been converted to containerised cargo, the imposition of a fixed charge (cargo dues / wharfage) to all containers handled, regardless of the type and value of the cargo contained therein, means that the charge levied represents a higher proportion of the lower valued cargoes as compared with the higher valued cargoes. For example, a fixed wharfage charge of $100/box levied against one box loaded with computers valued at $500,000 and another loaded with textiles valued at $100,000 results in the following. The wharfage on the box with the computers represents only 0.02% of the value of the computers whereas it amounts to 0.1% of the value of the textiles. The incidence of the wharfage applied in this manner thus distorts the true value of the respective cargoes transported in the containers. Therefore, the new challenge to ports is to apply value-based tariffs (e.g. cargo dues/wharfage) to cargoes transported in containers perhaps based upon the differentiation and value of the actual items transported. This would ensure that port pricing is in keeping with the cost structure of the relevant supply chains thereby meeting the strategic objective of the port itself.

1.5 Objective

The main aim of this thesis is to assess the efficacy of a computer based model (using appropriate computer software) that will assist ports wishing to utilize a market driven pricing strategy in the establishment of value-based tariffs for cargoes transported in containers and as break bulk. In seeking to address the above this thesis will: -

1. Explore the efficacy of applying value-based tariffs for differentiated cargoes transported in containers. Such differentiation to be based upon value.

2. Explore the efficacy of applying value-based tariffs for break bulk cargoes based upon their respective values.

Such a model, when provided with the required inputs will propose an upper and lower limit within which the tariff may be set.

1.6 Significance Of Research

The rapid spread of globalisation and supply chain management continues to place increased pressure on port administrators to abolish traditional port management methods in favour of modern business practices. Consequently, port pricing plays an important role since it has the ability to adversely affect the supply chain and in so doing the value afforded to the end customers. As containerisation continues to replace break-bulk cargo transport, port administrators will be hard pressed to adopt modern pricing policies, such as value-based strategies, that will augment rather than distort the relevant value chains within the supply chain. Port administrators will therefore be provided with an alternative method for the application of value based pricing strategies on cargo transported in containers and break-bulk cargo.

1.7 Methodology

Statistics and data gathered from the Saint Lucia Air and Sea Ports Authority (SLASPA), which owns and operates the Port of Castries situated on the island of Saint Lucia in the West Indies, was utilised in seeking to explore the efficacy of a computer based model for the establishment of a value-based tariff.

The data provided by SLASPA includes types of vessels calling at the port, types and values of cargo handled at the port and the current tariff rates applied for the port's resources and services. Ancillary data obtained from the Saint Lucia Central Statistics Office and the Customs Department helped to augment that received from SLASPA.

Microsoft Excel (a spreadsheet computer software) was used for research and development of the proposed model.

1.8 Limitations Of The Research

- Difficulty in obtaining all pertinent information regarding CIF values for cargoes imported/exported through Port Castries from the Customs Department or SLASPA
- Lack of verifiable information to accurately define and calculate elasticities for cargo transported through Port Castries

2

OVERVIEW OF PORT PRICING

2.1 Background

The various approaches to the issue of port pricing have been greatly influenced by the differing types of ownership of the ports themselves. As mentioned in the introductory chapter, the ownership of ports vacillates between State (local or regional government) owned to that of a private commercial enterprise. Within these two extremes ownership of ports around the world take on varied forms and combinations, which then impact on the approaches taken to port pricing. This occurs because each type of ownership would have its own objective. For instance, a state owned port might seek to advance the economic interests of the country at the expense of any financial goal. Thus the port would not seek to recover all of its costs from the users of its services. Rather, its operation would be financed through taxation that would then be received as a direct subsidy from the government. At the other end of the spectrum is a privately owned port whose main objective would be that of profit maximization. Consequently, the users of its services would be made to cover all costs plus an added premium (Strandenes & Marlow 2000).

Whilst it can be said that all ports have differing goals and objectives, Bennathan and Walters (1979) suggested that ports share the same motivation for all of their pricing policies and investment decisions i.e. promotion of the national interest. However, they further suggested that there are two basic underlying principles namely the (continental) European and the Anglo-Saxon doctrines. Under the European doctrine the port is viewed as part of the social infrastructure and as such its contribution is viewed in the context of the regional development rather than profitability. Conversely, ports operating under the Anglo-Saxon doctrine must generate a profit

or at least be able to stand on their own. Nevertheless, it is generally agreed that common to all these approaches is the use of economic techniques and principles to solve the question of port pricing

2.2 Traditional Cost Based Approach

Prior to the 1970's most ports practised some form of traditional cost based pricing wherein a financial approach to pricing was utilized. This practise is continued in some measure to the present day. Under this approach to pricing, tariffs are usually set at levels that seek to recover fixed and variable costs while providing an adequate return on investment and working capital employed (Frankel, E.G. 1987). Consequently, average cost is most often used in the determination of the tariff levels. However, as stipulated by Frankel (1987), use of this approach is extremely complex since pricing generally determines the level of demand and in doing so affects the long-run cost and the level of return.

2.3 Economic Approach To Pricing

During the 1970's developments in the area of port pricing attempted to change the traditional approach of using purely accounting costs (fixed and variable costs) to establish port tariffs. Using economic theory, it was argued that prices should be developed on the amount of resources used in providing that particular service rather than on what the service produced. Essentially, the marginal cost should be used as the base rather than average costs. Jansson and Ryden (1979) proposed a two-part tariff scheme based upon the usage of marginal costs. They proposed a charge to be levied per tonne on cargo differentiated with respect to its elasticity of demand and another charge to be levied on the carrier to reflect the opportunity cost of using the facility.[1]

[1] As discussed in Strandenes and Marlow (2000) Pg.318

Departing slightly from this approach, writers such as Button (1979) attempted to introduce a system wherein the users of the port would be required to pay the full marginal social opportunity cost (MSOC) of the resources they use at the port. The MSOC pricing approach starts from the axiom that the port provides a public service and as such its main objective is the economic good of the state or country that it serves. Consequently the port seeks, at best, to break even financially with regard to its operating costs. Following from this premise it can easily be conferred that the State owns the port. Button (1979) attempted to formalise this approach utilizing 'New Welfare Economics'. Differing slightly from the theorists at that time, Button applied economic theories based upon parking space allocation rather than on road usage that was commonly used. He argued that the MSOC system of pricing acted as a rationing mechanism that gave priority to potential users who were prepared to pay all costs (including external costs) for utilizing the port's services (Button 1979). However, in discussing this method of pricing, Button acknowledged that economies of scale experienced in most ports would present particular problems if the short run marginal cost pricing was used. Under conditions of increasing returns, the capital costs associated with investment in items such as infrastructure and superstructure would not be recoverable. As a result Button proposed three alternative ways of recovering these capital expenditures. He suggested that the government could directly subsidize the investments or alternatively the port authority could practise a system of discriminate pricing. As another alternative, Button proposed that the port could adopt a two-part tariff using the MSOC pricing for the cargo handled and a fixed periodic charge for the right to use the facility. This user charge would then reflect the capital expenditures.

Similar to the theorists of their time Bennathan and Walters (1979) argued that all port tariffs should be based upon the short run marginal cost, which would allow for efficient management. They further intimated that the tariff should at least cover the assigned variable cost of providing the service. In accounting for economies of scale, Bennathan and Walters suggested that the European Doctrine that supports

government subsidies would allow for the continued operation of the ports. Nevertheless, they cautioned the use of such subsidies since they realised that there were significant practical arguments against its use.

2.4 Congestion Pricing Approach

Having realised that excessive demand for port services creates congestion within ports, Bennathan and Walters (1979) suggested that the use of congestion levies and surcharges might provide ports the opportunity to earn high profits. They argued that increasing the price (congestion levy) would provide users the incentive to economise on the scarce resource. Similar to this approach, Strandenes and Marlow (2000) advocate the use of congestion pricing to obtain efficient exploitation of the port capacities. Nevertheless they contend that the main part of the congestion cost is related to the opportunity cost of vessel time since it reflects the alternative income the vessel foregoes by postponing the next fixture and the capital cost of the cargo itself. Whilst not articulated in that precise form, Bennathan and Walters (1979) indicated that ship owners were quick to add their queuing costs to the freight rates. Thus any increase or application of congestion levies would perhaps benefit the port at the expense of the shippers if the demand for port services was inelastic. They also contended that its practical application would present problems especially if the congestion tended to be seasonal. As a result, prices would vary over the season making it difficult to administer.

2.5 Strategic Pricing

Having recognised that ports are increasingly forced to operate within a competitive environment, economists and practitioners in the field of port pricing have sought ways to allocate benefits derived from port investments among the various stakeholders (i.e. shippers, ship owners and the government) whilst better utilizing the expensive port assets (UNCTAD 1975). Developing upon the economic

approach to port pricing it was suggested that ports should focus on three elements: costs, to recover the expenses incurred in providing port services and facilities; utilization, to rationalize the use of port assets; and prices structured on what the traffic can bear (UNCTAD 1995). Utilizing this multi-faceted approach to pricing meant that ports could now use port pricing as a main tool in assisting ports to achieve their strategic goals and objectives. Consequently, the term strategic pricing as defined by UNCTAD 1995 is "the use of pricing as a mechanism for achieving competitive advantage." This approach to pricing was enhanced by Arnold (1985), who also suggested that port tariffs should be based on a mix of pricing strategies that were designed to reflect the demand for port services, the competition amongst ports, and the costs incurred in providing those services.[2]

In furthering the idea of focusing on three elements in order to set port tariffs, UNCTAD (1975) proposed the 'cost, performance, value (CPV) approach.' They claim that this approach allows managers to accomplish different sets of objectives through the use of tariffs. As described by Strandenes and Marlow (2000), "cost based tariffs can maximise the use of port services; performance based tariffs can maximise the throughput and reduce congestion; value based tariffs generate sufficient revenue to cover the port's costs." In effect it is argued that the CPV approach provides flexibility for the port managers in establishing tariff limits. Thus, since the port cannot charge less than the incremental cost of providing the service, and cannot charge more than the value received by the user, the approach establishes both a floor and a ceiling for pricing purposes (Strandenes & Marlow 2000).

The use of pricing as a strategic element in meeting the strategic goals and objectives of ports has been further developed and applied to the recent phenomena of port privatisation. Ashar, A (2001) discusses the use of this principle for newly privatised ports and seeks to develop a formal methodology for performing strategic pricing

[2] As discussed in Strandenes & Marlow (2000)

analysis. In doing so he recommends that adoption of this approach would facilitate stability and avert possible price wars.

2.6 General Discussion

Having reviewed the literature on port pricing it is evident that the issue has been the subject of much thought and discussion especially during recent times. Whilst no one writer has been able to satisfactorily argue for any one approach to pricing, there appears to be a gradual shift towards the use of strategic pricing for all the various types of port ownership. As ports continue to evolve, they are no longer viewed as providing a public service and are consequently challenged to be self-sustaining and to operate along commercial lines. In this regard, the use of the CPV approach as suggested by UNCTAD appears to be aptly suited to this purpose. Nevertheless, one of the major drawbacks to its use is the high level of data that is required by the port in order to correctly utilize this approach to tariff setting.

Although first mooted in 1975 for the port sector, the value-based approach to price setting is currently widely used in other forms of business. One example of this was cited by George Cressman, a product-pricing consultant at Strategic Pricing Group Inc. in Marlboro, Massachusetts (Steadman, C. 2000) who indicated that a pharmaceutical maker used value-based pricing techniques (instead of actual costs incurred in developing the new drug) to get a higher price from medical insurers for a new anti-ulcer drug. Their studies showed that use of the drug would prevent expensive surgery in the future resulting in lower costs for the health insurance companies. Aside from this example perhaps the single biggest user of this approach to pricing is the burgeoning computer software industry. Rather than pricing the software according to the costs incurred in producing it, the vendors look towards the value provided to their customers who use this software. If viewed from another angle, one may argue that the actual intrinsic value of the CD containing the software is out of equilibrium with the price charged. However, the real value of the software is not in the CD itself but in the service provided to the customer by its use.

Similarly, the value afforded to cargo owners is not equivalent to the actual cost associated with the cargo handling but rather to the benefit derived from receiving the cargo. Whilst recognising that value-based tariffs can be applied in numerous areas associated with the cargo handling at the port, this paper will focus primarily on the application of wharfage which is itself a usage charge rather than a charge for providing an actual service. As indicated in Chapter 1, movement away from break bulk to containerised cargo presents a peculiar situation for ports wishing to implement a value-based wharfage tariff. The challenge for the port is to implement this pricing strategy in a fair manner to all cargoes transported in containers without prejudicing one product or category of products over another. Essentially, the charge levied should attempt to recover what the individual markets can bear without distorting the relevant supply chains.

3

PORT CASTRIES
AND
THE SAINT LUCIA AIR AND SEA PORTS AUTHORITY

3.1 The Island Of Saint Lucia

The island of Saint Lucia is located midway down the eastern Caribbean chain of islands. At coordinates 13.53° N and 60.68° W, Saint Lucia is one of the Windward Islands of the Lesser Antilles. Situated between the islands of Martinique to the north and Saint Vincent to the south, Saint Lucia is bordered by the Atlantic Ocean on its eastern coast and the Caribbean Sea on the west. Measuring 27 miles (43 km) at its longest point and 14 miles (22 km) across at its widest point, Saint Lucia approximately covers 238 sq miles (381 sq km). Within this relatively small landmass, the island supports two deep-water harbours – Port Castries located in the northern part of the island and Port Vieux-Fort located at the southern most tip of the island. Two airports assist in meeting the needs of air transport to and from Saint Lucia. Hewanorra Airport located in the south of the island has a runway length of 9,000 ft (2,744 metres) and George F. L. Charles Airport located in the north has a runway length of 6,200 ft (1,890 metres). (Saint Lucia Air and Sea Ports Authority 2000).

3.2 Basic Facts About Saint Lucia

In 1999 the population of Saint Lucia was estimated at 153,703 persons with an annual population growth rate of 1.15 (The Saint Lucia Central Statistics Office, 2001). The local currency used is the Eastern Caribbean Dollar (ECD), which is officially pegged at an exchange rate of ECD 2.67 to the US Dollar. This currency is

shared by eight small island economies of the Eastern Caribbean comprising Anguilla, Antigua and Barbuda, Commonwealth of Dominica, Grenada, Montserrat, St Kitts and Nevis, St Lucia, and St Vincent and The Grenadines and is managed by a central monetary authority, the Eastern Caribbean Central Bank. (Eastern Caribbean Central Bank, 1999). Saint Lucia recorded an estimated GDP in 1999 of 650 million US dollars that translated into a GNP per capita of USD 3,770 (The World Bank Group, 2000).

3.3 Overview Of The Saint Lucia Air And Sea Ports Authority (SLASPA)

Established by Parliamentary Act No. 10 of 1983, the Saint Lucia Air and Sea Ports Authority (SLASPA) is charged with the responsibility of providing for co-ordinated and integrated systems of airports, seaports and port services. (Saint Lucia Air and Sea Ports Authority Act, Government of Saint Lucia Printing Office 1983) Thus responsibility for the management of both airports and both seaports falls within the purview of SLASPA. Being governed by this act means that SLASPA is a statutory body which ultimately reports jointly to the Minister of Finance and the Minister of Communications and Works. As customary for organisations of this type, SLASPA is administered by a ten-member council whom are appointed by the Head of State whilst a management team manages the day-to-day operations.

As stipulated by the Act, the revenues of SLASPA are derived from all dues and charges levied with respect to the services that it provides. However, supplementary income may be derived from loans acquired from the Government or other organisations.

3.4 Physical Characteristics Of Port Castries

Port Castries is a natural, sheltered deep-water seaport situated on the north-western side of the island. The landward perimeter of the port is bounded by the capital city, Castries that restricts further expansion of the port area. The port has an entrance

channel width of 400 ft (122 metres), a draught of 42 ft (13 metres) and a turning circle radius of 1400 ft (427 metres). Being a multipurpose terminal, Port Castries comprises 5 berths (3 of which are continuous) totalling 2542 ft (775 metres) with a maintained depth alongside of 32 ft (9.75 metres). The majority of break-bulk operations are handled at berths 2 and 3, which have a combined quay length of 750 ft (229 metres). Berths 4 and 5 handle the majority of the container traffic with berth 5 having the ability to handle ro-ro vessels. The main export of the island, bananas, is handled at berth 6 which is also used to handle a range of bagged and bulk commodities including lumber, cement etc. Two additional berths are provided as part of a dedicated cruise ship facility. These berths measure 400 ft (122 metres) and 300 ft (91 metres) respectively with a maintained draft of 36 ft (11 metres).

Storage facilities at the port include 6 individual sheds for dry cargo with a combined covered shed storage area of 120,000 sq ft (11,200 m^2.). Four cold storage facilities are also provided with a combined storage capacity of 66,402 cu ft (1881 m^3). Sixty refrigerated containers can be simultaneously serviced at the port through connections to the reefer points located at the port. The space available for storage of containers at the container park is currently limited to 400 teu ground slots.

Two mobile shore cranes, one of which was newly commissioned in April 2000, provide cargo-handling capability at the port. Four high capacity top handlers and an empty container handler provide quay transfer, stacking, delivery and receipt operations for containerised cargo. This is supplemented by terminal tractor-trailer yard operating equipment. Stuffing and stripping container operations and break-bulk handling is carried out using various capacity forklift trucks (Flt's).

3.4.1 Management And Operation Of Port Castries

Prior to 1995, the ports of Vieux-Fort and Castries were managed and operated by SLASPA. However, in February of that same year the management of the port of Vieux-Fort came under the control of a private company, Saint Lucia Marine

Terminals Limited (SLMTL), that is a subsidiary of SLASPA. In this relationship Port Vieux Fort is a tool port with all the infrastructure and superstructure provided by SLASPA for which leasing fees and dividends are paid in return by SLMTL. Nevertheless, all management and stevedoring operations at Port Castries are still provided by SLASPA who recruits labour from the Seamen Waterfront and General Workers Union. Consequently, SLASPA is deemed an operating port authority at Port Castries.

3.4.2 Tariffs

The tariff schedule established and governed by Statutory Legislation in 1985 for all services rendered at the ports in Saint Lucia continue to the present without any amendments having been made. As stipulated in the tariff, SLASPA does not recognise individual owners of cargo but rather imposes all applicable dues on the vessels themselves. Nevertheless, charges such as storage for cargo held at the port in excess of the regulated free period is directly charged to the cargo owner. Identical tariffs are levied in the Port of Vieux-Fort since SLMTL is a subsidiary company of SLASPA.

This thesis will concentrate on the application of 'Cargo dues' (Wharfage) levied against break-bulk and containerised cargo. The following is extracted from the Saint Lucia Air and Sea Ports Authority (Seaport Tariff) Regulations with regards to the application of 'cargo dues' for break-bulk and containerised cargo:

SCHEDULE 4 (BREAK-BULK)

4. Cargo Dues — *Ships using a Port shall pay Cargo Dues as follows:-*

(I) Cargo carried in ships over 100 GRT - $6.00 per ton or part thereof landed or loaded.

(II) Cargo N.O.S. carried in ships under 100 GRT - $1.00 per ton or part thereof landed or loaded.

(III) Cargo consisting of agricultural products of Saint Lucia carried in ships under 100 GRT – 50 cents per ton or part thereof landed or loaded.

SCHEDULE 6

DUES AND CHARGES FOR CONTAINERS

2. Other Dues and Charges *Other dues and charges for containers shall be as follows:-*

(I) For landing or shipping a container loaded with cargo - $400.00 per TEU

(II) For landing or shipping an empty container - $100.00 per TEU

The charges in (I) and (II) above shall include Cargo Dues and Cargo Handling but shall not include stevedoring, storage charges or any stuffing and unstuffing.

It should be noted that the charges quoted above and throughout this thesis are and will be in the local Eastern Caribbean Currency. Although both cargo handling and cargo dues are incorporated into one charge for containers, they will be separated when the aspect of containers is dealt with in chapter 5.

3.4.3 Traffic

Port Castries, being a multi-purpose port handles varying types of cargo from bulk aggregates and palletised banana exports to containerised cargo. Nevertheless, this thesis will only focus on break-bulk cargo and containerised cargo throughput at the port.

3.4.3(a) Break-bulk Cargo

Port Castries handled a total of 158,634 tons of imported and exported break-bulk in the year 2000. Imported break-bulk of 111,373 tons accounted for approximately 70% of that total whilst exports, inclusive of banana exports, comprised 47,261 tons representing 30% of the total. The following table shows the tonnages of break-bulk imported and exported through Port Castries for the period 1992 – 2000.

Table 3.1 – Break-bulk cargo including banana exports handled at Port Castries 1992 – 2000 (Short Tons)

YEAR	IMPORT	EXPORT	TOTAL
1992	133707	83824	217531
1993	126759	75296	202055
1994	114682	58747	173429
1995	116130	65124	181254
1996	115267	57978	173245
1997	118044	34807	152851
1998	118956	37157	156113
1999	130232	40664	170896
2000	111373	47261	158634

Source: Compiled from SLASPA annual Statistical Digest 1993, 1996, 1998, 1999, 2000

Analysis of the above reveals that Port Castries recorded a 27% reduction in total break-bulk imported and exported through the port as compared with 1992 tonnages. Exports of break-bulk recorded a 43.7% reduction in exported tonnages in the year 2000 as compared with 1992 tonnages. Imports of break-bulk also reduced by 16.7% in 2000 as compared with 1992 levels.

Since special conditions apply for the levying of cargo dues (Wharfage) on banana exports, its respective annual contribution to the break-bulk tonnages will be subtracted for the purposes of this thesis. In addition, research has revealed that the export of bananas from Port Castries will be terminated shortly since the Port of Vieux Fort in the south of the island has been officially designated the official banana loading port.

Table 3.2 - Break-bulk cargo excluding banana exports handled at Port Castries 1992 – 2000 (Short Tons)

YEAR	IMPORT	EXPORT	TOTAL
1992	133707	3282	136989
1993	126759	2286	129045
1994	114682	2097	116779
1995	116130	2600	118730
1996	115267	3211	118478
1997	118044	3051	121095
1998	118956	2540	121496
1999	130232	1710	131942
2000	111373	1792	113165

Source: Compiled from SLASPA Annual Statistical Digest 1993, 1996, 1998, 1999, 2000

3.4.3(b) Containerised Cargo

In the year 2000, Port Castries handled a total of 27,050 TEUs, which comprised import, export, and transhipment of both full and empty containers. This represented an increase of 7.8% over 1999 levels. However, as indicated earlier, cargo dues are only levied on imported or exported containers at Port Castries. Accordingly, only the levels of imported and exported containers are highlighted in the following table. Nevertheless, it should be pointed out that transhipment business conducted at Port Castries amounted to 1,281 teu's in the year 2000.

Table 3.3 - Imported and exported containerised cargo at Port Castries 1992 – 2000 (TEUs)

	IMPORT		EXPORT		TOTAL		TOTAL
YEAR	Empty	Full	Empty	Full	Import	Export	Imp/Exp
1992	220	8931	8158	1119	9151	9277	18428
1993	460	9851	8327	1399	10311	9726	20037
1994	815	10234	9108	1376	11049	10484	21533
1995	663	10593	10095	961	11256	11056	22312
1996	959	9897	10356	725	10856	11081	21937
1997	568	9385	9126	639	9953	9765	19718
1998	486	10093	9178	583	10579	9761	20340
1999	205	12722	11288	840	12927	12128	25055
2000	120	12442	12307	900	12562	13207	25769

The trends observed for both break-bulk and containerised cargo handled at Port Castries suggests that the port might be experiencing a substitution effect from cargo being transported as break-bulk to that transported in containers. Consequently, the tonnages of cargo transported in containers for the same period was compiled in order to allow for comparison with break-bulk activity. The result is illustrated in the following tables.

Table 3.4 - Tonnages of imported and exported cargo transported in containers at Port Castries 1992 – 2000 (Short Tons)

	IMPORT		EXPORT		TOTAL	
YEAR	Empty	Full	Empty	Full	Import	Export
1992	554	166671	21412	19902	167225	41314
1993	1194	181295	21907	25329	182489	47236
1994	2128	191459	23974	24630	193587	48604
1995	1768	202453	26671	16557	204221	43228
1996	2568	192987	27286	11034	195555	38320
1997	1490	183652	24058	9965	185142	34023
1998	1278	198361	24231	8664	199639	32895
1999	527	246990	29901	12691	247517	42592
2000	318	244123	32632	14226	244441	46858

Source: Compiled from SLASPA Annual Statistical Digest 1993, 1996, 1998, 1999, 2000

Table 3.5 - Comparison of break-bulk and containerised cargo handled at Port Castries 1992 – 2000

YEAR	IMPORT		EXPORT		TOTAL	
	General Cargo	Containers	General cargo	Containers	GC	CONT
1992	45%	55%	14%	86%	42%	58%
1993	41%	59%	8%	92%	38%	62%
1994	37%	63%	8%	92%	35%	65%
1995	36%	64%	14%	86%	35%	65%
1996	37%	63%	23%	77%	37%	63%
1997	39%	61%	23%	77%	38%	62%
1998	37%	63%	23%	77%	37%	63%
1999	35%	65%	12%	88%	34%	66%
2000	31%	69%	11%	89%	30%	70%

Source: Compiled from SLASPA Annual Statistical Digest 1993, 1996, 1998, 1999, 2000

It can be ascertained from the above data that the percentage share of break-bulk tonnages to the overall tonnages of import and export cargo handled at the port decreased over the period. More specifically, whilst break-bulk imports represented 45% of total imports in 1992 this decreased to 31% in 2000. Similarly, break-bulk exports decreased from 14% in 1992 to 11% in 2000. This scenario is presented in the following figures.

Figure 3.1 - Composition of Import tonnages by Break-bulk and containerized cargo 1992 – 2000

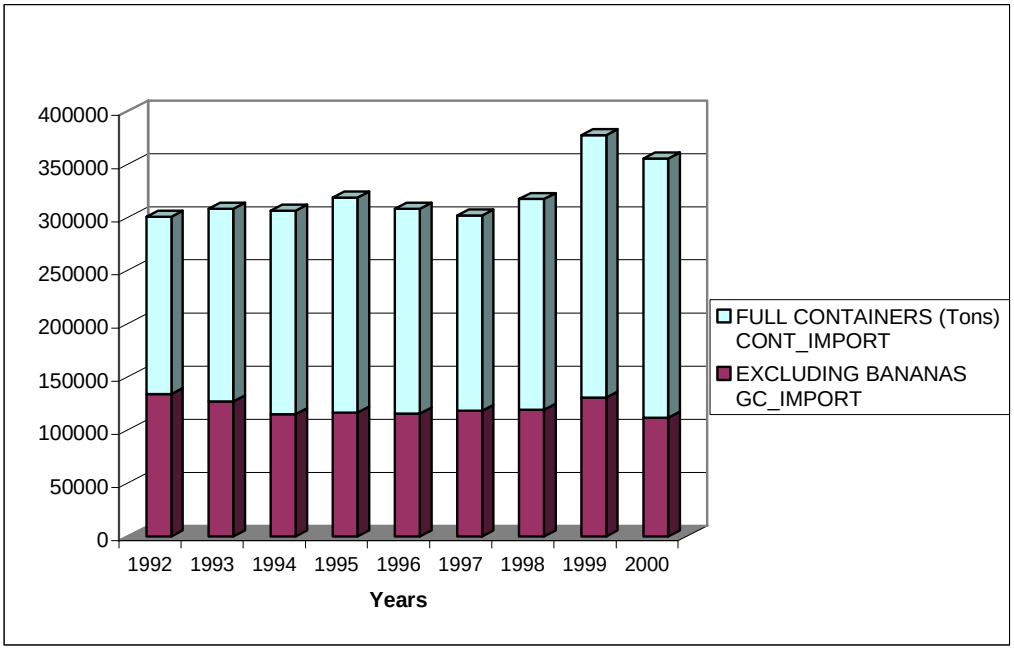


Figure 3.2 - Percentage contribution to total import tonnage by break-bulk and containerized cargo 1992 – 2000

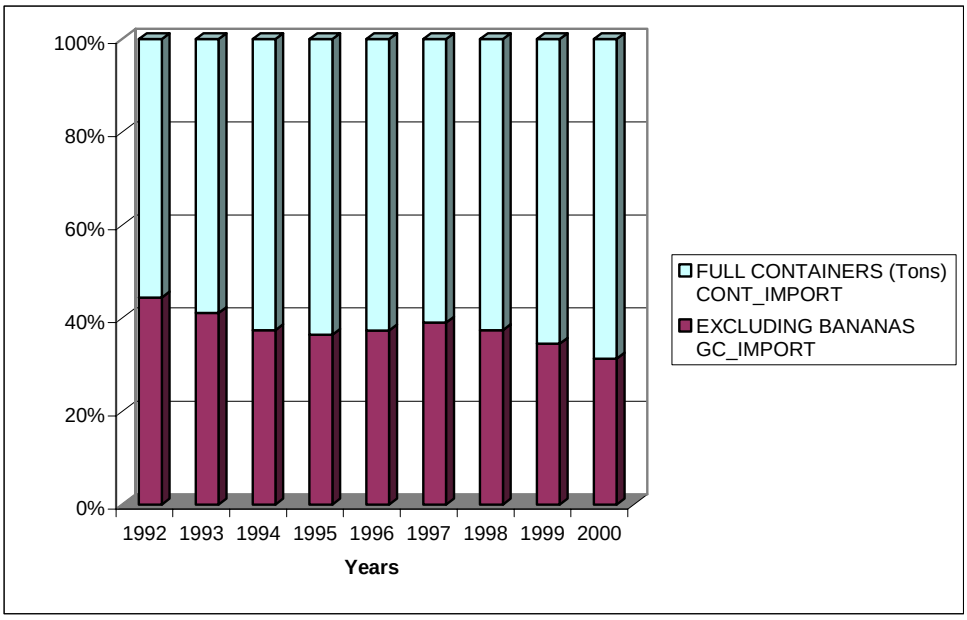


Figure 3.3 - Composition of export tonnages by break-bulk and containerized cargo 1992 – 2000

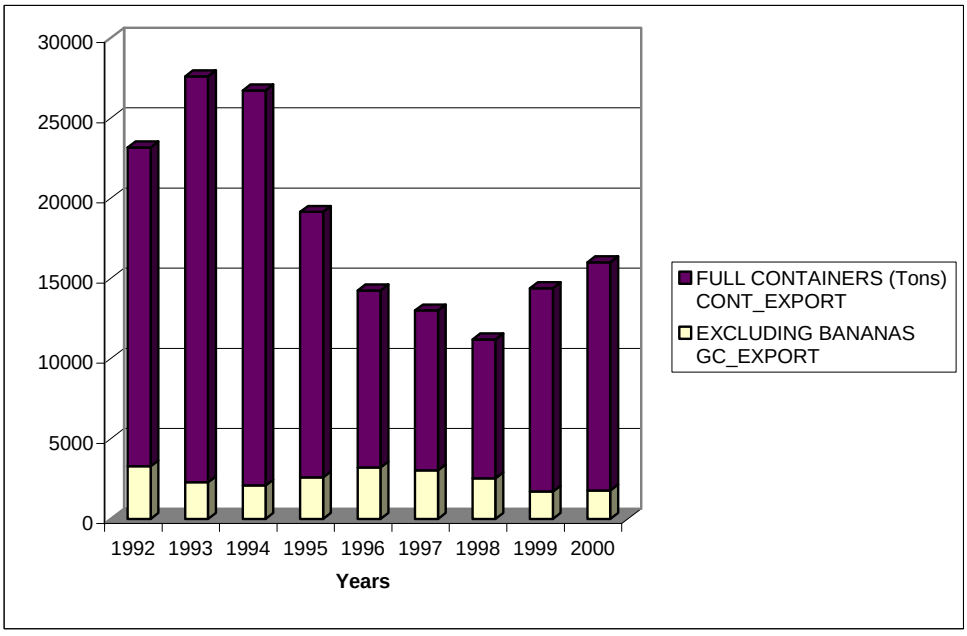
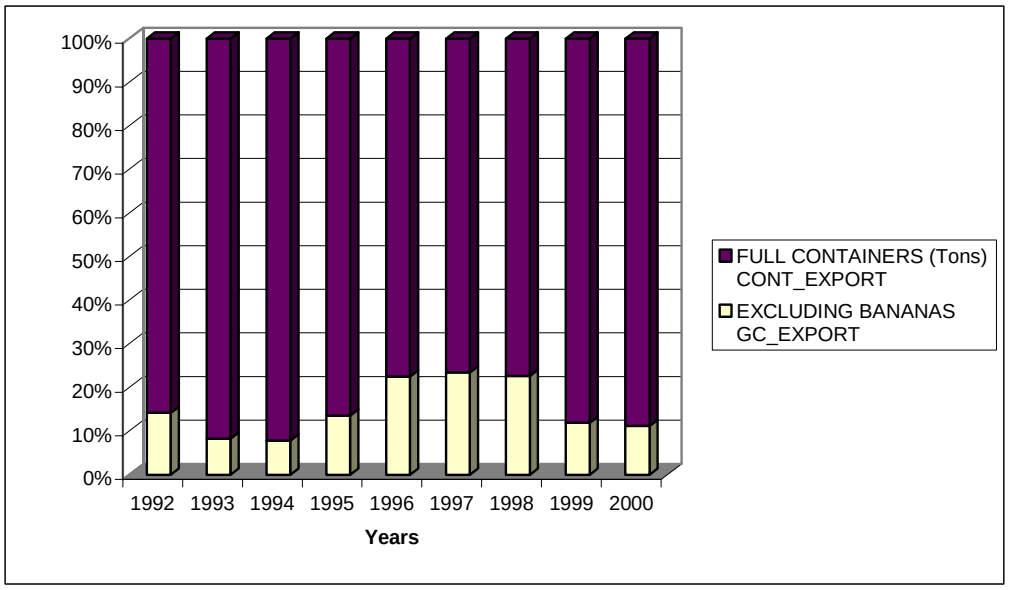


Figure 3.4 - Percentage contribution to total export tonnage by break-bulk and containerized cargo 1992 – 2000



As indicated earlier, the presence of this substitution effect has significant implications for ports wishing to implement value-based tariffs. Consequently, the following chapters will seek to provide a suitable means for addressing this situation.

4

THE VALUE CHAIN AND EXISTING TARIFF STRUCTURE OF PORT CASTRIES

4.1 Value Chain and Tariff Structure of Port Castries

In seeking to assess the efficacy of value based cargo dues for cargo transported in containers at Port Castries it is necessary to identify the value chain of the port. Doing so allows a better understanding of the nuances involved and the identification of possible impacts of the change in tariff structure on clients of the port. The process of identifying the value chain of Port Castries is done with the assistance of UNCTAD's 1975 depiction of the value chain of a large port as illustrated in Appendix A. Whilst the identification of the value chain is beneficial, its use is further extended when knowledge of the existing tariff structure at the port is used in conjunction with it. At present SLASPA being an operating port authority is solely responsible for the application and collection of charges for all services supplied at the port with the exception of landside telephone communication, potable water - provided by the Water and Sewerage Company, or bunkering services - which is done by tanker lorries. Similar to most operating port tariffs, the SLASPA Seaport Tariff is segmented into charges applicable to the ship and charges applicable to the cargo although all charges are billed directly to the ship. Bearing this in mind, the two issues regarding the value chain of port Castries and the existing tariff is dealt with simultaneously in the following sections.

4.2 Value Added Services to the Ship

The services to the ship provided by SLASPA can be broken down into two main categories namely safe navigation and services at the berth. Thus the value added from these activities is provided to the shipowner and the various freight forwarders operating at the port. This value is created through the speedy and careful handling of cargo to and from the ships within a reasonable time period (UNCTAD 1995) and the safe berthing of ships.

4.2.1 Safe navigation

SLASPA provides value to the ship through activities and facilities such as the provision of aids to navigation, adequate depth of the channel and alongside the berths, compulsory pilotage for ships over 100GRT and towage for ships greater than 250 feet LOA. These services ensure that all vessels entering or leaving the port are provided with safe navigation. Recovery of the costs associated with the provision of these facilities and services is sought by various charges as detailed in the Seaport Tariff.

The charge for pilotage is calculated per move differentiated according to the GRT of the vessel serviced. This charge starts at EC$25 per move for vessels under 100 GRT up to a maximum of EC$300 per move corresponding to vessels over 20,000 GRT. Since the pilots are monthly paid workers of SLASPA, the charge attempts to recover the fixed costs associated with the salaries of the pilots and the fixed and variable costs associated with the capital cost and the variable operational costs of the pilot vessels.

Navigational aids, charged at EC$0.02 per GRT subject to a minimum charge of EC$15.00 and a maximum charge of EC$100.00 attempts to cover the costs associated with the purchase, installation and maintenance of the various navigation aids located within the harbour limits.

Similar to pilotage, the charge for towage is calculated per move starting at EC$400.00 per move for vessels measuring 400 feet LOA to a maximum of EC$500.00 per move for vessels 500 feet and over. However, although towage is charged by SLASPA the service is provided by a private company, Tugs Ltd, who invoices SLASPA based upon a different scale. The amounts actually billed to SLASPA by Tugs Ltd for the towage services performed are calculated at a rate of EC$1.24 per foot per move. In addition, although SLASPA does not charge towage to ships below 400 feet LOA they nevertheless pay Tugs Ltd a flat fee of EC$350 per ship per move for all ships below 400 feet LOA. Consequently, SLASPA subsidizes the cost of towage charged to all ships.

4.2.2 Services at the berth

This aspect of the value chain provided at Port Castries includes berthing, stevedoring, equipment, water, bunkers, garbage removal, communications and wharf handling. Although all of these services that add value to the ship, are available at the berth, they are not all provided by SLASPA. Individual service providers who invoice the ship separately provide all the services of water, bunkers, garbage removal and communications. The Water and Sewerage Company provides water at the berths; various individual contractors hired by the ship's agents themselves provide garbage removal; local agents of Shell and Texaco provide bunkers via tanker lorries and the sole telecommunications provider, Cable and Wireless St. Lucia Ltd offers landside communication services.

As indicated earlier, SLASPA provides berthing, stevedoring, wharf handling and equipment services at the berth, which adds value to the ship. Value is added through the provision of a secure berth at which the ship is able to fulfil its contract (Bill of Lading) in either delivering or receiving cargo. In the course of doing so the port incurs costs that are recoverable from the charges levied. With regard to

berthing, the tariff is segmented into three areas including running lines, pratique and clearance.

Running Lines is charged on the arrival, shifting and departure of ships and is calculated in accordance with the GRT of the vessel. A minimum charge of EC$15.00 is applied for ships under 100 GRT up to a maximum of EC$80.00 for ships over 5,000 GRT between the hours of 0800 and 1600 Monday to Friday. This tariff is doubled for work conducted at any other time. Although the charges are applied and calculated by SLASPA, a private company, Lawrencin Lines Ltd performs the tasks on SLASPA's behalf. Consequently, they are paid 70% of the revenues generated from the tariff applied by SLASPA for running lines.

The tariff for 'pratique' is calculated and applied similar to that of running lines. A charge of EC$10.00 is charged to all ships under 100 GRT that is not engaged in commercial trading at any time. However, a similar charge of EC$10.00 is applicable to ships under 100 GRT who are engaged in trading but increases to EC$20.00 for ships over 100 GRT. Again this charge is only applicable between 0800 hrs to 1600 hrs Monday to Friday. The respective charge for vessels engaged in trading doubles for work conducted at any other time. The clearance charge on the other hand is a singular charge of EC$20 for all ships using the berth regardless of type, size or business orientation.

Charges for wharf handling are separated into port dues, cargo dues, passenger dues and cargo handling. These dues are applied not only for use of the port and berths but also for the receipt and delivery of cargo to and from ships to other modes of transport and storage. Port dues are based upon the ship's GRT and a minimum of EC$15.00 is charged for ships under 100 GRT for the first 48 hours in port. This charge increases to EC$300.00 for ships over 15,000 GRT for the same time period. Ships staying longer than this time period incur an additional cost for every 24 hour period ranging from EC$10.00 for ships under 100 GRT to EC$200.00 for ships over

15,000 GRT. The cumulative vessel charges collected in the financial year 2000/2001 were approximately EC$2.1 million.

Cargo dues are paid in accordance with the weight of break bulk cargo carried by ships in port. Ships over 100 GRT pay EC$6.00 per ton of cargo carried and ships under 100 GRT pay EC$1.00 per ton of break bulk cargo carried. These cargo dues are also applied to transhipment cargo on both movements. Ships carrying containerised cargo also incur cargo dues but this charge is incorporated cargo handling charges into a singular charge of EC$400.00 per TEU for full containers and EC$100.00 per TEU for empty containers.

Passenger dues of EC$10.00 per passenger embarking or disembarking is charged to all ships carrying passengers at the port. For passengers in transit, a charge of US$5.00 (Head tax) is charged instead of the embarkation or disembarkation tariff quoted above. However, it must be mentioned that the passenger in transit levy is applied on behalf of the government of St. Lucia for which SLASPA is given 25% of the revenues generated from this tariff item. Nevertheless, the portion of the head tax received by SLASPA is used to recover a EC 30 million dollar investment in two dedicated cruise ship berths constructed and commissioned in 1999. The application of the tariff for passengers including that for in transit passengers contributed EC$2.7 million for the financial year 2000/2001.

Cargo handling charges are levied differently on break bulk cargo and on containerised cargo. This charge covers the service of receiving from the ship's hook, sorting and checking to the bill of lading, transfer to a place of rest and delivery and vice versa (SLASPA Seaport Tariff). Import break bulk cargo is charged at a rate of EC$10.00 per ton if handled directly into a vehicle or EC$20.00 per ton otherwise. Export break bulk handled directly from vehicles is charged similar to that for import general cargo handled in the same manner whilst a charge of EC$15.00 per ton is levied for export break bulk cargo handled otherwise.

Various other charges apply for break bulk cargo overlanded or overcarried, sorting of cargo within a bill of lading and for coopering (handling damaged cargo or repairing the packaging). A charge of EC$16.00 per ton is also charged for handling break bulk transhipment cargo. Containerised cargo on the other hand is charged at a rate of EC$400.00 per TEU for landing or shipping a full container and EC$100.00 per TEU for landing or shipping an empty container. As stated earlier, this charge also includes cargo dues for use of the berths. Transhipment containers are charged EC$200.00 per TEU for full containers and EC$100.00 per TEU for empties. Additional charges of EC$70.00 per TEU per move for full containers and EC$20.00 per TEU per move for empty containers is levied for shifting containers during stevedoring operations. Total charges to cargo contributed EC$11.2 million to revenue for the financial year 2000/2001.

The full cost of labour and supervision employed on board a ship plus the cost of equipment used for loading or unloading is applied to the ship. An additional charge of 10% and 15% of the labour and supervision cost is applied for insurance cover and employers' contribution to the National Insurance respectively. A further charge of EC$4.00 per ton of cargo handled is also included in the stevedoring charge. Containerised cargo incurs an additional stevedoring charge of EC$70.00 per TEU and EC$20.00 per TEU per move for full containers and empty containers respectively for restowing or landing containers during operations. The total estimated onboard charges for the financial year 2000/2001 was approximately EC$7.2 million.

4.3 Value Added Services to the Cargo

Value added services rendered to cargo at Port Castries consist of cargo processing, storage and information processing. However, SLASPA's tariff is limited to that of cargo processing and storage.

4.3.1 Cargo storage

Storage at Port Castries is limited to that of short-term storage and consequently the charges for storage are penal. Import and export cargo are allowed a free storage period of five days, excluding Saturdays, Sundays and Public Holidays. Transhipment cargo is granted 21 free days and empty containers are allowed 30 days free excluding the weekends and Public holidays as mentioned for import and export cargo. Cargo stored in excess of the allotted time incurs a cost of EC$3.50 per ton for the first two succeeding days directly following the free period. This amount increases to EC$8.00 per ton for each succeeding three day period following 21 days in excess of the free storage period. Cargo stored in excess of three months at the port are placed on auction to recover the cost associated with the storage and also the recovery of any Customs duties that may be payable.

4.3.2 Cargo processing

SLASPA does not perform true cargo processing of the kind usually done in other ports. Instead its processing is restricted to that of consolidation or deconsolidation (stuffing or unstuffing) of containers. The applicable tariff for this service, which adds value to the cargo, is a charge of EC$15.00 per ton subject to a minimum charge of EC$150.00 per workday. Given the increases in associated costs such as labour and equipment, the revenue earned from this activity partially covers the costs of providing this service. The base charge as stipulated above represents only 8% of the average costs of stuffing or destuffing a 40-foot container. Further, the average revenue earned of EC$480.00 for destuffing a 40-foot container (based upon 32 tons) represents approximately 25% of the average costs of doing so (estimated at EC$1891.00).

4.4 Other Services to Users

Other value added services provided by SLASPA at Port Castries centres around leasing of warehouses and office spaces and the provision of security. Currently, SLASPA provides 80,000 cubic feet of cold storage facilities which are leased to private companies. As part of the leasing arrangements, SLASPA provides maintenance and security whilst the private operators are responsible for the payment of monthly rentals and utilities. All leasing fees are negotiated but SLASPA ensures that the agreed monthly rentals adequately covers the costs associated with the general maintenance and security of these facilities.

In 1996, SLASPA invested approximately EC$3 million and converted a cargo shed into a modern duty free shopping complex to service the in transit passengers onboard cruise ships. The shops within this complex are leased to various private individuals and companies who pay SLASPA a monthly rental. The negotiated leasing fees were calculated to recover the initial investment costs alongside other costs including maintenance, administration and security.

The security service available at Port Castries is provided by a permanent department of Port Police existing within the SLASPA establishment. Consequently, although SLASPA does not charge any user directly for its security services, the costs associated with the provision of this service are calculated and factored into other user charges. Thus both the ship and cargo owner benefits and pays for security services provided by SLASPA.

4.5 Other Port Activities

SLASPA's value chain at Port Castries includes other activities such as marketing and the development of its human resources. However, although users benefit from these activities they nevertheless are not charged for the provision of theses services. For instance, the development of SLASPA's human resources enables the users, both ship owners and cargo owners, to benefit from a more efficient workforce without

having to pay for it directly. The necessary funding is acquired from a multitude of other tariff items, most of which were discussed above.

4.6 General Discussion

As one of many ports operating within the Caribbean region offering similar services, Port Castries's ability to be financially self sustaining whilst remaining competitive hinges upon its tariff level and structure. Whilst the relevant costs associated with the provision of specific services was difficult to extrapolate from the financial statements of SLASPA it was easily identified that revenue generated at the port allowed for a surplus of EC$16.5 million which was then used to defer loan charges, depreciation and relevant shares of general expenditure for the 2000/2001 financial year. This resulted in a net operating surplus of EC$8.4 million for that year. Consequently, having identified the value chain at Port Castries and analysed the existing tariff structure in relation to the costs and revenue generating avenues, it appears that one of the areas available for revenue enhancement is that associated with its domestic (captive) cargo. Whilst an entire tariff review is outside the purview of this paper, the application of cargo dues can be analysed in seeking to redress this situation. As discussed in earlier chapters, UNCTAD proposes the use of a value-based tariff for the application of cargo dues (wharfage). This may be particularly applicable to Port Castries whose revenue base for this tariff is slowly being eroded by the substitution of containerised cargo for break bulk. As a result, an analysis into the possibility of amending the present tonnage based cargo dues to one calculated on the value of the cargo (especially that transported in containers) may offer an avenue for remedying the situation.

5

DEVELOPMENT OF A COMPUTER BASED MODEL

5.1 Identification Of The Wharfage Component Within The Container Charge

As stated in earlier chapters, wharfage forms part of a unitary charge levied on containers passing through the Port of Castries with the exception of transhipment containers. Consequently, the wharfage component has to be identified in order to allow further analysis regarding its conversion to a value-based format.

The first step in seeking to disaggregate the wharfage component is to detail all the various components included within that unitary charge. A review of the tariff schedule shows that the charge of EC$400/TEU for loaded containers and EC$100/TEU for empty containers includes both cargo handling and cargo dues (wharfage). The inclusion of only these two charges allows for easier computation.

5.1.1 Calculation Of Cargo Handling Costs

Historically, costing of services provided at the Port of Castries is calculated on the average cost principle rather than the marginal cost method. Consequently, this approach (average cost method) will be used in seeking to calculate the cargo-handling component of the container charge. Aside from this general assumption, other factors have to be considered. Firstly, the average cost will be calculated over a four-hour work period since this time frame represents the minimum call-out period for stevedores hired by SLASPA. Secondly, charges for use of the shore crane and other equipment used on board for cargo handling purposes is charged separately to the vessel. (As explained earlier, SLASPA invoices the vessel for all

charges incurred at the Port with the exception of storage charges). Thirdly, all stevedoring charges are applied separately.

Following from this information the necessary second step is the identification of the personnel costs incurred by SLASPA on the dockside. Table 5.1 below identifies the various personnel involved in the dockside operations and calculates the total costs incurred over the four-hour minimum period.

Table 5.1 - Personnel Costs Incurred Dockside

Personnel	Quantity	Hourly rate	Cost for 4 Hr minimum
Superintendent	1	$ 24.00	$ 96.00
Berth & Shed Supervisor	1	$ 17.69	$ 70.76
Tally Clerk	1	$ 9.77	$ 39.08
Fantuzzi Operator (top lifter)	2	$ 20.80	$ 166.40
Mechanic	2	$ 13.53	$ 108.24
Crane Operator	1	$ 20.80	$ 83.20
Transport Driver	1	$ 10.64	$ 42.56
Foreman	1	$ 38.09	$ 152.36
Terminal Labourer	2	$ 18.71	$ 149.68
Total personnel costs	**12**		**$ 908.28**

Having calculated the personnel costs incurred in cargo handling dockside, the next step is the identification of the equipment utilized dockside together with their respective costs. The hourly cost of equipment, obtained from SLASPA and used in the following calculations, was developed to include all costs such as fuel, maintenance (both routine and unplanned), labour (exclusive of the driver's personnel cost), spare parts and depreciation expenses. Consequently, Table 5.2 below identifies and calculates the associated costs of the cargo handling equipment used within the four-hour minimum call-out period as discussed previously.

Table 5.2 – Equipment Costs Incurred Dockside

Equipment Type	Quantity	Hourly cost	Cost for 4 Hr minimum
Fantuzzi (top lifter)	2	$250.00	$2,000.00
Tug Truck	1	$250.00	$1,000.00
Total equipment cost	3		$3,000.00

Given these costs, the average cargo handling cost per TEU can then be calculated utilising the personnel and equipment costs calculated above in conjunction with the average productivity (estimated at 13 TEU per hour as provided by SLASPA) of the container gang. The resultant calculation is provided below.

Figure 5.1 - Calculation of Cargo Handling Cost per TEU

Total personnel cost	908
Total equipment costs	3000
Total personnel and equipment costs	3908
General administrative cost (10%)	391
Total Handling cost over 4 hr minimum	4299
Average productivity (TEU/ hr)	13
Average TEUs handled in 4 hour period	52
Estimated average cargo handling cost per TEU	$82.68

A review of Figure 5.1 above shows that a 10% administrative cost was calculated on the total of the personnel and equipment cost. This added cost (expressed as a percentage) is used by SLASPA as a proxy to cover additional expenses incurred by other services provided by SLASPA that are not charged directly to the clients who benefit from these services. Such services include security, marketing, engineering, accounting and general administrative services.

5.1.2 Identifying The Wharfage Charge

Knowledge of the cargo handling charge is relevant but insufficient to estimate the wharfage component of the unitary charge levied on containers. Given that SLASPA was unable to provide the relevant basis upon which the wharfage for containerised cargo was levied, it became necessary that an assumption be made regarding the basis of application of the wharfage component as it relates to containers. This assumption was developed based upon an analysis of reasoning behind the application of any wharfage charge.

From its definition, wharfage is a charge levied on cargo for use of the berth or wharf (Brodie, P. 1997). This is interpreted to mean that any cargo passing over a wharf must bear a cost of using that wharf. In the case of containerised cargo, the actual commodity that is passing over the wharf is a unitary box. These boxes are of standard measurements and the respective weights are strictly monitored and allowed to vary within previously established ranges. This differs tremendously from what occurs with general cargo that varies in size, weight and packaging from one consignment to another. However, the common element between the two cargo trades is that 'weight,' expressed as short tons in the case of Port Castries, is moved over the wharf or berth. Given this commonality it can be argued that the container trade would be disadvantaged since the gross weight handled by the crane per box includes not only the weight of the cargo transported inside but the actual weight of the container itself. This differs for general cargo because the weight handled per consignment for general cargo pertains mostly to the cargo itself with the minimal addition of the weight of the pallets used to transport the cargo. The counter argument proposed is that the port should not excise the weight of the container since the actual container itself can be argued to represent cargo to the shipowner especially in the instance of the Port handling empty containers. These empty containers can be classified as cargo belonging to the various shipping lines that use them. This means that the gross weight of the container is relevant to the port since

it is that 'weight' that passes over the wharf. Consequently, wharfage can be applied based on the gross weight of containers passing over the wharf or berth.

Based on the above discussion of wharfage, the assumption made at this juncture is that wharfage for containers at Port Castries is applied similar to that of general cargo on ships over 100 GRT as stated in the Tariff of the Port and outlined in Chapter 3. Using this assumption implies that EC$6 per short ton is charged to all containers both loaded and empty. The suitability of this assumption is assessed using the estimated cargo handling costs in conjunction with the container charges.

Use of the ISO standardized container weights (both empty and full) in conjunction with the assumed Wharfage charge of EC$6.00 per ton would allow the Port to calculate wharfage charges as indicated in the following table. The ISO standardized container weight is used since SLASPA keeps a uniform charge on all containers regardless of their individual weights, which may vary when loaded.

Table 5.3 – Estimation of Wharfage Charges per Container

Container Description	ISO Weight (Short Tons)	Wharfage Charges
20 ft empty	2.5	$15
40 ft empty	5.5	$33
20 ft loaded	26	$156
40 ft loaded	34	$204

To further justify our assumption regarding the basis and amount of the Wharfage (cargo dues) applied on containers, the average handling cost and the wharfage charges calculated above is analysed together with the container charges levied by SLASPA. The results are illustrated in Table 5.4 below.

Table 5.4 – Comparison Of Container Charge With Cargo Handling And Cargo Dues

Container description	Charge	Cargo handling cost	Cargo dues	Total cost	Difference
20 ft empty	$ 100	$ 83	$ 15	$ 98	$ 2
40 ft empty	$ 200	$ 165	$ 33	$ 198	$ 2
20 ft loaded	$ 400	$ 83	$ 156	$ 239	$ 161
40 ft loaded	$ 800	$ 165	$ 204	$ 369	$ 431

The results of this analysis suggests that the assumption regarding the value and basis of the application of wharfage (cargo dues) on cargo transported in containers is a reasonable one, in that the container charge of EC$100 per TEU for empty containers and EC$400.00 per TEU for loaded containers allows SLASPA to recover the cargo handling costs and also the wharfage component whilst earning a profit. A closer look at the results obtained above may cause one to question the apparent exorbitant level of profit achieved on the 40 ft loaded box. However, it must be realised that the port is barely covering the cost associated with the empty containers and as discussed in the previous chapter, cross subsidies are required from certain services in order to compensate for the losses accruing by the port for other services rendered to the ports clients including those provided to the shipping lines. Further, the low level of profit received on the empty boxes is consistent with the practise at SLASPA wherein the captive domestic cargo is responsible for the majority of revenues generated at the port. Additional analysis was conducted using the four hour minimum call out period for the stevedores in order to ascertain the average costs and revenues obtained based upon the ratio of 20 and 40ft loaded and empty containers handled at the port. The results and calculations are illustrated in Appendix B.

5.2 The Computer Model for Containerised Cargo

In developing the model, sample data regarding the number of containers, type (LCL or FCL) and the respective CIF values of the cargoes transported within was collected from SLASPA and the Customs Department of Saint Lucia for the period January to March 2001. This data was then sorted in descending order according to the CIF values. In order to facilitate further manipulation and analysis of the data, a subjective decision was then taken as to the relevant grouping of the data into three distinct value groups. Additionally, this action was taken since it was anticipated that the varying numbers, values and types (FCL, LCL) of containers occurring within the sample data would respond differently to price changes. This reasoning is developed further in the following section on the estimation of price elasticities. Since the values sampled ranged from approximately EC$1,000 to EC$900,000 the data was then segregated into the following groups:

Group A Less than EC$100,000

Group B EC$100,000 to EC$200,000

Group C Over EC$200,000

These groupings were then analysed to determine the proportion of FCL to LCL containers contained within each group. This information was deemed necessary in order to make an estimation of elasticity required for the model.

5.2.1 Estimation of Elasticity

In order to determine how the incidence of the value-based wharfage tariff would affect the trade of cargo in containers it was necessary that an estimation of the price elasticity of the container trade be calculated. Without the luxury of time wherein the price (wharfage) could be fluctuated and the ensuing change in container trade could be measured, another method or proxy had to be developed to assist with the estimation of the price elasticity.

The first step in this process was to determine who bears the incidence of the port charges. A specific sampling of the shipping agents and the freight forwarders

operating in Saint Lucia was conducted using a questionnaire as illustrated in Appendix C. The response to this questionnaire although only received from a very small sample indicated that all the port charges (including wharfage) were passed on to the shippers or consignees of the cargo. This suggested that the trade in containerised cargo would be less elastic to price changes since the shipping lines did not have to bear the increase in costs. Whilst this knowledge was very informative it nevertheless could not be incorporated into the model. Consequently, an assumption was made using the knowledge obtained from the questionnaire and the corresponding number of consignees associated with FCL and LCL containers transiting the port. From the data received it was realised that LCL containers have many consignees for the cargo transported within whereas FCL containers are usually consigned to one consignee. In the situation of Port Castries, all LCL containers are destuffed at the port since none of the shipping lines or freight forwarders offer destuffing services outside of the port compound. Consequently, it was generally assumed that traffic involving LCL containers would be less elastic to price changes than FCL containers since the increase in costs would be shared amongst many consignees of cargo within each box. This increase in cost would probably represent a small cost per consignee as opposed to that borne by a single consignee of an FCL shipment. This assumption regarding elasticity was then incorporated into the model. Consequently, trade in containers was deemed to be price elastic if FCL containers within any group amounted to more than 60% of the total boxes handled in that group. Conversely, the trade in containers was deemed to be price inelastic if the percentage of FCL containers was less than 60% of total boxes handled in that group. For the purposes of calculations in the model, price elasticity was valued between 1 and infinity ($1 < E_d < \infty$). Price inelasticity was valued between 0 and 1 ($0 < E_d < 1$). This followed the convention of multiplying the formulae for price elasticity of demand by the number (-1), which nullifies the inverse relationship between price and quantity (Evans & Marlow 1990).

Following this logic, the elasticities for the container trades within each value group was subjectively estimated at (2) for the Group A with cargo below EC$100,000, (0.85) for Group B with cargo within the range EC$100,000 - EC$200,000 and (0.5) for Group C with cargo valued above EC$200,000. The respective elasticities were chosen because FCL containers represented 64% of containers handled in Group A which suggested that the trade would be price elastic, Group B with an elasticity of 0.85 was price inelastic since the FCL containers amounted to 35% of boxes handled whereas Group C was treated as more price inelastic with a value of 0.5 since FCL containers comprised only 25% of boxes handled. It must be noted that these elasticity values were subjectively assigned and as such field experiments would need to be conducted in order to ascertain their appropriateness.

5.2.2 Determination of Base and Maximum Charge

As explained in the introductory chapter to this thesis, the model for the application of the value-based tariff should propose both a minimum and a maximum charge within which the port may decide on the appropriate wharfage. Thus the minimum charge would have to allow the port to cover the costs associated with the relevant charge. Since wharfage is applied for use of the berth or quay, the minimum charge is calculated to cover the annual depreciation expense of the berths utilized. The expected contribution per box is calculated using the estimated annual throughput of full containers handled at the berths together with the annual depreciation expense of the berths. The final minimum wharfage charge, expressed as a percentage of the CIF value of the cargo transported in containers, is then calculated using the average CIF value of the cargo transported in all the containers sampled together with the expected contribution per box handled. This method of determining the minimum charge is only applicable when the berths concerned are restricted to handling only containerised cargo. In the instance of multi purpose berths handling both break bulk and containers the method has to be slightly modified but the principle remains the same. The minimum wharfage charge should allow the port to recover the annual depreciation expense of the berths being utilised. In order to accomplish this, the

respective total CIF values for break bulk cargo and containerised cargo must be calculated and expressed as percentages of their combined CIF value (i.e CIF value of break bulk plus CIF value of containerised cargo). The annual berth depreciation expense is then allocated to the various cargo traffic based upon the respective percentages of the total value of break bulk and containerised cargo handled at the port or berth as explained earlier. The minimum wharfage is then calculated as indicated above using this new figure.

The maximum wharfage charge per box, expressed as a percentage of the CIF value of the cargo transported inside, is calculated to maximise total wharfage revenue given the estimate of elasticity for the particular container trade. Thus, in instances of the trade being price elastic the wharfage revenue can only be maximised by reducing the tariff to an appropriate level wherein both trade and total revenue would be maximised. Conversely, the model also allows for the maximisation of wharfage revenue for instances when the trade in containers is deemed to be price inelastic. The model also provides the relevant effect on quantity traded whenever elasticity or price is varied. This task of maximising wharfage revenue is accomplished by use of the excel function 'solver' which allows the user to set the 'wharfage revenue after price change' to a maximum by varying the new price. Further analysis including determining the 'elasticity value' that will enable the port to maximise revenue for a given price increase can be performed by the model through use of either the 'goal seek' or 'solver' function.

In order to accomplish this task, certain assumptions gleaned from the sample data is utilised. Firstly, the average CIF value per box is calculated for the various groupings of containers. This average is then held constant for the future predictions of the model. Herein lies a weakness that can be overcome by routinely updating the data collected for the containers over time. Trends may be realised which would provide a more realistic approach to the prediction of the average CIF value of cargo transported in the containers. Secondly, the average wharfage charged, expressed as

a percentage of the average CIF value of the box (as calculated above), is calculated using the existing wharfage charge to provide the model with the initial tariff from which to analyse the impact of price and resultant trade movements. An illustration of the model is presented in Appendix D. The overall results as obtained by the model are presented in the following table.

Table 5.5 – Results Of Computer Model For Containerised Cargo

	Group A Less than 100000	Group B 100000 - 200000	Group C Greater than 200000
Estimated Elasticity	2	0.85	0.5
Initial Traffic (Boxes)	25	20	8
Average CIF value per box	$ 45,458	$ 138,123	$ 394,705
Initial Wharfage Charge as % of average CIF value per box	0.37%	0.13%	0.05%
Estimated initial wharfage revenue as predicted by model	$ 4,188	$ 3,696	$ 1,488
Estimated maximum wharfage revenue as predicted by model	$ 4,712	$ 3,720	$ 1,674
Difference	$ 524	$ 24	$ 186
Wharfage charge corresponding to maximised wharfage revenue	0.28%	0.15%	0.07%
Predicted Traffic (Boxes)	38	19	6
Initial wharfage revenue based on empirical data	$ 4,188	$ 3,696	$ 1,488
Predicted wharfage revenue based on empirical data	$ 3,141	$ 4,022	$ 2,232
Difference	$ (1,047)	$ 326	$ 744
Minimum Wharfage as calculated by model	0.014%	0.014%	0.014%

As illustrated in the table above, the total initial wharfage revenue based on the empirical data was calculated as EC$9372 as compared to that calculated based on the suggested maximum wharfage charge of EC$9395. Although these figures only allow for an increase of EC$23 it should be noted that the Port would benefit from other revenue generating areas resulting from the increased trades. The cargo-

handling tariff is one such area that would allow the port to increase its overall revenue as it relates to the container trade.

5.3 The Computer Model for Break Bulk Cargo

Similar to the analysis conducted above for the container trade, basic parameters must be established prior to the actual analysis itself. One such factor is the estimation of price elasticity. In the absence of detailed analysis of price elasticity of break bulk cargo it is generally assumed that the trade is price elastic since the packages tend to belong to only one consignee who must bear the full cost of transiting or using the port. Based on this assumption, the elasticity assigned to that of break bulk is (3) since it is assumed that the trade is more elastic than the container trade in Group A mentioned earlier.

Another parameter that has to be established is an average CIF value per short ton of break bulk cargo handled at the port. Similar to that devised for the container trade, this average CIF value per short ton of cargo is kept constant and used by the model in the future prediction of cargo trade and revenues. As in the case of the container trade, this weakness can be rectified through continuous data collection and analysis in order to assist with the identification and prediction of any trends that would allow the model to be refined.

The final two parameters for the development of the model include identification of the tonnages handled and the current wharfage charge. The initial wharfage charge to be used by the model in the analysis of the impact on trade and adjustments in price is determined by expressing the estimated wharfage revenue collected over the sample period as a percentage of the total CIF value of the cargo analysed. The tonnage handled is merely converted from kilograms to short tons which is the unit of measure used by the port.

5.3.1 Determination of Base and Maximum Charge

The calculation of a minimum wharfage charge for break-bulk cargo is proposed to cover that portion of the berth depreciation expense, attributed to break-bulk cargo handling. This base charge is calculated by expressing the allocated berth depreciation expense as a percentage of the estimated annual value of break-bulk cargo transiting the port. Whilst the limitation of the data provided by the Customs department did not allow for the exact replication of this proposal, a base charge was developed for the period under review by extrapolating the depreciation expense for the same period as covered by the data provided.

Having developed the model along the same lines as fashioned for the container trade, the maximum wharfage charge is determined by maximizing the wharfage revenue given the allocated elasticity for the trade. This is achieved via use of the 'solve' function in Microsoft Excel in which the model is developed. A curious scenario occurred when this wharfage charge was determined. The model indicated that the minimum charge was higher than that proposed to maximise the wharfage revenue. Further analysis of this scenario is warranted but the inability to verify the information sourced from St. Lucia negated any further attempt. Nevertheless, the model indicates that use of the minimum price as calculated would essentially stop all trade in break bulk cargo given the estimated price elasticity. Alternatively, the wharfage revenue would be maximised at that price if the trade in break bulk cargo is inelastic i.e. having a value between zero and one. An illustration of the model is appended as Appendix E.

5.4 General Discussion of the Models

Having developed the models a short discussion as to its relevance may be beneficial. The first and perhaps the most important factor in its use and further revision is the collection of accurate data for all cargoes transiting the port. In the case of Port Castries, data on cargo that includes CIF values is not collected and analysed by SLASPA. In addition, information sharing with the Customs department is

conducted manually with numerous incidences of re-entering of information thereby contributing to human error. This situation could be avoided if the port community was linked via one computerised system such as is done in larger ports like Aärhus in Denmark.

Another area that needs further analysis but may constitute a thesis on its own is the estimation of price elasticities of the various cargo trades. Whilst an attempt is made to circumvent this estimation as discussed earlier, the model would be better served with a more definitive calculation of price elasticity. This would provide the port with a clearer indication of the response of their clients to the proposed changes in tariff. The privilege of time will allow a port to vary the prices of its services and observe the resultant impacts on the various trades. In doing so, extensive collection of data and observation of customer reactions will enable ports wishing to utilise this model to refine the aspect of price elasticities. Nevertheless, operators of ports should have a fair understanding of their customers preferences that will enable them to estimate the elasticities required to be input into the model until more definitive information is obtained.

As previously discussed, one of the fundamental assumptions of the model is the constant average CIF values of the various cargo trades. Consequently, changes in the future CIF values of the cargo transported would significantly alter the actual outcome as compared with that proffered by the model. Thus, whilst this method allows for some insight into future actions based upon suggested price changes and estimated elasticities it is recommended that the model be used as a tool to assist with the process of tariff setting rather than an actual predictor of price.

In the current era faced by the maritime industry, ports are increasingly pressured to provide shipping lines with transparent costs and charges. The argument offered is that shipping lines are better able to plan their journeys if all relevant costs are provided before hand. Under this scrutiny, ports wishing to utilise this model for the determination and application of wharfage tariffs based on value may be faced with

some difficulty if the individual cargo trades are too segregated according to their respective elasticities. In such circumstances, ports would be well advised to attempt to minimize the respective groupings occurring within any individual cargo trade.

The model developed in this thesis can also be used to determine the wharfage to be applied on empty containers transiting the port over the berth. The necessary information required for this model to be adapted is the estimation of the value afforded to the shipping line by handling the empty containers. In addition, the price elasticity for this trade will have to be determined. Once this information is obtained the model can be used to provide Ports with an indication of the wharfage that can be charged in order to maximise their revenue.

By using the model and implementing the various wharfage charges according to the respective groupings, it may be argued that the port is still distorting the value chains of the cargo and perhaps the ideal solution is the application of a uniform percentage charge to all cargo values. Whilst this argument appears feasible it must be realised that the incidence of price elasticities on the respective cargoes plays an extremely critical role. Consequently, the consideration for the application of any price changes has to take into account the ability of the cargo to absorb that price. This ability is estimated through the use of elasticity calculations as utilised by the models.

In general, the models developed in this thesis provides Ports with an estimation of the impacts of price changes on the various cargo trades and resultant revenues whilst taking the respective price elasticities into account. In essence this gives Ports a good economic estimation of any suggested pricing changes.

6

SUMMARY AND CONCLUSION

Globalisation impacts on all facets of life including all aspects of trade and transportation. Ports, as key players within the transportation chain are increasingly challenged to assist with the development of the various supply chains. Although Ports have generally been slow to view themselves as integral members of these chains they have nevertheless contributed to the efficiency of these chains by reductions in delays for the transfer of cargo via the improvement of the port operating systems. Central to this strategy is the use of computerised systems that enable the rapid processing of information regarding the cargoes transiting the port. Technological advances with regards to the port operating equipment such as gantry cranes and container handling equipment have also aided in this process.

In recent times, increasing intensity of competition amongst ports have forced further self analysis and consequently ports have responded by reviewing their pricing systems and its impact on the supply chains. This review has been complicated by the varied forms of ownership and resultant interests practised by ports around the world. The services provided by ports are viewed at one extreme as serving the public good and as a result it is argued that the costs of providing the services should be borne through general taxation existing within the economy. At the other extreme, ports are viewed as purely commercial entities that seek to recover the costs associated with the provision of services from the users and beneficiaries of their services and facilities (Strandenes & Marlow 2000).

Given the increased attention to the pricing systems and strategies of ports, attempts have been made by agencies such as UNCTAD to provide ports with a method of

cost recovery and pricing strategy suitable to the varied forms of port ownership. Central to this proposal is the concept wherein the tariffs are developed based on three elements: 1. costs, to recover expenses incurred by the port in providing services and facilities; 2. utilization, to promote the better use of port assets; and 3. prices, structured on what the traffic can bear (UNCTAD 1995). This approach is known as the Cost-Performance-Value approach (CPV). Whilst UNCTAD has suggested that value-based pricing strategies can be applied to differentiated cargoes through broad definitions such as general cargo including break-bulk and containerised cargo, and dry and liquid bulk cargoes, ports facing a substitution effect of break-bulk cargo for containerised cargo may have difficulty in applying this strategy. More specifically, as the trade in break-bulk cargo is replaced by that of containers, the port may have difficulty in developing the appropriate value based tariff for the cargo transported within the containers.

In seeking to address this situation, this thesis proposes a computer based model which utilises the CIF value of the cargo transported in the containers and as break-bulk in calculating and providing a range within which the port may apply a value based tariff such as wharfage. The general assumption is that the CIF value of the cargo can be used as an approximation of the value provided to the respective owners of the cargo via the use of the port. Owners of higher valued cargo are assumed to derive more value from use of the port's services than those owners of lower valued cargo.

Central to this model is the estimation of price elasticity as related to cargoes transported in containers and as break-bulk. Without the privilege of an intensive study to ascertain the price elasticity of the various cargo trades, assumptions were developed along the lines of ownership of the cargo wherein it was assumed that single owners of a shipment (as occurs in FCL containers) would be more elastic to price changes than many consignees of cargoes transported within one container (as occurs in the LCL containers). A similar assumption was made in the case of break-

bulk cargo. However, it must be borne in mind that the price elasticity can be influenced by other factors including the relative bargaining power of the individual clients and also the willingness of the shipping lines to incur higher costs on behalf of their shippers (these costs are recovered in full from their shippers in the case of Port Castries). These factors would only be determined by a complete investigation into the relevant price elasticities of the different trades. Nevertheless, given the limitations of the assumptions regarding elasticities, the estimations proposed by the model provide a substantive base upon which the model can be used.

In conclusion, ports wishing to implement a value based wharfage tariff for cargoes transported in containers alongside that transported as break-bulk can use the model proposed in this thesis. Whilst requiring some measure of subjective judgement in using the model, the results ensure that ports are provided with a range within which they may set the wharfage tariff.

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APPENDIX A

The port's value chain

SERVICES TO THE SHIP

- **Safe Navigation**
  - Aids to navigation
  - Dredging
  - Pilotage, towage
- **Services at the Berth**
  - Berthing
  - Stevedoring, wharf handling
  - Equipment, short-term rental
  - Water, bunkers, garbage removal
  - Electricity and communications
  - Stowage planning

SERVICES TO THE CARGO

- **Cargo Processing, Storage**
  - Storage, short-term
  - Storage, long-term
  - Processing to different form
  - Consolidation/deconsolidation
  - Equipment, short-term rental
- **Information Processing**
  - Cargo inventory
  - Notification of vessel and cargo arrival
  - Cargo clearance

OTHER SERVICES TO USERS

- **Leasing land, other resources**
  - Office space
  - Warehouses
  - Equipment, long-term rental
  - Land for development
  - Land for operations
- **Security**
  - Vessels
  - Cargo

OTHER PORT ACTIVITIES

- **Marketing and Sales**
  - Market analysis
  - Marketing activities
- **Human Resource Development**
  - Training
  - Recruitment
  - Reorganization of work and gangs

Source: UNCTAD (1995). Strategic port pricing

CALCULATION OF TOTAL COSTS AND REVENUES FOR MINIMUM CALL OUT PERIOD

Revenues

Average productivity of container berth (TEU/ hr)			13
Minimum call out time for personnel (hours)			4
Average quantity handled in call out period (TEU's)			52
Charge to ship for containers (per TEU)			
Loaded		$	400.00
Empty		$	100.00
Ratio of loaded to total TEU's			53%
Ratio of empty to total TEU's			47%
Average number of loaded TEU's handled in period			27
Average number of empty TEU's handled in period			25
Average revenue earned during minimum call out period			
Loaded		$	10,955
Empty		$	2,461
TOTAL AVERAGE REVENUE		**$**	**13,417**
Total personnel costs		$	908
Total equipment costs		$	3,000
Total		$	3,908
General administrative cost	10%	$	391
TOTAL SLASPA AVERAGE HANDLING COST		**$**	**4,299**
Estimated cargo handling cost per TEU		**$**	**82.68**

General weights of containers (short tons)

20 ft empty	*2.5*
40 ft empty	*5.5*
20 ft loaded	*26*
40 ft loaded	*34*

Cargo dues for containerised cargo paid in accordance with that detailed for general cargo

Cargo dues as per tariff (per short ton)	*$*	*6*
20 ft empty container	*$*	*15*
40 ft empty container	*$*	*33*
20 ft loaded container	*$*	*156*
40 ft loaded container	*$*	*204*

Comparison of container charge with cargo handling and cargo dues

Container description	Charge	Cargo handling cost	Cargo dues	Total cost	Difference
20 ft empty	$ 100	$ 83	$ 15	$ 98	$ 2
40 ft empty	$ 200	$ 165	$ 33	$ 198	$ 2
20 ft loaded	$ 400	$ 83	$ 156	$ 239	$ 161
40 ft loaded	$ 800	$ 165	$ 204	$ 369	$ 431

Breakdown of TEU's handled in four hour period

Percentage of 20 ft empty	*45%*
Percentage of 40 ft empty	*55%*
Percentage of 20 ft loaded	*46%*
Percentage of 40 ft loaded	*54%*
Number of 20 ft empty units handled (expressed in TEU's)	*11*
Number of 40 ft empty units handled (expressed in TEU's)	*14*
Number of 20 ft loaded units handled (expressed in TEU's)	*13*
Number of 40 ft loaded units handled (expressed in TEU's)	*14*

Calculation of total revenues and costs incurred for a minimum call out period

Container Description	TEU's Handled	Revenue (per TEU)	Total Revenue	Cargo Handling cost	Cargo Dues	Total Cost	Difference
20 ft empty	11	100	$ 1,108	$ 916	$ 166	$ 1,083	$ 26
40 ft empty	14	100	$ 1,353	$ 1,118	$ 223	$ 1,342	$ 11
20 ft loaded	13	400	$ 5,042	$ 1,042	$ 1,966	$ 3,008	$ 2,033
40 ft loaded	14	400	$ 5,600	$ 1,157	$ 1,428	$ 2,585	$ 3,015
TOTALS	51		$ 13,103	$ 4,234	$ 3,784	$ 8,018	$ 5,085

APPENDIX C

Questions for Shipping Agents and Freight Forwarders

1. Is the container handling charge at Port Castries taken into consideration when the freight rate is being established?
   ☐ YES ☐ NO (If response is No then go to question 4)

2. If 'YES', what percentage of the container handling charge is factored into the freight rate quoted to shippers?

_____
_____

3. Is the remaining percentage of the container handling charge quoted to the shippers directly or is it shared between the line and the shipper?

_____
_____

4. Are shippers billed separately for the entire container handling costs?
   ☐ YES ☐ NO

5. If 'NO', how is the container handling cost recovered?

_____
_____
_____

6. Is the container handling charge recovered differently in the case of LCL containers? (If 'YES' please explain)

_____
_____
_____
_____

7. If the consignees are billed separately for the container handling charges, then how are the charges allocated amongst the various consignees within LCL containers?

_____
_____
_____
_____

Questions 1 – 3 above relate specifically to the Shipping Agents who would be in a position to determine or assist with establishing freight rates to St. Lucia. Since most of the freight forwarders do not set freight rates, then only questions 4 – 7 would apply to them.

APPENDIX C
(Response)

Questions for Shipping Agents and Freight Forwarders

8. Is the container handling charge at Port Castries taken into consideration when the freight rate is being established?
   YES ☐ NO (If response is No then go to question 4)

9. If 'YES', what percentage of the container handling charge is factored into the freight rate quoted to shippers?

   100% per container

10. Is the remaining percentage of the container handling charge quoted to the shippers directly or is it shared between the line and the shipper?

    N/A

11. Are shippers billed separately for the entire container handling costs?
    ☐ YES ☐ NO

12. If 'NO', how is the container handling cost recovered?
    As I said its included in the freight as part of what is called the LS&D

13. Is the container handling charge recovered differently in the case of LCL containers? (If 'YES' please explain)
    No

14. If the consignees are billed separately for the container handling charges, then how are the charges allocated amongst the various consignees within LCL containers?

    Normally the NVOCC pays the freight of which there is a separate rate for billing those various consignees within the LCL containers.

Questions 1 – 3 above relate specifically to the Shipping Agents who would be in a position to determine or assist with establishing freight rates to St. Lucia. Since most of the freight forwarders do not set freight rates, then only questions 4 – 7 would apply to them.

APPENDIX C
(Response)

Questions for Shipping Agents and Freight Forwarders

15. Is the container handling charge at Port Castries taken into consideration when the freight rate is being established?

    YES ☐ NO (If response is No then go to question 4)

16. If 'YES', what percentage of the container handling charge is factored into the freight rate quoted to shippers?

    Full container handling is incorporated

17. Is the remaining percentage of the container handling charge quoted to the shippers directly or is it shared between the line and the shipper?

    N/A

18. Are shippers billed separately for the entire container handling costs?

    ☐ YES ☐ NO

19. If 'NO', how is the container handling cost recovered?
    It is included in the freight

20. Is the container handling charge recovered differently in the case of LCL containers? (If 'YES' please explain)

    No

21. If the consignees are billed separately for the container handling charges, then how are the charges allocated amongst the various consignees within LCL containers?

    Handling charges (LS&D) are included in all costs except when signed to consignee's account

Questions 1 – 3 above relate specifically to the Shipping Agents who would be in a position to determine or assist with establishing freight rates to St. Lucia. Since most of the freight forwarders do not set freight rates, then only questions 4 – 7 would apply to them.

Analysis of Cargo transported in containers (January - March 2001

Consignment Type	Size of Box	CIF Value	Current wharfage Charge	Wharfage as % of CIF Value	New Wharfage Charge	Proposed Wharfage as % of CIF Value		Difference between new and current charge	Difference in grouping total
LCL	20	1440	156	10.83%	4	**0.28%**		-152	
FCL	20	9087	156	1.72%	25			-131	
FCL	20	11532	156	1.35%	32			-124	
FCL	20	13563	156	1.15%	37			-119	
FCL	40	15001	204	1.36%	41			-163	
FCL	20	16342	156	0.95%	45			-111	
FCL	40	18121	204	1.13%	50			-154	
LCL	20	19497	156	0.80%	54			-102	
FCL	20	23150	156	0.67%	64			-92	
LCL	20	23578	156	0.66%	65			-91	
FCL	20	30004	156	0.52%	83			-73	
FCL	20	43780	156	0.36%	121			-35	
FCL	40	48180	204	0.42%	133			-71	
LCL	20	52726	156	0.30%	146			-10	
LCL	20	54315	156	0.29%	150			-6	
LCL	40	58250	204	0.35%	161			-43	
LCL	20	59795	156	0.26%	165			9	
LCL	40	62322	204	0.33%	172			-32	
FCL	20	63120	156	0.25%	174			18	
FCL	20	76701	156	0.20%	212			56	
LCL	20	78926	156	0.20%	218			62	
FCL	40	87315	204	0.23%	241			37	
FCL	20	87531	156	0.18%	242			86	
FCL	20	90113	156	0.17%	249			93	
FCL	20	92059	156	0.17%	254	**4188**	**3141**	98	**-1047**
LCL	20	100493	156	0.16%	146	**0.15%**		-10	
FCL	20	105315	156	0.15%	153			-3	
LCL	40	107931	204	0.19%	157			-47	
LCL	40	108799	204	0.19%	158			-46	
LCL	40	109521	204	0.19%	159			-45	
FCL	40	109531	204	0.19%	159			-45	
LCL	20	111832	156	0.14%	163			7	
LCL	20	115480	156	0.14%	168			12	
FCL	40	119320	204	0.17%	174			-30	
LCL	40	120116	204	0.17%	175			-29	
LCL	40	135446	204	0.15%	197			-7	
FCL	40	140080	204	0.15%	204			0	
LCL	20	143102	156	0.11%	208			52	
LCL	20	152533	156	0.10%	222			66	
FCL	20	171113	156	0.09%	249			93	
LCL	40	173232	204	0.12%	252			48	
FCL	40	179530	204	0.11%	261			57	
LCL	20	180829	156	0.09%	263			107	
FCL	40	185118	204	0.11%	270			66	
LCL	40	193135	204	0.11%	281	**3696**	**4022**	77	**326**
FCL	40	209735	204	0.10%	148	**0.07%**		-56	
FCL	40	215139	204	0.09%	152			-52	
LCL	40	226511	204	0.09%	160			-44	
LCL	20	228843	156	0.07%	162			6	
LCL	20	360629	156	0.04%	255			99	
LCL	20	472191	156	0.03%	334			178	
LCL	40	548670	204	0.04%	388			184	
LCL	40	895922	204	0.02%	633	**1488**	**2232**	429	**744**
TOTAL	53		**9372**		**9395**				**23**

Minimum value	$ 1,440
Maximum value	$ 895,922

		Boxes	Percent
Number of entries below:	$100,000.00	25	
Breakdown of boxes within range			
20 ft		19	76%
40 ft		6	24%
LCL		9	36%
FCL		16	64%

Price	Quantity (boxes)	Elasticity
0.0037	25	2
0.0028	38	

% change in price	-0.25
% change in demand	0.500000009
New demand	38

Average CIF per box	45458	
Total CIF of cargo handled in containers	1136448	
Wharfage at start	4188	
Total CIF of cargo after price change	1704672	
Wharfage revenue after price change	4712	**Maximised**

GROUP A

Normal wharfage charge:				
	20'			156
	40'			204
Wharfage currently collected for Group A				
	20'			2964
	40'			1224
Total wharfage collected at present charge				4188
Average wharfage per box				168
Average CIF value per box handled in range				45458
Average wharfage as % of CIF per box				0.37%
Estimation of elasticity				**Elastic**
Suggested Max Wharfage charge				**0.28%**
Annual berth depreciation				178481
Total full boxes handled for period				9357
Average value per box handled annually				**133142**
Suggested Min Wharfage charge				**0.0143%**

		Boxes	Percent
Number of entries within	$ 100,000 $ 200,000	20	
Breakdown of boxes within range			
20 ft		8	40%
40 ft		12	60%
LCL		13	65%
FCL		7	35%

Price	Quantity (boxes)	Elasticity
0.0013	20	0.85
0.0015	19	

% change in price	0.088235294
% change in demand	-0.075
New demand	19

Average CIF per box	138123	
Total CIF of cargo handled in containers	2762458	
Wharfage at start	3696	
Total CIF of cargo after price increase	2555273	
Wharfage revenue after price increase	3720	**Maximised**

GROUP B

Normal wharfage charge:				
	20'			156
	40'			204
Wharfage currently collected for Group B				
	20'			1248
	40'			2448
Total wharfage collected at present charge				3696
Average wharfage per box				185
Average CIF value per box handled in range				138123
Average wharfage as % of CIF per box				0.13%
Estimation of elasticity				**Inelastic**
Suggested Max Wharfage charge				**0.15%**

		Boxes	Percent
Number of entries above	$ 200,000	8	
Breakdown of boxes within range			
20 ft		3	38%
40 ft		5	63%
LCL		6	75%
FCL		2	25%

Price	Quantity	Elasticity
0.0005	8	0.5
0.0007	6	

% change in price	0.499999997
% change in demand	-0.25
New demand	6

Average CIF per box	394705	
Total CIF of cargo handled in containers	3157641	
Wharfage at start	1488	
Total CIF of cargo after price increase	2368230	
Wharfage revenue after price increase	1674	**Maximised**

GROUP C

Normal wharfage charge:				
	20'			156
	40'			204
Wharfage currently collected for Group B				
	20'			468
	40'			1020
Total wharfage collected at present charge				1488
Average wharfage per box				186
Average CIF value per box handled in range				394705
Average wharfage as % of CIF per box				0.05%
Estimation of elasticity				**Inelastic**
Suggested Max Wharfage charge				**0.07%**