



A comparative analysis of port selection in Southern Africa

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ABSTRACT

In 2015, the estimated volume of world seaborne trade accounted for over 80 per cent of total world merchandise trade. In addition, containerised cargo has increased more than tenfold since 1985 (UNCTAD, 2016:6-7). Even though global trade has contracted over the past couple of years (an average of 3 per cent per year from 2012 to 2016), merchandise trade still constitutes more than half of the total global output. Combining the aforementioned statistics, seaports have a pivotal role to play in roughly 40 per cent of the world's economy in terms of volume. Selecting the most appropriate seaport within a set of criteria is of utmost importance to the various role players within global value chains.

The importance of port selection is also significant in Southern Africa, a region that contains a number of landlocked countries, not to mention various geographically-dispersed economic hubs. Therefore, a substantial proportion of the hinterland of Southern Africa is contested by only a small number of seaports. What drives the selection of a port within the Southern African context? Historically, port selection has been extensively studied throughout the developed world, as well as in Southeast Asia. However, since very little academic research on port selection has been done within the African context, a gap in the literature exists. This study aims to bridge that gap.

Traditionally, the topic of port selection has been studied from the perspective of different groups of role players through various research methods. From the perspective of shippers and freight forwarders, the majority of studies made use of stakeholder surveys. From the perspective of carriers and shipping lines, the preferred research method was equally divided between stakeholder surveys, the AHP (analytic hierarchy process) and port selection modelling. The findings showed that numerous traditional determinants exist in explaining port selection from a global perspective, which include cost, location, connectivity, port services and efficiency. This study investigated these determinants and estimated three econometric models for port selection in the Southern African context by means of panel data.

The focus of the study was on the Ports of: Beira in Mozambique, Dar es Salaam in Tanzania, Durban in South Africa and Walvis Bay in Namibia since, at the time of the study, these four selected ports had the largest container terminals in the region and contested the Southern African hinterland through various trade corridors. Descriptively, the Port of Durban had a distinct competitive advantage over its regional rivals in terms of traditional macro-determinants, such as connectivity and efficiency. In terms of traditional micro-determinants, the Ports of Durban and Walvis Bay were comparable and had a competitive advantage over the Ports of Beira and Dar es Salaam, which in turn were comparable.

Using data obtained from the national port authorities of the selected Southern African countries, as well as data from the World Bank, the World Economic Forum and the United Nations Conference on Trade and Development, three groups of models were then estimated for the selected Southern African ports. Severe data limitations necessitated the estimation of panel models by means of the OLS (ordinary least squares) method, as well as a fixed effects model and a random effects model. A number of different iterations were run to test various hypotheses that were drawn from existing literature. Ultimately, the models were estimated on seven traditional determinants of port selection in the period between 2005 and 2015.

The results indicated that when comparatively analysing port selection in Southern Africa, role players prefer ports that are better connected, in closer geographical proximity to their trading partners, and have better port infrastructure compared to their regional competitors.

Key terms: *port selection, Southern Africa, trade, value chains*

OPSOMMING

In 2015 is beraam dat meer as 80 persent van die wêreldwye handelsvolume uit seevrag bestaan het. Daarbenewens het houervrag sedert 1985 meer as tienvoudig toegeneem (UNCTAD, 2016:6-7). Alhoewel wêreldhandel oor die afgelope aantal jare verminder het (met gemiddeld 3 persent per jaar oor die tydperk tussen 2012 en 2016), verteenwoordig handel steeds meer as die helfte van die totale globale uitset. Indien hierdie bogenoemde statistieke gekombineer word, speel hawens 'n belangrike rol in ongeveer 40 persent van die wêreld se ekonomie. Om die mees toepaslike hawe vanuit 'n kriterialys te kies, is daarom van uiterste belang vir die rolspelers in globale waardekettings.

Die belangrikheid van hawe-keuse word vervolgens ook in Suider-Afrika aangetoon. In 'n streek met 'n groot aantal ingeslote lande, asook verskeie geografies uitgespreide ekonomiese kerne, word 'n aansienlike deel van die agterland van Suider-Afrika deur slegs 'n beperkte aantal hawens aangevoer. Wat bepaal die keuse van 'n hawe in die Suider-Afrikaanse konteks? Histories, is hawe-keuse uitgebreid bestudeer in verskeie ontwikkelde lande, asook Suidoos-Asië. Alhoewel, aangesien weinig akademiese navorsing oor hawe-keuse vanuit 'n Afrika-perspektief bestudeer is, bestaan daar 'n gaping in die literatuur. Hierdie verhandeling poog om hierdie gaping te oorbrug.

Hawe-keuse is tradisioneel vanuit die oogpunt van verskeie groepe rolspelers bestudeer deur verskillende navorsingsmetodes te gebruik. Vanuit die perspektief van versenders en vragverskaffers het die meerderheid van die studies gebruik gemaak van opnames deur belanghebbendes. Vanuit die oogpunt van vragdraers en verskeeplyne, was die verkose navorsingsmetode eweredig verdeel tussen opnames van belanghebbendes, die AHP (analitiese hiërargiese proses) en hawe-keuse modellering. Die bevindinge het aangetoon dat die tradisionele determinante van hawe-keuse vanuit 'n globale perspektief uit die volgende bestaan: koste, ligging, verbindings, hawe dienste en doeltreffendheid. Die gegewe determinante is in hierdie studie bestudeer deur die beraming van drie ekonometriese modelle vir hawe-keuse in die Suider-Afrika konteks deur te gebruik maak van paneeldata.

Die fokus van die navorsing was op die hawens van Beira in Mosambiek, Dar es Salaam in Tanzanië, Durban in Suid-Afrika en Walvisbaai in Namibië aangesien hierdie vier Suider-Afrikaanse hawens, tydens die studie, oor die grootse houer terminale in die streek beskik het, asook meeding oor die agterland van die streek deur verskeie handelspoorte. Beskrywend het die hawe Durban, 'n beduidende vergelykende voordeel bo sy streeksmededingers in terme van tradisionele makro-determinante soos verbindings en doeltreffendheid. In terme van tradisionele

mikro-determinante, was die hawens van Durban en Walvisbaai soortgelyk en het 'n vergelykende voordeel bo die hawens van Beira en Dar es Salaam geniet.

Met behulp van die data wat verkry is van die nasionale hawe-owerhede van geselekteerde Suider-Afrikaanse lande, sowel as data van die Wêreldbank, die Wêreld Ekonomiese Forum en die Verenigde Nasies se Konferensie oor Handel en Ontwikkeling, was drie groepe modelle dan beraam vir die verkose Suider-Afrikaanse hawens. Ernstige databeperkings het die skatting van paneelmodelle deur middel van die GKV (gewone kleinste vierkante) metode genoodsaak, asook 'n vaste effek model en 'n ewekansige effek model. 'n Aantal verskillende model-iterasies is aangevoer om verskeie hipoteses, wat vanuit die literatuur verkry was, te toets. Uiteindelik is modelle beraam op sewe tradisionele determinante van hawe-keuse oor die tydperk tussen 2005 en 2015.

Die resultate het aangedui dat wanneer Suider-Afrikaanse hawens vergelykend geanaliseer word, rolspelers hawens verkies wat beter verbind is, in nader geografiese nabyheid aan hul handelsvennote is, en oor beter vergelykende hawe-infrastruktuur as hul streeksmededingers beskik.

Sleuteltermes: *hawe-keuse, Suider-Afrika, handel, waardekettings*

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LIST OF ABBREVIATIONS

AAPA	=	American Association of Port Authorities
AfDB	=	African Development Bank
AHP	=	Analytic Hierarchy Process
AIMMS	=	Advanced Interactive Multidimensional Modelling System
ANOVA	=	Repeated Measures Analysis of Variance
BLNS	=	Botswana, Lesotho, Namibia and Swaziland
CFM	=	Mozambique Ports and Railways
CIA	=	Central Intelligence Agency
CIF	=	Cost, Insurance and Freight
DSS	=	Decision Support System
FDI	=	Foreign Direct Investment
FOB	=	Free On Board
GATT	=	General Agreement on Tariffs and Trade
GDP	=	Gross Domestic Product
GVCs	=	Global Value Chains
ICT	=	Information and Communication Technology
ITO	=	International Trade Organisation
IMF	=	International Monetary Fund
MCA	=	Multi-Criteria Analysis
MNEs	=	Multinational Enterprises
NAMPORT	=	Namibian Ports Authority
NPA	=	National Ports Authority

NPC	=	National Planning Commission
OECD	=	Organisation for Economic Co-operation and Development
OEEC	=	Organisation for European Economic Cooperation
OLS	=	Ordinary Least Squares
PMAESA	=	Port Management Association of Eastern and Southern Africa
RVCs	=	Regional Value Chains
SADC	=	Southern African Development Community
SARS	=	South African Revenue Service
SSA	=	Sub-Saharan Africa
TEU	=	Twenty Foot Equivalent Unit
TFA	=	Trade Facilitation Agreement
TFI	=	Trade Facilitation Indicator
TNPA	=	Transnet National Ports Authority
TPA	=	Tanzania Port Authority
TPT	=	Transnet Port Terminals
UN	=	United Nations
US	=	United States
UNCTAD	=	United Nations Conference on Trade and Development
WB	=	World Bank
WEF	=	World Economic Forum
WCO	=	World Customs Organisation
WTO	=	World Trade Organisation

CHAPTER 1: INTRODUCTION

1.1 Introduction

Over the course of the past 25 years, global trade has increased year-on-year by nearly 8 per cent. Over the same period, South Africa's trade has increased by only 5.7 per cent per annum (World Bank, 2017a). More recently, however, global trade (and indeed South Africa's trade) has contracted and during the period from 2012 to 2016, has decreased by 3 per cent per year. This contraction has occurred mainly due to an extended global economic downturn, lower commodity prices, and due to an increase in protectionist (and nationalist) policies that have been implemented by various developed countries. Trade in South Africa over the same period has decreased even more rapidly at 6.4 per cent per year (World Bank, 2017a).

Moreover, using the country's largest seaport (the Port of Durban) as a point of reference, the image of South Africa's decreased trade becomes even more apparent. Compared to its foremost regional rivals, the Port of Dar es Salaam in Tanzania, the Port of Beira in Mozambique and the Port of Walvis Bay in Namibia, the Port of Durban has grown at the slowest rate out of the four (Chapter 4 provides a complete breakdown). Frequently the automatic choice of seaport in the Southern African region, container port traffic in Durban has grown by only 3.9 per cent annually, from 2005 to 2015. On the other hand, container port traffic in the region has increased the most swiftly in Walvis Bay (12.8 per cent per annum), followed by Beira (12.1 per cent) and then Dar es Salaam (9 per cent) over the same period. Although all of these ports have grown significantly from a comparatively low base, this study will investigate the reasons behind the fact that these regional ports have all outpaced the largest port (Durban) in terms of maritime trade in Southern Africa.

As South Africa is situated along an extremely important traditional (and historical) trade route, the country's ports have, for a long time, enjoyed the role of supplier to the Southern African market (Kahn, 2011). As such, various trade routes stem from the country's ports (Figure 1-1). Over the past decade or two, this has however started to change. South Africa is starting to lose out on a large quantity of trade and/or a number of trade deals, because various logistical industry role players such as freight forwarders, logistics providers, consolidators and shipping lines are opting to go through other trade routes or corridors instead of the traditional ones in South Africa (Fraser & Notteboom, 2012). In addition, numerous Multinational Enterprises (MNEs) overlook South Africa and rather opt to set up their African headquarters elsewhere on the continent (Kahn, 2011). With the recent developments and upgrading of various ports around the Southern African region (notably Mombasa in Kenya, Beira and Maputo in Mozambique, Lüderitz and Walvis Bay in Namibia and Luanda in Angola), South Africa is losing its label as the 'gateway to Africa', with

various other African countries such as Egypt, Kenya, Mauritius and Nigeria, among others, also serving as 'gateway' destinations (The Economist, 2012).

In addition, the current trade corridors through South Africa are not operating at their full capacity due to various constraints. Issues such as increasing transportation costs, operational management of infrastructure, human resources-related problems, as well as delays due to encumbering processes have decelerated operations in South Africa's trade corridors (Badenhorst-Weiss & Waugh, 2015). Consequently, more and more trade is flowing through other routes and corridors to avoid these aforementioned constraints.

This study therefore aimed to provide valuable insights into the reasons behind the aforementioned growth in trade flowing through other ports by comparatively analysing South African ports with regards to their regional rivals. The following section explains the background to the study, which lays the foundation for the problem statement of the study.

1.2 Background

Global value chains (GVCs) and regional value chains (RVCs) have become a focal point in international trade literature over recent years. In conjunction with efforts by various international bodies, such as the World Customs Organisation (WCO) and the United Nations Conference on Trade and Development (UNCTAD), the World Trade Organisation (WTO) has been a champion of promoting the further integration of all elements within the value chain. With the WTO's new Trade Facilitation Agreement (TFA) that entered into force on 22 February 2017, GVCs are certain to become even more integrated and sophisticated (WTO, 2017a).

With the rapid integration of modern commerce, the facilitation of global value chains has become very important for developing countries, especially for African countries. The WTO expects a 14.5 per cent reduction in trade costs for low-income countries once the TFA enters into force (WTO, 2015a:5). However, as is the case in many African countries, various links within value chains have not developed at a parallel rate. Longo and Sekkat (2004) highlights poor infrastructure as the key element hampering trade in Africa. For any value chain to operate near full efficiency, all relevant chain links need to perform at the same desired level. This is no different to ports, as ports play such a fundamental role in the efficient functioning of a value chain. Therefore, when choosing from a handful of competitors, the precise selection of a port is paramount to the ultimate efficiency of the value chain.

Port selection as an isolated research subject, has been extensively investigated in the past. However, very little empirical research has focused on the subject within the African context, and even less so within the South African context. Recent trends within the field of study have migrated towards incorporating port selection as an important element within the greater value

chain system, and have thus started focussing on determining the factors that drive the choice of Port of entry as an essential element of analysing the greater value chain.

Simply investigating port selection¹ on its own will not provide clarity on the greater choice made by various role players in the value chain. As explained by Robinson (2002) and later by Magala and Sammons (2008) among others, one cannot merely examine ports as the determining factor in selecting a trade route. However, since very little research exists on the subject within the Southern African context, one cannot simply include the spill-over effects of ports into the value chain if the intricacies of port selection in the region has not yet been fully established. As the choice of port has a ripple effect in the greater value chain in Southern Africa, the analysis thereof is vital to ascertain the subsequent effects on the greater value chain.

Furthermore, since the development of a value chain tends to take place within certain regional trade routes or corridors, analysing and understanding the choice of ports along these regional routes is an important consideration for Southern African policy makers. It must be considered that, even very recently, some Southern African countries' level of value integration set off at a very low base (Allard *et al.*, 2016:1). Various value chain links were merely non-existent in these countries.

The concept of a 'value chain' has been widely defined, however for the purposes of this research, the concept is used to describe the process of receiving raw materials, adding value to raw materials through various processes to create a finished product to sell and finally delivering to end customers (Porter, 1985). It is this final stage - delivering to the end customer – that forms the focal point of this study. The question is, for maritime trade in a regional context, what drives the choice of selecting a certain port in favour of another?

Regional integration in the African context has progressed very slowly, with poor quality infrastructure being noted as one of the main concerns. In contrast, compared to the rest of Sub-Saharan Africa (SSA), South Africa's involvement in global value chains has been described as 'a bright spot' by the recent Global Value Chains Report of 2017. The report further noted that improvements in infrastructure have been identified as the greatest determinant for the potential increase in trade in SSA (World Bank *et al.*, 2017:168).

Ever since the great Dutch explorers of the 17th century set foot on South African soil, the country has become an important stopover for trade and commerce. Lead by Jan van Riebeeck, a port was established in Cape Town in 1652 (SA History, 2016). In modern times, the number of major South African seaports has expanded to eight (NPA, 2016). Since tangible international trade

¹ For the purposes of this study, the terms 'port selection' and 'port choice' are interchangeable and treated as the same concept.

cannot take place without cargo going through a port, the choice of port becomes an important consideration in the value chain as a whole. However, ports are not only important for ensuring the smooth functioning of South Africa's value chains, but also play an integral part in facilitating the bulk of the country's international trade. In addition, approximately "95 per cent of South Africa's trade volume and about 80 per cent by value is seaborne trade" (NPC, 2013:248). As some of these ports merely operate with specific functions in mind (for example, containerised cargo is handled in Cape Town, Durban, Ngqura - also known as Coega - and Port Elizabeth, while mineral bulk cargo is handled in Durban, East London and Port Elizabeth; with break-bulk cargo being handled in Durban, East London and Cape Town), port choice does not simply lend itself to choosing from a list of ports in desired geographical locations. The choice is much more complex.

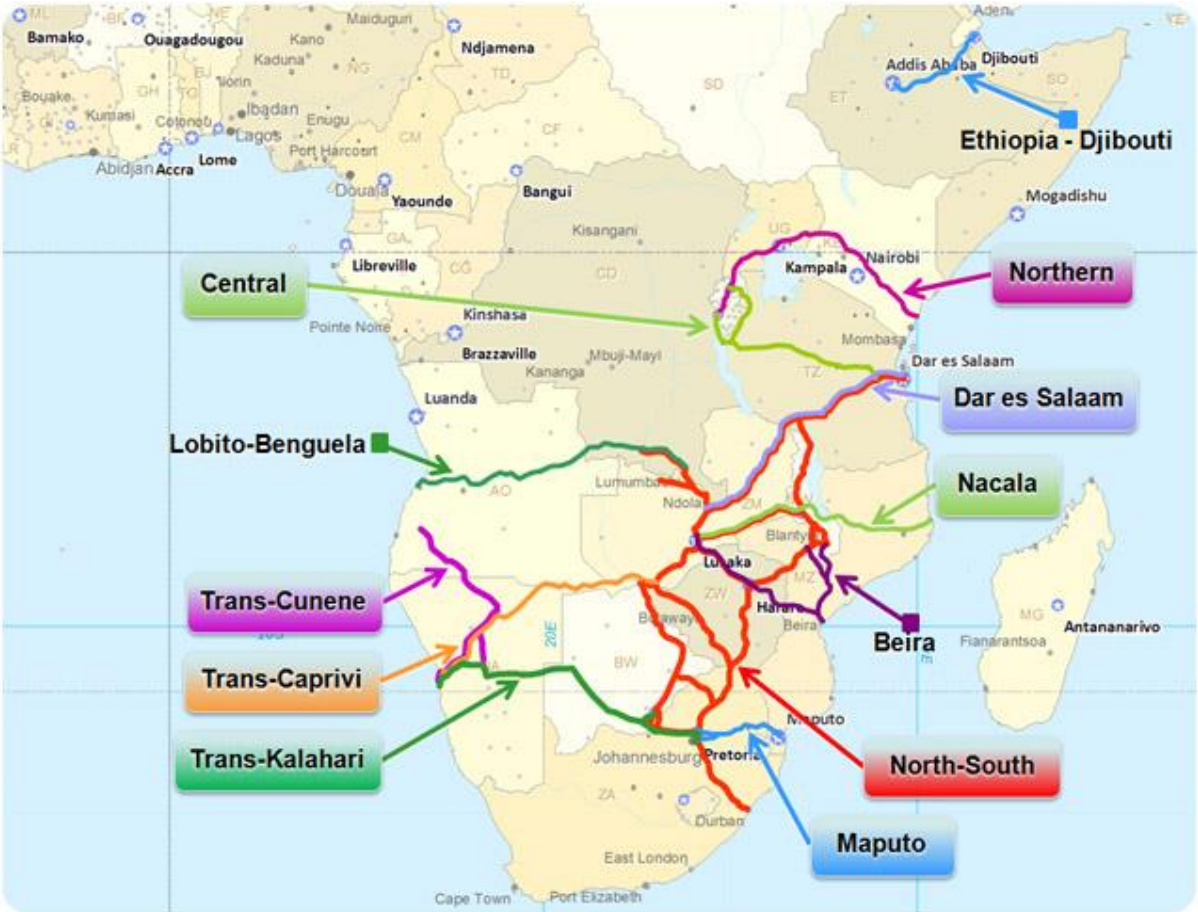
South Africa, being situated at the southern-most tip of Africa, has historically handled large quantities of the outside supply to various Southern Africa value chains. Thus, a great volume of transit cargo (South Africa's exports to BLNS – Botswana, Lesotho, Namibia and Swaziland– represents 61%, 85%, 53% and 89% of their respective imports in 2016 according to TradeMap, 2017) goes through South Africa's ports. However, the volume has subsequently diminished through time, as the emergence of other Southern African ports has occurred, providing these BLNS (and other Southern African countries) with additional trade route options. One particular factor of concern has been the efficiency of South Africa's ports. As efficiency is one of the most important factors in a freight forwarder's selection of a port (Tongzon, 2009), a sleek process within the country's ports will invariably assist in decreasing the time and cost of trade.

Efficiency, along with various other determinants of port selection, has in turn greatly increased in South Africa's neighbouring countries (as well as other SADC member countries). Of course, as mentioned earlier, some ports in question had very little foundations to start off with. Various Southern African ports have experienced increases in trade volumes that dwarfs against the volume increases experienced by established South African ports. This has culminated into new trade corridors coming into existence. No longer does Southern African trade exclusively flow through South African ports, with the choice of port having significantly expanded. The following illustration prominently attests to that.

As Figure 1-1 clearly indicates, various trade corridors now firmly exists in the Southern – and Central parts of Africa. If one compares that to the bleak picture some 20 years ago, a substantial expansion has taken place. For example, the Port of Walvis Bay handled a meagre 25 678 TEUs (twenty-foot-equivalent units) of containerised cargo in 2001 (NAMPORT, 2006), whereas the port handled in excess of 250 000 TEUs in 2014 (NAMPORT, 2015). In addition, as Figure 1-1 attests, the Port of Walvis Bay is now the starting point of three trade corridors in Southern Africa, namely the Trans-Cunene corridor, the Trans-Caprivi corridor and the Trans-Kalahari corridor.

Although trade flowing to various economic hubs in Southern and Eastern Africa is still dominated by the North-South corridor (which originates in the Port of Durban), both the Port of Beira and the Port of Dar es Salaam have broken the monopoly of the North-South corridor. The question that subsequently arises is just how much of the aforementioned trade stems from the emergence of Southern African ports, compared to the quantity of trade traditionally flowing through the Port of Durban?

Figure 1-1: Trade corridors in Southern Africa



Source: *Transport World Africa* (2015)

A considerable sum of the deferred trade has resulted from foreign direct investment (FDI), with various programmes put in place to increase African trade by means of infrastructure upgrades. These infrastructure upgrades are continuing in Namibia and Tanzania (Reuters, 2017; Musariri, 2017), with vast sums of money being spent on port infrastructure upgrades. Other notable programmes also include the building of railways and highways in central parts of the continent, with China increasingly their already significant footprint in Africa (Mutiso, 2016). These upgrades have mostly taken place in countries other than South Africa, since infrastructure in South Africa’s trade corridors is already of a relatively higher quality compared to the country’s regional rivals. Infrastructure upgrades, as well as the overall state of Southern African infrastructure are discussed in depth in Chapter 4.

1.3 Problem statement and research questions

No empirical literature exists in explaining port selection within the South African and greater Southern African context. Shedding light on this research subject is important since South Africa's ports are threatened to lose its competitive position in a regional context. To realise the competitive position of each port within the Southern African region, the determinants that drive the selection of a Southern African port by various role players should be investigated. Since port play such an integrated role within the greater trading environment in the region, the role of port selection within the broader scope of trade corridor decisions in Southern Africa should also be investigated. In order to address the research problem, South Africa's main seaport was compared to those in the greater Southern African region to better understand its current competitive position.

The questions regarding port selection in Southern African that seem to be most prominent are:

1. What are the traditional determinants of port selection as suggested by existing literature?
2. What are the determinants of port selection within the Southern African context?
3. How does South Africa's main port, Durban, compare to others in the greater Southern African region?

Summarising these three main questions into a cohesive research question leads to the following question which this study aimed to analyse:

What drives the selection of a port within the Southern African context?

1.4 Objectives

The core objective of this study was to comparatively analyse port selection in Southern Africa. Furthermore, this study aims to provide valuable insights into the reasons behind growth in trade flowing through other region ports by comparatively analysing South Africa's foremost port – the Port of Durban – with regards to their regional rivals. Additional objectives were to first determine the general criteria of port selection as suggested by existing literature, then to investigate the criteria of port selection in Southern Africa. In addition, the objective was to investigate the importance of viewing port selection as a significant element in the value chain rather than to view it in isolation. Listed specifically, the research objectives are:

1. To establish the traditional determinants of port selection as suggested by the literature.
2. To establish the determinants of port selection within the Southern African context.
3. To compare South Africa's ports to those in the greater Southern African region, and analyse the significance of the results according to the determinants of port selection.

1.5 Motivation

Port selection has been extensively studied in the past, with an initial focus on Western European countries such as The Netherlands, Belgium, Germany and Spain (Pearson, 1979; Willingale, 1981). Following in the rich history of maritime trade within this region, the conceptualisation of theories is therefore chronologically and geographically accurate (Chapter 3 provides an extensive background of the research subject of port selection). Thereafter, the subject was similarly studied in other developed countries, such as The United States and Australia. Consequently, as with the global trends in economic growth and development and subsequently trade, scholars in Southeast Asia also started researching port selection. Such is often the case in greater industrial and economic development where a prolonged period goes by before African countries catch on. A large proportion of the delay can in fact be explained due to the geography of the continent (Venables, 2005). Consequently, very little academic enquiries on port selection have been made within the African perspective. This study aimed to bridge that gap.

The study of comparatively analysing Southern African port selection is important for the following reasons:

- Even though port selection is a widely researched topic within the context of international trade, research on the determinants thereof in Southern Africa is limited. Adding to the literature on the subject would provide a greater understanding of the subject as a whole.
- South Africa is no longer considered as the sole 'gateway to Africa' in terms of trade. In fact, various other Southern African countries also have the capacity to serve as a possible gateway destination. Comparing other Southern African countries' ports to the South African Port of Durban would provide some insight in to the reasons behind South Africa's demise.
- There has been a trend towards studying port selection not only in isolation, but also as part of the greater value chain system. This study can add to that debate and can provide role players within the international trading environment with valuable information that can guide decision-making.

1.6 Research method

1.6.1 Literature review

The research method of this study commenced with an extensive review of recent literature on port selection. The subject was studied from the perspective of various role players within international trade, including shippers and freight forwarders, carriers or shipping lines and also port authorities. Then, the case of including port selection within the greater value chain was argued theoretically by means of the systems and bundling theory, as well as substantiating the

argument with various other studies that used the same approach. Lastly, the position of port selection within global value chains was investigated.

1.6.2 Empirical study

The empirical study firstly provided an in-depth, descriptive representation around trade volumes through South African ports, after which a comparative analysis was undertaken using yearly data obtained from Transnet National Ports Authority. The empirical study provided an in-depth depiction of trade volumes through Southern African ports after which a comparative analysis was undertaken using yearly data obtained from the National Ports Authority of Namibia (NAMPORT), the Tanzania Ports Authority (TPA), Transnet National Ports Authority (TNPA), Mozambique Ports and Railways (CFM), as well as the World Development Indicators obtained from the World Bank (WB) and Global Competitiveness Indices obtained from the World Economic Forum (WEF). The most important comparative analysis that was undertaken was to compare port data from Beira (Mozambique), Dar es Salaam (Tanzania) and Walvis Bay (Namibia) to port data of Durban (South Africa), as these three Southern African ports are direct rivals to Durban in terms of volume² and geographical location.

A panel regression, using eView³ software, was then estimated on the abovementioned four ports, using the main determinants of port selection as found in the review of recent literature on the subject. As the main limitation of this study is data constraints, an econometric analysis on these selected Southern African ports spanned the period from 2005 to 2015. Conclusions and policy recommendations would thus only cover a selected period. However, as there is an evident gap within the literature, the research still aimed to make a significant contribution to the limited knowledge on the subject, especially within the Southern African region. The main question that the empirical section aimed to answer was whether the traditional determinants of port selection were also important for these selected Southern African ports.

1.7 Chapter outline

The outline of this study follows that of a dissertation. The content is presented in six chapters and is divided as follows: Chapter 1 introduces the subject matter and the research topic that is investigated. Chapter 2 presents an investigation of the current sphere of international trade, global value chains, as well as the position of port selection within this domain. Along with recent developments in global trade literature, Chapter 2 also includes a discussion of the recent Trade Facilitation Act (TFA) introduced by the WTO, and the role that ports can play in facilitating trade.

² Volume will be measured in twenty-foot-equivalent units (TEU) containers.

³ eView is a statistical econometric software package for Windows.

Chapter 3 provides an overview of recent literature on port selection. Due to the fact that very little empirical studies have been conducted on port selection within the African context, the focus is firstly on literature on port selection in Asia, Europe and North America. In addition, attention turns towards port selection in Southern Africa. Finally, an overview and short description of the main determinants of port selection is provided.

Among other aspects, Chapter 4 provides an overview of the recent trends (in various different measurements) in selected Southern African ports. The chapter comparatively analyses Southern African ports based on various macro- and micro-determinants. The macro-determinants include: distance and location: connectivity; transport cost; and trade facilitation and efficiency. The micro-determinants include: port infrastructure; port congestion; port services; and port cost and charges. The chapter also investigates the increased development within these ports, and the areas surrounding the ports, over the last 15 years. Although the focal point of this research is concerned with ports as the point of departure, broader economic indicators in Mozambique, Namibia and Tanzania were investigated and are included in this chapter.

Chapter 5 provides an empirical analysis of port selection in the Southern African context. The research method is explained and the data sources are presented. A panel model is presented, which analyses the main determinants of port selection. A comparative analysis is also investigated within the greater Southern African context.

Chapter 6 concludes the study with a short summary of the research's key findings. After the summary, policy recommendations are made as well as recommendations provided for possible future research.

CHAPTER 2: LITERATURE REVIEW OF THE INTERNATIONAL TRADING ENVIRONMENT

2.1 Introduction

This chapter provides a comprehensive literature review covering the current state of the international trading environment. The aim of the chapter is to discuss the changing nature of global trade from a historical perspective up until current times. Applicable trade theories, as well as important international role players are also discussed. Ultimately, realising the importance of ports and plotting the position of port selection within the modern international trading environment is essential to understanding the exact role and functioning of the modern-day port.

In this belligerently changing trading world, the production environment is no longer limited to fixed final goods originating from one country. In modern times, merchandise trade has become so integrated that the buying and selling of goods across various stages of the processing scale almost dominate global trade. Scrawling through catalogues and scanning through labels, the phrase “assembled in country ...” is almost as commonplace as the phrase “made in country ...”, especially with regards to high-tech consumer goods. Goods at the far end of the processing scale, such as cell phones, laptops, drones and the like are no longer “made in China” for example, but rather “assembled in China”.

The use of China as an example is fitting, since opening its borders, its subsequent accession to the WTO and ultimate dominant role in global trade, China has been at the forefront of trade liberalisation (Ianchovichina & Martin, 2001; Ianchovichina & Martin, 2004). The same can be said with regards to some of the subjects within this chapter, as China has also been a pioneer of integrating value chains in the present globalised world. The WTO has also been at the head of promoting a globalised approach by means of several initiatives, such as their “Made in the World initiative” (WTO, 2017b). Instead of assigning the full commercial supply to the final country of production, the initiative creates production chains across various nations. Through continued transparency in trade, which is one of the WTO’s principles, we are also now realising the extent of global value chain integration.

By means of extensive and highly-integrated value chains, globalisation has truly emerged in the twenty-first century, with very little delay between intertwined nodes in the value chain. This chapter therefore aims to establish a similar case for ports in the greater value chain, especially with regards to the transport and logistics sector of the end-to-end value chain, as port selection cannot be investigated on its own. It is once again worth noting that none of the studies that are discussed in this chapter focussed on Africa, let alone Southern Africa. As is the recurring theme

regarding the subject of port selection, the lack of academic literature on the subject in the African context once again indicates the necessity to narrow the gap in the literature.

The structure of this chapter is as follows: To set the scene, Section 2.2 briefly discusses the background and evolution of the most important trade theories to date in an attempt to explain why countries trade in the first place. Trade is the fundamental reason why seaports developed over time. Section 2.3 provides an overview and background of the international trading environment as it has evolved in recent years. This section includes three sub-sections covering: globalisation, global value chains and finally, the role of international trade organisations. Section 2.4 highlights the importance of ports in global trade and Section 2.5 argues the case of including ports as an important element in the global value chain. Finally, Section 2.6 concludes the chapter.

2.2 Trade theories

Over the course of the past 250 years, various theories around international trade have been formed in an attempt to explain why countries engage in trade with each another. Initially, in an attempt to foil the thinking behind the mercantilist traders of the 16th century, the following section discusses the background and evolution of the most important trade theories to date. Since the theory of international trade is a research subject in its own right, a comprehensive discussion and explanation thereof falls outside the scope of this study. The aim of the following section is therefore to provide a succinct summary of theories in international trade to highlight that the mechanisms of trade have changed over time, especially over the past few decades.

2.2.1 Classical trade theories

From around the late renaissance period up to the 18th century, the mercantilist school of thought dominated economic theory in Europe. The literature around that time implied that the prosperity of a country originated from the state's regulation of trade for wealth and growth promotion, employment maximisation, achieving a favourable trade balance and protecting home industries (Van Marrewijk *et al.*, 2007:49). Therefore, with regards to international trade, government intervened by hoarding international reserves, with the ultimate goal of increasing export growth (Aizenman & Lee, 2007:6). In this way, countries amassed wealth through the accumulation of gold and silver, and further protecting these commodities by restricting imports.

The belief behind mercantilism was that one country could only prosper at the expense of another country. By challenging the mercantilism theory, Adam Smith in 1776 introduced his theory of absolute advantage and explained how countries can benefit in trade through specialisation. When producing a similar product in a more cost-effective way than another country, a country has an absolute advantage with regards to the product. Consequently, a country should export

the products with which they enjoy an absolute advantage, and import the products with which they do not enjoy an absolute advantage. Countries are thus encouraged to focus their production on products that they can produce more efficiently and cheaply in comparison to other countries. Therefore, under the circumstances where an absolute advantage in productivity is enjoyed by two countries engaging in trade, both countries will benefit (Van Marrewijk *et al.*, 2007:50). Furthermore, consumers were encouraged to purchase goods in the markets offering the lowest prices. In contrast to mercantilism, Smith's theory of absolute advantage opposed government intervention in trade.

The early 19th century brought about Ricardo's theory of competitive advantage. He explained that countries engaging in trade could benefit even in the absence of absolute advantage. The benefit derived from the comparative difference in opportunity costs that the countries faced. Through his historical example of England and Portugal trading wine and cloth, David Ricardo explained how (through specialisation) both countries benefitted by trading with one another, even though Portugal enjoyed an absolute advantage in both goods (Van Marrewijk *et al.*, 2007:55). Therefore, the production of all goods needs to be evaluated when engaging in trade with another country producing the same goods.

2.2.2 Neo-classical trade theories

During the 1930's, Swedish economists Eli Hecksher and Bertil Ohlin brought about the foundations to the period, which is now known as the neo-classical economic school of thought. By extending the comparative advantage theory developed by Ricardo, the Hecksher-Ohlin theory was conceived with the authors claiming that most international trade patterns are determined by the differences in resources or the abundant factors of production in certain countries (Van Marrewijk *et al.*, 2007). The Hecksher-Ohlin theory explained that countries are either capital-intensive or labour-intensive and concluded that countries will specialise in the production of those goods that it is better endowed in (Krugman & Obstfeld, 2009:54). The theory was based on the idea of two countries, two products and two factors of production, namely capital and labour and was later dubbed the "neo-classical structure".

Testing the Hecksher-Ohlin theory on the US in 1953, Russian-born American economist Wassily Leontief found the theory contradictory. In the first and most famous empirical study undertaken in neo-classical economics, Leontief found that the United States has an abundance of capital-intensive goods, yet the US's exports are predominantly labour-intensive. Leontief explained the contradiction by demonstrating that US labourers enjoy increased levels of productivity in relation to their foreign counterparts (Leontief, 1953:349). It was during this time in economic history when more robust empirical work became possible. The basic structure of neo-classical trade theories

was simply not comprehensive enough to explain the changing patterns occurring in international trade.

2.2.3 New trade theories

As globalisation gathered force and the international trading environment became more complex (globalisation is discussed further in Section 2.3), traditional trade theories became ineffective in explaining why countries presently engage in trade. Classical theories principally explained specialisation, with neo-classical theories limiting the theoretical structure to only two goods, two countries and two factors of production. In the 1980s it then became apparent that the tide was turning, since countries began importing goods similar to goods produced in their domestic markets. Krugman and Obstfeld (2009) called this occurrence intra-industry trade, mentioning that the majority of trade takes place between countries that have similar resources and similar product offerings. Furthermore, new trade theories were based on the notion that international trade can still take place even in the absence of comparative advantage.

A fair amount of the new trade theory's foundation can be attributed to American economist Paul Krugman. His pivotal contribution to trade appeared in 1991, when he offered a different view on the reasons for trade and inequalities. Adding transportation costs and spatial factors of production, his theoretical contribution can be summarised in the concept of "geographical economics" (Van Marrewijk *et al.*, 2007:54). Along with further iterations to the new theory of economic geography by Krugman, the concept combines elements of international economics, industrial organisation, economic geography, spatial economics, urban economics and endogenous growth (Fujita *et al.*, 1999). Furthermore, the theory explains geographical clustering and the influence of spatial economic activity on a given region's export activity (Krugman & Obstfeld, 2009). Krugman's new economic geography neatly fits into the explanation of the second phase of globalisation's unbundling (more in Section 2.3.1) and the eventual description of a "spiked" economic ecosphere.

The theory of new economic geography is especially important with regards to this study, since the theory incorporates two fundamental elements of ports selection: transportation costs and ports as spatial entities within the greater value chain.

2.3 Overview of the current sphere of international trade

The current sphere of international trade is characterised by an acutely complex set of interconnected networks, functioning on the backbone of technology and dominated by numerous large MNCs. The goal of most prospective international firms is to join a lucrative value chain in order to reap the collective rewards. The following section provides a brief overview of the current sphere of international trade, with its focus divided between globalisation, global value chains and

some of the most important international trade organisations that have driven development in trade in recent years.

2.3.1 Globalisation

The term “globalisation” is wide-ranging and encompasses many different aspects, such as culture, geography, institutions, politics and economy (Brakman, 2006:26). For the purpose of this study, the focus is on economic globalisation, as defined by Neary (2003:246):

"Economic globalisation is the increased interdependence of national economies, and the trend towards greater integration of goods and factor markets"

The existing economic globalised environment is highly integrated and connected. So much so, that the composition of a daily-used product makes (in some cases) a total of ten country stopovers before the product reaches the end consumer. An example that is often used is the Apple iPhone 6’s production network. Although the phone is developed in the US, its components are sourced from China, Japan, Korea, Taiwan and the US to name but a few. The product is finally assembled in China after which it is shipped back to the US for final distribution (Barker, 2014).

Furthermore, the act of purchasing a new iPhone 6 from an online supplier takes mere seconds to complete. The product duly arrives a week or so later in a case where express delivery is chosen. Two factors in this example showcases the state of modern day globalisation in terms of transmission and transportation - the speed of transmission in capturing the order on the one hand and the ease of transportation for the phone to reach the consumer on the other. Advances in these two factors have been the key drivers in globalisation (Baldwin, 2012:14). However, not only do these two factors explain the role of globalisation in the case of the consumer placing an order for a new phone, but also the role of globalisation in the entire value chain of manufacturing goods such as the Apple iPhone.

The smooth functioning of modern-day transportation has made it possible to extend the value chain across many different countries, as per the above example. Also, since the knowledge, expertise and technological know-how can now be transmitted seamlessly between subsidiaries, partners and organisations alike, the technological impact of globalisation has influenced the dispersion of tasks within an organisation which can now be sent to the most suitable geographical location (Baldwin, 2012:13-15). This is the result of a truly globalised world. To fully grasp these results, a brief historical perspective of globalisation is required.

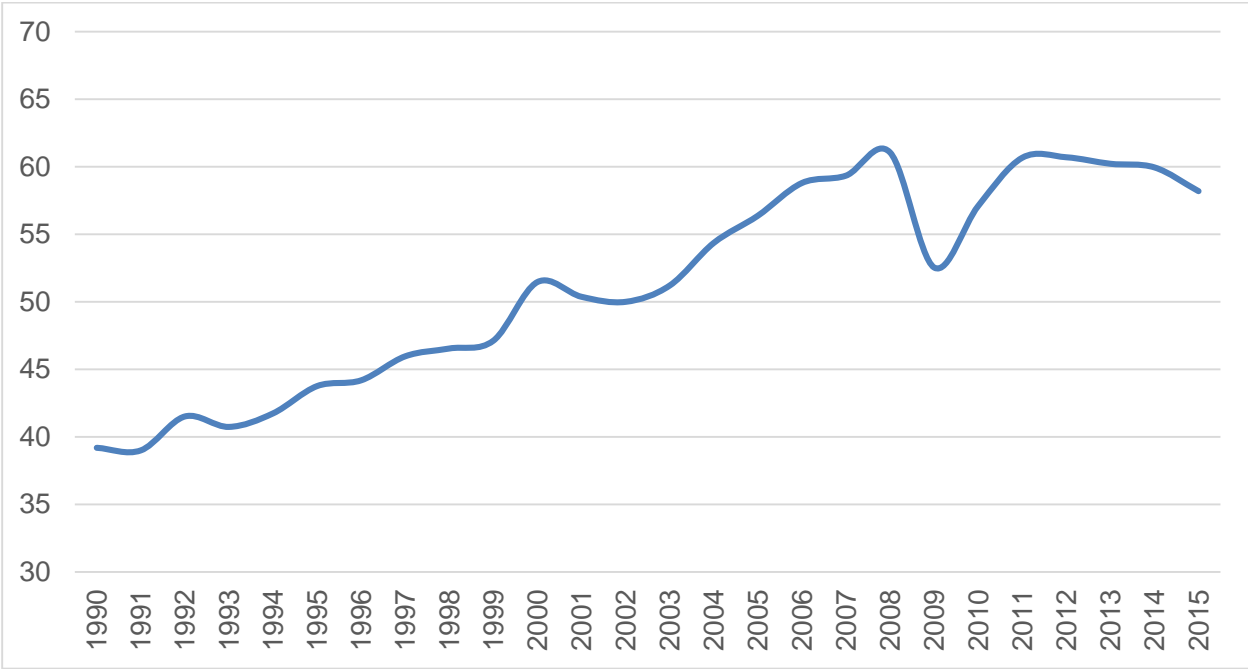
Globalisation has occurred over the course of three centuries in two phases of “unbundling” (Baldwin, 2012:12-19). The first unbundling commenced with the steam revolution starting in the

1830s. Europe, North America and Japan collectively industrialised, while notably, China and India stayed behind. The economic events that marked this period are rapid growth in the industrialised countries through innovation, economies of scale and specialisation. Furthermore, a great divergence in income was experienced between the North (Europe, North America and Japan) and the South (especially China, India and Korea), which has only started to reverse in recent times (Pritchett, 1997:5-6). The international movement of goods and labour flourished from 1870 onwards, only was halted by two world wars and a subsequent surge of protectionism after the World War II (Jacks *et al.*, 2011). Subsequently, through the liberalisation of trade policy and the role of international trade organisations like the WTO (more in Section 2.3.3), trade continued to grow. Ultimately, the world's economic geography went from homogenous (subsistence farming) to “spiky”, as production and other economic activity clustered in various locations (Florida, 2005).

The second phase of unbundling was characterised by the role of information and communication technology (ICT). For optimal production to occur in factories, a certain amount of coordination needs to take place as complex stages of various tasks typify most production processes. “The ICT revolution made it possible to coordinate complexity at distance” (Baldwin, 2012:16). The previous cumbersome transfer of technology (especially firm specific technology) was subsequently alleviated. Along with the decreases in transportation costs and the vast wage gap between the North and the South (which of course originated during the first phase of unbundling), the geographical dispersion of the production process was made profitable. This second phase of unbundling is currently continuing, with some referring to modern times as the fourth industrial revolution (Bloem *et al.*, 2014; Schwab, 2017).

The important impact of the fourth industrial revolution on trade cannot be overlooked. From the 1990s onwards, international trade has continued to increase its stake in worldwide GDP, as seen in Figure 2-1.

Figure 2-1: Trade (total imports and exports) as a percentage of global GDP (1990-2015)



Source: Author's own compilation from World Bank data (2017)

As seen in Figure 2-1, the continued growth of trade in total worldwide production is evident, which is a spill over effect of the globalisation that took place from 1990 to 2008. However, as Figure 2-1 indicates, trade experienced a decline in 2008, which was largely due to the impact and subsequent aftermath of the global financial crisis that took place that year (Chor & Manova, 2012). Following the crisis, trade's share in global GDP have not reached pre-2008 levels, with the increased role of recent protectionist policies employed (notably by the US) adding to the current situation in global trade (Irwin, 2017). Nonetheless, trade still represented more than half of the world's GDP in 2015, validating the description of “a truly globalised world”. Along with globalisation, global value chains have hallmarked the recent sphere in international trade.

2.3.2 Global value chains

The term “value chain” was first coined in the early 1980s in order to accentuate the need to integrate key business processes and ensure continuity. Through business continuity, along with a streamlined business approach, value chains are able to manage operational risks and provide cost saving approaches to the business, as well as strengthen customer-supplier relations (Kildow, 2011:60).

Widely quoted, Kaplinsky and Morris (2001:4) provide a benchmark definition of a “value chain”:

“The value chain describes the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use.”

Within this benchmark definition, this research focused on the penultimate phrase, the “delivery to final consumer”. However, before one can explain delivering the final goods to final consumers in modern times, a brief historical perspective needs to be explained. With the liberalisation of trade policies and the role of various international trade organisations (more in Section 2.3.3), goods and labour became more mobile during this time. In trade, the focus also shifted from a country-level to a firm-level perspective (Bernard *et al.*, 2007).

Michael Porter (1985) introduced the world to the competitiveness theory, explaining that firms spend too many resources on the performing stages and support activities where they do not enjoy a competitive advantage. He proposed that firms should rather focus on the tasks within the value chain in which they enjoyed a competitive advantage and outsource all the other tasks. Subsequently, he popularised the value chain concept (Baldwin, 2012:27). Porter explained the value chain as a single stage of operations, optimally taking out pre-fabrication, as well as post-fabrication stages and other support activities. The focal point of his argument was to apply the Ricardian principle (as mentioned in Section 2.2.1) of comparative advantage to firms’ value chains in order to achieve competitiveness.

The competitiveness theory came about in a time following the phenomenon of intra-industry trade. Intra-industry trade was realised in the formation of the European Common Market (Van Marrewijk *et al.*, 2007:202). With trade policies more liberalised, countries within the market imported and exported similar goods. Intra-industry trade can be explained by the fact that consumers demand different varieties of similar goods. It is at this juncture where it is also worth noting the impact of the Dixit-Stiglitz model of monopolistic competition, where firms should offer market solutions (or product diversity) at the appropriate profit margins, while taking into account the consumer’s surplus (Dixit & Stiglitz, 1977:308).

Being competitive while still providing consumers with a variety of choice was key to MNCs continuing their existence in a time when the ICT era came about, shaping the future environment of global value chains. This necessity can be highlighted by the fact that a mere 60 US-based MNCs that were listed in the Fortune 500 in 1955 were listed in 2016 (Perry, 2016). Furthermore, in this fast-paced consumer world we live in, change is inevitable. As the world changed due to globalisation, firms and their relevant value chains changed as well. Therefore, Baldwin encouraged firms to move away from Porter’s framework in modern times (2012:27).

Moving towards a modern framework, Baldwin (2012:27) unbundled the value chain in four levels of aggregation: products, stages, occupations, and tasks. Each of these four “operations” are geographically dispersed to the optimal location within the value chain. These four levels are coordinated through two ICT channels, namely communication and organisational technologies. Each level of aggregation also demands operations of various skills or technology levels. In the case of a low-skill or low-technology operation, geographical dispersion will result in the operation being sent to a low-wage location. Conversely, a high-skill or high-technology operation will be dispersed to the high-wage location. In essence, the value chain is unbundled in a functional way that results in operations that have more homogenous skills or technology demands.

GVCs have greatly contributed to the international fragmentation of merchandise trade, especially in the manufacturing sector (WTO, 2017c:43). Ultimately, the geographical unbundling of the value chain has created hub and spoke networks (as seen in the Apple iPhone example). The hub-and-spoke can also be applied to South Africa’s position in Southern Africa, as the country serves as the gateway to numerous Southern African value chains (Games, 2012).

As with all value chains, the external trading environment needs to be conducive to the optimal functioning thereof. Over the course of the last 80 years, various international trade organisations have pushed for a trading environment, which is more free and open. The following section briefly discusses some of the most important international trade organisations that have aimed to aid global trade.

2.3.3 International trade organisations

The cornerstone of modern day international organisations was laid during and in the immediate aftermath of World War II. On New Year’s Day 1942, US president Franklin D. Roosevelt first coined the name the “United Nations” (UN) in the declaration of the UN when 26 country’s representatives pledged their governments to continue fighting together against the Axis Powers of Nazi Germany, Italy and Japan (UN, 2017). When the war ended, the UN officially came into existence and on 24 October 1945, representatives of 50 countries gathered in San Francisco at the United Nations Conference on International Organisation to draw up the United Nations Charter (UN, 2017). Poland was not present at the time, but later signed the Charter to become one of the 51 original Member States of the UN. South Africa, incidentally, was also part of the original 51 member countries.

The establishment of the UN marked the foundations of the collective system of international bodies, later known as the “United Nations Family” (Van Marrewijk *et al.*, 2007:241). The UN was used as the initial medium of consultation, although the most important organisations were eventually situated outside of the UN (van Marrewijk *et al.*, 2007:242). The international

organisations in question were the International Monetary Fund (IMF), the World Bank (WB) and the General Agreement on Tariffs and Trade (GATT). The GATT later became the World Trade Organisation (WTO). With regards to international trade, the GATT/WTO is where this section on international trade organisations will focus.

Since the US Congress did not ratify the originally proposed International Trade Organisation (ITO) in the post war period, the General Agreement on Tariffs and Trade (GATT) was formed in 1947 with headquarters in Geneva, Switzerland. With the view to restore an open, unrestricted and multilateral trading environment, the GATT agreement was based on three principles, namely: non-discrimination, reciprocity and the prohibition of trade restrictions other than tariffs (Van Marrewijk *et al.*, 2007:243). After the establishment of the GATT, a series of trade liberalisation rounds ensued. Starting in 1948, tariffs levels were at approximately 52 per cent compared to the levels in 1930. After the completion of the complicated Uruguay round in 1994, the average tariff rates were reduced to approximately 15 per cent of the 1930 tariff value (Van Marrewijk *et al.*, 2007:157). The GATT was used as a basis for international trade until it evolved into a fully-fledged international organisation, namely the WTO, on 1 January 1995 (Van Marrewijk *et al.*, 2007:246; WTO, 2017d).

In terms of the trade environment currently, the WTO is the sole global organisation that deals with the rules of multilateral trade. Furthermore, the WTO acts as a forum for negotiating trade agreements and settles trade disputes through its trade dispute settlement body. Finally, the WTO assists developing nations with their global trading activities. To summarise the role and function of the WTO, the WTO lists their primary purpose as “to open trade for the benefit of all” (WTO, 2017d). As a showcase to the importance of the WTO as an international trade organisation, more than 98 per cent of global trade takes place between WTO member countries. Currently, 164 countries are WTO members, with Afghanistan and Liberia being the most recent additions, both joining in 2016 (WTO, 2016).

As with the establishment of the WTO, another substantial agreement was reached at the completion of the Uruguay round, namely the General Agreement on Trade in Services (GATS) (Van Marrewijk *et al.*, 2007:246). Additionally, on 1 January 1995, the GATS was inspired by principally the same objectives as its equivalent in merchandise trade, the GATT. These objectives were: creating a sound system of international trade rules for services, fair competition through non-discrimination, stimulating economic activity through guaranteed policy bindings, and finally, encouraging trade and development through progressive liberalisation (WTO, 2017e).

Along with the GATT and GATS, the WTO governs trade rules around intellectual property rights. Similar to the GATS, the Trade Related Aspects of International Property Rights (TRIPS) agreement was also concluded with the completion of the Uruguay round and attempted to narrow

the gap in the way intellectual property rights are protected around the world (WTO, 2017f). The agreement sets the minimum level of protection that each WTO member has to offer another member in terms of intellectual property. Although their contributions to global research and development is negligible, the agreement also provides assurance to developing nations of their innovations and inventions, which is especially important within the scope of the fast changing ICT environment (Correa, 2000:3). The TRIPS agreement is also based on the basic principles of the WTO.

The final discussion around the WTO concerns the recently ratified Trade Facilitation Agreement (TFA). As mentioned in Section 1.2, the TFA came into play on 22 February 2017 after two-thirds of the WTO membership completed their domestic ratification process (WTO, 2017g). The primary aim of the TFA was to decrease the time and cost of trade by simplifying the required paperwork, modernising procedures and harmonising customs requirements. The WTO argued that many countries and firms alike (especially those in developing countries) are left on the fringes of global trade. Along with the premise of globalisation, the implementation of the TFA aimed to facilitate firms and countries to seamlessly join global value chains and benefit from trade. The WTO estimates that the full implementation of the TFA will reduce global trade costs by an average of 14.3 per cent and add a further 2.7 per cent to world export growth and more than 0.5 per cent to global GDP in the 2015-2030 year period (WTO, 2017g).

The impact of the TFA on ports will be realised in the next couple of years, especially around the movement and release of goods in and around ports. Customs procedures vary widely between countries, with the WB reporting that the export process involves anything between two and 11 documents and takes between six and 86 days to complete (Doing Business, 2014:147). With regards to the import process, the number of documents that are required ranges from two to 17, with the process taking a minimum of four days and a maximum of a staggering 130 days to complete. The upper limits of these parameters highlights the scope of potential impact of the TFA, especially for developing countries. The red tape around customs procedures is a cumbersome factor in doing international business with developing countries (Nanda, 2003:2624; Lawrence & Tar, 2010:32).

In addition to the WTO, two other international trade organisations are also important. The first is the United Nations Conference on Trade and Development (UNCTAD), which was set up as an intergovernmental body of the UN in 1964 to look after the needs of developing countries. The primary aim of UNCTAD is to provide developing countries with support in accessing the potential benefits of a globalised world more fairly and effectively, through analysis, consensus-building and technical assistance. This support assists developing countries to use trade, investment, finance and technology as drivers for inclusive and sustainable development (UNCTAD, 2017).

In addition to the UNCTAD, the second international organisation that merits a brief mention is the Organisation for Economic Co-operation and Development (OECD). The OECD was established in 1961 as a successor to the Organisation for European Economic Cooperation (OEED) (Van Marrewijk *et al.*, 2007:251). The objective of the OEED was to implement the Marshall Aid programme to stimulate post war recovery in Western Europe. Membership to the organisation was subsequently extended when the OEED reached their objectives. Canada and the US joined in 1961 to form the OECD, with further members such as Japan, Finland, Australia and New Zealand being included in the 1970s. Currently, the OECD comprises of 35 member countries, with their headquarters based in Paris, France. The mission of the OECD is to “promote policies that will improve the economic and social well-being of people around the world” (OECD, 2017a).

In summary, the most important international organisations and their role in shaping the international trading environment were discussed in this section. Whether the focus of the organisations are developing countries (in the case of UNCTAD), or all countries (in the case of the WTO) and all people around the world (in the case of the OECD), the focal point of each organisation is around the promotion of an environment that is conducive for trade and development.

The following section presents a more detailed discussion of the importance of ports in global trade.

2.4 The importance of ports in global trade

In 2015, world seaborne trade volumes were estimated to have accounted for over 80 per cent of total world merchandise trade (UNCTAD, 2016:6). Furthermore, containerised cargo has increased more than tenfold since 1985 (UNCTAD, 2016:7). Even though global trade has contracted over the last number of years (as discussed in Section 1.1), transporting goods via the ocean has remained the most prominent choice for trade across the globe. The reasons behind the preferred choice of ocean transport over air transport can be attributed to the vast difference in volume that each mode of transport is capable of handling. For example, a US\$195 ocean shipment can cost US\$1 000 by air (Freightos, 2016). Furthermore, with the recent developments in ship building, larger and larger vessels are now traversing the world’s oceans.

Currently, four of the world’s foremost shipping lines (OOCL Hong Kong, Maersk, MOL and MSC) have at least one ship within their fleet that is capable of transporting in excess of 19 400 TEUs in a single voyage (Maritime Insight, 2017). Unfortunately, not all global ports can accommodate these gigantic vessels currently. Therefore, it is of vital importance that, as advances in ship building are made, concurrent advances are being made in port infrastructure to further increase

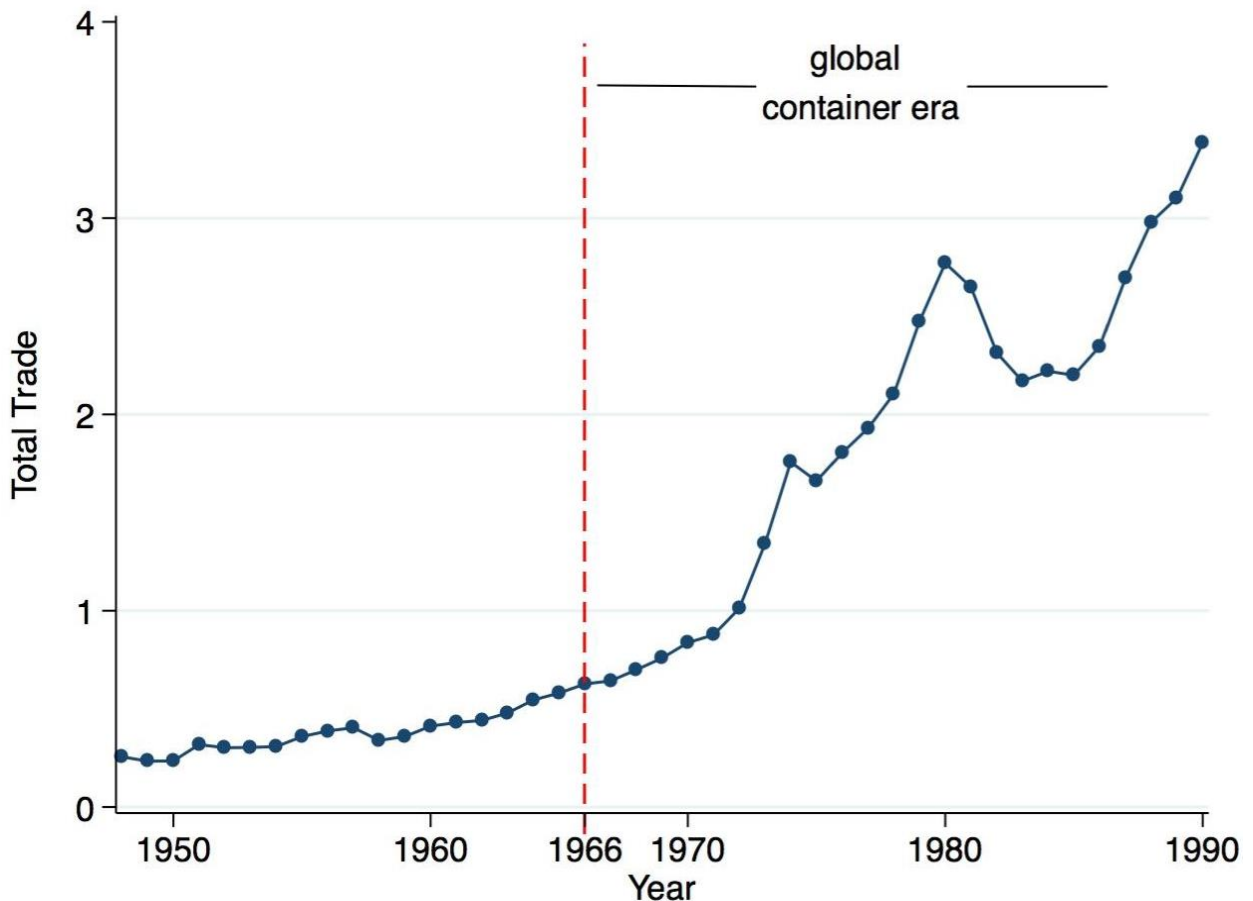
the number of ports at which these modern shipping marvels can call. This is especially true in the African context. Calling at an increased number of global seaports will undoubtedly be a prerequisite in further linking trade hubs with their hinterlands⁴ and vice versa. Without increasing the number of ports at which to call, the sheer size of these vessels will be wasted, which highlights the importance of ports in facilitating global trade.

As with the aforementioned parameter shift in the spheres of global trade, the emergence of mega ships is not isolated. It was indeed at a much smaller physical level, which pioneered this parameter shift. The end of World War II marked the first significant drive in global trade. In the aftermath of the war, many countries liberalised their trade policies and encouraged trade with one another. However, it was not until the early 1970s that international trade truly took off. As Bernhofen *et al.* (2016:2) put forth, literature has provided two broad explanations behind the growth of the international trade. One being the liberalisation of policies, and the other being the declines in transportation cost lead by advances in technology. It is this second explanation, declines in transportation costs, in which the theme of this specific study is incorporated.

However, as Bernhofen *et al.* (2016) further explain, advances in international trade were not only due to declines in transportation cost, but also due to the advent and international adoption and implementation of containers. Drawn up by the authors, the following figure shows the growth of world trade after World War II.

⁴ Notteboom (2008:4) defines a hinterland as “the area over which a port draws the majority of its business”. He does however warn to not treat the concept as static, especially within the dynamic nature of global markets.

Figure 2-2: The growth of world trade (1948-1990, deflated)



Source: Bernhofen et al. (2016)

Figure 2-2 clearly indicates the impact of containerisation on global trade. From the year 1966 – the dawn of the “global container era” – worldwide trade rapidly accelerated. Efficiency was the key, as goods could be shipped from their origin to their destination without the need for excessive and unnecessary handling. It is however worth noting that it was not the seaports that initially handled the containers.

The first container cranes were gantry cranes that were mounted on ships and not on the quays. Nevertheless, it did not take long before the gantry cranes were shifted to the shore. Sealand introduced their first A-framed ship-to-shore crane around 1966 in the Port of Seattle (Achterberg, 2012:7). Almost parallel to the emergence of containerisation, seaports around the globe were equipped with large gantry cranes required to handle containers from the 1970s onwards. In this way the relationship of containerised cargo and seaports began, which is why container volumes are an important measurement variable in most research surrounding ports.

The importance of ports for trade can be further emphasised by the recent ratification and implementation of the WTO's TFA (WTO, 2017a). Although the TFA will mostly create

opportunities to improve the speed and efficiency of border procedures through harmonisation and simplification of trade documents and customs procedures (that is, “soft infrastructure”), the role of ports cannot be neglected (in this case, “hard infrastructure”). The question whether one should indeed include hard infrastructure in the definition of trade facilitation, was raised in the 2015 World Trade Report published by the WTO (WTO, 2015b). Since the WTO (2015b:35) has, in the past, intentionally shied away from defining “trade facilitation” as such, attention should be turned to academic literature on the subject. Of the five studies mentioned by the WTO, two studies included hard infrastructure in their definition of trade facilitation. These were the studies by Duval (2007) and Portugal-Perez and Wilson (2015).

Whether or not hard infrastructure is included in the definition of trade facilitation is not necessarily important, as the net impact of trade facilitation (assuming the impact estimated by the WTO does indeed materialise) on ports would be similar. For instance, as the speed of border procedures increase, the pressure on port handling facilities will increase, because the difference in the time between goods arriving at the port and being handled (in other words “approved for import”), will decrease according to the TFA. Therefore, it is paramount that hard infrastructure, such as ports, improve in parallel with the soft infrastructure laid out by the TFA.

This section therefore emphasise that, not only are ports important for global trade, but the improvement thereof is also vital for global trade. The following section will investigate the inclusion of ports as part of the global value chain.

2.5 Port selection as part of the global value chain

Historically, port selection as a research subject has been studied in isolation. Research questions have largely been based on “what drives the choice of selecting one port over another?”, which is similar to the aim of this research. However, with the rapid integration of all elements within the value chain from origin to destination, some authors argued that it is paramount that the selection of a port is made in conjunction with the greater value chain system. This is especially true with regards to the transport and logistics’ element of the value chain system. Although revealed in some earlier studies regarding port selection, no empirical evidence existed until Robinson (2002) vehemently argued the case for investigating port choice models within an extended framework rather than merely selecting ports from a list.

In his article, titled, *Ports as elements in value-driven chain systems: the new paradigm*⁵, Robinson (2002) put forth a model that includes factors before and after port choice. He stated

⁵ The paradigm shift put forth by Robinson was done on the basis of the systems theory. Developed by the Austrian Biologist Ludwig von Bertalanffy (1968), the systems theory (also called the bundling theory) states that rather than to reduce an entity to the properties of its parts, systems theory focuses on the arrangement of and associations between the parts which connect them into a whole. The author

that ports are now seen as elements in the value chain, compared to an isolated choice in shipping. Furthermore, Robinson (2002) argued that ports and their authorities should position themselves in such a way that ports are included in the entire environment of the value chain. In other words, to offer a complete package of services to accommodate services before, in and around, and after the physical port. Additionally, restructuring has become commonplace in modern value chains, which is why it is important for the role players within those value chains to be proactive rather than reactive.

In fact, even before Robinson suggested the paradigm shift, concepts around a greater value chain were entertained. Although not in direct conjunction with port choice and its position in the entire value chain as such, but rather in terms of multi-stage value chain modelling, Beamon (1998) introduced a concept arguing that the supply chain should be studied as an integrated approach. The performance, design and analysis of the chain should not be focused on various processes, but rather on that of the chain as a whole.

Since the initial foray by Robinson (2003; 2006; 2007) into the paradigm shift, subsequent studies have been published promoting this approach further. For example, Tongzon (2008) echoed this viewpoint in his findings. Similarly, a few other authors agreed with the notion that value chains should be selected, not only ports, although their studies did not explicitly argue the case (Nugroho *et al.*, 2016; Vermeiren & Macharis, 2016). On the basis of concluding that determinants such as “feeder network” and “hinterland connectivity” were identified as being significant in explaining port selection, it can be easily argued that the authors in fact made attempts to include port selection as part of the greater value chain. It is on these determinants of networks and connectivity that a lot of research was based (Tables 3-5 and 3-6).

Robinson and Weston (2008) explored the concept of value migration and profit pools in two industry concepts. The authors argued that, since a disintermediation of non-adding and non-performing value chain players exists, restructuring continues to occur at port-orientated value chains. They also found that value is added and profit is realised through role players identifying value chain integration by means of the systems theory explained previously.

To supplement the case for the systems theory, Magala and Sammons (2008) argued the importance of viewing port selection as part of the greater value chain system rather than in isolation. The authors put forth the notion of shippers no longer choosing a port, but rather an extended value chain. They attribute the change in thinking to the competitive nature of the

explains that, contrary to the ability of an element, a system has the ability to interact with its entire environment, as well as evolving in such a manner that the system can acquire new properties conducive to its environment. Theoretically, the theory states that the system’s output is always greater than the sum of its parts.

industry, as well as the accelerated pace at which globalisation is occurring. Furthermore, Magala and Sammons (2008) conclude by suggesting that discrete choice modelling should be viewed as the preferred method when selecting a port encompassing system.

Two prodigious researchers in maritime economics, Notteboom and Rodrigue (2007) claimed that through the integration of global freight transport, improvements in maritime shipping are primarily consequential due to improvements in hinterland transport systems. This is because the dynamic nature of both the maritime shipping and the inland transport system is so inextricably linked. Notteboom and Rodrigue (2007) argue that ports have become regionalised entities, clustered into functionality according to the greater hinterland that it serves. Due to the nature of global commodity chains (including goods being country-specific, demands for increased variety and shorter product life cycles) the functional integration of ports goes beyond just manufacturing, but also includes transportation. Port selection is therefore not only based on a port, but on a greater supply corridor.

In their article, titled: *The future of containerisation: Perspectives from maritime and inland freight distribution*, Notteboom and Rodrigue (2009) once again concluded that the future of containerisation lies with the inland transport systems, and not the maritime system. This supports their idea of treating ports, as well as its ensuing and preceding elements, as part of the value chain as a collective entity.

Notteboom (2008) investigated the impact of both horizontal and vertical integration in the relationship between seaports and the intermodal hinterland systems. Similar to the approach in this study, Notteboom (2008) approached the dynamics of port-hinterland from the perspectives of various role players in the value chain. Also echoing his earlier studies, the author brought forward the idea that port competition is moving offshore as capacity constraints are resulting in market role players securing terminal and corridor capacity. Inter-modality, as the author contends, serves as the ultimate weapon in port competition (Notteboom, 2008:37). Not only does this conclusion highlight the case of evaluating decision based on multiple elements in the value chain (such as ports and its hinterlands), but also the case of evaluating service decisions on multiple role players (transport operators, shipping lines and port authorities).

Similarly, Talley (2014) divided cargo shipping role players into distinct groups and examined the maritime transport chain from the perspectives of carriers, ports and shippers. The author investigated arguably the most important measure on each role player's behalf: the effects of chain profit for the carrier, throughput for the ports and logistics cost accruing from a shipper's transport chain. Talley (2014) concluded that all three measures have both direct and indirect effects on the choice of maritime transport chains, indicating the reciprocal nature of the transport

chain. Collectively summarising the maritime transport chain, Talley (2014:178) defined it as “a network over which carriers, ports and shippers are involved in the movement of cargo”.

Rodrigue and Notteboom (2009) continued with their research on value chain integration by discussing how the increasing nature of “terminalisation” is adding new dimensions to logistics. Rodrigue and Notteboom (2009) contended that due to increasing levels of vertical integration in the market, seaport and inland terminals are now supplying customers with “extended gates” and “extended distribution centres” as part of their port regionalised strategies. These strategies include berthing windows, dwell time charges and truck slots. However, Rodrigue and Notteboom (2009) noted that “terminalisation” is in fact an unintended consequences of market needs. Whether it is intended or not, “terminalisation” does indeed add to the unique evolution of global value chains (Rodrigue & Notteboom, 2009). Furthermore, through the increased levels of integration, containerisation is more than likely entering a maturity phase with growth levels expected to slow down. It should however be noted that their findings were investigated from a European and a North American perspective.

In 2010, Rodrigue and Notteboom further examined ports and their role in the global value chain evolution. This time around, Rodrigue and Notteboom (2010) contended that not only does regionalisation occur with regards to the hinterland, but that regionalisation also takes place with regards to the foreland. Rodrigue and Notteboom (2010) analysed elements such as location and technical and market-related factors to determine the proposed foreland-based regionalisation. The study was concluded by stating that containerisation is maturing, a similar conclusion as their previous research on “terminalisation” (Rodrigue & Notteboom, 2009). What is apparent in their research is that Rodrigue and Notteboom (2009) were convinced that analysing the logistics elements of the value chain is no longer applicable to modern times and that a new era is dawning on the maritime transport industry. According to Rodrigue and Notteboom (2010), all decision should therefore be based on the collective functioning of the chain with regards to transport and logistics.

Up until this point in time, a number of authors put forth the argument of including ports in the context of supply chain management, however limited empirical evidence existed to confirm the integration of ports into the greater value chain. Panayides and Song (2009) bridged this gap by developing measures of seaport integration in global value chains. Panayides and Song (2009:133) established four key measurement parameters from the literature, namely: “information and communication systems, value-added services, multimodal systems and operations, and supply chain integration practices”. In an attempt to validate existing literature of postulated seaport and extended value chain integration, their study provided stakeholders and interested parties with measurement parameters whereby aspects such as competitiveness, cost comparison and terminal performance can be assessed (Panayides & Song, 2009).

In a recent study by Loh and Thai (2016), a management model was proposed to cope with port-related supply chain disruptions. Adding to the recent growing literature that included ports as part of the value chain system, the authors used survey data that was completed by port operators and port authorities to validate their model. Their results indicated that the proposed model, which incorporates risk management, business continuity management and quality management principles, ultimately has a positive impact on port performance in terms of financial health and market reputation. Even though the research does not aid in explaining port and/or value chain selection as such, it does indeed indicate the extent at which the academic fraternity has acknowledged ports as essential components within the value chain, as first proposed by Robinson (2002). Ultimately, by incorporating ports into extended value chains, supply chain disruptions can decrease and port performance can subsequently be improved.

To further outline the positive impact of integration, Seo *et al.* (2016) investigated the influence of supply chain collaboration on collaborative advantage and port performance in maritime logistics. Focussing on the relationship between terminal operators and port users within the container sector in South Korea, their findings indicated that collaborative efforts in the supply chain resulted in collaborative advantages that in turn aid improvements in the port's performance.

With the aim of integrating ports even further into individual value chains, an industry-specific study was conducted by Stevens and Vis (2016) where the authors analysed biofuel supply chains in the Netherlands. An "integration matrix" was developed that indicated what activities a port can engage to create a more cohesive value chain from origin to destination. The case of biofuels was analysed as an example of the projected trend in global value chains. Therefore, future research is undoubtedly expected in other industries, especially with regards to tech-based value chain integration.

The increased number of studies that have in recent years focussed on the inclusion of port selection as an important element of the value chain and focussed on the entire value chain selection – not only on port selection – indicates the need to do the same with the regional ports and value chains. However as previously mentioned, no research is available on the subject in an African context. This lack of research once again indicates the necessity to close the latency gap before Africa catches up to the rest of the world.

2.6 Conclusion

The purpose of this chapter was to provide a comprehensive literature review of the current state of the international trading environment. After a discussion of relevant trade theories, the changing global environment with regards to trade and value chain integration, as well as the important international organisations in this regard, the focus of the chapter shifted to explain the importance

of ports in the global trading sphere. International trade has greatly increased since the aftermath of World War II and has accelerated even more rapidly since the 1970s with the start of the “containerised-era”.

The theoretical framework laid down by Adam Smith and David Ricardo in the 18th and 19th centuries originally explained why countries engaged in international trade in the post-mercantilist era. The absolute advantage theory of Adam Smith argued that, in order to gain from trade, countries should specialise in the production of the goods that they are best equipped to produce cheaply and more cost-effective than their trading partners. David Ricardo followed with the theory of comparative advantage, explaining that countries can still benefit from trade in the absence of absolute advantage. By extending the comparative advantage theory, Heckscher-Ohlin in the 1930s demonstrated that countries are either capital-intensive or labour-intensive and that countries should specialise in the production of those goods in which they are better endowed. However, the Leontief paradox duly contradicted the Heckscher-Ohlin theory with the case of the United States.

As with the accelerated nature of global trade, globalisation and the evolution of global value chains in the 1990s, Krugman’s new economic geography theory indicated that trade is fast becoming regional; with economic clusters forming geographically as transport cost is continually decreasing. Moreover, the focus of production shifted from being country-specific to being firm-specific. The new economic geography partially explains the formation of new value chains in a globalised world.

Seeing that the modern world has become so interconnected, it is paramount for firms to join a value chain to assist their economic growth in trade. Baldwin (2012) explained the evolution of globalisation and value chains through the two stages of unbundling. The first stage is explained by the industrialisation of the North and the de-industrialisation of the South. However, hallmarked by the ICT revolution from the 1970s onwards, the South (especially China, Korea and India) caught up in the second stage of unbundling. The question of when Africa will catch up also arises in this regard. Globalisation and global value chains furthermore explain the continued role of trade in worldwide production, which is evidently illustrated by the continual growth of trade’s share in global GDP.

Bearing in mind that trade needs to be facilitated and governed, the role of international trade organisations is imperative in ensuring the global trading sphere is conducive for trade, which is why there should be an understanding of the role of the WTO and its agreements. As the global trading sphere has become a lot more liberalised, the recent ratification of the TFA is particularly important in moving forward even further. The agreement will duly assist in creating a more

simplified, harmonised and modernised approach to customs requirements which is an important consideration for the role of ports in global trade.

Since ports are necessities in facilitating the flow of goods across borders, realising their role is essential when considering that more than 80 per cent of total merchandise trade is seaborne. As such, the importance of including ports as a vital element in the value chain is evident. As the literature on this subject also indicated, ports are vital elements within the greater value chain system. However, before one can realise a port's function as a node in a network, it is first necessary to investigate a port on its own. Regrettably, very limited literature exists in the Southern African region in this regard. Bearing this in mind, the objective of the next chapter is to provide background of port selection, firstly from a global perspective and then from a Southern African perspective.

CHAPTER 3: LITERATURE REVIEW OF PORT SELECTION

3.1 Introduction

This chapter provides a contextual and theoretical background relating to existing literature that is relevant to port selection. Since realising the important role that ports play in trade and in value chains in Chapter 2, it is paramount to study the subject on its own in more depth. This chapter therefore aims to investigate all the relevant literature on port selection from the perspective of various important role players in the trading environment.

After a wide-ranging review of literature on the subject, the main determinants of port selection are examined, with the aim of determining the main drivers that shippers, freight forwarders, carriers and shipping lines, as well as port authorities and terminal operators face in choosing one port over another. The theoretical foundation and literature overview presented in the first three sections of this chapter provide the basis from which this can be answered, as the identification of these drivers are important for the empirical analysis of the study.

The structure of this chapter is as follows: Section 3.2 starts off by providing a global perspective of port selection. The section is sub-divided into the perspectives of shippers, freight forwarders, carriers and shipping lines, as well as port authorities and terminal operators. Section 3.3 then presents the subject from a Southern African perspective. This is followed by an overview and summary of the main determinants of port selection found in the literature in Section 3.4. Finally, Section 3.5 concludes the chapter.

3.2 Port selection within a global context

Since no standard definition exists for the term “port selection”, there is a need to define the term based on existing literature. Based on an extensive literature review, for the purpose of this study port selection can be defined as the systematic process of selecting one seaport over another by means of a specified list of determinants. The subject has been studied over the course of the last 40 years, with most studies focusing on port selection from the perspective of a specific role player in the value chain, such as a shipper, a carrier or an authority. Some studies refer to “choice” rather than “selection”, however for the purposes of this specific research, the terms “port selection” and “port choice” are treated as the same concept. The aim of this section is to review the subject of port selection from a global perspective.

When first investigated, the factors that influence port selection have been found to be port schedules, frequency of calling vessels, the variety of shipping routes and the accessibility of the port (Pearson, 1979). According to Willingale (1981) factors include the navigation distance,

hinterland nearness, connectivity to ports, port facilities, availability of port and port tariffs. In addition, Collison (1984) lists average port waiting time, confidence in port schedules and port service capacity, whereas Slack (1984) lists calling frequency, tariffs, the accessibility to the port, port congestion and interlinked transportation networks. All of these studies were conducted in either Western Europe or the United States. Since this initial foray into the investigation of port choice, the scope of research has branched out towards a more global sphere over the last thirty years approximately. For example, Jamaluddin (1995) studied the trade linkage between the Far East and Europe and Chiu (1996) investigated the performance of liner shipping in Taiwan.

Seeing that port selection has been so widely studied in the past, an analysis of the subject within a global context is the point of departure for the next section. However, as an abundance of recent literature exists explaining the subject as a whole, the need arose to distinguish even further. Different role players within the logistics industry will undoubtedly base their decision of port on a different set of criteria. Thus, to differentiate port selection within a global context, the subject can be divided into three distinct categories: port selection based on the perspectives of shippers and freight forwarders, port selection based on the perspectives of carriers or shipping lines, and port selection based on the perspectives of port authorities (or terminal operators).

3.2.1 The perspectives of shippers and freight forwarders

Nir *et al.* (2003) studied port selection behaviour from a shippers' perspective in Taiwan. By means of survey data, three different models were identified to distinguish between shippers' choice between Taiwan's three ports. In choosing nine different factors that influence a shippers' choice of port, only travel time, cost and distance were established as significant. As a general rule, it was found that shippers chose the port in their closest geographical proximity.

Tiwari *et al.* (2003) considered shippers' port and carrier selection behaviour in China. By virtue of a discrete choice analysis, the study's aim was to establish the most important factors that determine the choice of shipping line-port combinations based on fourteen possible combinations. Using survey data from shippers of containerised cargo in China in 1998, it was found that distance (in both the cases of importers and exporters), port congestion and the shipping lines' fleet size played an important role in the choice of port.

The first study on port selection from an African perspective was undertaken by Ugboma *et al.* (2006) and investigated the service characteristics that are important to shippers when selecting a port in Nigeria. The shippers were first questioned on pairwise comparisons between seven criteria that the authors identified as important to port selection. The study then made pairwise comparisons of four Nigerian ports with respect to the identified criterion. The study's results

indicated that service efficiency, the frequency of ships visits and adequate infrastructure were considered as important for shippers in Nigeria.

De Langen (2007) analysed port competition and selection for cargo to and from Austria. As a landlocked country, Austria's port competition is spread across multiple regional ports throughout Europe. In the study, four relevant factors were found. Highlighting the fierce competition, the first factor was the volatility of market share over the years. Secondly, infrastructure upgrades with the opening of the Rhine-Main-Donau Canal immensely increased the competitiveness of the Ports of Rotterdam and Antwerp. Thirdly, the demand for port services was more price-elastic for freight forwarders than for shippers - this factor also contributes to the fact that port choices are made rationally, instead of relying purely on traditional choices. Finally, a hesitant conclusion is drawn in the study, contending that where port choice can be made across regions, variances in regions are more noteworthy than variances between ports within the same regions (De Langen, 2007).

Furthermore, Grosso and Monteiro (2009) surveyed 26 freight forwarders who were operating at the Port of Genoa, Italy to determine the main factors that influence port choice. Their findings identified four broad categories of factors as the most important, namely: the connectivity of the port, cost and port productivity, electronic information and the logistics of the container.

Another important and widely quoted study on the subject of port choice is Tongzon's (2009) study that examined port selection from a Southeast Asian freight forwarder's point of view. In the study, the integration of port selection within the greater value chain was examined, especially in developing countries. Upon evaluating the major factors (such as the frequency of ship visits, port charges and efficiency, adequate infrastructure, location, quick response and reputation for cargo damage) through data obtained from surveys, the author found port efficiency was the most important determinant of port selection.

Focussing solely on containerised imports into the US, Steven and Corsi (2012) argued that the determinants of port choice differ according to the size of the shipper. Supporting their hypothesis, the study's findings indicated that large shippers are far more likely to be concerned by factors affecting the speed of delivery (service factors), compared to factors affecting the cost of delivery (cost factors). Alternatively, smaller shippers are more concerned with factors that influences the cost of the shipment (such as freight charges). For example, in freight dollar terms, a smaller shipper is only willing to spend \$11 per shipment to avoid an additional hour in ocean transit whereas a large shipper is willing to spend \$178 to avoid an additional hour in ocean transit (Steven & Corsi, 2012:892). It is however worth noting that in global merchandise trade, time and cost are inextricably linked.

Yuen *et al.* (2012) considered eight determinants in port competitiveness from the users' perspective in five container ports in China and its neighbouring countries. Port location, hinterland connections and shipping services were identified as the most important factors in port competitiveness for freight forwarders. For shippers however, port location was also identified as the foremost factor, along with hinterland connections and port costs. Similar to previous studies, the AHP method was used in the study.

In their study of port choice among shipping lines and shippers in Australia, Ng *et al.* (2013) found inland transportation cost to be the most significant factor with regards to the shippers' choice. Using semi-structured surveys, the results were divided into two categories, namely cost factors and service factors – echoing previous research by Steven and Corsi (2012). Shippers in Australia were found to be mostly price-sensitive, with all the cost factors found to be among the top 12 most important factors to influence port choice.

Kramberger *et al.* (2015) presented a new approach on hinterland port choice modelling, based on previous port choice results. It was argued that the shipper's choice is a trade-off between various objective and subjective factors. Along with various other authors, an AHP method was implemented again in order to acquire preferred rates, combining them with objective factors. These factors included port operation costs, sailing times, and land transport costs using a mixed integer programming method. The resulting model can be used in order to produce captive hinterlands of ports and determine how changes in traffic infrastructure influence the size of the hinterlands.

In a recent study by Vermeiren and Macharis (2016), it was found that shippers are not loyal to a certain port, but they do give preference to the lowest cost solution. These results were found upon investigating the intermodal land transportation system and port choice among shippers in the Rhine-Scheldt delta in Belgium and the Netherlands. With competition so fierce (as well as sharing the same rich hinterland), focus has shifted towards the land leg of the multimodal transport system. Similarly, the results indicated that “enhancing the frequency levels of the inland transportation solution is only at the benefit of the costlier chain” (Vermeiren & Macharis, 2016:992). The need to research the topic within “a global setting considering the total transport chain instead of just one of its components” was also identified in the study (2016:1002). The aforementioned statements add to the debate that is discussed in Section 3.3.

Table 3-1 presents a summary of recent studies of port selection from the perspectives of shippers and freight forwarders:

Table 3-1: Recent studies of port selection within a global context – the perspective of shippers and freight forwarders (2000-2016)

Author (s)	Title and Publication	Method	Focus and Findings
Nir, Lin & Liang (2003)	Port choice behaviour - from the perspective of the shipper. <i>Maritime Policy and Management</i> , 30(2):165-173.	Survey	Shippers' choice between three ports in Taiwan. Travel time, cost and distance were significant, with shippers generally choosing the port nearby.
Tiwari, Itoh & Doi (2003)	Shippers' port and carrier selection behaviour in China: A discrete choice analysis. <i>Maritime Economics and Logistics</i> , 5(1):23-39.	Survey	Determining shippers' port and carrier selection behaviour in China. Distance, port congestion and shipping lines' fleet size were important in choosing the best shipping line-port combination.
Ugboma, Ugboma & Ugwude (2006)	An analytic hierarchy process (AHP) approach to port selection decisions—empirical evidence from Nigerian ports. <i>Maritime Economics and Logistics</i> , 8(3):251-266.	AHP & Survey	Upon surveying the determinants of a shippers' port selection in Nigeria, service efficiency, frequency of ships visits and adequate infrastructure were found to be the most important.
De Langen (2007)	Port competition and selection in contestable hinterlands: The case of Austria. <i>European Journal of Transport and Infrastructure Research</i> , 7(1):1-14.	Survey	Port competition and port selection for cargo to/from Austria. Changes of market shares over time of different ports serving Austria were analysed.

Grosso & Monteiro (2009)	Relevant strategic criteria when choosing a container port - the case of the Port of Genoa. <i>Research in Transport and Logistics</i> , 299.	Survey	Four broad categories, namely: connectivity of the port, cost and port productivity, electronic information and logistics of the container were found to be the most important factors for freight forwarders operating at the Port of Genoa.
Tongzon (2009)	Port choice and freight forwarders. <i>Transportation Research Part E: Logistics and Transportation Review</i> , 45(1):186–195.	Survey	The major factors influencing port selection from the perspective of Southeast Asian freight forwarders, with port efficiency being the most important factor.
Steven & Corsi (2012)	Choosing a port: An analysis of containerized imports into the US. <i>Transportation Research Part E: Logistics and Transportation Review</i> , 48(4):881-895.	Model	Distinguishing based on the size of shippers of containerised imports into the US. Larger shippers are sensitive to speed of delivery, whereas smaller shippers are more sensitive to cost of delivery.
Yuen, Zhang & Cheung (2012)	Port competitiveness from the users' perspective: An analysis of major container ports in China and its neighbouring countries. <i>Research in Transportation Economics</i> , 35(1):34-40.	AHP	Port competitiveness from the users' perspective where port location was the most important competitiveness factor from the perspective of both shippers and freight forwarders.

Ng, Sun & Bhattacharjya (2013)	Port choice of shipping lines and shippers in Australia. <i>Asian Geographer</i> , 30(2):143-168.	Survey	Australian shippers are mostly price sensitive as “cost” factors were listed as more important than “service” factors.
Kramberger, Rupnik, Strubelj & Prah (2015)	Port hinterland modelling based on port choice. <i>Promet – Traffic and Transportation</i> , 27(3):195-203.	AHP & mixed integer programming method	Port hinterland modelling based on port choice in Europe. It was found that the shipper’s choice is a trade-off between various objective and subjective factors, such as port operation costs, sailing times, and land transport costs.
Vermeiren & Macharis (2016)	Intermodal land transportation systems and port choice, an analysis of stated choices among shippers in the Rhine–Scheldt delta. <i>Maritime Policy and Management</i> , 43(8): 992-1004.	ANOVA	Shippers have no preference when purchasing freight transportation services with intermodal land transportation options available that link Antwerp and Rotterdam with a shared hinterland.

Source: Author’s own compilation (2017)

3.2.2 The perspectives of carriers or shipping lines

Malchow and Kanafani (2001) studied exports of all shipments from the United States in December 1999 and presented the results in a multinomial logit model. Against expectations, it was found that only two of the four variables were significant. It was further established that ports become less attractive when either the oceanic or inland distance increases, as well as the shipment’s origin or destination, both with a high elasticity. The other two variables, namely sailing frequency and vessel capacity were neither significant nor as expected. The study was concluded with stating the necessity for the development of an expanded model, especially with regards to the period of analysis.

An expanded model was indeed tested three years later when the same authors, Malchow and Kanafani (2004) used a discrete choice model to analyse the distribution of maritime shipments among ten ports in the United States. It was found again that the most noteworthy characteristic of a port is its location. The study's results also indicated that the market share of each of these ports differ across the type of commodity (bulk, fruits and vegetables, fabrics and manufactured goods).

In an effort to find a market strategy for transshipments, Lirn *et al.* (2004) applied the AHP to analyse port selection from the perspective of global carriers. After finding 47 relevant service attributes by means of a literature review, the service attributes were narrowed down further by means of two rounds of surveys. "Four main service attributes/criteria comprising 12 sub-criteria" were found to be the most relevant. Furthermore, it was found that for transshipment port selection, the perceptions of both global container carriers and port service providers were comparable.

Upon assessing port selection in the Northeast region of North America, Guy and Urli (2006) suggested that shipping lines should bypass Montreal in favour of calling at New York. Using multi-criteria analysis based on the combined importance of infrastructure quality, cost, service and location, it was found that in order for Montreal to become the preferred choice, extensive hinterland coverage must be obtained. In addition, the Port of Montreal would need to perform better in terms of its costs and/or its service.

Tongzon and Sawant (2007) investigated port choice from the shipping lines' perspective in the Southeast Asian region. The study was divided into two parts: firstly, factors that shipping lines stated as being important when choosing between competing ports, and secondly, factors that were revealed to be important based on the shipper lines' actual port choices. As port operators have designed their strategies according to the stated preference from shipping lines, it is remarkable to note that no consistency between the stated preference of shippers and the revealed preference of shippers was found. In their final binary logistic regression model, the study indicated that, among the seven independent variables, port charges, port services and adequate infrastructure were the key factors influencing the choice of port from a shipping line's perspective.

Chang *et al.* (2008) identified six factors that demonstrated significance in port selection. These six factors include local cargo volume, terminal handling charge, berth availability, port location, transshipment volume and feeder connection. After ascertaining the important factors in port selection, the criteria across main haul and feeder services were compared. The study's results indicated that main haul services faced far fiercer competition, therefore requiring ports to provide more extensive and worthwhile services.

Wiegmans *et al.* (2008) examined port and terminal selection for deep-sea container operators specifically, in the Hamburg-Le Havre range. The authors analysed three different aspects, namely: buying-decision characteristics, port choice strategy and terminal selection. The results indicated that various company-level decisions were precursors to port choice that influenced the ultimate selection of a port. The most important criteria from a carrier's point of view in selecting one port over another within the Hamburg-Le Havre range is the availability of hinterland connections, reasonable tariffs and the immediacy of consumers. The study also emphasised the need to distinguish between port selection and terminal selection, as the factors influencing the selection of a port (factors such as tariffs, hinterland connections and hinterland size were identified), do not necessarily influence the selection of a terminal (as factors such as handling speed and handling cost do).

Yeo *et al.* (2008) surveyed shipping companies and owners in South Korea and China in order to evaluate the competitiveness of containers ports in these two countries. With the rapid emergence of China's ports through vast state investments in infrastructure, it was contested that the established regional hubs in South Korea were at risk. After consulting the literature on port selection and competition, it was found that port service, hinterland condition, availability, convenience, logistics cost, regional centre and connectivity were the determining factors in the Southeast Asian region. Using factor analysis, it was determined that the key aspects for port competitiveness in this region had shifted away from hardware and labour towards software and technology, implying that the most competitive ports rely on efficient hinterland logistics systems (Yeo *et al.*, 2008:920).

In support of port choice automation, Lam (2009) introduced an integrated approach for port selection, ship scheduling and financial analysis with the aim to assist ship operators in liner shipping. At the time, it was found that "many liners still perform ship routing and scheduling manually based on professional knowledge and experience" (Lam, 2009:33). However, as the age of big data continued to gather speed, the study's attempts were rather basic, at best.

Subsequently, Lam and Dai (2012) proposed a web-based decision support system (DSS) for port selection using an integrated analytical hierarchy process⁶ (AHP) method. The model

⁶ The Analytic Hierarchy Process is a multi-faceted, multi-layered decision-making technique developed by American mathematician, Thomas Saaty in the 1970s. Subsequently refined, the technique provides decision-makers with the opportunity to model a complex problem (often highly subjective) into a hierarchical structure, indicating the relationships of the goal, the objectives (criteria) and possible alternatives to each other. The process is made up of a number of components, such as the structuring of complexities, pairwise comparisons, subjective judgments, an eigenvector method for deriving weights and consistency considerations (Saaty, 1980; Saaty, 2008; Adamcsek, 2008).

incorporated an advanced interactive multidimensional modelling system (AIMMS) to optimise the choice based on various inputs, namely the region number of port calls and port criteria (location, infrastructure, charges, frequency, container traffic and water depth).

In addition, Chou (2010) constructed an AHP model for simulating the behaviour of carriers' port choice in Taiwan. The study's principle aim was to reduce a factor reoccurring throughout the literature, namely: transportation cost. Six first tier goals were identified in the study: port charges, operation efficiency, loading/discharge efficiency, size and efficiency of container yard, hinterland economy and berth depth. In refining the scope further, carriers were divided into two groups: oceangoing carriers and coasting carriers. The study's results indicated that only port charges and hinterland economy were very important to both carriers. For oceangoing carriers, berth depth was also established as very important, which can be explained by the sheer growth of oceangoing carriers, such as those mentioned in Section 2.2.

Upon studying port selection on liner routes from a logistics perspective, Tran (2011) set up a model to solve three matters concerning port choice decisions. These matters were: ports on a liner's route, the order of port call and the loading/unloading of ports for each shipment, all in an effort to reduce overall cost. In addition to solving the aforementioned three issues, two sensitive analyses were considered: the viability of a multi-port system compared to a hub-and-spoke system and the question of efficiency regarding large vessels. The results indicated that shipping is only a mere element in the entire logistics network, which once again aligns with the research question about including ports in the greater value chain (further explained in Section 3.3). In addition, deploying larger vessels does not imply that the number of port calls will be reduced. The contrary is in fact true. Tran's (2011) model was also applied to cargo flows between the United States and Northern Europe.

As mentioned in the previous section, Yuen *et al.* (2012) considered eight determinants in port competitiveness from the users' perspective in five container ports in China and its neighbouring countries. For shipping lines, port costs were the predominant factor of these five Southeast Asian ports' competitiveness. All the other factors shared comparable importance.

Also mentioned in the previous section, Ng *et al.* (2013) studied port choice among shipping lines and shippers in Australia. In slight contrast to the shippers, service factors were more important in the shipping lines' decision of a port. Although cost factors also played a key role, it was noted in the study that shipping lines mostly base their decision on a holistic approach to port choice. Factors in and around the port are also important to the shippers, with port changes, port congestion and berth-side efficiency being among the most important elements pertaining to port choice.

Building on the literature that proposed port choice modelling, Yeo *et al.* (2014) offered a new method of separating uncertain and incomplete raw data and making sense of vague logic in port choice modelling. This method was applied in their study to analyse the selection of major Northeast Asian container ports from a shipping line’s perspective.

Button *et al.* (2015) used an AHP to showcase the importance of the subjective measures that result in the selection of a seaport from the liners' perspective. The results indicated that, not only does subjectivity matter; the failure of incorporating subjectivity into policy-making can result in the exclusion of an important element in the management of port investment and financing.

Table 3-2 summarises recent studies in port selection from the perspectives of carriers and shipping lines.

Table 3-2: Recent studies of port selection within a global context – the perspective of carriers or shipping lines (2000-2016)

Author (s)	Title and Publication	Method	Focus and Findings
Malchow & Kanafani (2001)	A disaggregate analysis of factors influencing port selection. <i>Maritime Policy and Management</i> , 28(3):265-277.	Multinomial logit model	Model used to explain the selection of a port for each shipment exported from the US in December 1999. Location was found to be the most important factor.
Malchow & Kanafani (2004)	A disaggregate analysis of port selection. <i>Transportation Research Part E: Logistics and Transportation Review</i> , 40(4):317-337.	Alternate form of the discrete choice model.	Ten ports across the US were analysed, indicating that its location is the most important characteristic of a port.
Lirn, Thanopoulou, Beynon & Beresford (2004)	An application of AHP on transshipment port selection: a global perspective. <i>Maritime Economics and Logistics</i> , 6(1):70-91.	AHP	A global perspective case study on 47 global carriers was undertaken. Four main categories (physical and technical infrastructure, geographical location, management and administrative perspective and

			carriers' terminal cost) with 12 sub-categories were identified.
Guy & Urli (2006)	Port selection and multi-criteria analysis: An application to the Montreal-New York alternative. <i>Maritime Economics and Logistics</i> , 8(2):169-186.	Multi-criteria analysis	Alternative port selection analysis between Montreal and New York based on the combined importance of infrastructure, quality, cost, service and location. New York trumps on hinterland, service and cost.
Tongzon & Sawant (2007)	Port choice in a competitive environment: from the shipping lines' perspective. <i>Applied Economics</i> , 39(4):477-492.	Survey and binary logistic regression	Comparing stated and revealed preference from the shipping lines' perspective in Southeast Asia. Results indicated no consistency to port preference, but port charges, port services and adequate infrastructure were revealed to be key.
Chang, Lee & Tongzon (2008)	Port selection factors by shipping lines: different perspectives between trunk liners and feeder service providers. <i>Marine Policy</i> , 32:877-885.	Survey	Determining the factors affecting shipping companies' port choice, covering two distinct routes. These six factors were found to be important: local cargo volume; terminal handling charge; berth availability; port location; trans-shipment volume and feeder network.
Wiegmans, Van der Hoest & Notteboom (2008)	Port and terminal selection by deep-sea container operators. <i>Maritime Policy and Management</i> , 35(6):517-534.	Survey	Deep-sea container operators in the Hamburg-Le Havre range. Tariffs, hinterland connections and hinterland size influences port selection, whereas handling speed and

			cost influenced terminal selection.
Yeo, Roe & Dinwoodie (2008)	Evaluating the competitiveness of container ports in Korea and China. <i>Transportation Research Part A</i> , (42):910–921.	Survey	The components influencing their competitiveness for ports in Korea and China were identified. The most competitive ports relied on efficient hinterland logistics systems.
Lam (2009)	An integrated approach for port selection, ship scheduling and financial analysis. <i>Netnomics</i> , 11(1):33-46.	Model	Introduced a three-tiered integrated approach for port selection, ship scheduling and financial analysis to assist ship operators in liner shipping.
Chou (2010)	AHP model for the container port choice in the multiple-ports region. <i>Journal of Marine Science and Technology</i> , 18(2):221-232.	AHP	Container port choice in Taiwan was analysed from the perspective of oceangoing carriers and coasting carriers. Port charges and hinterland economy were very important to both.
Tran (2011)	Studying port selection on liner routes: An approach from logistics perspective. <i>Research in Transportation Economics</i> , 32(1),39-53.	Model	Port selection decision of liner routes between the United States and Northern Europe from a logistics perspective. To avoid lop-sidedness, the necessity to include all elements of the value chains was identified, not only shipping.

Lam & Dai (2012)	A decision support system for port selection. <i>Transportation Planning and Technology</i> , 35(4): 509-524.	DSS model based on AHP	Development of a web-based DSS for port selection using an integrated AHP method. Determinants include: location, infrastructure, charges, frequency, container traffic and water depth.
Yuen, Zhang & Cheung (2012)	Port competitiveness from the users' perspective: An analysis of major container ports in China and its neighbouring countries. <i>Research in Transportation Economics</i> , 35(1):34-40.	AHP	Port competitiveness from the users' perspective where port cost was found to be the most important competitiveness factor from the perspective of shipping lines.
Ng, Sun & Bhattacharjya (2013)	Port choice of shipping lines and shippers in Australia. <i>Asian Geographer</i> , 30(2):143-168.	Survey	Australian shipping lines' choice of ports based on a holistic approach. Service factors were listed as more important than cost factors.
Yeo, Ng, Lee, & Yang (2014)	Modelling port choice in an uncertain environment. <i>Maritime Policy and Management</i> , 41(3): 251-267.	Model	A model applied to analyse the selection of major Northeast Asian container ports from a shipping line's perspective.
Button, Chin & Kramberger (2015)	Incorporating subjective elements into liners' seaport choice assessments. <i>Transport Policy</i> , 44:125–133.	AHP	Subjectivity matters in factors affecting port choice and failure to incorporate it in policy-making can lead to the exclusion of an important element in the management of port investment and financing.

Source: Author's own compilation (2017)

3.2.3 The perspectives of port authorities

At the height of the Chinese trade boom, Cullinane *et al.* (2005) compared the relative competitiveness of neighbouring Ports of Shanghai and Ningbo in the West Coast region of China. Evaluated on the basis of price and quality of service, it was found that Ningbo would continue to gain greater market share, as the port maintained an advantage in natural endowments, price, in addition to quality of service improvements that were predicted to improve. In the subsequent years that followed the study, this prediction came to fruition. Although Shanghai remains atop the global port rankings in terms of container throughput (TEUs), Ningbo had climbed all the way to the fourth spot globally (Containerisation, 2016) from the 17th position when Cullinane *et al.* conducted their analysis in 2005.

Garcia-Alonso and Sanchez-Soriano (2009) analysed port selection by means of the actual inter-port traffic distribution from a holistic view, using the hinterland perspective while also incorporating an AHP. According to the study, an AHP should be the preferred choice when analysing port selection, as it is difficult to identify the relevant variables when only surveying the preferences of port agents, due to the heterogeneous nature of port selection. The question of the importance of location within port selection was posed and the Spanish inter-port container distribution among the main peninsular ports was used as a case study.

The following table provides a summary of recent studies on port selection from the perspectives of port authorities:

Table 3-3: Recent studies of port selection within a global context – the perspective of port authorities (2000-2016)

Author (s)	Title and Publication	Method	Focus and Findings
Cullinane, Teng & Wang (2005)	Port competition between Shanghai and Ningbo. <i>Maritime Policy and Management</i> , 32(4), 331-346.	Comparative analysis	The Port of Ningbo will continue to gain greater market share at the expense of the Port of Shanghai due to advantages in natural endowments, price and service quality.
Garcia-Alonso & Sanchez-Soriano (2009)	Port selection from a hinterland perspective. <i>Maritime Economics and Logistics</i> , 11(3):260–269.	AHP	Inter-port traffic distribution from a holistic view using the hinterland perspective. A case study on the Spanish inter-port container

			distribution and it was found that port location was key.
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Source: Author's own compilation (2017)

3.2.4 Summary

In summary, the literature on port selection within a global perspective was captured in this section. The key determinants of port selection found in the literature up until this point being connectivity, geographical location, port cost and port efficiency. These factors were found to be important based on the views of three distinct groups of decision-makers. These groups were shippers and freight forwarders, carriers and shipping lines, and finally, port authorities. The first two groups were evidently larger than the third mainly due to their role in hinterland connections, which is a fundamental consideration when selecting a port. Kramberger *et al.* (2015) explained that “port authorities generally play a minor role in the port hinterlands development, but shippers, freight forwarders and rail operators have always been involved in the port-hinterland connection” (2015:195). What this explanation, and indeed other explanations in various previous studies mentioned, is that ports are not merely a means to an end, but form an integral part of the entire value chain. Seamlessly connecting ports with other elements in the value chain is vital and extremely important for the unification of maritime transport economics with international trade economics. Ports as part of the global value chain are studied in further depth in Section 3.4. Hereafter follows a literature review on port selection from a Southern African perspective.

3.3 Port selection within a Southern African context

No comparative empirical evidence exists on port selection within a Southern African perspective. However, some broader studies, although not purely on the topic of port selection, have been conducted on Southern African ports. In this section some of the research that has been carried out on ports in the Southern African context are discussed.

Chasomeris (2005) assessed South Africa's shipping costs from three different perspectives: an import CIF/FOB ratio, a port pricing perspective and a Europe-South Africa freight rates perspective. In realising a continued increase from 1960 to 1999 in the CIF/FOB ratio, Chasomeris (2005:133) stated that one should be cautious using this ratio as a proxy for shipping costs, as the interpretation of the ratio depends on “both the level of transportation costs and the changes in the composition of a country's imports”. The CIF/FOB ratio should rather be used as a composite indicator. Along with shipping costs associated with ports, Chasomeris (2005) also

highlighted port governance, along with distance from primary markets, as important considerations for port users.

In addition, Gumede and Chasomeris (2012) and Chasomeris (2015) further examined port pricing and port governance structures in South Africa. Both studies found that South Africa's port model is distinctive by having both public and private operators, which has brewed a level of discontent among private stakeholders. With South Africa's port model, private operators had to compete with public operators for market share. Adding to the complexities of the port model, although land is publicly owned and operated (Transnet National Ports Authority – TNPA - being the port landlord as well as Transnet Port Terminal – TPT – being the port operator) and the Ports Regulator is also state-owned, the two entities are independent from each other. This port model is particularly different to other ports across the world and seemingly a cumbersome obstacle in facilitating trade through the country's ports. An improvement in port governance was proposed, firstly through transparency to the Ports Regulator (Gumede & Chasomeris, 2012) and secondly, the development of a port doctrine that is consistent with the country's vision and policies (Chasomeris, 2015). This doctrine was proposed to improve various factors mentioned by stakeholders, such as high port tariffs, low productivity and inefficiency, to name but a few.

With further regards to port pricing, Chasomeris (2015) constructively critiqued the revenue required methodology used by TNPA for the 2014/15 tariff application. Firstly, after questioning the use of this method as an appropriated tariff determiner, Chasomeris (2015) critiqued the methodology under six different scenarios. The following recommendations are made to the Ports Regulator in the study: "to include a debt beta in the calculation; allow for a market risk premium of 6.3 per cent or less; and use an asset beta of less than 0.5" (Chasomeris, 2015:167). Along with these recommendations, Chasomeris (2015) pointed out that TPNA's rounding resulted in errors in its tariff increase application indicates that the tariff increase should rather have been proposed at 14.29 per cent instead of 14.39 per cent. From the evidence presented in this article, it is clear that the recent tariff application presented by TNPA is could be significantly lower than what is proposed. Along with the intricate nature of South Africa's port model, the port pricing does not suggest that South African ports are nearing capacitive competitiveness.

All four of the previously discussed studies indicated the importance of port pricing or the broad determinant of "cost" as was found in previous studies on South African ports. Therefore, it can be expected that the determinant of cost would be similarly significant in explaining port selection in other areas of Southern Africa. As discussed further in Section 3.4, cost has been found to be significant in explaining port selection in multiple studies, from both the perspectives of shippers and/or freight forwards and carriers and/or shipping lines. Therefore, the determinant will be included in the empirical model that is discussed in Chapter 5.

A study identifying alternative locations for a container hub port in South Africa was conducted by Notteboom (2011) who identified three ports, Durban, Richards Bay and Ngqura as possible locations for the development of a large container hub for South Africa. Notteboom (2011) used a multi-criteria analysis approach to identify the most appropriate location (Ngqura scored the best). Despite falling beyond the scope of this study, some relevance can be drawn from Notteboom (2011) who used similar determinants, such as geographical location, service availability and port dues, as found in the literature review of port selection within a global perspective. Furthermore, an important statement is made in the study: “a detailed traffic analysis on potential transshipment/relay flows that could be captured by the port system falls beyond the scope of this paper”, which is exactly with what this study is concerned (Notteboom. 2011:52).

In a more recent study by Fraser and Notteboom (2014), the attractiveness of seaport-based transport corridors for Southern Africa was explored by means of the resource and capability approach/model⁷, a strategic appraisal analysis tool developed by Robert Grant (2010). By means of conducting a corridor stakeholder survey (36 respondents), it was found that the numerous resource and capability criteria selected from trade corridor literature were confirmed as still applicable. The resources included distance and infrastructure, whereas some of the capabilities included reliability and effectiveness. Therefore, Fraser and Notteboom’s (2014) study confirms the link between determinants for port selection and greater trade corridor selection.

Fraser and Notteboom (2015) further continued their research on seaports in Southern Africa. Their study, titled *‘Institutional development paths in seaports: The Southern African case’*, aimed “to provide a qualitative analysis of port institutional path development applied to Southern African container ports” (2015:513). The ports that were used in the case study were the Ports of Maputo, Durban, Port Elizabeth, Cape Town, Walvis Bay, Port Louis and Toamasina. All of these ports varied in terms of capacity and ownership, but all were similar in operations as all the ports were container ports. In the study it was found that investment funding was the primary driver for institutional reform. Other port reform drivers were greater operational efficiencies, strategic fit and market failure (Fraser & Notteboom, 2015:531).

As previously discussed, a number of studies have established that connectivity and efficiency are important factors of port selection, irrespective of the region. Gekara and Chhetri (2013) pointed out Africa’s vast shortcomings in this regard. In their study, the Port of Mombasa and the

⁷ The resource and capability approach assesses in broad terms with which division of assets an organisation is endowed (their *resources*) and how well the organisation in question can use these assets (their *capabilities*). Assets are defined as: financial, technological, plant equipment and location, distribution and brand. Capabilities, a more relative term, are rather functionally defined or defined by means of a supply chain analysis as developed by Michael Porter in 1985.

connecting Northern Corridor were analysed, concluding that the region was constricted due to “poor hinterland connectivity and chronic logistics bottlenecks” (Gekara & Chhetri, 2013:559).

Table 3-4 provides a summary of recent studies on port selection from a Southern African perspective.

Table 3-4: Recent studies on ports – Southern African perspective (2000 - 2016)

Author (s)	Title and Publication	Method	Focus and Findings
Chasomeris (2005)	Assessing South Africa's shipping costs. <i>Journal of Development Perspectives</i> , 1(1):125-141.	Case study	Evidence from the South African case advises researchers to be cautious when using the CIF/FOB as an indicator of direct shipping costs.
Notteboom (2011)	An application of multi-criteria analysis to the location of a container hub port in South Africa. <i>Maritime Policy and Management</i> , 38(1):51-79.	Multi-criteria analysis (MCA) approach	The author's highlight the necessity of establishing a large container hub in South Africa. Three ports, Durban, Richards Bay and Ngqura, were identified as possible locations. Ngqura scored the best according to the main criteria in the MCA model, which were related to the users, the terminal operators/investors and the community.
Gumede & Chasomeris (2012)	Port Governance in South Africa. <i>Interdisciplinary Journal of Economics and Business Law</i> , 1(4):82-98.	Case study	The historical evolution of South African port governance structures. Transnet can improve port governance with increased transparency and provision of data by TNPA to the Ports Regulator in order for the Ports Regulator to regulate more effectively.
Gekara & Chhetri (2013)	Upstream transport corridor inefficiencies and the implications for port performance: a case	Case study	Logistics accessibility in the East African region and an analysis of the Port of Mombasa and its subsequent trade corridor. It was found that poor

	analysis of Mombasa Port and the Northern Corridor. <i>Maritime Policy and Management</i> , 40(6):559-573.		connectivity and inefficiency of logistical performance greatly hampers trade in the region.
Fraser & Notteboom (2014)	A strategic appraisal of the attractiveness of seaport-based transport corridors: The Southern African case. <i>Journal of Transport Geography</i> , 36(2014):53-68.	Survey	Resource and capability criteria, which includes distance, infrastructure, reliability and effectiveness selected from trade corridor literature remained relevant with regards to the attractiveness of seaport-based transport corridors in Southern Africa.
Fraser & Notteboom (2015)	Institutional development paths in seaports: The Southern African case. <i>European Journal of Transport and Infrastructure Research</i> , 15(4):506-535.	Case study	For institutional reform in Southern African's ports, investment funding was found to be the primary driver. Other factors for port reform were greater operational efficiencies, strategic fit and market failure.
Chasomeris (2015)	Port infrastructure pricing: A critique of the revenue required methodology. <i>International Journal of Transport Economics</i> , 42(2):153-170.	Scenario analysis	Chasomeris recommended that the Ports Regulator of South Africa includes a debt beta, allows for a risk premium of 6.3 per cent or less and use an asset beta of less than 0.5 in the 2014/15 tariff increase.
Gumede & Chasomeris (2015)	Maritime port pricing and governance in South Africa: trends and stakeholder comments. <i>Journal of Economic and Financial Sciences</i> , 8(1):47-62.	Content analysis	South Africa has a distinctive port model that poses various challenges such as infrastructure, under-investment and poor port services.

Source: Author's own compilation (2017)

3.4 The main determinants of port selection

Various determinants of port selection have been included in studies concerning the subject, however some important elements seem to repeat throughout the literature review (as discussed in Sections 3.2 and 3.3). The following section provides an overview of the determinants of port selection. A complete summary of the determinants taken from the literature in the previous two sub-sections (3.3. and 3.4) is also provided. However, only the determinants found to be statistically significant in explaining the selection of a seaport over another are included. Along with the variables being significant in explaining port selection, only variables that were repeated across multiple studies will be included. The ultimate objective of this section is to comprehensively ascertain which determinants of port selection should be considered for the empirical part of this study.

Tongzon (1995), a prodigious scholar on port selection, initiated the research on the determinants of ports by dividing the elements into two sub categories, namely determinants of throughput (or performance) and determinants of efficiency. The determinants of port efficiency that were included are location, frequency of ship calls, port charges, economic activity and terminal efficiency for port performance, container mix, work practices, crane efficiency and vessel size. In the study, Tongzon (1995) sampled 23 global ports and found that economic activity, terminal efficiency and port charges were significant in explaining the performance and efficiency of the selected ports. Since these findings, the determinants of port selection have become broader. As seen in Section 3.3, the determinants of port selection are divided into groups according to the decision-makers that found them to be significant with regards to port selection.

Determinants that were identified across a number of studies from the perspective of shippers and freight forwarders were: transportation cost; distance/location; port congestion; efficiency; frequency of ship visits; infrastructure; cost and connectivity/hinterland. Shippers and freight forwarders provide a third party service and are quite price-sensitive, therefore it is expected that both transportation cost and other logistical costs are significant to them. Cost-specific determinants are found to be significant in a total of nine studies, with regards to shippers and freight forwarders as the decision-makers in port choice.

Table 3-5 provides a summary of the main determinants of port selection from the perspectives of shippers and freight forwarders:

Table 3-5: The main determinants of ports selection from the perspective of shippers and freight forwarders: A summary

Determinant	Study
Transport cost	Nir, Lin & Liang (2003); Ng, Sun & Bhattacharjya (2013); Kramberger, Rupnik, Strubelj & Prah (2015)
Distance/location	Tiwari, Itoh & Doi (2003); Tongzon (2009); Yuen, Zhang & Cheung (2012)
Port congestion	Tiwari, Itoh & Doi (2003); Steven & Corsi (2012); Ng, Sun & Bhattacharjya (2013)
Efficiency	Ugboma, Ugboma & Ugwude (2006); Tongzon (2009); Steven & Corsi (2012)
Frequency of ship visits	Ugboma, Ugboma & Ugwude (2006); Tongzon (2009); Kramberger, Rupnik, Strubelj & Prah (2015)
Infrastructure	Ugboma, Ugboma & Ugwude (2006); Tongzon (2009)
Cost	De Langen (2007); Grosso & Monteiro (2009); Steven & Corsi (2012); Yuen, Zhang & Cheung (2012); Kramberger, Rupnik, Strubelj & Prah (2015); Vermeiren & Macharis (2016)
Connectivity/hinterland	Grosso & Monteiro (2009); Yuen, Zhang & Cheung (2012); Vermeiren & Macharis (2016)

Source: Author's own compilation (2017)

With regards to carriers and shipping lines, the most important determinants of port selection were found to be location, cost, port service, handling/terminal charges, berth availability/depth, connectivity/hinterland and efficiency (including customs procedures). In the case of carriers and shipping lines, the most important elements do not substantially vary from those identified by shippers and freight forwarders. Cost, location, efficiency and connectivity were once again found to be significant. In contrast to what was expected, it is worth noting that infrastructure was expected to form part of this group of determinants that are significant to carriers and shipping lines. Other factors that occur at the port, such as port service and handling/terminal charges are evidently more important to these decision makers. However, it is worth pointing out that an element such as berth depth can also be argued as forming part of the physical infrastructure of a port.

Table 3-6 presents a summary of the main determinants of port selection from the perspectives of carriers and shipping lines:

Table 3-6: The main determinants of port selection from the perspective of carriers and shipping lines: A summary

Determinant	Study
Location	Malchow & Kanafani (2001); Malchow & Kanafani (2004); Guy & Urli (2006); Chang, Lee & Tongzon (2008); Chou (2010);
Cost	Guy & Urli (2006); Yeo, Roe & Dinwoodie (2008); Lam (2009); Lam & Dai (2012); Yuen, Zhang & Cheung (2012); Ng, Sun & Bhattacharjya (2013); Yeo, Ng, Lee, & Yang (2014);
Port service	Guy & Urli (2006); Tongzon & Sawant (2007); Yeo, Roe & Dinwoodie (2008); Lam & Dai (2012); Yeo, Ng, Lee, & Yang (2014)
Handling/terminal charges	Tongzon & Sawant (2007); Chang, Lee & Tongzon (2008); Chou (2010); Ng, Sun & Bhattacharjya (2013)
Berth availability/water depth	Chang, Lee & Tongzon (2008); Chou (2010); Yeo, Ng, Lee, & Yang (2014)
Connectivity	Chang, Lee & Tongzon (2008); Yeo, Roe & Dinwoodie (2008); Wiegmanns, Van der Hoest & Notteboom (2008); Chou (2010); Yeo, Ng, Lee, & Yang (2014)
Efficiency (including customs procedures)	Chou (2010); Button, Chin & Kramberger (2015)

Source: Author's own compilation (2017)

Similar to the previous group of determinants, although not nearly as extensive due to the low number of studies – the main determinants of port selection from the perspective of port authorities were found to be cost, service and location. Likewise, in the review of the studies pertaining to the Southern African region, the most important determinants were once again location, but also connectivity, cost and efficiency. In contrast to the main determinants found in Table 3-5 and Table 3-6, none of the determinants by port authorities and those significant to the Southern African region were repeated across multiple studies⁸. As mentioned above, the main

⁸ Hence the author chose not to summarise the main determinants into tables similar to Table 3-5 and Table 3-6.

reason for the lack of repetition is the shortage of studies conducted on these groups of decision-makers. In the case of port authorities, the lack of sufficient research is not important, as this research does not specifically relate to port authorities in Southern Africa. However, this study does specifically relate to port selection across the entire range of decision-makers in the Southern African region. Ultimately, the lack of sufficient research in this case accentuates the importance of this particular study.

3.5 Conclusion

This chapter reviewed the essential literature on port selection. As a large proportion of global trade is seaborne, the essence of facilitating trade between countries ultimately falls on the ports. Therefore, it is quintessential that maritime goods flow through seaports timeously and effectively in order to satisfy the progression of the modern global value chain. As a result, it has been determined that selecting the optimum port plays an integral role in efficiently facilitating the global value chain. After the importance of ports in global trade was explained, the focus of this chapter shifted towards discussing the subject of port selection in greater depth.

Initially, port selection was regarded from a global perspective. The relevant literature indicated the need to divide the subject into three distinct groups based on the decision-makers in terms of port selection. In other words, where does the choice of port originate? Three groups of decision-makers were identified: shippers and freight forwarders, carriers and shipping lines and port authorities. The bulk of the literature stemmed from the first two groups, as well as the main determinants that were identified later in the chapter.

Regarding the studies from a shipper or a freight forwarder's perspective, the use of surveys was undoubtedly the preferred method to determine the most important factors influencing port choice. This can be explained by the subjective nature of selecting one port over another (Button *et al.*, 2015). In the second group of decision-makers, the studies that focused on port selection from a carrier or a shipping lines' perspective, a more even distribution of research methods were used. In total, six studies proposed a new or adaptive model for port selection, while five studies made use of either surveys or the analytical hierarchical process to determine port selection from the perspective of a carrier or a shipping line.

Furthermore, two studies were conducted on port selection from the perspective of port authorities. The first study made use of a comparative analysis based on port choice in Spain and the second study made use of the analytical hierarchical process. Finally, case studies were also added to the list of research methods in the studies of port selection within the Southern African region. It is however evident that a vast gap exists with regards to existing literature on port selection in Southern Africa. This research duly intends to close that gap.

From a geographical perspective, since the turn of the century, the majority of research studies concentrated on port selection in Asian countries. This has coincided with the economic boom experienced in the region during this time. Since 2000, Asian ports have gradually ascended to the top and has continued to occupy the majority of the top spots in the annual port rankings. A large number of studies examined Chinese ports in particular (Containerisation, 2016). Other Asian countries' ports, for example the Ports of Taiwan, were also investigated multiple times. Outside of Asia, studies on European ports were similarly well-represented. A few investigations were also made into North American ports. Studies on port selection in Australian and Africa were each only mentioned once, while no studies were mentioned that focussed on port selection in South America.

Finally, this chapter focussed on the main determinants of port selection. Once again, the literature was investigated from the perspective of the relevant decision-makers. Since the vast majority of port selection decisions stem from the perspective of the shipper and freight forwarders and carriers and shipping lines, quite a large number of determinants within these studies were found to be significant in explaining the choice of port.

Furthermore, the determinants that were found to be noteworthy in multiple studies were summarised in Table 3-5 and Table 3-6. These were cost, location, port service and connectivity. The significance of these determinants found in Chapter 3 is further highlighted in Chapter 5 when port selection within the Southern African context is empirically investigated. The next chapter however investigates each of the four Southern African ports that were selected to form part of the empirical analysis of this study.

CHAPTER 4: A DESCRIPTIVE ANALYSIS OF PORT SELECTION IN SOUTHERN AFRICA

4.1 Introduction

This chapter provides a descriptive analysis of port selection in Southern Africa. The aim of the chapter is to provide a transparent overview of the current state of ports in the greater Southern African region. Since there were an abundant number of determinants established in Chapter 3 that influence the choice of a seaport, this chapter further compares the determinants descriptively across the region on both a macro- and a micro-level.

The focus of the chapter will be on the main Ports of the Southern African region. Although the Port of Durban is still the foremost port in terms of handling container volumes in the region (2 770 335 TEUs in 2015, according to Containerisation, 2016), the port has experienced a growth slowdown in recent years. Various competitors have emerged within the Southern African region, most notably the Port of Beira in Mozambique, the Port of Dar es Salaam in Tanzania and the Port of Walvis Bay in Namibia. As these ports serve to feed similar Southern- and Central African destinations through trade corridors of their own (Figure 1-1) Durban's port is at risk to lose additional volume, which is why they have been included in the comparative descriptive analysis.

The structure of the chapter is as follows: Section 4.2 commences by providing a comprehensive overview of Southern African ports. This section also explains the reasons behind the inclusion of some ports for the study's comparative (and later empirical) analysis. Section 4.3 then compares the macro-determinants for Southern African ports, with Section 4.4 comparing the micro-determinants. Finally, Section 4.5 concludes the chapter.

4.2 An overview of Southern African ports

A total of 48 seaports are located within the Southern African⁹ region (Searates, 2017). Of these 48 seaports, only 15 ports currently have operating container terminals. The number of container terminals is important, as the focus of Chapter 4 and Chapter 5 is on a comparative analysis between these container terminals. However, not all of these container terminals are included in the comparative analysis for the following reasons: of the 15 container terminals, only nine are large enough to be considered (handling in excess of 100 000 TEUs per annum across a number of years). These nine container terminals are: Beira and Maputo in Mozambique, Dar es Salaam in Tanzania, Cape Town, Durban, Ngqura and Port Elizabeth in South Africa, Walvis Bay in

⁹ Southern Africa in this instance is defined as the SADC member countries, however without the island members of the Comoros, Madagascar and the Seychelles, as these member countries do not contest the same hinterland as the mainland SADC member countries.

Namibia and Luanda in Angola. Therefore, for the purposes of this study, a comparative analysis was conducted on the four following ports:

Beira was included as it is the largest container terminal in Mozambique and presides over an important landlocked hinterland consisting of Botswana, Zambia and Zimbabwe. Furthermore, the port competes with the Port of Durban on the North-South trade corridor¹⁰ from the centre, splitting in both directions.

Dar es Salaam was included as it is one of two major container terminals in East Africa (along with the Port of Mombasa in Kenya). Dar es Salaam presides over the central African hinterland of Burundi, Rwanda, the Democratic Republic of the Congo, Malawi and also the Northern parts of Zambia. In addition, the Port of Dar es Salaam competes with the Port of Beira and ultimately the Port of Durban on the North-South corridor from the North.

Durban was also included as it is by far the largest port in the Southern African region. Furthermore, Durban is geographically located where the Southern point of the North-South trade corridor originates from, with the corridor flowing into the important contestable hinterland of Botswana, Mozambique, Zambia and Zimbabwe, but also importantly Johannesburg, the economic hub of the region.

Walvis Bay was included as its port is the starting point of the Trans-Cunene, the Trans-Caprivi and the Trans-Kalahari trade corridors that dominate the hinterland of Namibia, Angola, and Botswana. The corridors also feed into the hinterland of Zambia.

The following ports were not included in the analysis for the following reasons:

Cape Town, Ngqura and Port Elizabeth are mainly limited to supplying the South African hinterland and not the greater Southern African region, north of South Africa (as evident from Figure 1-1). In addition, within a Southern African context, not only does the Port of Cape Town handle less containers compared to the Port of Durban, the port also does not contest the hinterland of Botswana, Zimbabwe, Zambia and countries further north. Since this study focussed on port selection in Southern Africa as a region and not specifically on South Africa as a country, these three ports were not included in the analysis. Furthermore, as some of the analysis requires country-specific determinants (such as cost, efficiency and customs), including multiple ports from one country will thus discriminatorily influence the results. Durban is unequivocally South Africa's largest

¹⁰ Note, where mention is made to trade corridors in this section, Figure 1-1 in Chapter 1 can be used as a point of reference.

container port, which is why Durban was included at the expense of the other three South African ports.

Maputo was not included since, similar to Cape Town, Ngqura and Port Elizabeth; Maputo is not the largest port in its country. Besides, the Maputo trade corridor stemming from the Port of Maputo eventually only feeds into the North-South trade corridor dominated by the Port of Durban in the South and the Ports of Beira and particularly Dar es Salaam in the North.

Luanda was not included due to the fact that poor road conditions inhibit the port from connecting to the hinterland of Southern Africa. The last time that the WEF published competitiveness indices on Angola, the country ranked 138th out of 144 in terms of quality of roads (WEF, 2014). As seen in Figure 1-1, the Port of Luanda mainly serves the Angolan hinterland, with no connections to other Southern African trade corridors. Although a trade corridor does indeed stem from an Angolan port, the Port of **Lobito** handled too little containerised cargo over the period of analysis. The completion of a new container terminal at the Port of Lobito, which has increased capacity to 700 000 TEUs is worth noting (PMAESA, 2017:16). The impact of this infrastructure upgrade might invariably influence future research on the subject.

Finally, it is worth mentioning the omission of the Port of **Mombasa** in Kenya. While the Port of Mombasa is a large and important port in the East African region, with 899 628 TEUs handled in 2015 (AAPA, 2016), Kenya is not a SADC member, nor does the port contest for the Southern African hinterland.

In summary, a comparative analysis of port selection in Southern Africa was conducted on the Port of Beira in Mozambique, the Port of Dar es Salaam in Tanzania, the Port of Durban in South Africa and the Port of Walvis Bay in Namibia. The following table indicates how these four selected ports compared in terms of the container port traffic, from 2005 to 2015.

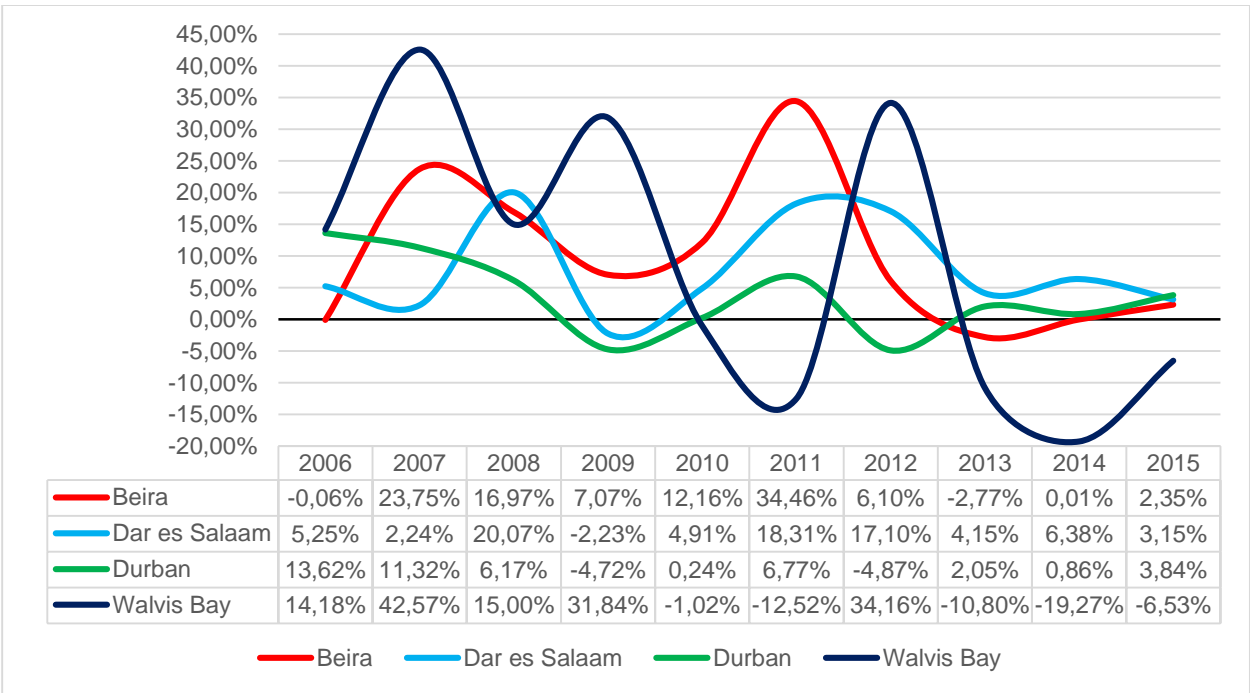
Table 4-1: Container port traffic for selected Southern African ports (2005-2015, TEUs thousands)

Port	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Beira	54.30	54.27	71.17	85.72	92.24	105.00	160.20	170.60	166.00	166.01	170.00
Dar es Salaam	258.39	272.70	278.96	349.00	341.39	359.01	439.46	530.09	553.05	590.76	610.00
Durban	1 899.07	2 198.60	2 479.23	2 642.17	2 523.11	2 529.21	2 712.98	2 586.89	2 641.10	2 664.00	2 770.34
Walvis Bay	71.46	83.26	144.99	170.59	250.26	247.74	220.18	334.41	301.82	253.05	237.55

Source: Author's own compilation (2017) from annual reports (CFM, NAMPORT, TNPA and TPA) and port statistics databases (AAPA, African Port Statistics and Containerisation)

Table 4-1 highlights the Port of Durban’s presence as the largest port within the Southern African region. However, it is worth noting that the other three ports started from a relatively low base in 2005, but have grown dramatically over the 10-year period. In fact, all three ports have experienced higher than average annual growth rates compared to the Port of Durban. From 2005 to 2015, container port traffic at the Port of Durban has grown by only 3.9 per cent annually over the period. On the other hand, container port traffic in the region has increased at the fastest rate in Walvis Bay (12.8 per cent per annum), followed by Beira (12.1 per cent) and then Dar es Salaam (9 cent) for the same period. Figure 4-1 further illustrates the year-on-year growth rates of the four selected ports in Southern Africa.

Figure 4-1: Container port traffic growth rate for selected Southern African ports (2005-2015)



Source: Author’s own calculations (2017) based on data from annual reports (CFM, NAMPORT, TNPA and TPA) and port statistics databases (AAPA and Containerisation)

From Figure 4-1, it is clear that the Port of Durban has experienced stagnated growth since 2008. However, the same can be attributed to the other three ports, especially from 2012. However, all the other three ports did at least experience various short periods of substantial growth. As illustrated above, the Port of Beira experienced a growth spurt from 2007 to 2012. The Port of Dar es Salaam’s container volume grew significantly in 2008 and again in 2011 and 2012. Lastly, the Port of Walvis Bay experienced considerable expansion in container throughput in the four-year period from 2006 to 2009 and then again in 2012. Subsequently, container port traffic has returned to 2009/2010 levels. The Port of Walvis Bay experienced the most volatile growth by far in container port traffic of the four selected Southern African ports.

Finally, a port function matrix is presented in Table 4-2. The functioning of a port can be divided into three elements, namely: the port regulations, the port operations and the land ownership (as indicated in the columns). The matrix indicates where the management and responsibility of these three elements lie, i.e. on the public sector or on the private sector. Furthermore, four different port models are presented in the first four lines of the table. A public model, whereby all the responsibilities rest on the state; a semi-public model, whereby the responsibility of the port operations rest on the private sector (and the other two functions on the state); a semi-private model, whereby both the responsibilities of the port ownership and port operations rest on the private sector (and the regulations on the state); and finally a private model, whereby all the responsibilities rest on the private sector. The table also includes the port function of the four Ports of discussion into the matrix.

Table 4-2: Port function matrix for selected Southern African ports compared to the world’s top 100 ports

Port models	Regulator	Land Owner	Operator	The world's top 100 ports
1. Public	Public	Public	Public	7
2. Semi-Public	Public	Public	Private	88
3. Semi-Private	Public	Private	Private	2
4. Private	Private	Private	Private	3
Beira (2)	Public	Public	Private	-
Dar es Salaam(2)	Public	Public	Private	-
Durban (1/2)	Public	Public	Public & Private	-
Walvis Bay (1)	Public	Public	Public	-

Source: Adapted from Mouknass (2001); and Gumede and Chasomeris (2015:49).

Table 4-2 shows that the Port of Walvis Bay is the only public port model of the four ports in question (similar to seven others in the world’s top 100 ports), while both the Ports of Beira and Dar es Salaam follow a semi-public port model (similar to the majority of the world’s top 100 ports). The Port of Durban on the other hand is quite distinct (as mentioned in Section 3.3), as it is mostly regarded as a public port, however, the port has a small number of private operators. As Gumede and Chasomeris (2015) indicated, the distinction is noted with Transnet being both the port landlord (TNPA) and the port operator (TPT), however with the responsibilities of the port regulations resting on the Ports Regulator, which is also state-owned, but independent from TNPA and TPT. Therefore, the majority of the responsibilities within the four selected Southern African ports lie with the state.

The following section comparatively analyses several macro-determinants that influence port selection in Southern Africa.

4.3 Comparative macro analysis

The aim of Section 4.3 is to compare the macro-determinants that influence port selection in Southern Africa. The determinants that are discussed were found to be significant in explaining port selection based on multiple research studies. These determinants were summarised in Section 3.4. An overview of the greater macro-economic environment of Mozambique, Namibia, South Africa and Tanzania is provided first to place the port operations into context.

4.3.1 Greater macro-economic environment

South Africa is unequivocally the largest economy in Southern Africa, accounting for more than half of the region's GDP, as seen in Table 4-3. Historically, the country has served as an important gateway to several of the other economies in the region. Presently, this remains true, however one can argue that the reliance on South Africa as a feeder nation by some of the other countries within the region has recently decreased. It is true that many of the SADC countries have outpaced South Africa in terms of GDP growth. Table 4-3 attests to this.

Table 4-3: Macro-economic profile of SADC countries for 2016 (US\$ billions)

Country	GDP	GDP Growth (%)	Export	Import	Trade balance	Trade (% of GDP)	GCI (out of 138)	Score (out of 7)
Angola	89.63	0.0%	27.39	10.64	16.75	42%	140*	3.04
Botswana	15.27	2.9%	7.32	6.10	1.22	88%	64	4.29
DRC	35.00	2.2%	4.55	4.13	0.42	25%	129	3.29
Lesotho	2.20	2.5%	0.90	1.33	-0.43	101%	120	3.57
Madagascar	9.99	4.2%	2.26	2.97	-0.71	52%	128	3.33
Malawi	5.44	2.5%	0.88	1.14	-0.27	37%	134	3.08
Mauritius	12.16	3.7%	2.19	4.65	-2.46	56%	45	4.49
Mozambique	11.01	3.8%	3.35	5.30	-1.94	79%	133	3.13
Namibia	10.27	1.2%	4.82	6.72	-1.91	112%	84	4.02
Seychelles	1.43	4.5%	0.56	0.76	-0.20	93%	97*	3.86
South Africa	294.84	0.3%	74.11	74.74	-0.63	50%	47	4.47
Swaziland	3.73	-2.2%	1.61	1.43	0.18	82%	123*	3.40
Tanzania	47.43	7.0%	4.40	7.69	-3.29	25%	116	3.67
Zambia	19.55	3.3%	5.31	3.99	1.32	48%	118	3.60
Zimbabwe	16.29	0.7%	2.83	5.21	-2.38	49%	126	3.41
Total	574.24	-	142.48	136.80	5.68	-	-	-
Average	38.28	2.4%	9.50	9.12	0.38	49%	107	3.64

Source: World Development Indicators (WB, 2017b); Trade Map (2017) statistics and Global Competitiveness Indices (WEF, 2014-2016).

* Note: Angola was not ranked in either the 2016-2017 or the 2015-2016 reports, thus the 2014-2015 report was used. For both the Seychelles, and Swaziland, the 2015-2016 report was used.

Table 4-3 presents some key macro-economic indicators for all 15 SADC countries. Since the study is concerned with Southern Africa as a geographical region, all of these countries were included in the table. However, Mozambique, Namibia, South Africa and Tanzania are subsequently highlighted in bold, since these four countries are the focal countries of this research study.

Mozambique's economy has grown annually by an average of 4.5 per cent over the period of 2000 to 2016 (WB, 2017b). In 2000, trade (the sum of exports and imports) constituted only 44 per cent of the country's GDP, compared to 79 per cent currently. However, typical of a low-income country, the vast majority of Mozambique's exports are raw materials and intermediate goods. Conversely, Mozambique's imports are mostly capital and consumer goods (WB, 2017a). Ultimately, Mozambique had a negative trade balance in 2016. Furthermore, the WEF reports corruption, policy instability and access to financing as the country's most problematic factors for doing business (WEF, 2016).

Trade dominates Namibia's economy. As Table 4-3 shows, trade constituted 112 per cent of the country's GDP in 2016. This means that a substantial amount of goods and services that are imported are used in the manufacturing process (such as capital goods) in adding value, which is then subsequently exported. In fact, the World Bank reports that capital goods constituted nearly 40 per cent of Namibia's imports in 2014. Namibia experienced a growth spurt between 2000 and 2010, growing on average at double digit figures (11.18 per cent) for the 10-year period (WB, 2017b). However, the annual GDP growth currently stands at a mere 1.2 per cent. Similar to Mozambique, the WEF reports access to financing as Namibia's most problematic factor for doing business (WEF, 2016).

South Africa's economy accounts for more than half of the region's total GDP, yet the country has experienced stagnated growth in recent years. Current GDP figures indicate that South Africa is only growing at 0.3 per cent per year, which is far too little for a country that is expected to drive the economic growth of an entire region. International trade is an important driver of the region's growth. South Africa's exports and imports made up approximately half of its GDP in 2016. These figures certainly point to South Africa being labelled as the "gateway to Africa". However, is this assumption true? An answer might be found when observing the top import partners of South Africa's neighbours. In 2016, South Africa was reported as the top exporter to all of its neighbouring countries. South Africa's export share in the value of imports of Namibia, Botswana, Zimbabwe, Mozambique, Swaziland and Lesotho was 57 per cent, 65 per cent, 41 per cent, 30 per cent, 81 per cent and 86 per cent respectively (Trade Map, 2017). Trade is undoubtedly an important driver in the South African economy, but the country regrettably has many obstacles in doing business. The WEF lists inefficient government bureaucracy and restrictive labour regulations as the most problematic factors for doing business (WEF, 2016).

Tanzania is currently one of the fastest growing economies in the world. In 2016, Tanzania’s GDP grew by 7 per cent with the World Bank forecasting that the country will grow by 7.2 per cent in 2017 (WEF, 2017). Compared to other SADC countries, Tanzania relies the least on trade, with only 25 per cent of the country’s economy being attributed to trade in 2016. However, the growth in GDP does reflect in the container port traffic, with volumes having doubled in the last 10 years (Table 4-1). Similar to other Southern African countries, the WEF lists access to financing as the most problematic factor for doing business in 2016 (WEF, 2016). However, on the positive side, Tanzania’s macro-economic environment is reported as their strongest pillar of competitiveness.

Although Mozambique, Namibia and Tanzania all experienced better growth figures in 2016 compared to South Africa, South Africa’s economy remains comfortably the largest in the region. However, within the scope of this research, GDP figures are not the focal point, but rather trade figures. Furthermore, the majority of international trade in these countries moves through seaports. The following section discusses each of these countries’ ports relative to their trading partners’ ports, by evaluating various macro-elements related to port development.

4.3.2 Distance and location

The determinant “distance” or “location” was found to be significant in explaining port selection in the nine studies discussed in the literature review in Chapter 3, clearly accentuating its importance. Given the fact that geographically, Africa is situated far from the economic hubs of North America, Europe, Asia and even the oil-rich Gulf nations, a fair amount of trade takes place over vast distances. Therefore, selecting a port in closer geographical proximity to a country’s own port might be a defining factor in an attempt to limit the time and cost of trade.

The following table depicts the distances between the four selected Southern African ports and the 10 largest container ports in the world (multiple ports in the same country, such as Shenzhen in China, were omitted) (Containerisation, 2016).

Table 4-4: Distance table for selected Southern African ports (kilometres)

Port	Beira	Dar es Salaam	Durban	Walvis Bay	Average
Antwerp	13502	11985	12872	10245	12 151
Beira	-	1 902	1 357	4 151	2 470
Busan	13 140	12 247	13 450	16 020	13 714
Dar es Salaam	1 902	-	2 987	5 781	3 557
Durban	1 357	2 987	-	2 844	2 396
Dubai	6 378	4 863	7 464	10 258	7 241
Hamburg	13 974	12 458	13 345	10 718	12 623
Kaohsiung	11 540	10 646	11 910	14 480	12 144
Kelang	8 169	7 275	8 674	11 385	8 876

Los Angeles	20 158	21 801	18 851	16 706	19 379
Rotterdam	13 509	11 992	12 879	10 252	12 158
Shanghai	12 508	11 614	12 869	15 439	13 107
Singapore	8 511	7 617	9 016	11 726	9 218
Walvis Bay	4 151	5 781	2 844	-	4 259
Average	9 908	9 475	9 886	10 770	10 009

Source: Author's own calculations from Searates (2017).

Table 4-4 emphasises the fact that Southern Africa is geographically very far from the main ports – and indeed the main markets – of the world. Neither port has a distinct competitive advantage with regards to distance from the top 10 global ports. However, Table 4-4 only provides a guideline, as Tanzania (through the Port of Dar es Salaam) does not necessarily trade with Taiwan (through the Port of Koahsiung). The following table provides a more detailed perspective by calculating the weighted average in distance between the respective countries and their top trading partners.

Table 4-5: Cumulative weighted average in distance between selected Southern African countries and their top 10 trading partners (2005-2015, kilometres)

Country (Import)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average:
Mozambique	4 472	4 299	4 373	5 816	5 330	5 718	5 542	5 906	4 561	5 056	5 645	5 156
Namibia	2 789	1 338	1 694	3 999	3 922	3 456	3 182	3 370	3 618	2 969	3 404	3 067
South Africa	7 674	5 685	5 609	6 775	6 914	6 747	6 764	6 657	6 948	6 910	7 247	6 721
Tanzania	4 577	3 895	3 830	4 374	4 531	4 906	5 064	5 079	5 335	5 489	5 272	4 759

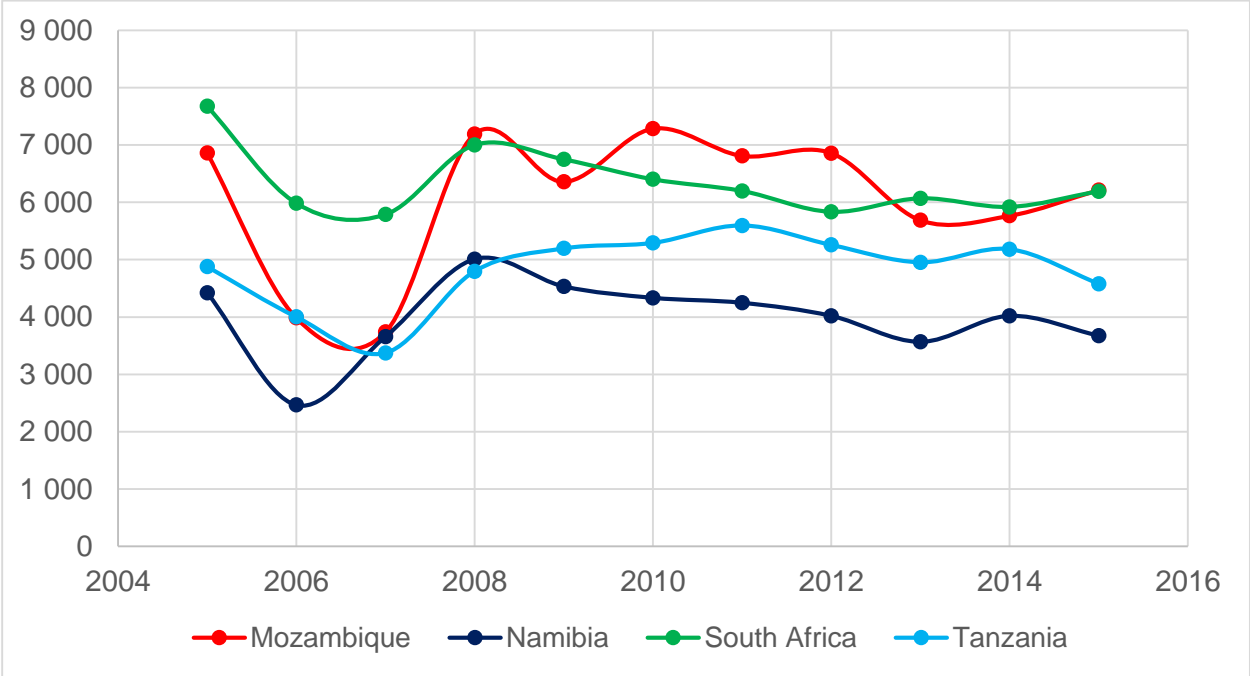
Country (Export)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average:
Mozambique	9 249	3 669	3 105	8 569	7 385	8 850	8 077	7 808	6 813	6 473	6 783	6 980
Namibia	6 051	3 595	5 622	6 016	5 141	5 211	5 312	4 670	3 519	5 070	3 944	4 923
South Africa	7 674	6 280	5 967	7 225	6 583	6 055	5 632	5 009	5 192	4 930	5 140	5 972
Tanzania	5 178	4 107	2 918	5 223	5 861	5 678	6 129	5 436	4 573	4 876	3 888	4 897

Source: Author's own calculations based on trade data from Trade Map (2017) and distance calculations from Searates (2017).

Table 4-5 depicts the cumulative weighted average in distance between the four selected Southern African ports and their top trading partners over an 11-year period. To calculate the cumulative average distance, the following formula was used: the distance between a respective country's port and a trading partner's main port was calculated using Searates (2017) and then multiplied by that trading partner's share of trade in the country in question. For instance, the distance between the Port of Durban and the Port of Shanghai is 12868.68 km and China's share of South Africa's imports in 2015 was 18.35 per cent. Thus, China's share of South Africa's distance from their respective import partners is 12868.68km multiplied by 18.35 per cent, which equals 2361.40km. This formula was then calculated for each of the top ten partners (for both imports and exports) and cumulated, which was applied to data for each year from 2005 to 2015.

Compared to Table 4-4, it is quite clear that a substantial amount of trade takes place regionally, since the distances depicted in Table 4-5 are comparatively less than the distances from the four selected Southern African ports and the main markets of Asia, Europe and the US. In fact, a total of 17.7 per cent of Africa’s total trade was regional in 2014 (WTO, 2015c:41). As mentioned in Section 4.3.1, Mozambique and Namibia are reliant on trade with South Africa. This reliance is reflected in Table 4-5, especially with the average import distance with both Mozambique and Namibia being relatively low. One can also realise the trend, with the average import distance increasing from the year 2005 to 2015, with average export distance decreasing during the same time. Figure 4-2 visually illustrates the trend in distance for total trade during the period from 2005 to 2015.

Figure 4-2: Cumulative weighted average in distance between selected Southern African countries and their top 10 trading partners (2005-2015, kilometres)



Source: Author’s own calculations based on trade data from Trade Map (2017) and distance calculations from Searates (2017).

For Figure 4-2, the average between import and export distance for each country was taken for each respective year (as per Table 4-5). The figure indicates, for these selected countries, trade is becoming more region-specific with the progressive downward trend in average distance from their respective trading partners. Furthermore, it is evident that the trading partners of Mozambique and South Africa are on average further away from the trading partners of Tanzania and especially, Namibia. The question arises whether this illustration infers that location is less important for the Ports of Beira and Durban compared to the Ports of Dar es Salaam and Walvis Bay. Chapter 5 aims to provide better insights with regards to the significance of the location of a

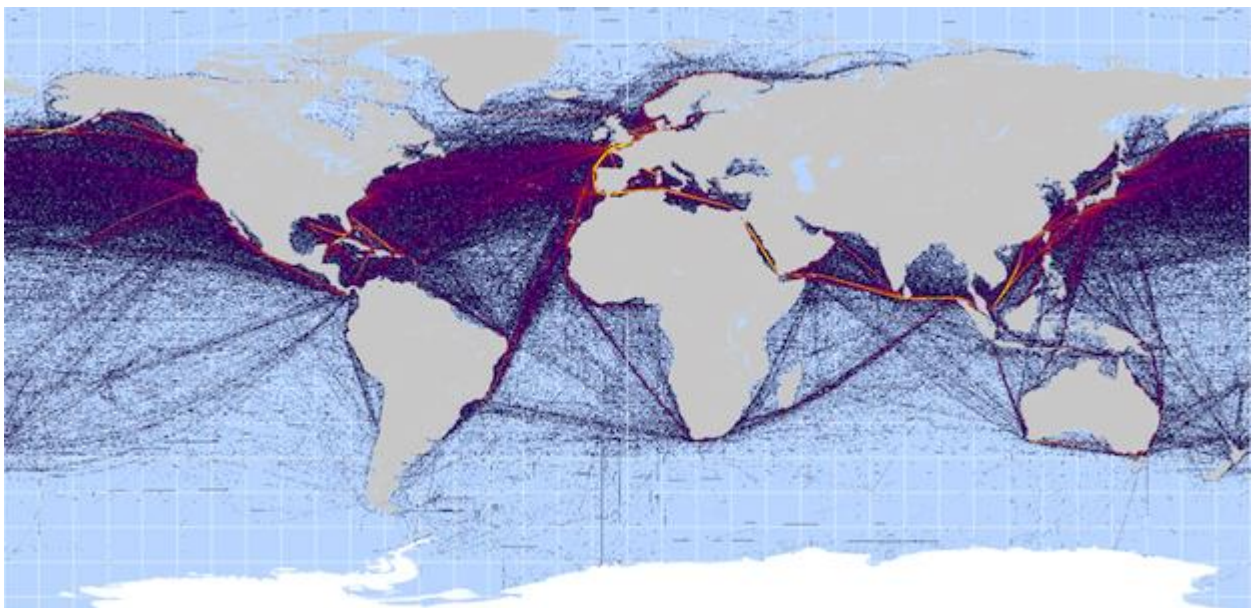
port and the role of distance. Or it can be argued that perhaps the Ports of Beira and Durban are better connected with various shipping lines around the globe, limiting the impact of distance. The following section discusses the importance of connectivity in port selection in Southern Africa.

4.3.3 Connectivity

Connectivity was found to be significant in explaining port selection in a total of nine studies based on the literature discussed in Chapter 3. However, distinction should be made to explain connectivity, as two distinct types of connectivity were found to be important. Firstly, connectivity in terms of the ports with the shipping routes was particularly important from the perspective of carriers and shipping lines. Secondly, connectivity in terms of the ports with the hinterland was particularly important from the perspective of shippers and freight forwarders.

Figure 4-3 depicts the most important global shipping routes in 2012. The thickness and density of the lines depict the volume of maritime traffic making use of the route. In other words, the thicker the line, the greater the volume.

Figure 4-3: Global shipping routes in 2012



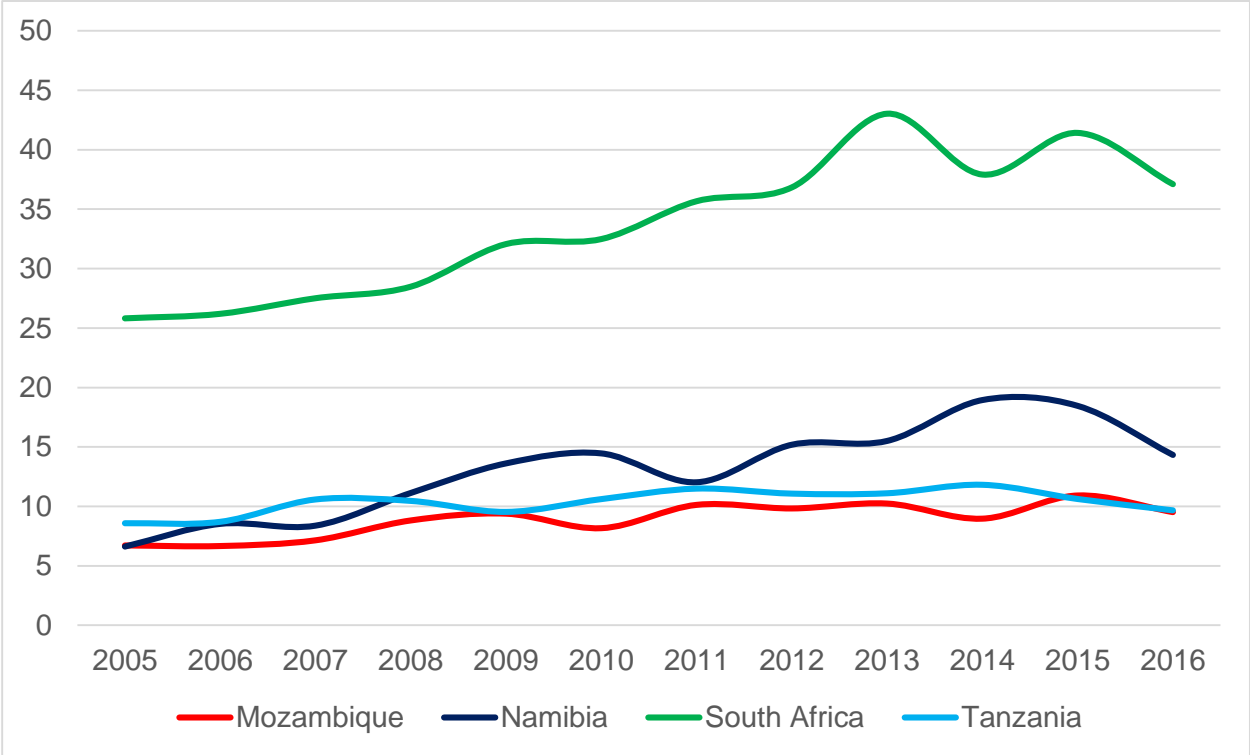
Source: European Commission Global Environment Monitoring Unit (Dai, 2012).

Figure 4-3 shows that the majority of maritime traffic occurs in the northern hemisphere, which puts African and, even more so Southern African countries at a distinct disadvantage. It is however worth pointing out that a fair amount of traffic does flow around the Cape of Good Hope, connecting all four selected Southern African ports along the routes that have their origins in Europe and their destination in Asia, and vice versa. Similarly, with regards to volume, maritime

traffic is concentrated more around the Port of Durban in comparison to the four selected ports. Therefore, it can be argued that Durban has a competitive advantage in terms of connectivity.

To provide further insight into the subject, the liner shipping connectivity index in the World Bank Development Indicators database can be consulted. The liner shipping connectivity index captures how well countries are connected to global shipping networks (WB, 2017). Figure 4-4 comparatively demonstrates the index of the selected Southern African countries.

Figure 4-4: Liner shipping connectivity index for selected Southern African countries (2005-2016, maximum 100)



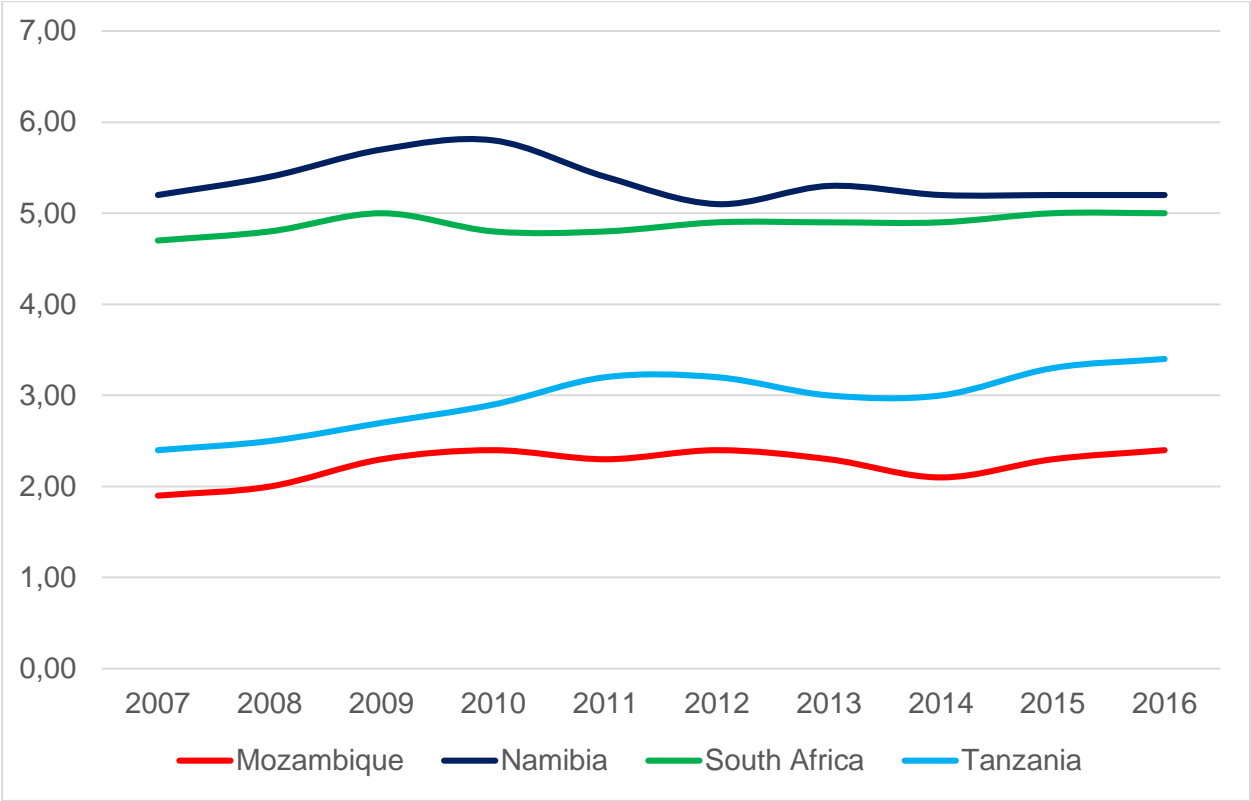
Source: World Development Indicators (WB, 2017b)

South Africa has a definite advantage over its regional rivals in terms of shipping connectivity. It is however noticeable that since 2005, the trend is overall positive for all four countries. In summary, Figure 4-4 emphasises the reasons behind the Port of Durban being the preferred Port of choice in terms of connectivity.

Along with connectivity in terms of shipping, connectivity in terms of the ports with the hinterland is also very important when selecting a seaport. Unfortunately, unlike with shipping connectivity, no standard connectivity index exists to explain the ports’ connection with the hinterland. Since the majority of Southern African land transport takes place on road (TPA, 2016:23), mainly due to the poor state of the rail networks in the region (Jedwab & Moradi, 2016), the WEF’s competitive index of “quality of roads” in the second pillar of “infrastructure” can be used to ascertain hinterland

connectivity to some degree. The following figure comparatively reveals the quality of roads for the selected Southern African countries. The index ranges from 1-7, where 1 depicts roads of overall poor quality, whereas an index of 7 depicts roads of overall excellent quality.

Figure 4-5: Quality of roads index for selected Southern African countries (2007-2016, maximum 7)



Source: Global Competitiveness Indices (WEF, 2007-2016)

As Figure 4-5 indicates, Namibia has the best quality roads among the selected Southern African countries. Furthermore, the illustration leaves little room for dispute, as no overlapping occurs. Namibia’s roads have been constantly better than South Africa’s roads, which in turn have been better than Tanzania’s roads, which have been ultimately better than Mozambique’s roads. Once again, all four countries have experienced a positive trend in terms of road quality. However, the WEF warns about South Africa’s infrastructure competitiveness going forward, reporting that infrastructure development has stalled, especially with regards to transport (WEF, 2016:30).

The quality of roads is unfortunately not the best proxy for hinterland connectivity, although the index does provide some valuable insights into the inbound and outbound transport before and after goods are shipped on board vessels. Additional insights into the hinterland connectivity determinant of port selection can be obtained by observing not only the quality of the roads, but also the length of the road network. Mozambique has the smallest road network (31 083km), followed by Namibia (44 138km), then Tanzania (86 472km), as reported by the Central

Intelligence Agency (CIA, 2017). South Africa, on the other hand, has more than four times the combined length of the other three countries. South Africa's road network totals 747 014km (CIA, 2017). Therefore, it can be argued that, seeing that South Africa's road network is proportionally much longer, although Namibia's road quality is better, South Africa still has a competitive advantage over its regional rivals in terms of hinterland connectivity.

In summary, the Port of Durban is clearly the best-connected port in maritime terms, with Namibia next in line, albeit a fair distance away. In inland connectivity terms, the Port of Walvis Bay slightly makes up the deficit to the Port of Durban through better quality roads. Ultimately, when choosing between the Ports of Dar es Salaam and Beira, solely based on connectivity, the Port of Dar es Salaam will be preferred by means of being better connected in maritime terms.

The following section discusses the comparative transport costs for the selected Southern African countries.

4.3.4 Transport cost

Transport cost was found to be significant in explaining port selection in three studies discussed in the literature review in Chapter 3. All three studies were from the perspective of shippers and freight forwarders (Nir *et al.*, 2003; Ng *et al.* 2013; Kramberger *et al.* 2015). Transport cost in this section exclusively relates to inland transport cost, for the following two reasons. Firstly, the aforementioned three references to "transport cost" in the literature review were specifically defined as "inland transport cost". Various other references to "cost" related to broader shipping costs, such as documentation costs, administrative and broker fees, terminal handling charges and also inland transport. (A similar determinant of "cost" will in fact be explained and captured in the estimated models discussed in Chapter 5). Secondly, maritime transport cost in its exclusivity was not found to be significant when explaining port selection from any role player other than carriers and shipping lines in any of the studies. This is curious, since it is in fact the carriers and shipping lines that determine the actual freight rates. Therefore, for the aforementioned reasons, transport cost in this section refers to inland transport cost.

Regrettably, very little statistics have been published on inland transport cost within the scope of this study, with the sole exception of South Africa. Havenga *et al.* (2016:1) stated that freight logistics costs totalled 11.1 per cent of South Africa's GDP in 2013. Since this is the only reference to transport cost in Southern Africa, the need arises to find another method of ascertaining inland transport cost.

Buys *et al.* (2006:6) noted that developed countries use distance as a proxy for transport costs in gravity models since the road quality is uniformly high. This is not the case in the Southern African countries selected for this study, as Figure 4-5 has clearly indicated. Due to varying road

conditions in developing countries, Buys *et al.* (2006:6) rather used road distance over road quality as a better approximation for inland transport cost. A similar approximation is used in this study, however with the additional element of fuel cost, since the majority of inland transport in Southern Africa occurs via road transport, as mentioned before. The following equation depicts transport cost:

$$C_j = \frac{D_j^\alpha F_j^\alpha}{Q_j}$$

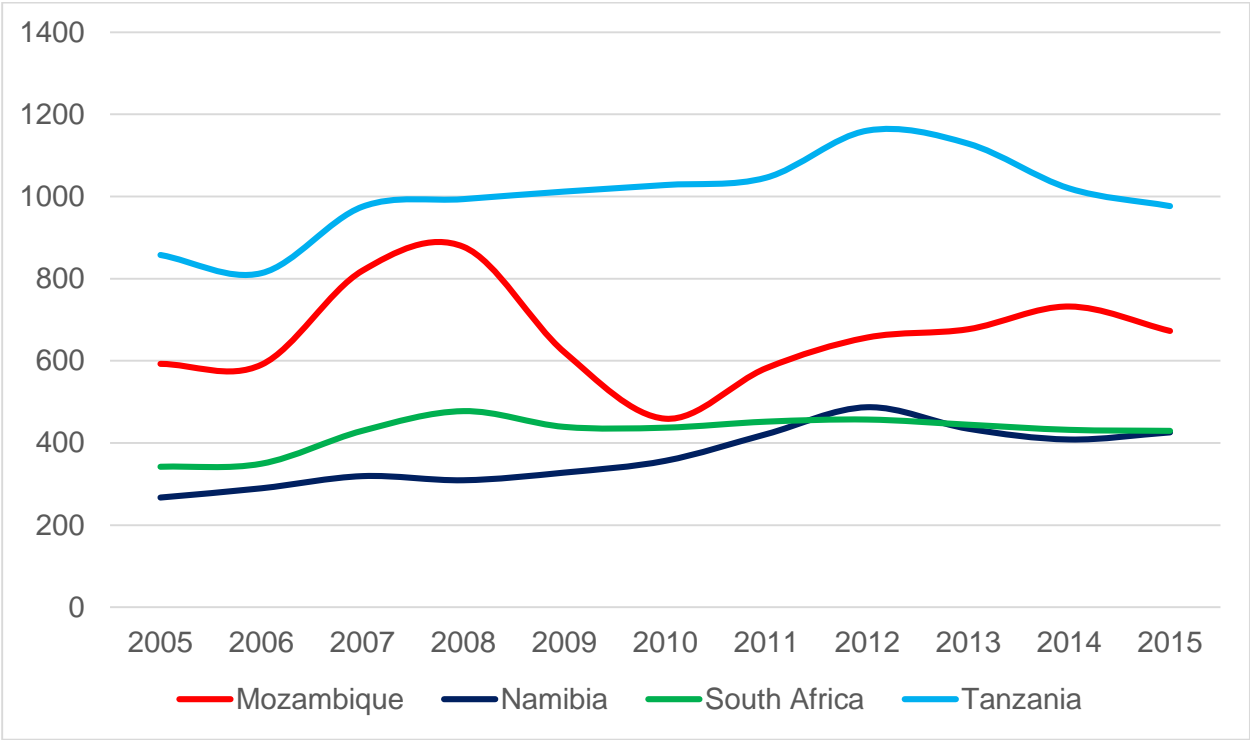
Where:

- C_j = Transport cost in US\$ for country j
- D_j = Distance between ports and contestable hinterland¹¹ for country j
- F_j = Pump price for diesel fuel (WB development indicators) for country j
- Q_j = Quality of roads (WEF Global Competitiveness indices) for country j

Figure 4-6 depicts the inland transport cost for the selected Southern African countries stretching over the period from 2005 to 2015, using the equation presented above.

¹¹ The average distance between the ports and the capitals of the surrounding landlocked countries was taken. The countries include: Botswana, Malawi, Zambia and Zimbabwe.

Figure 4-6: Inland transport cost for selected Southern African countries (2005-2015, US\$ per unit of distance)



Source: Author’s own calculations based on World Development Indicators (WB, 2017b), Global Competitiveness Indices (WEF, 2005-2015) and distance calculated from Google Maps (2017).

Based on Figure 4-6, it is clear that Tanzania has a distinct disadvantage in terms of inland transport cost, as it is by far the most expensive in comparison to the other three countries. On the other hand, Mozambique experienced a vast decrease in inland transport cost over a three-year period, from 2008 to 2010. This decrease in cost can be attributed to the conjunct decreases in fuel cost (from 1.37 US\$ per litre of diesel in 2008 to 0.86 US\$ in 2010 (WB 2017)), as well as increases in road quality (from 2.0 in 2008 to 2.4 in 2010 as seen in Figure 4-5). Since 2010, Mozambique’s inland transport cost has subsequently risen to similar levels around 2005/2006. Inland transport cost between Namibia and South Africa are very similar. Ultimately, when choosing between shipping through the Port of Durban or the Port of Walvis Bay, distance invariably becomes the determining factor, since the inland transport cost between South Africa and Namibia are very closely linked.

So far, this chapter clearly indicates that container volumes have increased in each of the four selected ports. The final macro-determinant of port selection that was established in the literature review and is left to be discussed is an efficient flow of trade. Since the WTO’s TFA agreement has been ratified by two-thirds of members, the following section discusses trade facilitation in conjunction with efficiency.

4.3.5 Trade facilitation and efficiency

Given the fact that the primary aim of the TFA is to decrease the time and cost of trade by simplifying the required paperwork, modernising procedures and harmonising customs requirements (WTO, 2017g), the TFA can be argued under the umbrella term of “efficiency”. Since efficiency was found to be significant in explaining port selection in no fewer than five studies, determining the comparative level at which the selected Southern African countries promote the efficient flow of goods across borders is important in aiding the selection of one seaport over another. In light of the recent ratification of the TFA, the OECD has developed a set of trade facilitation indicators (TFIs) (OECD, 2017b). The following table summarises their simulations of the selected countries in terms of intermediate level indicators.

Table 4-6: Trade facilitation indicators simulator for selected Southern African countries

Country	Information availability	Involvement of the trade community	Advance rulings	Appeal procedures	Fees and charges	Formalities - documents
Mozambique	0.52	0.50	0.00	0.44	0.85	0.75
Namibia	0.71	1.14	0.00	1.11	1.23	0.75
South Africa	1.62	1.63	1.67	1.46	1.43	1.78
Tanzania	1.10	1.43	0.50	0.89	1.29	0.50

Country	Formalities - automation	Formalities - procedures	Internal border agency co-operation	External border agency co-operation	Governance and impartiality	Total
Mozambique	0.50	0.96	0.36	0.73	0.50	6.11
Namibia	0.75	0.93	0.30	0.36	0.22	7.52
South Africa	1.62	1.50	0.91	1.09	1.78	16.47
Tanzania	1.00	0.87	0.82	0.90	0.67	9.96

Source: Author’s own compilation adapted from the TFI (OECD, 2017b).

The TFIs take values from 0 to 2, where 2 is the best performance that can be achieved. TFIs are calculated on the basis of information in the TFIs database (OECD, 2017b). The OECD states that the aim of the TFIs is for countries to identify their strengths and weaknesses with regards to trade facilitation. Table 4-6 quite clearly illustrates these countries’ strengths and weaknesses. Furthermore, Table 4-6 evidently indicates that South Africa is comfortably the leader within the group of countries in terms of the extent that the country has implemented trade facilitation measures. South Africa scores well in all 11 indicators, barring internal and external border agency co-operation. In fact, compared to the other three countries, South Africa scores the best in every indicator. Conversely, Mozambique scores poorly in all indicators. Namibia, on the other hand, scores well with three indicators and Tanzania scores well with a total of four indicators.

In addition to the OECD TFIs, the World Bank publishes another significant set of measurements of global trade. The annual Doing Business report measures a country's scores when it comes to trading across borders. The time and cost to export the product of comparative advantage and the import of auto parts is what is used as a proxy when determining a country's ultimate score of trading across borders (Doing Business, 2016:14). The score is calculated out of a 100, with a total of 16 countries obtaining a full score in the 2017 edition of the report. Table 4-7 depicts the scores of the selected Southern African countries when it comes to trading across borders.

Table 4-7: Ease of doing business: Trading across borders for selected Southern African countries

Country	Trading Across Borders Score (out of 100)	Trading Across Borders rank (out of 189)	Time to export: Border compliance (hours)	Cost to export: Border compliance (US\$)	Time to export: Documentary compliance (hours)
Mozambique	66.31	106	78	602	70
Namibia	61.47	127	120	745	90
South Africa	58.01	139	100	428	68
Tanzania	20.21	180	96	1160	96

Country	Cost to export: Documentary compliance (US\$)	Time to import: Border compliance (hours)	Cost to import: Border compliance (US\$)	Time to import: Documentary compliance (hours)	Cost to import: Documentary compliance (US\$)
Mozambique	220	14	354	24	171
Namibia	348	6	145	3	63
South Africa	170	144	657	36	213
Tanzania	275	402	1350	240	375

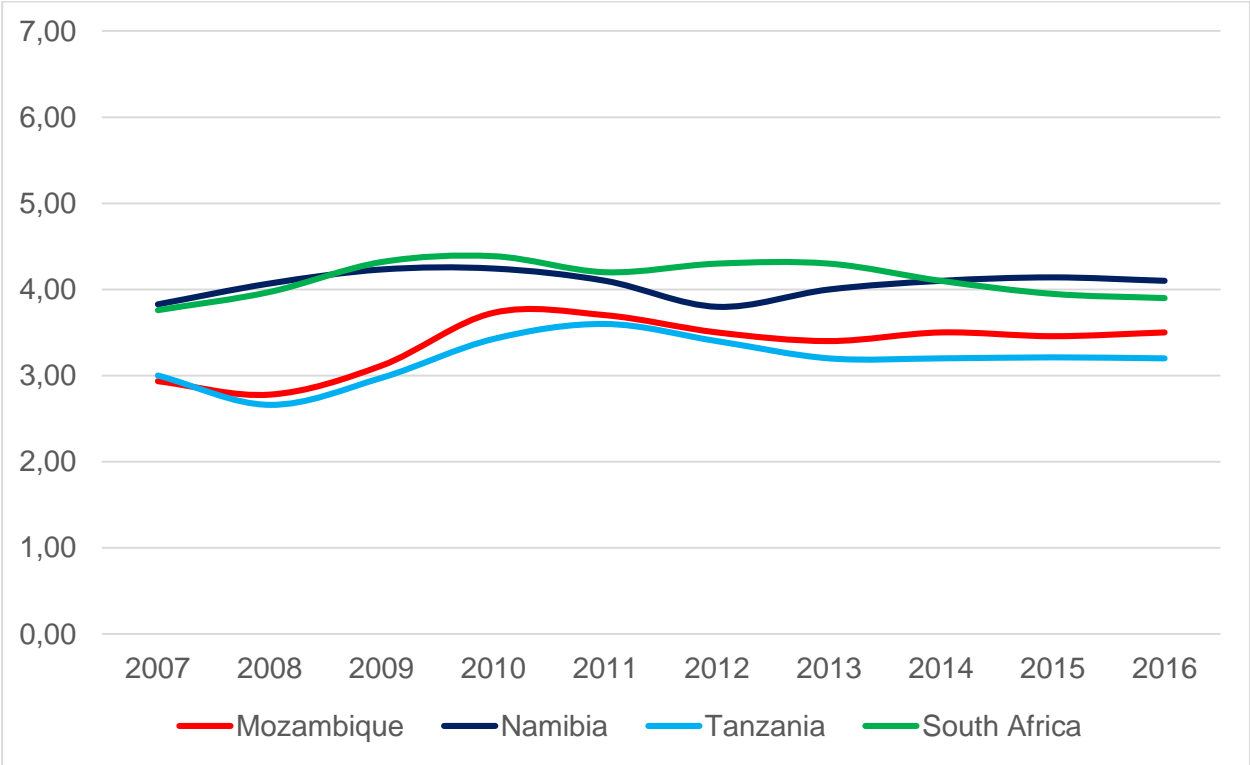
Source: Author's compilation from the World Bank's Doing Business report (2016)¹².

Table 4-7 indicates that both Mozambique and Namibia perform better than South Africa when it comes to trading across borders. However, Tanzania performs very poorly, ranking in the bottom ten of all the countries that were measured. Compared to Table 4-6, the ranking order is almost reversed. It can be concluded from the table above that there are cumbersome export requirements in all four countries. An inefficient export process is a very worrisome factor for all of these countries, as competitive exports (in especially raw and intermediate goods) have been an historical driver for all of them. In terms of the import requirements, it is worth noting that Namibia performs substantially better compared to the other three countries in every import measurement. Seeing that almost 60 per cent of Namibia's trade is imports (WB, 2017b), an efficient import process will greatly assist it in maintaining its advantage over the other three countries' import process. Tanzania, on the other hand, performs particularly poor in all four import processes.

¹² Note: the colour scales are benched against the best and worst performing countries in each measurement.

Since both Table 4-6 and Table 4-7 is a representation of the current environment around trade facilitation and the ease of doing business across borders for the selected Southern African countries, an historical trend cannot be recognised. It is unclear whether these countries improved in facilitating trade across borders. Therefore, to further measure trade facilitation and efficiency, the following Figure 4-7 illustrates the “burden of customs procedure” from 2007 to 2016. The index forms part of the sixth pillar, which is “goods market efficiency” as published annually by the WEF’s global competitiveness indices, where 1 depicts an extremely inefficient customs procedure and 7 depicts an extremely efficient customs procedure.

Figure 4-7: Burden of customs procedure index for selected Southern African countries (2007-2016, maximum 7)



Source: *Global Competitiveness Indices (WEF, 2007-2016)*

The figure illustrates that, similar to previous macro-determinants of port selection in selected Southern African countries (such as quality of roads and transport cost), Namibia and South Africa followed a comparative trend over the past nine years. The same can indeed be said of Mozambique and Tanzania, as Figure 4-7 indicates. The burden of both countries’ customs procedures is comparative. From Figure 4-7 it is worth noting that, the comparative difference in the burden of customs procedure is less discernible than the previous two measurements of trade facilitation and efficiency. Ultimately, as Figure 4-7 shows, all four countries have customs procedures that are burdensome.

As a result, neither one of the four selected Southern African countries is globally in the best position to facilitate trade and ensure an efficient flow of trade. However, from the evidence presented in this section, regionally, South Africa has a slight competitive advantage with regards to trade facilitation and trading across borders.

4.3.6 Summary

Considering the macro-determinants of port selection in Southern Africa, the Port of Durban still has a distinct competitive advantage over its regional rivals. Without incorporating subjective measures into the equation of port selection, the Port of Durban serves as the definitive choice for any hinterland, which all four ports contest. This is especially true with regards to the macro-determinants of connectivity and efficiency. Upon investigating the quality of roads and overall inland transport cost, South Africa also compares favourably, however the difference in relation to Namibia is not as noticeable as it is with connectivity and efficiency, in fact, Namibia scores slightly better in both determinants. On the other hand, Mozambique and Tanzania compare relatively poorly with regards to macro-determinants of port selection.

Furthermore, a substantial proportion of the advantage of the Port of Durban can be contributed towards a relatively better macro-economic trading environment in South Africa, when comparing the four countries. The macro-determinants of port selection also accentuate the fact that a role player within the value chain does not only base his/her choice on a port, but rather on a greater value chain/trade corridor. The evidence presented in this section supports the literature explained in the second school of thought, which incorporates ports as an important element within the greater value chain system.

The following section presents a comparative analysis of the micro-determinants that influence port selection in Southern Africa.

4.4 Comparative micro analysis

The previous section focused on comparing the macro-determinants of port selection in Southern Africa. Since the macro-determinants investigated the greater economic environment and the way they subsequently link to each port, the comparative analysis was not exclusively completed on the ports in Southern Africa, but rather on the entire chain moving to and from the ports. Therefore, the aim of Section 4.4 is to compare the micro-determinants that influence port selection in Southern Africa. The focus is exclusively on the infrastructure, the congestion, the services and the changes at each selected Southern African port. Similar to Section 4.3, the determinants that are discussed were found to be significant when explaining port selection in multiple existing studies (as found in Section 3.4).

4.4.1 Port infrastructure

Port infrastructure was investigated in a total of nine studies, as discussed in the literature review in Chapter 3. However, infrastructure was found to be significant in explaining port selection in only two of these nine studies (Ugboma *et al.*, 2006; Tongzon, 2009). This can partly be explained by the fact that a substantial share of the research on port selection focused on first world (Europe and the US) and advanced economies (Southeast Asia), where the quality of port infrastructure (similar to the quality of roads) is universally high. As mentioned in Section 1.1 and Section 3.3, very few research has been undertaken on port selection in Southern African, or Africa as a whole, where one would expect the quality of port infrastructure to be considerably lower. Therefore, throughout this section, the top container port, the Port of Shanghai in China (Containerisation, 2016), is included to use as a benchmark for the four selected Southern Africa ports in the study. Table 4-8 provides a summary of the physical characteristics of infrastructure for the four Southern African ports selected for this study, including the Port of Shanghai for comparison.

Table 4-8: Current port infrastructure for selected Southern African ports and the Port of Shanghai

Port	Port size	Harbour size	Harbour type	Shelter	Holding ground	Max vessel size	Container berths	Berth length
Beira	Medium	Medium	River natural	Good	No	>500 ft	4	645m
Dar es Salaam	Large	Medium	Coastal natural	Good	Yes	>500 ft	4	735m
Durban	Large	Large	Coastal breakwater	Good	Yes	>500 ft	10	2 578m
Walvis Bay	Small	Small	Coastal natural	Good	Yes	>500 ft	8	1 356m
Shanghai	Very large	Large	River natural	Good	Yes	>500 ft	125	20 000m

Source: Author's own compilation based on information from annual reports (CFM, NAMPORT, TNPA and TPA) and Searates (2017).

From Table 4-8, a number of conclusions can be drawn. Firstly, infrastructure development has played a key role in the Port of Durban's evolution. The Port of Durban is the only port listed as having a breakwater harbour. The breakwater, which was constructed around the 1870s has greatly aided operations inside the port (Steenkamp, 2010:7-9). In addition to the widening and deepening of the port's entrance, the ten container terminals and an excess of 2.5 kilometres of berth length assist in serving great quantities of trade shipped by large modern container vessels. All the other harbours from Table 4-8 are classified as natural.

Secondly, the Port of Walvis Bay, although classified as being both a small port and having a small harbour, makes efficient use of its space, with the same amount of container berths (eight) and almost the same berth length (1 356 metres) as the Ports of Beira and Dar es Salaam put together. However, when considering Table 4-8 in conjunction with the container traffic of each of the four ports in Table 4-1, the Port of Dar es Salaam clearly makes the most efficient use of

its four container terminals since the port has handled roughly double the number of containers compared to the Port of Walvis Bay over the period spanning from 2005 to 2015.

Thirdly, all four ports are capable of handling very large vessels, however, the relative size of each port gets somewhat distorted when compared to the benchmark Port of Shanghai. The Port of Shanghai has nearly five times as many container terminals as all four of the selected Southern African ports put together and nearly four times the berth length. Compared to the largest port in the region (the Port of Durban) Shanghai handled roughly thirteen times as many containers in 2015 (36.537 million TEUs in Shanghai versus 2.770 million TEUs, Containerisation, 2016:16-17). In order to handle these vast amounts of containers, large and efficient crane operations need to be in place. Table 4-9 summarises the crane infrastructure for the four selected Southern African ports, including the Port of Shanghai for comparison.

Table 4-9: Crane operations for selected Southern African ports and the Port of Shanghai

Port	100+ Ton lifts	50-100 Ton lifts	25-49 Ton lifts	0-24 Ton lifts	Fixed cranes	Mobile cranes	Floating cranes
Beira	No	No	Yes	Yes	Yes	Yes	No
Dar es Salaam	Yes	No	Yes	Yes	Yes	Yes	Yes
Durban	Yes	Yes	Yes	Yes	No	Yes	Yes
Walvis	Yes	No	Yes	Yes	Yes	Yes	No
Shanghai	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: Author’s own compilation based on information from annual reports (CFM, NAMPORT, TNPA and TPA) and Searates (2017).

Table 4-9 indicates that the Ports of Dar es Salaam, Durban and Walvis Bay are all well-equipped in terms of crane operations. The Port of Beira on the other hand, can only handle cargo of up to 49 tonnes. This equates to only one container at a time, since the maximum gross weight of a 40-foot standard container is 30 480 kg (Seaplus, 2017). In order to ensure high levels of productivity, most shuttle carriers operating on quay cranes at container terminals around the world load two containers simultaneously (Hambling, 2016). To measure berth productivity, the number of container moves per ship per working hour is used. Over the period of 2009 to 2015, the Port of Durban compares similarly to other global ports (Ports Regulator, 2016:15-16; Merk & Dang, 2012; Merk *et al.*, 2015). During this period, Durban averaged 47.1 container moves, per ship, per working hour, within the global average of between 40 and 80. However, these figures dwarf in comparison to the Port of Shanghai. JOC (2014:17) reported that the Port of Shanghai moves 104 containers per ship per working hour, which incidentally was only the tenth most efficient port in the world. The most efficient port according to JOC in 2013 was the Port of Tianjin in China with 130 container moves, per ship, per working hour.

Southern Africa clearly cannot compete with the global frontiers in terms of port efficiency and are clearly very small on the global scale. With this being said, various infrastructure upgrades are currently in progress with regards to three of the four Southern African ports.

The Port of Dar es Salaam has received three loans for infrastructure upgrades in 2017 so far. The World Bank approved two loans (US\$ 305 million in January and US\$ 345 million in July, Ng'Wanakilala, 2017) and another loan was given from the China Harbour Engineering Company (US\$ 154 million in June). The Port of Dar es Salaam handled an estimated 13.8 million tonnes of cargo in 2016, with the port aiming to increase its capacity to 28 million tonnes a year by 2020, as the port is struggling to keep up with the demand of feeding a substantial hinterland in Burundi, the Democratic Republic of the Congo, Malawi, Rwanda and Zambia since port congestion has started to inhibit trade flowing through the Port of Dar es Salaam (Ng'Wanakilala, 2017).

The container terminal at the Port of Durban is currently in the midst of an infrastructure expansion. The primary aim of the project is to increase the capacity of the container terminal at pier 1 to 2.4 million TEUs per year (Barradas, 2017). The current capacity at pier 1 is around 700 thousand TEUs per year (TNPA, 2017). TNPA also plans to deepen berths 203 to 205 at the container terminal, which could raise the capacity of pier 2 from 2.4-million TEUs to 2.9-million TEUs. The planned upgrades are set to alleviate port congestion and increase the port's capacity. Furthermore, the proposed expansion includes deepening the container berths from 12.8 metres to 16.5 metres, as well as lengthening the container berths from 914 metres to 1 210 metres. The objective is to enable the Port of Durban to handle three 350-metre vessels at the same time (Barradas, 2017). The expansion is projected to be completed in 2022.

Namibia's port authority on the other hand is implementing a multi-phase expansion project, including a new terminal at Walvis Bay (IHS, 2017). The aim of the project is to raise the container throughput capacity from 350 thousand TEUs to over 750 thousand TEUs on reclaimed land (Larkin, 2017). Furthermore, the project will include the installation of a modern terminal operating system, communication system, workstations, electricity supply upgrade and pilot and operator trainings centres (AfDB, 2013). The project is expected to be completed by 2019 (Larkin, 2017).

Although water depth is not exclusively applicable to port infrastructure, the determinant is nonetheless worth mentioning, as it relates to the physical characteristics of the port. Water depth was found to be significant in explaining port selection from the perspective of carriers and shipping lines in Chou (2010). Table 4-10 indicates water depth at the different locations of each port.

Table 4-10 Water depth for selected Southern African ports and the Port of Shanghai

Port	Mean tide	Channel		Cargo pier		Anchorage		Oil terminal	
		Min (m)	Max (m)	Min (m)	Max (m)	Min (m)	Max (m)	Min (m)	Max (m)
Beira	5ft	3,4	4,6	7,1	9,1	4,9	6,1	11	12,2
Dar es Salaam	3ft	9,4	10	9,4	10	20,1	21,3	9,4	10
Durban	1ft	11	12,2	7,1	9,1	21,6	22,9	9,4	10
Walvis Bay	2ft	9,4	10	9,4	10	7,1	9,9	9,4	10
Shanghai	6ft	7,1	9,1	3,4	17,5	7,1	9,1	9,4	10

Source: Author's own compilation based on information from annual reports (CFM, NAMPORT, TNPA and TPA) and Searates (2017).

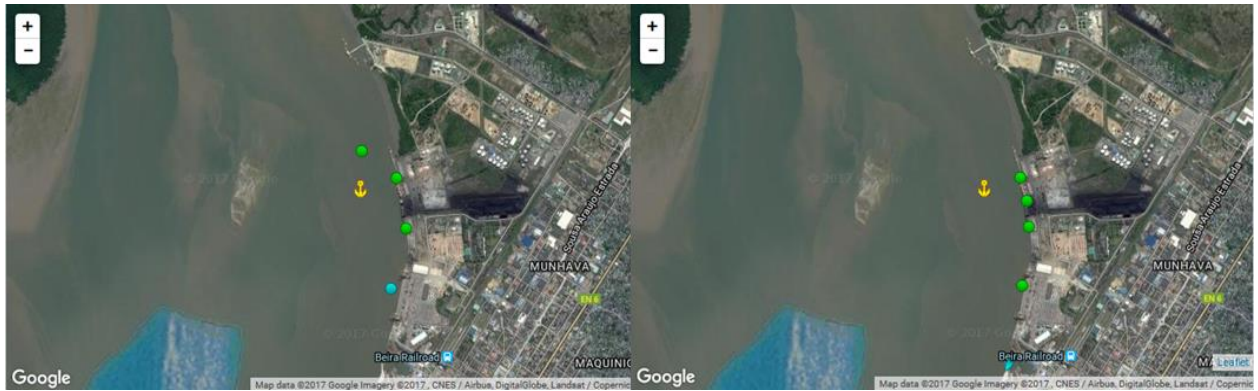
Shallow water levels and volatile tides could be seen as operational obstacles for any port. As seen in Table 4-10, two locations are noteworthy to carriers and shipping lines, the channel entering the Port of Beira and anchorage at the Port of Beira. These two locations can become un-operational in the event of tides reaching five feet. Weather permitting, all other locations seem to be sufficiently deep to handle large container vessels. However, it can be noted that deep water levels are not a prerequisite for handling high volumes of containerised cargo. The Port of Shanghai's cargo pier is relatively shallow compared to the other four, yet an excess of 36 million TEUs flowed through the terminal in 2015 (Containerisation, 2016:16). The Port of Durban and the Port of Dar es Salaam are the deepest of the four selected Southern African ports, with especially deep water levels for anchorage. In the case of a highly congested port whereby a number of vessels might first need to anchor, deep water levels might be especially required. The following section presents a discussion on port congestion and the frequency of ship visits.

4.4.2 Port congestion

Port congestion was found to be significant when explaining port selection in three studies in the literature review in Chapter 3. All three studies were undertaken from the perspectives of shipper and freight forwarders (Tiwari, *et al.*, 2003; Steven & Corsi, 2012; Ng *et al.*, 2013). However, port congestion, a substantial hindrance to port efficiency and port productivity, is cumbersome to capture. No quantifiable measurement exists that indicates the level of port congestion. Therefore, with the aim to overcome this hindrance, two visual snapshots of the four selected Southern African ports were captured to illustrate the comparative marine traffic that flows through each selected port. The illustrations on the left-hand side indicate a typical Friday morning, whereas the illustrations on the right hand side indicate a typical Monday morning¹³.

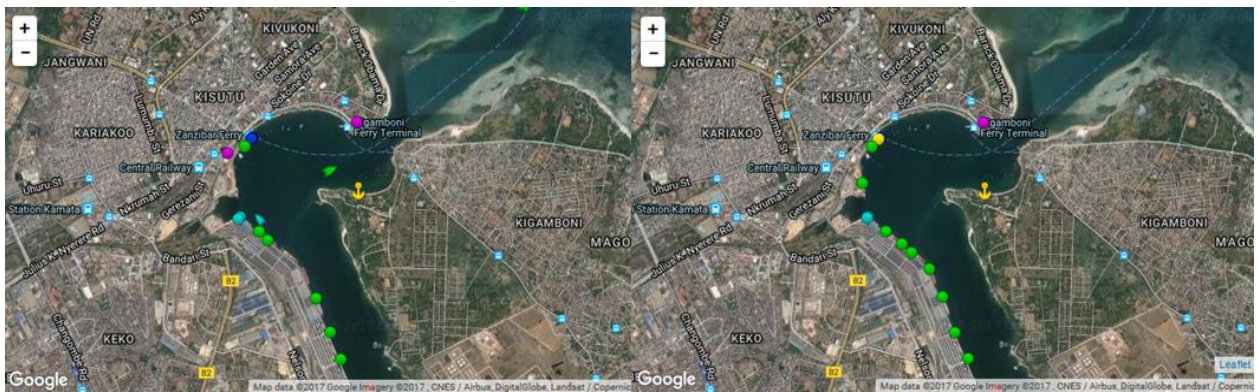
¹³ Note: Each different dot denotes a vessel, with each colour denoting a different type of vessel. Green depicts cargo vessels, red depicts oil tankers, blue depicts passenger vessels, turquoise depicts tug boats and purple depicts pleasure crafts. Figures 4-8 to 4-11 were captured between 10:30 AM and

Figure 4-8: Snapshot of port congestion at the Port of Beira



Source: Marine Traffic (2017) port database

Figure 4-9: Snapshot of port congestion at the Port of Dar es Salaam



Source: Marine Traffic (2017) port database

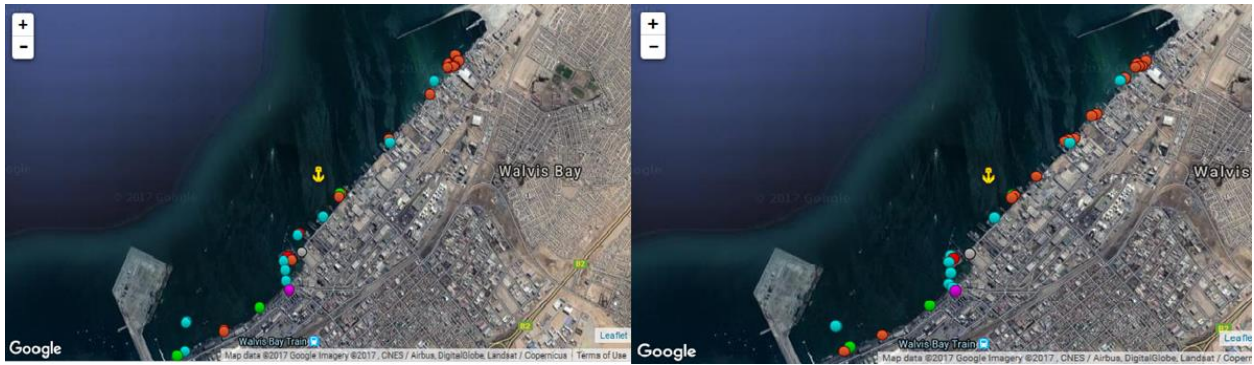
Figure 4-10: Snapshot of port congestion at the Port of Durban



Source: Marine Traffic (2017) port database

10:45 AM on Friday, 15 September 2017 for the left-hand side illustrations and between 08:00 AM and 08:15 Am on Monday, 18 September 2017 for the illustrations on the right-hand side.

Figure 4-11: Snapshot of port congestion at the Port of Walvis Bay

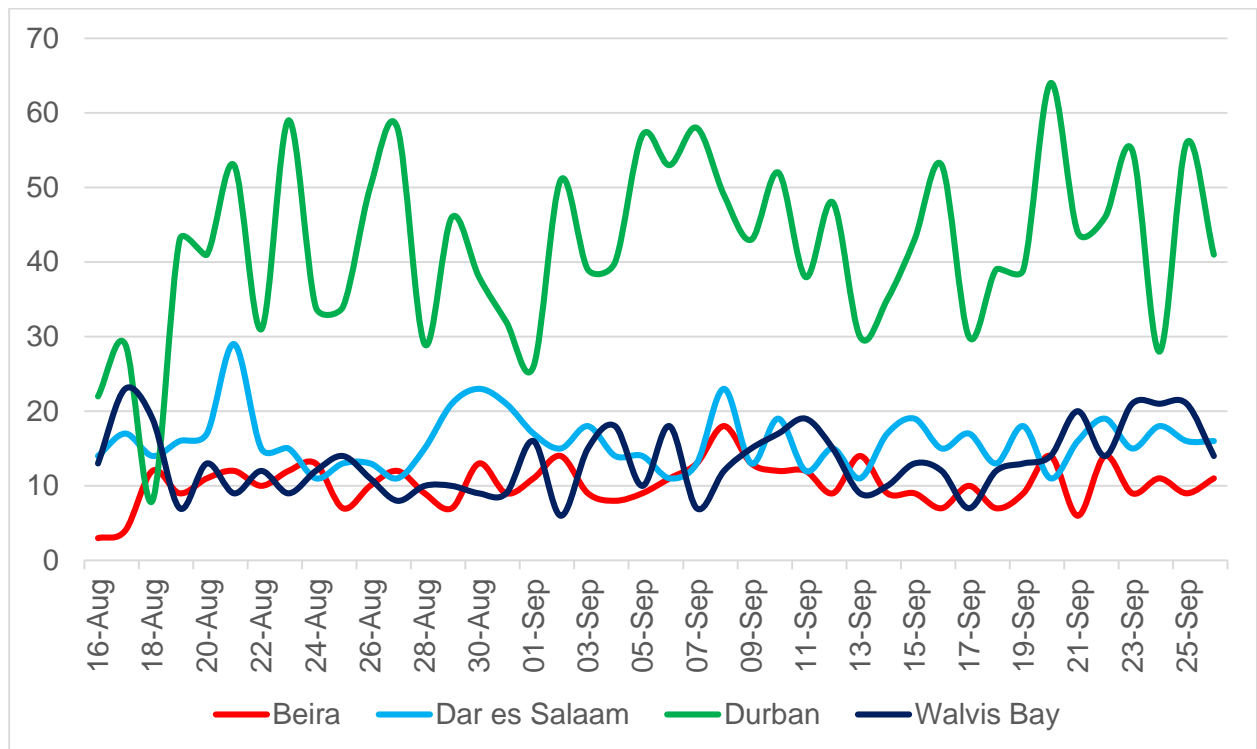


Source: Marine Traffic (2017) port database

Figures 4-8 to 4-11 illustrate the comparative port congestion of the four selected Southern African ports. From the figures above, it is abundantly clear that the Port of Durban is a lot more congested than the other three ports, with the Port of Beira not being congested at all. Along with the relative congestion, Figures 4-8 to 4-11 also provide some insight into the different characteristics and sizes of each port (Table 4-8). What is especially indicative of Figure 4-11 is the Port of Walvis Bay's efficient use of berth space. In addition to port congestion, the figures illustrate the progress of the container terminal expansion project on reclaimed land (as mentioned in Section 4.4.1).

Besides the visual snapshots of the comparative ports, the frequency of ship visits can also be used in an attempt to explain port congestion. In fact, realising the frequency of ship visits at the selected Southern African ports provided Figures 4-8 to 4-11 with substantiating information. As with various data-related aspects in this research, limited data was available for all of the four ports. That being the case, a sample was taken from the Marine Traffic (2017) port database. Figure 4-12 illustrates the number of ship visits for the selected Southern African ports over a six-week period in August and September, 2017.

Figure 4-12: Number of ship visits per day for selected Southern African ports (16 August 2017 to 26 September 2017)



Source: Marine Traffic (2017) port database

Similar to the previous illustrations, Figure 4-12 indicates that the Port of Durban constantly received substantially more ship visits compared to the other three ports. The Port of Dar es Salaam on the other hand, which is only behind the Port of Durban in terms of the amount of cargo handled, experienced cyclical spurts in the number of ship visits, most notably on Fridays. The Ports of Beira and Walvis Bay received an equal number of ships during the period in question, averaging around ten ship visits per day.

It can be deduced from the above figures that the Port of Durban is by far the busiest port in comparison to the four selected Southern African ports. This points to the fact that port congestion might be a significant consideration for role players when choosing between the Port of Durban and another suitable Southern African port. Furthermore, port congestion is indeed an important factor for the proposed infrastructure upgrades (Section 4.4.2). Port congestion also plays a significant role in the reasons behind the planned port upgrades in Dar es Salaam. After the Port of Durban, the Port of Dar es Salaam is the next busiest port, with the Ports of Beira and Walvis Bay experiencing similar levels of congestion, albeit considerably lower than the Ports of Dar es Salaam and Durban. In the following section, the comparable port services that each of the selected Southern African port offers are discussed.

4.4.3 Port services

Port services relate to refuelling, ship repairs and general supplies, among other services available at each respective port. Port services were found to be significant when explaining port selection in a total of five studies from the literature review conducted in Chapter 3. As expected, all five studies that found port services to be significant when explaining port selection were from the perspectives of carriers and shipping lines. Due to the fact that actual ships make use of port services, the results are not surprising, because the shipping lines are in most cases the owners of the vessels. The following table indicates the different services that are available at each of the selected Southern African ports. Once again, the Port of Shanghai is added for comparison purposes.

Table 4-11: Port services for selected Southern African ports and the Port of Shanghai

Port	Navigation equipment	Fuel oil	Deck	Diesel oil	Engine	Ship repairs	Marine railroad	Dry dock size
Beira	Yes	Yes	Yes	Yes	Yes	Major	Small	Medium
Dar es Salaam	No	No	No	No	No	Limited	Small	N.A.
Durban	Yes	Yes	Yes	Yes	Yes	Moderate	Large	Large
Walvis Bay	No	Yes	No	Yes	No	Limited	Medium	N.A.
Shanghai	Yes	Yes	Yes	Yes	Yes	Major	Large	Large

Source: Author's own compilation based on information from annual reports (CFM, NAMPORT, TNPA and TPA) and Searates (2017).

As seen in Table 4-11, it is clear that the Ports of Beira and Durban are the preferred choices when comparing the four ports in terms of services. Indeed, these two ports offer all of the different services listed above. In comparison to the other two ports, some services are not available at all. These include servicing navigation equipment and deck and engine repairs at the Port of Walvis Bay. With regards to the port at Dar es Salaam, almost no services are offered, except for limited ship repairs. In fact, only the Ports of Beira and Durban offer substantial ship repairs, since neither the Port of Dar es Salaam nor the Port of Walvis Bay has an operating dry dock. Compared to the frontier Port of Shanghai, the Ports of Beira and Durban compare well. However, the same cannot be said for the Ports of Dar es Salaam and Walvis Bay.

This following section briefly presents a discussion of port cost and charges between the selected Southern African ports.

4.4.4 Port cost and charges

Port cost and/or terminal handling charges was found to be an important and significant determinant when explaining port selection in a total of 11 studies (as discussed in Chapter 3). Similarly, with other micro-determinants of port selection, the majority of these studies that found

port cost and charges to be significant were undertaken from the perspectives of carriers and shipping lines. Once again, data availability is a constraint when conducting a comprehensive analysis between the four selected Southern African ports.

One of the reasons for the limited data on port cost and terminal handling charges could be due to the respective operators at each of the ports, as noted in the port function matrix (Table 4-2). Both the Ports of Beira and Dar es Salaam have private operators who are responsible for handling containerised cargo. In comparison to the Ports of Durban (to a large degree) and Walvis Bay, the responsibility of cargo handling rests on the state (Gumede & Chasomeris, 2015:50). As far as price competition is concerned, a port being privately operated is a positive factor (as in the case of the Ports of Beira and Dar es Salaam). As far as the availability of transparent historical data is concerned, being privately operated poses a challenge. For the aforementioned reason, only the most recent cargo handling charges are available for the Ports of Beira and Dar es Salaam. The following table compares container handling charges across the four selected Southern African ports in 2017.

Table 4-12: Container handling charges for selected Southern African ports (2017)

Port	Local currency		US\$	
	20ft	40ft	20ft	40ft
Beira	-	-	95	160
Dar es Salaam	-	-	98	158
Durban	2158	2968	167,35	230,17
Walvis Bay	3139	5649	243,45	438,12

Source: Author’s own compilation based on CMA-CGM (2017), MOL (2016), NAMPORT (2017) and TPT (2017).

**Note: The USD-ZAR exchange rate, as reported by the IMF on 1 September 2017, was 1\$=R12.89*

Based on the information in Table 4-12, it is clear that container handling charges at both the Ports of Beira and Dar es Salaam are substantially lower than the Ports of Durban and Walvis Bay. This demonstrates the fact that when the port operators are from the private sector, natural market forces competitively drive the prices down. However, when comparing only the two ports that are publicly operated – the Ports of Durban and Walvis Bay – the handling of containerised cargo at the Port of Durban is considerably cheaper than at the Port of Walvis Bay. However, it is worth noting that container handling, port security and a base tariff is included in the total price at Walvis Bay (NAMPORT, 2017:34).

4.4.5 Summary

With regards to the micro-determinants of port selection in Southern Africa, neither one of the four selected Southern African ports have a distinct competitive advantage over its regional rivals. The Port of Durban clearly has the best infrastructure, but received substantially more ship visits, which increases marine traffic and subsequent port congestion. The Port of Beira on the other hand, has the worst infrastructure, but has comparable service offerings to the Port of Durban, including offering major ship repairs. The Port of Beira, along with the Port of Dar es Salaam, also charges the least for handling cargo. Although the Port of Walvis Bay is a relatively small port compared to its regional rivals, the port has good infrastructure and makes efficient use of its space with eight container berths and a berth length that is comparable to the Ports of Beira and Dar es Salaam combined.

4.5 Conclusion

The objective of this chapter was to provide a full descriptive analysis of port selection in Southern Africa. Firstly, the chapter aimed to provide a transparent overview of the current state of ports in the greater Southern African region and secondly, to compare the determinants descriptively across the region from both a macro- and a micro-level.

Of the 48 seaports within the Southern African region, 15 ports currently have container handling facilities. Of these 15 container terminals, the Port of Durban is clearly the largest, resulting in the port being a focal subject of this research. With that being said, other noteworthy regional ports have grown more rapidly in the last ten years compared to Durban (the Ports of Beira, Dar es Salaam and Walvis Bay). In addition to rapid growth, these ports contest the same hinterland as the Port of Durban, which is why they have been included in the comparative descriptive analysis.

This chapter pointed to a number of factors that contributed to the growth in container volumes within the Southern African region. Furthermore, many factors stemmed from a more conducive macro-environment in the countries where the selected Southern African ports are situated. It is however worth noting that the rapid growth can further be attributed to the fact that all three competitors to the Port of Durban grew from a very low base. Nonetheless, in terms of macro-determinants explaining port selection in Southern Africa, the Port of Durban remains the pertinent choice within the Southern African region.

With regards to macro-determinants of port selection, better connectivity, greater quality and length of roads and less cumbersome trading processes are all characteristics that explain the choice of selecting the Port of Durban over other ports within the Southern African region. Indeed, with the abovementioned macro-determinants, the competitive advantage of the Port of Durban is distinct over its regional rivals. However, the Port of Walvis Bay does perform better than the

Port of Durban in terms of quality of roads and inland transport cost, as well as a more efficient customs procedure.

However, with regards to the micro-determinants of port selection, the advantages were not so conclusive. Here, the Port of Durban performed the best with regards to infrastructure and a greater number of services offered. With the comparative micro analysis, the Port of Beira was found to be the closest competitor to the Port of Durban due to less congestion and comparable port services and ship repairs. In fact, when comparing the four selected Southern African ports to one another, each port outperforms the other three in at least one element of port selection, indicating why it is paramount to also add additional quantitative empirical analysis when trying to determine port selection in Southern Africa.

Furthermore, some important conclusions can be drawn. When reviewing Chapter 4 in conjunction with Chapter 3, a clear distinction can be made with regards to the macro- and micro factors that influence port selection. The first group of important decision-makers regarding port selection – shippers and freight forwarders – found macro factors to be more important when selecting one seaport over another. The second group of decision-makers – carriers and shipping lines – found micro factors to be more important when choosing one seaport over another. However, since port selection should preferably be based on rather selecting the entire value chain system (Section 2.5), selecting the best combination of macro- and micro factors that determine the choice of port will ultimately be superior to a set of comparative macro- or micro factors only.

In conclusion, although some light was shed on various important determinants of port selection for the Southern African region (as per the literature review in Chapter 3), Chapter 4 evidently presents the need for further comparative analysis. To complement the descriptive findings of Chapter 4, the following chapter attempts to empirically clarify some of questions behind port selection in Southern Africa.

CHAPTER 5: AN EMPIRICAL ANALYSIS OF PORT SELECTION IN SOUTHERN AFRICA

5.1 Introduction

In Chapter 2, the greater global trading environment was discussed, in addition to explaining why ports are viewed as important elements within the greater value chain system. Chapter 3 then extensively reviewed the recent literature that exists on the subject of port selection. Depending on the perspectives of different role players, various different determinants of port selection play an important role in the port selection decision. Chapter 4 then provided a descriptive analysis of port selection in Southern Africa. With the aim of adding to the insights of port selection in a Southern African context, Chapter 5 provides an empirical analysis of port selection in Southern Africa.

As explained in Section 3.3, no empirical analysis currently exists on port selection within the Southern African region. This indicates the first gap in the literature that this study aims to bridge. Furthermore, of all the empirical analyses that have been conducted on port selection around the globe, almost all of the studies have been qualitative in nature. The analyses of stakeholder surveys have generally shaped the majority of the empirical sections of these studies, which leads to the second gap in the existing literature. To combine these two gaps, this chapter firstly aims to add to the body of empirical literature by providing a Southern African perspective on port selection and secondly, propose a new research approach that is quantitative in nature.

The fact that previous research on port selection used qualitative research methods has been mainly due to various data constraints surrounding ports. Data limitations are also a factor in this specific research (Section 4.4). Since most ports are driven by profit, the disclosure of some micro-determinants (such as port cost) might result in losing a competitive edge to rival ports. In addition to the availability of data, it is also cumbersome to quantify the various micro-determinants of port selection (such as port services). Nonetheless, the literature review in Chapter 3 provided a sufficient number of determinants that can be quantitatively analysed in this chapter. These determinants were: connectivity, cost, efficiency, location, customs, infrastructure and transport cost. Ultimately, the limited number of observations that are available for this research necessitates a panel estimation.

The structure of the chapter is as follows: Section 5.2 provides the background on the data and the research method. Section 5.3 then provides the model specification that was used in the empirical analysis. Section 5.4 summarises the results obtained from the estimated model and Section 5.5 then concludes the chapter.

5.2 Data and research method

Port selection in Southern Africa is investigated by means of econometric analyses of panel data using a pooled ordinary least squares (OLS) method, a fixed effects method and a random effects method. Subsequently, three models are estimated for the main container port in each of the four selected Southern African countries with the aim to explain the determinants of port selection (as found in Section 3.4) in Southern Africa. Each model is estimated over an eleven-year period, ranging from 2005 to 2015.

For the dependent variable of each port – container port traffic – data was sourced from the respective national port authorities in Southern Africa. These are: Mozambique Ports and Railways (CFM) for the Port of Beira, Tanzania Ports Authority (TPA) for the Port of Dar es Salaam, Transnet National Ports Authority (TNPA) for the Port of Durban and the National Ports Authority of Namibia (NAMPORT) for the Port of Walvis Bay. Reported container throughput volumes were cross-checked with international institutions, such as the AAPA's world port rankings and Lloyd's list from Containerisation (2016). The trend in global trade, coupled with the standardised measurement of container port traffic, explains why TEUs were used as the dependent variable in the empirical analysis.

For the independent variables of each port, data was sourced from the World Bank (WB, 2017b), the World Economic Forum (WEF, 2007-2016), TradeMap (2017) and the United Nations Conference on Trade and Development (UNCTAD, 2006-2016). The variables that were used in the model had to satisfy each of the following criteria to warrant their inclusion. Firstly, only variables found to be significant in explaining port selection, as well as being found significant in at least two studies (in Chapter 3) were considered. Secondly, only variables that were quantitative in nature, or at least could easily be quantified were considered. Thirdly, only variables that satisfied the first two criteria and those that had data available over the time period of analysis (2005 to 2015), were then included.

The World Bank's World Development Indicators provided data for the "transport cost" variable, whereas the annual World Bank's Doing Business reports provided data for the variables "cost" and "efficiency". The WEF's Global Competitiveness Indices provided data for the variables "customs", "infrastructure" and "transport cost". TradeMap data was extracted for the variable "location" and finally, UNCTAD's annual review of maritime transport's liner shipping connectivity index was used for the "connectivity" variable.

5.3 Model specification

The variables that satisfied the abovementioned criteria were used to estimate three panel regression models. The following equation (5.1) serves to econometrically explain port selection in Southern Africa:

$$TEU = f(\text{connectivity, cost, efficiency, location, customs, infrastructure, transport cost, dummy infrastructure upgrade})$$

Where:

TEU represents container port traffic. Data is measured in twenty-foot-equivalents, which is the global standard for measuring containerised cargo. Data for each port is obtained from the respective national ports authority and reviewed with the figures reported by international shipping institutions such as the AAPA and Containerisation.

Connectivity indicates how well countries are connected to global shipping networks. UNCTAD's liner shipping index, which is based on five components: the number of ships, their container-carrying capacity, the maximum vessel size, the number of services offered and the number of companies that deploy container ships in a country's ports. The index is annually reported in UNCTAD's maritime review report and is expressed as a number between 0 (not connected at all) and a 100 (extremely well connected).

Cost specifies the combined fees that are levied to import and export a twenty-foot container through each port. Yearly country data that is obtained from the World Bank's Doing Business reports are used. The summation of the import and export cost is used and expressed in US dollars. Only official costs are recognised and tariffs or trade costs are excluded.

Efficiency indicates the time required to comply with all procedures necessary to import or export goods. Yearly country data that is obtained from the World Bank's Doing Business reports are used. Time is used as a proxy for efficiency and is expressed as the average number of days it takes to both import and export goods. In other words, the lower number of days, the more efficient the process.

Location is the geographical proximity of each country to its top trading partners. Distance is used as a proxy for location, which is measured in kilometres between the respective port and the trading partner's main port. The distance is then multiplied by the trading partner's share of total trade. Maritime distance is calculated with Searates, an international freight brokerage service. Data that is obtained from TradeMap is used to

ascertain the top ten trading partners for each country for each respective year. The final figure on location is the sum of the distance, multiplied by the share in total trade.

Customs reveal the custom procedures in each country. The WEF's annual global competitiveness index on the burden of customs procedure is used. The index measures business executives' perceptions of their country's efficiency in customs procedures. The index is expressed as a number between 1 (extremely inefficient) and 7 (extremely efficient).

Infrastructure reflects the state of infrastructure at each port. The WEF's annual global competitiveness index on quality of port infrastructure for each country is used. The index measures business executives' perceptions of the quality of their country's port infrastructure. The index is expressed as a number between 1 (extremely poor) and 7 (extremely good).

Transport cost is the inland transport cost that is calculated between the most important Southern African economic hubs and their respective ports. The equation (adapted from Buys *et al.*, 2006:6) explained in Section 4.3.4 is used. The average distance between the ports and the capitals of the surrounding landlocked countries was taken, which was multiplied by the pump price of diesel. The reason for using the pump price of diesel instead of petrol is because the majority of road transport carriers that will ultimately haul the containers are diesel-powered. The World Bank's development indicators are used for the pump price of diesel. The answer of the initial part of the equation above the line (distance * fuel price) was then divided by the quality of road index. The WEF's annual global competitiveness index on quality of roads is used. The index is expressed as a number between 1 (extremely poor) and 7 (extremely good). Ultimately, the transport cost was expressed as a US\$-price per unit of road distance in each country (see Section 4.3.4).

Dummy infrastructure upgrade indicates the year in which infrastructure upgrades were completed and took effect at each port. However, this variable is only applicable to the Port of Durban and the Port of Walvis Bay, since neither of the other two ports underwent infrastructure upgrades during the timeframe in question. In the case of the Port of Durban, infrastructure upgrades came into effect in 2007 when the capacity of pier one at the container terminal was increased (Barradas, 2007). In the case of the Port of Walvis Bay, infrastructure upgrades took effect in 2012 when the capacity at their container terminal was increased (AfDB, 2013).

The limitations of the estimated model must be kept in mind, since data is only available for such a short period of time (eleven years). Therefore, the estimated model will inevitably have some restrictions. Nevertheless, the results obtained from the panel analyses can serve as a broad platform that can aid decisions to be made regarding port selection in Southern Africa. However, it is for this very reason that the findings in Chapter 5 should be discussed in conjunction with the findings in Chapter 4 to ultimately determine port selection in Southern Africa.

Table 5-1 summarises the above-mentioned model by means of the respective hypotheses that are tested in the study. The hypotheses are based on results obtained from existing literature on port selection (Chapter 3). In Table 5-1, the first column states each hypothesis, the second column lists the variable that is used to test each hypothesis and the third column indicates the expected outcome of the test.

Table 5-1: Main hypotheses drawn from port selection literature that were tested

Hypothesis	Variable to test hypothesis	Expected coefficient
Role players prefer ports that are better connected	Connectivity: liner shipping connectivity index	Positive (a better connected port will result in more TEUs)
Role players prefer ports in countries where the import/export process is cheaper	Cost: US\$ per container to import or export	Negative (a more costly process will result in less TEUs)
Role players prefer ports in countries where the import/export process is efficient	Efficiency: time to import or export	Negative (a slower process will result in less TEUs)
Role players prefer ports in closer geographical proximity to their trading partners	Location: distance between trading partners in kilometres	Negative (a greater distance will result in less TEUs)
Role players prefer ports in countries where the customs process is efficient	Customs: burden of customs procedure	Positive (a better customs procedure will result in more TEUs)

Role players prefer ports that have better infrastructure	Infrastructure: quality of infrastructure	Positive (a port with better quality of infrastructure will result in more TEUs)
Role players prefer ports in countries where the inland transport cost is cheaper	Transport cost: inland transport cost	Negative (a costlier inland transport leg will result in less TEUs)
Role players prefer ports that have undergone recent infrastructure upgrades	Dummy infrastructure upgrades	Positive (an upgrade in infrastructure will result in more TEUs)

Source: Author's own compilation (2017)

The hypotheses presented in Table 5-1 are based a global perspective, therefore, it is worth investigating what effects the determinants have from a Southern African perspective. Some determinants, such as connectivity and location, might not indicate the expected results since the selected Southern African countries are homogenously poorly connected (except for the Port of Durban) and are situated far away from most of the global trading powers of China, the US and Western Europe. Other determinants, such as efficiency and customs, might be significant, but for the opposite reasons as expected, because role players specifically avoid a port due to its burdensome processes rather than being drawn to ports with efficient processes. Insights into the hypotheses tabled above are revealed in the empirical results of the study.

The following section presents a discussion and summarises the results that were obtained from the panel analysis on port selection in Southern Africa.

5.4 Empirical results

In the empirical results discussed in this section, three models are estimated. Firstly, a pooled OLS model is estimated in order to establish a broad picture of port selection in Southern Africa. Thereafter, a fixed effects model and a random effects model is estimated for port selection in Southern Africa in order to determine the optimum explanation of port selection using the determinants explained in Section 5.3. The Hausman test was then applied to determine the most appropriate model. of each respective port. This section concludes with a discussion on the final hypotheses tested.

5.4.1 Model estimation and results

Table 5-2 below presents results for the three models estimated for port selection in Southern African. The models test the determinants of port selection that were found to be significant in explaining port section (equation 5.1).

The p-value for each variable is listed in brackets, with an asterisk (*) indicating if a variable is significant at a 5 per cent level when explaining port selection in the specific model. Note: the dependent variable for each respective model is container port traffic (measured in TEUs).

Table 5-2: Model estimation

Independent Variable:	Pooled OLS model	Fixed effects model	Random effects model
Constant	1.030000 (0.0907)	-68816068 (0.0032)*	1.030008 (0.0937)
Connectivity	74230.82 (0.0000)*	-2179.501 (0.7160)	74223.14 (0.0000)*
Cost	-13.94223 (0.9013)	39.58464 (0.1730)	-13.15312 (0.9022)
Efficiency	29613.60 (0.1442)	5121.358 (0.3450)	29571.28 (0.1480)
Location	61.78485 (0.0017)*	11.70343 (0.4290)	61.51913 (0.0017)*
Customs	-172919.6 (0.5026)	14839.50 (0.8250)	-172034.8 (0.5068)
Infrastructure	431342.4 (0.0017)*	-103775.4 (0.2978)	438685.1 (0.0017)*
Transport cost	-52.136.05 (0.0831)	34661.77 (0.0031)*	-52605.07 (0.0860)
Dummy infrastructure upgrade	123662.9 (0.0879)	0.065015 (0.307441)	146232.39 (0.0754)

Adjusted R-squared	0.941659	0.996213	0.941964
Probability (F-statistic)	0.000000	0.000000	0.000000

Source: Author's own estimations using eViews 8 (2017).

Note: An asterisk (*) indicating if a variable is significant at a 5 per cent level when explaining port selection in the specific model. The dependent variable for each respective model is container port traffic (measured in TEUs).

In the **pooled OLS model**, the results indicate that three variables are significant at the five per cent level. These were: connectivity, location and infrastructure. However, the coefficient of location had a negative influence on container port traffic, which was against expectations. The coefficients of connectivity and infrastructure on the other hand influenced container port traffic positively as expected. The R-squared value of the pooled OLS model indicates a very good fit, with 94.17 per cent of the variation in container port traffic for Southern Africa explained by the relevant variables included in the pooled OLS model.

In the **fixed effects model**, the results indicate that the model's constant and transport cost are significant at the five per cent level. However, the coefficients of both determinants were against expectations. No other variable indicated any form of significance. Although the R-squared value of the fixed effects model indicates an exceptionally good fit, with 99.62 per cent of the variation in container port traffic for Southern Africa explained by the relevant variables included in the fixed effects model, only two of the seven variables' coefficients indicated signs as expected. These were customs and dummy infrastructure upgrades. However, neither variable is significant at any level.

In the **random effects model**, similar to the pooled OLS model, the results indicate that three variables are significant at the five per cent level. These were once again connectivity, location and infrastructure. The coefficients of both connectivity and infrastructure were positive as expected. However, the coefficient of location indicated a negative influence on container port traffic, which was against expectations. It is worth noting that the variable dummy infrastructure upgrade also indicated some significance with a p-value of 7.54 per cent and a coefficient as expected. With the significance and expectations of the variable infrastructure, it can therefore be concluded that infrastructure and infrastructure upgrades are important for role players selecting a port in the Southern African region. Ultimately, the random effects model indicates a very good fit, with 94.20 per cent of the variation in container port traffic for Southern Africa explained by the relevant variables that are included in the base model.

In conclusion, connectivity and infrastructure in both the pooled OLS model and the random effects model indicates both significance and positive results, as expected. Other variables, such as location and transport cost indicate significance at the five per cent level, however the coefficients of these variables are against what is expected. The results of these three models of Southern African ports are inconclusive, which indicates the necessity to conduct a Hausman test in order to establish the best model for port selection in Southern Africa. The following section discusses the results of the Hausman test and ultimately provides the final equation for port selection in Southern African.

5.4.2 Hausman test and final equation

The Hausman (also referred to as the Durbin-Wu-Hausman) test is a statistical hypothesis test in econometric regression analysis. Named after econometricists James Durbin, De-Min Wu and Jerry Hausman, the statistical test calculates the consistency of an estimator when compared to a less efficient alternative estimator which is already known to be consistent (Greene, 2012:274-278). The test is therefore used to distinguish whether a fixed effects model or a random effects model should ultimately be used in explaining port selection in Southern Africa given the models estimated in the previous section. The hypotheses of the test are given as follows:

H⁰: bi = random effects are consistent and efficient

H¹: bi = random effects are inconsistent and inefficient

The test therefore suggests that the most appropriate model in explaining container port traffic in Southern Africa (the dependent variable). The Hausman test indicated that the random effects model is preferred under the null hypothesis, due to the model's higher efficiency at a probability of 33.88 per cent, therefore accepting the null hypothesis. This result means that the individual effects testing for port selection in Southern Africa are not correlated with the other regressors in the model.

Ultimately, the following model proves to be the best fit in explaining container port traffic (measured in TEUs) in Southern Africa can be given by the following equation:

$$TEU = 1.030008 + 74223.14 (\text{connectivity}) - 13.15312 (\text{cost}) + 29571.28 (\text{efficiency}) + 61.51913 (\text{location}) - 172034.8 (\text{customs}) + 438685.1 (\text{infrastructure}) - 52605.07 (\text{transport cost}) + 146232.39 (\text{dummy infrastructure upgrade})$$

The following section summarises the final results of the hypotheses empirically tested for port selection in Southern Africa.

5.4.3 Final results of the hypotheses that were tested

The results of the preceding models present great insights into the reasons why role players would choose one Southern African port over another. Some of the results that were obtained were as expected, however, some of the results were also against what was expected. The following table summarises the final results of the hypotheses that were empirically tested for port selection in Southern Africa.

Table 5-3: Results of hypotheses that were tested

Hypothesis	Coefficient: best fit model	Conclusion
Role players prefer ports that are better connected	Positive and significant as expected	Well-connected ports are an important consideration for port selection in Southern Africa
Role players prefer ports in countries where the import/export process is cheaper	Negative as expected, but insignificant	A cheaper import or export process is noted; but does not seem to be an important consideration for port selection in Southern Africa
Role players prefer ports in countries where the import/export process is efficient	Positive against expectations, but insignificant	Inconclusive. An efficient import or export process does not seem to be an important consideration for port selection in Southern Africa
Role players prefer ports in closer geographical proximity to their trading partners	Positive against expectations; significant	Ports in closer geographical proximity to their trading partners seems to be an important consideration for ports selection in Southern Africa
Role players prefer ports in countries where the customs process is efficient	Negative against expectations, but insignificant	Inconclusive. An efficient customs procedure does not seem to be an important consideration for port selection in Southern Africa; however role players are not discouraged by inefficient processes

Role players prefer ports that have better infrastructure	Positive and significant as expected	A port with better infrastructure is an important consideration for port selection in Southern Africa
Role players prefer ports in countries where the inland transport cost is cheaper	Negative against expectations; but insignificant	Inconclusive. Inland transport cost does not seem to be an important consideration for port selection in Southern Africa, however role players are not discouraged by expensive cost
Role players prefer ports that have undergone recent infrastructure upgrades	Positive as expected; but insignificant	Recent infrastructure upgrades seems to be an important consideration for port selection in Southern Africa

Source: Author's own compilation (2017)

Table 5-3 shows some broad conclusions that can be drawn from the various models that were estimated in this chapter. As mentioned at the beginning of the chapter, due to data limitations the timespan of the estimated models for the four sample ports was only eleven years. Therefore, not all conclusions drawn from the initial hypotheses are equally robust. Nonetheless, after analysing the key findings of Chapter 5, in conjunction with the descriptive analysis in Chapter 4, more insightful conclusions can be drawn about port selection in Southern Africa, so that the conclusions can become a lot more insightful.

In the case of connectivity, the model estimated indicate significant and expected results. When reverting back the analyses of the liner shipping connectivity index (Section 4.3.3), it can be deduced that the Port of Durban is by far the best-connected Port of the four ports in question. The Port of Walvis Bay subsequently follows the Port of Durban as the second best connected port. This is no coincidence as it is clear that role players who find connectivity to be an important consideration when selecting a Southern African seaport would consciously prefer the Port of Durban over the rest. Similarly, an argument can be made that role players who do not find connectivity to be as important when selecting a Southern African seaport, would be conscientious of (and duly not perturbed by) it when choosing either the Port of Beira or the Port of Dar es Salaam. However, that argument falls outside of the scope of this study. Ultimately, connectivity is found to be an important consideration of port selection in Southern Africa.

In the case of location, the model estimated indicate significant results. However, the results are slightly against what was expected. When reverting back the analyses of distance and location (Section 4.3.2), it can be deduced that over the course of the last 11 years, the Port of Durban

was on average the furthest away from its most important trading partners' ports (Figure 4-2). Being the furthest away, it is expected that distance is an important consideration, which was found to be true. Dar es Salaam is a lot closer to its trading partners compared to Durban, however the relationship between distance and container port traffic is slightly against what was expected. Therefore, it can be argued that the distance between Dar es Salaam and the port's most important trading partners is almost at an optimum level, meaning that a slight increase in distance might not negatively influence container port traffic. An extended model might provide sufficient results to that question (as suggested in Chapter 6). Ultimately, location is found to be an important consideration during port selection in Southern Africa.

Lastly, in the case of infrastructure, the model estimated indicate positive and significant results, as expected. With port infrastructure influencing port selection, very little room is left for interpretation. In substantiating the findings of Section 4.4.1, adequate port infrastructure is a necessity when facilitating container flows at Southern African ports. Role players unequivocally prefer ports that have better infrastructure. Ultimately, infrastructure is found to be an important consideration of port selection in Southern Africa.

5.5 Conclusion

The objective of this chapter was to provide an empirical analysis on port selection in Southern Africa. The manner in which this chapter aimed to achieve its objective was to estimate a panel regression model that best describes the most important determinants of port selection, as based on existing literature. The severe data limitations on the subject necessitated the use of a panel models.

Data for the dependent variable, container port traffic, was sourced from the national port authorities of Mozambique, Namibia, South Africa and Tanzania and cross-referenced with data reported by international institutions, such as the AAPA's world port rankings and Lloyd's list from Containerisation. For the independent variables, data was sourced from four key statistics databases and international reports, namely the World Bank's Development Indicators, the WEF's global competitiveness indicators, trade data from TradeMap and finally UNCTAD's annual review of maritime transport reports.

Three groups of models were estimated in an attempt to empirically explain port selection in each of the four, selected Southern African countries. These were: a pooled OLS method, as well as a fixed effects model and a random effects model. The models estimated port selection through seven key determinants, based on the literature review in Chapter 3. To warrant inclusion in the estimated model, the determinants had to satisfy the following criteria. Firstly, only variables found to be significant in explaining port selection, as well as being found significant in at least two

studies that were reviewed in Chapter 3 were considered. Secondly, only variables that were quantitative in nature, or at least could be easily quantified were considered. Thirdly, only variables that satisfied the first two criteria and had data available during the period of analysis (2005 to 2015) were then included.

In order to ascertain the most appropriate model, a Hausman test was conducted. The Hausman test indicated that the random effects model should be preferred. The key findings of the random effects model indicate that connectivity and infrastructure showed significance at the five per cent level and results were as expected in explaining the variation of container port traffic in Southern Africa. Location on the other hand also indicated significance at the five per cent level, however the coefficients of the variable was slightly against expectations.

Ultimately concluding the empirical analysis, the results indicate that role players in Southern Africa prefer ports that are better connected, are in closer geographical proximity to their trading partners and have better infrastructure. Therefore, the variables that conclusively explain the variation of container port traffic in Southern Africa are connectivity, location and infrastructure.

Chapter 6 summarises the key findings of this study and aims to make suitable and practical policy suggestions, as well as propose suggestions for future research.

CHAPTER 6: SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS

6.1 Introduction

Port selection has been extensively studied in the past, however, very little empirical research has been carried out on the subject within a Southern African context. Therefore, the primary objective of this study was to comparatively analyse the most significant drivers of port selection within this region. The fundamental research question therefore was: what drives the selection of a port within the Southern African context? In an attempt to answer this question, the study included a literature review in Chapter 2 and Chapter 3 and an extensive descriptive and empirical analysis of data in Chapter 4 and Chapter 5. This chapter summarises the main findings of this study.

The structure of the chapter is as follows: Section 6.2 summarises the study according to the content presented in each respective chapter. Section 6.3 then provides the policy and practical recommendations based on the results in Chapter 5. Section 6.4 will then conclude the study with remarks and suggest potential areas for future research.

6.2 A summary of the study

In order to provide the foundation upon which port selection in Southern Africa can be analysed, **Chapter 2** includes a literature review of the current international trading environment. The aim of the chapter was to discuss the changing nature of global trade from a historical perspective up until current times.

From Adam Smith's absolute advantage theory to Paul Krugman's new economic geography, the background and evolution of the most important trade theories to date were conferred in an attempt to explain why countries trade in the first place. As discussed, the emergence of international trade was in fact the fundamental reason why seaports developed over time. The importance of seaports was first noted when the effect of the standardisation of containers was realised with the commencement of the container-era.

Along with the development of international trade theories, Chapter 2 also includes a discussion of the development of the most important international trade institutions, such as the WTO, UNCTAD and the OECD. The main WTO trade agreements of the GATT, GATS, TRIPS and ultimately the TFA were discussed in an attempt to provide some background information about current developments in trade, which is an important when explaining why this study of port selection for Southern Africa is important.

Furthermore, in the chapter the interconnectedness of the modern world is explained, with terms such as “globalisation” and “global value chain” being at the forefront of the international trading sphere. Modern trade mostly takes place in terms of intermediate goods, with specialisation becoming more and more important. In the present day, the ICT revolution is the main driving force behind the world’s economy.

Chapter 2 was concluded with an explanation of the importance of ports in facilitating the flow of goods across borders. In addition, an explanation is included of the pivotal role that ports play and why they can be considered a vital element in the global value chain. Various existing literature on the paradigm shift of port selection is also cited, explaining the functions of ports in terms of the systems theory.

Chapter 3 included an in-depth investigation on all the relevant literature on port selection from the perspective of various important stakeholders in the trading environment. A global perspective was first provided, after which a Southern African perspective was provided. Global literature on port selection was divided into three groups of respective role players. These were shippers and freight forwarders, carriers and shipping lines and, finally, port authorities. The bulk of the literature that was cited focussed on the first two groups of role players.

From the perspective of shippers and freight forwarders, the majority of the studies made use of stakeholder surveys to gather data. Two studies used the AHP method and one study proposed a new model to use for port selection. The literature indicates that the most important determinants of port selection from the perspective of shippers and freight forwarders are transportation cost, distance/location, port congestion, efficiency, frequency of ship visits, infrastructure, cost and connectivity/hinterland.

From the perspective of carriers and shipping lines, the literature proves that the preferred research method was equally divided between stakeholder surveys, the AHP method and port selection modelling. The findings show that the most important determinants of port selection from the perspective of carriers and shipping lines are location, cost, port service, handling/terminal charges, berth availability/depth, connectivity and efficiency (including customs procedures).

From the perspective of port authorities, only two studies were cited given the lack of research conducted from these role players’ perspectives. Together, the two studies found that cost, service and location are the most significant when explaining port selection from the perspective of port authorities.

The lack of research on port selection in a Southern African perspective was evident when a regional literature review was conducted. In fact, not one study exists that focuses purely on port selection. This gap in the literature further motivated this particular study. Some broader studies

on South African ports were however mentioned and included studies on port governance, port pricing, institutions, developments and trade corridors.

Chapter 3 was concluded by a summary of the most important determinants of port selection. These determinants were further used in the descriptive and empirical analysis of the four, selected Southern African ports.

After the main determinants of port selection were established at the end of Chapter 3, the study shifted specifically to the region in question. Therefore, in order to gain a better understanding of the region, the aim of **Chapter 4** was to provide a descriptive analysis of port selection in Southern Africa.

The chapter started off by providing an overview of the current state of Southern African ports. The case of which ports to include and which ports to omit from the comparative analysis was made. Ultimately, after all the major regional ports were assessed, the argument was to include four Southern African ports for the comparative analysis. These four, selected ports were the Port of Beira in Mozambique, the Port of Dar es Salaam in Tanzania, the Port of Durban in South Africa and the Port of Walvis Bay in Namibia.

In addition, Chapter 4 included two data analysis processes: including comparative macro analysis and comparative micro analysis. The macro analysis compared the four, selected Southern African ports in terms of their macro environment, distance and location, connectivity, transport cost and trade facilitation. The Port of Durban's presence as the largest port within the Southern African was confirmed, however all of the other three ports experienced higher year-on-year growth rates. Other important macro measurements indicated that the Port of Durban was much better connected to global shipping routes compared to its regional competitors. Furthermore, the comparatively better macro environment of South Africa ensured that the Port of Durban operated in better macro conditions. Trade facilitation, an important trend in global trade, also indicated that South Africa is comparatively much better geared to ensure the smooth flow of goods across borders in the near future.

The micro analysis of Chapter 4 included the comparison of the four, selected Southern African ports in terms of port infrastructure, port congestion, port services and port cost. With these determinants, the Port of Durban was not found to have such a distinct advantage as it did with the macro-determinants. In fact, the Port of Walvis Bay compared very similarly to the Port of Durban. The Port of Durban clearly has the best infrastructure, but received substantially more ship visits, which increases marine traffic and subsequent port congestion. The Port of Beira on the other hand, has the worst infrastructure, but has comparable service offerings to the Port of Durban, including major ship repairs. The Port of Beira, along with the Port of Dar es Salaam,

also charges the least for handling cargo. Although the Port of Walvis Bay is a relatively small port compared to its regional rivals, the port has good infrastructure and makes efficient use of its space with eight container berths and a berth length that is comparable to the Ports of Beira and Dar es Salaam combined.

The chapter further indicated that not only one determinant provides one port with a competitive advantage over another, but rather a combination of factors. Since port selection should ultimately be based on the entire value chain system, a Southern African port that is characterised by the best combination of macro- and micro factors is ultimately superior to a port with only a few macro- or micro factors.

Chapter 4 provided a substantial amount of insight regarding the current set of variables that a specific role player in the end-to-end value chain will base their choice of port in Southern Africa. To aid the descriptive analysis of port selection, the aim of **Chapter 5** was to provide an empirical analysis on port selection in Southern Africa.

Chapter 5 aimed to achieve its objective by estimating a number of panel regression model that would best describe the most important determinants of port selection (based on existing literature). The variables that were used in the model had to satisfy each of the following criteria to warrant inclusion. Firstly, only variables found to be significant in explaining port selection and were significant in at least two studies (Chapter 3) were considered. Secondly, only variables that were quantitative in nature, or at least could easily be quantified were considered. Thirdly, only variables that satisfied the first two criteria and had data available during the period of analysis (2005 to 2015) were included.

Ultimately, a total of seven variables were used in the empirical analysis. These were connectivity, cost, efficiency, location, infrastructure, customs and transport cost. The severe data limitations on the subject necessitated the use of panel models estimated by means of a pooled OLS method, a fixed effects model and a random effects model.

Data for the dependent variable, container port traffic, was sourced from the national port authorities of Mozambique, Namibia, South Africa and Tanzania and cross-referenced with data reported by international institutions, such as the AAPA's world port rankings and Lloyd's list in Containerisation. For the independent variables, data was sourced from four key statistics databases and international reports, namely the World Bank's Development Indicators, the WEF's global competitiveness indicators, trade data from TradeMap and finally UNCTAD's annual review of maritime transport reports.

Three groups of models were estimated in an attempt to empirically explain port selection in the four selected Southern African countries. After conducting a Hausman test to determine the most

appropriate model, the random effects model indicated the best fit. The key findings of the random effects model indicated that connectivity and infrastructure showed significance at the five per cent level and results were as expected in explaining the variation of container port traffic in Southern Africa. Location on the other hand also indicated significance at the five per cent level, however the coefficients of the variable was slightly against expectations.

Ultimately, concluding the empirical analysis, the results presented in Chapter 5 indicated that role players in Southern Africa prefer ports that are better connected, are in closer geographical proximity to their trading partners and have better infrastructure. Chapter 5 concluded by stating that the variables that conclusively explain the variation of container port traffic in Southern Africa are connectivity, location and infrastructure.

6.3 Policy and practical recommendations

The in-depth analysis that this research provides poses both opportunities and threats for the respective four Southern African ports in the future. Since the bulk of world merchandise trade volumes travel across the ocean, the optimum strategic positioning of a seaport poses overwhelmingly more opportunities than threats. Within a geographical region, such as Southern Africa, where competition is relatively low, it is paramount for a seaport to be favourable in facilitating global trade. Although practical and policy recommendations were not the primary motivations of this study, a number of general recommendations can however be highlighted.

Firstly, seeing that connectivity, location and infrastructure were found to be the most important drivers of port selection in Southern Africa, the focus of ports should be on these three factors. However, ports can only really influence infrastructure. A focussed approach on sustained infrastructure upgrades should therefore be a given in these four (and indeed in all) Southern Africa ports. Quality port infrastructure is one of the fundamental drivers of port selection. Consequently, when the quality of port infrastructure increases, other determinants of port selection are expected to increase. These include port efficiency, port congestion and also connectivity, which is another significant determinant of port selection in Southern Africa. Ultimately, in Southern Africa where infrastructure is not homogeneously good, shipping lines would want to call at a port with high quality infrastructure compared to its rivals.

Secondly, since the state primarily drives the regulations and operations of a port in Southern Africa (as discussed in Section 4.2) the continued existence and growth of ports primarily rely on the private sector to make use of the port. Port regulations and port pricing should encourage an environment that is conducive for trade; therefore, policymakers should strive to formulate cohesive port policies. Trade should thus be facilitated as far as possible, which is clearly not the case at most of the selected Southern African ports (as seen in Section 4.3.5). This is especially

true with regards to the Ports of Durban and Walvis Bay that are a lot more expensive compared to the Ports of Beira and Dar es Salaam. Port pricing has been a particularly contentious issue in South Africa, with the Ports Regulator not yielding to the requests of the TNPA (for the benefit of port users). Even though the port infrastructure of the Ports of Durban and Walvis Bay are arguably better than their competitors having undergone various infrastructure upgrades as well as more infrastructure upgrades currently taking place, the question remains whether these ports have a divine right to charge exorbitant handling fees along with their other port services. With the advocacy of the WTO's new TFA, increased political will in facilitating trade is a recommendation this study would also make.

6.4 Concluding remarks

The role and position of seaports are imperative in the current climate of the global economy. Since world seaborne trade volumes account for more than 80 per cent of total world merchandise trade, with the latter accounting for more than half of the world's GDP (Figure 2-1), seaports have a pivotal role to play in around 40 per cent of the world's economy in terms of volume. The same can be said of seaports in Southern Africa. In a region with many landlocked countries, not to mention various geographically dispersed economic hubs, a substantial proportion of the hinterland of Southern Africa is contested by only a small number of seaports. Based on this background, the study comparatively analysed port selection in Southern Africa, because a gap in the literature existed since the research topic of port selection in Southern Africa has not previously been studied. Through the means of a literature review of port selection, a thorough descriptive analysis of port selection in Southern Africa and finally an empirical analysis of port selection in Southern Africa, this study aimed to close the existing gap in the literature.

At the outset of this study, the following research questions were identified:

1. What are the traditional determinants of port selection as suggested by existing literature?
2. What are the determinants of port selection within the Southern African context?
3. How does South Africa's main port, Durban, compare to others in the greater Southern African region?

These three questions were answered by means of the research methods summarised above. In summary, the answers to these three questions are:

Research question 1: What are the traditional determinants of port selection, as suggested by existing literature?

The literature on port selection indicates a vast array of traditional determinants, each varying in importance depending on the perspectives of different role players. From the perspective of

shippers and freight forwarders, the most important determinants of port selection are transportation cost, distance/location, port congestion, efficiency, frequency of ship visits, infrastructure, cost and connectivity/hinterland. From the perspective of carriers and shipping lines, the most important determinants of port selection are location, cost, port service, handling/terminal charges, berth availability/depth, connectivity and efficiency (including customs procedures). Finally, from the perspective of port authorities, the most important determinants of port selection are cost, service and location. In summary, based on existing literature, the most important traditional determinants of port selection are cost, location, connectivity, port services and efficiency.

Research question 2: What are the determinants of port selection within the Southern African context?

For comparative analysis, seven determinants of port selection were taken from the literature and tested on the selected Southern African ports. These seven determinants were connectivity, cost, efficiency, location, customs, infrastructure and transport cost. Following the empirical analysis, the results indicate that connectivity, location and infrastructure are ultimately the most important determinants of port selection in Southern Africa.

Research question 3: How does South Africa's main port compare to those in the greater Southern African region?

In terms of macro factors, the Port of Durban has a distinct competitive advantage over its regional rivals. In terms of micro factors, the Port of Durban is comparatively similar to the Port of Walvis Bay. However, both ports have a distinct competitive advantage over the Ports of Beira and Dar es Salaam.

In conclusion, this research shows that when comparatively analysing port selection in Southern Africa, the Port of Durban remains the pertinent choice in terms of both macro- and micro-determinants, however it only slightly edges out competition from the Port of Walvis Bay. In descending order, the Port of Beira follows, with the Port of Dar es Salaam being comparatively the least favoured port to be selected for the contestable Southern African hinterland. However, in order to comparatively gain an advantage over a rival, ports in Southern Africa should take specific note of connectivity, location and infrastructure, which were conclusively found as being the most important determinants of port selection in Southern Africa.

6.5 Suggestions for future research

The following three suggestions for future research on port selection in Southern Africa are made. Firstly, since various data limitations were noticed throughout this study, an expansion on the current models presented in this study can be done to ensure that more data becomes available, by adding not only to the number of observations in years in the current model, but also adding to the number of container port analyses. This is due to the fact that container port competition in Africa is set to follow the trend established by Asia, European and American ports.

Secondly, a possible suggestion for future research could be a comparative analysis of all port volumes, including bulk, break-bulk and liquid-bulk goods. None of these topics have been covered in the existing literature, therefore an opportunity for future research exists.

Finally, and most importantly, the following recommendation is made. Since this study has provided a foundation on the topic of port selection in Southern Africa, which has not previously been studied, future research can focus on realising the paradigm shift in the literature, as explained in Section 2.5. This shift proposes that the topic of port selection should be researched in conjunction with the greater value chain. Therefore, not only is a comparative analysis of port selection in Southern Africa suggested, but also a comparative analysis of trade corridors in Southern Africa from a value chain perspective.

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