# THE MACROECONOMIC IMPACT OF OCEAN ECONOMY FINANCING IN SOUTH AFRICA

**By**

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# ABSTRACT

The global ocean is responsible for providing seafood and employment to the world's population and is the key driver of global gross domestic product. The ocean economy (blue economy) has been identified as key to unlocking the growth potential of many economies. It is in this context that both the South African government and the private sector have invested in the ocean economy with the purpose of sustaining it and making it more productive. To this end, the government established the Operation Phakisa programme which is meant to fast-track ocean economy development. In line with operation Phakisa imperatives, the South African government began a series of budget allocations towards the various sectors of the oceans economy. This flow of public funds towards oceans economy sectors was with a view to reduce unemployment, grow the economy, increase trade as well as boost entrepreneurship. It is for this reason that the financing of the ocean economy needs to be assessed in terms of its role in ensuring sustainable economic growth through ocean economy activities. While the ocean economy is becoming a new focal point in the discourse on growth and sustainable development both globally and locally, it remains faced with a series of challenges in South Africa. These include inadequate economic incentives, outdated infrastructure, ineffective governance institutions, lack of technological advances, and insufficient management tools. All of these have led to unregulated competition among users, albeit in the context of extensive opportunities offered by the rising demand for seafood. The specific focus of the study is the macroeconomic impact of ocean economy financing in South Africa during the 1994 to 2019 period. The study employed ARDL to test long and short-run relationships. The results show that ocean economy financing in South Africa during this time to have had a positive effect on economic growth, and a negative relationship on unemployment, although the latter is statically insignificant, while ocean economy financing has a negative relationship with entrepreneurship, to have a positive relationship with total trade, and statistically significant. Based on the findings of the study recommendations are made for the South African government to continue investing in oceans economy marine infrastructure and to address any constraints that hinder the growth and sustainability of the country's ocean economy. In order to ensure the economic viability of ocean

economy financing four areas need attention, namely economic growth, entrepreneurship, job creation, and total trade. This study recommends that in order to grow the South African economy, a comprehensive growth strategy that looks beyond ocean economy should be adopted. Regarding entrepreneurship ease of doing business should be improved and all factors inhibiting entrepreneurship should be addressed. The requisite skills through human capital investment should be harnessed and decent and sustainable jobs in the ocean sector should be created. It is a well-known fact that an aggressive drive towards economic growth is not without negative externalities e.g pollutions, unreported, unregulated, and over-exploitation of ocean resources. Ocean governance is vital in preventing such negative externalities. The results of the study show that ocean governance boosts trade and reduces unemployment.

**Keywords:** *ocean economy, financing, ARDL, economic growth, GDP, unemployment, entrepreneurship, trade*

**DECLARATION**

I, Weliswa Matekenya declare that the thesis title macroeconomic impact of ocean economy financing in South Africa, which I hereby submit for the degree of Doctor of Philosophy in Economics at Nelson Mandela University, is my own work. I also declare that this thesis has not been previous submitted to any other tertiary institution and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

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**DEDICATION**

I dedicate this project to my loving mother, Miss. N. Matekenya, and my wonderful brothers and sisters who are my sources of inspiration. Without you, this journey would have been in vain.

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## ACRONYMS

The following abbreviations are used in the dissertation:

ADF  **:** Augmented Dickey-Fuller

ARDL  **:**Autoregressive distribution lag

AsgiSA  **:** Accelerated and Shared Growth Initiative for South Africa

BTH  **:** Beijin Tianjin Hebei

CBA  **:**Cost Benefit Analysis

CPUT  **:**Cape Peninsula University of Technology

CSIR  **:**Council for Scientific and Industrial Research

DAFF  **:**Department of Agriculture, Forestry and Fisheries

DCF  **:**Data Collection Framework

DEA  **:**Department of Environmental Affairs

DEA  **:**Department of Environmental Affairs

DEFF  **:**Department of Environment, Forestry & Fisheries

DPME  **:**Department of Planning, Monitoring and Evaluation

ECM  **:** Error Correction Model

EDA  **:**Economic Development Administration

EEZ  **:** Exclusive economic zone

EMFF  **:**European Maritime and Fisheries Fund

EU  **:** European Union

FAO  **:**Food and Agriculture Organisation

FIFA  **:** Federation Internationale de Football Association

GDP  **:**Gross Domestic product

GEAR  **:** Growth Employment and Redistribution

GEF  **:**Global Environment Facility

GEM  **:**Global Entrepreneurship Monitor

GIIN  **:**Global impact investing network

GMM  **:**Generalised Method of Moments

GNP  **:**Gross National Product

GSP          :Gross State Product

GVA          :Gross Value Added

ICT          : Information and communications technology

ILO          : International Labour Organisation

IMF          :International Monetary Fund

IOC          : Intergovernmental Oceanographic Commission

KZN          :KwaZulu National

LM           :Lagrange Multiplier

MPAs         :Marine Protected Areas

MTEF         :Medium-term expenditure framework

NDP          :National Development Plan

NGP          : New Growth Path

NIAS         :National Income Accounting system

NOAA         : National Oceanic Atmospheric Administration

NOEP         :National Ocean Economic Program

NPC          :National Planning Commission

NRC          :National Research Council

NTSS         :National tourism sector strategy

OCIMS        :Oceans & Coastal Information System

ODA          :Official Development Assistance

OECD         :Organisation for Economic Co-operation and Development

OLS          :Ordinary least squares

PLS          : Partial least squares

PMG          :Pooled mean group

PP           :Philips-Peron

RDP          :Reconstruction and Development Programme

SARB         :South African Reserve Bank

SBS          : Structural Business statistics

SDI          :Special Development Initiatives

SEFA         :Small Enterprise Finance Agency

SEM          :Structural equation modelling

SETAs        :Sector Education and Training Authorities

SMEs         :Small and medium-sized enterprises

SMMEs        :Small, Medium & Micro Enterprise Businesses

SWOT         : Strengths, Weaknesses, Opportunities, and Threats

TEA          :Total Early Stage Entrepreneurial Activity

TEP          :Tourism Enterprise Partnership

U.S          :United States

UN           : United Nations

UNCLOS       :UN Convention on the Law of the Sea

UNCTAD       :United Nations Conference on Trade and Development

UNDP         : United Nations Development Programme

UNEP         :United Nations Environment Programme

UNESCOs      :United Nations Educational, Scientific and Cultural Organisation

USD          :United States Dollar

WTO          : World Trade Organisation

WWF          : World Wild Fund

ZAR          : South African rand

<center>**Chapter One**</center>

<center>**Introduction and Background**</center>

## 1.1 Background

Given that, since the dawn of time, water has covered more than 70% of the earth's surface, it follows that oceans play a major role in supporting all life on the planet through generating oxygen, recycling nutrition, absorbing carbon dioxide, and regulating global climate and temperature (Cervigni and Scandizzo, 2017). Almost three-quarters of the world's cities and large towns are situated in close proximity to the sea, while approximately 40% of the world's population live close to 60 km from the sea. The major contributors to the world's wealth are its seas and rivers in the form of trillions of goods and services (United Nations Economic Commission for Africa, (UCECA), 2016). Globally oceans are the providers of both seafood and employment, are also responsible for continuing feeding the world's population, and together represent the key driver of global gross domestic product (GDP) (Patil, Virdin, Diez, Roberts and Singh, 2016).

According to Organisation for Economic Co-operation and Development (OECD 2016), the ocean economy (blue economy) is defined as the economic benefit and value realise from the earth's oceans and coastlines. Globally, the ocean economy which consists of marine tourism, aquaculture, shipping, and other ocean activities approximately generate $2.5 trillion per year. However, the figure excludes the cultural and less tangible components that are significant to the health of the ocean. In addition, if the ocean economy is not sustained, its resources and benefits may not be guaranteed (OECD, 2016). The World Wildlife Fund (WWF,2017) stresses that, with regard to oceans, acidity is increasing, biodiversity is declining, another waste is accumulating, and the temperature is rising. Further, the ecological crisis is affecting the ocean deeper and deeper which will affect both the future and the present of ocean health. Therefore, any investment guideline is needed and development policy in order to realise the full benefits of the ocean. Following the research of the United Nations Sustainable Development Goals, environmental goals were adopted by all nations in

2015, with the purpose of ensuring that economic use of the seas leads also to their long-term conservation, and indeed their restoration (WWF, 2017).

According to the UN, Food and Agriculture Organisation (FAO, 2018) fish play a vital role in the life of the world's population by providing food for almost 4.2 billion. Ocean transport constitutes around 90% of international trade. Oceans are responsible for 80% of global trade and are drivers of economic activities. Further, 32% of the ocean's hydrocarbons are extracted for both domestic and international tourism needs (Ebarvia, 2016).

Oceans play a crucial role in controlling climate change and therefore the functioning of coastal marine ecosystems, such as angiospermous tree forests, brown algae forests, ocean grass meadows, and brine marshes. Furthermore, they are responsible for storing and sequestering atmospherically carbon (UNECA, 2016). The ocean economy covers aquatic and maritime areas, as well as oceans, seas, coasts, lakes, rivers, and underground water. It includes a variety of productive sectors, such as bioprospecting, aquaculture, tourism, shipbuilding, transport, and underwater mining-related activities. According to Patil *et al.*, (2016), almost 1.5 trillion dollars are contributed annually to the global economy by oceans. The WWF (2017) report has, however, shown the importance of the ocean economy to the global macro-economic environment. The report also estimated the worth of ocean assets at $24 trillion, delivering annual merchandise and services of $2.5 trillion.

The ocean economy (or blue ocean economy) has been identified as another dimension for unlocking growth potential in the future of the global economy. In 2012 Rio de Janeiro held a United Nations Conference on sustainable development which where the ocean economy concept was endorsed (OECD, 2016). However, the ocean economy remains faced with a growing awareness of the heavy damage wrought on ocean ecosystems by human activities, which includes pollution, habitat destruction, overfishing, and the effect of climate change. Poor management of the ocean and economic activities linked to it has cost the global economy approximately $50 billion every year (Benkstein, 2015). However, this figure does not take into consideration the specific ways in which overfishing, illegal fisheries, and environmental degradation affect the livelihoods of coastal and riparian communities, more especially those countries that are still developing. It is in this context that ocean economy financing

plays a major role in sustaining and ensuring growth in ocean economic activities. This is one of the main assumptions informing the current study.

The ocean economy is that part of the global economy that depends on the ocean as the input in the production process, and which, by virtue of geographic location, takes place under the sea, while ocean economy financing refers to investment flowing to ocean sectors (Operation Phakisa, 2015). In this context, and according to the World Bank and United Nations Department of Economic and Social Affairs (2017), many countries have turned to the oceans as a source of economic innovation, competitive advantage, and as a source of job creation. For this reason, ocean economy financing seeks to promote economic growth by taking to account social inclusion. Social inclusion would involve the preservation or improvement of livelihoods while at the same time protecting the environment (World Bank and United Nations Department of Economic and Social Affairs, 2017).

The Economist Intelligence Unit Limited (2015) highlighted the various components of the ocean economy, components which are made up of traditional ocean industries and new emerging industries. The ocean traditional industries category refers to marine transport, tourism, and fisheries while new emerging activities include offshore renewable energy, seabed extractive activities, aquaculture, and marine biotechnology, and bioprospecting (The Economist Intelligence Unit Limited, 2015). Some ocean activities are difficult to measure, or their market does not exist. However, they contribute significantly to economic growth and other human activities, namely carbon sequestration, coastal protection, waste disposal, and the continued existence of biodiversity (World Bank and United Nations Department of Economic and Social Affairs, 2017).

South Africa is surrounded by a vast ocean space, which has a significant potential to provide growth but one that has not yet been tapped. The National Planning Commission (NPC) was established by former President Jacob Zuma, led by Traver Manuel, a former Minister of Finance, to draft a National Development Plan (NDP). The NDP was delivered in 2012 with the aim of increasing development in order to fight poverty, inequality, and unemployment by 2030 (NPC, 2012). The challenges related to the implementation of this plan are not easily overcome due to their being substantial in scope and structure. In 2017 the unemployment rate in South Africa

stood at 27.7%, while youth unemployed stood at an estimated rate of 67.4% (Statistics South Africa [StatsSA], 2019). South Africa has over the years achieved a sluggish growth rate which dipped further going into the recession in 2017 (Peyper, 2018).

The NPC, in terms of the NDP, has made the recommendation to the South African government to reassess the marine sector, to establish the extent of the contribution it could make in terms of increasing employment and regional trade. However, because of growing concerns around piracy and rising maritime insecurities, South Africa made a carefully considered assessment of the economic potential of its ocean, its maritime location, and its economic and structural capacity (NPC, 2012). To this end, the Operation Phakisa programme was incepted. Operation Phakisa is a South African Government delivery program initiated in 2014 in order to fast track the implementation of the country's NDP 2030 (Operation Phakisa, 2014). The program aims to create job opportunities, poverty alleviation, and social equity (Ken, 2018). According to Operation Phakisa, the ocean economy consists of six sectors, namely marine transport and manufacturing, offshore oil and gas exploration, aquaculture, marine protection and ocean governance, coastal and marine tourism, and small harbour development. The current study is investigating and assessing the macro-economic impact of ocean financing in South Africa.

## 1.2 Problem statement

South Africa developed the National Development Plan 2030 (NDP), an economic policy framework developed in 2012 by the National Planning Commission (NPC, 2012). The NDP has the objective of facilitating the triple developmental challenges facing South Africa. These are stated as promoting economic growth, poverty reduction, and reduction of inequality.

Furthermore, the NDP set out to reduce the unemployment rate to 20% by 2015, to14% by 2020, and 6% by 2030 (NDP, 2018). However, unemployment remains persistently high in the upper 2020s and has increased from 25% in 2014 to 27.2% in 2018, and 30.1% in 2019 (StatsSA, 2019). Due to the limited success of the NDP, Operation Phakisa was enacted to fast-track solutions to the triple developmental challenges by mobilising public and private resources towards the country's ocean economy.

The government and the private sector together made a total investment of R24.6 billion in Operation Phakisa for its ocean economy. The long-term targeted aim of the country's ocean economy is a total contribution of R129 billion to R177 billion to GDP for the purposes of creating approximately one million jobs, Small, Medium, and Micro Enterprise Businesses (SMMEs) development, and the inclusion of vulnerable groups - women, youth, and people with disability (Operation Phakisa, 2017). The short-term forecast goals of South Africa's ocean economy are the creation of 22 000 jobs and a contribution of R20 billion to GDP. The maritime initiative under Operation Phakisa has been said to potentially take South Africa to 5% growth by 2019 (Walker, 2018; Department of Environmental Affairs (DEA), 2017).

Since, as has been mentioned, on both a global and local scale, the ocean economy is becoming a new focal point in the discourse on growth and sustainable development, it is still faced with a series of challenges. These include the rising demand for seafood, inadequate economic incentives, ineffective governance institutions, lack of technological advances, and insufficient or inadequate management tools, all of which have led to unregulated competition among users (DEA, 2017). This in turn has resulted in the unreported, unregulated, and over-exploitation of fishing, and, in some cases, the irreversible alteration of valuable aquatic resources and coastal areas (Operation Phakisa, 2015). The oceans themselves remain saddled with problems related to environmental concerns that are in turn linked to climate change which constitutes a threat to the environment as well as to growth and development (Operation Phakisa, 2015). Another major problem is ocean acidification, a growing environmental concern linked to climate change. Ocean acidification refers to the change in seawater chemistry caused by the absorption of excess atmospheric carbon dioxide by oceans. Moreover, ocean acidification is a threat to national growth and development, particularly in developing nations (Council for Scientific and Industrial Research [CSIR], 2016). The urgent importance of investment resides in addressing these challenges faced by oceans and their sustainability.

South Africa is under pressure to address the triple development challenges which the strategies put forward so far are failing to yield significant results. This thesis is based on a premise that the problem, or set of problems confronting the ocean economy, can

be attributed to limited knowledge generated around the role of ocean economy financing and the extent of its ability to enhance ocean economy success.

## 1.3 Aims and objectives

The study aims and objective of the study are outlined as follows:

- To review trends in macro-economic indicators and South African ocean economy financing
- To conduct a literature review around ocean economy financing
- To econometrically evaluate the impact of the South African ocean economy financing on the country's macroeconomic indicators
- To econometrically evaluate the impact of ocean selected sectors on these macroeconomic indicators
- To provide policy recommendations

## 1.4 Hypothesis

$H_{01}$: there is no relationship between ocean economy financing and GDP

$H_{A1}$: There is a relationship between ocean economy financing and GDP

$H_{02}$: There is no relationship between the ocean economy and unemployment

$H_{A2}$: There is relationship between ocean economy financing and unemployment

$H_{03}$: There is no relationship between ocean economy financing and entrepreneurship

$H_{A3}$: There is relationship between ocean economy financing and entrepreneurship[1]

$H_{05}$: There is no relationship between ocean economy financing and total trade

$H_{A5}$: There is relationship between ocean economy financing and total trade

## 1.5 Significance of the study

Ocean economy as initiative and Ocean strategy to promote economic growth in South Africa. This strategy aims to fast-track the implementation of the country's National Development Plan (NDP) 2030 (Operation Phakisa, 2014) with the specific goal of

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[1] Measured in terms of TEA which is the total early-stage entrepreneurship in South Africa

promoting economic growth and creating jobs opportunities, poverty alleviation, and social equity (Ken, 2018).

As has been mentioned, the ocean economy has gained a significant attention and focus from the South African government and economic policy makers due to it having been identified as one of the major solutions to the triple developmental challenges: the high rate of unemployment, inequality, and poverty. In this era of globalisation, no country can afford to depend solely on its land resources. Therefore, sourcing alternative resources are essential, especially for developing countries. This sourcing of resources from the sea area is available to South Africa, which has a very long coastline zone of over 3000 km, therefore representing a solid opportunity for development (McCarthy and Rubidge, 2005).

It is important to note that any successful and sustainable use made of the ocean economy depends on the nature and quality of the financing devised and employed by the government. Based on this assumption or argument, the current study seeks to evaluate the social returns on South Africa's financial investment in its ocean economy through an assessment of the macroeconomic effects of ocean economy financing. Hence, sectors such as marine transport (shipbuilding, shipping), energy (oil, gas, and renewable energy), food (fisheries, aquaculture), marine ICT, and coastal tourism can be said to serve as appropriate means of economic development linked to the country's vast coastline. Moreover, given this potential, South Africa can be said to be able to look forward to maintaining this economic breakthrough for ensuring a sustainable ocean economy.

Furthermore, the outcome of the study presents the potential to help researchers in this field to a more in-depth understanding of the structure of the current ocean economy and the existing coastal and marine ecosystem, including the present and future potential threats to this ecosystem. The available literature shows that in South Africa the study of its ocean economy from the economic modelling site is very limited (the best available data on scenarios). By measuring the economic effects of ocean economy financing on the macro-economic environment, the proposed study presents the potential to indicate whether the ocean economy contribution to South African economic growth can be sustained over the long term. The results of the study would

also contribute to policymakers in formulating related policies based on creditable research.

## 1.6 Methodology of the study

The study applies the Autoregressive distribution lag (ARDL) approach in order to empirically investigate the impact of macroeconomic ocean economy financing on South Africa's economy. In testing for the unit root properties of the time series data, the variables were subjected to the Augmented Dickey-Fuller (ADF), Philips-Peron, and Dickey-fuller GLS(ERS**)** unit root test. Cointegration and Autoregressive distribution lag (ARDL) were employed. The study makes use of diagnostic tests, such as the residual normality test, heteroscedasticity, autocorrelation tests, and the Ramsey test for misspecification to validate the parameter estimation outcomes achieved by the estimated model. More details on research methodology are presented in chapter five.

## 1.7 Structure of the research

Chapter one provides an introduction and background to the study, together with the problem statement, objectives of the study, hypothesis, significance, and methodology of the study. This is followed by an overview of the South African ocean economy in Chapter two. This includes a discussion of the overview of ocean economy financing and the macroeconomic variables in South Africa. Chapter three presents a discussion of the theoretical framework pertaining to the relationship between ocean economic financing and macro-economic selected indicators. Chapter four presents empirical literature pertaining to the relationship between ocean economy financing and the macro-economic indicators selected for the study. Chapter five presents a discussion of the research design and methodology employed in this study and the rationale for using these. Chapter six presents the estimation techniques and interpretation of the results of the research. Chapter seven presents an estimation of sectoral analysis and interpretation of results. Chapter eight presents a summary of the research and the conclusions of the study; it also offers policy recommendations based on the research findings.

## 1.8 Concluding remarks

This chapter presented the introduction and background of the study. The research problem was outlined, together with the aims and objectives of the study. The method of research to be applied in this study was described and the deployment of the study was outlined. Having outlined the background to, and the conceptual framework of, the study in this introductory chapter, the scene is set to present the overview of ocean economy financing in South Africa. The overview of ocean economy financing and the macroeconomic variables in South Africa are provided in the next chapter.

**Chapter two**

**Overview of macroeconomic variables related to ocean economy in South Africa**

## 2.1. Introduction

The purpose of this chapter is to present an overview of ocean economy financing and its relationship to the selected macroeconomic variables in South Africa. The chapter is divided into three sections. The first section presents the country's selected macroeconomic trends during the period of 1994 to 2019, the macro-economic trends that are discussed in this chapter are GDP, unemployment, entrepreneurship, and total trade. These macroeconomic variables are also used in this study as main dependent variables mainly because in terms of Operation Phakisa (2014) the ocean economy was meant to achieve these set macroeconomic goals. The second section presents an overview of ocean economy financing. The third section presents an overview of the various sectors of ocean economy financing in South Africa. A summary and of all of these is provided at the end of the chapter.

## 2.2 Overview of economic growth in South Africa during the period 1994 to 2019

After the first democratic election in 1994, the primary aim of the newly elected government was to rebuild and transform the economy by creating jobs, ensuring sustainable economic growth, and reducing poverty. The macro-economic policies that were adopted included the Reconstruction and Development Programme (RDP), Growth Employment and Redistribution (GEAR), the Accelerated and Shared Growth Initiative for South Africa (AsgiSA), the New Growth Path (NGP), and the National Development Plan (NDP) (Padayachee, 2006; NDP, 2013). These policies were designed and established to stimulate the economic growth required to provide resources to meet the country's social investment needs (GEAR, 2006). Despite the promises, and some of the achievements, of these macro-economic policies, there were some disappointments such as low levels of economic growth. In addition, private investment was insufficient to contribute to a reduction in unemployment. As

such, the policies achieved very little success with regards to the distribution of wealth (Mtonga, 2011; Smit and Du Plessis, 2007).

In view of the failure of these policies to achieve their objectives 20 years into the new democracy, in 2014 Operation Phakisa was incepted and seen in terms of a new spirit of moving faster in the race to meet government targets. This was a programme designed to facilitate and accelerate the implementation of the NDP plan. The NDP was adopted in 2012, its goals being to achieve accelerated growth, reduce unemployment, and end, or significantly reduce poverty. The stated aim of the NDP was the government's promotion of economic growth by 5% by 2019.

In order to promote this economic growth, the Operation Phakisa initiative was created to take advantage of the potential and untapped resources of the South Africa country's territorial ocean. Operation Phakisa focuses on unlocking the economic potential of South Africa's oceans, with the goal of contributing up to R 177 billion to the country's GDP and creating between 800 000 and one million direct jobs by 2033 (Operation Phakisa, 2019). In addition, the estimations showed that Operation Phakisa would increase the economy's GDP contribution by R20 million and would result in the creation of 22 000 direct jobs by 2019. Figure 2.1 below offers an overview of GDP in South Africa from 1994 to 2019.

**Figure 2.1: GDP trends from 1994 to 2019**



Source: World Bank (2020)

Figure 2.1 shows the trends of the South African GDP growth rate, from 1994 to 2019. During the 1994 to 1996 period GDP increased from 3.0% to 4.29%; however, two years later, in 1998 GDP decreased to 0.50%. The sharp decline of GDP in 1998 was due to the financial crisis that arose in South Asia which had major worldwide consequences (International Monetary Fund [IMF], 1998; Jones and Inggs, 1999). The Asian financial crisis also had an impact on South African economic growth. During that time, the rand's exchange value fell. Because of the low level of domestic savings, South Africa remains heavily reliant on foreign investment. Long-term capital flows have slowed, and short-term capital has flowed out of the economy, contributing to the rand's depreciation. Over the same time period, the Johannesburg Stock Exchange all-share index lost one-third of its value. Furthermore, private consumption and retail sales have leveled off, export growth has slowed, and business confidence has been severely eroded (IMF, 1998).

South Africa's experience averaged a growth rate of 3% from 1994 to 2005 period and in addition from 2007 to 2008, it was 5% and 2.8% respectively (South African Reserve Bank [SARB], 2009). From 1999 to 2003 South Africa's economic growth fluctuated sharply, with upswings in 2000 and 2002, and downswings in 2001 and 2003. During the period 2004 to 2007, the economy grew at an average of around 5%. The high rate of economic growth during this period was supported by government fiscal policy and monetary policies adopted by the SARB in 2000. During 2000 South Africa also adopted an inflation-targeting monetary policy framework for targeting inflation between 3% and 6% for consumer inflation (SARB, 2000). South African economic growth was aided by these policies which stabilised the economy and increased investment (StatsSA, 2008).

 The prosperous years between 2004 and 2008 were cut short by the global financial crisis of 2008 and 2009 which started in the United States of America (USA) and spread to the rest of the world. The South African economy was hit hard by its close trade links with the US and other developed economies. The rand took a knock and economic growth contracted to a low of -1.53% in 2009 (Mahadea and Simson, 2010). For the first time in 17 years, the economy entered a recession in 2008 and 2009. In 2009 alone, nearly a million jobs were lost. Growth has resumed, but the recovery has been shaky, with another recession on the horizon. Rising unemployment and poverty have resulted in a precipitous decline in South African GDP growth over the last

decade. South African growth rebounded in late 2009, rising to 3.2% in the fourth quarter as a result of a recovery in the global economy, higher commodity prices, and sustained growth in government spending. From the record highs of over 5% in the mid-2000s to the sharp, global recession-induced decline, followed by a brief recovery in 2010. The economy had a growth rate of 2.3 % in 2010, owing largely to the returns on World Cup investments and massive public sector investment in economic infrastructure, before rising to 3.6 % by 2012 ( National Treasury, 2010). These levels approximate the levels of growth in 1996, when the government implemented GEAR, and are far below the 6% required to cut poverty and unemployment in half (GEAR,1996).

During the period of 2010 and 2011, South African economic growth had a brief recovery and then a continued decline from 2012 (StatsSA, 2014). Widespread strikes in the mining sector had a significant effect on the economy in 2012. During the period of 2013, the economic growth rate in South Africa was 2.48%, which then began its decline, up until 2016, to 0.39%. The potential gain from the consistent fiscal support was not realised due to a failure to implement structural reforms and improve the composition and quality of government spending. As the result of the slow economy resulted in a numerous revenue shortfall, larger budget deficits, and rising government debt. In 2017, there was slight growth to 1.41%; however, from 2018 to 2019 it declined again to 0.15%. South Africa's economic growth continues to lag behind what is required to generate jobs and improve the standard of living. Moreover, policy and political uncertainty have contributed to decreasing confidence, which has been exacerbated by drought and electricity supply shocks. Eskom and other state-owned firms' inefficient and ineffective investment spending which has been connected to corruption, has hampered productivity growth and confidence. Young workers have become vulnerable as a result of poor educational achievements. As a result, by 2018, South Africa has entered a technical recession (SARB 2018; National Treasury, 2019a).

## 2.3 Overview of Unemployment in South Africa

The unemployed are people of working age who are without work, are available for work, and have taken specific steps to find work. According to the International Labour Organisation [ILO], 2019), the unemployment rate is the proportion of the labour force

that is unemployed. It is the indicator that has been used globally in order to assess the performance of the labour market in the economy of a country. It is also used to assess the ability of a country's economy to create enough jobs for its jobseekers.

The unemployment rate reveals the economy's spare capacity and underutilised resources. Unemployment is cyclical, falling when the economy expands as businesses hire more workers to satisfy rising demand. When the economic growth rate of a country slows, and its economic activities are also low, unemployment usually increases (OECD, 2010). There are various types of unemployment. The term "frictional unemployment" refers to people who are unemployed while looking for work. Structural unemployment occurs when workers' skills or location do not match job requirements. Seasonal unemployment results from seasonal patterns in economic activity such as harvesting or tourism (Giuliano and Tsibouris, 2001).

Post-apartheid unemployment has remained high. This poses a problem for South Africa's economic growth and economic policy challenge (Meth 2001). Over the 27 years since the first democratic election, the government has implemented various policies or programmes to collectively serve as a remedy for the high right of unemployment. These policies include GEAR, Special Development Initiatives (SDI), the Umsombuvu Youth Agency, SMME development institutions, National Skills Fund, the Sector Education and Training Authorities (SETAs), the National Empowerment Fund, ASGISA (StatsSA, 2008,).   However, these interventions have not been effective, hence the persistence of the high rate of unemployment in South Africa (Bhorat and Kanbur, 2005). While the NPC (2012) highlighted that the government aimed to reduce the rate of unemployment in South Africa to 25.4% in 2010 and aimed to reduce it to 20% in 2015, and 14 % in 2020, the actual statistics of unemployment in South Africa have persistently increased as from 2010 it was 24%, and in 2019 it was 29%.

**Figure 2. 2: Trends of unemployment from 1994 to 2019**
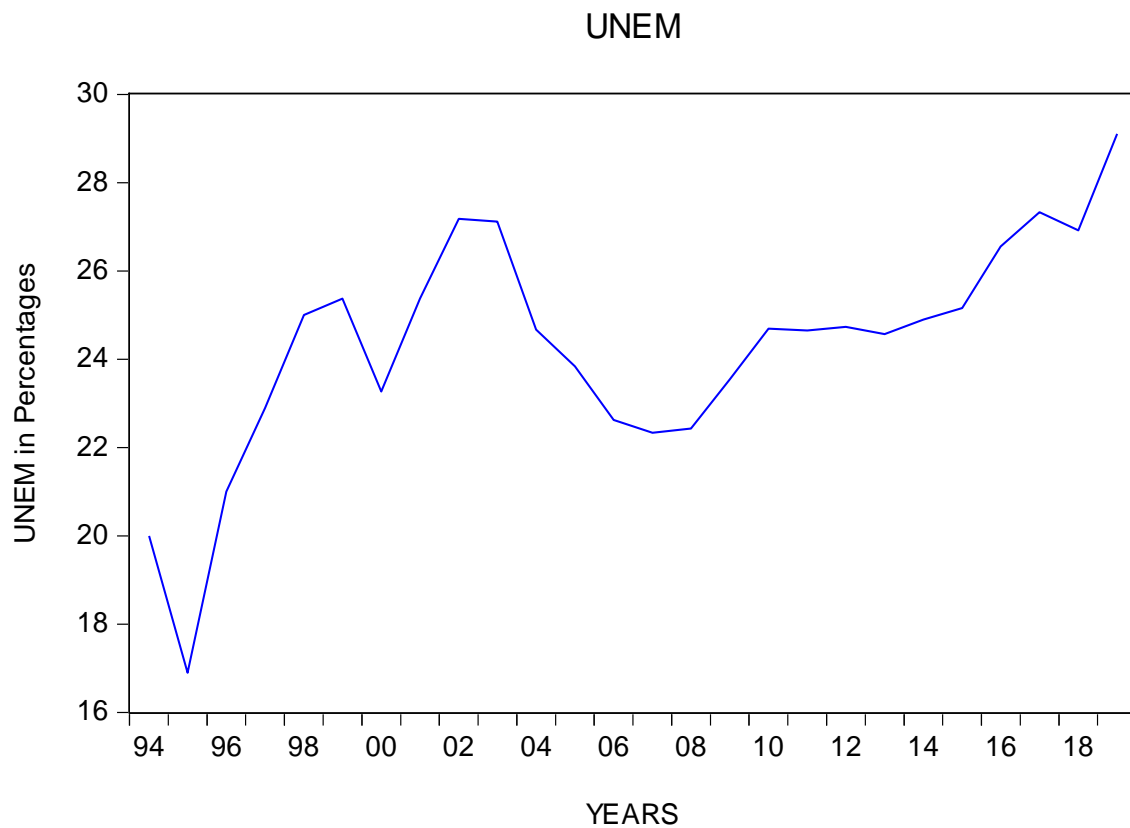
UNEM



Source: World Bank, (2020)

Figure 2.2 shows the trends of the South African unemployment rate from 1994 to 2019. In 1994 the unemployment rate was at 20% and dropped to 16.90% in 1995. This was the result of high employment growth which was accompanied by the economic growth increase from 1994 to 1995 (Kingdon and Knight, 2004). This includes the growth rate of 1.2% of the economy (SARB, 2001).

However, the unemployment rate started to increase from 1996 to 2003, from 21% to 27.12% respectively. Since 2000 the South African labour market has reflected a structural inefficiency that hinders transition. Further, South African economic growth has not been able to keep pace with an increasing labour force (Banerjee *et al.*, 2008). Despite this, and as a consequence of an increasing population growth rate that has surpassed the economic growth rate, the unemployment rate had increased to 27.1% by 2003 (Kingdon and Knight, 2004).

The inability of the economy to create jobs, coupled with the high-level entry requirements and the skills mismatch, are some of the reasons advanced for persisting structural unemployment. The unemployment rate started to fluctuate from 2004 to

2014 between around 22%, 23%, and 24%. A chronic skills mismatch is one of the most prominent features of the South African labour market. Reducing this mismatch will be a major challenge in the coming years and will be critical to lowering unemployment. The skills gap has its roots in the apartheid era (StatsSA, 2009). During the period 1995-2000, GDP-employment growth was consistently negative, with an average figure of -1.4 % (Mahadea, 2003), indicating that South Africa's growth has been slow and being labour displacing rather than a job-creating one. Labour displacement relative to the country's GDP appears to have been at -1.6% in 2001, but labour absorption improved after that. In 2003, the country's unemployment rate peaked at 28 %. South Africa's unemployment rate, which includes discouraged job searchers, was close to 30% in 2019, despite the fact that the 'official' unemployment rate was around 22% in the third quarter of 2008 and grew to 24.5 % in the third quarter of 2009 (StatsSA, 2009; National Treasury, 2019b).

According to Ghose , Majid and Ernst (2008), even after six years of the 2008 global financial crisis, unemployment continues to rise, with approximately 61 million jobs being lost. This means that the job crisis is far from being over. The reason for the persistently high rise in unemployment is that South Africa has hardly reached the pre-crisis growth levels (SARB, 2009). This unemployment rate continued to climb in 2019, reaching 29.1% in the third quarter of that year, its highest rate in over 16 years ( National Treasury, 2019a).

One of the solutions to unemployment and economic growth is entrepreneurship among other things (Bokhari, 2013). The economic growth trends outlined in the above paragraphs indicate that South Africa's economic growth rates from 1994 to the recent present (2019) have failed to create the necessary jobs which would, in turn, contribute to the country's economic growth. The following sections present an overview of entrepreneurship in South Africa.

## 2.4    Overview of entrepreneurship in South Africa

Apartheid left the South African economy with many challenges, which have led to entrepreneurship being seen as a critical tool for the creation of jobs and economic growth (Mahadea, 2012). According to Gaddefors and Anderson (2017), an entrepreneur is any person who can create a new business, bear all the risk of this process, and at the same time enjoy the reward. While entrepreneurship refers

specifically to the process of setting up a business, in the wider context entrepreneurship in any form has been seen by several researchers in the field to be central to economic development, poverty alleviation, job creation, and economic inclusion (Bruton , Filatotchev, Si and Wright, 2013; Malecki, 2018).

Entrepreneurs have been seen to play a major role in a failing economy such as that of South Africa: in many ways, they are seen to promote economic growth by providing growth opportunities and acting as catalysts for growth. These include the creation of employment, innovation, productivity, and measurable growth. Since 1994, the South African government has focused on promoting entrepreneurship and small business (Van Praag and Versloot, 2007). According to Abor and Quartey (2010), Small and Medium Enterprises (SMEs) have contributed approximately 57% of GDP, according to global economic monitor (GEM) standards. According to Cassim, Soni and Kordia (2014) highlighted that in terms of entrepreneurship opportunities and new small businesses South Africa was ranked poorly by GEM standards in the 2009 report. Similarly, Falconer and Herrington (2020) stated that the 2019 GEM standard report ranked South African as 49th out of 54 economies which also shows that South Africa is still doing poorly when it comes to entrepreneurship. The growth and development of entrepreneurship have gained attention from researchers (Bruton *et al.*, 2013; Bruton and Chen, 2019). Furthermore, entrepreneurship has been seen as an ideal activity for economic mobility, job creation, wealth creation, innovation, and economic growth (Ali,Topping and Tarig, 2011; Soomro and Shah, 2015; Bruton *et al.*, 2013; Sutter *et al.*, 2019). Figure 2.3 below illustrates entrepreneurship trends in South Africa on the total percentage of self-employed persons during the 1994 – 2019 period.

**Figure 2.3: Entrepreneurship trends from 1994 to 2019**

Total % of self employed person



Source: World Bank (2020)

Figure 2.3 shows the trends of the South African entrepreneurship rate from 1994 to 2019. From 1994, the entrepreneurship rate was stagnant at 17% until 2000. During 2001 the rate of entrepreneurship increased to 22% and decreased from 2002 to 18% up until 2004. According to Berry , Seiders and Grewal (2002), the small-medium and micro-enterprise (SMME) model failed to transform small businesses in South Africa into a growing sustainable sector. Entrepreneurship started to pick up from 2005 and reached 19% in 2006. However, the South African economy, like many other economies, was deeply affected by the 2008 financial crisis. Various domestic challenges resulted in a slow recovery, and economic flatlining. The decline of entrepreneurship from 19.70% in 2006 to 15.88% in 2008 can also be explained by an economy that has consistently underperformed (Galindo and Mendez, 2014).

Between 2007 and 2019 South Africa entrepreneurship fluctuated from around 14% to 15%. According to Herrington, Kew and Kew(2009), the GEM ranking placed South Africa 35th out of 54 GEMS, and its Total Early-Stage Entrepreneurial Activity (TEA) rate was 5.9%, which is an indication of low levels of entrepreneurial activity. Further, the expected TEA rate of a country in South Africa's economic development stage

would be 13%. Despite all the policies that were put in place, South Africa's entrepreneurship rate remains low (Bosma *et al.,* 2020).

According to Economic policy, (National Treasury,2019a), the sluggish growth of 0.4% recorded in 2019 translated into limited job creation and had the potential to deepen the existing rifts caused by unemployment and financial inequality. There was stagnant economic growth which hindered the development of both entrepreneurship and SMEs because of the ongoing challenges such as economic size, market structures, institutions, and regulations that affect the business environment. Additionally, there was, and remains, significant over-regulation of small businesses, saddling them with unnecessary bureaucratic burdens. In addition, there remain various labour market rigidities (OECD, 2019; Ntshavheni, 2019).

Other factors seem to have hindered, and continue to hinder, the growth and sustainability of entrepreneurship in South Africa. These include the government tender system, lack of motivation embarking on entrepreneurship, lack of role models, a gap between theory and practice, and lack of practical experience. Lack of experience as a stumbling block to entrepreneurship growth has also been and continues to be, caused by the poor quality of the education system in the entrepreneurship space in South Africa. Due to the persistent poor quality of education, most businesses are embarked upon without aspiring entrepreneurs having done the appropriate market research and ending up being both unsuccessful and discouraged. The lack of necessary skills and experience has also contributed to the lack of success of the unemployed in becoming entrepreneurs and running successful businesses. In addition, the poor or non-existent sustainability of start-ups in South Africa also has a bearing on the lack of motivation to embark on entrepreneurship. This is further exacerbated by a lack of adequate and appropriate training by consultants with practical experience (Herrington and Kew, n.d.). Having presented these trends in entrepreneurship, it is imperative to look at the total South African trade context as trade also serves as the backbone of economic growth and is a key factor in ocean economic activities. The following section presents and discusses an overview of total trade in South Africa.

## 2.5 Overview of total trade in South Africa

South Africa has one of the largest economies in Africa. It shares borders with Botswana, Lesotho, Mozambique, Namibia, ESwatini, and Zimbabwe, and is located at the continent's southernmost tip. Foreign trade in South Africa has increased since the end of apartheid, following the lifting of several sanctions and boycotts imposed as a means of ending apartheid (Mbatha and Charalambides, 2008). South Africa and the other four Southern African Customs Union members (Botswana, Lesotho, Namibia, and eSwatini) have duty-free trade (SACU). As of 2012, the Southern African Development Community (SADC) Free Trade Agreement allowed duty-free trade among 12 of the 15 members ( Edwards, 2005).

South African trade policy has had a significant impact on trade composition and aggregate growth. During the Apartheid era, trade barriers hampered both exports and imports, and the economy relied on favourable global commodity price trends to avoid an external constraint. South Africa developed a comparative advantage in capital-intensive primary and manufactured commodities, in part due to its natural resource endowments, but also because the pattern of protection was particularly harmful to non-commodity manufactured goods exports.

Trade liberalization did not increase imports but also increased exports by lowering both input costs and the relative profitability of domestic sales. Non-commodity manufactured sectoral exports grew faster than sectoral imports as a result of liberalization. This evidence suggests that further trade liberalization could be part of the strategy to increase export diversification. It emphasises the significance of policies that provide South African firms with access to inputs at world prices, as well as a competitive real exchange rate.

Figure 2.4 below presents total trade trends in South Africa during the 1994 – 2019 period.

**Figure 2. 4: Total trade trends from 1994 to 2019**
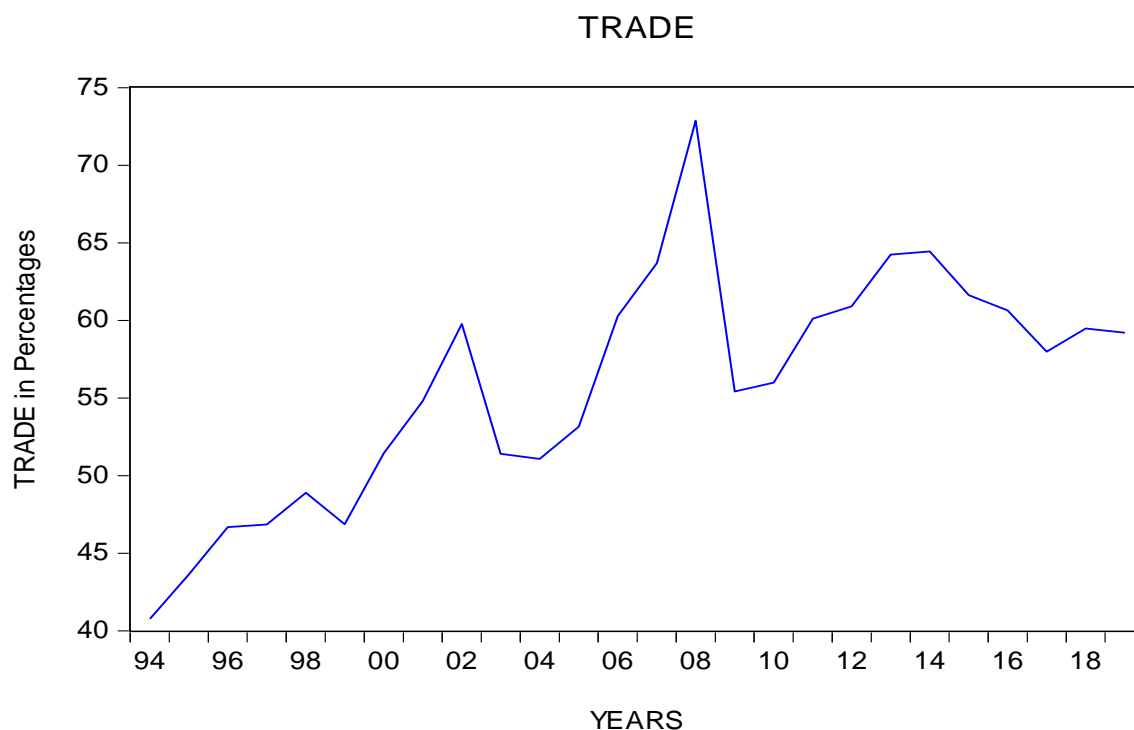
TRADE



Sources: World Bank (2020)

Figure 2.4 shows the trends of the South African trade rate from 1994 to 2019. In 1994 the rate of total trade was approximately 40%, the trade policy regime adopted at that time has transformed the economy. This transformation caused trade to expand significantly from 1994 to 2001 from 40% to 59% expressed as percentage of GDP (Edwards and Schoer, 2001).

During the period 2002 to 2004, there was a slight drop in trade: 59% to 51% expressed as percentage of GDP respectively. This was due to the fact that import volume was extremely rapid, while export volume was sluggish in terms of growth. This trend caused a decline in total trade (Edwards and Lawrence, 2006). The global economic downturn had a negative impact on South Africa's trade flows. Imports and exports in the country went from positive growth in the third quarter of 2008 to negative growth rates in the following two quarters (Malouche, 2009). This trend continued until the third quarter of 2009 when import and export volumes and values began to show signs of improvement (SARB, 2010).

During the 1995 – 2008 period total trade in South Africa increased from 53% to 72% in 2008, this increase being due to the tariff reform programme taking effect in early 1995, signaling the commitment of the new government to trade reform. This reform was to enhance the competitiveness of local industry (Lewis, 2001). During the period 2002 to 2010, South African total trade increased by approximately 17%, with exports increasing by 15% and imports by 25%. However, during the period 2008 - 2009, the global financial crisis, which hit the global economy from 2008 to 2009, shrank South Africa's total trade by 24% (IMF, 2016). However, in 2010 South Africa's total trade witnessed a recovery trend: there was a growth of 17% in 2010 ( Fundira, 2011).

According to the latest available data from the World Trade Organisation (WTO), South Africa exported USD 90 billion in goods in 2019, while importing USD 107 billion. In the same year, the country imported services worth USD 15.3 billion and exported services worth USD 14.4 billion. In 2019, South Africa had a trade surplus of USD 1.7 billion. South Africa exported approximately $10 billion in 2019, ranking it as the world's 36th largest exporter. This represents an increase from $103 billion in 2014 to $109 billion in 2019, while the imports decreased from $106 billion in 2014 to $88.5 billion in 2019 (WTO, 2019).

Having presented the macroeconomic indicators in South Africa for the 1994 – 2019 period, the following sections provide an ocean economy overview in South Africa.

## 2.6 Overview of the South African ocean economy

South Africa has a vast offshore ocean space and approximately 3 924 kilometers of coastline, both of which factors highlight the relatively unexplored economic potential of its ocean economy (Operation Phakisa, 2015). The ocean economy is defined by the Organisation for Economic Co-operation and Development (OECD) as the sum of the economic activities of ocean-based industries, together with the assets, goods, and services provided by marine ecosystems (OECD, 2016). The concept 'ocean economy' refers to 'that portion of the economy which relies on the ocean as an input to the production process or which, by virtue of geographic location, takes place on or under the ocean (Walker, 2018; 6).

In October 2014, the South African government announced that it would be implementing a number of ocean economy projects that would contribute more than R20 billion to the country's GDP by 2019 (Operation Phakisa, 2014). The Operation Phakisa initiative forms part of the government's NDP economic blueprint that aims to promote economic growth and job creation (SAinfo Reporter, 2015).

South African former president Jacob Zuma adopted the Malaysian Big Fast Result Approach which was renamed Operation Phakisa (meaning hurry up in Sesotho) to address national key priorities, namely, a low economic growth, a high rate of unemployment, inequality, and poverty (Operation Phakisa, 2014). Operation Phakisa is a results-oriented strategy that entails establishing clear goals and objectives, tracking progress, and making the outcomes public. Initially, Operation Phakisa focused on two areas: the ocean economy and health.

Operation Phakisa represents a new spirit of moving more quickly to meet the government's goals. At the time, the South African government's starting point was that South Africa was surrounded by vast ocean space and had not fully capitalised on the enormous potential of this untapped resource. Between 2014 and 2019, the government unlocked R29.4 billion in oceans economy investments, resulting in the creation of 7 093 direct jobs (Operation Phakisa, 2019). In 2019, it was reported that R40.8 billion in investments had been made in the Oceans Economy, which had resulted in the creation of 7 385 direct jobs (Operation Phakisa, 2019).

Operation Phakisa has six priority sectors as new growth areas; Maritime Transport and Manufacturing activities, such as coastal shipping, trans-shipment, boat building, repair, and refurbishment; offshore oil and gas exploitation; aquaculture; marine protection services and ocean governance; maritime transport and manufacturing, and two additional sectors which were later added: marine and coastal tourism and small harbour development. The current study intentionally excludes offshore oil and gas exploration because of the limited availability of data. Table 2.1 provides a summary of investment per ocean sector by 2019.

**Table 2. 1: Summary of investment per ocean sector in South Africa**

| Delivery unit | Gov investment | PVT sector investment | DTI incentives | Total investment |
|---|---|---|---|---|
| Marine transport and manufacturing | 7 646 800 000 | 1 153 300 00 | 4 28852 000 | 9 228 952 00 |
| Aquaculture | 260 000 000 | 940 000 000 | - | 29 850 000 00 |
| Marine Protection and ocean governance | 58 550 000 | - | - | 58 550 000 |
| Small harbour development | 311 000 000 | - | - | 311 000 000 |
| Coastal marine tourism | 164 345 000 | - | - | 164 345 000 |
| Total investment | 23 440 695 000 | 16943 300 000 | 428 852 000 | 40 812 847 000 |

Source: Operation Phakisa, (2019)

Table 2.1 presents a summary of investment in ocean-selected sectors for 2019. It shows marine transport and manufacturing to have the highest investment compared with other sectors. Table 2.2 below shows the short, medium, and long-term goals of Operation Phakisa in terms of jobs and economic growth.

**Table 2.2: Operation Phakisa: Objectives**

|  | Short term (2016) | Medium term (2019) | Long term (2033) |
|---|---|---|---|
| **Jobs** | 26 00 | 77100 | 1000 000 |
| **GDP growth** | R7.5 billion | R32 billion | R129-R177 billion |

Source: Department of Environmental Affairs (DEA),(2019)

Table 2.2 presents a summary of short and medium progress reports, together with a projected estimate for 2033, in terms of growth and job creation. The objective of Operation Phakisa's ocean economy was to achieve 77100 jobs by 2019 and is aiming to increase this to 1 million by 2033. The GDP contribution of R7,5 billion in 2016, increased to R32 billion in 2019 and is projected to increase to between R129 and R177 billion in 2033.

In addition to Operation Phakisa's overall progress report and future projections, a comparison between the trends of ocean economy financing and selected macro-economic indicators are graphically represented in Figure 2.5.

**Figure 2. 5: Trends of ocean economy financing comparing with macro-economic variables from 1994 to 2019**
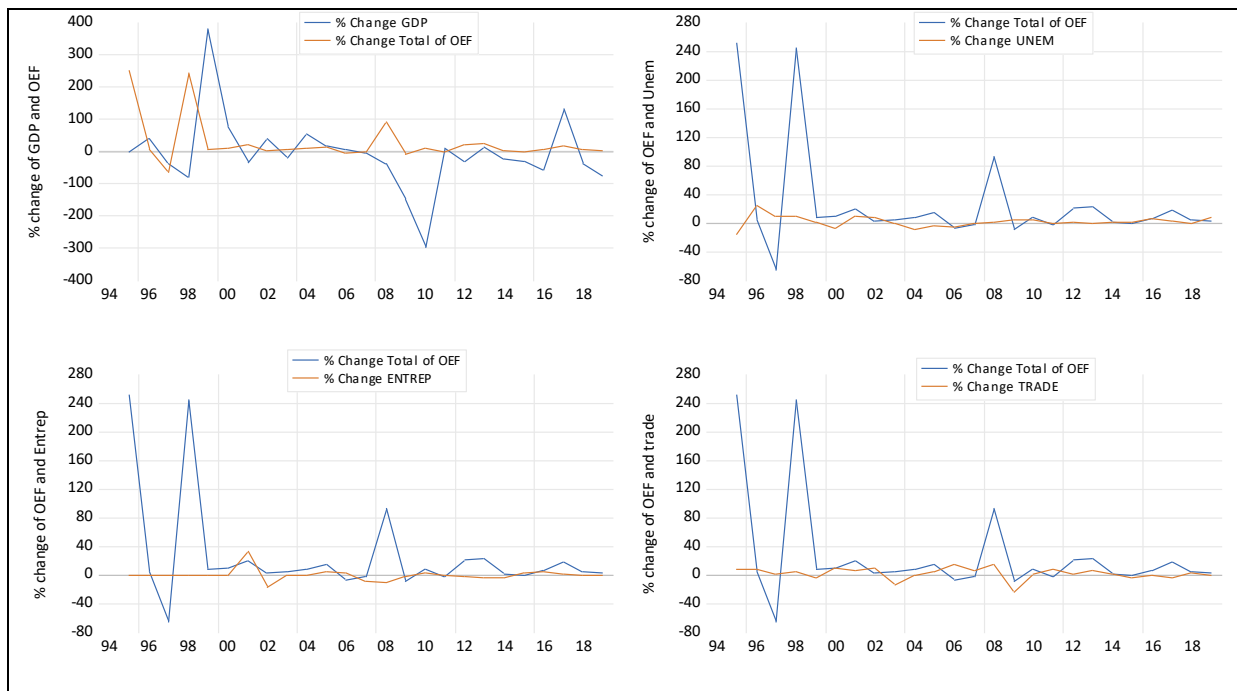


Source: National treasury (2020) and World bank (2020)

Figure 2.5 shows the trends in ocean economy financing in South Africa from 1994 to 2019. The graph depicts an upward trend during the selected periods. During 1997 there was a slight drop in financial expenditure on the ocean sector. The decline in economic growth between 1997 and 1998 is in line with the reduction in ocean economy financing, which is an indication of the linkages between the variables. Parallel with this unemployment was increasing, which can be seen as evidence of low growth and low investment in South Africa. In addition, entrepreneurship did not show any significant increase or decrease until 2000 while 2001 reflected a sharp positive trend, while total trade in South Africa reflected a positive trend during this period. Therefore, it can be deduced that ocean economy financing, and economic growth shows a similar downward trend, whilst ocean economy financing reflected an opposite trend to those of unemployment and total trade.

Government expenditure recorded an upward trend during the 2004 to 2008 period, in line with a steep economic growth trend. The ocean economy financing from 2008 to 2009 shows a slight drop, which is also in line with the impact of the global financial

crisis at that time, and which negatively affected South Africa's economic growth. One of the consequences of this is also reflected in government expenditure on the ocean economy at this time. This is also shown to have affected the unemployment rate as evidenced by the increased rate of unemployment. The entrepreneurship trend also reflects a declining trend for this period due to the knock-on effect of the global financial crisis. This trend is also in line with the 24% decreasing effect on total trade. Thus, ocean economy financing and unemployment show opposing trends, while economic growth, entrepreneurship, and total trade show similar trends.

After the financial crisis, while ocean economy financing reflected an upward trend, economic growth started to pick up, although only for 2010 and 2011, and began to decline again. This means that the upward trend of ocean economy financing was not sufficient to make an overall measurable positive impact on economic growth. This, in turn, also reflects the persistently high rate of unemployment during this period, showing a rising trend. Therefore, ocean economy financing and economic growth can be said to show opposite trends while unemployment shows a similar trend to that of economic growth.

For the period 2014 to 2016, ocean economy financing shows a flattening trend, then begins to pick up, with an upward trend continuing to 2019. This shows that, while there was an upward ocean economy financing trend, economic growth was decreasing. Therefore, from this, it can be deduced that ocean economy financing has a contradictory relationship with economic growth. This is also reflected in the persistently high rate of unemployment, which is also an indication that the jobs created in the ocean economy sectors were insufficient to be able to reduce overall unemployment in South Africa. This again reflects an opposite trend relationship between economic growth, entrepreneurship, and ocean economy financing, while unemployment has shown a similar trend.

Having presented the macro-economic trends and ocean economy financing in South Africa for various periods between 1994 and 2019, together with analyses of their relationship, it is necessary, in the following section, to discuss the trends of each of the individual ocean economy financing ocean sectors.

## 2.7 Sectorial overview of the selected ocean sectors

Ocean economy financing is made of the following sectors: aquaculture, coastal marine tourism, maritime transport and manufacturing, marine protection and ocean governance, and small harbour development. An overview of aquaculture is described and discussed below.

### 2.7.1 Overview of aquaculture sector

The cultivation of aquatic organisms in controlled aquatic environments for any commercial, recreational, or public purpose is referred to as aquaculture. Plants and animals are bred, reared, and harvested in a variety of water environments, including ponds, rivers, lakes, the ocean, and man-made "closed" systems on land (Brick and Hasson, 2018). The cultivation of oceanic species is referred to as marine aquaculture (as opposed to freshwater species). Oysters, clams, mussels, shrimp, salmon, and algae are some examples of marine aquaculture production (National Oceanic Atmospheric Administration [NOAA], 2011).

According to Operation Phakisa (2014), aquaculture is a young industry with a low scale of production. Since 2014 Operation Phakisa programme took an initiative to of unlocking the potential of the aquaculture sector in South Africa (Operation Phakisa, 2014). The goal is to develop aquaculture to the point where it can play a significant part in the supply of fish products, as well as a greater role in job creation and revenue generation. Aquaculture is the world's fastest-growing food production sector, rising at a rate of 8% to 10% per year for the previous two decades and accounting for half of all worldwide fishery products. In South Africa, however, aquaculture is an underdeveloped sector, contributing a small fraction to the country's GDP (Operation Phakisa, 2016).

The aquaculture sector is estimated to be the largest contributor of job creation within South Africa's ocean economy, and in 2019 the sector was shown to have created 2 030 jobs through Operation Phakisa (DEA, 2019). Financially, R1.2 billion has been invested in the industry, of which R260 million was from the public sector. Over the next 10 to 20 years, the aquaculture sector as a whole is expected to rise from 3 543 tons of production (R218 million) in 2016 to more than 90 000 tons (R2.4 billion) (Brick

and Hasson, 2018; Department of Environment, Forestry, and Fisheries [DEFF], 2019).

These statistics are a strong indication of the ability of South African aquaculture to ensure growth and economic development, and fisheries industries being a source of sustainable livelihoods through the provision of public support and an integrated platform for the management of aquaculture (University of Stellenbosch, 2018). The current study makes use of evidence of government expenditure on aquaculture as a proxy to measure aquaculture financing in South Africa. Figure 2.6 below shows the trend of aquaculture as a percentage change of government expenditure in aquaculture in South Africa for the 1994 – 2019 period.

**Figure 2.6: Trends of government expenditure on aquaculture from 1994 to 2019**



Source: National Treasury (2020)

Figure 2.6 shows trends of percentage change in annual government expenditure on aquaculture in South African from 1994 to 2019. From 1999 to 2000, and from 2003 to 2004, there was a significant increase in the government budget for fisheries. This was caused by heavy expenditure on fisheries' patrol vessels. These vessels were used to protect South African fisheries from over-fishing and illegal use. The cost of these vessels was between approximately R30 million and R25 million for 2004 - 2005,

and 2005 - 2006 respectively. Further, there was an additional expenditure of R10 million over the previous three periods because of undeveloped and unexploited South Africa fisheries species (National Treasury, 2003).

Expenditure increased at a 5.5 % annual rate from R351.3 million in 2008-2009 to R412.6 million in 2011-2012. This was expected to fall to R374.4 million over the medium term, at a 3.2 % annual rate, due to a decrease in financial assistance for Working for Fisheries projects from 2013 to 2014 (National Treasury, 2012).

During 2009 - 2010 there was a slight decrease in the expenditure of marine living resources. This resulted in the aquaculture function receiving R 6.3 million, which resulted in a decrease from R350.1 million in 2009 - 2010 to R189.2 million in 2012 - 2013 (National Treasury, 2010). At this time there was an additional increase in expenditure of R60 million over the medium term to support 23 aquaculture projects. This was intended to provide support through establishing hatcheries, revitalising existing fishponds, and broadening the scope of the aquaculture sector by encouraging small fish farmers to participate in aquaculture projects through workshops in the Operation Phakisa initiative.  Through this initiative government aimed to implement its policies and programmes more efficiently and effectively (National Treasury, 2015).

By 2012-2013, the government hoped to expand the marine fisheries sector by broadening the scope of the aquaculture sector through the national aquaculture strategy, and by 2014-2015, it hoped to establish 12 smallholder producer associations.  In the course of the 2014 - 2015 programme for fisheries 50 community projects were to be implemented (National Treasury, 2012). For the 2013 - 2015 period approximately R128.7 million expenditures were allocated to the aquaculture programme in order to promote the fisheries sector as a sector that would be able to sustainably address food security and adopt transformation. Further, these projects were and are expected to increase the production of fish from the 4 000 tonnes per year being produced to 20 000 tonnes per year over the medium-term expenditure framework (MTEF) period (National Treasury, 2015).

For the 2017 - 2018 period various projects for fisheries and aquaculture had an allocation of R365.2 million over the medium term and these projects were expected to create approximately 1693 jobs in the fisheries sector (National Treasury, 2018). An

additional expenditure, totalling R 117 million was budgeted for the aquaculture sub-program. These funds were used to purchase fishing equipment and provide training to fishing communities in rural and coastal areas to harvest fish for subsistence consumption. The inclusion of South Africa's aquaculture sector in Operation Phakisa in 2014 gave it a boost, and R40 million of the R125 million budget was allocated to fund 24 aquaculture projects over the medium term. In addition, 210 000 jobs were expected to be created by 2030 (National Treasury, 2018).

According to National Treasury (2019a), Operation Phakisa would provide support to 435 000 farmers more especially smallholders in the required infrastructure, and also provide training to enhance their technical capacity/expertise. From this initiative, it was expected that, within the aquaculture sector, production would be increased from 4000 tons of fish in 2018 to 20 000 in 2019. This increased government expenditure on the aquaculture programme to R137.9 million (National Treasury, 2019a). The following section presents a description and discussion of the coastal and marine tourism sector of South Africa's ocean economy.

### 2.7.2 Overview of Coastal and marine tourism

Coastal tourism refers to land-based tourism activities such as swimming, surfing, sunbathing, and other coastal recreation activities that take place on the coast and are characterised by their proximity to the sea. Maritime tourism encompasses sea-based activities such as boating, yachting, cruise, and nautical sports, as well as the services and infrastructure that support them on land (Stelzenmüller *et al.*,2013).

According to Scheyvens and Biddulph (2017), the tourism industry in South Africa employs around 686 000 people and contributes little under 3% of GDP. Furthermore, from 2012 to 2016, tourism outperformed other main industries in terms of job generation, adding just over 40 000 net new jobs to the economy. However, the sector has been constrained by access to the finance required to ensure broad-based benefits in the sector. There were various initiatives to promote and ensure progress, such as the national tourism sector strategy (NTSS) for the development, training, and mentorship of businesses in the sector (Butler and Rogerson, 2016). Another initiative is the Small Enterprise Finance Agency (SEFA) established in 2012 for assisting small businesses in the tourism sector to access funding up to the maximum of R 5 Million and this includes funds working capital needs, bridging finance, and loans and asset

finance. The National Youth Development Agency (NYDA) is another government institution established to support tourism development for youth aged between 14 and 35 years. In 2008, the Tourism Enterprise Program (TEP) was established as an independent organisation with funding from the Department of Tourism and other sources. The TEP invested more than ZAR 550 million in tourism development from 2000 to 2015, trained over 25 000 SME operators and employees, and mentored over 450 tourism SMEs. The Tourism Transformation Fund, a collaboration between the National Empowerment Fund and the Department of Tourism that supports the establishment and growth of black-owned businesses in the tourism sector, is another important source of funding for new tourism-related businesses. While there is a relatively well-developed system of institutions, programmes, and initiatives aimed at supporting SME development in South Africa's tourism sector, the focus on coastal and marine tourism as a particular sub-set of the broader tourism sector is relatively new. The impetus for a focus on marine and coastal tourism has emerged primarily from South Africa's prioritisation of its ocean economy through Operation Phakisa (Butler and Rogerson, 2016; Scheyvens, and Biddulph, 2017; United Nations Conference on Trade and Development [UNCTAD], 2017; Rogerson, Benkenstein and Mwongera, 2018). Therefore, the proxy used to measure coastal and marine tourism in South Africa is government expenditure on the promotion of tourism because government expenditure between tourism and coastal marine tourism is not separated (National Treasury, 2019a). Figure 2.7 shows trends of government expenditure on tourism in South Africa from 1994 to 2019.

**Figure 2. 7:  Trends of government expenditure coastal marine tourism trends 1994 to 2019**
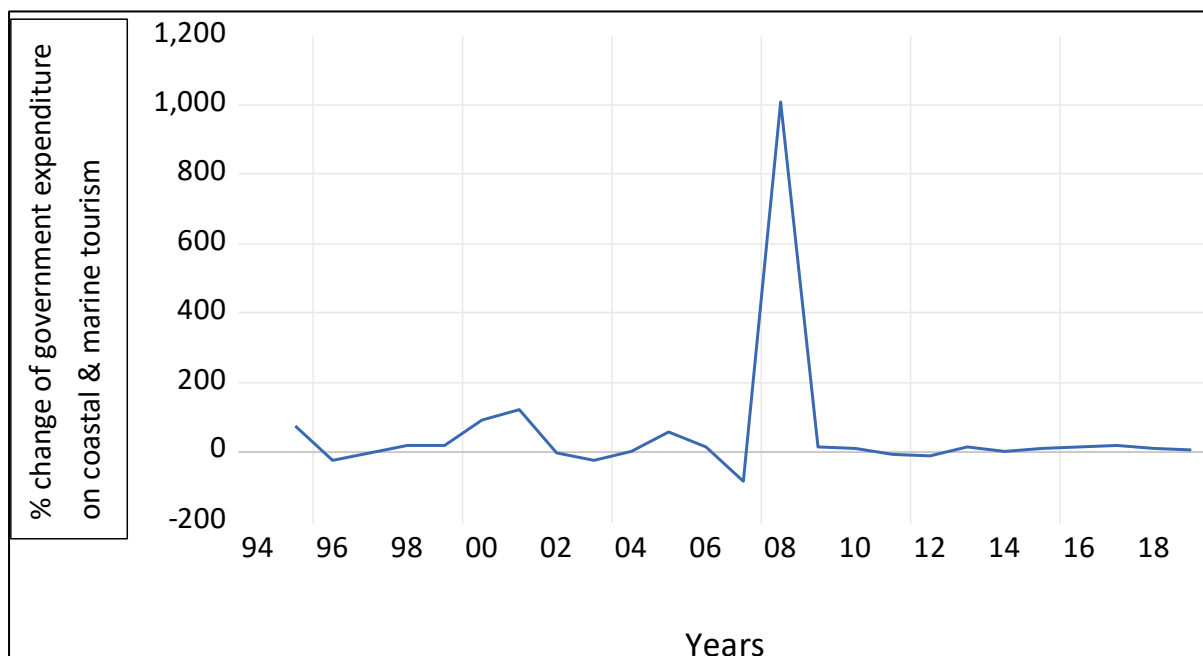


Source: National Treasury (2020)

Figure 2.7 shows the annual trends of percentage change government of coastal and marine tourism in South Africa from 1994 to 2019.  During the 1998 - 1999 period, the South Africa tourism operation expenditure was R86 million which included an income of R21 million and a government grant of R65 million. From 1999 to 2000 government allocated a budget of approximately R70 million to the tourism sector. Out of that budget R33 million was for tourism marketing on the international platform, and the rest was for infrastructure and expenditure. An additional R50 million was allocated for the MTEF period for a marketing partnership with the private sector (National Treasury, 1999).

During the period of 2002 to 2003 expenditure of R1.2 billion was allocated to the South Africa tourism program which was a 6.7% increase from the previous allocation over 2001 – 2002. An addition allocation was made during 2002 – 2003 was R102 million and for 2003 -2004 was R127.7 million. Further, there was an additional expenditure of R12 million for hosting the World summit on the sustainable

development of national parks. An expenditure of R50 million during the period of 2003 – 2004 and 2004 -2005 was made for tourism promotion ( National Treasury, 2002).

During the period of 2006 to 2007  transfer of R457,2 million which includes R326 million for international tourism marketing was made to South Africa tourism ( Nation Treasury, 2006). During 2005 - 2006 government expenditure on tourism increased from R150 million in 2002 - 2003 to R240 million in 2005 - 2006. South African Tourism also received an increasing allocation over the previous three-year period, and expenditure was expected to rise from R68,7 million in 2002 - 2003 to R87,0 million by 2005 - 2006 (National Treasury, 2006). Expenditure increased at a 10.6 % annual rate from R853.5 million in 2006/07 to R1.2 billion in 2009/10, owing primarily to increased allocations to South African Tourism for international tourism marketing (National treasury, 2010). Over the 2012-2013 period, expenditure was expected to rise at a 3.8% annual rate, reaching R1.3 billion in 2012. The slower medium-term growth rate is primarily due to a reduction in the transfer payment to South African Tourism for internal tourism marketing(National Treasury, 2010).

According to the National Treasury budget during the 2014 - 2015 to 2016 - 2017 period, approximately R99.6 million to R199.6 million was allocated as an incentive programme. During the 2014  - 2015 period the department had a reduction of R32 million, some of which was used to expand public works programmes. The remaining funds were spent on transfers to South African Tourism, transfers and subsidies to SMMEs, and non-essential goods and services such as catering, travel, subsistence, and consultants. During the 2016 - 2017 fiscal year, the department relies on South African Tourism to market South Africa and transfers a projected 53.2%  of its budget to the organisation for this purpose ( National Treasury, 2017). Over the medium term, an additional R174 million has been allocated to the organisation to increase marketing in established and emerging markets.

During the 2018 - 2019 period the department allocated approximately R11.2 million expenditure for the purpose of boosting international tourism. In addition to stepping up its foreign marketing activities, the company expected to raise the number of local vacation visits from 3.2 million in 2018 to 3.4 million in 2019. From 2016 to 2017, the number of business events conducted in South Africa climbed from 125 to 206, with

91 740 international delegates attending business events between 2017 and 2018. Increase the number of delegates to 99 500 in 2021-2022, as well as the number of proposals to organize events supported from 105 in 2018-2019. The following section presents a description and discussion of marine transport and manufacturing in South Africa.

Over the MTEF period 2018-2019, the Tourism Incentive Programme sub-programme in the Tourism Sector Support Services programme received 7.6% (R576.9 million) of the department's total budget ( National Treasury, 2019). These funds were expected to facilitate conformity to quality standards through increased participation in the tourism grading system, to enable black-owned businesses to access foreign tourism markets, to unlock black investment in viable tourism projects by closing funding gaps that may exist between loans and own contributions, and to facilitate conformity to quality standards through increased participation in the tourism grading system., and to encourage businesses to become more energy-efficient and to contribute to the growth of the green economy through job creation and business development According to the 2018-20109 budget review, a total of ten incubators are expected to be established to support emerging enterprises, with 2.2% (R168.3 million) of the department's total budget allocated for the creation of virtual platforms aimed at providing remote support to small, medium, and micro-enterprises (SMMES) in the sector( National treasury, 2019).

### 2.7.3  Overview  of marine transport and manufacturing

Maritime transportation is an integrated system that includes the construction, designing, management, operations, servicing, maintenance of merchant, leisure, and other ships services of seaborne trade. In addition, maritime transportation also includes conducting offshore operations and moving cargo and people by inland waterways or sea (Walker, 2018).  It is a network of maritime navigation infrastructure and associated services that allows ships to safely interconnect to the hinterland's trade facilitation centres via a gateway of seaport and harbours complexes that provides operations and commercial services.

Maritime transport, according to the Department of Environmental Affairs [DEA], 2019), is a critical vein in the South African economy's bloodstream. The majority of South African trade is in seaborne and moves through the country's commercial port system. It is estimated that seaborne trade accounts for between 80% and 90% of South Africa's economy (International Trade Administration, 2020).

Furthermore, maritime transport is one of the priority economic sectors in terms of its potential to unlock the country's ocean economy by increasing its contribution to South Africa's Gross Domestic Product (GDP) and the creation of jobs and employment opportunities (Operation Phakisa, 2019). It is one of the options for achieving the goals outlined in the 2030 National Development Plan (NDP) and the New Growth Pathway (NGP). In terms of the challenges that maritime transport infrastructure faces, the National Transport Master Plan 2050 is instructive. If we are to meet the 2030 target, we must prioritise the critical interventions identified in the NDP for maritime transport infrastructure (NDP, 2012).

All commercial and non-commercial ships that navigate our inland waters, seas, and oceans are included in the maritime transport sector, as are the laws, regulations, and governance support services that enable maritime human capital, marine construction and infrastructure, technologies, commercial support services, research, and various cargoes and passengers carried on the backs of these ships (Ntuli, 2017). Maritime transport allows for a wide range of complicated maritime operations at sea, as well as the transportation of people and commodities from one point to another, connecting suppliers to markets and facilitating global international trade. Figure 2.8 shows the trends of marine transport and manufacturing as percentage changes in government expenditure in South Africa for the 1994 – 2019 period.

**Figure 2. 8: Trends of government expenditure on marine transport and manufacturing from 1994 to 2019**
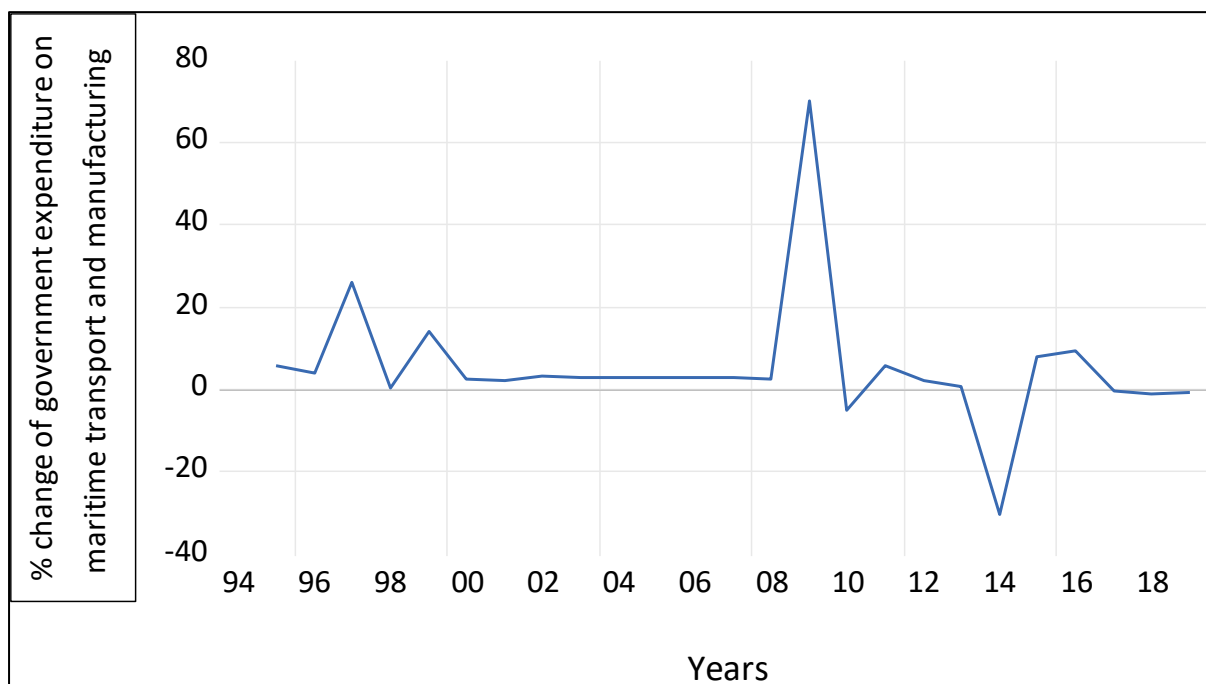


Source: National Treasury (2020)

Figure 2.8 shows the annual trends of the financing of marine transport and manufacturing in South Africa from 1994 to 2019. During the 1997 - 1998 and 2003 - 2004 period, government expenditure for marine transport increased by 6.6%. However, the 2000 - 2001 to 2003 - 2004 period shows a higher increase of 8.4%. All these increases were due to the maintenance and development of maritime infrastructure (National Treasury, 2001).

This steady increase in expenditure on the sector was driven by new activities which were related to the ports regulator (National Treasury, 2004). In addition, during the period 2001- 2002 and 2004 - 2005 expenditure increased rapidly at an approximate annual average rate of 20.6% due to maritime policies and research and development

(National Treasury, 2005). In the medium term, expenditure was expected to grow from R134.7 million to R160.1 million, at an average annual rate of 5.9% (National treasury, 2011). The increase was largely due to the projected increase in the use of consultants in the maritime sub-program for the writing of maritime industry development policies (National Treasury, 2011).

During the period 2008-2009 to 2011-2012, spending on this program fell from R74.3 million to R67.1 million, at a 3.4% annual rate. This was primarily due to the reprioritisation of funds in 2008-2009 in order to host the African Indian Ocean regional aviation navigation conference (National Treasury, 2012). As a result of reprioritisation, allocations to the ports regulator increased from R13.6 million in 2009-2010 to R15.1 million in 2012-2013. This was done to improve the entity's staffing and enable it to carry out its economic regulation duty. From R17.3 million in 2009-2010 to R9.3 million in 2012-2013, transfers to the South African Maritime Safety Authority entity were reduced. This was due to savings being made in line with the authority's revenue increase (National Treasury, 2013).

The ports regulator increased by R7.1 million in the 2013 - 2014 period from a reprioritisation of funds. This was done to enhance its human resource capacity to fulfil its economic regulation mandate. Transfers to the regulator were expected to increase to R18.6 million by 2016 - 2017. The transfers to the South African Maritime Safety Authority decreased from R14.9 million in 2010 - 2011 to R6.4 million in 2013 - 2014 as a result of reprioritisation and a reallocation in the department for the feasibility study investigation into the undertaking of tugboat services and developing maritime revenue sources (National Treasury, 2013). Another reason for this decrease in funding was because of the operational cost of the international maritime organisation office, the International Maritime Organisation diplomatic conference, and the development of the business model for regional shipping and transhipment.

During the 2016 - 2017 to 2018 - 2019 period, the departmental budget was intended to be increased by approximately R56.3 billion to R68.6 billion. This included R15.9 million to support the operations of maritime transport, R19 million for strengthening the regulatory capacity of the port's regulator (National Treasury, 2017). While this section has presented the trends of marine transport and manufacturing, the following section provides an e overview of marine protection and ocean governance.

### 2.7.4 Overview of marine protection and ocean governance

Marine or ocean governance refers to the rules, institutions, processes, agreements, arrangements, and activities carried out to manage the use of the ocean. It is also integrated conduct of the oceans policy or actions with the purpose of protecting the ocean environment. In the South African context, the marine protection services and ocean governance focus on the country's jurisdiction over an extensive exclusive economic zone, with an area of one and a half million square kilometres. For a large area of ocean jurisdiction such as this, effective governance is both critical and challenging, given the size and complexity of the South African oceans (DPME, 2020). According to the DEFF (2020) , an Oceans and  Coastal Information Management system (OCIMS) began to be implemented in 2016 to track vessels entering the EEZ and to monitor harmful algal blooms.

South Africa's ocean policy seeks to balance sustainable development and protection of the ocean environment for societal benefit (DEA, 2017). Given that the importance of the oceans to the planet and its inhabitants cannot be underestimated, effective ocean governance is imperative.  Marine governance is highly complex as it involves a number of interrelated and often contesting factors. State sovereignty, resource development, international commerce, environmental protection, and military activities are examples of these. As a result, issues concerning the management of competing uses and users of ocean space and resources arise. Addressing these issues through governance necessitates both horizontal and vertical integration of institutions (Operation Phakisa, 2014).  The current study used government expenditure on maritime defence as a proxy to measure marine protection and ocean governance financing are given that the sector deals with maritime security which is the umbrella body responsible for the governance and protection of areas where ships and maritime operations need protection from such threats as terrorism, piracy, robbery, illegal trafficking of goods and people. It is also responsible for the general protection of the

ocean environment and of military activities (National Treasury, 2019a) Figure 2.9 presents the trends of marine protection and ocean governance as percentages of government expenditure on maritime defence.

**Figure 2.9: Trends of government expenditure on maritime defence from 1994 to 2019**
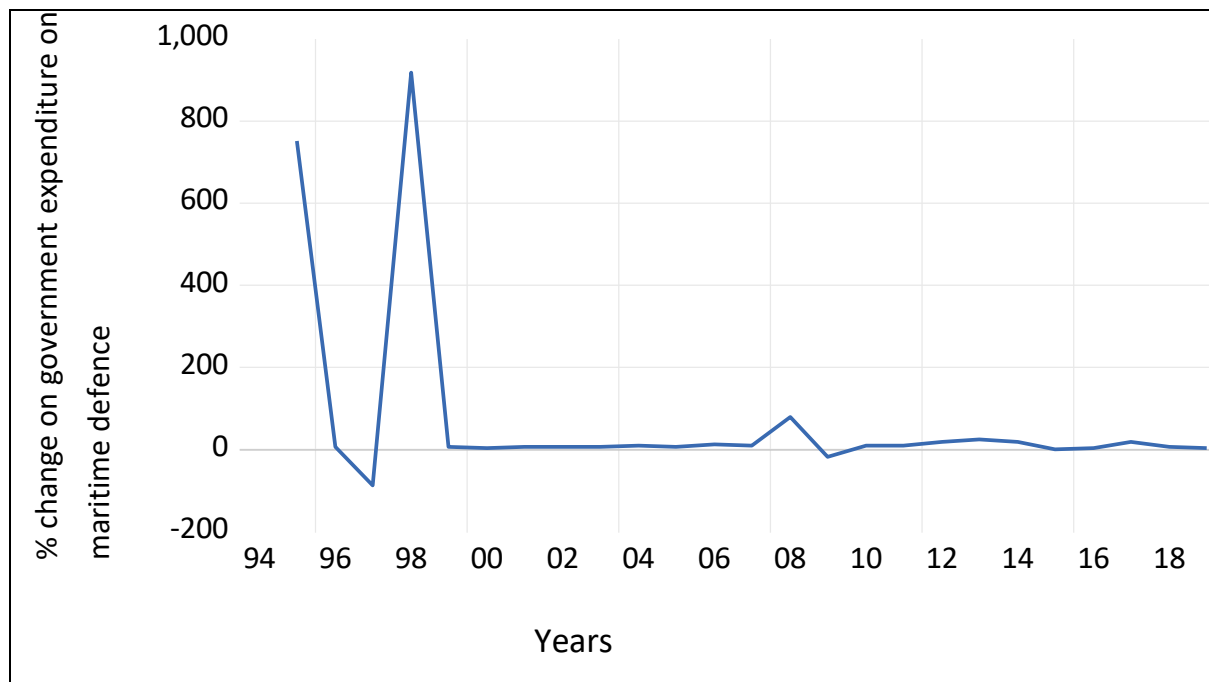


Source: National Treasury, (2020)

Figure 2.9 shows the annual trends of financing of marine protection and ocean governance in South Africa from 1994 to 2019. In 1994 - 1995 government expenditure on marine defence was approximately R76546 thousand and increased to R 68 million in 1996. During the period 1997 - 1998 government expenditure dropped approximately to R788 thousand (National Treasury, 1997). During the 1998 - 1999 and 2004 - 2005 period, government expenditure increased by an average of 5.3% for the maintenance or refitting of vessels (National Treasury, 2002).

During the 2003 - 2004 and 2004 - 2005 period, government expenditure increased from R1 billion to R1.7 billion. This was due to the services provided by the South Africa Navy regarding maritime protection and operations in various commercial ports. The increase also included the military skills development required for those serving on the vessels (National Treasury, 2004). An additional increase during the 2005 -

2006 period was for the purpose of providing full operational utilisation of four corvettes and three submarines (National Treasury, 2005).

Over the medium term, the maritime training capability sub-programme experienced an average annual increase of 24.4 %, owing primarily to an increase in military skills development system members. Over the review period, transfers and subsidies from this program amounted to 40.4 percent of program expenditure on average. This was due to the program's large strategic defence procurement projects. Transfers and subsidies expenditure was set to decrease from 43.5 % in the 2007 - 2008 period to 15.2 % in the 2010 - 2011 period (National Treasury, 2008).

During 2010 there was an annual increase of 57.8 % in payments for capital assets over the medium term to make provision for investment in the sea mine detection capability for use during the 2010 FIFA World Cup and the upgrade of existing training facilities at SAS SALDANHA to cater for the increased military skills development system intake (National Treasury, 2009). The increase of 52.3 % in the Maritime Combat Capability subprogramme in 2013 - 2014 provided for the replacement of the offshore and inshore patrol vessels, the procurement of new harbour tugs, and the replacement of small boats. This was also the reason for the increase of 73.9 % in transfers and subsidies in 2013 - 2014 (National Treasury, 2011).

During the 2016 - 2017 period the department had the largest expenditure over the period of 1994 -2019 of approximately R26.9 billion and increased this to R27.1 billion in 2018 - 2019. This included the cost of maintaining equipment such as ships (National treasury, 2016). During the 2015 - 2016 period there was a slight decrease in expenditure due to the termination of outsourced labour staff when their contract was terminated. This resulted in a decrease from 7590 posts to the 7415 posts which in 2016 were designated as permanent posts (National Treasury, 2017).

The South African Navy continues to prepare naval forces for operations in support of the maritime security strategy. These operations involve ongoing maritime border patrols along the Mozambican channel in order to combat piracy. During the period of 2019, a provision was made in the Maritime Defence programme over the MTEF period to finalise the acquisition of a new hydrographic survey vessel at an estimated

cost of R2.1 billion. The vessel was intended to be used to conduct hydrographic research for purposes of producing nautical charts which would ensure safe navigation for military and civilian shipping. The acquisition of this vessel also formed part of Operation Phakisa; an initiative of the Department of Environmental Affairs intended to unlock the economic potential of South Africa's oceans. Over the medium term, R1.6 billion was allocated, mainly for the maritime defence programme, whose purpose was the implementation of the maritime security strategy along the east coast of Africa (National Treasury, 2019a). For this purpose, R48.1 million was allocated over the MTEF period in the Force employment programme.  The department would focus on preparing and deploying the South African National Defence Force for the 2019 national and provincial elections in support of the South African Police Service at a projected cost of R67.7 million in the 2018 - 2019 period in the force employment programme (National Treasury, 2019a). The following section provides a description and discussion of small harbour development in South Africa.

### 2.7.5   Overview of small harbour development

Any small harbours, which are situated along with the coastal water-land border interface and which are primarily in support of the nearshore and offshore industries of fishing, aquaculture, and other maritime economic activities, have deteriorated over several decades to the point of a state of near collapse. This is the result of a general lack of maintenance, safety, and security measures, as well as a lack of investment, and as a result, the offshore industries have been deprived of their much-needed launching and development. Landing, processing, and service sites that connect fishing, aquaculture farming as well as other maritime economic activities have been neglected. South Africa has approximately 50 small harbours. These include public proclaimed, non-proclaimed, and potential harbours, and private harbours, as well as landing sites and the 12 proclaimed small harbours, namely, Stilbaai, Lamberts Bay, St Helena Bay, Saldanha Bay, Gansbaai, Arniston, Kleinmond, Hermanus, Struisbaai, Gordon's Bay, Kalk Bay, and Hout Bay, and three un-proclaimed harbours, namely Port Edward, Ray Nkonyeni Municipality in KZN, Port St Johns, Port St Johns Municipality in Eastern Cape, and Port Nolloth, and the Richtersveld Municipality in Northern Cape ( Operation Phakisa, 2015). The current study makes use of government expenditure on marine and coastal management as a proxy to measure

for small harbour development financing in South Africa since the expenditure on this programme incorporates the expenditure for maintenance and upgrading of small harbours ( National Treasury, 2000). Figure 2.10 below shows the annual trends of government expenditure on the ocean and coastal management.

**Figure 2. 10: Government expenditure on marine and coastal management from 1994 to 2019**
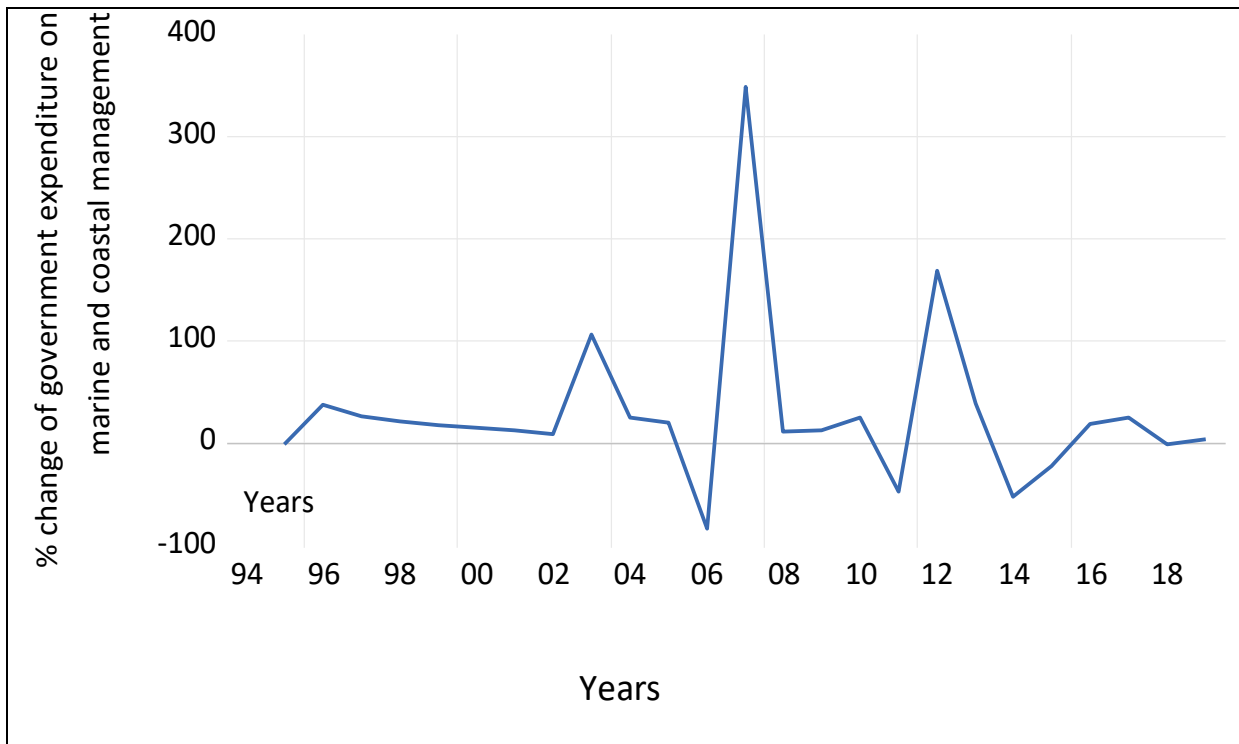


Source: National Treasury (2020)

Figure 2.10 shows the annual trends of financing of the ocean and coastal management in South Africa from 1994 to 2019. During the 2000 - 2001 and 2001 - 2002 period, the expenditure on this sector increased due to the maintenance and upgrading of harbours. Further, during the  2001 - 2002 to 2003 - 2004 period approximately R400 million was allocated for the design and construction of three inshore patrol vessels and one offshore patrol vessel, and on the refurbishment of a research vessel. This included maintaining 12 harbours and supporting over 4000 vessels (National Treasury, 2000).

During the period 2001 - 2002 to 2002 - 2003 period expenditure on marine and coastal management decreased from R257.9 million to 257.0 million   (National

Treasury, 2003). An amount of R147,0 million per year for the period 2001 - 2002 to 2003 - 2004 was allocated for the acquisition of patrol vessels (National treasury,2002). The additional funding also provides for infrastructure investment in parks and harbours amounting to R50 million and R80 million for 2003/04 and 2004/05 respectively ( National Treasury, 2002).

During 2002 - 2003 to 2003 - 2004 period expenditure increased from R36.8 million to R46.4 million. This was intended for various coastal and community-based projects (National Treasury, 2001). The expenditure increased from R206.8 million in 2006 - 2007 to R227.5 million in 2009 - 2010, with an average annual rate of 3.2%. In the medium-term expenditure was expected to grow to reach R251 million in 2012 - 2013, which amounted to approximately 3.3%. This was for operational costs for research vessels (National Treasury, 2010). The additional funding also provided for infrastructure investment in parks and harbours amounting to R50 million and R80 million for 2003 - 2004 and 2004 - 2005 respectively

During the 2014 - 2015 period expenditure increased by 49.6 %.  This was due to the expenditure needed for the replacement of offshore and inshore patrol vessels, and the procurement of harbour tugs for the naval base (National treasury, 2015). During the 2014 - 2015 period medium-term spending on maritime protection and ocean governance was projected to increase due to the need for the replacement of an offshore patrol vessel and the procurement of harbour tugs. This also included the increase of transfers and subsidies because of the upgrading of harbours in Durban. Further, the increase was also in line with peacetime operating support activities**.** During the 2018 - 2019 period government expenditure remained around 2.3% and was for repairs and maintenance of fisheries harbours in the Western Cape (National Treasury, 2019).

## 2.8 Concluding remarks

This chapter offered an overview of selected macroeconomic indicators. These include GDP, unemployment, entrepreneurship, and total trade from 1994 to 2019**.** This was followed by the government expenditure trends in each macro-economic environment. The overview showed economic growth in South Africa continuing to stagnate during the period, which is the focus of the study, while the unemployment growth rate

continued to accelerate during the period.  At the same time, entrepreneurship and total trade presented upward fluctuating trends. The chapter also presented an overview of the South African ocean economy. This overview included the relationship between the macro-economic indicators and the country's ocean economy. The last part of the chapter presented an overview of the various ocean sectors in South Africa, including their trends. Chapter three presents a review of existing literature relating to the area of research.

# Chapter three

# Theoretical literature review

## 3.8 Introduction

This chapter presents a review of the theoretical framework underpinning the study. This chapter is divided into three sections. The first section covers economic growth theories. In order to enhance economic growth through ocean economy, it is important to ensure that oceans resources are sustainable, whilst at the same time, entrepreneurial activities are promoted. In this regard theories of sustainable development and entrepreneurship are presented in the second section of the chapter. One of the objectives of Operation Phakisa is to increase and stimulate trade. Trade is determined by the distance of trading partners; in this instance, the third section presents gravity model literature. The last section of the chapter presents an assessment of the theoretical framework.

## 3.2 Theoretical framework review

A review of a number of the established theories on economic growth shows various schools of thought have attempted to analyse and assess the relationship between ocean economy financing and macro-economic indicators. The main theories, or models, under review include the Harrod-Domar, neoclassical growth, endogenous growth, sustainable development theory, economic development theory on entrepreneurship, and gravity models. These theories are all relevant to this practical study because all of them make reference to both saving and investment as key determinants of economic growth, unemployment, and the role of investment on entrepreneurship. In addition, each of them, in differing ways, can be said to support the view that the services provided by ports and/or transport infrastructure play an essential role in reducing time and transport costs in order to promote production and trade.

### 3.2.1    Harrod-Domar theory

Although around eight decades ago Harrod (1939) and Domar (1946) developed their respective Keynesian models of economic growth individually, their assumptions and results were similar. This means that their respective models can be said to complement each other. The primary distinction between the two models is their respective theories of economic origin. While Harrod's economy seeks equitable ways to transition from underemployment to full employment, Domar seeks the conditions for an economy's balanced growth at full employment (Harrod, 1939; Domar, 1946). Subsequent economic growth theorists, therefore, joined the models together as the Harrod-Domar model, which was the forerunner of the exogenous growth model. In economic development research, the model is used to explain economic growth in terms of savings (S) and investment (I). Thus, in essence, the Harrod-Domar growth model attempts to explain how economies need to grow or could stagnate over time.

The model implies that investment plays a substantial role in economic growth. This means that all investments are net investments, and all savings are used to fund all the investments. A number of assumptions influence the model: The product of the savings rate and output equals saving, which is equivalent to investment; output is a function of capital stock; capital is required for production; and the product of the savings rate and output equals saving, which is equal to investment (Harrod, 1939). These assumptions can be presented in the following equations:

Output is a function of capital stock

$$Y = f(k)$$ ………………………………………………………………… …...3.1

The marginal product of capital is constant; the production function exhibits constant returns to scale. This implies capital's marginal and average products are equal.

$$\frac{dY}{dK} = C = \frac{dY}{dK} = \frac{Y}{K}$$ ………………………………………………………...…3.2

The product of the savings rate and output equals saving which equals investment

$$sY = S = I$$ ………………………………………………………….…...……....3.3

$s$ = Savings rate,

$S$ = Level of Saving, and

$I$=Levels of Investment.

The change in the capital stock equals investment less the depreciation of the capital stock

$$\Delta K = 1 - \delta K$$ …………………………………………………..…………………………3.4

According to this paradigm, countries must save and invest a particular percentage of their GDP in order to build their economies. The more people can save and invest, the faster their economies will rise. The real rate at which they can grow at any level of saving and investment, on the other hand, is determined by how much additional output they can generate from an additional unit of investment. This output can be measured by the inverse of the capital-output ratio, $c$, because this inverse, $\frac{1}{c}$ is simply the output-capital or output-investment ratio. It follows that multiplying the rate of new investment, $s = \frac{1}{c}$ by its productivity, $\frac{1}{c}$ will give the rate by which national income or GDP will increase.

The Harrod Domar basic growth equation is shown below. G stands for the geometric rate of growth of income or output in the system, "s" for the fraction of income which individuals and corporate bodies choose to save, and "c" for the value of the capital goods required for the production of a unit increment of output:

$$G = \frac{s}{c}$$ …………………………………………………………………………..…… 3.5

Harrod- Domar adopted three concepts of growth, namely the warranted growth rate $(G_w)$, the actual growth rate $(G_A)$ and the natural growth rate $(G_N)$. Warranted growth $(G_w)$ refers to the economy's growth rate when it is operating at full capacity and all savings are invested. Warranted growth rate (Gw) is determined by capital-output ratio and saving-income ratio. Actual growth rate $(G_A)$ is the rate of growth determined by the country's actual rate of savings and investment. In other words, the actual growth rate can be defined as the ratio of income change to total income over a given time period. The actual growth rate $(G_A)$ refers to the growth rate which is determined by the saving-income ratio and capital-output ratio. Natural growth rate $(G_N)$ is determined by 'natural' occurring conditions or factors, such as the labour force, natural resources, capital equipment, technical knowledge, etc. These factors set a

limit beyond which output expansion is not possible. As a result, the natural growth rate is the maximum rate of growth that an economy can achieve with its available natural resources (Harrod, 1939).

$G_w$, and $G_A$ can be differentiated from each other. Three possibilities emerge if $G_w$, and $G_A$ are equal to each other or different from each other. The first of them is $G_w$, $= G_A$, is the equilibrium condition, which is called two knife-edges. This balance between warranted growth rate and actual growth rate is also known as macroeconomic stability. There is no economic imbalance in such a 'stable' state. Because all goods produced in the economy are consumed, a supply and demand equilibrium exist. Another possibility is that the actual growth rate is greater than the warranted growth rate ( $G_A > G_w$). In such a case, the required warranted growth rate is met, if not exceeded. However, as a result of the disinvestment of the economy's stocks, this situation results in a demand surplus and places the economy in an inflationary process. The last possibility is the $G_A < G_w$. situation. In this case, the actual growth rate has remained lower than the warranted growth rate capable of satisfying all economic actors. Because all of the manufactured goods could not be consumed, stocks increased, and the economy entered a deflationary spiral (Ülgener, 1991: 416).

The last growth rate Harrod defined is $G_N$, which is the natural growth rate. This concept refers to the maximum rate of growth permitted by population growth, capital accumulation, and technological advancements (Harrod, 1939). Given that the model takes the approach that the increase in labour force caused by population growth should also be employed, $G_N$ will reach the level permitted by the population growth rate and the innovations in manufacturing technologies. In Equation 3.6 below, *n* stands for population growth rate and *t* for technological improvements:

$$G_N = n + t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.3.6$$

The relationship between $G_w$ and $G_N$ is an important part of the model. If $G_w$ exceeds $G_N$ the economy will be dragged into a recession; this will cause $G_w$ to drop below the beginning level and thereby the average $G_w$ rate will stay below $G_N$ . Such a situation will only emerge under the condition of chronic unemployment. In a contrary case, $G_w$

will increase with the increment of profit margins and surpass its average value. This will result in the economy's tendency towards an inflationary propensity (Harrod, 1939).

According to Harrod, the ideal growth rate under these conditions is the equilibrium condition of $G_w$ and $G_N$ (Harrod, 1939). So, only with convenient and long-term economic growth is it possible the $G_w = G_N$ At this point, the economy will not experience a demand-supply gap, nor will there be inflationary or deflationary pressures. The balance between warranted and natural rates of growth is also known, as employment stability. However, providing this balance, or maintaining the economy at this point even if this balance is provided, is not always practical (Domar, 1946). This is due to the fact that the two growth rates are determined by different sets of factors, and a variety of impediments are likely to intervene and make the balance of all these factors difficult. If the magnitudes of these parameters shifted even slightly away from the dead center, the result would be either increased unemployment or chronic inflation. In Harrod's terminology, this balance is poised on the equality of $G_w$ (which depends on the saving and investing habits of households and firms), and $G_N$ (which depends on the absence of technical change, and the increase of the labour force).

The Harrod-Domar model makes reference to the low rates of economic growth and development of developing countries being linked to low saving rates. This creates a vicious cycle of low investment, low output, and low savings. To increase economic growth rates, either domestically or from abroad, savings must be increased. Higher savings fuel a self-sustaining economic growth cycle. Capital transfer to developing economies should enable higher growth, which in turn should lead to higher savings and growth that is self-sustaining.

In the Harrod-Domar model labour force growth is not explicitly described. This is because, in a developing country, labour is assumed to be abundant and can be hired as needed in a given proportion to capital investments. In general, technological progress can be expressed in the Harrod-Domar context as a reduction in the required capital-output ratio, resulting in greater growth for a given level of investment. This is obvious when we consider that, in the long run, this ratio is not fixed but can change

over time in response to how financial markets operate and the policy environment. However, the emphasis in this model is once again on the role of capital investment.

The output growth rate is equal to the savings rate multiplied by the marginal product of capital minus the depreciation rate. In the Harrod–Domar model, increasing the savings rate, increasing the marginal product of capital, or decreasing the depreciation rate will increase the growth rate of output; these are the means to achieve growth. According to the model, economic growth is dependent on policies that increase investment, save more, and use that investment more efficiently through technological advances. According to the model, an economy does not achieve full employment and stable growth rates through natural processes.

The following part reviews the Harrod model in order to explain the problem of unemployment in the economy. The Harrod growth model explains the relationship between unemployment and investment. The theory in order to provide the basis of understanding the unemployment problem through the following fundamental equations in the model which are as follows:

$$gk = su$$ …………………………………………………………………………….3.7

Where:

$g_K$ = refers to the growth of capital stock

s= propensity to save

u= output – capital ratio $(1/v)$

$$gk = gL$$ ……………………………………………………………..………...…..…..3.8

Where :

$gL$ = growth of labour force

$$gL = gE + ga$$ …………………………………………………………….…...……3.9

Where :

gE=employment growth

ga=rate of labour augmenting technical progress

$$gLS = gN + ga$$ …………………………………………………………..….3.10

Where:

gLS= effective labour supply growth

gN= labour force growth

ga=rate of labour augmenting technical progress

$$gU = gN - gE \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.11$$

Where:

gU=rate of change of the unemployment rate

gN= labour force growth

The output-capital ratio can be thought of as the capacity utilisation rate that is given to us exogenously. The goods market-clearing condition, denoted by Equation (3.7), requires that the rate of capital accumulation equal the rate of saving. The Harrod model's important feature is that the savings rate or investment drives capital accumulation. Therefore, the aim fundamental problem is the basis of balancing the warranted growth rate with the natural growth rate. Goods markets ( equation. 3.7 ) determine the warranted growth rate while the supply side determines the natural growth rate (equation 4). If gN > gE = the unemployment rate will rise steadily, creating an explosive deflationary gap. If gN < gE = The unemployment rate will continue to fall, resulting in an implosive inflationary gap. The possibility of these unemployment rate dynamics lends the model a Keynesian patina.

Equations (3.7) yields the fundamental differential equation for the unemployment rate in the Harrod model

$$gU = gN + \alpha_0 - \alpha_2 U - [1 - \alpha_1]su \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.12$$

Where the parameters $(\alpha_0; \alpha_1; \alpha_2)$ refers to technological change

The stability is satisfied since $d_{gU}/d\,U = -\alpha_2 U < 0$. Setting $g_U = 0$ then enables solution

for the steady-state unemployment rate which is given by

$$U = \frac{\{g_N + a_0 - [1 - a_1]su\}}{a_2} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.13$$

To be feasible, the unemployment must also satisfy 0 ≤ U∗ ≤ 1. That imposes the parameter restrictions $g_N + \alpha_0 - [1 - \alpha_1]su > 0$ and $g_N + \alpha_0 - [1 - \alpha_1]\,su < \alpha_2$. Capital

accumulation cannot be too low, or the unemployment rate will explode, and the economy will be driven to an immiserized state. On the other hand, the economy will hit the full employment boundary if the capital accumulation cannot be too fast.

Harrod model illustrates the relationship between growth and the equilibrium unemployment rate and the following key important features: Firstly, savings rate drives capital accumulations which shows the model follows the classical accumulation process. Therefore, a high savings rate increases capital accumulation and output growth, then decreases the unemployment rate. While capital-output rates decrease output growth and increase unemployment. This implies that a low saving rate will result in low capital accumulation or output rate which in turn lowers employment growth. While on the other hand if capital accumulation is too fast, and the economy will hit the full employment boundary. Therefore, changes in investment cause a change in employment and unemployment. Further, in Harrod's theory investment has a dual character in the sense that it can increase production capacity and at the same time generate income. This implies that a higher saving rate/ investment will increase capital accumulation and growth which will lower unemployment. Therefore, there is a negative relationship between investment growth and unemployment

Second, the model has shown that unemployment has a negative association with output growth or investment. The natural rate of production growth adjusts to the warranted rate of increase, according to Hicks (1932), by adjusting the rate of labour augmenting technical advancement. Finally, the justified rate rules the roost in the Harrod model with a Kaldor–Hicks technical advancement, and labour force expansion has no effect on steady-state growth. Fourth, higher unemployment rates are caused by quicker labour force growth ($g_N$). Lastly, increases in the parameters $\alpha_0$ and $\alpha_1$ increase the unemployment rate. These parameters accelerate productivity growth, which accelerates effective labour supply growth and crowds out jobs for actual workers. As a result, technological progress leads to unemployment. The opposite is true when the parameter $\alpha_2$ is increased. Higher unemployment slows technological progress more strongly in this case, which helps to reduce the unemployment effect of technological progress ( Hicks, 1932).

Furthermore, according to Palley (2012), when total factor productivity stagnates, co-movements in other important variables slow down. Consumption expenditures, for example, will not rise above the trend, nor will investment spending. GDP and total hours worked will also be below trend. When consumption, investment, GDP, and hours worked fall, so does Solow's residual, which represents labour productivity growth and is measured by the difference between actual and predicted productivity growth (or shocks). That is, under these conditions, there is no advancement in technology or productivity. As a result, unemployment will rise.

Harrod (1939) provides an understanding of the unemployment problem, where he explained the challenge of balancing warranted growth rate with natural growth rate. Therefore, if $g_N > g_L$ = the unemployment rate will steadily increase which then produces an explosive deflationary gap. Whilst if $g_N < g_L$ = the unemployment rate will steadily fall and produce an implosive inflationary gap. Therefore, Harrod (1939) investigated the growth rate at which the economy must develop in order to remain in a continuous state of full employment. The failure of the economy to grow at the required rate create unused capacity and unemployment.

Further, theoretically, investment has reflected two sides: the first side effect level of national income and employment rate while the other side effects the national production capacity. According to the economic perspective, fiscal policies have a mandate of promoting economic growth, stabilising the country's economy, and increasing employment opportunities. The economic perspective of government expenditure on the economy can be in two ways, either to be harmful to the economy or promote the economy. Government spending can be harmful in the number of ways such as mismanagement of government expenditure or the increase of budget deficit may cause subsequent government spending (Palley, 2019). According to Sriyana, (2006) if government spending is beneficial to the economy then an increase in government spending will increase economic activities with the increase of investment. Therefore, increases in investment will increase output, employment, and exports.

The Harrod-Domar model can be said to have various weaknesses and strengths, firstly presents the strength of the model followed by its weaknesses.

The Harrod- Domar model was initially created to analysis the business cycle, and only later adapted to explain economic growth with an emphasis on the importance of savings or investment as key determinants of economic growth. This means that growth depends on the quantity of labour and capital and that more investment leads to capital accumulation, which in turn generates economic growth. Therefore, this model's contribution is to be providing an understanding of how economic growth rates derived from the productivity of capital and the level of savings.

The weakness of the model has been critiqued in terms of its emphasis on the saving rate being equal to investment. In reality, developing countries find it difficult to increase savings because a large proportion of their populations struggle to get basic food on the table when compared with wealthier countries which can save more. Because developing countries do not have high enough average incomes to allow for high rates of saving, capital stock accumulation through investment is low. However, this does not mean these countries cannot experience rapid growth. There are other factors that drive growth in developing countries, such as high rates of exports, labour productivity, and plentiful natural resources (Sachs and Warner 1995; Kavoussi, 1985; Caves, 1971). Therefore, it can be argued that, in a real context, savings and capital accumulation may be necessary for economic growth, but not a sufficient condition.

Another criticism is that the theory states that poor countries should borrow in order to be able to finance investment, in order in turn to increase their economic growth rates (Harrod, 1939; Domar, 1946). However, the repayment of, and interest accumulating from, the debts or loans in fact has a negative impact on economic growth. Further, this makes countries incrementally dependent on loans, their governments become serious debtors, and they run the risk of bankruptcy which is detrimental to economic growth.

As a result of the perceived limitations of the Harrod-Domar model in explaining the workings of economic growth, the neoclassical growth model emerged. This included labour in the system, a factor that was neglected or unforeseen, at the time by the Harrod-Domar growth model. The neoclassical growth model is discussed and critiqued in the following section.

### 3.2.2 Neoclassical growth model

Solow-Swan model which is the neoclassical growth model is the economic model for long-run economic growth which was developed by Solow (1956) and Swan (1956) independently and introduce the model in 1956 (Solow, 1956; Swan, 1956). The model attempts to explain long-run economic growth through capital accumulation, population growth or labour, and an increase in productivity. The fundamental neoclassical growth model, which assumes that increasing a country's savings (i.e. investment) ratio can raise an economy's income level in the short run by increasing the growth rate of capital and income (Solow, 1956; Swan, 1956). This means that capital accumulation drives economic growth in the short run. While in the long run, the theory emphasised that technological innovation plays a major role in determining economic growth.

The basic neoclassical growth model was developed by 'Solow-Swan'. This model used the aggregate production function based on three key assumptions:

- The labour force grows at a constant exogenous rate
- Output is a function of capital and labour, which is the production functions relating output to constant returns to scale as $Y = F(K, L)$
- There is no independent investment: $S = I = sY$

In the Solow model, the amount of savings, population growth rate, and technology are all considered exogenous. They consider the output to be the result of both capital and labour. Labour and capital generate as much revenue as marginal products as a result of participation in production. The Cobb-Douglas1 type production function in the Solow model has a constant return to scale (Solow, 1956). Solow's objective, according to Solow (1956: 66), was to create a long-term growth model "that accepts all of the Harrod-Domar assumptions save those of fixed proportions." In fact, Solow's model emphasizes the neoclassical growth theory of production function in its most basic form as follows:

$$Y = K^{\alpha} AL^{1-\alpha}$$ ………………………………………………………….………3.14

Y stands for the amount of produced output at any given time, *K* for the amount of capital used for production, *L* for the amount of labour, and *A* for the changes in technology. The amount of labour and changes in technology increase externally by *n* and *g* rates. The model assumes that, first, the labour force growth is constant; second, all saving is invested, that is, saving (S), investment (I), and the propensity to save (sY), are all equal; and, third, output, Y, is determined by the interaction of capital and labour, that is, Y = F (K, L). The production function Y = F (K, L) exhibits constant returns to scale, and diminishing returns to the variable factor, in the event of other factors being held constant (Mankiw, 2003).

Solow contends that population growth and saving rates determine the long-term steady-state level. As a result, countries with a high rate of savings and a low rate of population growth, in his opinion, are wealthier than countries with a low rate of savings and a high rate of population growth (Mankiw, Romer and Weil, 1992).

To summarise, economic growth, according to the Solow model, is the result of savings and technological advances. For production, two factors are used: labour and capital. Although an increase in savings can result in short-term economic growth, it does not guarantee long-term economic growth because according to the Solow growth model regardless of higher saving or investment has no effect on economic growth in the long run. According to Mankiw, Romer and Weil (1990) the role of adding human capital would enhance the quality of the labour force. The Solow model supports this, and empirical evidence supports the theoretical result that higher population growth rates lead to lower steady-state economic growth, whereas higher savings rates have the opposite effect (Mankiw *et al.,* 1992; Mankiw, *et al.,*1990; Shackleton, 2013). Further, the model emphasises that technological change is the basis for long-term economic growth.

Poor countries, according to the model, will be stuck at a low steady-state per-capital ratio that does not grow. Furthermore, rich countries are constrained by the fact that there is no steady state in which per-capita income will continue to rise indefinitely. As a result, there is no "convergence" of growth rates between rich and poor countries. According to Mankiw *et al.* (1992), growth rates are converging as a result of the Solow and Swan growth models. However, because the saving-to-income ratio cannot

continue to rise indefinitely, investment cannot cause income to grow indefinitely. Countries that invest more would be wealthier, but not grow faster, because the only source of long-term growth is technical progress (or "knowledge accumulation"), which is assumed to happen at an exogenous rate (Barro and Sala-i-Martin, 2004).

Investment and capital accumulation, according to Abramovitz (1979), played a critical role in the growth process. Furthermore, it is clear from neoclassical growth theory that poor countries should, in theory, grow faster than rich countries, resulting in the convergence of per capita incomes, because poor countries with a low capital-labour ratio will have a higher rate of capital productivity or a lower capital-output ratio. Mankiw (1995:283), however, argue that: "Poor countries must be using a technology that is vastly inferior to that of rich countries". As a result, poor countries could produce much more output without increasing the quantities of capital or labour. If this were the case, the incentive to mimic rich-country technology would be enormous.

However, if there is no diminishing return to capital accumulation, the capital-output ratio will not increase as more investment occurs, and thus the investment-to-GDP ratio does matter for growth because growth is endogenously determined by the rate of labour force growth and technological progress. This served as the foundation for the "new endogenous" growth theory.

The various weaknesses and strengths of the neoclassical growth model are discussed below.

The neoclassical growth model draws its strength from the Harrod-Domar model, which represents a delicate balance between a warranted growth and natural growth rate from the crucial assumption of fixed proportions in the production where there is no possibility of substituting labour for capital. Therefore, if this assumption is abandoned, the knife-edge balance between warranted growth rate and natural growth rate disappears with it. Then, without the assumption of fixed proportions in production, a model of long-run growth demonstrating steady-state growth would be constructed. As a result, unlike the Harrod-Domar model, which shows steady-state growth paths, the assumption of substitutability between labour and capital gives the growth process adjustability and a touch of realism. Furthermore, the long-run rate of growth is determined by an expanding labour force and technological advancement.

Despite the neoclassical growth model drawing its strength from the Harrod-Domar model, it also suffers criticism; it also has its weak aspects which are discussed below.

Solow assumed factor price flexibility, which could lead to difficulties on the path to steady growth (Kaldor, 1956). For example, the problem of a liquidity trap may prevent the interest rate from falling below a certain minimum level. This, in turn, may prevent the capital-output ratio from rising to the level required to achieve the path of equilibrium growth.

Solow also ignores the causative of technological progress, viewing it as an exogenous factor in the growth process. As a result, he ignores the issues of inducing technical progress through the processes of learning, research investment, and capital accumulation. The Solow model is based on the unrealistic assumption that capital is homogeneous and malleable. Indeed, capital goods are highly heterogeneous, posing the problem of aggregation. As a result, when capital goods are diverse, it is difficult to achieve a steady growth path. The neoclassical growth model implies that savings (capital accumulation) can account for growth in output in the short run. However, long-run growth rates cannot be explained by the model. Further increases in the savings rate would only increase the steady-state level of capital stock and not change output levels. To stimulate increases in output, the output curve will expand outwards over time, signifying that capital becomes more productive at each time period, thereby countering the growth-destroying tendency of diminishing returns. For capital to become more productive in each time period, there has to be some form of technological progress that is capital leaning. Thus, the inevitability of the neoclassical growth model to predict long-run growth rates heralded the endogenous growth models that emphasised technological progress in predicting long-run growth rates which emerge during the 1980s ( Romer, 1994).

The main criticism of the neoclassical growth model is its insufficient explanation of long-term growth giving rise to the endogenous growth model. Thus, it was that endogenous growth models which also internalised technology emerged especially in the 1980s. The Endogenous growth model is described and discussed in the following section.

### 3.2.3 The endogenous growth model

Economic growth, according to endogenous growth theory, is the outcome of endogenous processes (Romer, 1994). As a result, it is reasonable to predict that investments in human capital, innovation, and knowledge can contribute significantly to economic growth. Positive externalities and spillover effects of a knowledge-based economy are also addressed in the idea, which will lead to economic development. Romer (1986), Lucas (1988), Rebelo (1991), and Ortigueira and Santos (1997), omitted technology from their versions of this model and instead saw growth in this model as being due only to indefinite investment in human capital. They saw this investment as having a spill-over effect on the economy and as reducing the diminishing return capital accumulation (Barro and Sala-i-Martin, 2004; Carroll, 2011).

The AK model is the first and most straightforward of the endogenous growth models. The absence of declining returns to capital is a crucial feature of this paradigm (Barro and Sala-i Martin, 2004: 63). One of the model's unique aspects is that it assumes that long-term economic growth is achievable even at an exogenous and stable technological level. The model establishes a direct link between total production and capital. Human capital is included in the model's definition of capital, as well as physical capital. The model has constant returns-to-scale, just like the neoclassical growth strategy. So, the production function in the AK model is as follows:

$$Y = F(K, L) = AK^{\alpha} (HL)^{1-\alpha} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.15$$

In the equation above, *A* stands for the stable and exogenous technological level, *K* for physical capital, and *H* for human capital. Human capital contains features such as the knowledge, skills, and talents of those members of the population who constitute the labour force; *L* stands for labour force. As the labour force works with more capital and develops its characteristics, such as knowledge and skills, a country's human capital grows. As a result, the human capital rate shifts in the same direction as the stated rate of capital per labour force as $= \frac{K}{L}$. If this statement is written in the equation above, the production function can be written as follows:

$$Y = AK^{\alpha} K^{1-\alpha} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.16$$

$Y = AK$ ……………………………………………………………..…..3.17

If equation 3.17 is stated with rates per capita, the $Y = AK$ equation emerges. In the function, $A$ represent a constant. In this case, the output per capita $k$ must increase too while capital per capita $Y$ increases so that $A$ = Y/K can stay stable. This situation nullifies the neoclassical growth model's diminishing returns rule. The main distinction between the AK model and the neoclassical growth model is that an increase in capital entails not only an increase in physical capital but also an increase in human capital.

In the model, the investment per worker can be stated as $i = sy$ . If $Ak$ is used instead of $y$, the $i = sAk$ equation emerges. The term $s$ stands for the marginal propensity to save. The change in capital per worker while technology is stable is stated as follows:

$\Delta K = i - (d + n)k$……………………………………………………….….3.18

If $i$ is replaced with $sAk$ in equation 3.4 and required mathematical operations are done,

$\Delta K = sAk - (d + n)k$……………………………………………………….3.19
$\Delta K = (sAk - (d + n))k$……………………………………………….….3.20
$\frac{\Delta K}{K} = sA - (d + n)$……………………………………………………...3.21

Equation 3.21 is obtained. By using the equation $\frac{\Delta K}{K} = \frac{\Delta Y}{Y}$, it is possible to express the economic growth as follows:

$\frac{\Delta Y}{Y} = sA - (d + n)$……………………………………………………….….3.22

In equation 3.22, $d$ stands for the capital's rate of depreciation and $n$ for the population growth rate. According to this, economic growth is determined by the amount of investment per worker $sA$ the total amount of capital's depreciation rate, and the rate of population growth $(d + n$ ). Economic growth will be achieved if the amount of investment per worker in an economy is greater than the total amount of capital depreciation and population growth rates. As a result, an economy with the highest

rate of savings and the lowest rate of population growth and capital depreciation will have the highest rate of economic growth (Taban, 2014). This result shows the importance of savings-incentive fiscal policies. At this point, according to the model, it would be the responsibility of a government to increase investments by promoting savings and providing economic growth. Another result obtained from the AK model is that the convergence hypothesis of the neoclassical growth model is not valid here. The rejection of the capital's rate of returns shows that countries with the same $s, A, d, n,$ rates would reach the same economic growth rate. In such a case, it is impossible for underdeveloped or developing countries to achieve the same level of growth as developed countries. This criticism of the endogenous growth model's limitations leads to a discussion of Barro's 1990 endogenous growth model based on government spending.

### 3.2.4 Robert Barro: endogenous growth based on government spending

The broad concept of capital (physical and human capital) in the AK model was expanded to include government spending in Barro's 1990 growth model based on government spending. Barro (1990) claimed in his endogenous growth model for government spending that tax-financed government services would accelerate growth. According to this model, increasing government spending on consumer goods has a negative impact on economic growth and savings, whereas increasing government spending on producer goods has a positive impact on economic growth and savings (Barro, 1990:103).

The model shows that tax-financed government services have a positive impact on production and overall utility. Barro (1990) included government spending as a new production factor in the production function from this perspective. Each household producer receives government spending per capita in the amount of $g$. Consumers can use these government-provided services for free. This additional government spending would boost growth through externalities. With the condition of constant returns to scale, a new production function that contains public spending transforms into:

$$Y = \emptyset(k, g) = K. \emptyset \left(\frac{g}{k}\right) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.23$$

If the equation above is written in the Cobb-Douglas production function, it becomes $\frac{Y}{k} = A.\left(\frac{g}{k}\right)^{\alpha}$ while 0 < α < 1. Government spending is supplied by flat tax rates. If $T$ stands for government spending and $\tau$ for tax rates, and if the government is assumed to implement balanced budget policies, the budget policy is written as follows:

$$g = T = \tau y = \tau . K . \emptyset \left(\frac{g}{k}\right)^{\alpha} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.24$$

where $T$ is government revenue and $\tau$ is the tax rate. The number of households is normalised to unity so that g corresponds to aggregate expenditures and $T$ to aggregate revenues. Note that equation (3.24) constrains the government to run a balanced budget. That is, the government can neither finance deficits by issuing debt nor run surpluses by accumulating assets.

In a situation in which government spending is added to the function, the marginal return of the capital is as follows:

$$\frac{\partial y}{\partial k} = \emptyset \left(\frac{g}{k}\right).(1 - \emptyset')\frac{g}{Y} = \emptyset \left(\frac{g}{k}\right).(1 - \eta)\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.25$$

In this equation, $\eta$ is the elasticity of $y$ in the amount of given $K$ with respect to $g$. Although there is a change in the amount of capital of the companies in the private sector, there is no change in the enormity of government spending. If the taxes collected by the government for public spending are taken into consideration, the individual optimum consumption is as follows:

$$Y = \frac{c}{c} = \frac{1}{\sigma} . \left[(1 - \tau).\emptyset \left(\frac{g}{k}\right).(1 - \eta - p\right] \dots\dots\dots\dots\dots\dots\dots\dots.\dots\dots\dots 3.26$$

In Equation 3.26 above, $\frac{g}{k}$ , $\eta$ and the growth rate of consumption $Y$ will stay stable as long as $\tau$ and $\frac{g}{Y}$ remain stable (in other words, if, $g, T$ and $Y$ increase at the same rate). Consumption will continue to grow at a flat rate $y$ starting from a value of $C(0)$. Similarly, $k$ and $y$ will also continue to grow at a flat rate $y$, beginning with the starting values of $k(0)$ and $y(o)$. Without moving from one steady-state to another, the economy will maintain growth at $y$ rate at a similar steady-state level. With the given

capital stock $k(0)$, levels of all variables are redetermined. The initial consumption function is as follows:

$$C(0) = k(0) = \frac{1}{\sigma} \cdot [(1 - \tau. \emptyset \left(\frac{g}{k}\right). - y]\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots3.27$$

Participation of governments in the economy at different rates creates two different effects on economic growth. While an increase in tax rates Y decreases the growth rate Y, the increase of the governmental investment rate in total investments $\frac{g}{k}$ results in the increase of Y. If the impact of government effectiveness on the economy is small, the second condition applies; if the impact is large, the first condition applies. This is also evident in the Cobb-Douglas production function. In the Cobb-Douglas function, the elasticity of governmental spending with respect to total output $\eta$ is equal to α. In this case, the steady-state growth rate becomes as follows:

$$\frac{dY}{d\left(\frac{g}{y}\right)} = \frac{1}{\sigma} \emptyset \left(\frac{g}{k}\right) (\emptyset' - 1) \ \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots3.28$$

In such a case, the share of government capital in total capital $\frac{g}{k}$ should be proportionately smaller so that the increase of government spending in total output results in high economic growth. If $\emptyset' > 1$, this condition can be created. The Cobb-Douglas type of production function is $\emptyset' = 1$. So, if α = $\eta$ = $\emptyset'$. $\left(\frac{g}{y}\right)$, it is α = $\left(\frac{g}{y}\right)$, = $\tau$ . This equation states that in order to achieve the maximum growth rate, the portion of governmental services based on governmental spending in the gross domestic product should be equalised to the amount of services provided in a competitive environment. The savings rate in an economy is as follows:

$$s = \frac{k}{y} = \frac{k}{k} \frac{k}{y} = \frac{y}{\emptyset \left(\frac{g}{k}\right)}\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots3.29$$

If $\frac{k}{y}$ decreases, $\frac{g}{y}$ decreases, too. Therefore, the maximum level of savings rate is recognised at a level of government spending that is lower than the growth rate. If the production type of the economy is Cobb- Douglas, like the production function, the maximum savings level will be reached under the condition of $\tau = \frac{g}{y} < α$. Due to this, the government does not need to look for any policies to maximize the level of savings rate $s$ or growth rate $y$. As the economy is always in the same steady-state balance, it would be more beneficial for the government to follow policies that ensure that the

utility of the household stays at the maximum level as long as the $\tau = \frac{g}{y}$ the rate remains stable over the course of time (Barro, 1990:105-110). While the economy grows at the same steady-state level, the utility function can be restated as follows:

$$U = \frac{C(0)^{1-\sigma}}{(1-\sigma)[p-y(1-\sigma)-p)]} \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\text{3.30}$$

Considering the $C(0)$ and $y$ expressions in the social utility function, the public spending/GDP ratio that can transport the social utility to the maximum level can be achieved. Therefore, the public spending/GDP ratio can be written as:

$$C(0) = \frac{k(0)}{1-\eta}[p + y(\sigma + \alpha - 1)]\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\text{3.31}$$

When $C(0)$ is substituted in this equation, it shows the relationship between the social utility function and growth:

$$U = \left[\frac{k(0)}{1-\eta}\right]^{1-\sigma} \left[\frac{p+y(\eta+\sigma-1)}{(1-\sigma[p-y(1-\sigma)])}\right]^{1-\sigma} \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\text{3.32}$$

If η is constant between 0 and 1, the effect of the economic growth $y$ on the social utility ∪ is positive for all values of **σ** > 0 as long as social utility is bounded. Therefore, if η is constant, the maximization ∪ corresponds to the maximization of $y$ (Barro, 1990). This implies that, at least in the long run, the only way a government can influence economic growth is through its impact on capital investment, education, and research and development (R&D). In these models, growth is reduced when government spending discourages investment by imposing tax burdens that are greater than what is required to finance their investments, or by removing incentives to save and accumulate capital.

According to Barro (1990), a growth model which is based on the following input factors such as capital (physical and human capital) based on the AK model and government spending was included as a new production factor in the mode. Barro claimed that tax-financed government services would accelerate growth in his endogenous growth model of government spending. According to this model, an

increase in government spending on consumer goods has a negative impact on economic growth and savings, whereas an increase in government spending on producer goods has a positive impact on economic growth and savings (Barro, 1990:103). As a result, tax-funded government services will have a positive impact on production and overall utility. From this point of view, the spillover effects from the investment will keep generating a return, and spillover effects are increasing the rate to scale from capital investment more especially in infrastructure and investment (Cortright, 2001).

Abramowitz (1965:7) saw investment and capital accumulation as playing a crucial role in the growth process. Samuelson (1975) argued that, in the law of diminishing return, an increase in some inputs relative to other fixed inputs would cause the total output to increase to a certain point, but after that point, an extra output resulting from the additional extra inputs was likely to become less and less. This means that the growth rate is not sustained. However, if both land and labour are increased at the same rate, there may be no diminishing returns; instead, there may be "constant returns to scale," which is defined as "a state in which there is no reason for diminishing returns to operate because all factors grow in balance, and where all economies of large-scale production have already been realised" (Samuelson 1975; 38). When economies of scale are realised, an increase in the factors of production across the board will result in increased returns to investment rather than decreased returns.

Barro (1990) defined government spending as a fiscal policy tool that has a long-term effect on economic growth. He contended that tax policies only encourage investment and improve growth rates and utility levels if the social rate of return on investment exceeds the private rate of return on investment. The important implication of the Barro (1990) model is that when the marginal productivity of government expenditure is one, the size of the government is efficient and optimal.

Endogenous growth models as a whole depend to a large extent on the assumptions of the neoclassical theory which has proven inadequate for developing economies (Onyimadu, 2015). The endogenous growth models abstract from reality wrongly by assuming the symmetry of sectors in the economy or there being a single product market. Inefficiencies arising from poor infrastructure, institutional inadequacies,

imperfect markets, institutions, and transaction costs are some common variables that impede economic growth in developing economies. The model also neglects the political nature of innovation where countries create a strong barrier to innovations.

In the long run, economic growth is exogenous which makes government decisions ineffective. Further, government spending (wasteful expenditure) often makes goods and services more expensive, causes chronic inefficiencies, and leads to more debt and too disruptive financial bubbles. Furthermore, high government spending is likely to be detrimental to economic growth due to inefficiencies caused by government institutions. This high level of spending crowds out private investment, resulting in a slowing of growth and a reduction in capital accumulation. The impact of government spending on the economy, on the other hand, results in an inverted U shape curve. This implies that government spending boosts growth until a certain point, at which point it begins to decline (Barro, 1990; Armey, 1995). Government spending, far from being an economic stimulus and a cure for unemployment, is increasingly proving to be detrimental to the economy.

The concept of economic growth-based development persisted among governments and economic policymakers until the 1970s, when it became clear that consumerism and economic growth were putting pressure on the global environment, with the consequences of polluted and inadequate living space, poverty, and illness (Simlesa, 2003:404). Simultaneously, the exploitation of natural resources, particularly the stock of raw materials and fossil fuels, has resulted in a serious (re)consideration of future generations' needs, and has created a prerequisite for defining the attitude of long-term and rational use of limited natural resources. The imbalance between human development and ecological limits has pointed to growing environmental problems and potentially disastrous consequences.  This has led to a discussion amongst governments, environmentalists, and economists of the sustainable development model.

### 3.2.5   Sustainable development model

The term "sustainable development" was first used in the field of forestry. The types of afforestation and harvesting of interconnected forests that should not jeopardise forest biological renewal were discussed (Črnjar and Črnjar,, 2009: 79). This term was first used in the International Union for Conservation of Nature and    Nature

Conservation and Natural Resources Strategy, which was published in 1980 (International Union for Conservation of Nature [IUCN], 1980). Although initially those championing sustainable development primarily viewed and studied it from an ecological perspective, it soon spread to social and economic aspects of the study. Sustainable development is the practice of maintaining processes of productivity that are natural, or are human-made, by replacing the resources previously and continuing to be  used, and unregulated, with greater or equal resources without decreasing the resources for future generations (Lynn and Gurel, 2013). The term development refers to processes that include goals and the resources projected to be used to achieve the goals. In addition, in this particular context, 'development' means structural transformation which emphasizes human development, and development as environmental sustainability (Vázquez and Sumner, 2013; Lélé, 1991). While the term "sustainability" refers to the ability to maintain some entity, outcome, or process over time and the performance of activities that do not deplete the resources on which that capacity is based (Jenkins, 2009).

Sharpley's (2009) concept of sustainable development is based on a collection of specific development and sustainability concepts. These include socio-economic development in accordance with ecological constraints, the concept of needs (resource redistribution to ensure a high standard of living for all), and the concept of future generations (the possibility of long-term usage of resources to ensure the necessary quality of life for future generations). The essence of the concept of sustainable development derives from the triple bottom line concept, which implies the balance between the three pillars of sustainability. The first pillar is environmental sustainability, which focuses on preserving the quality of the environment required for conducting economic activities and improving people's quality of life. The second pillar, social sustainability, works to ensure human rights and equality, cultural identity preservation, and respect for cultural diversity, race, and religion. The third pillar is economic sustainability, which is required to maintain the natural, social, and human capital required for a minimum income and living standards.  This means that certain pillars of sustainable development can become sustainable while others can remain unsustainable, more especially for ecological sustainability on which the overall capacity of development depends.

The concept of sustainable development has two fundamental elements; development and sustainability, and these precede the creation of the concept itself. Sachs (2010) suggests that there is no development without sustainability and that there is no sustainability without development. Furthermore, traditional theories of 'development' consider development within the context of economic growth and development. According to these traditional theories, development is a synonym for economic growth, which every state must go through at some point, and it is driven by the transformation of traditional production into modern industrialised production of various products and services. In other words, a necessary transition from traditional society to a stage of societal maturity and high consumption is required.

According to growth theories, developing countries are countries whose economic growth and development are hampered by inefficient resource allocation caused by an oppressive and corrupt government and insufficient economic initiatives, and political, institutional, and economic austerity, which renders them able to be captured and kept in a state of dependence, domination, and exploitation by developed wealthy states (Todaro and Smith, 2003). Willis (2005) defines development in this context as a process whose output aims to improve the quality of life and increase the self-sufficiency capacity of economies that are technically more complex than developing countries' economies and rely on global integration.

The essential purpose of sustainable development is the creation of a stimulating environment that people are able to enjoy and which enables them to have long and healthy lives. According to the endogenous growth model, if countries want to stimulate economic growth, they should encourage investment and human capital accumulation, based on the assumption that a sufficient level of state capital stock is the key to economic growth (Romer, 1986). If the pressure of economic development is not to gradually deplete these resources, changes in producer and consumer behaviour must include the rational use and renewal of natural resources. This assumes that economic development cannot occur in the absence of these resources. Further, the direction of sustainable development and use of resources includes weak and strong sustainability (Črnjar and Črnjar,, 2009).

Turner (1993) defines weak sustainability as a 'techno-optimistic' or 'techno-centric' viewpoint, whereas strong sustainability is a distinct 'ecological' or 'eco-centric' viewpoint of sustainable development. According to these categories, weak sustainability implies a constant amount of total capital assets (resources) over time, while natural and manufactured (produced) capital are interchangeable, via a process in which some resources may be reduced due to the increase of other resources, i.e. natural resource reduction must always be replenished by increasing natural or manufactured resources (Davies, 2013). Furthermore, the concept emphasizes that total capital protection is insufficient, with natural resource protection being especially important. This claim is based on the fact that certain critical natural resources can never be supplemented or replaced by other types of resources because they are irreversible, and thus their loss has an impact on all other forms of capital (Turner, 1993; Neumayer, 2003; Črnjar and Črnjar,, 2009).

Hartwick (1977) in studying weak sustainability came up with a definition of the investment savings rule known as "Hartwick's rule". Hartwick's rule for sustainability includes reinvesting 'resources rents' from exhaustible resources, in this way keeping the value of net investments equal to zero. Furthermore, he argued that if resources are optimally allocated, reinvestments can compensate for losses, resulting in a stable stock of total capital over time. Natural capital and produced capital, according to this viewpoint, can be substituted for one another. The rent derived from the depletion of non-renewable natural resources, on the other hand, should be saved and invested in manufactured capital production. Overall, the flawed sustainability paradigm holds that technological advancements can improve human well-being despite the environmental damage caused by technology and industrialization.

According to the neoclassical viewpoint, sustainability is defined as the optimal extraction of non-renewable natural resources (Črnjar and Črnjar,, 2009:87). According to this approach, sustainability also refers to the use of innovative technologies that have increased the environment's capacity in minimising environmental challenges and should compensate for their negative impact. While Solow (1974) the max-min principle was used to explain the intergenerational problem of optimal capital accumulation, implying constant consumption per capita over time. The Kuznets curve for the environment explains the implications of sustainable

development. According to the Kuznets curve, as the economy grows, capital and knowledge-intensive production become more prevalent. This means that as the economy grows, pollution output increases until it reaches a point where production becomes less resource-intensive and more sustainable (Davidson and Matusz, 2005). The ocean economy is one area or sector in which opportunities for increased or new sustainable economic activity derived from the ocean may exist. However, much of this area remains unsustainable in terms of pollution and its negative effects on species diversity, making this an important ocean economy opportunity to implement more sustainable practices (Rogers *et al.*, 2008).

Sustainable development processes entail activities that do not deplete the resources on which a specific capacity is dependent. Because this is the general understanding of sustainability, it can be applied to all human activities and business processes. Thus, according to this definition, each activity can be performed in varying volumes and variations without requiring long-term repetition and resource renewal **(**Jenkins, Jalal and Boyd, 2009).

The various weaknesses and strengths of the sustainable development model are to be discussed.

Initially, the concept was used and agreed upon in a general and broad sense, and did not focus on specific areas and objects, nor did it set any deadlines. Therefore, its general acceptance and lack of examination enabled this concept to become an insignificant cliche (Lélé, 1991). Another criticism of the concept used in its general, unexamined sense relates to western techno-centric development based on economic growth, a concept of development that is the opposite to environmental sustainability and human development in both meaning and effects. As a result, the cause and effect relationship between poverty and environmental degradation became superficially described in theory, whereas in reality, this relationship is highly complex and is linked to specific historical socio-economic, and political contexts.

This unexamined acceptance of a simple and superficial understanding of the terms has meant that the operationalisation of goals has not been clearly exposed, in particular the goal of achieving economic growth and the eradication of poverty. While

eradicating poverty undoubtedly necessitates economic development, it must also be sustainable and not have a negative impact on the environment.

Growth theories failed to explain the role of entrepreneurship. According to Baumol (1968) has made attempts to incorporate entrepreneurial behaviour into the economics mainstream through economic development theory. Hence Baumol (2010) along the lines of Schumpeter (1949) provides useful conceptualising of the role of the entrepreneur in the economy from a rich vein of historical studies. Therefore, the following section will discuss the role and contribution of entrepreneurship in economic development.

### 3.2.6   Entrepreneurship theory

The classical work of Knight's (1921) risk-bearing theory of entrepreneurial action and Schumpeter's (1935) theory of innovation where entrepreneurship and competition fuel growth through creative destruction. In the earlier stage of economic development, scholars did not much consider entrepreneurship as important and they consider the importance of entrepreneurship in the later stage of development. This is because in the early stage of development entrepreneurship plays a less role in growth because growth was largely driven by factor accumulation (Acs and Naude, 2013). Therefore, in the theory of economic development endogeneity of innovation was re-introduced. As a result, the innovative entrepreneur became the focal point of economic analysis. Whereas an entrepreneur is defined as a human agency that adapts the development process to complex challenges. Schumpeter,1949). Entrepreneurship, on the other hand, is the process of creating and discovering new business ventures (Baumol, 1968).

Entrepreneurship has been defined in economic theory as an occupational choice between self-employment and wage employment. (Murphy, Schleifer and Vishny, 1991; Evans and Jovanovic, 1989;Lucas, 1978). Thus, if the profit and non-pecuniary benefits of self-employment outweigh the benefits of salary or income and another park wage of employment,  someone will choose to have become an entrepreneur. As a result, entrepreneurship is frequently associated with self-employment. However, self-employment is frequently not by choice, but by necessity, and a distinction is

frequently made in the Global Entrepreneurship Monitor (GEM) between necessity and opportunity entrepreneurs (Reynolds *et al.* 2005).

Schumpeter (1934) emphasised the role of the entrepreneur as an agent of change and the coordinator production also an innovator and the bearer of the mechanism of economic change. The role of the entrepreneur is to combine the productive factors and coordinate the productive resources. In addition, in the economic development theory, entrepreneurial activities include the introduction of new products or goods or services, discovering new markets, and discovering new sources of supply of raw materials. The fundamental function of entrepreneurship is given by:

$$E(t) \equiv dE(t)/ dt = IhE(t)\varepsilon(t)\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.33$$

Where:

E(t) = entrepreneur (agent) possesses a cumulative stock of firm-specific entrepreneurial human capital.

I= investment

H= entrepreneurial general educational attainments

$\varepsilon(t)$= that takes place at the enterprise level beyond formal schooling. The investment's efficiency is augmented by existing entrepreneurial capacity, which makes such knowledge business specific (Casson,1987). The components of entrepreneurship are all enhanced by investment which promotes innovation and capabilities of entrepreneurship. There is a linear relationship between the production of new knowledge and accumulated knowledge. This implies that new product knowledge is not subject to diminishing returns. As a result, investment serves as a catalyst for entrepreneur growth. If no effort is made to accumulate entrepreneurial capital and the economy is in a standard neoclassical stagnant equilibrium, in the sense that the growth rate of per capita output is zero. According to Schultz (1980) investment enhances the entrepreneurial ability to innovate and be productive. Therefore, the government's role in promoting entrepreneurship plays an important role in reducing uncertainty and transaction cost (Baumol, 1968). According to Courvisanos and Mackenzie (2014), an insufficient supply of entrepreneurs does not necessarily lead to underdevelopment, but rather to institutional weakness as a result of a lack of profit opportunities tied to activities that yield economic growth.

Both empirical and theoretical, the understanding of the entrepreneur's role is still lacking. Hence, there is a lack of evidence on the role of entrepreneurship on economic growth and its contribution to developing countries (Naudé, 2010). Entrepreneurship also emphasizes the risk-taking that is associated with entrepreneurship because of the responsibilities that entrepreneurs must take which include productivity uncertainties, production management, and payment of workers among others (Kanbur, 1979). According to Nelson (2012), this risk turns to be very high in developing countries where most entrepreneurs are characterised by small and medium enterprises (SMEs) which have a low probability of success. Government plays an important role in addressing the market failures in the entrepreneurial start-up and growth process and innovation (Acs and Naudé, 2013). This role is through reducing regulations and requirements or providing subsidised credit (Mouhammed, 2010). Therefore, the public sector supporting entrepreneurship is an important but vexing issue and thus the design for entrepreneurship policies is delicate.

The role of investment in entrepreneurship stimulates employment growth whereby the entrepreneurs generate new jobs when they enter the market. Therefore, the employment effect from the new business that arises from the new jobs being created. The other factors that influence the ability of entrepreneurs to be productive include institutions, regulations, and economic policy factors which affect the incentives of entrepreneurs to generate and produce new knowledge into goods or products in order to be productive and promote growth. As a result, investing in entrepreneurial activities improves the effectiveness of entrepreneurial activities. The investment maximizes the utility of the enterprise (Barreto, 1989). Investment in entrepreneurial capital becomes a critical factor influencing the current vs. long-term rate of productivity and real per-capita income growth in this approach. The ability of entrepreneurship is important as it determines development, thus entry of entrepreneurs with low ability might hinder growth and development because such entrepreneurs may be less productive and have less ability to increase (Frederick *et al.,* 2006 ). Given this notion, it becomes of importance to examine the extent to which oceans economy as indicated in operation Phakisa has boosted entrepreneurship in this sector.

The following section presents a description and discussion of the gravity model in order to help explain the determinants of international trade.

### 3.2.7 Gravity model literature review

The gravity model is used in this context to explain the impact of trade facilitation on international trade.

The gravity model is an international trade model that predicts bilateral trade flows based on economic sizes and distance between two units. Timbergen first introduced the model in 1962. Using macroeconomic properties such as GDP, geographic distance, and possibly other factors, the gravity model successfully reproduces the volume of trade between connected countries (Van Bergeijk and Brakman, 2010). The traditional gravity equation is as follows:

$$Trade_{ij} = \alpha \cdot \frac{GDP_i \, GDP_j}{D_{ij}} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.34$$

- whereby, $trade_{ij}$ is the value of the bilateral trade between country *i* and *j*, *GDPi* and *GDPj* are countries *i* and *j* respective national incomes. The distance is measured in terms of the bilateral distance between countries and is a constant of proportionality. Taking logarithms of the gravity model equation as in (3.34) provides the corresponding estimates equation as:

$$\log (Trade_{ij}) = \alpha + \beta_1 \log ( \, GDP_i \cdot GDP_j) + \beta_2 \log (Distance) + u_{ij} \dots\dots\dots\dots\dots 3.35$$

Where, $\alpha, \beta_1$ and $\beta_2$ are coefficients to be estimated. The error term, $u_{ij}$, captures any other shocks, events, and unobserved factors that may affect bilateral trade between two countries. The equation (3.35) is the core gravity equation where the bilateral trade is predicted to be a positive function of income and a negative function of distance.

In international trade, the gravity equation has proven to be surprisingly stable over time and across different samples of countries and methodologies. Another proxy for trade cost is distance, infrastructure, and so on. When modelling international trade flows, the gravity model is commonly used. The gravity model is based on Isaac Newton's "law of universal gravitation in physics," which he developed in 1687 (Tinbergen, 1962). The gravity model in international trade, on the other hand, incorporates the law of universal gravity into the economic context. It is interpreted as the export volume from country I to country j being determined by "the economic masses" (as measured by the country's GDP) and the distance represented by the

geographical distance between the capital cities of the two trade countries (Head, 2003).

According to the gravity model, relative economic size attracts countries to trade with one another, while greater geographical distances detract from the attractiveness. As a result, according to the model, distance is important in international trade. The gravity model is now regarded as the workhorse of trade theory, particularly for forecasting the impact of trade policy changes on trade costs. The model is adaptable in the sense that 'distance' between countries can include a variety of relevant variables, such as cultural and political differences between trading nations.

The gravity model can be said to explain the influence of transport cost on the effect of quality infrastructure on trade. In addition, transport costs are assumed to be trade barriers and to discourage trade activities. Therefore, according to the model, investment in infrastructure would reduce those trade barriers. Investing in infrastructure thus has a positive influence on trade volume and reduces the transport cost. According to this model, transportation is treated under the category of services that need to be consumed for international trade to take place. These transport costs could be financed in a variety of ways including government expenditure on infrastructure.

The empirical evidence of the gravity model when applied to international trade is strong. Both the role of distance and economic size are remarkably stable over time, across different countries, and using various econometric methods. Another way of improving the application of the model has been to use nautical distances for countries trading by sea, as "great circle routes often differ substantially from actual cargo routes". However, no clear effect was found using either parameter (Disdier and Head, 2008; 32).

Other research has gone into great detail about the qualification of maritime routes and ports. In their study of bilateral trade among Latin American countries, Wilmsmeier *et al.* (2006), for example, used port infrastructure efficiency, port privatisation, general transport infrastructure, customs delay, and port connectivity. Although the introduction of containers is thought to have reduced distance impacts after 1980 (Hummels, 2001), economic mass dispersion is seen as a counterforce in addition to

the changing composition of trade (Brun *et al.,* 2005), and to the inclusion of bulks in trade flow measures in most gravity models.

Several studies, such as those of Limão and Venables (2001), Nordas and Piermartini (2004), and Clark, Dollar and Micco, (2004), have revealed increasing evidence of the effect of investment in seaport infrastructure quality on international trade. The literature has suggested that investing in seaport infrastructure has played, and continues to play, an important role in facilitating international trade by reducing trade costs. Trade costs include transport cost, tariffs, and cost of days and uncertainties of shipment deliveries (Nordas and Piermartini, 2004). Therefore, the literature suggests that seaport investment substantially reduces trade costs and increases trade. Similarly, Nordas and Piermartini (2004) used the gravid model to explore the infrastructure quality on trade performance and the conclusions from their study that port efficiency has a strong impact on trade flows. According to Yeaple and Golub (2002), countries that invest in seaport infrastructure also explain the absolute and comparative advantage of these countries in terms of the positive effect of this investment on total factor productivities. Thus, the various reviewed studies suggest that specialisation in international trade depends not only on factor endowments but also on increasing the volume and quality of public infrastructure provision.

Conversely, poor infrastructure increases transportation costs, and thus, the overall benefit for a country investing would be economic growth. The quality of its infrastructure, and the services this provides, would seem from the literature to be an important determinant of a country's ability to trade with the rest of the world, and one that should be included when analysing the beneficial impact of infrastructure investment. The public sector in South Africa has made an intensive investment in seaport infrastructure. This includes both improving the infrastructural quality of these ports and developing new ports. In recent times, in an international context, ports have come to play an increasingly important role not only in cargo handling but also in the provision of better logistics services in order to meet the increasing demand and global supply chain (Hausman, Lee and Subramanian ,2013).

Furthermore, investment in seaport infrastructure has been shown to improve the business environment and transportation efficiency, which in turn facilitates export

growth (Portugal-Perez and Wilson, 2012). According to Yeo, Roe and Dinwoodie(2008), port service quality, logistics costs, regional connectivity, hinterland condition, and port accessibility all contribute significantly to a port's competitiveness. Gordon, Lee and Lucas (2005) added that a port's combination of facilities, including sufficient investment, supportive government policies, excellence in operation, and information technology, can help it achieve long-term competitiveness, resulting in higher volumes of seaborne trade than less competitive ports that are not as well equipped.

The model suffers from the limitation of being the simplest and the gravity model of international trade is criticised for failing to account for comparative advantage. This criticism is especially relevant when using the gravity model for policy purposes, such as designating priority markets for trade promotion programs.

## 3.3 Assessment of the theoretical literature review

The growth theories from the reviewed literature that have been described and discussed include the Harrod-Domar, neoclassical, endogenous growth, and sustainable development theories. The primary focus of the Harrod-Domar model is saving and investment as the key determinants for driving economic growth, while the neoclassical growth model focuses on the growth of productive inputs, savings, and capital accumulation (associated with depreciation) in determining economic growth. The endogenous growth model builds upon the components of the neoclassical growth model and focuses on how innovations, technology, and the role of government expenditure can lead to economic growth in the long run. The sustainable development model framework is inclusive of the whole natural environment and advocates for the integration of the sustainable development of the whole ecosystem.

Harrod-Domar emphasised the importance of saving and investment as determinants of growth in the economy. The neoclassical growth theory assumes that capital and labour productivity are determinants of economic growth. The endogenous growth theory holds that economic growth is primarily the result of endogenous forces rather than external ones and the role of government expenditure. Because of the diminishing marginal product of capital and technology, the theory predicts that an economy will reach a steady state of equilibrium. In this regard, any decrease in

productivity in either investment or labour will result in a decrease in the country's economic performance. It makes sense that an increase in investment is likely to increase productivity, which will result in growth in the economy. It is in this respect that both the Harrod-Domar Model and the neoclassical growth model can be said to plausibly explain the role of, and impact on, economic growth of investment contribution. Sustainable development theory discusses why and how resources need to be renewed and sustained for future generations. In this case, sustainable development can be said to play a vital role specifically in the ocean economy, given that this particular economy is concerned with issues relating to the exploitation and preservation of the marine environment and ocean resources. This includes the particular mechanisms for sustaining the ocean for the growth of a country's economy.

The growth theories highlighted those factors that play a major role in the production process which influences economic growth. The growth models indicate that input factors play a major role in the transition of an economy to its steady and that productivity growth is the major driving force for long-run economic growth (Solow, 1956; Romer, 1986). According to Solow (1956) to sustain the growth, a government needs to make use of investment in order to increase output, while Romer (1986) argued that the use of a combination of physical capital and investment will provide new ways of, and ideas for, improving production and/or enhancing the production process. Further, Barro (1990) pointed to the use of government expenditure to explain its role in economic growth. This implies that government investment in the ocean economy sector can directly contribute to its production which in turn promotes economic performance. Thus, engaging in production activities or economic activities has the potential to create jobs and to add value to economic growth (Timmer, 1992). As a result, the sum of all the value-added generated by a country's firms, or the sum of all the value-added generated by a country's economic sectors, equals the country's total production, national income, or gross national product, as demonstrated by the equations of this economic theory (GDP). This includes labour, the sector responsible for the creation of employment.

Romer's (1986) model seeks to explain the endogenous positive effect on the long-run economic growth rate. According to the endogenous growth model, economic growth takes place mainly due to internal factors which are different from or distinct from external factors. Therefore, to promote productivity, a government needs to

increase investment. Similarly, the Barro (1990) model without doubt constitutes a breaking point in the economic growth evolution. Allowing for productive public spending, i.e., public spending that increases private capital marginal productivity where there exists a positive correlation between government spending and long-run economic growth.

Generally, and in theory, government expenditure should enhance long-run economic growth. However, the endogenous growth model suggests that, without productive spending, all government spending is rendered neutral if not harmful to the economic growth of a country (Romer, 1986; Barro, 1990). Moreover, if public funding is financed through deficit or debt, in the long run, it will generate a flow of interest burden, with a crowding-out effect on the public resource and government budget constraints. Therefore, if the negative effect is not compensated for by some positive backup, deficit financing translates into growth reduction. However, financing public expenditure with a deficit can enhance growth in the long run if the government can reduce that unproductive expenditure (Minea, Rault and Villieu, 2008). Therefore, the model strongly suggests that government expenditure plays an important role in economic growth and how is funded.

Entrepreneurial theory highlighted that investment plays a vital role in promoting and enhancing entrepreneurial abilities and capabilities. This means that investing in entrepreneurship improves activities and effectiveness. Furthermore, promoting the ability of entrepreneurship increase its productivity and growth while low ability hinders growth and productivity. Therefore, investment stimulates entrepreneurial employment growth. Entrepreneurship theory is relevant in explaining the role of investment in promoting entrepreneurship. Furthermore, the government also plays an important role by providing better institutions and reducing regulations that hinder the growth of entrepreneurship.

In the context of the ocean economy, economic theory (gravity theory) has traditionally supported such beliefs about the wisdom and necessity for investment and government expenditure since such theory, suggest that services provided by ports (harbours) and transportation infrastructures have a positive impact on a country's industry productivity in a variety of ways, with the main channel being a reduction in time and transportation costs. This, in turn, can have a variety of consequences,

including increased productivity of other inputs, lower production costs, greater specialisation, trade growth, more intense competition, market expansion, improved division of labour, better access to foreign intermediates, and exploitation of scale economies.

## 3.4 Concluding remarks

The chapter offered a review of the existing theoretical literature that describes and helps to explain, the relationship between macro-economic indicators and the ocean economy. In addition to a review of the descriptions of three long-established growth theories, and one relatively recently developed growth model, the chapter focused on critiques and the limitations of the models. The growth models on which the chapter focused included the Harrod-Domar model, the neoclassical growth model, the endogenous growth model, the sustainable development model, and the gravity trade model. Three of the growth models have been in existence for decades and attempt to explain the factors that affect economic growth, while the relatively recent sustainable development model explains the relationship between ways of promoting and maintaining economic growth without depleting natural resources and the preservation of the environment for future generations. The gravity growth model supports the view that the services provided by the ports/ harbours or transport infrastructure together play an important role in international trade.

Given the foregoing discussion in this chapter, one can safely say that growth theories are useful in explaining the impact of ocean economy financing unemployment, entrepreneurship, and trade in South Africa. Harrod-Domar's growth model is relevant in the sense that in order to promote and improve economic growth the key important factors which include saving/investment or capital accumulation are vital in the production process. Therefore, the policies of increasing savings/ investment and also using investment more efficiently and effectively in order to promote productivity in the economy. However, low savings leads to low investment and low growth which then create the problem of unemployment. Then, the growth in the economy should then decrease unemployment. While neoclassical and endogenous growth models also identify the key factors that determine growth in the economy which includes proper infrastructure and more investment in human capital from the government and private sector institutions play an important role in generating economic growth and are vital

to the economy. In addition, effective and efficient means of productivity can generate and promote growth in the economy. Therefore, this is how the endogenous growth model is relevant to the study as the study examines the role of government investment in promoting economic growth, entrepreneurship, and total trade while reducing unemployment. Apart from the factors that promote growth in the economy, the endogenous growth model also introduced government spending which plays a vital role in economic growth, entrepreneurship, total trade, and reducing unemployment, however, if the expenditure is effective and productive otherwise it can be harmful to economic growth. Sustainable development is relevant because, in order to maintain long-term growth, resources used in production need to be sustained so that they do not deplete in the future.

# Chapter Four

## Empirical literature review

### 4.4 Introduction

This chapter aims to present an empirical literature review. This chapter is divided into three sections. The first section presents a literature review from developed countries. This is followed by a literature review from developing countries. The last section of the chapter presents a literature review on the various sectors of the ocean's economy. The main thrust of this chapter is to examine previous work done in this area of study with a view to identify if there be any gaps in the literature related to this area of study. The chapter concludes with an assessment of the empirical literature review.

### 4.2 Empirical literature review

Previous chapters have described how the ocean economy has recently gained widespread attention globally as a new economic frontier with the potential of boosting economic growth, employment, and innovation (OECD, 2016; Cervigni and Scandizzo, 2017; Scandizzo, Cervigni and Ferrarese, 2018). A sizeable body of literature has in recent decades focused on estimations of the contribution of the global ocean economy, and local economies, to economic growth and job creation in both developed and developing countries, and to international trade. However, a review of this literature has revealed a gap in the literature on the specific impact of investment in the ocean economy on economic growth and other economic indicators in both developed and developing countries. The overall economic impact of investment, or the lack thereof, on these ocean sectors/industries remains unclear as do the distinctions in this regard between developed and developing countries, and between various sectors in these economies. One of the reasons for this appears to be that the magnitude of the impact of ocean economy financing on economic growth has in general been based on global estimates, even though this financing may affect various countries, and various sectors in the economy, unequally. This chapter reviews the empirical literature which attempts to explain and to make specific distinctions between, the relationship between the impact of ocean economy financing on those various sectors across the globe. This study draws from previous studies in its investigation of the macro-economic impact of ocean economy financing globally, and

specifically on the South African economy. The following section provides a review of the empirical literature on developed countries.

### 4.2.1    Developed countries empirical literature review

Shields O'Connor and O'Leary (2005), in a briefing document that explained its recommendations for Ireland's investment in, and development of, its marine resource, estimated the role of Ireland's ocean economy in the country's economic growth at the time with an investment of €60 million.  According to Shields *et al.* (2005), close to 22000 jobs would be directly or indirectly created by the country's marine sector. In this respect, it was recommended that investment should be channelled to the marine sector which would contribute 1.2% to the countries employment. The ocean economy at the time was contributing €1 billion to Ireland's overall gross national product (GNP). Marine tourism was in 2005 the largest employer with approximately 5100 jobs created, followed by shipping and maritime industry, which created 3000 employments (Shield *et al,* 2005). The lowest sector in terms of employment creation was marine manufacturing, with more than 900 employed people.  Shields *et al.* (2005), saw the largest potential contributor to export to be maritime transport which also at the time accounted for approximately 99% of imports and exports, while seafood accounted for approximately 60%. The only sector that was experiencing decline was aquaculture, specifically the fishing industry. However, this industry at the time of the report employed 2600 people most of whom were part-time or casual, and accounted for 75% of exports (Shields *et al.,* 2005). However, the briefing report by Shields *et al.* (2005),  was unclear as to the specific ways in which the investment overall would affect the economy of Ireland.

At the time of the study done by Kildow and Colgan (2005), California had the greatest ocean economy in the United States, with the highest employment and gross state output (GSP).  In 2000, the overall GSP of California's ocean economy was around $42.9 billion and created employment amounting to approximately 408 000 jobs at that time, and almost 700,000 jobs when multiplier effects are included. Between 1990 and 2000, the ocean related GSP increased by 10.64 % in constant 2000 dollars ( Kildow and Colgan, 2005). In the year 2000, California's ocean economy directly supported over 400,000 employment and indirectly supported over 690,000 jobs when multiplier effects are taken into account (Kildow and Charles, 2005). The tourism and recreation

sector accounted for the greatest share of employment and generated the most GSP, accounting for the largest proportion with 76.8% of the former and 58 % of the latter. The transportation industry, which accounted for 18.2% of employment and nearly a third of GSP, was the second largest in terms of employment and GSP. Between 1990 and 2000, the transportation industry lost nearly 60,000 jobs, accounting for more than half of all jobs lost (Kildow and Colgan 2005). This was due to a decline in the ship and boat building sector, together with freight transport, which lost 40% of its employment total. The report by Kildow and Colgan, (2005) stated that its analysis was incomplete because of inadequate time and resources, as well as the fact that multiple aspects of the California Ocean Economy data were unavailable at the time the survey was conducted.

Morrissey and O'Donoghue (2012) estimated the economic impact of the marine sector at the national level for Ireland at the regional level for 2007. The study is focused on the key marine sectors that drive economic growth performance with the marine sector. According to the study's findings, Dublin and the South West have the highest levels of marine GVA; however, the marine sector is more important in the West and South West region as a percentage of regional GVA. In terms of marine employment, the West and South-West have the highest levels.

Colgan (2013) used Cost-Benefit Analysis (CBA) to assess the impact of ocean-related economic activities and the National Ocean Economic Program (NOEP) EPA in the great lakes of the U.S. The results show ocean economy financing to have had a positive effect on GDP from 2005 to 2007, while a negative effect on employment is shown from 2007 to 2009. The results show a decline in other sectors such as natural resources, which in turn led to a decline in employment because of the decline in fish harvesting and processing. Two sectors that show significant gains in GDP are marine construction and tourism. More investment was moved to construction projects because of the positive effects of this sector shown in 2009. The results show that the US ocean economy created approximately 2.68 million jobs over 140 000 industries. In 2007 these industries contributed over $238 billion to the US. GDP (Colgan, 2013). The sectoral evaluation of ocean activities shows tourism and recreation to have been the largest employer in that year, with oil and gas exploration being the largest contributor to GDP. The most dominant employment creation is shown to be tourism,

recreation, and transportation which accounts for 83%, and the most dominant GDP contribution is shown to be output related industries, such as construction mineral ship and boat building, which accounted for 58% of the US ocean economy output (Colgan, 2013). The study drew attention to the fact that the conclusions drawn from the analysis were incomplete because of gaps in the data, while some sectors were either under-estimated or over-estimated. While the net effect of these errors was difficult to compute due to uncertainty as to which results were due to imperfect measurement of the data, the CBA was nevertheless considered to have clearly shown the considerable impact of investment on the ocean economy. The underestimation of the contribution of the fisheries industry could have been due to a lack of data because some of those working in the industry were self-employed and self-employed people are not considered or recorded as employees. The overestimation was said to be of the contribution of the tourism and recreation sector because annual data was used to show comparability, while tourism and recreation data are seasonal.

According to the findings of a 2015 study conducted in the Baltic Sea Region by Hoegh-Guldberg Tanzer, Gamblin and Burgener (2015), €145 million was allocated to blue growth during the 2014-2015 period, and invested in the following targeted sectors in Europe's Blue Growth strategy: aquaculture, coastal tourism, ocean energy, biotechnology, and seabed mining. The study made use of a SWOT analysis to estimate the annual economic growth from the ocean sectors. The results showed that the blue economy continued to be underperforming because of environmental stress from both land and sea human activities. In addition, there are still opportunities from the economic projections which showed €32 billion in additional revenue, and 550,000 jobs, by 2030 (Hoegh-Guldberg *et al.,* 2015). The findings from this study suggest that small sectors that have potential growth, in the long run, are offshore wind, seabed mining, and biotechnology and these sectors have the potential for creating more jobs and helping to reduce poverty.

The report by the OECD (2016) in addition to listing the goals of the ocean economy from an economic and foresight perspective for sustainability, explores the contribution of the ocean economy to economic growth on a global scale and its ability to create employment. The cross-sectorial analysis results show the ocean economy to have contributed approximately $1.5 trillion in 2010, which is approximately 2.5% of the

world's gross value added (GVA) ( OECD, 2016). The largest contributor to GDP at the time of the report was offshore oil and gas, followed by maritime and coastal tourism, and maritime equipment and ports. The ocean economy directly created full employment of 31 million jobs in 2010. The report highlighted that fisheries at the time were the largest employer, followed by maritime coastal tourism. The future estimation of the ocean economy, according to the report, would be $3 trillion in 2030 value-added in a sustainable scenario, while $2.8 trillion is considered to be unsustainable (OECD, 2016). In addition, employment in a sustainable future scenario was estimated at approximately 43 million in 2030, and 7 million in an unsustainable scenario. The OECD (2016) study used the Cobb-Douglas production function approach to estimate the results of ocean sectors in terms of macroeconomic indicators. The report estimates show a positive significance of ocean-based industries to economic growth and employment.

According to the European Commission (2017), the blue economy is a driver of Europe's welfare and prosperity. According to European Commission (2017), report, at the time of publication, Europe's maritime sector employed over 5 million people and generated nearly $500 billion in revenue per year, with the potential to employ many more people. Offshore renewable energy had grown to be a significant source of employment, accounting for 150,000 jobs. The output of the global ocean economy in 2017 was estimated at $1.3 trillion and this could more than double by 2030. The European Maritime and Fisheries Fund contributes approximately $ 275 million (EMFF) (European Commission, 2017). These funds were specifically targeted at maritime priorities and are expected to play a significant and decisive role in piloting the Blue Growth Strategy. However, access to finance remains a challenge for many blue economy sectors, particularly high-potential but risky ventures that face difficulties in obtaining adequate investment funding.

Vega and Hynes (2017) investigated the ocean economy of Ireland. In 2016, the country's ocean economy generated €5.7 billion in revenue, with a direct economic impact of €1.8 billion, or approximately 0.9 % of GDP. Furthermore, Ireland's ocean economy employed approximately 30,176 people in 2016 (Vega and Hynes. 2017). When compared to 2014, 2016 saw a 23% increase in turnover, a 20% increase in gross value added (GVA), and a 10% increase in employment. In 2016, the indirect

GVA generated by ocean-related activity in Ireland was €1.57 billion, with a total GVA (direct and indirect) of €3.37 billion, representing 1.7 % of GDP. In 2016, the marine industries generated €5.3 billion in revenue and employed 28,231 people, accounting for 93 % of total revenue and 94 % of total employment in Ireland's ocean economy (Vega and Hynes, 2017). In 2016, the emerging marine industries generated €383 million in revenue and employed 1,945 people, accounting for 7% of total revenue and 6% of total employment in Ireland's ocean economy. According to the report by Vega and Hynes, (2017), Ireland's ocean economy has a positive impact on the country's overall economy. While the Irish economy grew by about 8% from 2012 to 2014, the ocean economy grew by more than 19% during the same time period.

A European Commission (2018) study examined the impact of investing in the blue economy and its potential for economic development from 2009 to 2016. The findings are based on two data sets: Eurostat's structural business statistics (SBS) for industry construction and trade, and the EU Data Collection Framework (DCF) for the primary sectors (capture fisheries and aquaculture). According to the study by  European Commission (2018), 3.48 million people were directly employed in 2016, a 2% increase from 2009. From 2009 to 2016, net investment in tangible goods increased by 71.7 %, rising from $ 12.9 billion to $ 22.2 billion. Similarly, net investment in GVA increased from 18 % in 2009 to 29 % in 2016, with a peak of 30.6 % in 2014 and more than 3.6 % in 2015. Fisheries have been identified as the largest employer, with 28% of the country's jobs created by this industry, followed by wholesale, with 25 %, fish processing, 22 %, retail, 13 %, and aquaculture 12 % (European Commission, 2018). However, while its share of total employment remained stable during the study period (2009-2016), its share of GDP fell steadily until 2015, then increased in 2016, but has yet to return to pre-crisis levels. There are numerous factors at work in these trends, one of which is that several established blue economy sectors, such as shipbuilding (e.g., pleasure boat building), maritime transport, and port activities, were severely impacted by the crisis. It's also possible that some land-based emerging sectors are gaining traction faster than their maritime counterparts.

The following sections provide a discussion of the literature dealing with the ocean economies of developing countries and the impact of these ocean economies on macroeconomic variables.

### 4.2.2    Empirical literature review: developing countries

Turpie and Wilson (2011) investigated the economic value of marine and coastal resources in South Africa and Mozambique. All fisheries, coastal tourism, coastal agriculture and forestry, mariculture and/or aquaculture, energy, ports and coastal transport, and coastal mining are among the resources. All values are in US dollars and have been standardised to 2009. In South Africa, fisheries contribute approximately 2.9 % of GDP, while the commercial fishing industry contributes approximately 0.5 % of GDP, employing approximately 27,000 people, directly and indirectly, employing an additional 81,000 people (Turpie and Wilson, 2011). These figures and values are dominated by a few large fisheries, but also include some small-scale fisheries; coastal tourism contributed approximately 38% of GDP, and ports and coastal transport are estimated to be worth US$1.5 billion per year (Turpie and Wilson, 2011). While Mozambique the fisheries sector contributes approximately 1.6% to GDP and the gross output of the commercial fishery was estimated to be US$63.5 million. The total gross value is US$6.7 million per annum, ports were estimated revenue of US$60 million, and coastal tourism is estimated to be approximately US$145 million (Turpie and Wilson, 2011). Turpie and Wilson (2011) highlighted that aquaculture in both countries is still relatively small, but the export is very high.

According to Zhao (2013), the economic impact of the ocean economy on China's national economy had not yet been clearly understood at either the national or regional levels at the time of the study. The study used input-output (I-O) analysis to investigate the impact of the ocean industry on the economy of Tianjin, a Chinese coastal province. The Chinese ocean economy accounts for less than 10% of China's GDP and is primarily centred on traditional industries such as fishing, transportation, and tourism (Zhao, 2013). Emerging industries such as marine-related biomedicine, power, chemicals, and seawater utilisation account for only 5% of total marine output (Zhao, 2013). As a result, the study by Zhao, (2013) concentrated on traditional industries such as ocean transportation, coastal tourism, shipbuilding, and marine

fishery. According to Zhao's 2013 sectoral analysis of China's ocean economy, marine fishery, seawater utilisation industry, and coastal tourism are the top three sectors with the highest income type II multipliers in a coastal province like Tianjin. Furthermore, Zhao (2013) found that marine fishery has the highest output type II multiplier and income multiplier among ocean industries in Tianjin province.

Zhao Hynes and Shun He (2014) investigated China's ocean economy from 2001 to 2010, with a particular emphasis on the expansion of ocean industries. According to the study, the major ocean industries in China contributed $239.09 billion in value-added output in 2010, accounting for 4.03 % of China's national GDP, and the major ocean industries employed 9,253,000 people (Zhao *et al.,* 2014). Furthermore, on the sectoral analysis, the most dominant in China's oceans sectors are coastal tourism, transport industry and marine communication, and marine fishing industry. In terms of GVA, coastal tourism is the largest contributor to the overall value of the ocean economy, accounting for US$78.33 billion, followed by marine communications and transportation, which accounts for $55.92 billion (Zhao *et al.,* 2014). The largest employer in terms of job creation was found to be marine fisheries, which employed 5.53 million people, followed by coastal tourism, which employed 1.24 million, and marine communications and transportation, which employed 0.81 million (Zhao *et al.* 2014).

Rustomjee (2016) explored the impact of blue economy financing on the economies of a number of Caribbean and Pacific small states. According to the report by Rustomjee (2016), the majority of such small states' financing has come from international public finance sources, such as grants and loans from global and regional development banks, other development finance institutions, and both bilateral and multilateral donors. The Global Environment Facility (GEF), the United Nations Development Programme (UNDP), the World Bank Group, the United Nations Environment Programme (UNEP), and the United Nations Food and Agriculture Organisation are all important sources (FAO). Globally, the GEF and UNDP have funded catalytic interventions to address marine ecosystem degradation and livelihood loss, with more than $1.1 billion in GEF investment leveraging $4.7 billion in co-financing for water environment and community security projects in over 170 countries, including the majority of small states (Rustomjee, 2016). The World Bank Group has

provided approximately $6.4 billion in blue financing to developing countries, including approximately $1 billion for sustainable fisheries, aquaculture, and coastal and ocean habitat conservation, as well as $5.4 billion for coastal infrastructure and other activities that help reduce coastal pollution (Rustomjee, 2016). Small states are steadily gaining access to blue financing and investment. However, this progress has been piecemeal, and it is too slow and insufficient to realise the transformative potential of these small states' blue economies.

Thiele and Gerber (2017) explore different innovative finance approaches for the high seas. Innovative financing is the creation of new funding sources and mechanisms in which the private sector is viewed as leading finance to deliver the impact of the ocean economy on a country's economic growth. According to the report, this approach may result in more significant financial flows from the private sector and commercial entities to address issues such as ocean hypoxia, acidification, overfishing, and marine invasive species. Private investors polled said they plan to invest more than $5 billion in conservation impact over the next five years (Thiele and Gerber, 2017). Conserving 20–30% of the world's oceans in marine protected areas has the potential to generate 1 million jobs, sustain fish catch worth US$70–80 billion per year, and provide ecosystem services worth US$4.5–6.7 trillion per year (Thiele and Gerber, 2017).


 Scandizzo *et al.* (2018) used the computable general equilibrium (CGE) model to investigate the impact of investing in Mauritius' ocean economy. This model assumes that investments will be concentrated in four major ocean economy sectors: fishery and seafood processing, sea transport ports and related services, ICT, and sewage and water treatment. The ocean economy investment increased from $25 million in year 1 to ten times as much in year 10 (Scandizzo *et al.,* 2018). Scandizzo *et al.* (2018) predicted that Mauritius' ocean economy would more than double in ten years, despite the fact that the investment stimulus only gradually increases to ten times its first-year size, from $25 million, or 2.37 % of total investment, to $2.5 billion, or about 30 % of total investment. Although the investment in the country's ocean economy was double the size, its share of GDP (including the indirect effects) only increased from 12.6 to 20%. The ocean economy scenario also has a more equitable impact on value addition, job creation, and poor income. According to simulation results, concentrating

investment in ocean economy sectors may be a winning strategy (Scandizzo *et al.,* 2018).

Syamsuri Amril and Triana (2018) explored the impact of the maritime sector on economic growth in South Sulawesi Province in Indonesia from 2006 to 2015 using multiple linear regression. The study's findings show that marine tourism and capture fisheries had a positive and significant effect on economic growth during this time period, whereas sea freight had no effect. The simultaneous test reveals a significant relationship between marine tourism, capture fisheries, and sea freight companies in terms of their impact on South Sulawesi Province's economic growth during this period.

Wignaraja, Collins and Kannangara. (2018) investigate whether the Indian Ocean economy, which consists of 28 states spread across three continents, has the potential to become a growth pole for the global economy. The Indian Ocean connects the Middle East, Africa, and East Asia to Europe and the Americas via major sea routes. According to the study, the Indian Ocean economy has evolved into a critical global shipping hub. In recent years, its trade and GDP have grown faster than the global economy. According to projections, the Indian Ocean economy will likely account for more than 20% of global GDP by 2025, with GDP per capita nearly doubling to USD 6150 (Wignaraja *et al.,* 2018). Furthermore, projections based on reasonable assumptions indicate that the Indian Ocean economy will play a larger role in the global economy with rising prosperity by 2025. Furthermore, the proportion of the population living in poverty is expected to be cut in half by 2025, to 7% (Wignarajaet *et al.,* 2018). In the future, the Indian Ocean's position as a global growth pole is threatened by a number of challenges that threaten the region's prosperity. Gaps in port infrastructure and customs procedures in some economies are a major impediment to maritime trade, raising the cost of moving goods across borders. Tariffs have been significantly reduced, but non-tariff measures, trade barriers in services, and FDI restrictions remain problematic. Despite significant economic progress, development disparities and capacity gaps persist. Furthermore, achieving this outlook will require addressing a number of pressing policy challenges, such as improving port quality and logistics, lowering trade and investment barriers, closing development gaps, and strengthening regional economic governance. Addressing these challenges necessitates a

coordinated set of national and regional policy measures. As a result, addressing these challenges will necessitate a combination of coherent national and regional policy measures, such as investing in port development and lowering trade and investment barriers.

Kaidou-Jeffrey *et al.,* (2018) assessed the blue economy potential for the Caribbean, including small islands and coastal developing states in the region, and focused on innovative financing options. The results of the report by Kaidou-Jeffrey *et al.* (2018) show that global ocean-based activities in the Caribbean region generated $1,5 trillion in 2010 and directly provided 31 million jobs in fisheries maritime and coastal tourism, offshore oil and gas exploration, and port activities. A future projection/ estimation shows ocean value as being likely to add $3 trillion, with employment increasing by over 40 million by 2030 (Kaidou-Jeffrey *et al.,* 2018). The exports of fish and seafood were approximately $290 million during 2013 and 2014, while employment created during this period amounted to 116 000, and the GDP contribution increased from 0.32% to 2.3%. In addition, 64 000 people were directly employed in small-scale fisheries and aquaculture, and the boat construction industry employed approximately 18 000 people (Kaidou-Jeffrey *et al.,* 2018).

The report by Kaidou-Jeffrey *et al.,* (2018)  highlights the success of Seychelles' blue economy financing model. The Seychelles government, with the help of The Nature Conservancy (TNC), has combined the use of several innovative finance models to fund long-term ocean development and conservation. It issued its first blue bond in 2017 to raise $ 15 million in capital to finance the transition to sustainable management of small-scale artisanal fisheries, which includes measures to rebuild fish stocks, harvest control measures, post-harvest, value-added activities, and scientific and sector support services.

The report Kaidou-Jeffrey *et al.,* (2018) also stressed that economies differ, some being more complex than others, and that the blue strategy cannot be applied uniformly across sectors, industries, and countries. Funds should be allocated to sectors that have a comparative advantage in terms of the likelihood of a bond leading to greater benefits for a developing country or small state. Domestic resources and traditional sources of funds, such as Official Development Assistance (ODA), are

unlikely to be sufficient to fund investments in the blue economy for more than a few islands or small states within the Caribbean region.

South Africa has eight major seaports: Durban and Richards Bay in KwaZulu-Natal, Saldanha Bay, Gqeberha (formerly Port Elizabeth), Ngqura, and East London in the Eastern Cape, and Cape Town and Mossel Bay in the Western Cape. According to Walker (2018), an estimated 80 % to 95 % of all South African trade includes a maritime component. Because of its reliance on the sea, the country's economy is frequently referred to as an island economy. The country's ocean economy finance shows a contribution of R56 billion to GDP, and that approximately 316 000 jobs have been created in renewable energy and fisheries. The study has highlighted and speculated on growth in the long term (Walker, 2018).

Potgieter (2018) sees the oceans economy as a crucial factor in global economic growth and development, offering challenges and risks as well as great opportunities. He sees South Africa's large sea area, and its abundant marine resources, as providing the country with opportunity and with a considerable marine infrastructure and ocean economy that can contribute substantially to the country's GDP. The results of his study show the country's ocean economy as having great potential to contribute to socio-economic growth, development, and transformation. The government's intention to realise this 2014, investments and projects nine-point plan emerged under the Phakisa maritime umbrella which was worth R17 billion, with 4500 jobs being created, and much-needed infrastructure developments progressing well (Operation Phakisa, 2014).

Hosking Hosking, Du Preez, Kaczynsky, Hosking, Du Preez and Haines (2014) made use of two methods to determine the contribution of the ocean economy to South Africa's GDP. The results show that the ocean sector contributed 33% to GDP at the time the study was conducted. The major weakness of the closeness methods, however, is that many economic activities taking place near the ocean use little or no ocean resources or the ocean environment as inputs in production. The other method used was the sum of the value-added, which was based on the National Income Accounting system (NIAS). This method provides the value of the ocean using selected sub-sectors of the economy and it remains the most accurate method as, in the case of the Hosking *et al.* (2014) study, it allows the researcher to identify the

contribution of the ocean economy to GDP. This is due to the categorisation under this analysis of GDP being the nature of the activity, and from the nature of activity one can judge the degree to which the value-added incorporated is dependent on the ocean sector input (Hosking *et al*, 2014).

Flowing from the above discussion it can be noted that the various studies in both developed and developing countries paid special attention to the various sectors of the ocean economy. These studies through the use of various research methodologies and techniques were able to present a picture of how the various sectors of the ocean economy perform. In order to gain more insight into the contributions as well as constraints in the various sectors of the ocean economy, the following section presents an empirical literature review that is focused primarily on sectoral analysis of the ocean economy. The ocean-selected sectors include aquaculture, coastal and marine tourism, marine protection and ocean governance, marine transport and manufacturing, and small harbour development.

## 4.3 Empirical literature review of ocean sectoral analysis

This section provides an empirical literature review on the selected ocean sectors.

### 4.3.1    Aquaculture

Guillen *et al*. (2019) examine two allocated structural fund investment phases in the aquaculture sector across EU member states during the 2000 to 2020 period. The first investment phase examined is from 2000 to 2014, the second from 2014 to 2020. From 2000 to 2014 the EU spent €1.17 billion in the aquaculture sector, and from 2014 to 2020 €1.72 billion. While the results of a study by Guillen *et al*. (2019)  the €1.17 billion spent during the first period did not lead to an overall increase in the production volume, the funds did increase the rate of the construction of new farms and investment in environmentally friendly technology. In the first investment phase, the EU did not direct the funds where they could have made a more significant impact.  In the second phase, up to the time of the study, the investment has been more significant and well-thought-out and generated more than 75 thousand jobs, employing on average about 5.9 persons per enterprise (Guillen *et al.,* 2019). Approximately, 90% of firms have been characterised as micro-enterprises employing less than 10 employees in coastal and rural areas (Guillen *et al.,* 2019).

The study by Abdul, Zhang, Sehresh and Chandio (2019) assessed the causal relationship between aquaculture and capture fisheries production and economic growth in Pakistan. The autoregressive distributed lag (ARDL) bounds testing approach was used to estimate the relationship between aquaculture production and economic growth. The results of the study showed aquaculture and capture fisheries production to have had a positive effect on economic growth in Pakistan. This study by Abdul *et al.* (2019) suggested that, in a developing country such as Pakistan, government expenditure on technological facilities could and should be increased in order to provide better infrastructure for the country's fishing industry and that promoting financial support for the fish farmers has the potential to contribute to economic growth in the future.

The study done by Kleih, Linton, Marr, Mactaggart, Naziri and Orchard (2013) on developing countries in sub-Saharan Africa which includes Egypt, Ghana, Maldives, South Africa, Tanzania, and Vietnam examined the impact of investment on small and medium-scale aquaculture and fisheries in six developing countries. The study highlighted the problems fisheries in these countries face with stagnating or declining stocks. The findings showed that traditional financial instruments seemed unable to meet the financial needs of small- and medium-scale enterprises (SMEs) in the aquaculture and fisheries sector. Kleih *et al.* (2013) concluded that aquaculture businesses in sub-Saharan Africa need financial support to overcome some technical constraints. This conclusion and recommendation were based on the key characteristic of investment funds being a combination of business development funds and investment funds whose purpose is ensuring growth in aquaculture SMEs. According to Kleih *et al.* (2013), many developing countries face a significant challenge in stimulating the necessary growth of fish production, particularly in the development of the aquaculture sector, due to declining stock levels in capture fisheries. Thus, it could be argued that further development of the sector in sub-Saharan Africa is necessary for many countries on the continent to stimulate local supplies for food security and income-generating activities.

Tisdell, Hishamunda, Van Anrooy, Pongthanapanich and Arjuna Upare (2012), in a paper examining and critiquing the constraints operating against, investment in

aquaculture in Bangkok and the negative effects of this, stress the need for adequate investment in aquaculture to promote economic development. They examine the impact of investment on aquaculture in detail,  highlighting the challenges that hinder the return on investment. These include the risks and uncertainties of investment in aquaculture. Economic growth in general, and the expansion of aquaculture specifically, have resulted in an increased scarcity of those resources vital for the growth of aquaculture.  Natural resource scarcity such as that of water, together with various ecological challenges have resulted in a global decline in the growth of aquaculture. The level of investment in aquaculture is a critical factor in sustaining growth in aquaculture. In addition, they recommend that, for the future growth of aquaculture, investment should be channelled into developing the appropriate science and technology.

Olaoye and Odebiyi (2013) assessed the impact of microfinance on aquaculture in the Ogun state in Nigeria. The results showed microfinance to have had, and by continuing to have, a measurable impact on fishing production and fisherman income. However, they stated the following factors needing to be considered as constraints on productive aquaculture: the high cost of feeding, poor marketing channels, lack of adequate capital, and the high cost of investment, among others. The study recommended that the government increase the number of loans allocated to the agricultural sector, and invariably to the fisheries sector. Olaoye and Odebiyi (2013) recommended that the government see the granting of a loan to the aquaculture sector, and the monitoring of the loan to ensure that it is used for its intended purposes.  A further recommendation was for credit to be made available from other sources, including non-governmental organisations at very low-interest rates. In addition, banks should provide a reasonably sized financial package to be disbursed to farmers to help them increase production.

The study conducted by Gbigbi Achoja and Temile (2019) in Nigeria concluded that more cooperative funding intervention could positively impact aquaculture business development with the merit of increased income and employment creation in the country's economy. The study made use of a linear regression model. The authors argued for investment in aquaculture having the positive effect of profit in aquaculture enterprises accruing to the cooperative members. However, Gbigbi *et al*. (2019) pointed to the high cost of inputs, inaccessibility to credit facilities, political instability,

organisational and operational difficulties, and pilfering were serious constraints to the aquaculture development sector.

Aquaculture, according to Brummett Lazard and Moehl (2008), has struggled to realise its high biophysical potential in Africa despite 40 years of research and development and hundreds of millions of dollars spent. The substantial gains in desperately needed food security and economic growth predicted by development agencies have generally not been achieved, owing to ineffective institutional arrangements and donor-driven projects. Furthermore, key constraints to broader growth include a lack of high-quality seed, feed, and technical advice; poor market infrastructure and access; and weak policies that, rather than accelerating, impede expansion, owing to a preference for central planning over the private-sector initiative. As a result, if African aquaculture is to make significant and much-needed contributions to the continent's development, government policy should attempt to alleviate key constraints while relying more heavily on commercial investments to drive future growth. To date, evidence suggests that a pragmatic business approach centered on small and medium-sized private enterprises would benefit more people than centrally planned and government-led development projects.

Yan, Zhang, Mu and Liang (2004) examined the role of investment in aquaculture in China. Due to limited financing in aquaculture, the available funds were at the time of the study being channelled towards labour instead of towards capital infrastructure. This renders the sector unable to produce the necessary output. This lack of investment was and is due to the aquaculture sector being at high risk compared with other sectors. Therefore, the accessible investment in the sector does not lead to any significant impact on the country's economy.

Jarvinen (2000) investigated the temporary federal assistance programs, which represented a small but immediate infusion of funds available for aquaculture development in the United States' northeast. The US government Economic Development Administration (EDA) provided $30 million in financial assistance to the north-eastern fishing industry at the time of the study's conduct (Jarvinen, 2000). These funds supported technical assistance and revolving loan funds to help affected fishing communities recover economically. The experiences shown in eight states in

the northeast of the US suggest that species, technologies, and environments defined the risks of aquaculture investment 20 years ago.

Rothuis, Van Duijn, Van Rijsingen, Van der Pijl and Rurangwa. (2011) highlighted the significant impact aquaculture had at the time of the study on the Kenyan economy, including on its population. Aquaculture had by 2011 played a major role in job creation, creating approximately 80 000 direct jobs, while indirect jobs at that time amounted to 800 000 (Rothuis *et al.,* 2011). Aquaculture had also 2011 contributed 0.5% GDP (Rothuis *et al.,* 2011). At that time, the Kenyan public sector recognised the role of aquaculture in reducing poverty and food insecurity in the rural population, in addition to reducing pressure on the fishing sector. In this context, in 2010, the Ministry of Fisheries Development published the National Aquaculture Strategy and Development Plan 2010-2015. The plan outlined a program for indirectly contributing to food security through the community food supply, community employment opportunities, and infrastructure improvement. According to the program, small-scale subsistence aquaculture has the potential to contribute only to local community food availability, whereas large-scale commercial aquaculture not only provides food but may also contribute to employment and economic growth (Rothuis *et al.,* 2011).

### 4.3.2    Coastal and marine tourism

Coastal and marine tourism (CMT) is one of the fastest-growing sectors globally. However, it is only fairly recently that it has gained serious attention both academically and in the area of policymaking. The empirical literature review summarises the relevant existing literature in relation to the impact of coastal and marine tourism financing on the global macro-economic environment.

The empirical literature review also highlights the limited established body of literature that assesses the economic impact of investment in coastal and marine tourism Cape Peninsula University of Technology [CPUT], 2017).   In addition, South Africa is currently characterised by limited data to assess the economic impact of CMT (CPUT, 2017; Operation Phakisa, 2014;  Van Wyk, 2015). This is in spite of the fact that the South African coastline is a major tourist destination, attracting both domestic and international tourists.

Dicken and Hosking (2009) explored the effect of the tiger shark diving industry within the Aliwal Shoal Marine Protected Area (MPA) in South Africa. The Aliwal Shoal diving with tiger sharks, one of several ecotourism activities, at the time of the study by Dicken and Hosking (2009) was found to be adding a direct value of R12.4 million to the country's economy.

Edwards, Sutton-Grier and Coyle (2013) assessed the impact of investing in coastal habitat restoration projects in the U.S. The study by Edwards *et al* (2013) estimated approximately 1409 jobs were created based on the results. Furthermore, these habitat restoration projects generated an average of 17 jobs per million dollars spent, which is comparable to other conservation industries in the United States, such as parks and land conservation, and significantly higher than other traditional industries such as coal, gas, and nuclear energy generation. According to studies like Edwards *et al.* (2013), habitat restoration is an effective way to stimulate job creation. Furthermore, habitat restoration has been shown to have long-term economic benefits, such as future job creation in rebuilt fisheries and coastal tourism, as well as benefits to coastal economies, such as higher property values and improved water quality.  As a result, there is a case to be made for investing in blue infrastructure habitat restoration as a green opportunity that will benefit coastal economies and societies in the short and long term (Edwards *et al.,* 2013).

Lange and Jiddawi (2009) assessed the economic value of marine ecosystem services to Zanzibar using a survey carried out in 2007 and 2008.  The study by Lange and Jiddawi (2009) highlighted that the marine ecosystem services on that island are under-invested and undervalued. By 2009 this had resulted in the services being unsustainable and in lost opportunities for economic growth. The findings revealed that while marine ecosystem services contributed 30% of GDP at the time, the ecosystem had been severely degraded due to both human and natural causes (Lange and Jiddawi, 2009).

In his accessible contribution to a range of facts on South Africa's oceans, Duncan (2016) reports that ocean tourism is one of the major contributors to socio-economic growth and development in the country.  He offers the estimate that in 2016 coastal tourism contributed R26 billion to the country's GDP and estimated the contribution of direct coastal resources at that time to be 35% of the annual GDP ). Similarly, Soomere

and Quak (2013), in their research on managing environmental damage from coastal and offshore activities globally, described tourism around the ocean environment as a major business, generating entrepreneurial activity which was at that time contributing to the social and socio-economic upliftment and wellbeing of the people who live around the coastal areas.

Hampton Jeyacheya and Long (2017), highlighted that employment in the tourism industry is extremely weak more especially from the government while individual businesses in the sector are very strong at Ha Long Bay, Vietnam. In addition, employment in the tourism industry is very weak from the government side. However, private individual businesses in the sector were found to be very strong in terms of employment at Ha Long Bay. The study also highlighted the country's lack of vocational training or technical experience, as well as its limited soft skills. Due to this scarcity, in-house training has become the standard operating procedure for large corporations, with some hiring training managers and one large tour operator privately owned running their training school. At the same time, individual business strategies for employment were broadly divided into those who preferred to employ locals and those who did not. In addition, other well-paying sectors exacerbated this situation for tourism because other university-educated people did not want to work in the tourism space.

According to Brumbaugh and Patil (2017), regions like the Caribbean, Southeast Asia, and China are more strongly dependent on tourism for the growth of their economies. Therefore, in 2017 coastal and marine tourism represented a significant share of the contribution to the economy by creating approximately 6.5 million jobs, and with anticipated global growth of more than 3.5%, and the future growth in the ocean economy of 26% by 2030 (Brumbaugh and Patil, 2017). Brumbaugh and Patil (2017) saw capitalising on this "ocean wealth" as requiring a deliberate approach to shaping investment through initiatives such as marine spatial planning, well-designed and funded marine managed areas, and new tools that assist local communities and national governments alike in making the best long-term decisions possible.

CPUT (2017) created a framework to evaluate the economic impacts of coastal and marine tourism in South Africa. Various methods have been used to assess the economic impact of this coastal marine tourism. These include CBA and the I-O model,

together with a systematic literature review for analysis. The desktop study by CPUT (2017) highlighted that, while there is a body of literature on measuring economic impacts and modelling impacts, tourism research in this area is relatively new in the global context and has generally focused, and continues to focus, on the impacts of specific tourism events or tourism types. It has done relatively little assessment of the broader contributions of tourism, including coastal and marine tourism, to global, national, and regional economies. In this regard, the only contributions that tend to dominate this research are a contribution to GDP and the creation of jobs. There is currently limited data available in South Africa on the economic impact of coastal marine tourism and its contribution to the economy (Operation Phakisa, 2014; Van Wyk, 2015). Further, since the tourism sector is labour intensive, sustaining high-quality jobs remains a challenge due to seasonality. These considerations suggest that investment in tourism should be aimed more at improving the quality and the performance of the sector than at increasing its size.

Dwyer (2018) sees the coastal and maritime tourism sector, in the global context, as characterised by seasonal employment opportunities, as well as being, challenged by the difficulties attracting and maintaining enough skills, resulting in poor service quality. Globally, the sector is characterised by small and medium enterprises (SMEs). The results of his analysis show the limited capacity of this sector to be effective and efficient is due to lack of infrastructure, and various constraints, such as restricted/limited market access, and financial constraints. In addition, there a lack of an innovative culture constrains entrepreneurship and the creation of new products development in the sector. There is also a measure of the inconsistency of reported measuring of, and irregularities in, data coverage.

Rogerson *et al.* (2018) reviewed the potential of coastal and marine tourism through promoting the participation of local entrepreneurs as SMEs in the coastal and marine tourism sector in the Indian Ocean Rim Association (IORA) states. The study made use of desk-top research focussing on coastal and marine tourism, in particular on economic inclusion and SME development. The two countries used as a case study were Kenya and South Africa. The results showed that local entrepreneurship is always excluded from international tourism and tourists. There are also high entry points for aspiring entrepreneurs, which excludes locals, including marginalised groups such as women and youth, who should be participating in the globalised

tourism industry. The low-budget sector of international tourism, as well as the markets provided by domestic and regional tourists, are ideal entry points for the establishment and expansion of locally owned SMEs. Thus, focusing on the budget tourism sector can help to strengthen the local population's skills, increase their self-reliance, and increase community members' confidence in dealing with outsiders, all of which are signs and characteristics of empowerment.

 In the South African context, Goliath Mxunyelwa and Timla (2018) assessed the effect of coastal tourism on the Wild Coast community of Elliotdale in South Africa.  Using qualitative and quantitative research analysis, the study showed the coastal tourism sector to be one of the sectors identified by the South African government as having the potential to contribute to economic growth, and employment, in particular amongst rural communities.  However, the results of the study show a lack of awareness of the tourism sector among the Elliotdale community. Also lacking were the facilities for a tourism development environment. In addition, there was a persisting lack of community participation in the process of tourism development, while some members of the community did not have access to wild coast tourism products or locales. The study however reported that coastal and marine tourism is under research.

Cañavate *et al.* (2018) examined the impact of nautical tourism on economic growth in Spain and Portugal. Nautical tourism is also known as water tourism and is tourism that combines sailing and boating with vacation and holiday activities. Applying the Delphi method to analyse tourism with a blue economy. The study was based on the assumption that seas and coasts are key determinants of economic growth and have various benefits for and from human activities and create jobs. The results show that nautical tourism in these two countries has the potential to contribute to the development of their economies, as well as to create jobs. The study concluded that that the sector is still faced with the challenges of education and training and a lack of community involvement in the sector.

There is a growing recognition by both government and the private sector of coastal and marine tourism (CMT) of its potential, and importance for South Africa, as articulated in the Phakisa Oceans Economy framework. However, to date, limited research exists in relation to the specifics of the economic impact of financing  CMT in the country as well as this tourism's sustainability in both economic and environmental

terms (Operation Phakisa, 2019). For purposes of better planning and more efficient management of CMT destinations, as well as ensuring long-term sustainability, examining the profiles of visitors to such destinations would be useful (Munien Gumede, Gounden, Bob, Gounden and Perry, 2019). Recently Munien Bob, Swart, Ngalawa and Nzimande (2019) made a valuable contribution to this limited body of research with their case study of Cape Town, one of South Africa's key coastal tourism destinations. The study examined profiles of visitors to this CMT site using a diverse range of categories. Bob *et al.* (2018) argue that Coastal and Marine Tourism (CMT), as part of the ocean's economy, offers significant development opportunities that have the potential to contribute to job creation and sustainability. In 2013 CMT contributed R19 billion to GDP with projections that it would yield an amount as high as R44 billion in 2020. rising rapidly to R134 billion in 2033 and generating between 800 000 and 1-million jobs (Operation Phakisa, 2019).

Wang and Zhang (2019) found the level of marine tourism in China to be relatively low when compared with other countries. The finding by Wang and Zhang (2019) concluded that the likelihood exists that marine tourism resources in China have the potential for both underdevelopment and over-utilisation, which in turn is likely to result in the decline of these resources in a cyclical process. They found the investment in the development of the sector to be relatively small and not sufficiently effective in the overall development of marine tourism, which has, in turn, resulted in a large number of marine resources lying idle and being wasted, and in turn resulting in a lack of depth in marine tourism resources development. Further, China has promoted marine development resources, national marine awareness cultivation, master the ocean, and enjoy the ocean through marine tourism. Wang and Zhang (2019) were of the view that ocean tourism is of great significance in terms of complementing or compensating for land tourism. However, most marine tourism products in China's coastal tourism cities retain the traces of the old communist-inspired traditional tourism. Most tourism products are in the form of offshore tourism, which also lacks innovation. All of this lack of innovation and investment makes China's CMT compare unfavourably compared with the coastal marine tourism of other countries. This has undoubtedly hindered the marine tourism industry development in the country, which has seriously affected the sustainable development of China's marine tourism economy (Wang and Zhang, 2019).

Recently Lal Mukherjee (2021) examined the impact of tourism in coastal areas in the European Union. The results show coastal tourism to have a positive impact on employment, government revenue, and foreign and entrepreneurship opportunities. Coastal tourism employs over 3.2 million people and generates a total of € 183 billion in gross value added, accounting for more than one-third of the European Union's maritime economy. According to these findings, the rapid expansion of international coastal tourism has resulted in significant job creation in Europe. Lal Mukherjee (2021) also reports that coastal tourism represents around 7 % of the world's employees (Lal Mukherjee, 2021). These figures indicate that coastal tourism can persuade local governments to improve their countries' infrastructure by building better water and sewage systems, roads, electricity, telephone, and public transportation networks. All of this can raise the standard of living for residents while also facilitating coastal tourism.

### 4.3.3 Marine protection and ocean governance

Hunt (2008)  assessed the socio-economic impact of New Zealand marine protected areas (MPAs) which were established in 1975 using survey analysis. The results show that the establishment of these MPAs has played a significant role in local economy contribution with the direct creation of approximately 10 jobs, as well as 173 jobs in tourism, and have resulted in a contribution of NZ$18.6 million per year in total turnover Hunt (2008).

The National Research Council (NRC) (2000), noted the important role played by MPAs in helping to restore and protect ocean resources, and in helping to avoid the degradation of ocean resources, However, weak governance has led to overfishing, climate, pollution, and loss of habitats, and biological diversity. At the time of the report, the council saw all of this as being detrimental to the growth and sustainability of the ocean. Therefore, according to Ehlers, (2016) argued, ocean governance should be the integrated conduct of the policy, actions, and affairs regarding the world's oceans to protect the ocean environment, sustainable use of coastal and marine resources as well as to conserve its biodiversity. Based on the literature, established regulations and policies are not enough; there is a need for ensuring that there is compliance with the regulations and policies. Thus, finding a sound balance between

the use of the protection of the seas, a sustainable and comprehensive ocean governance system is urgently needed.

According to the European Union (2017), the EU committed € 37.5 million in 2017 to improve maritime security and combat piracy along the south-eastern African coastline and in the Indian Ocean, as well as to contribute to UNESCO's intergovernmental oceanographic commission (IOC-UNESCO) in developing international guidelines for maritime spatial planning worldwide. Despite progress with the UN Convention on the Law of the Sea (UNCLOS), there are gaps and outdated approaches in ocean-related policy and law, as well as significant shortcomings in implementation and law enforcement. As a result, many unregulated, partly illegal, activities have occurred, as has inadequate or non-existent stewardship of many parts of the ocean.  Based on the literature review bad governance can be seen to increase investment risks and hold back the growth of a sustainable ocean economy. In addition, developing countries are still lacking in the provision of marine protection and ocean governance. Monitoring, control, and surveillance of any areas covered by existing and future treaties (including MPAs) are likely to be dependent on cooperation between countries and the private sector.

 Pascal Brathwaite, Brander, Seidl, Philip and Clua(2018) assessed the impact of investing in marine conservation in a global context. Their findings showed that investing in the industry is still in its infancy and has the potential to grow. The study by Pascal *et al.* (2018)  also estimated the value of the industry to be US$500 billion by 2019. Entrepreneurship would be the investment vehicle whereby business models are used instead of grants in order to achieve the desired outcome. The entrepreneurial aspect of marine protected areas includes the collection of a diver's fee and directly funded park management, the design and implementation of co-management arrangements in state-designated parks, and the establishment of varying degrees of private tenure over a marine habitat.  Other entrepreneurs in developing countries such as Tanzania, Belize, and Indonesia play similar roles in marine protected areas and this is also dependent on government, and local communities (Thomas and McMullen, 2007).

In a more recent study, Pascal Brathwaite, Bladon, Claudet and Clua(2021) explored the impact of investment in marine conservation on a country's economy in a global

context. The study makes use of desktop research as well as interviews of local stakeholders for purposes of analysing the results. The study by Pascal *et al.* (2021) has shown that insufficient funding for efficient and effective expansion of MPAs remains a challenge and particularly affects developing countries. In 2017, the global impact investing network (GIIN) reported deals worth US$35 billion, a 17 % increase over 2016. At the end of 2018, the industry was estimated to be worth US$502 billion (GIIN, 2019), with investments focused on energy (15%), microfinance (13%), and other financial services (11%) (Pascal *et al.,* 2021). Globally, it was estimated in 2017 that 65 % of MPAs had insufficient management budgets and 91 % had insufficient staff capacity (Gill *et al.,* 2017). Rapid growth without the necessary investment could result in an explosion of 'paper parks,' which fail to meet social or ecological goals and are financially unsustainable.

### 4.3.4 Marine transport and small harbour development

Generally, transport/ports and harbour infrastructure that are well developed promote effective and efficient productivity in the macro-economic environment. Therefore, a viable marine transport system plays an important role in international trade, economic growth, etc (Loon, 2009). Mazaza (2001), in an assessment of the impact of harbours and ports on international trade and economic growth in South Africa, found that approximately 95 % of the country's international trade takes place via the sea. Ports and harbours are thus economic generators with long-term community benefits because they play an important role in generating and maintaining local, national, and international economies. These findings suggest that international trade has a positive impact on the country's economic growth.

Acciaro (2008) examined the role and economic effects of the ports industry of Sardinia on employment in that country. Sardinia experiences chronic unemployment and poor economic performance. This study maritime and ports industries were identified for developing opportunities for Sardinia and the Mediterranean. Traditionally, the ports industry used to be labour intensive, employing large numbers of unskilled workers. However, the process of development has caused changes in the structure of ports in the Mediterranean region, which renders these ports capital intensive, requiring the employment of well-trained reliable workforces, and resulting

in the reduction of employment in the sector. The results of Acciaro's 2008 study showed that in the province of Cagliari ports were generating approximately 4% of total employment at the time of the study. The percentages for the other provinces were above 2%. The results also show that in Sardinia approximately 3% of total island employment was created and over 8% on average of the employment in a single municipality (Acciaro, 2008). This number had by 2007 slightly decreased, even though cargo volumes had by then steadily increased. The municipalities where ports generated the largest impact are Golfo Aranci, Sarroch, and Palau, with 43%, 20%, and 14% respectively (Acciaro, 2008). Therefore, the study by Acciaro, (2008) has shown that ports play a vital role in creating employment and stimulating the economic growth of the Sardinia region.

Several Asian studies done between 2010 and 2014 assessed the impact of seaport investment in relation to economic growth and development. Jiang (2010) explored the effects of such investment in China and Korea. The results showed a positive effect of seaport investment on the economic growth of these countries. These results are supported by those of the study conducted by Song and Van Geehuizen (2014) in China. These scholars found there to be a positive effect of such investment on regional growth. Similarly, Hargono , Sutomo and Alisyahbana (2011), in their study conducted on Batam Island in Indonesia, found a positive relationship between seaports exports and imports and economic growth.

Also, in the Asian context, Jung (2011) explored the economic contribution of ports to the local economy of Korea during the period 1990 to 2008. Due to the advancement of logistic technology, the change of economy showed a decreasing trend. According to input-output linkages analysis, the port employment opportunity created effect was lower than most other industrial sectors.in addition, the employment coefficient dropped drastically during the 1990 -  2008 period. This was due to global developments such as transportation technology. This development meant that the port infrastructure of the country needs to be developed in order to meet the demands of the future business environment. In this context, Helling and Poister (2000), based on their comprehensive review of studies and surveys done on ports and marine shipping in the United States since 1960, argued that failure to improve the quality of

port infrastructure continuously and on a regular basis may have a substantial adverse impact on the economy of a country.

Biggar Economics (2013) conducted a study on the impact of Aberdeen harbour on economic growth and employment in northeast Scotland. The harbour is important to the economies of both Aberdeen and Scotland, generating approximately £1.5 billion GVA and 12,000 jobs for the Scottish economy, and 9500 jobs for the Aberdeen City and Shire economy, in addition to £1.2 billion GVA and 9,630 jobs associated with offsite activity at the time of the report (Biggar Economics, 2013). By 2013, the harbour's services had experienced a significant increase in demand. Despite significant investment in facility upgrades, the existing site was at or near full capacity at the time. The report by Biggar Economics (2013) informed that if this capacity was not developed, Norway would risk losing both new and existing demand. Capacity constraints at the port were also likely to stymie existing and potential users' efforts to develop new market opportunities in areas such as renewable energy, decommissioning passenger ferries, and cruise liners. According to the report, this investment would help to make industrial land surrounding the new harbour more appealing to potential investors, potentially resulting in a significant increase in employment in this area.

Bottasso, Conti, Ferrari and Tei (2014) investigated the effect of seaport activities on regional economic growth for the sample of 621 regions in the European countries over the 1998 to 2009 period. The results showed that every 10% increase in port throughput was able to generate a 6–20% increase in the GDP as well as a spillover effect on the GDP of nearby seaport regions. Similarly, Shan, Yu and Lee, (2014) in their study of the economic impact of seaports, focussing on major ports in China, found that a 1% increase in port cargo throughput can increase GDP per capita growth by 7.6% and that the port throughput of a country can have a positive impact on neighbouring economies. The findings from these two studies would suggest that the existence of the positive effect of seaport activity on regional GDP could confirm or encourage opportunities for further investment in a port's infrastructure development. In this context, Bottasso Conti, Ferrari, Merk and Tei (2013) assessed the effect of ports on employment using a sample of 560 regions in West European countries. The

results from this assessment suggested that, at the time of the study, efficient productivity had the potential to create approximately 400–600 jobs in the region.

Deng Lu and Xiao (2013) explored the relationship between ports and respective regional economies in major cities in China. The results were estimated using structural equation modelling (SEM) in the study. The study's findings show that port activities have a positive effect on the respective regional economies, whereas port demand and supply have no significant effect on a regional economy. These findings imply that a port city that wishes to accelerate the development of the regional economy must consider the acceleration of the total volume of imports and exports.

Song and Van Geenhuizen (2014) investigated the impact of port infrastructure investment on regional economic growth in China between 1999 and 2010. The findings revealed that port infrastructure investment had a clear positive impact in all regions. These findings indicate that port infrastructure investment may have a positive impact on regional economic growth in China, though there are significant differences at the regional and provincial levels. However, Chang, Shin and Lee (2014) in their assessment of the economic impact of ports in the South African economy with input-output analysis produced different results to those of Song and Van Geenhuizen (2014). The findings of the South African study show fewer, or a relatively small number of, port activities can have a negative effect on economic growth. Extrapolating from their findings, Chang *et al.* (2014) acknowledge the possibility of zero port sector activities resulting in an R1.481 billion direct loss to the entire economy.

Ismail and Mahyideen (2015) examined the effect the quality of port infrastructure had on trade flows in some Asian countries. Their results showed a measurable increase in trade flows from improvements to transport infrastructure in these countries. Similar results were obtained from the study by Helble (2014) who found transport infrastructure quality to have positively affected trade flows and to have been statistically significant.  Such studies indicate port infrastructure to be vital to the economic development of a country, and being key to achieving low trade costs, a factor that would increase the trade value and volume for a country. According to the World Economic Forum (2021) report, quality infrastructure not only reduces the

distance between regions but also integrates national markets and connects them to other economies at a low cost.

Martin Associates and Apex Companies (2016) explored the local and regional economic impacts and employment creation from the maritime and seafood activity taking place at Fairhaven harbour, Bedford on the southern coast of Massachusetts in the US. The study showed the harbours to have created 36 578 jobs both direct and indirect and estimated maritime activity at the port in 2015 at $9.8 billion, which at the time accounted for 2% of $481.6 billion gross domestic product for the Commonwealth of Massachusetts (Martin Associates and Apex Companies, 2016). These statistics suggest that as with all waterfront infrastructure, continued and regular investment in dredging is needed for a working waterfront to not only work at full capacity, but to create incentives for businesses to continue growing and investing in the economy of a city such as Bedford.

Jouili and Allouche (2016) examined the impact of seaport investment on Tunisia's economic growth from 1983 to 2011. The Cobb-Douglas production function was used in this study's econometric model. The study's findings indicated that public investment in seaport infrastructure during the study period had a positive impact on Tunisian economic growth. The study also revealed that the service sector benefited the most from the seaport investment infrastructure. The results also showed that seaport investment serves the services and manufacturing sectors to a greater extent than it does the agricultural sector, which was not shown to have benefited during the period from this investment. These results are similar to those from studies conducted in Nigeria by Igberi, and Ogunniyi (2013), and by Lloyd *et al.* (2020), both of which showed maritime transport to have had positive and significant impacts on the economic growth of that country.

Park and Seo (2016) assessed the impact of seaports on the regional economy using panel data on panel data covering all the regions of Korea over the period 2000 to 2013. The results show that cargo ports without sufficient throughput hinder regional economic growth, while cargo ports with sufficient throughput contribute to economic growth. The study suggests that port activities have a strong positive impact on regional economic growth, while port investment has an indirect impact on economic

growth. This means that port investment can have a positive impact on both cargo and container throughput. Those throughputs, in turn, have the potential to contribute to the regional economy.

Munim and Schramm (2018) analysed the impact of port infrastructure quality and logistics performance from 91 countries on seaborne trade. A structural equation model (SEM) was used to provide empirical evidence. The countries were divided into developing and developed groups. The results show that it is important for developing countries to continuously improve their port infrastructure in order to promote seaborne trade and economic growth. However, this relationship weakens as the developing countries become richer. Therefore, the improvement of port infrastructure would benefit the country's economy. The study showed the quality of port infrastructure to have a significant positive effect on the economic growth of a country. The results of the study are supported by those of the study conducted by Ferrari. Percoco and Tedeschi (2010), Bottasso *et al.* (2014), Park and Seo (2016), while Deng *et al.* (2013) found a contradicting result, concluding that no relationship to existing between port and nation economy.

Han Wang and Bo Li (2019) examined the effect on the economic growth of the ports in the  Beijing Tianjin Hebei (BTH) region in China from 1996 to 2015. The study made use of partial least squares (PLS) and ordinary least squares (OLS) using panel data. The findings show the ports studied contributed greatly to the economic development of the BTH regions. Tianjin Port was found to have much more influence on the BTH regions than did the Hebei ports, and that the Hebei ports needed to develop their own special logistics functions to realise high efficiency in the logistics system. One could argue that this was yet another study suggesting that investment and logistics function improvement plays a key role in creating and sustaining port efficiency and in the economic development of a region.

 Kazutomo and Wilson (2019) examined the impact of port infrastructure on exports and imports of emerging economies in East Asia. The results of the study show that port congestion increased transport costs. These results also suggest that a significant amount of investment has a positive effect on exports and also reduces transport costs. In a similar study, Gani (2017) examined the quality of overall logistic

performance on exports and imports for a large sample of countries. The results from these two studies would seem to suggest that better quality of logistics performance has a positive effect on exports and imports.

Rehman, Noman and Ding (2020) examined the short- and long-run impact of infrastructure – of transport and other sectors - on export and trade deficit in selected South Asian countries during the period 1990 to 2017. Their study made use of pooled mean group (PMG) estimator and cointegration techniques, such as the Pedroni and Kao test, as methodology. The results showed infrastructure to be positively related to, and/or to promote, exports, together with a negative relation between infrastructure and trade deficit. In addition, the Pedroni Kao test brought to light strong evidence of cointegration among the variables of interest. Based on the results of their study it could be argued that, in the long run, the quality of infrastructure promotes exports and decreases trade deficit. Rehman *et al.* (2020) recommended a focus on generally enhancing the quality and efficiency of infrastructure.

Mudronja Jugovic and Skalamera-Alilovic (2020) assessed the effect of seaports on economic regional growth for a sample of 107 European Union (EU) port regions over the 2005 to 2015 period. The study by Mudronja *et al.* (2020) made use of the GMM dynamic panel data analysis. The results showed that the operation of seaports in the sampled countries to have a positive impact on the economic growth of their regions, while investment in transport infrastructure was shown to have a negative impact on economic growth and to be statistically insignificant. One reason for this could be that the effects and benefits of investing in transportation infrastructure take time to manifest. This can also be justified by the fact that if a country has a developed economy, quality infrastructure will already be in place. This means that high-quality infrastructure is a result of a developed economy, rather than the other way around, where infrastructure drives the economy. Furthermore, variations in transportation infrastructure within regions were minor, which may explain the variable's statistical insignificance. Furthermore, the maritime labour market has recently been and continues to seek highly educated individuals with knowledge of new technologies and communication methods (application of clouds in business, blockchain technology, drones, 3D printers, 5G networks). Technology is a process that does not end with a single cycle, but rather forms a network that must be constantly upgraded. As a result,

given that the EU invests heavily in transportation infrastructure, the question of whether some of these funds could be redirected to other sectors arises.

Akbulaev and Bayramli (2020) assessed the relationship between maritime transport and economic growth in Russia, Azerbaijan, Turkmenistan, Kazakhstan, and Iran. The study uses the SWOT-analysis and correlation analysis methodology to estimate results that show a positive relationship to economic growth. These results are similar to those from the study done by Tayebi *et al.* (2015) using GMM and survey to estimate the impact of maritime transport on economic growth in Iran from the 1996 to 2012 period. The results show a positive effect on the country's economic growth and suggest that increasing investment in maritime transport is advisable. These results are similar to the study that was done by Tayebi Gholami, Rashidi and Rameshi (2015) using GMM, and a survey to estimate the impact of maritime transport on economic growth in Iran from the period 1996 to 2012. The results show that there is a positive effect on the economic growth, there increasing investment in maritime transport is advisable based on the results of the study by (Akbulaev and Bayramli, 2020).

Fedorenko Yakhneeva, Zaychikova and Lipinsky (2021) explored the impact of port investment on trade on five sampled Russian regions during the 2010 to 2019 period. The study makes use of regression analysis using panel data and nonlinear models. The results of the study show that investing in seaports promotes foreign trade growth in the host and neighbouring regions, while the cost of environmental is shown to have a negative relationship with the volume of exports and imports.

Sakyi and Immurana (2021) assessed the effect of seaports' efficiency on total trade in the sampled 27 countries in Africa during the 2010 to 2017 period. The study employed the dynamic system Generalised Method of Moments (GMM) estimation technique. The results of the study show seaports' efficiency increased the trade balance of these countries in both the long and short run. These results suggest that it is imperative to enhance seaport efficiency in Africa. This implies that, in order to improve seaport efficiency, African seaports must address such hindrances and bottlenecks as inadequate up-to-date infrastructure, manual operations, cumbersome documentation procedures, congestion, and delay in container clearing, among others. According to the study's authors, doing so would improve trade performance

and thus benefit the African economy. Fratila *et al.* (2021) examined the effect of maritime transport on economic growth in the EU countries, using the panel data, from 2007 to 2018. The panel regression model was used to estimate results that show that investment in maritime infrastructure has had and continues to have a positive effect on economic growth. However, the continued existence of environmental issues hinders growth in the sector.

In the South Africa context to date, not much research has been done to investigate the impact of marine transport financing on international trade and some studies were too limited to explore the various method of contribution or assessing the impact of marine transport financing on economic growth and other economic indicators while other studies are based on estimates.

The following sections first provide the assessment of empirical literature on the effects of the ocean economy on macroeconomic selected variables, and the relevance of this to the current study. Secondly, or lastly, certain conclusions are drawn from the empirical literature review.

### 4.3.5    Assessment of the empirical literature review

The overall discussion and review of the literature on the ocean economy and its contribution to the economies of developed countries shows the majority of the empirical studies reviewed to have highlighted the contribution to, and the role of the ocean economy in, local and international economic growth, job creation, and international trade. The results of these studies showed both the extent of the contribution of ocean economies to regional and global economic growth and the number of jobs created over a particular period of a study. While a number of the studies produced estimations of the extent of contributions of investments in ocean economies and to GDP, together with the number of jobs created, a few studies highlighted the positive effect of the ocean economy on the macro-economic environment. A review of the empirical literature in developed countries reveals a gap in that literature which assesses the impact of investing in ocean economy/ies on the macroeconomic environment.

Whereas the empirical literature review discussion also shows that the majority of studies show contribution and the role of ocean economy to economic growth, jobs creation, and international trade. the results of the few studies that examine the effect of investing in the ocean economy highlighted that although the developing countries are making progress in financing the ocean economy is still slow or insufficient in recent years and currently to make a measurable impact on the macro-economic environment. Other studies show that, while investment might be doubled, the rate of growth would still be low. Further, domestic and traditional finances of funding ocean economies on their own are likely to be insufficient to fund the ocean economy. Thus, there is little evidence regarding assessing the relationship between the financing of the ocean economy macroeconomic environment, while other studies have indicated inconclusive results, and the rest of the studies reported limitations to the testing of the evidence due to limited data. This can be said to highlight the gap in the body of literature on the subject. Thus, this thesis could go some way toward filling this gap.

The assessment of the empirical literature on ocean sectors in the developed countries shows that coastal and marine tourism is a leading sector in this economy in terms of employment, GDP, and international trade. Based on these criteria, this sector is followed by marine transport and manufacturing. A few studies also identified aquaculture as the largest employer and on exports and imports, Some of the studies conducted in a developing country such as China show coastal and marine tourism and aquaculture in this country to be the largest contributor to GDP, followed by marine transport.

The overall empirical literature review, i.e. the bulk of this literature on ocean-based sectors, in particular, studies were done on aquaculture highlights the contribution of this sector to economic growth and employment in both developed and developing countries. However, the specifics and extent of the overall impact are inconclusive due to the various constraints operating in this sector, including financial constraints that tend to hinder the growth and development of aquaculture. While studies done on coastal and marine tourism indicate a positive effect on entrepreneurship and small business from coastal and marine tourism, much of this literature on this ocean economy sector highlights the contribution of this tourism to economic growth, job creation, and entrepreneurship in the U.S, Zanzibar, EU member states, Pakistan among other countries identified in the literature. However, the studies have also

highlighted the persistent challenges facing this sector, particularly in developing countries. These include a lack of infrastructure, or appropriate and quality infrastructure,  lack of investment in, and improvement, of, tourist facilities or products, lack of skills, and insufficient finances, all of which have hindered the growth of the sector.  However, other studies show that the sector has the potential to grow the economies of both developed and developing countries and to create job opportunities. So far, investment in the sector has not been found to be sufficient to make an overall beneficial impact on the macro-economic environment.

The empirical literature on marine and ocean governance shows that the sector's economic contribution to job creation, the promotion of entrepreneurship, and the protection of marine resources has not been sufficient or effective due to the lack of both efficient management and investment. The review found there to be a paucity of literature on marine protection and ocean governance. Most of the literature on marine transport and small harbours has examined the impact of marine transport/ port/ harbour infrastructure on economic growth and international trade. The findings of these studies have been shown to have had a positive effect on economic growth and trade flows. Other studies have highlighted the contribution of the marine transport sector to employment and/or job creation. Overall, the studies reviewed have shown the relationship between financial investment in marine infrastructure and economic growth and trade flows to be a positive relationship.

Another group of studies shows the impact of the ocean economy on both global and local economic growth remains below its potential because of the range of constraints facing the sectors which hinder the growth not only of local economies but of those sectors themselves.  However, the empirical literature has highlighted two shortcomings of this latter group of studies.  One is the over or underestimating of the data in the analysis of the findings of a study, while other studies were limited due to the unavailability and inaccuracy of data.

Thus, this review of the empirical literature on the ocean economy has revealed a gap in this literature on the impact of ocean economy financing on economic growth. However, most of the literature reviewed focused on the contribution of the ocean economy to economic growth rates in countries where the studies were conducted, and these are based on estimates rather than on detailed and systematic assessments

of the impact of investment over a particular period. There is a paucity of tested evidence on the relationship between ocean economy financing and macroeconomic indicators.

In the South Africa context not, much research has been done to date which investigates the extent and/or the impact of its ocean economy financing. Some of the studies reviewed proved to be too limited to render any in-depth exploration of the various methods of the contribution of the country's ocean economy or to assess with accuracy the impact of the country's ocean economy financing on its economic growth and other economic indicators. Other studies, as is the case with some studies done in other countries, are based on estimates. For example, Hosking's 2014 study was too limited to explore the various ways in which the impact of ocean economy financing may manifest in the economic growth of the country. The study did not show in any detail the specific ways in which investment in its ocean economy has affected or could affect the growth rate of the South African economy. The study does not seriously attempt to explore the specifics of the ways in which ocean economy financing contributes to the economy nor present an argument as to whether or not the ocean economy can achieve the projected future growth proposed by Operation Phakisa.

### 4.4 Concluding remarks

This chapter provided a review of empirical literature dealing with both global and local ocean economies, including the South African ocean economy. It looked at studies and reports on various sectors of ocean economies in both developed and developing countries. The first part of the review discussed the impact of the ocean economy on macroeconomic indicators, and the second part the impact on macro-economic indicators of the selected ocean sectors. These sectors included aquaculture, coastal and marine tourism, marine protection and ocean governance, marine transport and manufacturing, and small harbour development. The first part of the literature review on the impact of ocean economy financing was divided into two sections, the first presenting a discussion of the empirical literature from developed countries, the second reviewing the literature on developing countries.

What emerged from the literature review was that most of the studies are based on the role and the contribution of the ocean economy to economic growth, job creation, entrepreneurship, and international trade in both local and global contexts. The results

from the empirical literature on developed countries showed a positive relationship between their ocean economies and their GDP, unemployment, and entrepreneurship while providing little or no detailed evidence from assessments of the impact of investing on the ocean economy. Other studies were found to be lacking in details of the impact of ocean economy financing on the macroeconomic environment. The methodologies used in these studies included CBA, I-O, ECG, GMM multiple-regression, and linear regression. The discussion of the empirical literature on selected developing countries emphasised that the ocean economy of these countries has been underperforming, and continues to underperform due to a lack of viable infrastructure, various constraints on their development, and environmental issues that hinder the growth of the sector. The lack of available data for both developed and developing counties was shown to be a common factor hindering the clarity and depth of analyses of results from many of the studies reviewed.

Lastly, the review of the ocean sectoral literature showed aquaculture financing to have an insignificant effect on the economic growth of many countries and regions, while globally, particularly in developing countries, employment has been declining due to the sector being seasonal in providing employment. In the reviewed aquaculture sector is also seen as an underdeveloping sector in developing countries. And its impact on the macroeconomic environment is as yet unclear. The overall results are inconclusive

Most of the studies done on all of the ocean sectors mentioned in this chapter highlighted the significant potential of actual contribution to, and role of, ocean sectors in, the macro-economic environment. However, the studies found this contribution to be characterised by various constraints and environmental issues. However, there appeared to be general agreement amongst the authors of these studies that all of these sectors have the potential to contribute positively in the future to the macro-economic environment. The empirical literature review on marine transport and harbour infrastructure revealed that investing in infrastructure in these sectors plays, and could increasingly play, an important role in promoting and contributing to the growth of both local economies and the global economy, and international trade. The following chapter presents the research design, together with the methodology used to collect the data for the current study.

<div align="center">

**Chapter five**

**Research Methodology**

</div>

## 5.1 Introduction

The aim of this chapter presents a discussion of a research methodology that includes the various phases of the research, and the procedures are undertaken to empirically provide answers to the research hypothesis. This section outlines the methodology applied by the researcher to examine the macroeconomic impact of ocean economy financing on South African from 1994 to 2019. The Chapter is divided into three sections include, firstly, the research design, model specification, the definition of a variable, and data sources, followed by a description of the research techniques and diagnostic tests employed in this study, and lastly a concluding remarks.

## 5.2 Model Specification

In examining the macroeconomic impact of ocean economy financing in South Africa the researcher's choice of variables was informed by the objectives of the Operation Phakisa (2019) ocean economy initiative programme, and by literature review in the previous two chapters. The model used to examine the relationship between ocean economy financing and macroeconomic variables are specified in the following four functions whereby the GDP growth rate ($GDP_t$) is a function of ocean economy financing ($OEF_t$) business freedom ($BF_t$), government integrity ($GI_t$), lending rate ($LR_t$), and dummy variable financial crisis ($FC_t$) and Operation Phakisa ($OP_t$). These independent variables are also applicable with the three other models which are unemployment ($UNEM_t$), entrepreneurship ($ENTRE_t$) and total trade ($TRADE_t$). The models are presented in an equation format as follows:

$$GDP_t = \beta_0 + \beta_1 OEF_t + \beta_2 BF_t + \beta_3 GI_t + \beta_4 LR_t + \beta_5 FC_t + \beta_6 OP_t + \mu_t \dots\dots\dots(5.1)$$

$$UNEM_t = \beta_0 + \beta_1 OEF_t + \beta_2 BF_t + \beta_3 GI_t + \beta_4 LR_t + \beta_5 FC_t + \beta_6 OP_t + \mu_t \dots\dots(5.2)$$

$$ENTRE_t = \beta_0 + \beta_1 OEF_t + \beta_2 BF_t + \beta_3 GI_t + \beta_4 LR_t + \beta_5 FC_t + \beta_6 OP_t + \mu_t \dots\dots(5.3)$$

$$TRADE_t = \beta_0 + \beta_1 \sum OEF_t + \beta_2 BF_t + \beta_3 GI_t + \beta_4 LR_t + \beta_5 FC_t + \beta_6 OP_t + \mu_t \dots\dots(5.4)$$

- where:

$GDP_t$        the gross domestic product growth rate in South Africa

$UNEM_t$         the total unemployment rate in South Africa

$ENTRE_t$       percentage of self-employed in South Africa

$TRADE_t$      total trade as a percentage of GDP in South Africa

$OEF_t$          total government capital expenditure of ocean sectors which includes aquaculture,  coastal and marine tourism, marine protection and ocean governance, marine transport and manufacturing,  and small harbour development.

$BF$            business freedom in South Africa

$GI_t$           government integrity

$LR_t$           lending rate,

FC            dummy for the financial crisis (1 is for the years 2008 and 2009 when there was a financial crisis ad 0 for the other years)

OP           dummy for Operation Phakisa ( 1 for the period after operation Phakisa was incepted since 2014 and other years is 0)

$\mu_t$           error term

Where β0, β1 are coefficients of the explanatory variables, *t* represents time series and μ is the error term. The error term represents the influence of the omitted variables.

## 5.3 Explanation of variables

This study utilises annual data for the period, 1994 to 2019 with all variables related to South Africa.

***Ocean economy financing =*** Ocean Economy financing refers to government expenditure on the ocean sectors. These include the following: marine transport and manufacturing, offshore oil and gas exploration, aquaculture, marine protection services, ocean governance, coastal and marine tourism, and small harbours (Kildow and Colgan, 2005; Operation Phakisa, 2014). However, offshore oil and gas exploration is excluded because of the limited data. Therefore, the ocean economy financing is measured by the total government expenditure of five selected ocean sectors.

***GDP =*** The gross domestic product (GDP) is a monetary measure of the market value of all final goods and services produced in a given time period. The growth rate is the amount of increase or decrease of GDP from the previous measurement cycle. The

GDP growth rate is measured as the percentage increase or decrease of GDP from the previous measurement cycle (Mohr and Fourie, 2008).

*Unemployment* = the unemployment rate in South Africa is a measure of the underutilisation of the available labour supply. This also describes the inability of the economy to create employment for those who want to work but are not working (ILO, 2020). Unemployment is measured as a percentage of the unemployment rate in South Africa.

*Entrepreneurship =* Entrepreneurship refers to the activity of setting up a business or businesses and taking on financial risks in the hope of profit. It is measured in terms of TEA, which is the total early-stage entrepreneurship in South Africa (Herrington and Kew, n.d.). Because of the limited data on TEA, the study uses the total percentage of self-employed persons as a proxy to measure entrepreneurship in South Africa.

 *Total trade =* trade refers to international trade in goods and services between residents and non-residents (WTO, 2012). Total trade is measured as a percentage of  GDP.

*Business freedom =* refers to the freedom to do business, which also means the ease with which one can do business in South Africa. The ability to start and run a business in South Africa is used to measure business freedom.  It assesses the ability to start, operate, and close a business, and it represents the overall regulatory burden as well as the government's efficiency in the regulatory process. Business freedom is a broad measure of the effectiveness with which the government regulates business or businesses. The quantitative score is calculated using a variety of measurements of the difficulty of starting, operating, and closing a business (Friedman and Friedman, 1979).

*Government integrity =* refers to one of the most important determinants of trust in a country's government. Evidence suggests a link between the business community's and citizens' trust in politicians and the perception of corruption. Integrity policies aimed at preventing corruption and fostering high standards of behaviour help to strengthen the credibility and legitimacy of those involved in policy decision-making, while also protecting the public interest and restoring trust in the policymaking process. Economic freedom is eroded by corruption because it introduces insecurity and uncertainty into economic relationships (Weinreb, 2003).

**Lending rate =** The lending rate, also known as the interest rate, is the amount charged by lenders for a specific period expressed as a percentage of the amount lent or deposited (Jelilov, Chidigo and Onder, 2016).

**Aquaculture financing** = refers to government spending on aquaculture, whereas aquaculture is the farming of aquatic organisms such as fish, shellfish, and even plants. The cultivation of both marine and freshwater species is referred to as aquaculture, and it can range from land-based to open-ocean production. To measure aquaculture financing in South Africa the study uses government expenditure on aquaculture (National Treasury, 2020).

**Coastal and marine tourism financing** = refers to government expenditure on coastal and marine tourism. Coastal tourism refers to land-based tourism activities such as swimming, surfing, sunbathing, and other coastal recreation activities that take place on the coast and are dependent on proximity to the sea, as well as their respective services. Marine tourism, on the other hand, refers to sea-based activities such as boating, yachting, cruising, and nautical sports, as well as the land-based services and infrastructure that support them (Stelzenmuller *et al.,* 2013). The measurement for this variable is government expenditure on tourism in South Africa (National Treasury, 2020).

**Small harbour development financing** = refers to government expenditure on small harbour development. Small harbours, which are located along with the coastal water-land border interface and primarily support the nearshore and offshore industries of fishing, aquaculture, and other maritime economic activities. A harbour is a protected body of water where ships, boats, and barges can dock. The terms harbour and port are frequently used interchangeably. A port is a man-made facility built for loading and unloading vessels as well as dropping off and picking up passengers. Ports are usually made up of one or more harbours (South Africa, Department of Transport, 2018). The proxy used to measure small harbour development is government expenditure on marine and coastal management (National Treasury, 2020).

**Marine transport and manufacturing financing** = refer to government expenditure on marine transport and manufacturing. While marine transport and manufacturing refer to the activities of building ocean vessels, offshore fixed and floating equipment made of metals or nonmetals, as well as repairing and dismantling ocean vessels. This

also includes activities such as carrying out and serving sea transportations with vessels as main vehicles, such as ocean-going passenger transportation, auxiliary water transportation, pipeline transportation, loading, unloading, and transport, as well as other transportation and service activities. The measurement of the variable is government expenditure on marine transport in South Africa (National Treasury, 2020).

***Marine protection and ocean governance financing*** = refer to government expenditure on marine protection and ocean governance. Furthermore, marine protection and ocean governance encompass the rules, institutions, processes, agreements, arrangements, and activities used to manage the use of the ocean for commercial or recreational purposes. The proxy used to measure the variable is government expenditure on marine defence (National Treasury, 2020).

## 5.4 Data sources

The three sources of data utilised for the current study are the World Bank, National Treasury, and the Heritage fund.

## 5.5 Expected signs

**Table 5.1: Shows the expected signs of the variables**

| VARIABLES | EXPECTED SIGN | EXPLANATION |
|---|---|---|
| OEF | +/- | *While the ocean economy financial will increase economic activities, promote entrepreneurship and total trade, it has a negative impact on unemployment. Ocean economy financing includes other related ocean sectors, such as aquaculture, maritime transport, coastal and marine tourism, marine protection and ocean governance, and small harbour development financing (Kildow and Colgan, 2005; Colgan, 2013; Sumaila et al., 2021).* |
| BUSINESS FREEDOM | +/- | *Overall ease of doing business has a positive effect on business creation. Therefore, the index of business freedom is statistically significant and positively related to growth. This means that less business regulation experience results in high total factor productivity, reduce high unemployment rates, and promotes entrepreneurship. In addition, relaxing regulations can also improve trade (Aghion 2004; Fonseca et al., 2001)* |
| GOVERNMENT INTEGRITY | +/- | *This has either a positive or a negative expected effect on economic growth, entrepreneurship, total trade, and unemployment. A high degree of government integrity significantly promotes economic activities, entrepreneurial spirit, and total trade, while it has a negative effect on* |

| | | |
|---|---|---|
| | | *unemployment and vice versa (Aidt, 2003; Pak Hung, 2001; Levchenko, 2009),* |
| LENDING RATE | +/- | *This is expected to affect economic growth either positively or negatively. Decreasing the lending rate due to expansionary monetary policy may stimulate the economy because of increased economic activities, while a higher lending rate can lead to a fall in the rate of economic growth. In addition, lower economic growth can cause a high rate of unemployment. Therefore, a high lending rate is positively related to a high rate o* |
| | | *f unemployment. A high lending rate is also detrimental to entrepreneurship and exports, which reduces total trade (Jelilov et al., 2016; Jelilov and Onder, 2016; Kohler and Saville, 2011).* |

## 5.6 Research techniques

Economic analysis suggests that there is a long-run relationship between variables under consideration. This indicates that the long-run relationship properties are still intact. In other words, the means and variances remain constant over time. However, most empirical research has shown that when analysing time series variables, the consistency of the means and variances is not satisfied. In the event that this problem is solved, most cointegration techniques are incorrectly applied, estimated, and interpreted. The Autoregressive Distributed Lag (ARDL), a cointegration or bound cointegration technique, is one of these techniques. As a result, this study examines the issues surrounding the application, estimation, and interpretation of cointegration techniques within the context of an ARDL cointegration framework.

### 5.7 Testing for Stationary

The majority of time series analysis modelling techniques are primarily concerned with data stationarity. The first step in such an analysis is to look at the properties of the series and confirm them statistically. Stationarity is the quality of a process in which the statistical parameters (mean and standard deviation) remain constant over time. The value of the covariance between two time periods is determined solely by the distance, gap, or lag between the time periods, not by the time at which the covariance is computed (Gujarati, 2004). The autocorrelation function (ACF) based on lag alone is the most important property of a stationarity process; it does not change the time at which the function was calculated. The classical regression assumption states that both the dependent and independent variables must be stationary and that the errors must have a zero mean and a finite variance (Brooks, 2008).

A non-stationary time series will have a time-varying mean or variance, or both. If a non-stationary series must be differenced d times before becoming stationary, it is said to be integrated into the order d. This would be written in form I (d). An I (0) series is a stationary series, whereas an I (1) series has a single unit root. Because an I (2) series has two-unit roots, this series would require differencing twice to achieve stationarity (Gujarati, 2005).

The following are the reasons why data should be tested for stationarity: First, series can have a strong influence on their behaviour and properties; second, failing to test the data can result in spurious regression problems, which means that if two variables are trending over time, a regression of one on the other could have a high R squared even if the two variables are completely unrelated; and third, the standard assumption for asymptotic analysis will be invalid. As a result, the standard t-ratio will not follow a t-distribution, and the F-statistic will not follow an F-distribution, making a hypothesis test about the regression parameter invalid (Brooks, 2008). Data unit root testing is necessary before estimating an econometric model because an unidentified unit root can lead to spurious regressions, which can lead to bias in the results. Spurious regressions are situations in which non-stationarity produces results that establish a causal relationship between variables that do not exist in reality (Noriega and Ventosa-Santaularia, 2011). As a result, the unit root tests in this case are critical in the adoption of a model to analyse data. For the purpose of robustness, this study employs the

most commonly used Augmented Dickey-Fuller (ADF) test, the Phillips Perrons (PP) test, and the Dickey-fuller GLS(ERS) test unit root test.

### 5.7.1   The Augmented Dickey-Fuller test

The ADF test is a modified version of the Dickey-Fuller test and is used to address more complex models, notably unknown ordered $ARMA_{(p,q)}$ models (Said and Dickey, 1984). The ADF test evaluates the null hypothesis that a time series is nonstationary (I (1) or more against an alternative that the series has no unit root.

The ADF test is a stricter version of the DF test. The ADF test estimates three models for each of the variables, as shown below:

The equation with no constant and no trend is represented by:

$\Delta Y_t = \gamma\ y_{t-1} \sum_{i=2}^{a} \beta_i\ \Delta y_{t-1+1} + \mu_t$...........................................................................(5.1)

The equation with a constant and no trend is represented by:

$\Delta y_t = a_0 + \gamma\ y_{t-1} + \sum_{i=2}^{a} \beta_i\ \Delta y_{t-1+1} + \mu_t$...............................................................(5.2)

The equation with both a trend and a constant is given by:

$\Delta y_t = a_0 + \gamma\ y_{t-1}\ a_2 \sum_{i=2}^{a} \beta_i \Delta y_{t-1+1} + \mu_t$..............................................................(5.3)

In these models:

$= \gamma - (1 - \sum_{i=1}^{a} \alpha_i)$ ................................................................. (5.4)

And

$\beta = - \sum_{i=1}^{a} \alpha_i$...................................................................... (5.5)

The ADF test corrects for high-order serial correlation by introducing a lagged differenced term on the right side of the DF equations. The null hypothesis ($\gamma = 0$) and alternative hypothesis for the ADF test are the same as that of the DF test. In both tests, if the calculated statistic is less (in absolute terms) than the MacKinnon (1991:117) values used by the E-views software, the null hypothesis is accepted, implying that the series has a unit root. To put it another way, it means that the time series is not stationary. When the calculated statistic exceeds the MacKinnon critical values, the opposite is true. However, in this ADF equation, the coefficient of interest is $\gamma$, if $\gamma = 0$. Because the equation is entirely in the first difference form, there is no unit root. If a difference equation's coefficients add up to one, at least one characteristic root has unity. In these equations, if $\sum \alpha i$i =1, $\gamma = 0$, then the system has a unit root.

After that, the calculated ADF value is compared to the critical value. If the calculated value exceeds the critical value, the null hypothesis that the series has a unit root is rejected, confirming that the series is stationary. According to Gujarati (2004), an important assumption of the DF test is that the error terms are distributed independently and identically. The ADF test modifies the DF test to account for possible serial correlation in the error terms by including the regress's lagged difference terms.

The Dickey-Fuller test, like other unit root tests, has its own set of flaws. According to Gujarati (2002), most Dickey-Fuller tests have low power, which means they accept the null hypothesis of unit root more frequently than is warranted. As a result, even if no unit root exists, these may find one. Power is determined by the time span of the data rather than the size of the sample. Furthermore, the Dickey-Fuller test has a poor ability to detect a false null hypothesis.

The DF test has a flaw in that it does not account for possible autocorrelation in the error processor term. According to Lopez, Montanes and Reyes(1998), a well-known weakness of the Dickey-Fuller style unit root test with I (1) as a null hypothesis is the potential misinterpretation of structural breaks in the series as evidence of non-stationarity. According to Blungmart (2000), the Dickey-Fuller test has a flaw in that it does not account for possible autocorrelation in the error process. If the data is auto-correlated, the OLS estimates of the coefficients will be inefficient, and the t-ratios will be skewed.

### 5.7.2   Philips Peron test

Phillips and Perron (1988) created a number of unit root tests that have become popular in financial time series analysis. The main difference between the Phillips-Perron (PP) unit root tests and the ADF tests is how they handle serial correlation and heteroskedasticity in the errors. Whereas the ADF tests use a parametric autoregression to approximate the ARMA structure of the test regression errors, the PP tests ignore any serial correlation in the test regression. The test regression for the PP tests is :

$$\Delta Y_t = \beta_0 D_t + \pi Y_t - 1 + \upsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(5.6)$$

- where

$\upsilon_t$ is I(0) and maybe heteroskedasticity. The PP tests correct for any serial correlation and heteroskedasticity in the errors $\upsilon_t$ of the test regression by directly modifying the test statistics $t_\pi$ =0 and $T_\pi$ . These modified statistics denoted $Z_t$ and $Z_\pi$.

Under the PP test, the null hypothesis that is π = 0, the PP $Z_t$ and $Z_\pi$ statistics have the same asymptotic distributions as the ADF t-statistic and normalised bias statistics. One advantage of the PP tests over the ADF tests is that the PP tests are robust to general forms of heteroskedasticity in the error term $\upsilon_t$. Another advantage is that the user does not have to specify a lag length for the test regression.

Perron and Phillips (1986) developed a broader theory of unit root non-stationarity. The tests are similar to ADF tests, but they include an automatic correction to the DF procedure to accommodate auto-correlated residuals. The Phillips-Perron (PP) test, according to Gujarati (2004), employs a non-parametric statistics method to account for serial correlation in error terms without the addition of lagged difference terms. The tests frequently yield the same results as and have many of the same significant limitations as, the ADF tests (Brooks, 2008).

**5.7.2.1 A critique of Augmented Dickey-Fuller (ADF) and Philips-Peron (PP) tests**

According to Brooks (2008), the most significant criticism of unit root tests is that their power is low if the process is stationary but has a root close to the non-stationary boundary. Consider, for instance, an AR (1), data generating process with coefficient 0.95: if the true data generating process is = 0.95 -1 the null hypothesis of a unit root should be rejected. It has thus been argued that if the analysis of the tests is poor at one of the reasons that could contribute to that is the small sample size (Davidson, and MacKinnon, 2004).

Brooks (2008) goes on to argue that the source of this problem is that the null hypothesis is never accepted in the classical hypothesis-testing framework; it is simply stated that it is either rejected or not rejected. This means that a failure to reject the

null hypothesis could occur for one of two reasons: the null hypothesis was correct, or there was insufficient information in the sample to allow rejection.

The ADF and PP tests are asymptotically equivalent, but they may differ significantly in finite samples due to differences in how they correct for serial correlation in the test regression. In particular, Schwert (1989) found that, if $\Delta y_t$ has an ARMA representation with a large and negative MA component, then the ADF and PP tests are severely size distorted (reject I(1) null much too often when it is true) and that the PP tests are more size distorted than the ADF tests. More recently, Perron and Ng (1996) have suggested useful modifications to the PP tests to mitigate this size distortion.

The ADF and PP tests, in general, have very low power against I(0) alternatives that are close to being I(1). That is, unit root tests cannot reliably distinguish highly persistent stationary processes from nonstationary processes. Furthermore, as deterministic terms are added to the test regressions, the power of unit root tests decreases. That is, tests with a constant and a trend in the test regression have less power than tests with only a constant in the test regression. For maximum power against very persistent alternatives, the recent tests proposed by Elliott, Rothenberg, and Stock (1996) and Ng and Perron (2001) should be used for maximum power against very persistent alternatives. The following section describes these tests.

### 5.7.3   Dickey-fuller GLS(ERS) test

When the autoregressive root is large but less than one, the DF-GLS test has higher power than the ADF test, according to three researchers, Elliott *et al.* (1996). That is, when the sample data comes from a time series that is close to being integrated, the DF-GLS has a higher probability of rejecting the false null of a stochastic trend. When GLS estimates of the deterministic components are used to obtain the detrended version of the original series, the DF-GLS test looks for an autoregressive unit root in the detrended series. Elliott *et al.* (1996) proposed an efficient test by modifying the Dickey-Fuller test statistic with a generalised least squares (GLS) reasoning. They show that this modified test has the best overall performance in terms of small sample size and power, decisively outperforming the standard Dickey-Fuller test. Elliott *et al.* (1996:33) discovered that their "DF-GLS" test "has significantly improved power when an unknown mean or trend is present." In the construction of the ERS feasible point,

optimal test the unknown parameters β of the trend function are efficiently estimated under the alternative model with

$\overline{\varphi}$ =1 + $\overline{c}$/ T. That is, β $\overline{\varphi}$ = ( $\grave{D_\varphi}D_\varphi)^{-1}\grave{D_\varphi}\grave{y_\varphi}$. ERS used this insight to derive an efficient version of the ADF t-statistic, which they call the DF-GLS test. They constructed this t-statistic as follows. First, using the trend parameters β $\overline{\varphi}$ estimated under the alternative, define the detrended data.

$$y_t^d = y_t - β \overline{\varphi}\ D_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.5.7$$

ERS called this detrending procedure GLS detrending . Next, using the GLS detrended data, the estimate by least-squares the ADF test regression which omits the deterministic terms.

$$Δy_t^d = πy_{t-1}^d + \sum_{j-1}^{p} Δy_{t-1}^d + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.. \dots.5.8$$

and compute the t-statistic for testing π = 0. When $D_t$= 1, ERS shows that the asymptotic distribution of the DF-GLS test is the same as the ADF t-test but has higher asymptotic power (against local alternatives) than the DF t-test. Furthermore, ERS showed that the DF-GLS test has essentially the same asymptotic power as the ERS point optimal test when $\overline{c}$ = −7. When $D_t$= (1, t) the asymptotic distribution of the DF-GLS test, however, is different from the ADF t-test. ERS and Ng and Perron (2001) provide critical values for the DF-GLS test in this case. ERS shows that the DF-GLS test has the same asymptotic power as the ERS point optimal test with c = −13.5 and has higher power than the DF t-test against local alternatives. The DF-GLS t-test may be computed using the function unit root with method ="DFGLS".

## 5.8 Cointegration test

Cointegration can be used to model time series in order to preserve their long-run information. Granger (1981) and Engle and Granger (1987) were the first to formalise the concept of cointegration, developing tests and estimation procedures to assess the presence of a long-run relationship between sets of variables within a dynamic specification framework. The Co-integration test investigates how time series that are individually non-stationery and drift far from equilibrium can be paired in such a way that the workings of equilibrium forces ensure they do not drift too far apart.  That is, cointegration entails a stationary linear combination of variables that are individually

non-stationary but integrated to an order, I. (d). Cointegration is an econometric concept that simulates the existence of a long-run equilibrium among underlying economic time series as they converge over time. As a result, cointegration provides a more solid statistical and economic foundation for an empirical error correction model that combines short-run and long-run information in modelling variables. Cointegration testing is a necessary step in determining whether a model empirically exhibits meaningful long-run relationships. If the model fails to establish cointegration among underlying variables, it is necessary to continue working with variables in differences. However, in this case, the long-term data will be missing. Other than the Engle and Granger (1987) procedure, there are several cointegration tests.

The presence of a long-run relationship between variables is referred to as cointegration. There are several methods for establishing cointegration that is currently available. The current study employs the ARDL approach, which was pioneered by Feridun (2007) and Tzougas (2010) in their research. In terms of small sample data and variable order integration, the ARDL model differs from conventional models such as those of Engle and Granger (1987) and Johansen (1988). The ARDL model, in particular, can be used to examine a small data sample rather than using conventional methods, which are more reliable for larger data samples. Variables also show different levels of integration that can be used in the ARDL model. The ARDL model can be applied to variables of order zero I(0), one (I(1)), but not of order equal to or greater than two (I(2)) (Alimi, 2014). Pesaran Shin and Smith (2001) provide two critical values for the cointegration test. The lower critical bound assumes that all variables are I(0), implying that there is no cointegration relationship between the variables under consideration. The upper bound assumes that all the variables are $I(1)$, meaning that there is cointegration among the variables. When the computed $F$-statistic is greater than the upper bound critical value, then the H0 is rejected, meaning that the variables in the model are cointegrated). If the $F$-statistic is below the lower bound critical value, then the H0 cannot be rejected (meaning that there is no cointegration among the variables). When the computed Wald-test $F$-statistic falls between the lower and upper bound, this indicates that the results are inconclusive, meaning that the relationship between the variables cannot be ascertained.

This model takes sufficient numbers of lags to capture the data generating process in a general to specific modelling framework. A dynamic error correction model (ECM)

can be derived from ARDL through a simple linear transformation. Likewise, the ECM integrates the short-run dynamics with the long-run equilibrium without losing long-run information and avoids problems such as spurious relationship resulting from non-stationary time series data.

To illustrate the ARDL modelling approach, the following simple model can be considered:

$$GDP_t = \beta_0 + \beta_1 OEF_t + \beta_2 BF_t + \beta_3 GI_t + \beta_4 LR_t + \beta_5 FC_t + \beta_6 OP_t + \mu_t \ldots\ldots\ldots 5.8$$

$$UNEM_t = \beta_0 + \beta_1 OEF_t + \beta_2 BF_t + \beta_3 GI_t + \beta_4 LR_t + \beta_5 FC_t + \beta_6 OP_t + \mu_t \ldots\ldots 5.9$$

$$ENTRE_t = \beta_0 + \beta_1 OEF_t + \beta_2 BF_t + \beta_3 GI_t + \beta_4 LR_t + \beta_5 FC_t + \beta_6 OP_t + \mu_t \ldots\ldots 5.10$$

$$TRADE_t = \beta_0 + \beta_1 OEF_t + \beta_2 BF_t + \beta_3 GI_t + \beta_4 LR_t + \beta_5 FC_t + \beta_6 OP_t + \mu_t \ldots\ldots 5.11$$

The error correction version of the ARDL model is given by:

$$\Delta GDP_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta GDP_{t-i} + \sum_{i=1}^{p} \beta_2 \Delta OEF_{t-i} + \sum_{i=1}^{p} \beta_3 \Delta BF_{t-i} + \sum_{i=1}^{p} \beta_4 \Delta GI_{t-i} +$$
$$\sum_{i=1}^{p} \beta_5 \Delta LR_{t-i} + \sum_{i=1}^{p} \beta_6 \Delta FC_{t-i} + \sum_{i=1}^{p} \mu_t \Delta OP_{t-i} + \alpha_1 GDP_{t-i} + \alpha_2 OEF_{t-i} + \alpha_3 BF_{t-i} +$$
$$\alpha_4 GI_{t-i} + \alpha_5 LR_{t-i} + \alpha_6 FC_{t-i} + \alpha_7 OP_{t-i} +$$
$$\varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 5.12$$

$$\Delta UNEM_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta UNEM_{t-i} + \sum_{i=1}^{p} \beta_1 \Delta OEF_{t-i} + \sum_{i=1}^{p} \beta_3 \Delta BF_{t-i} +$$
$$\sum_{i=1}^{p} \beta_4 \Delta GI_{t-i} + \sum_{i=1}^{p} \beta_5 \Delta LR_{t-i} + \sum_{i=1}^{p} \beta_6 \Delta FC_{t-i} + \sum_{i=1}^{p} \mu_t \Delta OP_{t-i} + \alpha_1 UNEM_{t-i} +$$
$$\alpha_2 OEF_{t-i} + \alpha_3 BF_{t-i} + \alpha_4 GI_{t-i} + \alpha_5 LR_{t-i} + \alpha_6 FC_{t-i} + \alpha_7 OP_{t-i} + \varepsilon_t \ldots\ldots\ldots\ldots 5.13$$

$$\Delta ENTRE_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta ENTRE_{t-i} + \sum_{i=1}^{p} \beta_2 \Delta OEF_{t-i} + \sum_{i=1}^{p} \beta_3 \Delta BF_{t-i} +$$
$$\sum_{i=1}^{p} \beta_4 \Delta GI_{t-i} + \sum_{i=1}^{p} \beta_5 \Delta LR_{t-i} + \sum_{i=1}^{p} \beta_6 \Delta FC_{t-i} + \sum_{i=1}^{p} \mu_t \Delta OP_{t-i} + \alpha_1 ENTRE_{t-i} +$$
$$\alpha_2 OEF_{t-i} + \alpha_3 BF_{t-i} + \alpha_4 GI_{t-i} + \alpha_5 LR_{t-i} + \alpha_6 FC_{t-i} + \alpha_7 OP_{t-i} + \varepsilon_t \ldots\ldots\ldots\ldots 5.14$$

$$\Delta TRADE_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta TRADE_{t-i} + \sum_{i=1}^{p} \beta_2 \Delta OEF_{t-i} + \sum_{i=1}^{p} \beta_3 \Delta BF_{t-i} +$$
$$\sum_{i=1}^{p} \beta_4 \Delta GI_{t-i} + \sum_{i=1}^{p} \beta_5 \Delta LR_{t-i} + \sum_{i=1}^{p} \beta_6 \Delta FC_{t-i} + \sum_{i=1}^{p} \mu_t \Delta OP_{t-i} + \alpha_1 TRADE_{t-i} +$$
$$\alpha_2 OEF_{t-i} + \alpha_3 BF_{t-i} + \alpha_4 GI_{t-i} + \alpha_5 LR_{t-i} + \alpha_6 FC_{t-i} + \alpha_7 OP_{t-i} + \varepsilon_t \ldots\ldots\ldots\ldots 5.15$$

The first part of the equation with β and $\mu$ represents the short-run dynamics of the model. The second part with $\alpha$ represents a long-run relationship. The null hypothesis

in the equation is $\alpha_0 + \alpha_1 + \alpha_2 + \alpha_3 + \alpha_4 + \alpha_5 + \alpha_6 + \alpha_7 = 0$, which means the non-existence of a long-run relationship.

## 5.9 Diagnostic test

The ARDL model tries to find the best linear unbiased estimator (BLUE), and therefore diagnostic tests need to be conducted. Diagnostic tests are a series of evaluations that examine the stochastic model components for the validation of estimated model outcomes. As a result, checks are performed to ensure that issues such as normality, heteroscedasticity, serial correlation, and stability are investigated (Greene, 2008; Gujarati and Sangeetha, 2007). The Breusch-Pagan-Godfrey, Breusch-Godfrey Serial Correlation LM Test, Jarque-Bera, and Specification tests were among the econometric tools used (Ramsey RESET test).

### 5.9.1   Jarque–Bera test

This study adopts the Jarque-Bera test, developed by Jarque and Bera (1980). This test is used to test whether the residuals are normally distributed within the series. Therefore, the Jarque-Bera test of the null hypothesis of the normal distribution is written as follows:

$$JB = \frac{N}{6}\left(S^2 + \frac{(K-3)}{4}\right) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad 5.16$$

In this equation, JB is the abbreviation for Jarque-Bera, S is the Skewness, and K is the Kurtosis (In'nami and Koizumi 2009). As a result, non-normality may cause issues with the statistical inference of coefficient estimates, such as significance tests, and confidence intervals that rely on the normality assumption (Brooks 2014). The following is a very general null and alternative hypothesis: H0 indicates that the residuals are normal; H1 indicates that the residuals are non-normal.

### 5.9.2   Serial correlation Lagrange Multiplier (LM) test

Before proceeding with the use of ARDL model estimation results, it is critical to check for serial correlation and stability. A situation in which the residuals are correlated is known as serial correlation. Estimates are biased and inconsistent when residuals are correlated.

The Breusch–Godfrey serial correlation Lagrange Multiplier (LM) test, for example, rejects the presence of serial correlation in the residual. The Breusch-Godfrey serial correlation test must be used to check. The null hypothesis ($H_o$) claims that there is no autocorrelation, while the alternative hypothesis ($H_1$) claims the opposite. The decision rule states that the null hypothesis ($H_0$) should be rejected if the p-value of the observed R-squared is less than the 0.05 level of significance.

### 5.9.3   Heteroscedasticity

The Breusch–Pagan–Godfrey test is used to check the model's heteroscedasticity. The null hypothesis of this test is that the series contains homoscedasticity. So, if this test fails to reject the null hypothesis, there is no heteroscedasticity in the model's residuals (Breusch and Pagan, 1979).To do so, we fit the following equation:

$$Y_t = \beta_1 + \beta_2 X_1 + \beta_3 Z_1 + \varepsilon_1 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots5.17$$

- where ε is the residual and $\beta$ are the estimated parameters in the equation. The residuals are further tested for checking the heteroskedasticity of the residuals if there is any. The acceptance of the null hypothesis that there are no serial correlations (autocorrelation) documents that the semi-log model is valid, and that the results obtained are of sufficient validity (Breusch and Pagan, 1979). The diagnostic test is for heteroscedasticity where the null hypothesis ($H_0$) claims that residuals are homoscedasticity, and the alternative hypothesis claims that the residuals are heteroscedastic, and thus the variance is not constant. The rejection rule states that the null hypothesis should be rejected if the probability value of observation R-squared is less than the 0.05 level of significance

### 5.9.4   Ramsey RESET test

Ramsey (1969) proposed the Regression Specification Error Test (RESET). It is a general linear regression model specification test. It specifically examines whether non-linear combinations of the fitted values aid in explaining the response variable. The Ramsey RESET test is used to test specification errors and the model's linearity. If the model's test p-value is significant, the test suggests that the model is well specified. This test's null hypothesis is that the model is correctly specified.

## 5.10   Concluding remarks

This chapter discussed the stages and methods that the study uses to generate empirical results. The chapter introduced four econometric regression analyses together constituting the basic model for estimating the impact of ocean economy financing on economic growth, unemployment, entrepreneurship, and total trade in South Africa from the 1994 to 2019 period.

The chapter discussed the importance of time-series stationarity and the unit root tests thereof. It showed how data that contain a unit root can lead to false conclusions due to spurious results obtained. Hence, the rationale for utilising unit root tests is to identify any unit roots and order of differencing. Thus, the chapter offered reasons why ADF, PP, and GLS tests are critical steps in this research. Data diagnostic tests are also considered to constitute a further step in addressing and/or correcting biased results. The diagnostic tests include the Jarque-Bera test, the Breusch-Godfrey serial correlation LM test, and the Breusch-Pagan-Godfrey test, all of which evaluate normality, serial correlation, functional form, and heteroscedasticity.  Moreover, the reason for adopting stability tests was given in terms of checking the stability of the models described and specified in this chapter.

Based on previous models and studies described and discussed in the theoretical and empirical literature review chapters (Chapters three and four) the current study adopted the ARDL model for cointegration purposes. The ARDL model overwhelmingly fits the data due to its ability to estimate using small size samples and accounting for time series with differencing order zero or one but not more than two. This decision to use this model was based on the cointegration of the variables being essential in determining the existence of a relationship amongst the variables for further tests of causality. Lack of cointegration leads to the rejection of the existence of a long-run relationship and the adoption of the short-run dynamic model.  These steps discussed in this chapter and their adoption and implementation for purposes of the current research are described and discussed in Chapter 5 in terms of obtaining results that are hoped to lead to informed and valuable conclusions as well as policy recommendations.

# Chapter Six

## Presentation and analysis of results and discussion

### 6.1 Introduction

The preceding chapter described and discussed the methodological framework adopted for the study to answer the research questions. These methodological steps are described in detail in this chapter using time series annual data from 1994 to 2019, the period on which the current study focuses. The chapter has four sections. The first presents descriptive statistics; this is followed by a presentation of unit root test results. The third section presents the bound and ARDL tests results both in the long and short run. The chapter concludes by presenting the diagnostic test and concluding remarks.

### 6.2 Descriptive Statistics

Table 6.1 shows the statistical synopsis of variables used in this research, namely GDP, unemployment, entrepreneurship, trade, ocean economy financing, business freedom, government integrity, and lending rate.

**Table 6.1: Descriptive results**

| | GDP | UNEM | ENTR | TRADE | OEF | B_FREEDOM | LGOV_INTEGRITY | LENDING_RATE | AQUA | CMT | MPOG | MTM | SHD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean | 2.66 | 24.31 | 16.84 | 55.85 | 21.46 | 74.52 | 3.85 | 13.09 | 17.54 | 19.53 | 21.01 | 18.26 | 19.06 |
| Median | 2.82 | 24.68 | 17.06 | 56.98 | 21.36 | 72.65 | 3.86 | 11.50 | 17.54 | 19.79 | 20.96 | 18.20 | 19.45 |
| Maximum | 5.60 | 29.10 | 22.70 | 72.86 | 22.60 | 85.00 | 4.04 | 21.79 | 18.21 | 20.91 | 22.27 | 18.80 | 20.55 |
| Minimum | -1.53 | 16.90 | 14.12 | 40.76 | 19.31 | 62.00 | 3.68 | 8.50 | 16.46 | 17.67 | 18.15 | 17.54 | 17.28 |
| Std. Dev. | 1.73 | 2.55 | 1.938 | 7.48 | 0.87 | 7.18 | 0.09 | 3.89 | 0.44 | 1.087 | 1.058 | 0.39 | 0.97 |
| Skewness | -0.31 | -0.81 | 1.07 | -0.07 | -0.72 | 0.38 | 0.06 | 0.70 | -0.36 | -0.509 | -1.26 | -0.19 | -0.46 |
| Kurtosis | 2.83 | 4.24 | 4.28 | 2.64 | 3.07 | 2.046 | 2.67 | 2.33 | 2.54 | 1.758 | 4.71 | 1.96 | 1.89 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| J-B | 0.46 | 4.54 | 6.75 | 0.16 | 2.27 | 1.61 | 0.12 | 2.60 | 0.80 | 2.79 | 10.16 | 1.32 | 2.25 |
| Proba | 0.79 | 0.10 | 0.03 | 0.92 | 0.32 | 0.44 | 0.93 | 0.27 | 0.66 | 0.24 | 0.00 | 0.51 | 0.32 |
| | | | | | | | | | | | | | |
| Sum | 69.11 | 632.14 | 437.88 | 1452.11 | 558.04 | 1937.60 | 96.37 | 340.52 | 456.08 | 507.92 | 546.27 | 475.01 | 495.64 |
| Sum Sq. Dev. | 74.82 | 163.08 | 93.90 | 1401.04 | 19.19 | 1289.46 | 0.19 | 378.90 | 4.967 | 29.58 | 28.03 | 3.80 | 23.63 |
| | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 |

Source: Author's own computation using World Bank, Heritage Foundation and National Treasury, (2020)

Table 6.1 shows the descriptive statistics. GDP has a mean value of 2.66 %, unemployment 24.31 %, entrepreneurship 16.84 %, total trade 55.85 %, ocean economy financing 21.46 %, business freedom 74.52 %, government integrity 3.85 %, lending rate 13.09 %, aquaculture financing 17.54 %, coastal and marine tourism financing 19.53 %, marine protection and ocean governance financing 21.01%, maritime transport and manufacturing 18.26 %, and small harbour development a mean value of 19.06 %. Each of these mean values represents the average of the annual values between 1994 to 2019.

GDP has the standard deviation value of 1.73 %, which is almost the size of the mean. This means that there is a wide deviation from the mean. Unemployment is 2.55 %, entrepreneurship 1.93 %,  total trade 7.48 %, ocean economy financing 0.87 %, coastal and marine tourism financing 1,08 %, marine protection and ocean governance financing 1.05 %, maritime transport and  manufacturing financing 0.39 %, small harbour development financing 0.79, aquaculture financing 0.44 %, business freedom 7.18 %, government integrity 0.09 % ,and the lending rate is 3.89 %. These values are almost the size of the means, and they all show a narrow deviation from the mean.

GDP has a skewness value of -0.31 %, total trade is -0.07 % and unemployment is -0.81 %.  This means that the skewness has the long-left tail, entrepreneurship is 1.07 %, which means that the skewness has the long right tail, while aquaculture financing is 0.31%, business freedom is 0.47 %, government integrity is 0.29 %, and the lending rate 0.70 %.  Thus, all are normally distributed.

GDP has the kurtosis value of 2.83 %, total trade 2.64 %, aquaculture financing 2.54 %, business freedom 2.04 %, government integrity 2.67 %, the lending rate 2.33 %, coastal and marine tourism 1.75 %, ocean economy financing 2.27 %, maritime transport and manufacturing 1.96 %,  and small harbour development 1.89. All of these are normally distributed,   while the kurtosis value of unemployment is 4.24 %, entrepreneurship 4.28 %, while marine protection and ocean governance are 4.71% are leptokurtic.

GDP has the Jargue-bera value of 0.46,  total trade the value of 0.16,  ocean economy financing 2.27, business freedom 1.61,  government integrity 0.12, lending rate 2.60,

aquaculture financing 0.80, coastal and marine tourism financing 2.79 %, maritime transport and manufacturing financing 1.32, and small harbour development financing is 2.25. The probability value is greater than 5% which means that the series is normally distributed, while unemployment is 4.54 %, the probability is not greater than 5%, and the series is not normally distributed. Entrepreneurship is 6.75 and aquaculture financing is 0.81, and all their probabilities are greater than 5%, which means that they are normally distributed.

**Table 6.2: Pairwise correlation matrix**

| | GDP | UNEM | ENTR-EP | TRADE | OEF | BF | GI | LR | AQU | CMT | MPOG | MTM | SHD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP | 1 | | | | | | | | | | | | |
| UNEM | -0.42 | 1 | | | | | | | | | | | |
| ENTREP | 0.55 | -0.15 | 1 | | | | | | | | | | |
| TRADE | -0.71 | 0.29 | -0.36 | 1 | | | | | | | | | |
| OEF | -0.54 | 0.51 | -0.68 | 0.63 | 1 | | | | | | | | |
| BUS_ FREEDOM | 0.11 | -0.61 | 0.04 | -0.60 | -0.67 | 1 | | | | | | | |
| GOV_ INTEGRITY | 0.01 | -0.29 | 0.37 | -0.66 | -0.72 | 0.60 | 1 | | | | | | |
| LENDING_ RATE | 0.11 | -0.38 | 0.36 | -0.63 | -0.74 | 0.69 | 0.78 | 1 | | | | | |
| AQUA | 0.50 | 0.12 | 0.66 | -0.16 | -0.47 | -0.15 | 0.16 | 0.24 | 1 | | | | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CMT | -0.55 | 0.57 | -0.59 | 0.59 | 0.95 | -0.71 | -0.63 | -0.75 | -0.45 | 1 | | | |
| MPOG | -0.55 | 0.54 | -0.69 | 0.61 | 0.99 | -0.63 | -0.71 | -0.70 | -0.50 | 0.93 | 1 | | |
| MTM | -0.47 | 0.43 | -0.61 | 0.58 | 0.77 | -0.50 | -0.53 | -0.82 | -0.50 | 0.80 | 0.71 | 1 | |
| SHD | -0.33 | 0.41 | -0.57 | 0.58 | 0.70 | -0.53 | -0.69 | -0.76 | -0.35 | 0.71 | 0.73 | 0.818 | 1 |

Source: Author's own computation using World Bank, Heritage Foundation and National Treasury, (2020)

Table 6.2 shows a pairwise correlation matrix's among variables used in the study. The data presented in table 6.2

There is a positive relationship between government and itself, and this is theoretically supported. However, there is a negative relationship between ocean economy financing and economic growth, unemployment, total trade, coastal and marine tourism financing, marine protection and ocean governance financing, maritime transport and manufacturing financing, and small harbour development financing.

Business freedom is positively related to economic growth and entrepreneurship but negatively related to total trade and unemployment. The positive relationship between Business freedom, and economic growth and entrepreneurship, is supported by empirical and theoretical underpinnings (Scully, 2002). Further, the negative relationship between business freedom and unemployment is also supported by the empirical and theoretical perspective that holds that business freedom is likely to substantially reduce unemployment (Feldmann, 2007).

There is a moderate negative relationship between GDP and ocean economy financing, a weak positive relationship between GDP and business freedom, a weak positive relationship between GDP and government integrity, and a weak positive relationship between GDP and lending rate. There is a moderate positive relationship between unemployment and ocean economy financing, a strong negative relationship between unemployment and total trade, and a weak negative relationship between unemployment and government integrity and lending rate.

Government integrity is positively related to economic growth and entrepreneurship, but negatively related to trade and unemployment. In addition, the lending rate is positively related to economic growth and entrepreneurship,  while the lending rate is negatively related to unemployment, total trade, and ocean economy financing.

## 6.3 Stationarity test

The study assessed the long-run relationship between economic growth, unemployment, entrepreneurship, total trade, and ocean economy financing before applying the ARDL. It was necessary to use this method in order to discover the order of integration of variables for purposes of confirming the suitability of the ARDL method. The ARDL approach is suitable if the series is stationary at I(0) or I(1); if there is any variable that is integrated into I(2), the use of ARDL is not valid (Nkoro, and Uko, 2016). The study used a three-unit root test: namely the Augmented Dickey-Fuller (ADF), the Phillips-Perron (PP), and the Dicky-fuller GLS(ERS). These tests were used to ascertain the order of integration that would be appropriate for the ARDL modelling technique. The use of more than one-unit root test was to ensure the robustness of the results. Table 6.3 reports the results of the ADF. The results show a mixture of variables that are integrated of order zero I(0) as well as those integrated of order one I(1). Being stationary simply means that the variable has a zero mean, constant variance, and uncorrelated residuals over time. This justifies the use of ARDL, as the order of one is the highest order of integration recommended by ARDL.

**Table 6.3:** *ADF test*

| ADF | | | | |
|---|---|---|---|---|
| **Order of Integration** | **Variable** | **Intercept** | **Trends and Intercept** | **Order of integration** |
| Levels | BUS_FREEDOM | -1.442 | -1.994 | |
| 1ˢᵗ Difference | BUS_FREEDOM | -4.949*** | -4.837*** | I (1) |
| Levels | UNEM | -1.558 | -2.010 | |
| 1ˢᵗ Difference | UNEM | -5.107 | -5.088 | I (1) |
| Levels | ENTREP | -1.962 | -2.797 | |
| 1ˢᵗ Difference | ENTREP | -6.573*** | -6.462*** | I (1) |
| Levels | GDPG | -2.608 | -3.105 | |
| 1ˢᵗ Difference | GDPG | -5.723*** | -5.637*** | I (1) |
| Levels | TRADE | -2.477 | -2.897 | |
| 1ˢᵗ Difference | TRADE | -5.629 | -5.234 | I(1) |
| Levels | GOV__INTEGRITY | -1.413 | -3.271 | |
| 1ˢᵗ Difference | GOV__INTEGRITY | -4.515*** | -4.442*** | I (1) |
| Levels | LENDING_RATE | -1.445 | -3.305 | |
| 1ˢᵗ Difference | LENDING_RATE | -4.536*** | -4.501*** | I (1) |
| Levels | AQUA | -1.454 | -1.784 | |
| 1st Difference | AQUA | -4.427*** | -4.401*** | I (1) |
| Levels | CMT | -0.337 | -3.345 | |
| 1st Difference | CMT | -6.336*** | -6.407*** | I (1) |

| | | | | |
|---|---|---|---|---|
| Levels | MPOG | 0.281 | -1.818 | |
| 1st Difference | MPOG | -6.256*** | -6.814*** | I (1) |
| Levels | MTM | -1.509 | -2.031 | |
| 1st Difference | MTM | -5.404*** | -5.376*** | I (1) |
| Levels | OEF | 2.256 | -2.273 | |
| 1st Difference | OEF | -6.191*** | -4.721*** | I (1) |
| Levels | SHD | -2.057 | -3.944 | |
| 1st Difference | SHD | -5.828*** | -5.688*** | I (1) |
| *Note: (*; **; ***) indicate significance at 10%; 5% and 1% level of significance respectively* | | | | |

Sources: Author's own computation using World Bank, Heritage Foundation and National Treasury (2020)

Table 6.3 shows the ADF test results.  According to ADF test criteria, the calculated results show a null hypothesis of the unit root test. The calculated ADF results are compared with critical values. Therefore, the statistical value is greater than the critical value, and thus H0 is rejected. Therefore, the data are stationary.

The ADF results consist of intercepts and trends. The results show that not all of the variables are stationary at levels, and they are stationary at 1st Difference. This means that the series are integrated at first order, or I (1). Following these ADF test results, are the PP test results, a summary of which is presented below in Table 6.4.

**Table 6.4: PP test**

| PP | | | | |
|---|---|---|---|---|
| **Order of Integration** | **Variables** | **Intercepts** | **Trend and intercepts** | **Order of Integration** |
| Levels | BUS_FREEDOM | -1.442 | -1.994 | |
| 1st Difference | BUS_FREEDOM | -4.949*** | -4.838*** | I (1) |
| Levels | UNEM | -1.554 | -2.010 | |
| 1st Difference | UNEM | -5.071*** | -5.049** | I (1) |
| Levels | ENTREP | -1.962 | -2.797 | |
| 1st Difference | ENTREP | -7.135*** | -7.162*** | I (1) |
| Levels | GDP | -2.560 | -3.072 | |
| 1st Difference | GDP | -9.853*** | -13.183*** | I (1) |
| Levels | TRADE | -2.438 | -2.917 | |
| 1st Difference | TRADE | -6.829 | -8.998 | I(1) |
| Levels | GOV__INTEGRITY | -1.369 | -3.158 | |
| 1st Difference | GOV__INTEGRITY | -4.547*** | -4.395*** | I (1) |
| Levels | LENDING_RATE | -1.232 | -2.374 | |
| 1st Difference | LENDING_RATE | -4.010*** | -4.511*** | I (1) |
| Levels | AQUA | -1.539 | -1.8424 | |
| 1st Difference | AQUA | -4.427*** | -4.401*** | I (1) |
| Levels | CMT | 0.752 | -3.280 | |
| 1st Difference | CMT | -8.699*** | -10.926*** | I (1) |
| Levels | MPOG | 1.921 | -1.552 | |
| 1st Difference | MPOG | -6.483*** | -18.916*** | I (1) |

| | | | | |
|---|---|---|---|---|
| Levels | MTM | -1.477 | -2.055 | |
| 1st Difference | MTM | -5.406*** | -5.380*** | I (1) |
| Levels | OEF | 2.104 | -2.021 | |
| 1st Difference | OEF | -6.520*** | -15.575*** | I (1) |
| Levels | SHD | -1.904 | -3.824 | |
| 1st Difference | SHD | -12.809*** | -12.724*** | I (1) |
| *Note: (\*; \*\*; \*\*\*) indicate significance at 10%; 5% and 1% level of significance respectively* | | | | |

Sources: Author's own computation World Bank, Heritage Foundation and National Treasury, (2020)

Table 6.4 shows the PP test results.  According to the PP test criteria, the calculated results have a null hypothesis of the unit root test. The calculated PP results are compared with critical values. Therefore, the statistical value is greater than the critical value, and thus H0 is rejected. Therefore, the data are stationary.

The PP results consist of intercepts and trends. The results show that all the variables are stationary at levels and 1st Difference. From the above unit root tests, it is clear that all series are integrated at first order I (1). The results of the Dickey-fuller GLS (ERS) test, a test that followed the PP test,  are summarised in Table 6.5

**Table 6.5: Dicky-fuller GLS (ERS)**

| Dicky-fuller GLS | | | | |
|---|---|---|---|---|
| **Order of Integration** | **Variables** | **Intercepts** | **Trend and intercepts** | **Order of Integration** |
| Levels | BUS_FREEDOM | -1.101 | -2.064 | |
| 1st Difference | BUS_FREEDOM | -5.042*** | -5.062*** | I (1) |
| Levels | UNEM | -1.194 | -2.076 | |
| 1st Difference | UNEM | -3.931*** | -4.474*** | I (1) |
| Levels | ENTREP | -2.013 | -2.824 | |
| 1st Difference | ENTREP | -6.720*** | -6.759*** | I (1) |
| Levels | GDP | -2.684 | -3.250 | |
| 1st Difference | GDP | -5.849*** | -5.898*** | I (1) |
| Levels | TRADE | -1.819 | -2.993 | |
| 1st Difference | TRADE | -5.688*** | -5.629*** | I (1) |
| Levels | GOV__INTEGRITY | -1.468 | -3.434 | |
| 1st Difference | GOV__INTEGRITY | -4.601*** | -4.660*** | I (1) |
| Levels | LENDING_RATE | -1.295 | -3.392 | |
| 1st Difference | LENDING_RATE | -3.349*** | -4.226*** | I (1) |
| Levels | AQUA | -1.465 | -1.735 | |
| 1stDifference | AQUA | -4.526*** | -4.598*** | I (1) |
| Levels | CMT | -0.195 | -3.488*** | I (0) |
| 1st Difference | CMT | -6.478*** | -6.697*** | I (1) |
| Levels | MPOG | 0.568 | -1.935 | |
| 1st Difference | MPOG | -5.737*** | -6.476*** | I (1) |

| Levels | MTM | -1.1272 | -2.195 | |
|---|---|---|---|---|
| 1st Difference | MTM | -5.519*** | -5.617*** | I (1) |
| Levels | OEF | 0.600 | -2.396 | |
| 1st Difference | OEF | -5.972*** | -6.506*** | I (1) |
| Levels | SHD | -1.9037 | -4.107 | |
| 1st Difference | SHD | -5.949*** | -5.968 | I (1) |
| *Note: (\*; \*\*; \*\*\*) indicate significance at 10%; 5% and 1% level of significance respectively* | | | | |

Sources: Author's own computation using World Bank, Heritage Foundation and National Treasury, (2020)

Table 6.5 shows the DF-GLFS test results. According to the DF-GLFS test criteria, the calculated results have a null hypothesis of the unit root test. The calculated DF-GLFS results are compared with critical values. Therefore, the statistical value is greater than the critical value, and so H0 is rejected. Therefore, the data are stationary.

The DF-GLFS results consist of intercepts and trends. The results show that all the variables are stationary at levels and 1st Difference. From the above unit root tests, it is clear that the series are integrated at first order or I (1). This indicates that the results of all three-unit roots tests confirm the suitability of the ARDL approach. Having outlined the unit root tests in the above sections, the next section presents the cointegration approach.

## 6.4 Cointegration

The cointegration test is used to determine the long-run relationship between the variables in the study, which are GDP, unemployment, entrepreneurship, and trade models. The ARDL Bounds test was used in the study to determine whether there is a long-run relationship between variables. The decision criteria are as follows: if the F-statistics value is greater than Upper bound I (1) then one can assume there is cointegration among the set of models. The findings of the cointegration test based on ARDL bound testing approach are reported in Table 6.6 below:

**Table 6.6: Results ARDL Bound test**

| Dependent variable | F-stats | 1% | 5% | 10% |
|---|---|---|---|---|
| GDP | 18.06 | Cointegration | Cointegration | Cointegration |
| UNEM | 8.48 | Cointegration | Cointegration | Cointegration |
| ENTREP | 7.00 | Cointegration | Cointegration | Cointegration |
| TRADE | 6.258 | Cointegration | Cointegration | Cointegration |
| | | Level of significance | Lower I (0) | Upper I (1) |
| Critical values | | 1% | 3.74 | 5.06 |
| | | 5% | 2.86 | 4.01 |
| | | 10% | 2.45 | 3.52 |

Sources: Author's own computation with World Bank data, Heritage Foundation and National Treasury (2020).

The results for the bounds test shown in Table 6.6 reveal that there is a long-run and short-run relationship among the variables. Firstly, the GDP model has an F-statistic value of 18.06, which is greater than all the Bounds critical values, which is 4.01 %, and the null hypothesis is rejected. Unemployment has an F-statistic value of 8.48, which is greater than all of the Bounds critical values, which 4.01%, a null hypothesis is rejected, and entrepreneurship has an F-statistic value of 7.00%, which is greater than the upper bounds critical value of 4.01%, and a null hypothesis of no cointegration is rejected. Lastly, the trade model has an F-statistic of 6.25%, which is greater than 4.01%, and a null hypothesis is rejected. The following section presents a long-run and short-run analysis of the results for the GDP model.

## 6.5 Long and short-run dynamics model

The bound test is an important tool for identifying the existence of cointegration among the variables. The results from the bound test applied in this study show that there is

cointegration among the variables. Table 6.5 shows the long and short-run dynamics model.

### 6.5.1 Model 1: GDP

**Table 6.7: Long run and short run model**

| Variable | Coef. | Std. Error | t-statistic | Prob |
|---|---|---|---|---|
| **Long run** | | | | |
| C | -16.382 | 18.247 | -0.897 | 0.392 |
| LOG(OEF) | 0.275 | 0.562 | 0.488 | 0.636 |
| BUS_FREEDOM | 0.056 | 0.021 | 2.598 | 0.028 |
| LGOV_INTEGRITY | 4.502 | 1.863 | 2.415 | 0.038 |
| LENDING_RATE | -0.485 | 0.067 | -7.139 | 0.000 |
| F_CRISIS | -3.813 | 0.402 | -9.465 | 0.000 |
| OP | -0.751 | 0.245 | -3.066 | 0.013 |
| **Short run** | | | | |
| D (GDP (-1)) | 0.308 | 0.094 | 3.274 | 0.009 |
| DLOG(OEF) | -0.572 | 0.472 | -1.210 | 0.257 |
| D(BUS_FREEDOM) | 0.141 | 0.042 | 3.318 | 0.009 |
| D (BUS_FREEDOM (-1)) | 0.058 | 0.040 | 1.439 | 0.183 |
| D(LGOV_INTEGRITY) | 8.535 | 3.690 | 2.313 | 0.046 |
| D(LENDING_RATE) | -0.191 | 0.141 | -1.356 | 0.208 |
| D (LENDING_RATE (-1)) | 0.217 | 0.117 | 1.854 | 0.096 |
| D(F_CRISIS) | -7.229 | 0.914 | -7.901 | 0.000 |
| D(OP) | -1.424 | 0.491 | -2.899 | 0.017 |
| CointEq(-1)* | -1.895 | 0.163 | -11.613 | 0.000 |

Source: Author's own computation using World Bank, National Treasury and Heritage Foundation (2020)

The above table shows the long-run and short-run model, with GDP as a dependent variable, with independent variables, such as ocean economy financing, business freedom, government integrity, and lending rate. The results show that the coefficient of logged GDP is positive and significant, which suggests that past GDP growth has a positive impact on economic growth.

The results show that ocean economy financing has a positive effect on economic growth in the long run while there is a negative effect in the short run, and both are statistically insignificant.  This means that the null hypothesis of the relationship between ocean economy financing and economic growth cannot be rejected. Operation Phakisa (2019) estimated that the ocean economy would contribute approximately R20 million to South Africa's economic growth. Similarly, Shields *et al.* (2005) in their study examine the impact of ocean economy financing on Ireland's economic growth show that there was no evidence of any positive impact on the country's economic growth.  Furthermore, Wignaraja *et al.* (2018)  state the growth of the ocean economy is still hindered by a lack of infrastructure. Notwithstanding, a study by Colgan (2013) highlights a positive effect of ocean economy financing on USA economic growth. From this one can be deduced that ocean economy financing has a probability of producing different results in different countries. More especial developed countries show a positive effect of ocean economy to economic growth. Vega and Hynes (2015) ocean economy in Ireland has a positive effect on economic growth. In addition, OECD (2016) reported a positive effect between ocean economy and economic growth while Hoegh-Guldberg *et al.,* (2015) ocean economy was underperforming.

According to Sumaila *et al.* (2021), the contribution of the South African ocean economy to GDP has declined since 2010 from 4.4% to 4.2% in 2019. According to Walker (2018), several maritime initiatives under Phakisa might help South Africa meet its 5 % growth target by 2019 was not achievable as the growth rate of South Africa's economy in 2019 was 4.2%.

Business freedom and government integrity have a positive and significant effect on economic growth in both the long run and short run. This indicates that improving the ease of doing business in South Africa and the overall efficiency of government regulation has the potential to promote more solid investments, which would benefit the economic growth of the country. According to Heritage Foundation (2021), the average value of the business freedom index for South Africa during that period of 1995 to 2021 was 73 points with a minimum of 62 points in 2017 and a maximum of 85 points in 1995. The latest value from 2021 is 62 points, this shows that the efficiency of the government of South Africa in the regulatory process. Government integrity can be enhanced through maintaining accountability and eradication of corruption. Therefore, a high government integrity index has the potential to promote and foster a high standard of behaviour, helps to reinforce credibility, and restore confidence in policy decision-making, all of which would be beneficial to the country's economic growth.

The lending rate is shown to have a negative effect on economic growth through the increase in the cost of borrowing, and the reduction in disposable income, both of which are depreciating effects on economic growth. Lending rates have a substantial influence on the rate and pattern of economic growth by influencing the volume and productivity of investment. A high lending rate has a negative effect on economic growth which slows the growth of the economy.

The dummy variables representing the period after the global financial crisis and Operation Phakisa have a negative sign. This is the evidence that the period after the global financial crisis was characterised by low economic growth, while the negative coefficient of the Operation Phakisa dummy variable suggests that, since the inception of Operation Phakisa in 2019, economic growth has been on a downward trend. This was also indicated by the graphical analysis presented in Chapter 2 (see Figure 2.1). However, this current study does not make any assumption that the negative impact on GDP was the direct result of Operation Phakisa. The result could have been explained by other variables, or by factors not indicated in the study that could have had a depreciating effect on economic growth during this period. This is also indicated by the downward trend in the GDP graph presented in Chapter 2 ( see Figure 2.1).

The error correction (ECM) coefficient is negative and significant at -1.89. This suggests that speed adjustment confirms the long-run relationship. This implies that any deviation from the long-run equilibrium of only 1.8 % is corrected.

A further step to be taken to estimate the model would be checking the model's adequacy before making a forecast. Therefore, the following tables present the diagnostic tests.

### 6.5.1.1 Diagnostic tests

Diagnostic tests, which included a normality test (JarqueBera Test), a serial correlation test (Autocorrelation test), heteroscedasticity (Breusch-Pagan Godfrey Test), and the stability test proposed by Brown *et al.* (1975) examined the validity of the ARDL models. To make sure that the empirical model is correctly specified, these various tests were conducted. Table 6.8 shows the various diagnostic tests and their p-values.

**Table 6.8: Diagnostic test**

| Jargue-Bera | 0.795 [0.671] |
|---|---|
| Autocorrelation | 3.506 [0.088] |
| Heteroskedasticity | 0.598 [0.806] |
| RESET TEST | 0.16 [0.69] |

Sources: Author's own computation using World Bank, National Treasury, and Heritage Foundation data (2020)

Table 6.8 shows the residual diagnostic test of the GDP model. The residuals are normally distributed in the model as evidenced by non-rejection of the null hypothesis using the Jarque-Bera test. Therefore, the JB test and p-value are 0.79 and 0.67% respectively, which is greater than a 5% level of significance. Therefore, the null hypothesis is not rejected. The following diagnostic test, the Breusch–Godfrey serial correlation Lagrange Multiplier (LM) test, is a test that fails to reject the presence of serial correlation in the residuals. The LM test and p-value are 3.50 and 0.88% respectively, which is greater than a 5% level of significance. Therefore, a null hypothesis is not rejected, and the series does not have a serial correlation.

Heteroscedasticity, where the null hypothesis ($H_o$) claims that residuals are homoscedasticity, and the null hypothesis is not rejected at 5% level, of significance.

The use of the stability test (RESET) shows that the model is correctly specified, evidenced by the probability value of 0.69% which is greater than the 5% level of significance. Therefore, we do not reject the null hypothesis that the model is correctly specified.

The results of model 1 ( GDP model)  having been explained, the results of model 2, which shows unemployment as a dependent variable are presented in the following section.

### 6.5.2   Model 2: Unemployment

This section investigates the impact of ocean economy financing on unemployment. The long-run and short-run results are shown in Table 6.9.

**Table 6.9: Long and short-run model**

| Variable | Coef. | Std. Error | t-statistic | Prob |
|---|---|---|---|---|
| **Long run** | | | | |
| C | 113.936 | 78.344 | 1.454 | 0.167 |
| LOG(OEF) | -2.020 | 1.642 | -1.229 | 0.239 |
| BUS_FREEDOM | -0.371 | 0.150 | -2.475 | 0.026 |
| LGOV_INTEGRITY | -10.292 | 14.390 | -0.715 | 0.486 |
| LENDING_RATE | 1.401 | 0.618 | 2.267 | 0.039 |
| F_CRISIS | 9.288 | 3.873 | 2.397 | 0.031 |
| OP | -0.096 | 2.132 | -0.045 | 0.965 |
| **Short-run** | | | | |
| DLOG(OEF) | -0.695 | 0.498 | -1.395 | 0.184 |
| D(BUS_FREEDOM) | -0.212 | 0.040 | -5.233 | 0.000 |
| D(LGOV_INTEGRITY) | -8.385 | 2.640 | -3.175 | 0.006 |
| D(LENDING_RATE) | 0.482 | 0.106 | 4.533 | 0.000 |
| D(F_CRISIS) | 3.197 | 0.618 | 5.172 | 0.000 |

| | | | | |
|---|---|---|---|---|
| D(OP) | -0.033 | 0.728 | -0.045 | 0.964 |
| CointEq(-1)* | -0.344 | 0.088 | -3.889 | 0.001 |

*Note: (*; **; ***) indicate significance at 10%; 5% and 1% level of significance respectively*

Sources: Author's own computation using National Treasury, World Bank, and Heritage Foundation data (2020).

Table 6.9 shows that ocean economy financing reduces unemployment both in the long and the short run but is statistically insignificant. This means that the null hypothesis of the relationship between ocean economy financing and unemployment cannot be rejected. Unemployment has been on the rise in South African for almost a decade and shows no sign of decline. Most recently unemployment has risen to reach 34.4% (StatsSA, 2021) due to COVID 19 pandemic. However, Operation Phakisa estimated that the South African ocean economy would create 77 100 direct jobs by 2019. According to Freight News (2019), while over R40 billion was invested in targeted ocean sectors between 2014 and 2019, less than 10 000 of the 77 100 direct jobs promised to be created by 2019 were created. This means whilst the ocean economy has the probability to reduce unemployment this has not been met with much success in South Africa. A similar finding has also been reported by Colgan (2013) in the U.S who found a negative impact of the ocean economy on employment between 2007 and 2009. Colgan ( 2013) alludes to the depletion of natural resources, particularly in the fisheries industry. The Green Connection (2021) also confirms the ocean economy's failure to generate the number of jobs projected by the programme. It is, therefore, no wonder that this study fails to reject the null hypothesis of no relationship between ocean economy financing and unemployment during the period under review. Notwithstanding this finding, this thesis does not in any way suggest that the ocean economy financing does not have the potential and the capability to create jobs in South Africa; a comprehensive strategy that includes the ocean economy should be adopted but certainly not on its own alone.

Business freedom and government integrity have a negative relationship with unemployment both in the long and short-run meaning that both these variables lead to a reduction in unemployment albeit that government integrity is statistically insignificant in the long run and not in the short run. Business freedom on the other

hand is statistically significant both in the long run and short run. In this case, the null hypothesis of no relationship between business freedom and unemployment is rejected. Business freedom is an overall indicator of the efficiency of government regulation of business. This means that the red tape on business is reduced so that entrepreneurs can operate with much ease. Entrepreneurs create employment opportunities not only for themselves but for others as well. Entrepreneurial activities may influence a country's economic performance by bringing new products, methods, and production processes to the market and by boosting productivity and competition more broadly (Heritage Foundation, 2021). According to Doing Business (2020), South Africa scored 67 % in ease of doing business. Clearly, there is a significant improvement in ease of doing business in South Africa. Such improvement in ease of doing business can go a long way in leveraging the ocean economy in its endeavour to create jobs. It is pleasing to note that government integrity has a probability to boost job creation in South Africa albeit statistically insignificant in the long run. In this case, the results suggest that the null hypothesis of no relationship between government integrity and unemployment cannot be rejected in long run. This is not surprising in the sense that whilst government invests billions of Rands in the ocean economy, the main operators are from the private sector. It is in fact the private sector that drives job creation ocean economy. For example, the South African Institute of International Affairs [SAIIA], (2021) is calling for public-private partnerships in ocean governance and protection. In this respect, SAIIA (2021) encourages a dialogue between the government the private sector in ensuring the effectiveness of the ocean economy in job creation. Keynes ( Snowdon and Vane, 2005) warns against a crowding-out effect as result of too much government involvement in the economy to the exclusion of the private sector. The role of the private sector in the ocean economy can never be over-emphasised. According to Gqubule, (2021) the expected investment in the oceans economy over the next five years is estimated at R3.8-billion by the government and R65-billion by the private sector. These investments are expected to create over 100 000 direct jobs and more than 250 000 indirect jobs.

The main threat to private sector investment flow towards the ocean economy is the heightened level of corruption that is continuously reported in government circles. However, a discussion on government corruption falls beyond the scope of this thesis.

The lending rate variable shows a positive and statistically significant relationship with unemployment both in the long run and short run. This implies that the null hypothesis of no relationship between the lending rate and unemployment is rejected. The lending rate influences unemployment via investment channels ( Mohr and Fourie, 2008). This means that high-interest rates lead to low investment which ultimately increases unemployment. Notwithstanding, interest rates in South Africa have been on a downward trend since 1994 from just over 20% to approximately 7% by 2020. In line with the rest of the world as the result of the COVID 19 pandemic South Africa has maintained a low interest in order to stimulate the economy. What has been disappointing in South Africa is that the low-interest rate has not been followed by increased investment and jobs creation. This problem has also been compounded by low savings in South Africa. It is, therefore, no wonder that lending rates are positively related to unemployment.

The dummy F_CRISIS representing financial crisis shows a positive and statistically significant relationship with unemployment meaning that during the time of the financial crisis unemployment increases. The global financial crisis in 2008 affected most countries of the world particularly international trade ( Mahadea and Simson, 2010). This means that during the time of global financial crisis ocean economy may also fail to create the expected number of jobs. The final control variable is OP representing the period of the implementation of operation Phakisa program. The results of this research show a negative and statistically insignificant relationship with unemployment meaning that whilst the implementation of the operation Phakisa program has the potential to create jobs; the null hypothesis of no relationship between operation Phakisa program and job creation during the period under review cannot be rejected. This implies that the operation Phakisa program with all its good intention cannot go alone in fighting unemployment in South Africa. It is, therefore, no wonder that the number of jobs created under the operation Phakisa program was less than those that were targeted ( Freight News,2019).

The error correction (ECM) coefficient is negative and significant at -0.34. This implies that any deviation from long-run equilibrium only 34% is corrected.

A further step in estimating the model is checking this model's adequacy and its robustness. As already mentioned, these checking steps are divided into checking model stability and the diagnostic of residual performance.

### 6.5.2.1 Diagnostic test

This section deals with the diagnostic of residual performance. In order to make sure that the empirical model is correctly specified, various tests were conducted. Table 6.10 shows the diagnostic test**.**

**Table 6.10: Diagnostic tests**

| Jargue-Bera | 0.51 [0.77] |
|---|---|
| Autocorrelations | 0.327 [0.727] |
| Heteroscedasticity | 0.565 [0.803] |
| RESET TEST | 0.379 [0.710] |

Sources: Author's computation using National Treasury and World Bank and Heritage Foundation data (2020)

Table 6.10 shows the residual diagnostic test of the unemployment model. The residual is normally distributed in the model as evidenced by the non-rejected null hypothesis using the Jarque-Bera test. Therefore, the JB test and p-value are 0.51 and 0.77% respectively, which is greater than a 5% level of significance. Therefore, the null hypothesis is not rejected. The following diagnostic test is the Breusch–Godfrey serial correlation Lagrange Multiplier (LM) test, which failed to reject the presence of serial correlation in the residual.   The LM test and p-value are 0.32 and 0.72% respectively, which is greater than the 5% level of significance. Therefore, the null hypothesis is not rejected, and the series does not have a serial correlation.

Heteroscedasticity is where the null hypothesis ($H_o$) claims that residuals are homoscedasticity, and the null hypothesis is not rejected. Therefore, the heteroscedasticity test and p-value are 0.56 and 0.80% respectively, which is greater than 5%. Therefore, we do not reject the null hypothesis that the model is correctly specified.

The Ramsey RESET test is carried out to test specification errors and to check the linearity of the model. This test also suggested that the model is well specified. The

null hypothesis of this test is that the model is correctly specified. The RESET *F*-statistic has a p-value of 0.710, which explains that there is no need to reject the null hypothesis. Hence, the functional form of the model is correctly specified. The results of model 3, which shows entrepreneurship as the dependent variable, are presented in the following section.

### 6.5.3   Model 3: Entrepreneurship

This section presents the results of the analysis of ocean economy financing on entrepreneurship. The long and short-run results are shown in Table 6.11

**Table 6.11: Long and short-run results**

| Variables | Coef. | Std. Error | t-statistic | Prob. |
|---|---|---|---|---|
| **Long run** | | | | |
| C | 135.05 | 40.259 | 3.354 | 0.005 |
| LOG(OEF) | -4.566 | 1.446 | -3.157 | 0.00 |
| BUS_FREEDOM | -0.205 | 0.046 | -4.395 | 0.00 |
| LGOV_INTEGRITY | 0.254 | 4.064 | 0.062 | 0.95 |
| LENDING_RATE | -0.434 | 0.160 | -2.701 | 0.01 |
| **F_CRISIS** | -0.958 | 0.867 | -1.104 | 0.28 |
| **OP** | 0.235 | 0.737 | 0.319 | 0.75 |
| **Short run** | | | | |
| DLOG(OEF) | -1.38 | 0.493 | -2.814 | 0.014 |
| DLOG (OEF (-1)) | 1.081 | 0.425 | 2.544 | 0.024 |
| D(BUS_FREEDOM) | -0.309 | 0.092 | -3.329 | 0.005 |
| D(LGOV_INTEGRITY) | 0.248 | 3.967 | 0.062 | 0.951 |
| D(LENDING_RATE) | -0.423 | 0.158 | -2.664 | 0.019 |
| D(F_CRISIS) | -0.933 | 0.883 | -1.056 | 0.310 |

| | | | | |
|---|---|---|---|---|
| D(OP) | 0.229 | 0.716 | 0.320 | 0.754 |
| CointEq(-1)* | -0.974 | 0.12 | -7.880 | 0.00 |
| *Note: (*; **; ***) indicate significance at 10%; 5% and 1% level of significance respectively* | | | | |

Source: Author's computation using National treasury, World Bank and Heritage Foundation (2020).

The results in table 6.11 shows that ocean economy financing has a negative and statistically significant  relationship with entrepreneurship both long and short run. However, this relationship after one lag becomes positive and statistically significant in the short run. This means that it takes almost on year for the ocean economy financing to impact entrepreneurship positively. It is well known fact that entrepreneurship faces a number of challenges in South Africa, particularly in the ocean economy sector. The main constraints facing entrepreneurship in the ocean economic sector is relevant skills as well as capital  (Bosma *et al.,* 2020).Whilst there is evidence of investment flow towards the ocean sector with the purpose of igniting entrepreneurship there is a lag  before fruition of such investment is realised. Clearly there exists a number of barriers to entry for business in the ocean sector (OECD, 2019;  Ntshavheni, 2019). Some of these barriers among others is licence requirements, quotas, boat building and repairs, to mention a few. One of the elements that affect entrepreneurship is business freedom. The following section presents the impact of business freedom on entrepreneurship .

The results in table 6.11 show that business freedom has a negative and statistically significant relationship on entrepreneurship both long run and short. Business refers to ease of doing business which implies the length of time it takes to register a business. The matter relating to ease of doing business was also mentioned in State of National Address by President Ramaphosa on 11 February 2021(SONA, 2021). These results show that a drive towards improving ease of doing has not been so effective in the ocean economy. This no surprise because there are still barriers to entry in ocean economy sector. As mentioned in the forgoing paragraph such barriers include licence requirements, quotas, requisite skills, boat building and repairs etc. Anecdotal evidence suggests that they could also be socio- cultural religious belief systems that hinders some cultures not to enter the space of the ocean economy.

However, constraints that inhibit entry to ocean economy for beyond the scope of this thesis.

Government integrity has a positive and statistically insignificant relationship with entrepreneurship both long and short run. Notwithstanding the positive relationship, the null hypothesis of no relationship between government integrity and entrepreneurship cannot be rejected. Whilst the government provides the suitable infrastructure it is yet the private sector that runs the businesses in the ocean economy. What affects and possible crowds the private sector is lending rate, the following paragraphs the impact of the lending on entrepreneurship.

The lending rate has negative and statistically significant relationship with entrepreneurship both long and short run. The effects of the lending rate in the economy have already been presented in the forgoing paragraphs under unemployment. The final control dummy variables tested in this model are financial crisis and operation Phakisa. Financial crisis has a negative and statistically insignificant relationship with entrepreneurship. This implies that the null hypothesis of no relationship cannot be rejected. The Operation Phakisa dummy has positive and statistically insignificant relationship with entrepreneurship both long and short run. This means whilst the null hypothesis of no relationship between operation Phakisa and entrepreneurship cannot be rejected, entrepreneurship seems to have been positively influenced during the period under review.

The error correction (ECM) coefficient is negative and significant at -0.97. This implies that any deviation from long-run equilibrium only 97% is corrected.

A further step in estimating models is checking this model's adequacy before making a forecast; these checking steps are divided into checking model stability and diagnostic of residuals performance.

**6.5.3.1 Diagnostic test**

**Table 6.12: Diagnostic test**

| | |
|---|---|
| Jargue-Bera | 0.024 [0.987] |
| Autocorrelation | 0.782 [0.483 |
| Heroskedasiticity | 2.068 [0.064] |
| RESET TEST | 3.07 [0.068] |

Source: Author's computation National treasury, World Bank and Heritage Foundation (2020).

Table 6.12 shows the residual diagnostic test of the entrepreneurship model. The residual is normally distributed in the model as evidenced by the no-rejected null hypothesis using the Jarque-Bera test. Therefore, the JB test and p-values are 0.024 and 0.98% respectively, which is greater than a 5% level of significance. Therefore, the null hypothesis is not rejected. The following diagnostic test is the Breusch–Godfrey serial correlation Lagrange Multiplier (LM) test, which fails to reject the null hypothesis. The LM test and p-values are 0.78 and 0.48% respectively, which is greater than a 5% level of significance. Therefore, the null hypothesis is not rejected, and the series does not have a serial correlation.

Heteroscedasticity occurs when the null hypothesis (Ho) asserts that residuals are homoscedastic, while the alternative hypothesis asserts that residuals are heteroscedastic, and thus the variance is not constant. Therefore, the heteroscedasticity test and the p-values are 2.068 and 0.06% respectively, which is greater than 5%. Therefore, we do not reject the null hypothesis.

The Ramsey RESET test is used to test specification errors and the model's linearity. The RESET $F$-statistic has a p-value of 0.068, which is greater than 0.05 level of significance. The null hypothesis no misspecification cannot be rejected. This means the model was correctly specified. The results of model 4, which total trade is the dependent variable, are presented in the following section.

### 6.5.4   Model 4: Total trade

The effect of ocean economy financing on trade is presented in this section. Table 6.13 shows the long-run and short-run results.

**Table 6.13: long and short run results**

| Variable | Coef. | Std. Error | t-statistic | Prob |
|---|---|---|---|---|
| **Long run** | | | | |
| **C** | 694.821 | 297.949 | -2.332 | 0.036 |
| LOG(OEF) | 25.421 | 9.490 | 2.678 | 0.019 |
| BUS_FREEDOM | 0.915 | 0.340 | 2.689 | 0.018 |
| LGOV_INTEGRITY | 41.449 | 24.800 | 1.671 | 0.118 |
| LENDING_RATE | -0.952 | 0.918 | -1.036 | 0.319 |
| F_CRISIS | -18.760 | 7.417 | -2.529 | 0.025 |
| OP | -6.829 | 3.244 | -2.105 | 0.055 |
| **Short run** | | | | |
| DLOG(OEF) | 9.099 | 3.692 | 2.463 | 0.028 |
| D(BUS_FREEDOM) | 0.421 | 0.171 | 2.460 | 0.028 |
| D(LGOV_INTEGRITY) | 29.500 | 15.351 | 1.921 | 0.076 |
| D(LENDING_RATE) | 1.649 | 0.816 | 2.021 | 0.064 |
| D(F_CRISIS) | -13.351 | 4.138 | -3.226 | 0.006 |
| D(OP) | -4.860 | 2.621 | -1.853 | 0.086 |
| CointEq(-1)* | -0.711 | 0.174 | -4.086 | 0.0013 |
| *Note: (\*; \*\*; \*\*\*) indicate significance at 10%; 5% and 1% level of significance respectively* | | | | |

Sources: Author's computation using National treasury, World Bank and Heritage Foundation (2020).

Table 6.13 presents the long and short run total trade model, and independent variables, namely ocean economy financing, business freedom, government integrity, and lending rate. Ocean economy financing has a positive and statistically significant relationship with total trade both long and short run. This implies that ocean economy finance has a positive relationship with total trade in South Africa. This means that

ocean economy financing in South Africa plays a role in promoting trade flows in the country. According to the WTO (2019), the South African economy recorded a trade surplus of $1.7 billion in 2019. Furthermore, International Trade Administration (2020) and Ntuli, Jagers, Linell, Sjöstedt and Muchapondwa, (2019) have highlighted that ports and terminals in South Africa are regarded as the engine of economic development. Further, the South African government has identified the sector as one of the sectors that will play a pivotal role in promoting growth and development in the economy of the country. Therefore, to achieve NDP 2030[2] targets investing in the sector is critical and the interventions for maritime transport infrastructure should receive its importance.

Business freedom and government integrity both have a positively and statistically significant relationship with total trade both long and short run. This indicates that the ease of doing business in South Africa, and the overall efficiency of government regulation of business are likely to promote more business in South Africa, which would be beneficial to total trade. The government integrity policies that aim to prevent and foster a high standard of behaviour are likely to help to reinforce credibility and restore confidence in policies and decision-making, which would be beneficial to total trade. However, the threat to government integrity that may reverse the gains and the confidence our main trading partners and investors have in the South African economy is the continued reports on corruption cases in government. Nonetheless, the government under the current President Ramaphosa has taken a serious stance against corruption ( SONA 2021; budget speech 2021; Transparency International, 2021).

The lending rate has a negative and statistically insignificant relationship with total trade in the long run and the short-run lending rate has positive and statistically significant with total trade. This implies that the null hypothesis of no relationship between the lending rate and total trade cannot be rejected in the long run. The financial crisis and operation Phakisa dummy variables have a negative and statistically significant relationship with total trade. From the inception of operation

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[2]The NDP sets out ambitious goals for poverty reduction, economic growth, economic transformation and job creation.

Phakisa in 2014 to 2019, total Trade shows a declining trend from 64. 43% to 59.20% respectively ( World Bank, 2020).

The error correction (ECM) coefficient is negative and significant at -0.71. This implies that any deviation from long-run equilibrium only 71% is corrected.

 A further step in estimating the model is checking this model's adequacy, and checking steps are divided into checking model stability and diagnostic of residuals performance.

### 6.5.4.1 Diagnostic test

**Table 6.14: Diagnostic test**

| Jargue-Bera | 1.118 [0.571] |
|---|---|
| Autocorrelation | 0.314 [0.735] |
| Heteroskedasticity | 0.861 [0.586] |
| Reset test | 2.755 [0.095] |

 Sources: Author's computation using National treasury, World Bank and Heritage Foundation (2020).

Table 6.14 shows a residual diagnostic test of the entrepreneurship model. The residual is normally distributed in the model, as evidenced by the non-rejected null hypothesis using the Jarque-Bera test. Therefore, the JB test and p-value are 1.118 and 0.57% respectively, which is greater than a 5% level of significance. Therefore, the null hypothesis is not rejected. The following diagnostic test is the Breusch– Godfrey serial correlation Lagrange Multiplier (LM) test, which fails to reject the presence of serial correlation in the residual.  The LM test and p-value are 0.314 and 0.73% respectively, which is greater than a 5% level of significance. Therefore, the null hypothesis is not rejected, and the series does not have a serial correlation.

Heteroscedasticity occurs when the null hypothesis (Ho) asserts that residuals are homoscedastic, while the alternative hypothesis asserts that residuals are heteroscedastic, and thus the variance is not constant. Therefore, the heteroscedasticity test and p-value are 0.86 and 0.58% respectively, which is greater

than a 5% level of significance. Therefore, we do not reject the null hypothesis and confirm that the model is correctly specified.

The Ramsey RESET test is used to test specification errors and the model's linearity. This test also indicated that the model was properly specified. The null hypothesis of this test is that the model is correctly specified. The RESET $F$-statistic has a p-value of 0.09%, explaining that there is no need to reject the null hypothesis. Hence, the functional form of the model is correctly specified.

## 6.6 Concluding remarks

The main aim of the chapter was to assess the macro-economic impact of ocean economy financing on the South African economy, with the selected economic indicators being GDP, unemployment, entrepreneurship, and total trade, from 1994 to 2019. The correlation statistics results show that ocean economy financing is negatively related to GDP and entrepreneurship while having a positive relationship with unemployment and total trade. The three tests used for testing stationarity were the ADF, PP, and Dickey-fuller GLS (ERS) tests. The results show that, in the ADF tests, all the variables were stationary at first difference i.e I(1), the PP and dickey-fuller tests show that all variables were stationary at first difference and i.e I(1). Since all the tests confirmed the stationarity of the series, the ARDL model was employed. The results of the ARDL bound tests confirmed the existence of cointegration between ocean economy financing and the three models: GDP, unemployment, and total trade while entrepreneurship there was no cointegration. Furthermore, the results confirm the existence of a positive relationship between ocean economy financing and economic growth in South Africa, the relationship was shown to be ineffective in terms of promoting economic growth during the period under review. A negative relationship was shown between unemployment and the ocean economy, and this also reflects the ineffectiveness of ocean economy financing in reducing the country's unemployment rate during the period under review. In addition, the results for entrepreneurship and ocean economy financing( lag once) reflect a positive and statistically significant relationship. This means that investment flowing to ocean economy financing has the potential to promote entrepreneurs in South Africa. Lastly, total trade and ocean economy financing reflect a positive and statistically significant, which implies that

ocean economy financing plays a significant role in promoting trade flows in South Africa during the period under review.

This chapter provided the econometric results of the impact of ocean economy financing on the selected macroeconomic indicate namely GDP, unemployment, entrepreneurship, and total trade in South Africa. The following chapter presents a sectoral analysis of the ocean economy financing in order to analysis individual sectors and their impact on the selected macroeconomic variables.

# Chapter seven

## Presentation of empirical results on the various sectors of the ocean economy

### 7.1 Introduction

The preceding chapter discussed the analysis of the results of the study to investigate the aim of the research. This chapter presents a discussion on sectoral analysis of ocean economy financing. The sectors that are presented in this chapter are aquaculture financing, coastal marine tourism financing, marine protection and ocean governance financing, maritime transport, and manufacturing financing and small harbour development financing. Concluding remarks are provided towards the end of the chapter.

### 7.2 Cointegration Approach

The cointegration test is used to determine the long-run relationship between the variables used in the study, which include GDP, unemployment, and entrepreneurship, as well as trade models for the ocean sectors. The ocean sectors include aquaculture, coastal and marine tourism, marine protection and ocean governance, marine transport and manufacturing, and small harbour development. The ARDL bounds test was used in the study to determine whether there is a long-run relationship between variables. The decision criteria are as follows: if the F-statistics value is greater than Upper bound I (1), then assume there is cointegration among the set of models. The finding of the cointegration test based on the ARDL bound testing approach are presented in table 7.1 below

**Table 7.1: Bound test**

| Dependent variable | GDP | UNEM | ENTREP | TRADE |
|---|---|---|---|---|
| AQUA | 16.57 | 16.09 | 5.204 | 4.06 |
| CMT | 12.326 | 12.44 | 12.40 | 7.52 |
| MPOG | 13.58 | 7.86 | 4.65 | 5.30 |
| MTM | 13.754 | 7.70 | 6.39 | 4.24 |
| SHD | 13.541 | 6.85 | 7.03 | 4.76 |
| | | **Level of significance** | **Lower I (0)** | **Upper I (1)** |
| **Critical values** | | 1% | 3.74 | 5.06 |
| | | 5% | 2.86 | 4.01 |
| | | 10% | 2.45 | 3.56 |

Sources: Author's own computation with World Bank, and National Treasury, (2020)

Table 7.1 presents the results for the bound tests for the four models: namely GDP, unemployment, entrepreneurship, and total trade as the dependent variables and with the five ocean sectors: namely Aquaculture, coastal and marine tourism, marine protection and ocean governance, marine transport and manufacturing, and small harbour development. The results for the aquaculture sector reveal a long-run relationship among all four models, with F-statistics values of 16.57; 16.09; 5.20; 4.06; respectively. Therefore, this shows that all the F-statistic values are greater than the upper bound critical value of 4.01, which means that there is a long-run relationship among all four models.

The second ocean sector is coastal marine tourism financing, and the results for the bounds test for the four models, GDP, unemployment, entrepreneurship, and total trade as dependent variables show a long-run relationship among all four variables with an F-statistics value of 12.32;12.44;12.40 and 7.52 respectively. These are greater than all the upper bounds critical values, which is 4.01%, and a null hypothesis is rejected.

The third ocean sector is marine protection and ocean governance (MPOG) financing and the results for the bounds test for the same four models, GDP, unemployment, entrepreneurship, and total trade as dependent variables show F-statistics value to be 13.58; 7.86; 4.65, and 5.30 respectively. The result reveals that the F-statistics for GDP, unemployment, entrepreneurship and total trade is greater than the upper bound critical value which confirms the existence of long-run cointegration for these three models.

The fourth ocean sector is marine transport and manufacturing (MTM) financing and the results for the bounds test for four models which GDP, unemployment, entrepreneurship, and total trade as dependent variables reveal that there is a long-run relationship among all four variables with F-statistics value 13.75; 7.70; 6.39 and 4.24 respectively. Therefore, there is long run cointegration among the above mention three models. Therefore, all the F-statistic values are greater than the upper bound critical value of 4.01 which means that the null hypothesis is rejected. This means that there is the long-run relationship among all four models.

The fifth ocean sector is small harbour development (SHD) financing and the results for the bounds test for the four models, GDP, unemployment, entrepreneurship, and total trade as dependent variables show the F-statistics values are 13.54; 6.85; 7.03, and 4.76 respectively. The F-statistics for GDP, unemployment, entrepreneurship and total trade is greater than the upper bound critical value, which confirms the existence of long-run cointegration. Given the presentation of the bounds test, this confirms the existence of long-run cointegration which is presented in the following section.

### 7.3 Long and short-run ARDL model

The bounds test is an important tool for identifying the existence of cointegration among the variables. The results from the bounds test in this study show that there is cointegration among the variables. Table 7.2 presents long run a short-run dynamics model ( only main variables are reported in table 7.2; full details of other control variables are attached in Appendix A).

## Table 7. 2: Long run and Short-run model

| | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|
| **Variables** | GDP | UNEM | ENTREP | TRADE |
| **Long run** | | | | |
| Log (AQUA) | -0.500 [-1.912] | 3.574*** [4.430] | 1.887*** [2.160] | -22.680** [-2.2258] |
| Log (CMTF) | -0.523*** [-2.817] | 5.859*** [3.693] | 2.746*** [5.643] | -2.810 [0.006] |
| Log (MPOG) | -0.226*** [-2.880] | -1.079 [-1.150] | -0.565 [-1.127] | 14.168*** [2.5360] |
| Log (MTM) | -1.641*** [-2.224] | -25.098 [-1.548] | -5.348*** [-2.385] | 44.307*** [2.869] |
| Log (SHD) | -0.142 [-0.406] | -2.215 [-1.319] | -1.086 [-2.457] | 8.782 [1.835] |
| **Variables** | **GDP** | **UNEM** | **ENTREP** | **TRADE** |
| **SHORT RUN** | | | | |
| D(Log (AQUA) | -0.950 [-1.97] | 1.094*** [2.375] | 1.322 [1.395] | -10.664*** [-5.182] |
| CointEq(-1)* | -1.899*** [-10.72] | -0.699 [-4.713] | -1.138 [-3.72] | -0.470 [-2.618] |
| D(Log (CMTF) | -0.720*** [-2.803] | 0.805*** [3.057] | 1.262*** [3.417] | 1.545 [0.756] |
| CointEq(-1)* | -1.376*** [-10.663] | 0.378*** [-5.806] | -1.465*** [-7.62] | -0.418*** [-2.06] |

| D(Log (MPOG) | -0.440*** | -0.388 | -0.501 | 4.411*** |
|---|---|---|---|---|
| | [-2.82] | [-1.23] | [-1.26] | [2.00] |
| CointEq(-1)* | -1.947*** | -0.359*** | -0.887*** | -0.620*** |
| | [-12.015] | [-3.532] | [-5.992] | [-2.942] |
| D(Log (MTM) | -3.059*** | -4.869*** | -0.809 | 16.222* |
| | [-2.250] | [-2.694] | [-0.338] | [1.796] |
| CointEq(-1)* | -1.863*** | -0.194*** | -0.933*** | -0.605 |
| | [-13.074] | [-2.481] | [-7.949] | [-3.721] |
| D(Log (SHD) | -0.194 | -0.6320 | -1.093*** | 1.331 |
| | [-0.410] | [-1.793] | [-2.588] | [0.668] |
| CointEq(-1)* | -1.362*** | -0.285*** | -1.007)*** | -0.518** |
| | [-8.819] | [-3.136] | [-6.834] | [-3.045] |
| *Note: (*; **; ***) indicate significance at 10%; 5% and 1% level of significance respectively* | | | | |

Source: Author's own computation with World Bank, and National Treasury, (2020)

Table 7.2 presents a negative and statistically insignificant relationship between aquaculture financing and South Africa's economic growth, both long and short run. This implies that the null hypothesis of no relationship between aquaculture financing and economic growth cannot be rejected.   This could be explained by the fact that the aquaculture sector in South Africa is still in the process of developing and still at the infant stage in terms of yielding significant results (Britz and Venter, 2017). These results are similar to those done by Guillen *et al.* (2019) in the EU, and by Yan *et al.* (2004) in China.   They examined the impact of structural funds invested by the governments of these countries in aquaculture. While the results of these respective studies did not show this investment as leading to an overall impact of the aquaculture sectors on the economic growth of these respective countries, the funds were shown to increase the construction of new farmers and investment in environmentally friendly technology. According to AgriSETA (2018), the aquaculture sector in South Africa was

contributing a mere 0.2% to the GDP at the time of their report, which can be said to be insignificant.

Despite aquaculture being the fastest growing ocean economy sector globally, in South Africa it continues to lag behind as compared with other countries. The aquaculture sector in South Africa continues to be faced with various challenges. One of these challenges is the availability and accessibility of necessary resources such as land, water, infrastructure, financial assistance, and market access (Madibana *et al.,* 2020). In South Africa, limited human resources in capacity building, skills, and aquaculture expertise also impede the development and expansion of aquaculture. Complex legislation governing aquaculture further stifles development and discourages potential investors. Theft of fish and machinery in fish farms has had a negative impact on the industry, resulting in the closure of many businesses in recent years (Fouché and Mnisi2020). South Africa, unlike some other countries, is not a traditional fish-eating nation, and as a result, many emerging entrepreneurs have struggled to commercialise their products locally (Madibana *et al.,* 2020).

In addition, evidence from empirical literature has highlighted that the contribution of aquaculture and fisheries to economic growth in developing countries is very weak (Heck, Bene and Reyes-Gaskin, 2007; World Bank and Food and Agriculture Organisation, 2009; Dyck and Sumaila, 2010; Stevenson and Irz, 2009; Beveridge, Phillips, Dugan and Brummet, 2010). Small scale aquaculture in these countries has not yet provided/delivered promising evidence of this contribution, while medium to large commercial scale aquaculture has recorded good returns. Despite rising trends in recent years, aquaculture's contribution to global GDP remains limited (Tsani, and Koundouri,2018). Furthermore, Tisdell *et al.* (2012) also highlighted that the aquaculture sector is characterised by uncertainties and constrained which hinder growth in the sector. According to Olaoye and Odebiyi (2013) in Nigeria constraints that hinder the growth of Aquaculture include poor marketing channels, high cost, and lack of investment.

The results in table 7.2 presents a positive and statistically significant relationship between aquaculture financing and unemployment in South Africa, both long and short run. This implies that aquaculture financing in South Africa has not yield to effective results in reducing unemployment. The review of empirical literature in Chapter four

suggests that, in developing countries, fisheries which are more labour intensive, and less technology-driven, can provide seasonal employment, therefore when the season is over people are again left unemployed (Teh and Sumaila, 2013; Wilson and Boncoeur, 2008). Other studies have shown that technological replacement in the aquaculture sector reduces employment over time (Burbidge Hendrick, Roth, and Rosenthal, 2001; Tsani and Koundouri, 2018). Thus, it can be argued from these findings that aquaculture benefits require large initial capital investment in infrastructure and the appropriate skills (White and Costelloe, 1999). Limited human resources for capacity building, skills, and aquaculture expertise has been found to hinder the development and expansion of aquaculture in South Africa (Madibana *et al.*, 2020).

It was estimated that South African aquaculture would create an increase in jobs from 2 227 to 15 000 by 2019 (Operation Phakisa, 2015). However, by 2018, the aquaculture sector had created 6500 jobs (The Green Connection, 2021), which is less than the  number of jobs that was estimated. Other causes of the aquaculture financing not being able to provide the expected results could be the fact that the sector remains constrained by a paucity of appropriate skills and knowledge: despite the aquaculture sector having been identified as an emerging sector, there remain limited specialists to advise and assist and support aquaculture farmers in research (Operation Phakisa, 2017).

The results of the current study show a positive and statistically significant relationship between aquaculture financing and entrepreneurship in the long run while the short run is insignificant. The positive effect of aquaculture financing on entrepreneurship is an indication that investing in aquaculture benefits the growth of this industry. While empirical literature review has highlighted that SMMEs in aquaculture are faced with financial and technical constraints which hinder the growth of entrepreneurs (Kleih *et al.* 2013). This is supported by the theoretical perspective which states that according to  Frederick *et al.* (2006) low ability of entrepreneurs hinders growth and development because such entrepreneurs may be less productive and have less ability to increase.

The analysis of the results shows a negative and statistically significant relationship between aquaculture financing and total trade in both the long and short run. This implies that aquaculture financing has not yield to a positive effect on total trade in

South Africa during the period under review. According to Hare and Stoneman (2017) despite regional free trade agreements, most small-scale trades in South Africa continue to face challenges when conducting cross-border trade, and most people both in South Africa and SADC are heavily reliant on the informal sector. This includes structural and institutional weaknesses together with inefficiency at most South African and other SADC member state borders, with the result that these traders have very little confidence in formal border systems, thus encouraging and reinforcing informal systems and channels in a cyclical process.

The expected EC term, where it is represented as CointEq(-1) of estimated coefficient for the four models, GDP, unemployment, entrepreneurship, and total trade are as follows: -1.89%, -0.69%, -1.13%, and -0.47 respectively, and all are significant. This implies that any deviation away from long equilibrium only 1.89 %, 0.69 %,1.13 %,0.47 % is corrected.

Table 7.2 shows a negative and statistically significant relationship between coastal marine tourism financing and economic growth both long and short run. This implies that financing coastal and marine tourism has not yet yield to a positive effect on economic growth in South Africa from the period under review. This could be because coastal and marine tourism continues to be faced with various constraints that hinder the growth of the sector. These constraints include lack of resources available or being developed to promote tourism, insufficient tourism products in the right markets in those coastal areas which are popular destinations for local domestic and foreign tourists, lack of uptake of coastal and marine tourism resources for tourism purposes, unskilled human resources, around marine assets, in particular, lack of participation from the private sector, together with underdeveloped and uncoordinated marine-related events and recreation, and unpredictable economic shifts and climate change (Bob *et al.,* 2018; Shelembe, 2015; South Africa. Department of Planning, Monitoring and Evaluation, [DPME], 2015). It is important to note, as Saayman, Saayman and Ferreira(2009) highlighted, that in South Africa there are high leakages in the tourism sector, and therefore the local economy does not enjoy the benefit to its full potential. The results of the current study are also supported by a study done by Goliath *et al.* (2018) in South Africa which emphasised growth in coastal and marine tourism is hindered by lack of awareness, lack of proper facilities, and development of the sector.

Coastal marine tourism financing has a positive and is statistically significant relationship with unemployment in both long and short-run analyses. This implies that coastal marine tourism financing has not yield effective results in reducing unemployment in South Africa during the period under review. According to the DEA (2016), the challenges that hinder the growth of the coastal and marine tourism industry in South Africa include lack of access and skills and the high cost to new entrants into coastal and marine tourism businesses. There are also high levels of unemployment, together with a lack of skills and capacity for building and technology innovations (Bob *et al.,* 2018). Furthermore, Hampton *et al.* (2017) highlighted that coastal marine tourism lacks technical and vocational training experience which hinders employment growth in the sector while Dwyer (2018) employment in the sector is seasonal. The problem of unemployment in South Africa is a general problem that affects almost all sectors of the economy and is not specifically confined to coastal and marine tourism. Unemployment in South Africa has been on the rise since the early 2000s and shows no signs of declining due to various factors, a discussion of which falls beyond the scope of the current study.

Results show coastal marine tourism financing has positive and statistically significant relationship with entrepreneurship in both long and short-run analyses. It implies that coastal and marine tourism financing in South Africa promotes entrepreneurship, and these results and indicate that coastal and marine tourism financing promotes entrepreneurship. These results are also supported by  Lal Makherjee (2021) emphasised that better infrastructure has a positive effect on entrepreneur growth and development in the coastal and marine tourism sector. Therefore, the results would indicate the likelihood that increased financing of coastal and marine tourism increases the growth of entrepreneurship in South Africa. These results are also supported by the study done by  Overbeeke, Leigh Shepherd, Canac and Grosskopf (2021) coastal and marine tourism is the most vibrant sector in that country and one which generates a substantial number of local businesses and stimulates entrepreneurship.

The results show coastal marine tourism financing has a negative and statistically insignificant relationship with total trade in South Africa, both long and short-run analysis. This implies the null hypothesis of no relationship between coastal and marine tourism financing and total trade cannot be rejected.

The expected EC term, where it is represented as CointEq(-1) of estimated coefficient for the four models, GDP, unemployment, entrepreneurship, and total trade are -1.37%, -0.37%, -1.46%, and -0.41 respectively, and all are significant. This implies that any deviation from long equilibrium only 1.37%, 0.37%,1.46%,0.41% is corrected.

Table 7.2 shows marine protection and ocean governance financing have a negative and statistically significant relationship with economic growth both long and short run. This implies that the null hypothesis of no relationship between marine protection and ocean governance financing and economic growth cannot be rejected. Financing marine protection and ocean governance with the purpose of protecting and governing the countries ocean and its contribution to economic growth has not been effective and efficient during the period under review. This deficiency has a detrimental effect on ocean sustainability productivity. Taking into account stagnant economic growth in South Africa, according to the Department of International Relations and Cooperation (2018-2019) governance structures in the country, beyond those of the ocean economy sectors, have been ineffective in too many critical areas. This has been due to uncertainty around the role and responsibilities of these structures, an inability to be effective, and limited human and infrastructural capacity (Operation Phakisa, 2015). The policy brief done by Kraemer (2017) reported that in a G20 context bad governance increases investment risks and holds back the growth of a sustainable ocean economy. In addition, the unstainable ocean hinders economic activities which are harmful to the growth of the economy.

In addition, a study by Vreÿ (2020) highlighted that by 2018 the SAPS had not yet been operational in sea areas to deal with threats within its area of responsibility coastal and marine areas, and therefore, the responsibility remains solely that of the SA Navy. Therefore, it does not matter how many investments are channelled into the marine protection and ocean governance sector, if these challenges are not dealt with, marine governance will remain ineffective. According to Operation Phakisa (2014), the country's marine areas continue to be characterised by high levels of illegal, unreported, and unregulated (IUU) fishing. Illegal harvesting of living marine resources has a negative impact on the sector's sustainability and economic benefits, indicating the urgent need to improve governance and protection of these areas and the sector. Furthermore, unless human activities are better regulated and marine life is protected

through better governance, South African ocean ecosystems will suffer irreversible damage (Walker, 2018).

Walker (2018) reports that South Africa has also sought to establish a representative network for marine protected areas (MPAs), with the goal of increasing the amount of Exclusive Economic Zone (EEZ) protected from 0.4 % to 5 % by 2019. Short-term MPA targets established by the marine protection and governance (MPG) lab, on the other hand, are unlikely to be met. The original proposal for a network of 22 MPAs was scaled back to 18, resulting in coverage of only 4.4 % of the exclusive economic zone (EEZ). The maritime defence has highlighted an increase in illegal development of South African natural maritime resources, which has led to an increase in the level of crime and instability. This represents a shortfall of 0.6% on the Operation Phakisa (2019) protection target as well as indicating the impossibility of achieving a sustainable ocean economy without adequate maritime security.

Marine protection and ocean governance financing have a negative and statistically insignificant  relationship with unemployment both long and short-run analysis. This implies that the null hypothesis of no relationship marine protection and ocean governance financing and unemployment cannot be rejected. Operation Phakisa (2014) highlighted that the sector is characterised by a lack of skills, capacity, and the appropriate knowledge for sound decision-making.

Marine protection and ocean governance financing have a negative and statistically insignificant relationship with entrepreneurship in long and short-run analysis. This implies that the null hypothesis of no relationship between marine protection and ocean governance financing and entrepreneurship cannot be rejected. Entrepreneurship in South Africa has been stagnant over several years. Aspiring entrepreneurs in the maritime sectors are faced with both the lack of building and good and governance structures, while at the same time promoting the eco-entrepreneurial spirit so that they can operate sustainable businesses which are environmentally sensitive.  Many entrepreneurs are also faced with the high cost of ecological activities (Jobo, 2020).

In the context of South African entrepreneurship, SMEs have been found to be generally failing during the start-up phase due to the risks of not being properly

managed (Jobo, 2020). Having a proper risk management strategy remains a challenge in the SME environment, regardless of the industry in which they operate (Mahembe, 2011). This is due to management's lack of risk management knowledge, insufficient resources, and poor control of environmental and risk management skills in capitalising available funds for the business's well-being and sustainability.

Marine protection and ocean governance financing  have a positive and statistically significant  relationship with total trade both long and short-run analysis. This implies that investing in marine protection and ocean governance can be beneficial to total trade as it will facilitate efficient and effective trade among countries. This means that establishing an effective regime for the ocean economy is essential to create and regulate a suitable balance between the utilisation of marine resources and the protection of marine ecosystems. Therefore, in the area of trade governance, marine protection and ocean governance play a vital role that enforcing and enhancing trade rules and regulations in a manner that promotes total trade (Eugui, Onguglo, Fevrier, Razzaqu and Roberts, 2014). Furthermore, this is beneficial to sustainable development because it seeks to protect and preserve the environment in a way that is consistent with the needs and concerns of countries at various stages of economic development.  This is also evidence of the upward trends of total trade trend that is presented in Chapter 2 (Figure, 2.4).

The expected EC term is represented as CointEq(-1) which estimated coefficients for the four models, GDP, unemployment, entrepreneurship, and total trade, are -1.94%, -0.35%, and -0.60 respectively, and all are significant.  This means that any deviation away from equilibrium only  1.9%, 35%, 0.60% are corrected.

 Following on from this discussion of the results for marine protection and ocean governance financing, the next sections present a discussion on the effects of marine transport and manufacturing financing on economic growth, unemployment, entrepreneurship, and total trade in South Africa.

Table 7.2 shows marine transport and manufacturing financing has a negative and statistically significant relationship with economic growth both long and short run. This implies that marine transport and manufacturing financing has not yield to a positive effect on economic growth from the period under review in South Africa. Given the sluggish growth rate of the South African economy during this period, marine transport

and manufacturing represent a critical vein of the economy and importance for its growth. However, marine transport infrastructure in South Africa has been faced with challenges such as outdated, insufficient, and expensive infrastructure, and limited support for market growth from both public procurement and for a national ship registry or flagging of SA ships (Operation Phakisa, 2015). Further, the high rental and tariffs costs, and the short tenure of leases for manufacturing hinder growth in the sector. Moreover, the sector has faced regulatory constraints in the form of "onerous" immigration regulations. These regulations have categorised oil rigs as refineries, a classification that has required crews to be in possession of visas to disembark or transfer to another destination.

Marine transport and manufacturing financing have a negative relationship with unemployment and to be statistically insignificant in the long run and significant in the short run. This implies that there is no relationship between marine transport and manufacturing financing and unemployment. The negative sign suggests that the marine transport and manufacturing sector has the potential to reduce unemployment in South Africa. In addition, Operation Phakisa (2015) estimated that it would create from 6 000 to 40-50 000 jobs by 2019. From the number of jobs provided in the Operational progress report in 2019 the number of jobs created by the marine transport and manufacturing sector was not clear (Operation Phakisa, 2019). This sector is characterised by a lack of skills, in particular artisan and professional skills.

Marine transport and manufacturing financing have a negative relationship with entrepreneurship in the long-run analysis, and to be statistically insignificant in the short run, while in the long run significant. This implies that, in the short run, according to the results, there is no relationship between marine transport and manufacturing financing and entrepreneurship. However, in the long run, marine transport and manufacturing financing has the probability to reduce entrepreneurship. Generally, as already mentioned, entrepreneurs are known to face the challenge of failing at the starting phase due to a plethora of challenges, including technical issues, insufficient resources, etc. (Mahembe, 2011).

Marine transport and manufacturing financing show a positive relationship with total trade both long and short-run analysis, and to be statistically significant. The study by Rehman and Noman (2020) examined the effect of transport infrastructure on trade in

selected South Asian countries during the period of 1990 to 2017, and also found this infrastructure to have a positive relationship with total trade. The results of the study by Rehman and Noman (2020) and of the current study suggest that investing in maritime transport has the potential to promote exports, or trade flows, and can contribute to higher volumes of seaborne trade.

The expected EC term, where it is represented as CointEq(-1) of estimated coefficient for the four models, GDP, unemployment, entrepreneurship, and total trade are -1.86%, -0.19%, -1.93%, and -0.60 respectively, and all are significant. This means that any deviation away from equilibrium only 1.86%, -0.19%, -1.93%, and -0. 60% is corrected.

Table 7.2 shows small harbour development financing has a negative and statistically insignificant relationship with economic growth both long and short run. This implies that the null hypothesis of no relationship between small harbour development and economic growth cannot be rejected. This means that the financing flowing to small harbour development sector has not been effective in growing the economy in the period under review. Furthermore, small harbours in South Africa continue to be faced with infrastructure constraints that hinder the growth of the sector. These constraints include insufficient and outdated maritime infrastructure, inadequate artisanal and professional skills both in infrastructure and management (Operation Phakisa, 2015). Operational inefficiencies that have been reported to be causing significant delays, increasing the number of teams operating to get all cranes working in the port, addressing structural challenges, and providing a sufficiently capacitated equipment fleet in the short to medium term to meet importer-exporter needs (Meintjes, 2020).

These results have also supported the results of a study done by Mudronja *et al.* (2020) on EU port regions. They found investment in transport infrastructure to have a negative impact on economic growth in the region and to be statistically insignificant. They suggested that one of the reasons for this could be that the effects of investing in transport infrastructure can only be seen after several years. In addition, studies done by scholars such as Clark *et al.* (2004) and Park and Seo (2016) in the US and Korea respectively, highlighted that inefficient ports hinder growth in the economy.

South Africa's busiest ports are Cape Town and Durban, these ports continue to be faced with challenges, such as poor performance and inefficiency which are having a direct effect on economic growth and employment in South Africa (Bisseker, 2021; Venter, 2021). One of the problems of efficiency has to do with the reliability of equipment which affects poor performance. The ports in Cape town are faced with congestions and shipping lines are cancelling calls. This lack of effectiveness and efficiency is critical for economic growth (Meintjes, 2020). In addition, the ports in Durban are challenged by technical issues which leads to congestion, and there is a general lack of investment in the upgrade and maintenance of the country's ports. South African harbours and ports remain challenged by insufficient container storage, long container dwell time, and outdated infrastructure (Sihlobo, 2019). Urgency resources are needed to solve the operational issues in Cape Town.

Additionally, some studies in the review of the empirical literature (Chapter 3B) have highlighted that investment in ports has been found to stimulate economic growth (Shan *et al.,* 2014; Bottasso *et al.,* 2014; Ferrari *et al.,* 2010), while Jung (2011) and Deng *et al.* (2013) have challenged the view that ports do not stimulate economic growth. Jung (2011) and Deng *et al.* (2013) in their studies done in South Korea found ports in that country to have a declining impact on the economy.


Small harbour development financing is shown to have a negative effect on unemployment both long and short-run analysis and to be statistically insignificant in the long run, and significant in the short run. This implies that in the long run there is no relationship between small development financing and unemployment, although this investment has the potential to reduce unemployment. In the short run, small harbour development financing is shown to reduce unemployment in South Africa. Jung (2011) and Deng *et al.* (2013) in their studies done in South Korea found ports to have a declining impact on the economy and employment rate in that country, with approximately 87.5% during the period of 1990 to 2008. In addition, Operation Phakisa (2019) estimated that small harbour development would create 12 000 jobs by 2019. According to the Fishing Industry News and Aquaculture (FANSA) 2020 report, small harbour development has created only 380 jobs. This means that Operation Phakisa failed to reach its objective. Operation Phakisa (2015) reported that the small harbour development industry continues to face the challenge of inadequate artisanal

professional skills. Therefore, if such skills can be fostered, or made available in the market, the sector is likely to absorb them.

Small harbour development financing has been shown to have a negative effect on entrepreneurship both long and short run analysis and to be statistically significant. This implies that there is no relationship between small harbour development and entrepreneurship. Since the small harbours or ports of the country have been found to be generally inefficient and ineffective, this imposes extra costs on entrepreneurship businesses, which make it difficult for entrepreneurship to grow.

Small harbour development financing is shown to have a positive effect on total trade both in the long and short-run and statistically significant in the long run, while insignificant in the short run. This implies that, in the long run, small harbour development financing promotes total trade in South Africa, while in the short run, the results suggest that there is no relationship, although the positive effect would suggest potential. These results are also supported by a study done by Sakyi and Immurana (2021) in Africa and a global survey by Fedorenko, *et al.* (2021), both of which studies found investments in seaports to stimulate trade.

These results suggest that there remains a need for constant investment and improvement in small harbours for development of the sector through the use of technological innovation. Further, the results suggest the need for constant improvement of seaport operations and the implementation of new knowledge and technologies in business. Ports play a major role in the ocean economy by providing storage facilities for the docking, loading, and unloading of cargo, all of which enhance the profitability of the country's imports and exports.

The expected EC term, where it is represented as CointEq(-1) of estimated coefficient for the four models, GDP, unemployment,  and total trade are as follows -1.36%, -0.28%, and -0.51  respectively, and all are significant. This suggests speed adjustment, and this implies that any deviation from long-run equilibrium only 13%, 28%, and 51% are corrected.

A further step in estimating models is checking for the adequacy of the aquaculture model before making a forecast. This checking step is divided into phases: checking model stability and diagnostic of residual performance.

## 7.4 Diagnostic tests

**Table 7. 3: Diagnostic tests: Aquaculture (AQUA)**

|  | GDP | UNEM | ENTREP | TRADE |
|---|---|---|---|---|
| Normality | 0.561(0.755) | 1.296(0.523) | 0.159(0.923) | 1.526(0.466) |
| Autocorrelation | 0.554(0.467) | 1.485(0.265) | 0.956(0.344) | 1.552(0.254) |
| Heteroscedasticity | 1.745(0.163) | 0.824(0.604) | 1.58(0.211) | 2.067(0.109) |
| RESET test | 0.768(0.394) | 0.324(0.578) | 2.756(0.082) | 1.342(0.204) |

Source: Author's own computation using data from the World Bank and National Treasury (2020)

Table 7.3 shows the residual diagnostic test of the GDP, unemployment, entrepreneurship, and total trade models. The residual is normally distributed in the model as evidenced by the null hypothesis not being rejected. Therefore, the probability is 0.75%, 0.52%, 0.92% and for 0.46% respectively, which are all greater than 5%. Therefore, all four models are normally distributed.

The autocorrelation test suggests that there is no serial correlation among GDP, unemployment, entrepreneurship, and total trade, as the p-values are 0.46%;0.26%;0.34%; and 0.25% respectively, which are greater than a 5% level of significance. The heteroskedasticity test for the three models, GDP, unemployment, entrepreneurship, and total trade shows the probabilities are 0.27%, 0.69%, 0.21%, and 0.057% respectively. This means that the test fails to reject the null hypothesis of constancy of variance among the residuals in the models, and thus these are deemed to be homoscedastic. Therefore, there is no heteroskedasticity.

The Ramsey RESET test shows that from four of the models the GDP, unemployment, entrepreneurship, and total trade. The results of the RESET test show that the model is correctly specified evidence by the probability value of 0.38%, 0.76%, 0.08% 0.07% respectively, which is greater than the 5% level of significance. Therefore, we do not reject the null hypothesis that the model is correctly specified.

The diagnostic results for aquaculture, having been presented and interpreted, the coastal and marine tourism diagnostic tests results are discussed in the following section.

**Table 7. 4: Diagnostic tests : Coastal and marine transport (CMT)**

| Test | GDP | UNEM | ENTREP | TRADE |
|------|-----|------|--------|-------|
| Normality | 0.924(0.629) | 1.620(0.448) | 0.265(0.875) | 3.00(0.222) |
| Autocorrelation | 2.995(0.069) | 0.453(0.647) | 3.627(0.079) | 0.00(0.999) |
| Heteroscedasticity | 1.725(0.168) | 0.917(0.553) | 0.896(0.552) | 0.330(0.951) |
| RESET test | 1.212(0.243) | 0.374(0.715) | 4.075(0.032) | 7.376(0.004) |

Author's own computation using World Bank and National Treasury, (202)0

Table 7.4 shows the residual diagnostic test for the GDP, unemployment, entrepreneurship, and total trade models. The residual is normally distributed in the model, as evidenced by the non-rejection of the null hypothesis using the Jarque-Bera test. Therefore, the probabilities are 0.62%, 0.44%, 0.87%, and 0.22% respectively, all of which are greater than 5%. Therefore, all three models are normally distributed.

The autocorrelation test suggests that there is no serial correlation among GDP, unemployment, entrepreneurship, and total trade, as the p-values are 0.46%;0.26%;0.34%; and 0.25% respectively, which are greater than a 5% level of significance. The heteroskedasticity test for the four models, GDP, unemployment, entrepreneurship, and total trade shows the probabilities to be 0.16%, 0.06%, 0.64% 0.07%, and 0.22 respectively, all of which are greater than a 5% significance. This means that the test fails to reject the null hypothesis of constancy of variance among the residuals in the model, and thus these are deemed to be homoscedastic. Therefore, there is no heteroskedasticity.

The results of the Ramsey RESET test for the GDP, unemployment, entrepreneurship, and total trade models show that the model is correctly specified, evidenced by the probability value of 0.24% 0.71%, 0.01% 0.00% respectively. Therefore, GDP and unemployment models can be said to have been correctly specified because their p-values were greater than the 5% level of significance, and entrepreneurship and total

trade were not correctly specified since their p-value is less than 5% of the level of significance.

The following marine protection and ocean governance diagnostic are s presented below.

**Table 7.5: Diagnostic tests : Marine protection and ocean governance (MPOG)**

| Test | GDP | UNEM | ENTREP | TRADE |
|------|-----|------|--------|-------|
| Normality | 0.402(0.817) | 0.540(0.763) | 0.717(0.698) | 0.762(0.682) |
| Autocorrelation | 0.429(0.661) | 0.316(0.734) | 4.734(0.048) | 0.798(0.471) |
| Heteroscedasticity | 0.793(0.637) | 0.659(0.731) | 1.891(0.137) | 1.680(0.179) |
| RESET test | 0.414(0.531) | 0.220(0.646) | 0.764(0.087) | 1.685(0.112) |

Author's own computation with World Bank and National Treasury (2020)

Table 7.5 shows the GDP, unemployment, entrepreneurship, and total trade models. The residual is normally distributed in the model, as evidenced by the no-rejection of null hypothesis using the Jarque-Bera test. Therefore, the probabilities 0.81%, 0.76%, 0.69%, and 0.68% all are greater than 5%. Therefore, all four models are normally distributed.

The autocorrelation test suggests that there is no serial correlation among GDP, unemployment, entrepreneurship, and total trade, as the p-values are 0.66%, 0.73%, 0.04, and 0.25% respectively, values which are greater than a 5% level of significance. The heteroskedasticity test shows the results for the four  GDP, unemployment, entrepreneurship, and total trade models, and the probabilities are 0.63%, 0.73%, 0.13%, and 0.17% respectively, and are all greater than a 5% significance. This means that the test fails to reject the null hypothesis of constancy of variance among the residuals in the model, and thus is deemed to be homoscedastic. Therefore, there is no heteroskedasticity.

The Ramsey RESET test for the four models, GDP, unemployment, entrepreneurship, and total trade models. The results of the RESET test show that the model is correctly specified, evidenced by the probabilities 0.53%, 0.64%, 0.08%, and 0.05%

respectively, which is greater than the 5% level of significance. Therefore, we do not reject the null hypothesis that the model is correctly specified.

Diagnostic tests for marine transport and manufacturing are presented below in table 7.5.

**Table 7. 6: Diagnostic test: marine transport and manufacturing (MTM)**

|  | GDP | UNEM | ENTREP | TRADE |
|---|---|---|---|---|
| Jarque-Bera | 0.450(0.798) | 0.928(0.628) | 1.233(0.539) | 1.471(0.479) |
| Autocorrelation | 0.408(0.674) | 1.924(0.259) | 3.156(0.078) | 0.315(0.735) |
| heteroskedasticity | 0.514 (0.851) | 0.945 (0.510) | 0.827 (0.619) | 1.640 (0.190) |
| Stability test | 0.108 (0.747) | 0.165(0.690) | 2.653(0.112) | 3.136(0.077) |

Source: Author's own computation with World Bank and National Treasury (2020) data

Table 7.6 shows the residual diagnostic test for the GDP, unemployment, entrepreneurship, and total trade models. The residual is normally distributed in the model, as evidenced that the null hypothesis is not rejected. Therefore, the probabilities are 0.79%, 0.62%, 0.53%, and 0.47% respectively, which are all greater than 5%. Therefore, all four models can be said to be normally distributed.

The autocorrelation test suggests that there is no serial correlation among GDP, unemployment, entrepreneurship, and total trade, as the p-values are 0.67%, 0.25%, 0.07, and 0.75% respectively, all of which are greater than the 5% level of significance. The heteroskedasticity test for the four GDP, unemployment, entrepreneurship, and total trade models showed the probabilities to be 0.85%, 0.51%, 0.61%, and 0.19% respectively, and all to be greater than the 5% significance. This means that the test fails to reject the null hypothesis of constancy of variance among the residuals in the model, and thus the residuals are deemed to be homoscedastic. Therefore, there is no heteroskedasticity.

The following small harbour development diagnostic test is presented below in table 7.6.

**Table 7. 7: Diagnostic test: Small harbour development (SHD)**

|  | GDP | UNEM | ENTREP | TRADE |
|---|---|---|---|---|
| Jarque-Bera | 0.800(0.670) | 0.526(0.768) | 0.089(0.580) | 0.195(0.906) |
| Heteroskedasticity | 2.499(0.056) | 1.409(0.276) | 1.206(0.363) | 1.152(0.387) |
| Autocorrelation | 0.472(0.635) | 0.045(0.956) | 2.213(0.152) | 0.445(0.653) |
| Stability test | 1.116 (0.308) | 0.004(0.947) | 9.344(0.002) | 2.851(0.081) |

Source: Author's own computation with World Bank data and National Treasury, (2020)

Table 7.7 shows the residual diagnostic test of the GDP, unemployment, entrepreneurship, and total trade models. The residual is normally distributed in the model as evidenced by non-rejected of the null hypothesis using the Jarque-Bera test. Therefore, the probabilities are 0.67%, 0.76%, 0.58%, and 0.90% which are all greater than 5% significance. Therefore, all three models are normally distributed.

The heteroskedasticity test for the four  GDP, unemployment, entrepreneurship, and total trade models shows the probabilities to be 0.056%, 0.27%, 0.35%, and 0.387% respectively, which are all greater than 5% significance. This means that the test fails to reject the null hypothesis of constancy of variance among the residuals in the model, and thus these models are deemed to be homoscedastic. Therefore, according to the test, there is no heteroskedasticity. The autocorrelation test suggests that there is no serial correlation among GDP, unemployment, entrepreneurship, and total trade, as the p-values are 0.63%, 0.95%, 0.15, and 0.65% respectively, all of which are greater than the 5% level of significance.

The Ramsey RESET test is conducted for the GDP, unemployment, entrepreneurship, and total trade. The results of the RESET test show that the model is correctly specified, evidenced by the probabilities value of 0.30%, 0.94%, 0.02%, and 0.08% respectively, which is greater than the 5% level of significance. Therefore, we do not reject the null hypothesis and see the model as being correctly specified.

## 7.5 Concluding remarks

The main aim of this chapter was to assess the macro-economic impact of the selected ocean sectors in South Africa. The results of the ARDL bound test show the four GDP, unemployment, entrepreneurship, and total trade models as the dependent variable, and with five ocean sectors. The results for the aquaculture sector reveal a long-run relationship among all four variables. The bound test for coastal and marine tourism confirms the existence of long-run cointegration among the four models. The bound test for marine protection and ocean government also confirms the existence of cointegration in three models, with the exception of entrepreneurship, the results for this model showing no cointegration. In addition, the bound test for marine transport and manufacturing also confirms the existence of long-run cointegration among all the models. while the bound test for small harbour development shows long-run cointegration only exists in three models, the exception being entrepreneurship, which shows no cointegration.

The results confirm a negative relationship between aquaculture financing and economic growth. This implies that government expenditure that has been flowing to the sector during the 1994 – 2019 period has not had the effect of promoting South Africa's economic growth, whilst the results suggest a positive relationship with unemployment to be statistically significant. Coastal and marine tourism financing is shown to have a negative relationship with economic growth and total trade, while a positive relationship is shown with unemployment and entrepreneurship. The Marine protection and ocean governance sector financing is shown by the tests to have a negative relationship with economic growth, unemployment, and entrepreneurship while a positive relationship with total trade is shown. The marine transport and manufacturing sector have shown to have a negative relationship with economic growth, unemployment, and entrepreneurship, while a positive relationship with total trade is suggested. In addition, small harbour development financing is shown to have a negative relationship with economic growth, unemployment, and entrepreneurship, while showing a positive relationship with total trade.

The findings presented in this chapter to have provided a valuable contribution to research in the area of the South African ocean economy, specifically in terms of the effects of investing in this ocean economy, by filling the existing gap in current

research. This contribution has been in the form of detailed analyses of the relationship between investing in ocean sectors and the macro-economic environment and thus making a useful contribution to the body of literature on the subject of interest.

Chapter 8 provides the summary, conclusions, and recommendations from the findings of the current study.

# Chapter eight

## Summary, Conclusions, and Recommendations

### 8.1 Introduction

This chapter presents summary of the findings, conclusions and recommendations. The chapter begins by presenting the highlights of the main findings in each chapter. This is followed by  presenting conclusions. Recommendations emanating from this study as well as recommendations for future studies are presented towards the end of the chapter.

### 8.2 Summary of the main findings

The first chapter presented the introduction and background to the study and outlined the objectives, hypotheses, problem statement and organisation of the study. In order to present the conceptual framework of the study , the overview of the macroeconomic environment within which the ocean economy operate was presented in chapter two. The macro-economic environment is important because the ocean economy of South Africa operates within the macro-economic environment and which has bearing on the outcome of any economic activities taking place in South Africa. The macro-economic variables presented in this chapter in graphic form showed the various trends of macro-economic variables used in the study. The overview of South African economic growth over the period under review showed the growth rate to have been on a continuous downward trajectory, particularly between 2012 and 2019. With regard to the unemployment rate during this period, the trends show the unemployment rate to have been increasing with no sign of decline. Entrepreneurship was also fluctuating, with a downward trend. The total trade in South Africa during this period showed a fluctuating upward trend. Despite all the negative trends in some of the macro-economic variables, total trade maintained its upwards trajectory during the period under review. It is concerning that whilst total trade maintained upward trend but for some reason failed to translate to economic growth and reduction of unemployment. Clearly the economic as well as social benefits derived from ocean economy financing towards various sectors has been sub-optimal during the period under review.

The conceptual framework for the study was informed by both theoretical and empirical literature reviews which were provided in chapter three and four. The main aim of chapter three was to present economic theories namely Harrod-Domar, Harrod model, neoclassical, endogenous, sustainable development model, international trade theory namely, gravity model, and economic development theory that explain the role of investment in entrepreneurship. The theories provided the basis for understanding the role of capital, saving/investment, and government expenditure on economic growth. The growth theories postulate that factors of production are the determinants of economic growth, while sustainable development explains ways of sustaining the growth in the economy. From the growth theory perspective investment and technological innovation are considered the key drivers of long-term economic growth. Barro (1990) endogenous growth model emphasised the role of government expenditure on the growth of the economy as a new production factor. Barro (1990) claimed that tax-financed government services would speed up growth. However, Barro also argued that, while in general, government expenditure should enhance growth in the long run, without productive spending, government plays a neutral if not harmful role in the growth of a country's economy. Harrod model explains the problem of unemployment in the economy which states that high saving increases investment and output growth which results in decreasing unemployment. In addition, if there are low savings which means low investment will decrease output growth which in turn will increase unemployment in the economy. The role of investment in entrepreneurship stimulates employment growth whereby the entrepreneurs generate new jobs when they enter the market and improve the productivity of entrepreneurs. In the context of the ocean economy sustainable development has to do with how the ocean's resources need to be sustained for future generations and this development has increasingly come to be seen as playing a vital role in both the ocean economy and the planet's future. It deals with issues relating to the exploitation and preservation of the marine environment or ocean resources. The gravity model suggests that the services provided by ports or harbours, and by transport infrastructure, have a positive impact on industry productivity through increasing time efficiency and reducing transport costs, which in turn promotes international trade. Given the theoretical literature review in the study it cannot be denied that ocean economy within the framework of operation Phakisa presents South Africa with a potential to grow as well

as develop the economy. Nonetheless such potential is neutralised by the endemic structural constraints present in the  South African economy, e.g inequality.

The empirical literature review was provided in two sections in chapter four. The first section reviewed the literature on the relationship between ocean economy financing and the selected macro-economic variables namely GDP, unemployment, entrepreneurship and total trade. This was grouped into the literature on developed and developing countries respectively. The second section reviewed the literature on various sectors of the ocean economy, which included aquaculture, coastal and marine tourism, marine protection and ocean governance, marine transport and manufacture, and small harbour development and the relationship of these with the macro-economic environment. Based on the empirical literature review it is notable that several authors have applied different methods of estimation in order to test for hypothesis, namely CBA, cobb-Douglas, I-O, and ECG which are considered as starting models. Furthermore, the results from the literature review reflected a picture of unclear or inconclusive in terms of the impact of ocean economy financing and economic growth. It is with this respect that the current study fills this gap by using a dynamic model namely ARDL, and this study is modified to include variables that were not included in the literature review namely unemployment, and entrepreneurship. From the discussion of the empirical literature, it is clear that there are different views with respect to the impact of ocean economy financing on the macro-economic environment.  In addition, the literature revealed a paucity of research on the subject. Thus, this study fills this gap in order to make an important contribution to the body of literature on the impact of investment in the ocean economy and its sectors, particularly the South African ocean economy.

Concerning, the literature reviewed on the individual sectors of the ocean economy the bulk of the literature reviewed was found to be based on the contribution of the ocean economy to economic growth, employment, entrepreneurship, and trade flow. From the literature review of the sectoral analysis reflected that in the aquaculture sector results mostly show negative relationship with economic growth, while coastal marine and  marine protections and ocean governance sector, were inconclusive and marine transport and harbour development results were mostly positive  and some unclear  on  the  impact  on  economic  growth.  Most  of  the  authors  used  various

methodologies to estimate hypothesis namely SEM, GMM, and CBA survey instruments which is already mentioned that they are starting models.

Chapter five presented the model specifications and the estimations. The variables included in the models were economic growth, unemployment, entrepreneurship, total trade, business freedom, government integrity, lending rate, and dummy variables which are financial crisis and Operation Phakisa. To test for stationarity the current study employed three tests, the ADF, PP, and dickey fuller GLS(ERS) tests. The bound test was employed to test for long and short-run analysis, and the study adopted the ARDL approach. In this chapter, the diagnostic tests were discussed. These included the residual normality test, the heteroscedasticity, and the autocorrelation Lagrange multiplier and stability tests.

Chapter six presented the analysis of the results. First, the stationary test using ADF showed the series to be integrated at first order or I(1), the PP test showed the series to be integrated at a mixture of order I (0) and I (1), and the dickey-fuller test showed the series to be integrated at a mixture of order I (0) and I (1). The study adopted the ARDL model because of the small size of the sample. There are four models that were tested namely GDP, unemployment, entrepreneurship, and total trade. The bound test from four models confirmed existence of cointegration among the variables. Model 1 which is GDP showed ocean economy financing to be positively relationship with economic growth in the long run, but a negatively relationship in the short run, both were statistically insignificant. Model 2 which is unemployment showed ocean economy financing has a negative and statistically significant relationship with unemployment both long and short run analysis. Model 3 showed ocean economy financing has a negative and statistically significant relationship with entrepreneurship both long and short run whilst this relationship after one lag becomes positive and statistically significant in the short run. Model 4 which is trade showed ocean economy financing has a positive and statistically significant relationship with total trade both the long and short-run analysis. The diagnostic test was performed on all four models, and the results showed that the residuals from all of the four models to be well behaved. The overall results seemed to be consistent with the prediction of the empirical literature review from developing countries that persisting constraints on ocean economies will continue to hinder the growth of the sector. Whilst the analysis of the results of the current study suggests that the South African ocean economy

plays an important role on the impact of total trade and entrepreneurship, with economic growth there still constraints that needs to be addressed before the country can realise the impact and various benefits of its ocean economy.

Chapter seven presents the results of the sectoral analysis. This chapter tested five sectors of South Africa's ocean economy: aquaculture, coastal and marine tourism, marine transport and manufacturing, marine protection and ocean governance, and small harbour development. The bound tests showed that all four models of the aquaculture sector confirmed the existence of long-run cointegration. The first sectoral analysis showed that aquaculture financing has a negative and statistically significant relationship with economic growth both long and short run analyses, while it has a positive statistically significant relationship with unemployment both the long and the short run. Aquaculture financing has positive and statistically significant relationship with entrepreneurship in the long run, although insignificant in the short run. Aquaculture financing has a negative and statistically significant relationship with total trade, both long and short run. The diagnostic tests done on the aquaculture sector found the residuals to be behaving in all four models.

The second sectoral analysis, that of the coastal and marine tourism sector showed the bound test to confirm the existence of cointegration from all four models. The results showed coastal and marine tourism financing has negative and statistically significant relationship with economic growth in both long and short run. Coastal marine tourism financing has a positive and statistically relationship with unemployment both the long and short run. Coastal marine tourism financing has a positive and statistically significant relationship with entrepreneurship both long and short run analysis. Coastal marine tourism financing has a negatively and statistically insignificant relationship with total trade both long and short run. The diagnostic test was shown to be behaving, with the exception of the stability test for entrepreneurship, and the total trade model, which show an indication that the models were not stable.

The third sectoral analysis was done on the marine protection and ocean governance sector, where the bound test confirmed the existence of cointegration, with the exception of the entrepreneurship model which showed no cointegration. The results showed marine protection and ocean governance financing has a negative and statistically significant relationship with GDP both the long and short run. In addition,

marine protection and ocean governance financing has negative and statistically insignificant relationship with unemployment in both the long and short run. Marine protection and ocean governance financing have a negative and statistically insignificant relationship with entrepreneurship both long and short run. The marine protection and ocean governance financing have a positive and statistically significant relationship with total trade both long run and short run. The diagnostic tests done on all four models was shown to be behaving.

The fourth sector, marine transport and manufacturing, the bound test confirmed the existence of cointegration in all four models. The results showed marine transport and manufacturing financing have a negative and statically significant relationship with economic growth in both the long and short run. Marine transport and manufacturing financing have a negative relationship with unemployment statistically insignificant in the long run while significant in the short run. Marine transport and manufacturing financing have a negative with entrepreneurship and statistically significant in the long run while insignificant in the short run. Marine transport and manufacturing financing have a positive and statistically significant relationship with total trade in both the long and the short run. Therefore, these results can be said to be consistent with those of studies and analyses done in both the theoretical and empirical literature reviewed and to be an indication that investing in marine transport infrastructure has the potential to promote trade flows. The diagnostic tests showed that, in all the four models, the residuals were behaving.

The fifth sector was small harbour development, where the bound test confirmed the existence of cointegration in all four models. The results showed small harbour development financing have a negative and statistically insignificant relationship with economic growth both long and short run. Small harbour development financing has negative and statistically insignificant relationship with unemployment both long run and short. Small harbour development financing has a negative and statistically significant with entrepreneurship both long and short run. Small harbour development financing has a positive and statistically insignificant relationship with total trade both long and short run. The diagnostic tests showed that in all the three models the residuals were behaving, with the exception of the stability test for entrepreneurship, which shows that the model was not stable. The analysis of results was consistent with the empirical literature on the constraints that hinder growth in some of the ocean

sectors. The analysis of results also suggests that extensive improvements need to be made in the ocean sectors in South Africa before they can collectively realise an impact on the macro-economic environment.

## 8.3 Conclusion

The macroeconomic impact of ocean economy financing in South Africa was measured through use of four main dependent variables, namely, GDP, unemployment, entrepreneurship and total trade. Based on the empirical analysis presented in this thesis the following conclusions are made.

- Ocean economy financing has a positive and statistically insignificant relationship with GDP meaning that it has potential to grow the economy in the long run provided structural constraints in South Africa are addressed. Given this result it can be concluded the null hypothesis of no relationship between ocean economy and GDP cannot be rejected. This implies that economic growth strategy in South Africa should go beyond just oceans economy. A comprehensive economic growth strategy for South Africa is needed.

- With respect to unemployment it can be concluded that ocean economy financing has a negative and statistically insignificant relationship with unemployment meaning that the null hypothesis of no relationship between ocean economy and unemployment cannot be rejected. The negative sign of the coefficient implies that ocean economy financing has potential to reduce unemployment in South Africa in the long run. Once again as in the case of GDP reported above ocean economy financing cannot be regarded as panacea for resolving unemployment problem in South Africa. A comprehensive strategy to fight unemployment in South Africa is needed.

- Entrepreneurship has negative and statistically significant relationship with ocean economy financing in the long run but has a positive and statistically significant relationship in the short run after one lag. This implies that the null hypothesis of no relationship between ocean economy financing and entrepreneurship is rejected both in the long and short run. The negative relationship in the long run implies that the ocean

economy financing poses a potential to foster entrepreneurship, but such entrepreneurship is constrained in the long run. This means that a comprehensive strategy to boost entrepreneurship through ocean economy financing should be in place. All factors inhibiting entrepreneurship should be removed.

- Total trade has positive and statistically significant relationship between ocean economy financing and total trade meaning that ocean economy financing does boost total trade in South Africa. This implies that the null hypothesis of no relationship between ocean economy financing and trade is rejected. It can, therefore, be concluded that ocean economy financing is an important ingredient to boost trade in South Africa.

- With regard to sectoral analysis it can be concluded that sectors that are likely to boost entrepreneurship are aquaculture, coastal marine tourism, marine protection and ocean governance and sectors that likely to promote trade and reduce unemployment are marine transport and manufacturing and small harbour development. Notwithstanding, in order to achieve the macroeconomic goals of the oceans the economy financing, none of these sectors should be considered in isolation, but an all-encompassing strategy which covers all sectors related to ocean economy should be considered.

## 8.4 Policy recommendations

Based on the findings, this study proposes the following recommendations for increasing a return on investment in the ocean economy sectors in South Africa.

Although the ocean economy has been predicted to be the cornerstone for promoting present and future economic growth and job opportunities in South Africa ( Operation Phakisa, 2014), levels of investment in a sustainable ocean economy remain drastically low, an indication that much needs to be done to promote a sustainable ocean economy in the country. According to the National Treasury (2019), investment has been steadily declining as a percentage of GDP, reaching a low of 17.7 % in the third quarter of 2018. This is confirmed by the flat trend of government expenditure in the ocean economy (Refer to Figure 2.5 in chapter 2), which shows that government expenditure has not been increasing and it has remained almost the same over the

period under review. Therefore, a combination of low growth in employment, as well as in investment and productivity, continues to restrain economic growth in South Africa. This has also been strongly suggested by the results of this study which indicate a positive and statistically insignificant relationship between ocean economy financing and economic growth. Whilst these results suggest that the null hypothesis of the relationship between economic growth and ocean economy financing cannot be rejected, this thesis does not in any way suggest that a flow of investment towards ocean sectors is not important. What is encouraging though, in terms of future productivity of South Africa's ocean economy, is the fact that the results of the current study provide some evidence of investment flow towards ocean economy sectors contributing positively to the country's economic growth (by virtue of the positive coefficient of the ocean economy financing variable).

Thus, the findings of the current, and other studies reviewed, indicate that the South African government should be encouraged to increase investment in all of the country's ocean economy sectors in order to promote the productivity of its ocean economy and the sustainability of its ocean and its resources. A sustainable ocean economy requires adequate financing  specifically aligned to economic activities. This financing includes economic policy instruments as well as other finance mechanisms available for South Africa to create incentives and to generate revenue for the sustainable use of the ocean and sustainable future economic growth.

Whilst the government is encouraged to implement economic instruments which can create incentives for actors in the ocean economy on a continuous basis, the government should not turn a blind eye to various negative externalities that may result from such investments in the near and long-term future.  These negative externalities include pollution, climate change, depletion of marine life and species, as well as bunkering, to mention a few possible threats which should be anticipated and addressed, for example by levying taxes, fees or charges, licence requirements etc. Concerning the effects of ocean economy financing on unemployment, which, according to the results of the current study, are shown to be in a negative relation toward one another, and to be statistically insignificant, it is notable that the ocean economy has the potential to reduce unemployment, even though it is statistically

insignificant. The persistent unemployment problem in South Africa is a general and pervasive problem, one that affects all sectors of the economy, and is not specifically or solely linked to the ocean economy. Unemployment in South Africa has been on the rise since the early 2000s without any sign of declining due to various factors, and a detailed discussion of which falls beyond the scope of this study. However, the matter of structural unemployment in South Africa needs to be addressed by both government and private sector as it pertains to the skills shortage. Since, as has been mentioned, the ocean economy, and some sectors, in particular, requires certain high-level skills, the usefulness and effectiveness of ocean economy financing on unemployment may be somewhat compromised. For this reason, this study recommends that government should continue to encourage institutions of higher learning to offer more programmes relating to maritime studies. In this context, colleges and other higher education institutions should be encouraged and supported in providing appropriate curricula that provide young people with the knowledge and skills for the specialist technical positions in the ocean economy. Government should also provide scholarships, internships, and graduate programmes for individuals who want to pursue careers in the ocean and maritime sectors.

The results showing the relationship between entrepreneurship and ocean economy financing (lagged once) indicate that this investment has the potential of enhancing entrepreneurship in South Africa. This was shown by a positive and statistically significant relationship between ocean economy financing and entrepreneurship. Therefore, it is recommended that, in order to sustain entrepreneurial activity within the ocean economy, the government should continue to provide a conducive environment for aspiring entrepreneurs entering this sector, together with the relevant resources in the form of policy and regulatory environments geared specifically to SMMEs, finance, skills and training, supporting services, and market access, based on the assumption that entrepreneurs and innovators play an important role in the economic growth of the country. The government is also encouraged to build the capacity of young entrepreneurs. To achieve this, the government should develop sustainable entrepreneurship education and skills related to the marine economy. In addition, as has already been mentioned in the context of unemployment, the government should continue to support the development of entrepreneurial skills, attitudes, and experience through education and training within the ocean economy.

Similar recommendations as those made above for unemployed youth apply to the development and training of aspiring entrepreneurs, in the various sectors of the ocean economy. These include appropriate entrepreneurship curricula, which include practical knowledge and experience of entrepreneurship and experiential training firmly embedded in training programmes. This strategy would entail forming alliances between education and training providers and the private sector. Policymakers and program managers should strengthen their engagement with existing youth networks and ensure that they are closely aligned with efforts to promote youth entrepreneurship in the ocean economy. All the entrepreneurs in the marine space should be mentored and trained in marine environmental issues as well as in relevant risk management strategies at an early stage. Business owners and managers in a specific ocean sector need to work more collaboratively and coherently in raising the level of business sustainability.

Given, as has been stated and described in previous chapters, that the South African ocean economy plays a critical role in the economy of the country and serves as a cornerstone of international trade, through international trading partnerships, the results of this study on ocean economy financing also confirm a positive statistically significant relationship on total trade, which in turn has the potential to encourages more investment in the sector so as to promote exports and imports.

Balancing the ocean economy as a productive system, while at the same time promoting sustainability and environmental protection, is necessary in order to achieve a sustainable and healthy ocean off the shores of South Africa. Therefore, addressing infrastructural challenges that hinder the growth of the sector is necessary. In this context, South Africa should strengthen its monitoring and evaluation systems for ocean economy financing in South Africa.

## 8.5 Recommendations pertaining to ocean sectoral analysis

The results show aquaculture financing to have a negative and statistically significant relationship with economic growth. This indicates that aquaculture financing has not yet yield to positive relationship with economic growth in South Africa. This implies the persistence of constraints slowing down the productivity and profitability of this sector. The neutralising and compromising effect of these constraints on the financing of this sector were discussed in the previous chapter. In this context, South African

policymakers should monitor and evaluate the systems used in aquaculture production in terms of which promote productivity and do not.  The results of the current study would indicate the advisability of linkages between aquaculture smallholder farmers and commercial farmers for the purposes of exchanging expertise and training as one of the ways of promoting productivity in the sector. Improvement in the aquaculture technological system would be an obvious requirement and one which could be achieved through better infrastructure and facilities and greater financial support. As with entrepreneurship, the government would do well to provide programs that focus on promoting small-scale aquaculture production through an interventionist approach for boosting fish production, not only for consumption but also for commercial enterprise.

In their formulation of policies for promoting aquaculture development, knowledge, and more economic sustainability of the sector, policymakers should shift the focus of incentives to rewarding aquaculture sustainability as a way of encouraging aquacultures to adapt to a more technologically advanced system so that they can be rewarded at the same time as improving their productivity. The government also needs to fund the training of small-scale farmers so that they are more knowledgeable about the industry and should encourage knowledge and skill transfer.  As has been mentioned for other ocean economy sectors, the government should strengthen the capacity of SMEs in the fisheries and aquaculture value chains through the design and implementation of projects that support SME mentorship, incubation, and development, and create an environment conducive to private investment.

Intra-Africa fish trade could be developed and improved through the establishment of various reforms and improved infrastructure which would facilitate the movement of quality fish across the continent's borders as well as internationally. Informal trade participation in this intra-regional and international trade should be encouraged by the removal of tariffs and the promotion of regional free trade agreements. In addition, the intra-regional trade should be equipped with better trade facilities for the improvement of cross-border trade governance that would enhance informal exchange that can, in turn, encourage smallholder traders.

The results for coastal and marine tourism show sector financing to have a negative relationship with economic growth in both the long and short run, and to be statistically

significant. This implies that investment in this sector has not been effective in growing the economy during the period under review.  From this finding, a recommendation would be that the government address all the constraints facing the marine tourism sector, all of which are discussed in detail in Chapter seven. One of the ways to address these constraints would be to curb the crime taking place in coastal areas, and thereby not only enhance the safety and security of local and international tourists but protect marine industries. This can be achieved by SAPS involving local communities to work with them in strengthening safety security and implementing safety awareness. This includes encouraging and ensuring the cooperation of all stakeholders involved in coastal and marine tourism: the tourism industry, local community, national authorities, police, NGOs, and state agencies.  Given the vast area and extent of South Africa's coastline and sea-beach, the government is also encouraged to improve or upgrade existing coastal and marine tourist sites, and to develop a variety of new sites and brands, such as health and wellness tourism, educational tourism, long-distance coastal walking path tourism, eno-gastronomic, nautical excursions in historical boats, underwater archaeology, maritime heritage tourism (including shipbuilding), among others, to attract local and international tourists.   This would be done alongside efficient and innovative marketing strategies designed to attract domestic and international tourists. The marketing strategies would include the development of lifelong learning programs, with inter-regional centres for employees and tourism sector students, the sharing of good practices and the creation of appropriate fora to exchange ideas and experiences, the creation of coastal tourism centres of excellence which would promote coastal tourism product innovation, the promotion of early and late season cruising and sailing tourism, sponsoring eco-friendly boating such as yachting, port development, and the enhancement of entrepreneurial skills (e.g. training on tourism image and branding). Implementing these recommendations for South African coastal and marine tourism has the potential to boost GDP, create more jobs, earn foreign currency, gain socio-cultural benefits, conserve the environment, and protect coastal areas. Finally, the government could play an important role in promoting coastal and marine tourism by offering special services to facilitate easier movement into and around the country, such as an on-site visa and a one-stop-shop for foreign tourists. The results of the study show coastal and marine tourism financing to have a positive relationship with entrepreneurship. This implies the potential for coastal and marine tourism financing to boost

entrepreneurship. However, to ensure that entrepreneurship is sustainable in this sector, more resources such as capital skills, mentorship, innovation, amongst others would need to be provided and fostered.

The results of the marine protection and ocean governance financing analysis show a negative and statistically significant relationship with economic growth. This implies that investing in this sector was not effective in growing the economy during the period under review. Even though there was a gradual increase in investment in the e sector during the period under review, the benefits derived from this flow of investment are shown to have been sub-optimal. The sector remains faced with various constraints to its effectiveness and efficiency. Therefore, these findings would suggest that, in order to keep the ocean resource safe and sustainable, the government should increase the marine protected areas (MPAs) and institute measures to prevent further degradation of South Africa's ocean and marine resources. These would include the eradication of poaching and the reduction of illegal fishing and exploitation of marine resources. As was mentioned above for the coastal and marine tourism sector, this could be achieved through increasing SAPS and SA Navy patrolling, tighter port controls, better information gathering and sharing across jurisdictions, and furthermore transparency in vessel identification and location. Further, strategies should be devised for enforcing the rules and regulations for protecting the ocean and marine coastal areas. These strategies should include innovative technologies for monitoring and enforcement in MPAs, such as passive sonar, high-frequency radar, satellite radar photography, vessel tracking, and autonomous sailboats.

The results of the marine transport and manufacturing financing analysis show a negative and statistically significant relationship with economic growth. This implies that marine transport and manufacturing financing has not yet been effective in growing the economy during the period under review. Therefore, it is recommended that the government should continuously update the infrastructure in the sector to promote the efficiency and effectiveness of the services in the sector. In addition, existing facilities should be regularly maintained, refurbished, and upgraded. The ports authorities should continue upgrading and maintaining ports infrastructure in order for maritime service to be in a competitive advantage position. In addition, local ship

owners should have access to contracts supported by sustainable and forward-driven legislation that would develop the competitiveness of local ship owning.

Further, the government should provide and enhance support for market growth from public procurement by requiring local content for all public procurement. In addition, the government should build a strong collaboration with the private sector market. Government should also establish a South African flagged fleet for coastal and international shipping, and venture into a strategic collaboration with other major maritime nations in order to gain access to further shipping knowledge and expertise. Strengthening the maritime education system in higher education institutions would help create a pool of maritime experts and professionals so that they can offer strong leadership and management of the maritime sector in South Africa. This could be achieved through collaboration with other maritime countries for the purpose of knowledge sharing and skills transfer.

The South African government regards the country's ports and terminals as critical economic growth engines (Sanjay, 2021 ). South Africa is located on one of the busiest international sea routes, which is essential for international maritime transportation. The country's geographical location presents a significant opportunity for investing in a diversified maritime market, thus expanding the capacity of container terminals and inland depots, and in so doing improving efficiency and productivity within existing port infrastructure and equipment. This would raise the sector's level of efficiency to another level,  improve economic activities, and promote economic growth. In this context, the public sector should encourage private involvement in the sector in port operation to increase port development.

Encouraging port maintenance and upgrades to provide better storage infrastructure, as well as increasing the number of teams operating to get all cranes working in ports, would go a long way toward fully meeting importer and exporter requirements. Therefore, it is recommended that policymakers remedy the development of ship owning through various investments and reforms. Ports, logistics systems, and customs administrations investments together constitute a key, well-equipped infrastructure with the potential to accommodate larger ships and thus increase the number of port calls. This has the potential of measurably improving the cargo volume,

and in this way creating opportunities for ship owning to develop around sustainable cargo volumes.

It is also recommended that the government design policies promote total trade through improving harbour and port efficiency. This would entail addressing those bottlenecks formed by inadequate up-to-date infrastructure, manual operations, cumbersome documentation procedures, congestion, and delay in clearing of containers, among several others that confront South Africa seaports and cause them to work below capacity and efficiency. Doing so would boost total trade and in turn promote economic growth. Further, as a further way to boost entrepreneurship, the government should encourage inclusive maritime enterprise development through co-operative partnerships and SMMEs.

## 8.6 Delimitations of the study

This study covers the period 1994 to 2019, which includes the Operation Phakisa phase. The current study's sectoral analysis included five ocean economy sectors: aquaculture, coastal and marine tourism, marine protection and ocean governance, marine transport and manufacturing, and small harbour development. The sixth sector, oil and gas exploration, was excluded due to the scarcity or non-availability of data for the period under review.

## 8.7 Future Research

In South Africa's ocean economy, quantifying is an area that is still worthy of further research. In addition, there are new marine industries that are emerging from the ocean economy space the designing a mechanism for data collection in order to assess those industries is necessary. As a result, more research is needed to develop an appropriate methodology for the classification and collection of economic data for these emerging ocean industries – data that is difficult to extract from national economic accounts. As a result of the increased emphasis on the ocean economy, policymakers require easily accessible and dependable information as well as accurate data on the role and the impact of the ocean industries in the broader economy. The collection, compilation, and management of socioeconomic data for the various marine-related sectors is a critical component of the information system needed to promote this more sustainable approach to ocean policy.

Traditionally, South Africa's economic development model is characterised by extensive exploitation and environmental challenges of marine resources, with intense competition among coastal zones more especial on the marine traditional industries such as fishing and port activities. Therefore, this new model of ocean economy sustainability places a higher value on marine life and resources to be conserved and sustained for the future generation. The adoption of Operation Phakisa initiative and establishment of the ocean industries pilot test sites for the ocean economy to be recognised of its importance and its role in the economy.

Many efforts have been made around the world to determine the worth of these various ocean resources so that they can be taken into consideration when making ocean policy decisions. South Africa is still at the beginning stage of building and promoting ocean resources and also understanding their value. Significant investment in research aimed at establishing the non-market or public good element of the total economic value of ocean resources in South Africa will be required in order to underpin the value of ocean economic activity and other opportunities associated with the quality of its marine environment and ocean economy. Therefore, it is recommended that future research should focus on designing an ocean economy GDP decomposition satellite account. Furthermore, a  full cost-benefit analysis (CBA) should be applied in future studies in this area.

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# APPENDIX A

## 7.1 Model 1: Aquaculture

### Table 7.1 Bound test

| Dependent variable | F-stats AQUA | 1% | 5% | 10% |
|---|---|---|---|---|
| GDP | 16.57 | Cointegration | Cointegration | Cointegration |
| Unem | 16.099 | Cointegration | Cointegration | Cointegration |
| Entrep | 5.204 | Cointegration | Cointegration | Cointegration |
| TRADE | 4.06 | Cointegration | Cointegration | Cointegration |
| | | Level of significance | Lower I (0) | Upper I (1) |
| Critical values | | 1% | 3.74 | 5.06 |
| | | 5% | 2.86 | 4.01 |
| | | 10% | 2.45 | 3.56 |

### Table 7.2: Long and short run

| Variables | GDP | UNEM | ENTREP | TRADE |
|---|---|---|---|---|
| **Long run** | | | | |
| C | 4.533 [0.539] | 123.765 [-3.593] | -67.569 [-1.922] | 825.564*** [3.605] |
| LOG(AQUA) | -0.500* [-1.912] | 3.574*** [4.430] | 1.887** [2.160] | -22.680* [-2.225] |
| BUS_FREEDOM | 0.044*** [2.048] | -0.045 [-0.837] | 0.058 [0.788] | -0.719 [-1.871] |
| LGOV_INTEGRITY | 3.325*** [2.030] | 20.461*** [3.464] | 13.348*** [2.222] | -74.810 [-1.419] |
| LENDING_RATE | -0.518*** [-7.524] | 0.357 [1.714] | -0.361*** [-2.180] | -0.320 [-0.220] |
| F_CRISIS | -4.481*** [-8.22] | 8.567*** [4.134] | -0.946 [-0.670] | -34.420 [-1.709] |
| OP | -0.676*** [-2.654] | 1.895** [3.068] | -0.446 [0.582] | -6.062 [-1.123] |
| **SHORT RUN** | | | | |
| D(GDP (-1) | 0.358*** | - | - | - |

| | | | | |
|---|---|---|---|---|
| | [3.513] | | | |
| D(UNEM(-1)) | - | 0.165 [1.302] | **-** | **-** |
| D(LOG(AQUA) | -0.950* [-1.97] | 1.094*** [2.375] | 1.322 [1.395] | -10.664*** [-5.182] |
| D(BUS_FREEDOM) | 0.125*** [2.891] | -0.197*** [-5.419] | -0.156*** [-2.228] | -0.262 [-1.321] |
| D(BUS_FREEDOM(-1)) | - | - | - | -0.618*** [-2.937] |
| D(LGOV_INTEGRITY) | 6.316* [1.959] | -5.063** [-2.219] | 5.645 [1.308] | **-**28.599* [-1.810] |
| D(LGOV_INTEGRITY (-1)) | - | -10.889*** [-3.428] | - | -21.214 [-1.563] |
| D(LENDING _RATE) | -0.363*** [-3.116] | 0.591*** [4.799] | -0.050 [-0.314] | 0.631 [1.551] |
| D(LENDING _RATE(-1)) | 0.356*** [2.878] | - | - | - |
| D(F_CRISIS) | -8.511*** [-7.848] | 5.991*** [6.779] | -1.077 [-0.660] | -16.184*** [-3.774] |
| D(OP) | -1.284*** [-2.474] | 1.325** [2.244] | -0.508 [-0543] | -2.850 [-0.877] |
| CointEq(-1)* | -1.899*** [-10.722] | -0.699 [-4.713] | -1.138 [-3.722] | -0.470 [-2.618] |
| Note: (*; **; ***) indicate significance at 10%; 5% and 1% level of significance respectively | | | | |

## Table 7.3: Diagnostic tests

| Test | GDP | UNEM | ENTREP | TRADE |
|---|---|---|---|---|
| Normality | 0.561(0.755) | 1.296(0.523) | 0.159(0.923) | 1.526(0.466) |
| Autocorrelation | 0.554(0.467) | 1.485(0.265) | 0.956(0.344) | 1.552(0.254) |
| Heteroscedasticity | 1.745(0.163) | 0.824(0.604) | 1.58(0.211) | 2.067(0.109) |
| RESET test | 0.768(0.394) | 0.324(0.578) | 2.756(0.082) | 1.342(0.204) |

## 7.2 Model 2: Coastal marine tourism

## Table 7.4: Bound test

| Dependent variable | F-stats CMT | 1% | 5% | 10% |
|---|---|---|---|---|
| GDP | 12.326 | cointegration | cointegration | cointegration |
| UNEM | 12.447 | Cointegration | Cointegration | Cointegration |
| ENTREP | 12.405 | Cointegration | Cointegration | Cointegration |
| TRADE | 7.524 | Cointegration | Cointegration | Cointegration |

|              |       | Level of significance | Lower I (0) | Upper I (1) |
| ------------ | ----- | --------------------- | ----------- | ----------- |
| Critical values | | 1%  | 3.74 | 5.06 |
|              |       | 5%    | 2.86 | 4.01 |
|              |       | 10%   | 2.45 | 3.52 |

**Table 7. 5:  Long and short run**

| Variables | GDP | UNEM | ENTREP | TRADE |
| --------- | --- | ---- | ------ | ----- |
| **Long run** | | | | |
| C | 10.924 (1.294) | -19.354 (-0.488) | -50.009 (-3.850) | 183.985 [0.732] |
| LOG(CMT) | -0.523*** (-2.817) | 5.859*** (3.693) | 2.746*** (5.643) | -2.810 [0.006] |
| BUS_FREEDOM | 0.040*** (2.153) | -0.035 (-0.332) | 0.071* (1.954) | -0.003 [-0.290)] |
| LGOV_INTEGRITY | 2.010 (0.918) | -25.662*** (-3.683) | 2.474 (1.412) | -8.571 ([-0.290)] |
| LENDING_RATE | -0.535*** (-7.628) | 2.336*** (5.336) | 0.082 (1.185) | -2.696 [-1.627] |
| F_CRISIS | -3.491*** (-8.397) | 3.568* (1.836) | -5.787*** (-10.342) | -6.353 [-0.560] |
| OP | -0.591* (-1.825) | -1.369 (-1.303) | -1.093*** (-3.428) | -3.035 [0.732] |
| **Short run** | | | | |
| DLOG(CMT) | -0.720*** (-2.803) | 0.805*** (3.057) | 1.262*** (3.417) | 1.545 [0.756] |
| D(BUS_FREEDOM) | 0.055** (2.035) | -0.131*** (-3.670) | -0.098* (-1.951) | 0.001 [0.006] |
| D(LGOV_INTEGRITY) | 2.767 (0.933) | -9.700*** (-4.404) | 3.625 (1.438) | -3.583 [-0.285] |
| D(LENDING _RATE) | -0.308*** [-2.763] | 0.773*** [8.9011] | 0.120 [1.126] | 0.520 [0.971] |
| D(LENDING_RATE (-1)) | - | -1.180*** [-2.389] | - | - |
| D(F_CRISIS) | -4.805*** [-6.066] | 1.384*** [2.049] | -8.478*** [-6.714] | -2.685 [-0.602] |
| D(OP) | -0.814 [-1.915] | -0.517 [-1.458] | -1.602*** [-2.978] | -1.268 [-0.611] |
| CointEq(-1)* | -1.376*** [-10.663] | 0.378*** [-5.806] | -1.465*** [-7.621] | -0.418*** [-2.063] |
| *Note: (*; **; ***) indicate significance at 10%; 5% and 1% level of significance respectively* | | | | |

**Table 7.6 : Diagnostic tests**

| Test | GDP | UNEM | ENTREP | TRADE |
|---|---|---|---|---|
| Normality | 0.924(0.629) | 1.620(0.448) | 0.265(0.875) | 3.00(0.222) |
| Autocorrelation | 2.995(0.069) | 0.453(0.647) | 3.627(0.079) | 0.00(0.999) |
| Heteroscedasticity | 1.725(0.168) | 0.917(0.553) | 0.896(0.552) | 0.330(0.951) |
| RESET test | 1.212(0.243) | 0.374(0.715) | 4.075(0.032) | 7.376(0.004) |

## 7.3 Model 3: Marine protection and ocean governance

### Table 7.7: Bound tests

| Dependent variable | F-stats MPOG | | 1% | 5% | 10% |
|---|---|---|---|---|---|
| GDP | 13.58 | | Cointegration | Cointegration | Cointegration |
| UNEM | 7.867 | | Cointegration | Cointegrated | Cointegration |
| ENTREP | 4.65 | | Cointegration | Cointegration | Cointegration |
| TRADE | 5.307 | | Cointegration | Cointegration | Cointegration |
| | | | Level of significance | Lower I (0) | Upper I (1) |
| Critical values | | | 1% | 3.74 | 5.06 |
| | | | 5% | 2.86 | 4.01 |
| | | | 10% | 2.45 | 3.52 |

### Table: 7.8 Long and short run

| Variables | GDP | UNEM | ENTREP | TRADE |
|---|---|---|---|---|
| **Long run** | | | | |
| C | 1.891 [0.330] | 80.880 [1.342] | 7.614 [0.290] | 392.248** [-2.019] |
| LOG(MPOG) | -0.226*** [-2.880] | -1.079 [-1.150] | -0.565 [-1.127] | 14.168*** [2.536] |
| BUS_FREEDOM | 0.063** [4.191] | -0.323*** [-2.845] | -0.059 [-1.023] | 0.508** [1.957] |
| LGOV_INTEGRITY | 2.462* [1.933] | -7.674 [-0.571] | 7.956 [1.363] | 36.926 [1.441] |
| LENDING_RATE | -0.515*** [-10.573] | 1.322*** [2.146] | -0.292 [-1.717] | -1.575 [-1.432] |
| F_CRISIS | -3.507*** [-15.130] | 8.203*** [2.326] | - | -13.979** [-1.996] |
| OP | | | | |
| **Short run** | | | | |
| D(GDP (-1) | 0.336*** [3.741] | - | - | - |

| | | | | |
|---|---|---|---|---|
| D(LOG(MPOG) | -0.440*** [-2.824] | -0.388*** [-1.235] | -0.501 [-1.266] | 4.411*** [2.000] |
| D(BUS_FREEDOM) | 0.122*** [4.260] | -0.202*** [-4.425] | -0.228*** [-2.529] | 0.315*** [1.995] |
| D(LGOV_INTEGRITY) | 4.795*** [1.923] | -8.078*** [-2.624] | 1.684 [0.391] | 22.923* [1.710] |
| D(LENDING _RATE) | -0.309*** [-3.547] | 0.475 [4.177] | -0.259* [-1.837] | 1.257 [1.641] |
| D(LENDING _RATE(-1)) | 0.353*** [3.144] | - | - | - |
| D(F_CRISIS) | -6.828*** [-12.843] | 2.952*** [4.548] | -2.928*** [-3.078] | -8.678*** [-3.055] |
| D(OP) | -1.451 [-3.055] | 0.051 [0.073] | -0.232 [-0.267] | -3.613 [-1.378] |
| CointEq(-1)* | -1.947*** [-12.015] | -0.359*** [-3.532] | -0.887*** [-5.992] | -0.620*** [-2.942] |
| Note: (*; **; ***) indicate significance at 10%; 5% and 1% level of significance respectively | | | | |

**Table 7.9 : Diagnostic tests**

| Test | GDP | UNEM | ENTREP | TRADE |
|---|---|---|---|---|
| Normality | 0.402(0.817) | 0.540(0.763) | 0.717(0.698) | 0.762(0.682) |
| Autocorrelation | 0.429(0.661) | 0.316(0.734) | 4.734(0.048) | 0.798(0.471) |
| Heteroscedasticity | 0.793(0.637) | 0.659(0.731) | 1.891(0.137) | 1.680(0.179) |
| RESET test | 0.414(0.531) | 0.220(0.646) | 0.764(0.087) | 1.685(0.112) |

**Model  7.4: Marine transport and Manufacturing**

**Table 7.10 :Bound tests**

| Dependent variable | F-stats MTM | 1% | 5% | 10% |
|---|---|---|---|---|
| GDP | 13.754 | Cointegration | Cointegration | Cointegration |
| UNEM | 7.704 | Cointegration | Cointegration | Cointegration |
| ENTREP | 6.392 | Cointegration | Cointegration | Cointegration |
| TRADE | 4.248 | Cointegration | Cointegration | Cointegration |
| | | Level of significance | Lower I (0) | Upper I (1) |

| Critical values | 1% | 3.74 | 5.06 |
| | 5% | 2.86 | 4.01 |
| | 10% | 2.45 | 3.52 |

**Table 7.11: Long and short run**

| Variables | GDP | UNEM | ENTREP | TRADE |
|---|---|---|---|---|
| **Long run** | | | | |
| C | 24.706 [1.565] | 633.841* [1.728] | 67.482 [1.420] | 754.098*** [-2.630] |
| LOG(MTM) | -1.641*** [-2.224] | -25.098 [-1.548] | -5.348*** [-2.385] | 44.307*** [2.869] |
| BUS_FREEDOM | 0.055*** [3.002] | -0.755*** [-2.144] | -0.042 [-0.715] | 0.479* [1.973] |
| LGOV_INTEGRITY | 3.356*** [2.554] | -35.492 [-1.608] | 15.467*** [2.944] | -4.414 [-0.300] |
| LENDING_RATE | -0.563*** [-11.117] | 2.618*** [2.097] | -0.665*** [-2.915] | -0.484 [-0.749] |
| F_CRISIS | -2.771*** [-5.099] | 31.187** [1.886] | -1.746 [-1.084] | -28.062*** [-2.728] |
| OP | -1.207753*** [-4.211] | -10.970* [1.542] | -0.608 [-0.703] | 7.110* [1.872] |
| **Short run** | | | | |
| D(GDP (-1) | 0.322*** [4.142] | - | **-** | **-** |
| D(log(MTM)) | -3.059*** [-2.250] | -4.869*** [-2.694] | -0.809 [-0.338] | 16.222 [1.796] |
| D(BUS_FREEDOM) | 0.103*** [3.025] | -0.238*** [-5.886] | -0.193*** [-2.355] | 0.290 [1.676] |
| D(LGOV_INTEGRITY) | 6.253*** [2.425] | -6.886 [-2.729] | 3.924 [1.271] | -2.671 [-0.314] |
| D(LENDING _RATE) | -0.394*** [-3.946] | 0.508*** [5.791] | -0.350*** [-2.998] | 1.372*** [2.565] |
| D(LENDING _RATE(-1)) | 0.363 [2.991] | - | - | - |
| D(F_CRISIS) | -5.164*** [-4.756] | 6.051*** [4.930] | -1.631 [-1.059] | -16.978*** [-3.431] |
| D(OP) | -2.250 [-3.929] | -2.128*** [-2.930] | -0.568 [-0.684] | 4.302 [1.543] |
| CointEq(-1)* | -1.863*** [-13.074] | -0.194*** [-2.481] | -0.933*** [-7.949] | -0.605 [-3.721] |
| *Note: (*; **; ***) indicate significance at 10%; 5% and 1% level of significance respectively* | | | | |

**Table 7.11: Diagnostic tests**

|  | GDP | UNEM | ENTREP | TRADE |
|---|---|---|---|---|
| Jarque-Bera | 0.450(0.798) | 0.928(0.628) | 1.233(0.539) | 1.471(0.479) |
| Autocorrelation | 0.408(0.674) | 1.924(0.259) | 3.156(0.078) | 0.315(0.735) |
| heteroskedasticity | 0.514 (0.851) | 0.945 (0.510) | 0.827 (0.619) | 1.640 (0.190) |
| Stability test | 0.108 (0.747) | 0.165(0.690) | 2.653(0.112) | 3.136(0.077) |

## Model 7.5: Small Harbour development

### Table 7.12: Bound tests

| Dependent variable | F-stats SHD | 1% | 5% | 10% |
|---|---|---|---|---|
| GDP | 13.541 | Cointegration | Cointegration | Cointegration |
| UNEM | 6.856 | Cointegration | Cointegration | Cointegration |
| ENTREP | 7.03 | cointegration | cointegration | cointegration |
| TRADE | 4.768 | No cointegration | Cointegration | Cointegration |
|  |  | Level of significance | Lower I (0) | Upper I (1) |
| Critical values |  | 1% | 2.45 | 5.06 |
|  |  | 5% | 2.86 | 4.01 |
|  |  | 10% | 2.45 | 3.52 |

### Table 7.13: Long and short run

| Variables | GDP | UNEM | ENTREP | TRADE |
|---|---|---|---|---|
| **Long run** | | | | |
| C | 4.444 [0.263] | 222.922*** [2.672] | 28.898* [0.107] | 139.584 [-0.682] |
| LOG(SHD) | -0.142 [-0.406] | -2.215 [-1.319] | -1.086*** [-2.457] | 8.782* [1.835] |
| BUS_FREEDOM | 0.061*** [2.330] | -0.568*** [-2.699] | -0.105*** [-2.352] | 0.316 [0.701] |
| LGOV_INTEGRITY | 1.218 [0.404] | -39.631*** [-2.849] | 5.497 ([1.305] | 7.341 [0.200] |
| LENDING_RATE | -0.494*** [-6.706] | 2.656*** [2.991] | -0.259** [-1.833] | -1.243 [-0.885] |
| F_CRISIS | -3.802*** [-6.459] | 14.744*** [2.343] | -2.602*** [-3.160] | -11.439 [-1.288] |
| OP | -0.690 [-1.463] | -3.578*** [2.672] | -1.028 [-1.322] | -1.988 [-0.341] |
| **Short run** | | | | |
| D(LOG(SHD) | -0.194 | -0.6320* | -1.093*** | 1.331 |

| | | | | |
|---|---|---|---|---|
| | [-0.410] | [-1.793] | [-2.588] | [0.668] |
| D(BUS_FREEDOM) | 0.084***<br>[2.159] | -0.227***<br>[-6.162] | -0.250***<br>[-3.203] | 0.164<br>[0.756] |
| D(LGOV_INTEGRITY) | 1.659***<br>[0.405] | -11.305***<br>[-6.454] | 0.420<br>[0.129] | 3.806<br>[0.201] |
| D(LENDING _RATE) | -0.255***<br>[-2.196] | 0.689***<br>[-6.364] | -0.261***<br>[-2.240] | 1.158*<br>[1.855] |
| D(LENDING_RATE (-1)) | - | -0.218***<br>[-2.991] | - | - |
| D(F_CRISIS | -5.180***<br>[-4.741] | 4.2058***<br>[6.596] | -2.620***<br>[-3.125] | -5.931<br>[-1.573] |
| D(OP) | -0.940<br>[-1.529] | -1.020<br>[-1.683] | -1.035<br>[-1.165] | -1.031<br>[-0.338] |
| CointEq(-1)* | -1.362***<br>[-8.819] | -0.285***<br>[-3.136] | -1.007***<br>[-6.834] | -0.518**<br>[-3.045] |
| *Note: (*; **; ***) indicate significance at 10%; 5% and 1% level of significance respectively* | | | | |

**Table 7.14: Diagnostic tests**

| | GDP | UNEM | ENTREP | TRADE |
|---|---|---|---|---|
| Jarque-Bera | 0.800(0.670) | 0.526(0.768) | 0.089(0.580) | 0.195(0.906) |
| Heteroskedasticity | 2.499(0.056) | 1.409(0.276) | 1.206(0.363) | 1.152(0.387) |
| Autocorrelation | 0.472(0.635) | 0.045(0.956) | 2.213(0.152) | 0.445(0.653) |
| Stability test | 1.116 (0.308) | 0.004(0.947) | 9.344(0.002) | 2.851(0.081) |