EXAMINING THE ASYMMETRIC EFFECTS OF FISH EXPORTS ON ECONOMIC GROWTH IN NAMIBIA

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE

DEGREE OF

A MASTER OF SCIENCE IN ECONOMICS

OF

THE UNIVERSITY OF NAMIBIA

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APRIL 2024

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ABSTRACT

The main aim of this study was to investigate the asymmetric effects of fish exports on economic growth in Namibia. To achieve the main objective, the study used quarterly data from the 2008Q1 to 2020Q4 and employed the Nonlinear Autoregressive Distributed Lag (NARDL) Bounds testing approach for cointegration. The Augmented Dickey Fuller and Phillips Perron tests were applied to examine the order of integration of variables while the vector error correction (VEC) causality technique was used to test for Granger causality. Suitability of NARDL method was confirmed by unit root test results which showed mixed order of integration where some variables were stationary in levels and others were integrated of the first order. Furthermore, the results found evidence of cointegration among variables under study and rejected the null hypothesis of no long run asymmetry between economic growth and fish exports. Therefore, this study presents evidence of long and short run asymmetry between fish exports and economic growth at 5%. Moreover, study results present evidence of unidirectional causality from positive of fish exports shocks (FX_POS) to gross domestic product (GDP) and no evidence of causality from negative shocks of fish exports (FX_NEG) to growth was observed. In the long run, the results showed that FX_POS positively impacts growth at 1% significance level while in the short run FX_POS positively impacts growth at 5%. Also, the second lag of FX_POS positively impacts output at 1% significant level. At the same time, results showed that FX_NEG has an insignificant impact on growth in the short and long run.

In the final analysis, this study posits that fish exports in Namibia can be stimulated by improving infrastructure and port facilities as well as improving transportation networks to ensure efficient and timely transportation of fish products from processing centres to ports.

Keywords: Fish exports, economic growth, money supply, Granger causality and integration.

ACKNOWLEDGEMENTS

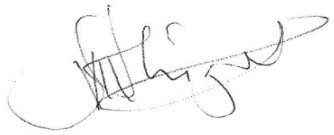
I would like to thank the Almighty God for being my strength and protecting me throughout my studies. I would not be where I am today if not for His grace and unconditional love.

DEDICATION

I dedicate this thesis to my late beloved grandmother Kuku Vistorina Kalyenge KuUwa Wa Alombole ya Mha for installing in me a culture of education, independence and being the fierce woman, I have become.

DECLARATION

I, Vistorina Shithigona, hereby declare that this study is a true reflection of my own research and that this work or part thereof has not been submitted for a degree in any institution of higher education.



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Vistorina Shithigona Date

ABBREVIATIONS AND ACRONYMS

ADF: Augmented Dickey-Fuller

GDP: Gross Domestic product

FX: Fish Exports

BON: Bank of Namibia

NARDL: Nonlinear Autoregressive Distributed Lag model

CPI: Consumer Price Index

CRDF: Co-integrating Regression Dickey-Fuller

D-W: Durbin-Watson

ECM: Error-Correction Model

E-G: Engle-Granger GDP: Gross Domestic Price

CPI: Consumer Price Index

M2: Broad Money supply

NPC: National Planning Commission

NSA: Namibia Statistic Agency

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CHAPTER ONE: INTRODUCTION

1.1 Orientation of the study

The impact of fisheries on the level of economic activity has been one of the topics of the economic debate around the world. In 2018, global fisheries and aquaculture amounted to approximately 179 million tons, with an estimated value of US$401 billion, generating over US$164 billion in exports, including 60% from developing countries [Food Agricultural Organisation (FAO), 2020]. The export of fish and fish products can potentially stimulate sustained economic growth over time (Emam, Leibrecht, & Chen, 2021). According to Moyo (2022) Namibia's fisheries sector contributes over N$9 billion (3% of GDP) to the country's gross domestic product on an annual basis. Moyo (2022) further added that the fishing sector is Namibia's third-largest employer accounting for over 15 000 direct jobs after mining and agriculture. In 2022, Fish products accounted for 13% of total exports, and were the second biggest export product category, after commodities.

The export-led growth hypothesis has been thoroughly examined by researchers around the world. However, no consensus has been reached, some researchers hold that exports are crucial for economic growth (Syed et. al., 2019; Ali, Ali Yali & Dalmar, 2018; Sunde, 2017; Sothan, 2016; Ee, 2016; El Alaoui, 2015 and Dritsaki & Stiakakis, 2014) while others maintain that exports do not matter for growth (Mahmood & Munir, 2017; Bakari, 2017; Shihab, 2014 and Abbas, 2012).

In the same way, Golub & Varma (2014) postulate that fish exports can significantly contribute to economic growth and enable an economy to participate in international markets. For Namibia, it is documented that exports are of great importance (Amavilah,

2003; Jordan & Eita, 2010). Studies also showed that it is possible to promote economic growth in Namibia by increasing exports (Joel & Eita, 2010; Simasiku & Sheefeni, 2017).

Regrettably, however, the fishing sector in Namibia has remained relatively the same since independence (NSA, 2022). It is dominated by the export of unprocessed fish products to the rest of the world (Chiripanhura & Tweldeedhin 2016). It is for that reason that Chiripanhura & Tweldeedhin (2016) advised for further investigative research on the fishery sector in Namibia using econometric modelling approaches.

The government of Namibia realized the need for exports in stimulating economic growth and put in place several initiatives to promote exports, such as the Export Processing Zone (EPZ) whose main objective was to boost the export of manufactured products to create employment and investment as well as transfer technology to the rest of the country (Bank of Namibia, 2002). Regrettably, however, the structure of the Namibian economy is still the same in terms of the contribution of the primary, secondary, and tertiary sectors to GDP despite efforts to transform the economy [National Planning Commission (NPC), 2016].

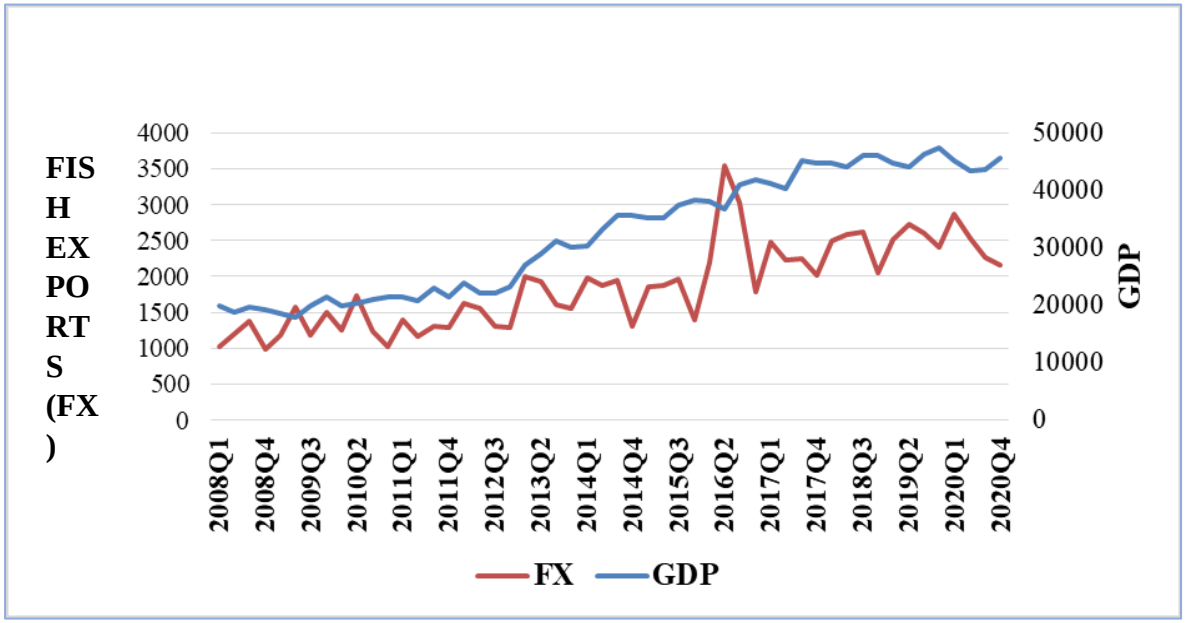
To the researcher best knowledge, no econometric empirical study found investigated the relationship between Namibia's fish exports and economic growth. Thus, there is no statistical or empirical evidence to confirm the correlation between fish exports and economic growth in Namibia which necessitates the need for testing. Most importantly, Natale, Borrello & Motova (2015) stressed the need to conduct studies that make it possible for policy makers to embark on evidence-based policy making.

1.1.2 Overview of Fishery Exports and Output in Namibia

Mainstream economics acknowledges the positive impact of exports on national output. An increase in exports is by theory expected to lead higher national income ceteris paribus.

This equally applies to fish exports in Namibia. For an overview, figure 1.1 presents the trends of fish exports and economic growth in Namibia from the first quarter of 2008 to the last quarter of 2020.

Figure 1.1: Trend in Fishery Exports and GDP in Namibia



Source: Author's computation using excel

Figure 1.1 shows that, variations in GDP were more pronounced than those in fish exports during the review period.

The Namibian coastline stretches for 1,570 km, from the Kunene River to the Orange River, Fishing activities are conducted in Walvis Bay, Swakopmund and Lüderitz. The

Namibian economy was estimated at N$45.9 billion in nominal terms in the first quarter of 2021 with the agriculture, forestry, and fishing sector accounting for N$3.8 billion (8.3 % of GDP). Furthermore, the country's exports of agricultural, forestry, and fishery products for the first quarter of 2021 totaled N$531.2 million (2.6 % of total exports).

Most notably, the Namibia Statistics Agency (NSA) report for the third quarter of 2018 highlighted that fish exports were among the top five exports from the country during the quarter. Other commodities were diamonds, precious metals, ores, and concentrates. The report further highlighted that fish exports generated N$2.5 billion during the third quarter of 2018 in comparison to N$2.3 billion generated during the same quarter the previous year. On a quarterly basis, fish exports increased by 12% during the third quarter of 2018 from that exported during the third quarter of 2017 and contributed about 10% to total export earnings of N$24.3 billion.

It is however important to note that fish products are exported in raw form with little or no value addition. Notably, Chiripanhura & Tweldeedhin (2016) analysed the fishing industry in Namibia with regards to its structure, challenges and prospects for growth using a sectorial approach. Their study concluded that the fishing sector is one sector where the government can achieve great value addition and provide job opportunities through sustainable management of fish stocks.

Eita (2016) showed that Namibia's export potential is not fully exploited specifically to countries such as Australia, Belgium, Kenya, Mauritius, Netherland, Portugal, South Africa, and Swaziland. For effective trade policy formulation and implementation, it is critical to assess the asymmetry effects of fish exports on economic growth in the country. Due to the above, this study investigates the relationship between positive and

negative changes in fish exports and economic growth in Namibia by applying the Nonlinear Autoregressive Distributed Lag Model (NARDL) on quarterly data from 2008 to 2020.

1.2 Research problem

According to NSA (2020) report, Namibia's fishing sector contributes about 20% to total exports revenue.

An analysis of the two trends shown in figure 1.1 revealed that they move in divergent directions at times. For instance, the trend in GDP fell from the first quarter of 2020 while that for fish exports increased. Therefore, there relationship seems to be unclear and indeterminate justifying the need for further examination econometrically.

Studies have been conducted on the relationship between total exports and economic growth in Namibia (Simasiku & Sheefeni, 2014; Niishinda & Ogbokor, 2013; Jordaan & Eita, 2007 and Ogbokor & Meyer, 2016). However, no studies have analysed the relationship between marine fishing industry, specifically fish exports as one unique sector of the economy in relation to economic growth. This therefore infers that the relationship between economic growth and fish export can be established and improved. Equally so, export diversification would reduce the sector's vulnerability to international economic shocks and could potentially unlock additional supply strategies for the most lucrative export opportunities (Rizal et al., 2021).

The relationship between exports and economic growth in Namibia have been thoroughly examined (Simasiku & Sheefeni, 2014; Niishinda & Ogbokor, 2013; Jordaan & Eita, 2007 and Ogbokor & Meyer, 2016) among others. All the above studies

examined the linear relationship between exports and economic growth in Namibia and did not look at fish exports alone despite its huge growth potential. There is, therefore, a gap in literature and a methodological weakness that this study wishes to address. It is against this background that this study wishes to fill this gap and investigates the issue using the Nonlinear Autoregressive Distributed Lag- (NARDL) bounds test approach to cointegration.

1.3 Research objectives

The main aim of this study is to determine the long run, short run and causal relationship between fish exports and economic growth in Namibia. The specific objectives of the study are stated as follows:

- To determine the short and long run asymmetric effect of fish exports on economic growth in Namibia.
- To assess the direction causal relationship between positive and negative fish exports shocks on economic growth in Namibia in the long and short run.

1.4 Hypothesis of the study

For the study to achieve the outlined objectives, the following hypotheses will be tested:

1. $H^1{}_0$: There is no long-run and short-run asymmetric effects of fish exports on economic growth in Namibia.

   $H^1{}_1$: There is long-run and short-run asymmetric effects of fish exports on economic growth in Namibia.
2. $H^2{}_0$: There is no causal relationship between positive and negative fish exports shocks and economic growth in Namibia.

H^2_1: There is a causal relationship between positive and negative fish exports shocks and economic growth in Namibia.

1.5 Significance of the study

Methodologically, no study found examined the nexus between export-growth nexus allied the NARDL approach. More so, there is lack of empirical work on the relationship between fish exports and development in Namibia. Unless this is addressed, decision makers and policy makers will be limited in their work.

This is because some of the arguments in both theoretical and empirical literature suggests that economic prosperity is associated with significant inflows of export revenues from fishing industry (Shamsuzzaman et al., 2020; Maldonado et al., 2017). According to FAO (2020), fish production and trade supports employment across a variety of sectors. This is evident in Namibia where the fishing sector supports the livelihood of 11 per cent of the population which is over 280 000 people (The Namibian, 2022).

This study will therefore be of great benefit to the government of Namibia, the citizens, the participants in the fishing sectors, and other researchers that wish to carry out similar studies on the nexus between fish exports and economic growth in Namibia. From a practical side, the study adds to the knowledge of fish trade in Namibia by detailing how countries can better utilize individual combinations of advantages using sectoral approaches. From a methodological side, this study is the first of its kind to establish the asymmetric effect of fish exports in Namibia.

1.6 Limitations of the study

The lack of fish exports data from 1990 will be a serious limiting factor for this study. The study will therefore not capture the relationship between the variables shortly after independence and the results should therefore be interpreted with caution. This problem of data limitation is resolved by the used of NARDL model which is not that data hungry and more suitable for small samples.

1.7 Delimitations of the study

In analysing the relationship between fish exports and economic growth, this study uses quarterly data from 2008 to 2020 due to the lack of data on fish exports from 1990. As a result, the results of the study cannot be generalised to other periods.

1.8 Organisation of the study

The rest of this study is organized as follows. Chapter one provided an in-depth orientation of the study, this was followed by the problem statement, the objectives of the study, the significance of the study, and then the limitations and delimitations of the study. The rest of the paper is divided into five chapters. Chapter Two presents the relevant theoretical and empirical literature. The methodology follows in Chapter Three, Chapter Four analyzes the data and presents the findings, while in the study presents the conclusion and recommendations based on the results in Chapter Five.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents the theoretical and empirical literature considered by the study on the relationship between fish exports and economic growth. The chapter is organised as follows. Section 2.2 presents the theoretical literature followed by the empirical literature in 2.3 and a summary and gap exposure in 2.4.

2.2 Theoretical literature review

There are several theories on the benefits that accrues to a nation from participation in international trade, the earliest of which is mercantilism which dominated economic thought between the 16th and 18th century states. This was followed by the theory of absolute advantage and then the theory of comparative advantage. The export-led growth hypothesis has also been the subject of economic debate recently. These theories are presented and explained in detail below.

2.2.1. Mercantilism theory

There are several theories which relates international trade in goods and services to economic growth. The first of these theories is the Mercantilism. This theory dominated economic thought between the 16th and 18th centuries. Mercantilism is an economic theory that postulates there is more benefit to a nation from selling to other countries more than it buys from them.

Simply put, mercantilists advocated that a nation should increase its accumulation of gold and silver by encouraging exports and reducing imports. Mercantilist policies are directed towards simultaneously accumulating wealth and resources and realising a

positive trade balance with trading partners such that the total of exports are invariably more than imports.

Johann Joachim Becher is the most famous of the 17th century German mercantilists. According to Mun (1895) countries should put in place a rule that enables them to export more of their products to other countries than they consume from them on an annual basis. This was further supported by Moon (2000) who holds that it is better for a country to sell more to other countries than it buys from them due of the advantages associated with trade surplus and unavoidable damage caused by trade deficits. Moon (2000) further added that countries that incur deficits are currently consuming future goods, which implies that the performance of these countries is overstated by measures used to establish the income and wealth levels of these countries today.

Even though mercantilism is among the oldest theories of trade, it remains part of the modern ways of economic thought. For instance, several countries such as Japan, China, Singapore, Taiwan, and German support mercantilism in one way or another such as by implementing protectionist policies, restrictions on trade and giving subsidies to domestic industries.

2.2.2. Adam Smith theory of absolute advantage

Afterwards in 1976, Smith argued that using protectionist policies on international trade such as those proposed by mercantilism could lead to retaliation by other countries in a similar way. He therefore proposed that, countries could benefit from international trade if each country focused on the production of the goods or services which it could be produce cheaply or faster. In this way, more of those goods and services will be produced to sustain the domestic economy and export to the rest of the world.

Hypothetically, given a two-country world, say Namibia which can produce fish product cheaper and faster and other Namibian trading patterns which produces goods Namibia needs faster and cheaper.

If Namibia could for instance produce fish and fish products cheaper or faster (or both) than the rest of the world, then Namibia has an absolute advantage in the production of fish and fish products. It should therefore focus on producing fish and fish products.

In the same way, if Namibia's trade partners are better at producing other goods and services Namibia wants in abundance cheaply and faster, they should as well focus on producing those goods and services. Doing so enables Namibia and its trading partners to generate factor productivity efficiencies, because their labor force becomes more skilled from doing the same tasks over and over. Ultimately, production will therefore be more efficient, because there is an incentive to create faster and better production methods to increase specialization. Namibia could then sell fish and fishing products to the rest of the world and buy other goods and services from the rest of the world which it cannot produce at a low cost or faster.

Smith's theory reasoned that due to increased efficiencies, people across the globe stand to benefit from international trade and it should be promoted and allowed. According to his theory, the wealth of a nation should not be judged by how much gold and silver it has but rather by the living standards of its people. Therefore, since these products are produced at a low cost, they will not be expensive on international markets, which makes it possible for all countries and citizens to benefit from international trade.

2.2.3 The Theory of comparative advantage

Ricardo (1817) argued that it is still possible to benefit from international trade even if one of them was more efficient at producing both goods because of the differences in opportunity costs between them. Put simply, opportunity cost refers to the potential benefit that is lost when a different alternative is chosen.

Ricardo emphasised that by focusing on the production of those goods and services which a country can produce at the lowest opportunity cost, countries stand to gain massively from international trade.

For instance, since Namibia produces fish at a lower opportunity cost than other countries. It should focus on fish production and export surplus fish products to other countries and then import goods and services that it produces at a higher opportunity cost. According to Ricardo, doing so will benefit both countries massively since they will be able to produce enough for domestic consumption and then sell surplus amounts to trading nations.

2.2.4 Heckscher-Ohlin Theory (Factor Proportions Theory)

The theories of Smith and Ricardo did not help countries establish which products would give them an advantage. Notably, the assumption by both theories was that free and open markets would lead countries and producers to determine which goods they could produce more efficiently. In the early 1900s, two Swedish economists, Eli Heckscher and Bertil Ohlin, focused their attention on how a country could gain economic advantage by focusing production on products that used resources that are in abundant supply in the country. Their theory is based on a country's factors of production mainly: land, labor, and capital.

Accordingly, they reasoned that a factor of production would be cheaper if supply was more than demand and expensive if it was demanded more than it was supplied. Their theory is also known as the factor proportions theory. It states that countries should divert attention to the production and export of goods and services which use factors of production that are in abundant supply because they are cheap.

On the other hand, the factor proportions theory suggests that countries will then buy goods or services that require the use of factors of production that are in short supply because these goods are expensive to produce. For example, Namibia is endowed with fish resources.

2.2.5. The export-led growth hypothesis

The export-led growth hypothesis (ELGH) points out that increasing exports is associated with higher national income. The ELGH advocates that in addition to increasing overall growth by increasing labour and capital, countries can also expand their level of exports (Medina-Smith 2000). Since exports are a component of GDP as indicated by the Keynesian national income identity, theoretically, the spill overs from international trade could considerably stimulate national output.

The export-led growth hypothesis has been examined by several researchers around the world among which are: Michaely (1977), Balassa (1985), Ram (1985, 1987), Bhagwati (1988), Greenway & Nam (1988), Alam (1991) and Salvatore & Hatcher (1992). They concluded that export expansion promotes economic growth. Ali et al. (2018) added to the evidence in support of the export-led growth hypothesis in Somalia using data from 1970 to 1991. In the same way, Bakari & Mabrouki (2017) provided further evidence

that exports and imports Granger cause economic growth at 1 percent significant level in Panama.

2.2.6. The growth-led exports hypothesis

The growth-led export hypothesis is the opposite of the exports-led growth hypothesis. Proponents of the growth-led exports hypothesis hold contrary to the export-led hypothesis that it is rather an increase in output that stimulates exports (Shihab, 2014; Shihab, Soufan & Abdul-Khaliq, 2014, Abbas, 2012 and Bhagwati, 1988).

In his study, Bhagwati (1988) postulates that the growth-led exports hypothesis reinforces the neoclassical trade theory where the author believes that economic development should focus on developing both demand and supply sides of the economy. Among others, Mahmood & Munir (2017) found an insignificant positive long run relationship between agricultural exports and economic growth in Pakistan and evidence in support of the growth exports hypothesis.

Also, Shihab et al (2014) provides further evidence of the growth-led exports hypothesis in Jordan. His data is from 2000 to 2012. The results present evidence of uni-directional causality between export and economic growth in Jordan and the direction of causality is strictly from economic growth to exports. In the same vein, Shihab et al. (2014) showed evidence of unidirectional Granger causality from economic growth to exports. This means that policy makers should increase production to increase the level of exports.

A study by Abbas (2012) provides further support in favor of the growth-led exports hypothesis. This study examined the relationship between exports and GDP in Pakistan

during the period 1975 to 2010. The Granger causality results indicated that causality runs from economic growth to exports in the short run.

2.3 Empirical literature review

2.3.1 Studies supporting the export-led growth hypothesis only.

Syed et al. (2019) explored the relationship between fish exports and economic growth of Pakistan by employing time series data for the period of 1974 – 2013. A linear Autoregressive distributive lag (ARDL) and Johansen and Jusellius cointegration results confirmed the existence of positive long run equilibrium relationships. Furthermore, the error-correction model revealed that no immediate or short-term relationship exists between fish exports and economic growth. While different sensitivity analysis tests presented evidence to the contrary showing that the results are robust, rolling window analysis was applied to identify the behavior of fish exports on an annual basis, and it showed that exports negatively impact growth from 1979 to 1982, 1984 to 1988 as well as from 2010 to 2013 and revealed that fish exports positively impact growth from 1989 to 1992, 2000 to 2003 and from 2005 to 2009.

Adding to the evidence in support of the export-led growth hypothesis, Ali et al. (2018) found that exports Granger cause growth in Somalia based on data from 1970 to 1991. They applied various econometric techniques such the Augmented Dickey Fuller test to examine the order of integration of variables, pairwise Granger causality to test for causal relationships as well Ordinary Least Squares (OLS) techniques and the Johansen co-integration tests to assess the long run association between variables.

Using these methods, their study also found a long run equilibrium relationship among variables and bidirectional causality between exports and imports. The authors suggested

that government should improve the knowledge and skills of the population to simulate exports in the long run.

Analysed differently, Faisal, Türsoy, & Reşatoğlu (2017) employed the ARDL-bounds testing approach to cointegration to examine the nature of the relationship between economic growth, exports, and imports in Saudi Arabia. Their study is premised on annual data from 1968 to 2014. The results showed that variables under study are strongly cointegrated. Accordingly, the resulted further showed that an increase by 1 percent of exports will ceteris paribus increase GDP by 3.39%. The parameter of error correction term is 2.89% which represents the speed of adjustment to long run equilibrium. Moreover, the Granger causality results presented evidence of a uni-directional causality from exports to GDP validating the export led growth hypothesis. The study further found evidence of uni-directional causality from imports to exports.

In Sub-Saharan African countries, Ee (2016) showed that it is possible to stimulate economic growth through the manipulation of exports. This study subjected time series data of African countries from 1985 to 2014 to panel unit root tests and panel cointegration tests. Unit root results revealed that variables are integrated of the first order hence the need to test for long run equilibrium relationships. The panel cointegration test proposed by Pedroni (2000, 2004) showed that there exists long run equilibrium relationships between exports and economic growth in Sub-Saharan Africa countries. This provides further evidence of the export-led growth hypothesis and shows that policies to promote exports on the continent are of great benefit in the long run.

Dritsaki & Stiakakis (2014) embarked on a study to assess the nature of the relationship between Foreign Direct Investments, Exports, and Economic Growth in Croatia. Their

study applied the ARDL model and ECM-ARDL on data from 1994 to 2012. The Augmented Dickey Fuller test was used to test for the presence of unit root among variables. Interestingly, foreign direct investments and exports were found to be integrated of the first order while GDP was found to be stationary at first differences.

The ARDL results presented evidence of long and short-term relationships between exports and economic growth. It is therefore documented that, stimulating exports promotes economic growth in Croatia.

2.3.2 Studies supporting the Growth-led export hypothesis only.

Mahmood & Munir (2017) found an insignificant positive long run relationship between agricultural exports and economic growth in Pakistan and evidence in support of the growth exports hypothesis. Their study considered data of agricultural export (AX), Consumer Price Index (CPI), Gross Domestic Product Growth (GDPG), Gross Capital Formation (GCF) and Labour Force Participation Rate (LFPR) from 1970 to 2014. The Dickey-Fuller test results showed that GDPG, AX and LFPR are stationary in levels while GCF is integrated of the first order and CPI of the second order. The Johansen co-integration was used to test for long run equilibrium relationship among variables. The Granger causality test revealed evidence of causality from GCF to AX at 10 percent significant level and 5 percent significant from AX to LFPR and from GDPG to AX. This study adds to literature on the evidence against the export led growth hypothesis. In the final analysis, the authors attributed the insignificant long run relationship between agricultural exports and economic growth to primary and raw material denominated exports which cannot compete on international markets.

In Jordan, Shihab (2014) looked at the role of exports on promoting economic growth by employing causality tests on data for the period 2000 to 2012. Granger causality procedures were applied to examine the causal relationship between export and economic growth. The results showed that there is uni-directional causality between export and economic growth in Jordan and the direction of causality runs strictly from economic growth to exports. In conclusion, this study provided support for growth-led export in case of Jordan.

In addition, Shihab, Soufan & Abdul-Khaliq (2014) applied the Granger causality test on exports and economic growth from 2000 to 2012 in Jordan to examine the nature of causation between the variables. The Augmented Dickey Fuller test found the presence of unit root among the variables. The study found evidence of unidirectional Granger causality from economic growth to exports. This means that policy makers should increase production to increase the level of exports in the economy which invalidates the export led growth hypothesis.

A study by Abbas (2012) provided further evidence in favor of the growth-led exports hypothesis. This study examined the relationship between exports and GDP for the Pakistan economy during the period 1975 to 2010. The Johansen cointegration, Granger causality tests and the Wald test were used in the analysis. Long and short run Granger causality tests were applied after one cointegration equation was established. The results indicated that causality runs from economic growth to exports both in short and long run at 5 percent significant level.

2.3.3 Studies supporting both export-led growth and growth led export.

The study by Kalaitzi and Chamberlain (2020) investigated the export-led growth hypothesis (ELG) in five GCC countries, namely, Bahrain, Kuwait, Oman, Saudi Arabia, and the United Arab Emirates. The study tested for unit root using the augmented production function and annual time series data over the period 1975-2016. The Johansen cointegration test was employed to examine the long run relationship between growth and exports.

Moreover, the multivariate Granger causality tests in a vector autoregressive model framework and a modified version of the Wald test were applied to examine the direction of the short-run and long-run causality. The empirical results provided evidence to support the validity of the ELG hypothesis in the short run for the UAE. In addition, the results show the presence of bi-directional causality between exports and growth in Kuwait. In the long run, the validity of the ELG is confirmed in the case of Bahrain, while economic growth causes exports in the case of Kuwait and Saudi Arabia.

At the same time, Öztürk & Özet (2020) assessed the validity of the export-led growth hypothesis in Turkey for the period from 2002Q1-2018Q4. Their study applied the Toda-Yamamoto causality test as well as the augmented dickey fuller and Phillip Perron unit root tests to examine the order of integration of variables. The results of the study showed that some variables are stationary in levels and others became stationary after first differencing. Furthermore, the results showed evidence in support of the growth-led exports in the manufacturing sector and the presence of the export-led growth in the agriculture, forestry, and fishing sectors. Regrettably, however, the results found no

evidence of causality between variables under study in the service sector. The causal relationship between total exports and GDP was proved to be bi-directional. Lastly, the authors advised government to implement policies that stimulate agriculture, forestry, and livestock sectors to promote economic growth in the country.

Consistent with the export-led growth hypothesis, Sunde (2017) investigated the nature of the relationship between economic growth, exports and foreign direct investments in South Africa using data from 1970 to 2014. His study employed the Augment Dickey Fuller and Phillip Perron test to examine the order of integration of variables.

Moreover, the Autoregressive Distributed Lag (ARDL) model and VECM Granger causality approach were employed to investigate the existence of cointegration and causality between variables. Study results showed that GDP and FDI were stationary in levels while exports were integrated of the first order. In addition, co-integration results showed evidence of long run relationships among the variables understudy, unidirectional causality from foreign direct investments to exports and bi-directional causality between exports and economic growth.

In Asia, Sothan (2016) took data to the test to estimate the impact of FDI and exports on economic growth of 21 Asian countries for the period between 1980 and 2013. The study used panel cointegration and Granger causality analysis. Moreover, the Augmented Dickey Fuller test was adopted to examine the presence of unit root among variables. Surprisingly, all variables were found to be stationary after first differencing which necessitated the need to assess the nature of the long run relationship. The results confirmed the presence of a long run equilibrium relationship between variables under study. Furthermore, the panel Granger causality analysis found evidence of the existence

of a strong bi-directional causal relationship between variables. It was therefore concluded that the export-led growth and the growth-led exports hypothesis hold for Asian countries. Based on the findings, the authors advised policy makers to consider policies that promote exports and foreign direct investments to their countries.

In the same vein, El Alaoui (2015) provided evidence in favor of the export-led growth hypothesis in Morocco. The Johansen cointegration test and Augmented Dickey Fuller tests were employed to estimate the long run relationship and order of integration of variables respectively. Using these tests, the author found the presence of unit root and established a long run relationship among variables under study.

Most notably, results showed that there is bidirectional causality between imports and economic growth as well as from exports to imports significant at 1 percent while from exports to economic growth Granger causality is significant at 10 percent.

In another study, Kumari & Malhotra (2014) provided evidence in favor of the export-led growth hypothesis in India. Their study employed the Johansen cointegration and Granger causality approach on annual data of exports and GDP per capita from 1980 to 2012. Accordingly, the Phillip Perron and Augmented Dickey Fuller test results showed that variables are integrated of the first order while the Johansen cointegration approach to cointegration found the presence of no long run equilibrium relationships among variables. However, Granger causality results confirmed the presence of bidirectional causality between variables at 5 percent.

Jaunky (2011) explored the causal relationship between fish export growth and economic growth for 23 small Island Developing States (SIDS) over the period 1989-

2002. Various panel unit root and cointegration tests were applied. The results showed strong evidence of long run relationships between the growth of fish exports and economic growth. In addition, the Blundell- Bond system Generalized Method of Moments (GMM) method was utilized to conduct Granger- type Causality tests within a Vector Autoregressive (VAR). The paper revealed that variables under scrutiny were not stationary and cointegrated. Bidirectional causality was found in the long run, implying the prevalence of a virtuous circle between fish exports and economic growth. This study adds to literature in support of both the growth-led and export-led growth hypothesis.

In addition, Nasreen (2011) took the initiative to analyze the export-led growth hypothesis for 15 Asian developing countries for the years 1975 to 2008. He used the panel unit root developed by Levin et al. (1993), the MW unit root test and panel co-integration tests developed by Pedroni (2000, 2001) and Larsson et al. (2001) as well as panel causality tests for his analysis.

The results of the study confirmed the existence of a long run relationship between economic growth and exports in some Asian developing countries running from export growth to economic growth and from economic growth to exports.

2.3.4 Studies that do not support both the export-led growth and growth led exports.

Panta, Devkota & Banjade (2021**)** assessed the presence of long equilibrium relationships and the nature of causality between economic growth, exports, and imports in Nepal using time-series data between 1965 and 2020. Their study employed the

Johansen (1988, 1991, and 1992) and Johansen and Juselius's (1990) maximum likelihood cointegration techniques assess the presence of long-run equilibrium relationships among variables. Equally so, the study made use of the VECM to assess the short and long-term Granger causality. Study results showed no evidence in favour of the exports-led growth and growth-led exports hypotheses in both the short and long run.

Kalaitzi & Chamberlain (2020) presented evidence to the contrary in UAE.

Their study looked at the causal effects of traditional UAE exports on economic growth over the period 1981-2012, using a neoclassical production function augmented with fuel-mining exports and imports of goods and services. To investigate the existence of a long-run relationship between fuel-mining exports and economic growth, the study applies the Johansen cointegration test, while the direction of the short-run causality is examined by applying the Granger causality test in a vector error correction model framework. In addition, a modified Wald test in an augmented vector autoregressive model, developed by Toda and Yamamoto (1995), was applied to investigate the existence long-run causality among variables under study. The cointegration analysis revealed the presence of a long-run relationship between the variables. While fuel-mining exports were found to have a negative impact on economic growth. Moreover, the study finds that fuel-mining exports do not cause economic growth in the short-run or the long-run.

In the same vein, Schmidt (2020) refuted the validity of the export-led growth hypothesis and the growth-led exports hypothesis in Brazil. This study subjected time

series data from 1990 to 2018 to econometrics analysis applying the Johansen cointegration test to examine the nature of the long run relationship among variables under study. Short run causality was examined using the Granger Causality wald test. The results showed that, there is no causality and long run relationship between variables under study.

Equally so, Bakari & Mabrouki (2017) presents evidence that exports and imports Granger cause economic growth at 1 percent significant level in Panama. Their study was premised on time series data from 1990 to 2015. Accordingly, the study employed the Augmented Dickey Fuller and the Phillip Perron test to establish the order of integration of variables and the Johansen co-integration analysis of Vector Auto Regression Model to assess the relation between variables. Using these methods, the results showed that imports and exports do not influence economic growth in Panama.

2.3.5 Studies on the Namibian economy

Simasiku & Sheefeni (2017) showed that agricultural exports in Namibia do not influence economic growth while non-agricultural exports significantly impact growth. Their study subjected time series quarterly data from 1990 to 2014 to econometrics tests using Eviews9 using the Johansen cointegration approach. The results further showed that, variables are integrated of the first order and found a stable long run relationship between agricultural exports and economic growth in the country which supports the export-led hypothesis.

Chiripanhura & Teweldemedhin (2016) analyses the fishing industry by focusing on the structure, performance, challenges and prospects for growth and diversification in

Namibia. The study examines the sector's governance structure and the evolution of fishery stocks and assessed the performance of the sector in terms of catch effort, sectoral contribution to GDP, employment, and the contribution to international trade. The analysis concentrates on the marine based fisheries applies two analytical methods: a qualitative approach that solicits views from local fishing associations and companies and a quantitative approach that uses the Decision Support Model. The paper found a need for examining the government's value addition policy as it instigates problems for the fishery sector in the long run.

Moreover, Ogbokor (2015) took data to the test to assess the export-led growth paradigm for Namibia through econometric methods. His study considered data from 1990 to 2012 and employed VAR and Granger causality tests for his analysis.

The cointegration test results indicated that there is a stable long-run relationship among the variables used in the VAR while the Granger-causality test found a unidirectional causality from exports to economic growth. Sheefeni & Kalumbu (2014) investigated the factors that led to changes in terms-of-trade and correspondingly how terms-of-trade had an impact on Namibia's economic growth. The study focused on the period 1980 to 2012 and employed time series techniques such as unit root, Granger Causality, cointegration and impulse response functions in the context of a vector autoregression model. The results revealed a negative relationship between terms-of-trade and economic growth of Namibia. Moreover, the study found a unidirectional relationship from economic growth to terms-of-trade.

Niishinda & Ogbokor (2013) investigated the relationship between exports and economic growth for Namibia using data from 1972 to 2010. The study used the

augmented neoclassical production function framework and employed the Johansen co-integration approach, the vector-error correction model (VECM) and the Granger causality tests to assess the relationship between variables. The Granger causality test found evidence of one-way causality running from exports to economic growth and one cointegration relationship was established between variables under study.

Jordaan & Eita (2010) examined the nexus in Namibia for the period 1970 to 2005 using granger causality and co-integration techniques. Granger causality was used to determine the nature of the causal relationship between variables, using data from 1970 to 2005 on the Namibian economy their results showed that exports Granger cause economic growth, suggesting that the country must raise exports to accelerate economic growth.

2.4. Chapter summary and gap exposure

The export led growth hypothesis has been thoroughly examined in literature in both developing and developed countries, as supported by the empirical reviews done. However, literature is inconclusive with regards to the impact of exports on economic growth. Some authors postulate that exports matter for growth (Simasiku & Sheefeni 2017; Ogbokor 2015; Niishinda & Ogbokor 2013; Syed et. Al. 2019; Ali, Ali YYali & Dalmar 2018; Sunde 2017; Sothan 2016; Ee 2016; El Alaoui 2015 and Dritsaki & Stiakakis 2014) while others present evidence to the contrary (Mahmood & Munir 2017; Bakari 2017; Shihab 2014 and Abbas 2012).

A thorough review of literature from Namibia showed that even though the relationship between exports and economic growth has extensive empirical backing (Jordan & Eita 2010; Ogbokor 2015 and Niishinda & Ogbokor 2013). There was no study that looked at the asymmetric effects of fishery exports on economic growth or the relationship between fish exports and economic growth in Namibia. This has serious implications for trade policy formulations and implementation in the fishing sector. It is for that reason that this study wishes to close that gap and investigate the issue.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter provides details on the methodology adopted by the study. The study follows a quantitative econometric approach. It is organized as follows. Section 3.2 provides the theoretical framework, 3.3 presents the specification of the model, description of variables in section 3.4, unit roots and cointegration tests in sections 3.5 and 3.6, respectively. Moreover, the chapter outlines the Granger causality tests in section 3.7 as well as the short and long run asymmetries in 3.8. These are followed by diagnostic tests in section 3.9 and then the data and data sources 3.10, the data analysis in section 3.11, and lastly, the section provides a summary in 3.12.

3.2 Theoretical framework

Exports affect economic growth through two channels, mainly the externality and product differential effects (Begum & Shmsuddin, 1998). Given the size of the Namibian economy this study assumes that the fishery export sector's growth is mostly constrained by domestic supply and not foreign demand. Thus, to model the effect of fish exports on economic growth, this study focuses on the supply side of the economy. Therefore, Feder (1983)'s theoretical framework is adopted by the study. According to this framework, the supply side of the economy is given as:

$$Y = N + X \quad \ldots 3.1$$

$$N = F(K_N, L_N, X) \quad \ldots 3.2$$

$$X = F(K_X, L_X) \quad \ldots 3.3$$

Equation 3.1 holds that a nation's Gross Domestic Product (Y) is given by the sum of the export (X) and non-export sectors (Y). K_N and K_X represents the capital used by the sectors and L_N and L_X represents the amount of labour employed by the two sectors. Taking the differentials of equation 3.1 and 3.2 yields:

$$dN = F_K dK_N + F_L dL_N + F_X dX \quad \text{.....3.4}$$

$$dX = H_K dK_X + H_L dL_X \quad \text{.....3.5}$$

Where: F_i and $H_i (i = K, L)$ are marginal productivities of input i in the non-export and export sectors respectively. Substituting, equations 3.4 and 3.5 into the identity $dY = dN + dX$, we get:

$$dY = F_K dK_N + F_L dL_N + F_X dX + (1 + \delta) F_K dK_X + (1 + \delta) F_L dL_X \quad \text{.....3.6}$$

or

$$dY = F_L * L\left(\frac{dL}{L}\right) + F_K\left(\frac{I}{Y}\right) + \left(\frac{\delta}{1+\delta} + F_X\right)\left(\frac{X}{Y}\frac{dX}{X}\right) \quad \text{.....3.7}$$

Where: $L = L_X + L_N$, $I = dK_X + dK_N$, and $\left(\frac{\delta}{1+\delta} + F_X\right)$ gives us the sum of productivity differentials and production externality effects. More so, the term $\frac{X}{Y}\left(\frac{dX}{X}\right)$ is an expression of the weighted export growth. Noteworthy, the marginal productivity of a factor for the whole economy can be established by rewriting equation 3.7 as:

$$dY = F_K dK + F_L dL + \delta F_X dK_X + \delta F_L dL_X + F_X dX \quad \text{.....3.8}$$

The marginal productivities can be derived from equation 3.8 above equation as:

$MP_k = F_K(1 + \delta \frac{I_X}{I})$ ……..……..…..……3.9

$MP_L = F_L(1 + \delta \frac{dL_X}{dL})$ ……..……3.10

Where: $\frac{I_X}{I}$ gives the proportion of export sector investment in total investment and $\frac{dL_X}{dL}$ is the proportion of additional employment created in the export sector. If $\delta = 0$, there are no productivity differentials between the export and non-export sector and the marginal productivity of an input for the whole economy will be equal to the marginal productivity of the non-export sector.

3.3 Model specification

Following an exhaustive analysis of empirical literature as well as the theoretical framework presented above, the relationship between fish exports and economic growth in Namibia can be presented as shown below following Jawaid et al. (2019).

$Y = f(FX^+, FX^-,\ M2)$……..… 3.11

The elasticity model can be presented as:

$\text{LN}Y_t\ = \beta_0 + \beta_1 LNFX_t^+,\ \beta_2 LNFX_t^- + \beta_3 LNM2_t + \varepsilon_t$……..…..…3.12

Where:

LN : shows the transformation of variables to logarithms.

LNY_t symbolized as is per capita real GDP (N$)

LNM_t : is real money supply data (N$).

$LNFX_t^+$: symbolizes positive changes in fish exports.

$LNFX_t^-$: Symbolizes negative changes in fish exports.

β_0 - is a constant

Where β_1, β_2 and β_3 are the coefficients of the variables.

According to Benoit (2011) Logarithmic transformations are best when there are nonlinear relationships between variables. The author believes that doing so enables interpretation of coefficients as elasticity and addresses problems posed by outliers in the process.

To answer the objectives of this study, fish exports are decomposed into positive (ΔFX_t^+) and negative shocks (ΔFX_t^-) where FX_t^+ and FX_t^- are partial sum processes of positive and negative shocks. Asymmetry shocks are negative and positive shocks to a variable which may have different effects on other variables in short and long run (Rahaman, Chen & Jiang, 2023). Employing the NARDL model helps establish the different impacts of shocks to fish exports on Namibia's economic growth. Fish exports are decomposed into positive and negative shocks as follows:

$$Ln\ FX_t^+ = \sum_{i=1}^{t} \Delta Ln\ FX_t^+ = \sum_{i=1}^{t} max\ (\Delta LnFX_t, 0) \quad \text{.....3.13}$$

$$LnFX_t^- = \sum_{i=1}^{t} \Delta\ LnFX_t^- = \sum_{i=1}^{t} min\ (\Delta LnFX_t, 0) \quad \text{.....3.14}$$

The reduced form of equations 3.13 and 3.14 can then be re-specified in a NARDL to capture the relationship between fish exports and economic growth as shown in equation (3.15):

$$LnY_t = \alpha_0 + \alpha_1^+ FX_t^+ + \alpha_2^- FX_t^- + M2_t + e_t \quad \text{.....3.15}$$

Equation 3.15 is respecified fully in a NARDL form in equation 3.16 as follows:

$$lnY_t = \alpha_0 + \sum_{i=1}^{q1} \varphi_{0i} \Delta lnY_{t-i} + \sum_{i=0}^{q2} \varphi_{1i}^{+} \Delta FX_{t-i}^{+} + \sum_{i=0}^{q3} \varphi_{2i}^{-} \Delta FX_{t-i}^{-} + \sum_{i=0}^{q4} \omega_{3i} M2_{t-i} +$$
$$\gamma_0 Y_{t-1} + \gamma_1^{+} FX_{t-1}^{+} + \gamma_2^{-} FX_{t-1}^{-} + \gamma_3 M2_{t-1} + \varepsilon_{it} \quad \text{.....3.16}$$

Accordingly, short run asymmetric effects of fish exports are given by φ_{2i}^{+} for positive shocks and φ_{2i}^{-} for negative shocks in equation 3.16. At the same time, long run asymmetric effects are given by γ_1^{+} for positive changes and by γ_1^{-} for negative changes.

3.4 Description and justification of variables and sources of data

Table 3.1 below provides a description of variables. Data from the first quarter of 2008 to the last quarter of 2020 was used by the study.

Table 3.1: Description of variables

Variable	Description	Source
Y	The Gross Domestic Product is the dollar value of all final goods and services produced within the borders of a country during a specified period adjusted for inflation (Mohr et al. 2001). In this study, GDP is used as a proxy for real economic growth.	Namibia Statistics Agency
M2	M2 is a measure of money supply that includes currency in the hands of the public, checking deposits, money market, unit trusts, and forms of near money that can be easily changed to cash (Mohr et al. 2001). Broad money supply is expected to positively impact economic growth. This study uses M2 following Kurniasih (2019) who assessed the long-run and short-run impacts of investment, export, money supply, and inflation on economic growth in Indonesia.	Bank of Namibia
FX	This refers to the sale of fish products by a country to other countries. Fish exports are expected to positively impact growth.	Ministry of Fisheries and Marine Resources

3.5 Diagnostic checks

3.5.1 Unit root tests

The Augmented Dickey Fuller and the Phillip Perron Tests were employed to examine the presence of unit root. The hypothesis to be tested are as follows:

H_0: Presence of unit root → non-stationary

H_1: Absence of unit root→ stationary

3.5.1.1 Augmented Dickey-Fuller Test

The ADF is deemed appropriate because it includes maximum lags of the depended variable. This enables the test to correct for autocorrelation in the error term. This study considers the following forms of ADF for its analysis.

$\Delta Y_t = \beta_1 + \beta_2 Y_{t-1} + \sum_{t-1}^{m} \beta_t \Delta Y_{t-1} + \mu_t$ (intercept)……..….3.17

$\Delta Y_t = \beta_1 + ¥ T + \beta_2 Y_{t-1} + \sum_{t-1}^{m} \beta_t \Delta Y_{t-1} + \mu_t$ (intercept and trend) ….....3.18

Where:

ΔY_t - is the variable of interest.

Y_{t-1} - is its one-period lag.

β_1 – is a constant and T is the time trend.

The null hypothesis that a variable is non-stationary against the alternative hypothesis that the variable is stationary is tested. According to Gujarati et al. (2012), the null hypothesis is rejected if the calculated t-statistics are less than the critical t statistics at 10% significant level. When this happens, it means that variables being examined are stationary.

3.5.1.2 The Phillips Perron test

In addition to the ADF test, the Phillips Perron (PP) test is deemed appropriate for this study because it has an added advantage of correcting for heteroscedasticity or any serial correlation in the errors. Another advantage of the PP tests over the ADF is that it can capture the properties of time series data in the presence of possible structural change because PP tests do not require lag length specification for the test regression (Enders, 2004). Below are the forms of the PP test by employed the study.

$\Delta Y_t = \beta_1 + \beta_2 Y_{t-1} + \mu_t$ (Intercept)……..3.19

$\Delta Y_t = \beta_1 + ¥\, T + \beta_2 Y_{t-1} + \mu_t$ (Intercept and trend) ……..…3.20

The hypotheses to be tested are:

H_0: $\sigma_\varepsilon^2 = 0$, $Y_t \sim I(0)$

H_1 : $\sigma_\varepsilon^2 > 0$, $Y_t \sim I(1)$

Equally so, the null hypothesis to be tested is that a variable has a unit root, implying that the variable is not stationary against the alternative that the variable has no unit root. In the same way, the PP test uses the same rejection rule as the ADF test.

3.5.2 Granger Causality Tests

The Granger causality was employed to provide a comprehensive answer to the second objective of the study. Granger causality is established when one variable causes the other (Engle & Granger, 1987). For this purpose, this study employed the VECM Granger causality. The null hypothesis of no Granger causality is ejected if the probability value is less than 10%.

3.5.3 Long and Short run asymmetries

Finally, long, and short run asymmetries will be tested. The null and alternative hypothesis for long run asymmetry is presented below:

$H_o: \frac{\varphi_{2i}^{+}}{\varphi_{oi}} = \frac{\varphi_{3i}^{-}}{\varphi_{oi}}$ (this means that the two impacts are the same) ……...……3.21

$H_A: \frac{\varphi_{2i}^{+}}{\varphi_{oi}} \neq \frac{\varphi_{2i}^{-}}{\varphi_{oi}}$ (this means that there is long-run asymmetry) ……..…...3.22

Long run asymmetry is established if the associated p value from the wald statistics is less than or equals to 10 percent.

Furthermore, short run asymmetry is established by adding up the positive and negative lags of each regressor. There is evidence of short run asymmetry if the associated probability values are lower than 10 percent. The null hypothesis to be tested is:

$H_o: \sum_{i=0}^{q2} \varphi_{2i}^{+} = \sum_{i=0}^{q2} \varphi_{3i}^{-}$……..…3.23

3.5.4 Lag length determination

This study uses the Akaike information criterion to select the appropriate lag length of variables. Eviews9 provides an option for automatically choosing the optimal lag length of various models and displays these models on a figure. This figure will then be copied into word and reported accordingly.

3.5.5 Normality Test

The Jarque-Bera test is used by this study to test for normality. The test assesses whether the data has a skewness and Kurtosis which matches a normal distribution. The test statistic is defined as:

$JB = \frac{n}{6}(S^2 + \frac{1}{4}(K-3)^2$ ……3.24

Where: n is the sample size or degrees of freedom, S is the skewness of the sample and K is the kurtosis of the sample.

The null hypothesis that the residuals are normally distributed against the alternative hypothesis that, they are not normally distributed is tested. Subsequently, the study fails to reject the null hypothesis if the probability value is greater than 10%.

3.5.6 Model Specification Test

The Ramsey reset (1969) test will be used to examine the specification of the model. This test assesses whether non-linear combinations of fitted variables help explain the dependent variable. Accordingly, this test fails to reject the null hypothesis that the model if the probability value is greater than 10 percent.

3.5.7 Autocorrelation Test

Autocorrelation results when residuals are associated over time. To test for autocorrelation, this study employs the Breusch-Godfrey LM test (1978) to test for serial correlation. To do this the null hypothesis of no serial correlation and the alternative hypothesis of serial correlation are tested. The null hypothesis of no autocorrelation is not rejected if the probability value is greater than 10 percent.

3.5.8 Heteroscedasticity Test

According to Gujarati (2004) Heteroscedasticity refers to the situation where the variance of the Y population varies with X. Symbolically, this can be represented as:

var $(U_i| X_i) = Q^2$ ……3.25

Gujarati (2004) further noted that, in the presence heteroscedasticity OLS estimators no longer have a minimum variance even though there are unbiased and consistent.

This study employs the Breusch-Pegan test (1979) to test for heteroscedasticity. The study does not reject the null hypothesis of no heteroscedasticity if the P value is greater than 10%.

3.6 Chapter summary

This chapter discussed the methodology adopted by the study. Eviews9 was used to analyze the data. In brief, the ADF test was applied to assess the presence of unit root while the Non-Linear Autoregressive Distributed Lag modelling approach was followed to examine the asymmetry effects of fishery exports on economic growth in Namibia. In addition, the study tested for Granger causality using the Pair wise Granger Causality test. In the next chapter, the findings and analysis of the results are discussed.

CHAPTER FOUR: DATA ANALYSIS AND EMPIRICAL RESULTS

4.1 Introduction

This chapter presents the empirical results of this study. The descriptive statistics is presented in 4.2, followed by pre-estimation diagnostic checks in 4.3, VECM Granger causality results in 4.4, and the long and short run estimation of NARDL in 4.5. The long run and short run asymmetry results in 4.6 and then the post estimation Diagnostic tests 4.7**.** The section concludes the chapter with a summary in 4.9.

4.2 Descriptive Statistics

Table 4.1 below presents the descriptive statistics of variable considered by the study. The mean for LNGDP is 10.34, for positive changes in LNFX_POS is 2.89, for negative changes its --2.34and for LNM2 its 11.17. The skewness of all variables is close to zero which shows that they are perfectly symmetrical around the mean. The table further shows that all other variables are normally distributed except GDP whose Jarque-Bera of 5.7243 and a probability value of 0.05714.

Table 4.1: descriptive statistics

	LNGDP	**LNFX_POS**	**LNFX_NEG**	**LNM2**
Mean	10.34025	2.894465	-2.338778	11.17018
Median	10.46691	2.689597	-2.048011	11.21676
Maximum	10.76752	5.115124	0.000000	11.74283
Minimum	9.797583	0.149295	-4.369057	10.23996
Std. Dev.	0.337127	1.567524	1.307202	0.376529
Skewness	-0.231572	-0.058243	0.059620	-0.552064
Kurtosis	1.425419	1.717939	1.817250	2.894101
Jarque-Bera	5.724341	3.521656	3.002872	2.614415
Probability	0.057145	0.171902	0.222810	0.270575
Sum	527.3527	147.6177	-119.2777	569.6790
Sum Sq. Dev.	5.682732	122.8566	85.43890	7.088710
Observations	**51**	**51**	**51**	**51**

Source: authors computation using eviews9

4.3 Pre-estimation diagnostic checks

4.3.1 Unit root test results

It is important to examine the order of integration of variables before performing economic modelling. This is because the method to be applied depends on the order of integration of variables. For instance, the presence of I (2) variables invalidates the bounds testing approach to cointegration (Simasiku, 2022). Table 4.2 below presents the unit root test results.

Table 4.2: presents the unit root results.

Name of variable	Model Specification	Unit root test				Order of integration
		ADF test		PP test		
		Levels	First differences	Levels	First differences	
GDP	Intercept	-0.69	-7.86***	-0.52	-10.47***	I (1)
	Intercept and trend	-2.11	-6.10***	-2.27	-11.67***	I (1)
M2	Intercept	-0.761	-5.015***	-2.690	-7.20***	I (1)
	Intercept and trend	-3.620**	-5.01***	-5.50***	-7.50***	I (0)
FX	Intercept	-1.35*	-5.56***	-2.95**	-6.09***	I (0)
	Intercept and trend	-8.84***	-8.80***	-19.1***	-20.5***	I (0)

*Note: *** p<0.01, ** p<0.05, * p<0.1. indicating significance at 1%, 5%, and 10%.*

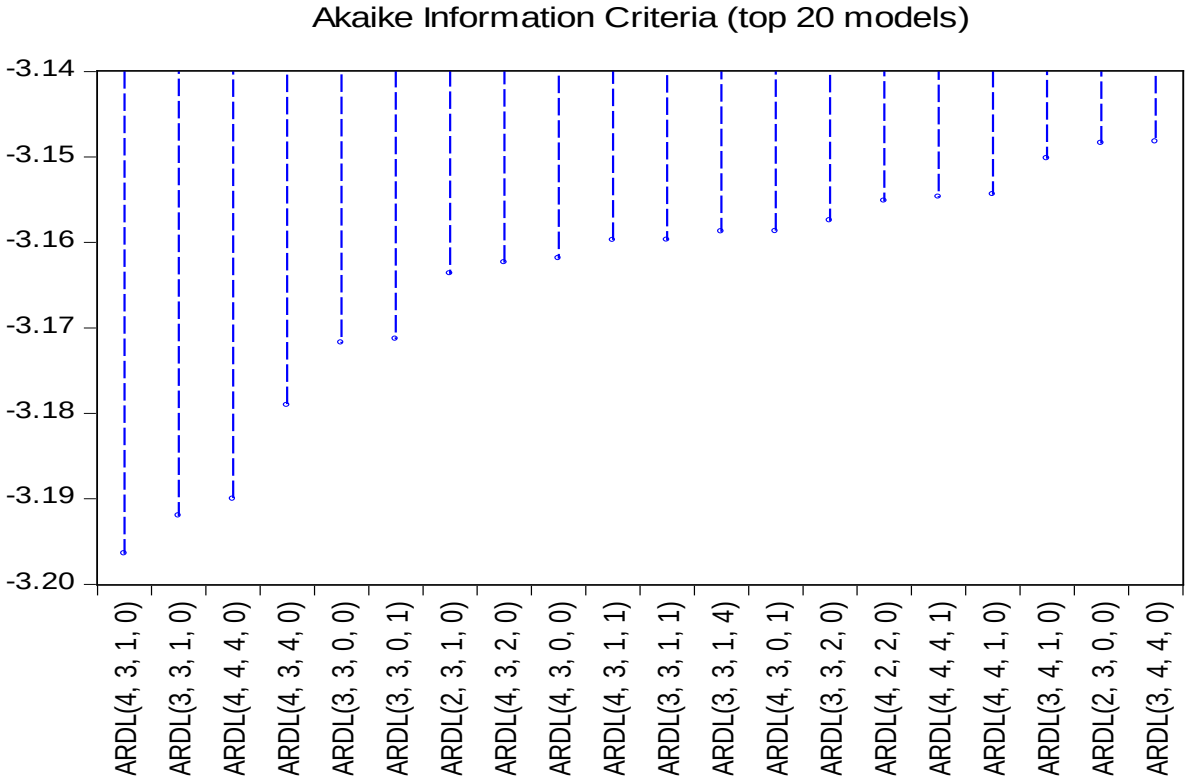
Source: Author's computation using Eviews9

Unit root test results above revealed that M2 and fish exports are stationary in levels while GDP is integrated of the first order. The absence of I (2) variables make it possible to investigate whether a long run relationship exists among variables by employing the NARDL model.

4.3.2 Model selection criteria

The appropriate model was automatically selected in Eviews9. The Akaike information criterion was used to select the optimal lag length of variables using equation 3.16. The best model or lag order is one that minimizes the value of AIC. As a result, NARDL (4, 3, 1,0) was chosen for this study as the best lag order since it has the smallest AIC value.

Figure 4.1: Akaike Information Criteria Model selection criteria



Source: authors computation using eviews9

4.3.4 Cointegration Tests results

To examine the long run equilibrium relationship between variables. The bounds test approach to cointegration was used to test for cointegration among variables under study. The results are presented in Table 4.4. Because the computed F-statistics of 4.46 is greater than the lower and upper bounds at 5 percent, the study rejects the null hypothesis of no cointegration in support of alternative of presence of cointegration. Therefore, the study concludes that there is cointegration among variables.

Table 4.3: Cointegration results

Dependent: RGDP	F statistics	Level	Lower Bound	Upper Bound	Outcome
	4.46*	10%	2.72	3.77	Cointegrated
		5%	3.23	4.35	
		1%	4.29	5.61	

Source: Authors' computation using EViews 9

4.4 VECM Granger Causality results

Table 4.5 presents VECM Granger causality results. In the table, ECT (-1) in each equation is the respective adjustment coefficient where LNGDP, FX_NEG, FX_POS and M2 are dependent variables. The results show that only the adjustment coefficient when LNGDP is the dependent variable is negative and significant at 10%. This provides evidence of unidirectional long run causality among variables under study from fishing export to growth.

Table 4.4: Granger causality results

Dependent variable	SR causality				LR causality
	ΔLNGDP	ΔFX_NEG	ΔFX_POS	ΔM2	ECT_{t-1}
ΔLNGDP	-	0.046	-0.125*	-0.12	-0.027*
		(0.538)	(0.068)	(0.071)	(0.089)
ΔFX_NEG	-0.338	-	0.302	0.049	0.156
	(0.215)		(0.029)	(0.83)	(0.00)
ΔFX_POS	-0.322	0.4**	-	0.358	0.11
	(0.31)	(0.015)		(0.19)	(0.00)
ΔM2	0.017	-0.197**	-0.013	-	-0.023
	(0.92)	(0.03)	(0.8)		(0.237)

*Note: ***, **, * denote significance at 1%, 5% and 10% level respectively*

Source: Author's computation using Eviews9

At the same time, VECM Granger causality results in Table 4.5 also revealed evidence of unidirectional causality in the short run from FX_POS to LNGDP at 10 percent, respectively. In the same way, also in the short run, this study presents evidence of unidirectional causality from FX_NEG to FX_POS and M2 at 5% significant level.

4.5 Long and short run estimation of NARDL

The long and short run estimation of NARDL results are shown in table 4.6. A variable significantly influences another in the short or long run if its associated probability value is less than or equal to 10 percent. The first part of the table presents long run estimation results followed by the short run results.

Results show that LN_NEG and M2 do not have significant impacts on growth in the long run because their associated p values are greater than 10% while FX_POS positively impacts GDP at 1 percent significant level.

Table 4.5 Long and Short run results from NARDL

Variable	Coefficient	t-Statistic	Prob.
Long run model			
LNFX_POS	0.213***	3.024	0.0040
LNFX_NEG	-0.005	0.013	0.9898
LNM2	-0.045	-0.318	0.7517
Short run model			
DLNGDP (-1)	0.208	1.291	0.2048
DLNGDP (-2)	-0.145	-1.037	0.306
DLNGDP (-3)	-0.112	-0.825	0.415
DLNGDP (-4)	0.254*	1.873	0.069
DLNFX_POS	0.103**	2.214	0.033
DLNFX_POS (-1)	-0.066	-1.495	0.144
DLNFX_POS (-2)	0.159***	3.670	0.001
DLNFX_POS (-3)	-0.108***	-3.305	0.002
DLNFX_NEG	0.011	-0.296	0.769
DLNFX_NEG (-1)	0.099	1.614	0.117
DLNM2	-0.174	-0.665	0.510
ECT (-1)	**-0.112**	**-1.249**	**0.219**

Source: authors computation using eviews9

These results are consistent with the findings by Jaunky (2011) and Syed et al. (2019) who presented evidence of strong long run relationships between fish exports and

economic growth for 23 small Island Developing States (SIDS and Pakistan respectively).

In the short run, the fourth lag of GDP positively impacts the current level of GDP at 10%, FX_POS positively impacts GDP at 5% and the second lag of FX_POS positively impacts output at 1 percent significant level. On the contrary, the third lag FX_POS negatively impacts GDP at 5%. The error correctional is negative but not significant.

4.6. Long run and short run asymmetry test

The presence of long run asymmetry was tested by evaluating the hypothesis below:

$H_o: \frac{-\varphi_{2i}^{+}}{\varphi_{oi}} = \frac{-\varphi_{3i}^{-}}{\varphi_{oi}}$ (this means that the two impacts are the same) ……4.1

$H_A: \frac{-\varphi_{2i}^{+}}{\varphi_{oi}} \neq \frac{-\varphi_{2i}^{+}}{\varphi_{oi}}$ (this means that there is long-run asymmetry) ……4.2

While the presence of short run asymmetry was testing by

$H_o: \sum_{i=0}^{q2} \varphi_{2i}^{+} = \sum_{i=0}^{q2} \varphi_{3i}^{-}$……4.3

The results for long run and short run asymmetry revealed evidence of long and short run asymmetry relationship between GDP and positive and negative changes in FX given p-values lower than 5%. This provides the answer to the first objective of the study.

Table: 4.6: long run and short run asymmetry

	F-statistics	P-value
Long-run	6.108**	0.019
Short run	5.013**	0.033

****, ** and * indicates the level of significance at 1 %, 5% and 10% respectively.*

Source: authors computation using eviews9

4.7 Post estimation Diagnostic tests

Table 4. presents the diagnostics test results for the adopted model which is NARDL (4, 3, 1, 0) as previously reported using equation 3.16.

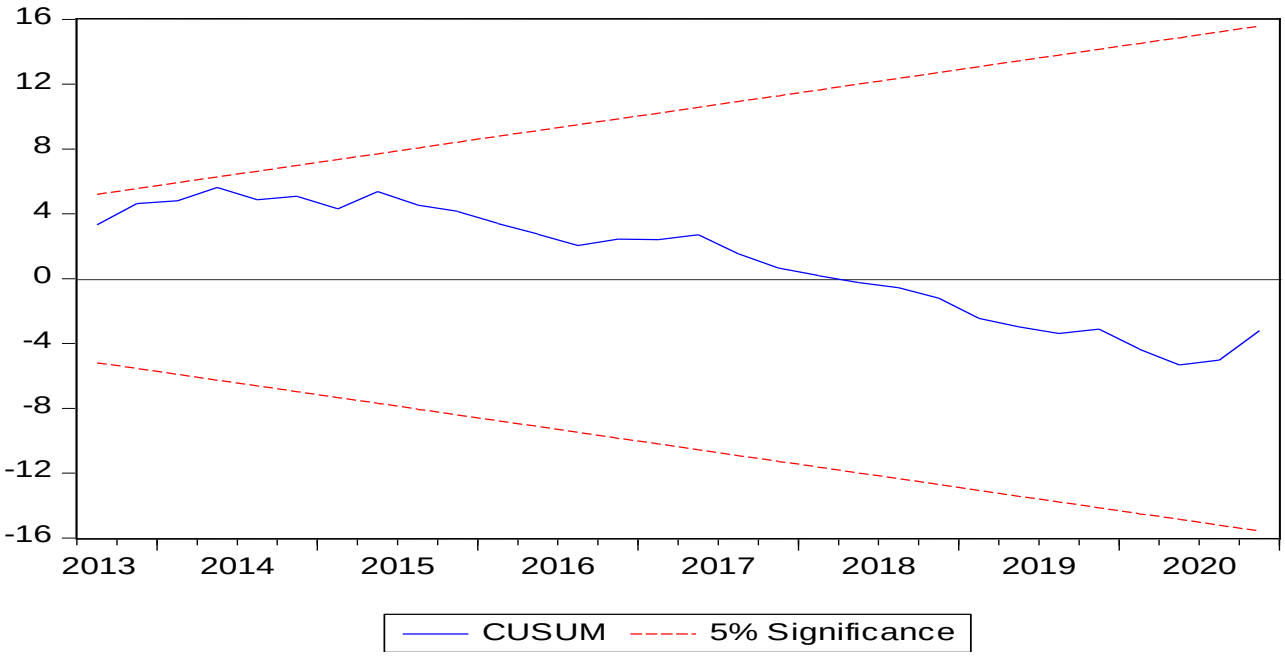
Table 4.7: Diagnostics test results

TYPE OF TEST	TEST STATISTICS	PROBABALITY
Breusch-Pegan-Godfrey	1.002641	0.4938
Breusch-Godfrey serial correlation LM	0.489692	0.6193
Ramsey Reset test	1.334176	0.2575
Jarque Bera test	5.5581	0.9045

Source: Author's computation using Eviews9

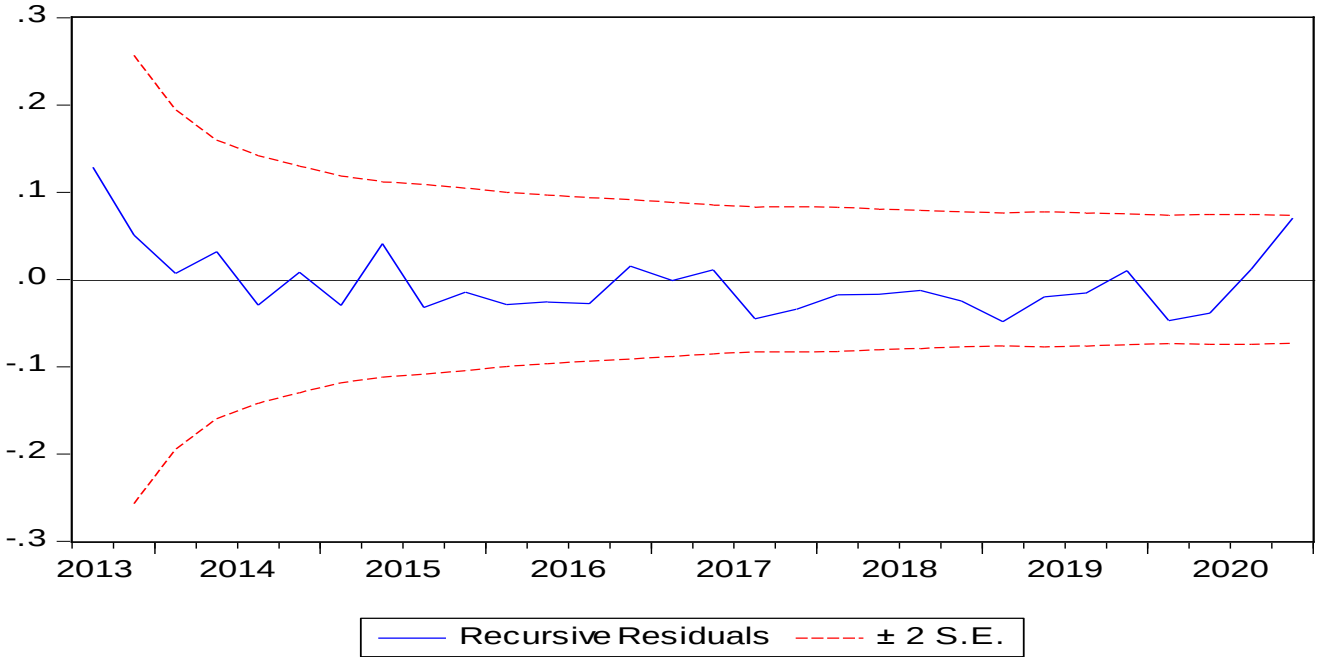
The Breusch-Pagan-Godfrey and Breusch-Godfrey serial correlation LM tests results show that there is no heteroskedasticity and autocorrelation since the corresponding probability values are more than 5%. Equally so, the probability value of the Ramsey RESET and Jarque Bera tests of 0.1373 and 0.9045 NARDL (4,3,1,0) is correctly specified and residuals normally distributed. The model is therefore stable and the null hypothesis that the model is stable is not rejected. This is further confirmed by the by the cumulative sum (CUSUM) and the CUSUM of squares (CUSUMQ) of recursive residuals. The results show that the estimated model is within the 5% significant levels. These are shown in figures 4c and 4d, respectively.

Figure 4.2: CUSUM stability test



Source: Author's computation using Eviews 9

Figure 4.3: CUSUMQ stability test



Source: Author's computation using Eviews 9

4.8 Summary

This study investigated the asymmetric relationship between fish exports and output in Namibia. The results of the study were presented in this chapter. Unit root test results revealed that some variables are stationary in levels while others are integrated of the first order which is a confirmation for the suitability of the NARDL estimation approach. Moreover, the results showed that there is cointegration among variables under study and rejected the null hypothesis of no long run asymmetry between economic growth and fish exports. Lastly, the study results further show that there is unidirectional causality from both positive and negative fish exports to economic growth in the long run and from only positive fish exports to growth in the short run. In the same way, this study showed that there is long run asymmetric effect between fish

exports and economic growth in the short and long run. The study does not find evidence of causality between negative shocks of fish exports and growth in the short run.

CHAPTER FIVE: GENERAL CONCLUSION AND RECOMMENDATION

5.1 Introduction

The main objective of the study was to assess the nature of the relationship between economic growth and fishery exports in Namibia and to assess the nature of causality between them. In this chapter, a summary of the results is offered in section 5.1 as well as the conclusion, recommendations, and area for further research in 5.2, 5.3 and 5.4 respectively.

5.2 Summary of the study

The study set out to examine the relationship between positive and negative changes in fishery exports on economic growth in Namibia using quarterly data from the first quarter of 2008 to the last quarter of 2020. The NARDL bounds test approach to cointegration and VECM causality approach were employed by the study. Positive and negative fish exports, and broad money supply were the dependent variables in the study.

Unit root test results revealed that some variables are stationary in levels while others became stationary after first differencing. Moreover, the results revealed that there is a cointegration between variables under study. showed that there is no cointegration among variables under study and failed to reject the null hypothesis of no long run asymmetry between economic growth and fish exports.

Moreover, the study found unidirectional causality from positive fish exports shocks to growth and no evidence of causality from negative fish export shocks to growth. In the long run positive fish exports shocks were found to positively impact growth at 1

percent significant level. At the same time, positive fish exports shocks were found to have a positive impact on growth in the short run at 5% significant level.

5.3 Conclusion

The main objective of this study was to investigate the non-linear relationship between fish exports and economic growth and assess the nature of causality among the variables under study. Other objectives of this study were to determine the short and long run asymmetric effect of fish exports on economic growth in Namibia and to assess the direction of causal relationship between positive and negative fish exports shocks on economic growth in Namibia in the long and short run. Study results show that there is a long-run relationship between the variables under study and found evidence of causality from positive fish exports shocks to growth in the country.

5.4 Policy implications

This study found that there is unidirectional causality between positive shocks to fish exports and economic growth and long run relationship between positive shocks to fish exports and growth at 1 percent significant level. These results show that policies aimed at increasing the level of fish exports or improving the efficiency of processes involving the exporting of fish products can increase both the quantity of fish exported and economic growth in the country in the long run. Below are a few policy implications to be considered:

- Promotion of Fish Exports: Policymakers may consider strategies to promote and support the fish export industry. Encouraging fisheries development, export

infrastructure improvement, and trade agreements can facilitate sustained export growth, potentially stimulating economic growth over time.

- Diversification and Economic Stability: Recognizing the positive impact of fish exports on economic growth, governments can emphasize diversification efforts within the fisheries sector to mitigate the vulnerability to economic shocks. This can lead to more stable and resilient economies.
- Investment in Sustainable Fisheries: Sustainable fisheries practices should be prioritized to ensure the long-term viability of fish exports. This includes regulating fishing activities, protecting marine ecosystems, and addressing overfishing to maintain a continuous positive impact on economic growth.
- Trade Agreements and Market Access: Governments can explore trade agreements and international market access opportunities to expand the export market for fish products. Reducing trade barriers and enhancing market access can further boost the positive shocks to economic growth.
- Infrastructure and Logistics: Investment in transportation and export-related infrastructure, such as cold storage and processing facilities, can help improve the efficiency and quality of fish exports. This, in turn, can increase the competitiveness of the industry in the global market.
- Risk Management: Recognizing the potential for economic shocks, policymakers should establish mechanisms to manage and mitigate adverse effects on the economy when fish export shocks are negative. This can include creating contingency funds and social safety nets to support affected communities.

- Economic Planning: Government economic planning can incorporate the findings from this study. Understanding the long-term relationship between fish exports and economic growth can assist in creating more informed and effective economic policies and development plans.

In summary, the study's findings suggest that positive shocks in fish exports can be a catalyst for economic growth. Therefore, policymakers should focus on strategies that enhance the fish export industry, ensure its sustainability, and capitalize on the potential for long-term economic benefits. Additionally, they should remain vigilant and prepared to manage any negative shocks to maintain economic stability.

5.5 Area for further research

Researchers are invited to investigate the relationship between fish exports and economic growth through other methods. More so, this study invites researchers to conduct research on how best to regulate the fishing sectors to prevent and minimize cases of corruption. All in all, this study invites researchers to conduct studies focusing looking at the relationship between fish exports and other macroeconomic variables such as exchange rates, government revenue and government debt.

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List of appendices

Appendix A: Unit root test results

Augmented Dickey Fuller Test: Levels

Null Hypothesis: LNFX has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.345904	0.6006
Test critical values:	1% level	-3.574446	
	5% level	-2.923780	
	10% level	-2.599925	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey Fuller Test: First Differences

Null Hypothesis: LNFX has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.562795	0.0002
Test critical values:	1% level	-4.152511	
	5% level	-3.502373	
	10% level	-3.180699	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNFX) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.839330	0.0000
Test critical values:	1% level	-3.574446	
	5% level	-2.923780	
	10% level	-2.599925	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNFX) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.799637	0.0000
Test critical values:	1% level	-4.161144	
	5% level	-3.506374	
	10% level	-3.183002	

*MacKinnon (1996) one-sided p-values.

PHILLIPS PERON TEST: LEVELS

Null Hypothesis: LNFX has a unit root
Exogenous: Constant
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.951759	0.0465
Test critical values:	1% level	-3.565430	
	5% level	-2.919952	
	10% level	-2.597905	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.044682
HAC corrected variance (Bartlett kernel)	0.040271

PHILLIPS PERON TEST: FIRST DIFFERENCES

Null Hypothesis: D(LNFX) has a unit root
Exogenous: Constant
Bandwidth: 16 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-19.11374	0.0001
Test critical values:	1% level	-3.568308	

	5% level	-2.921175
	10% level	-2.598551

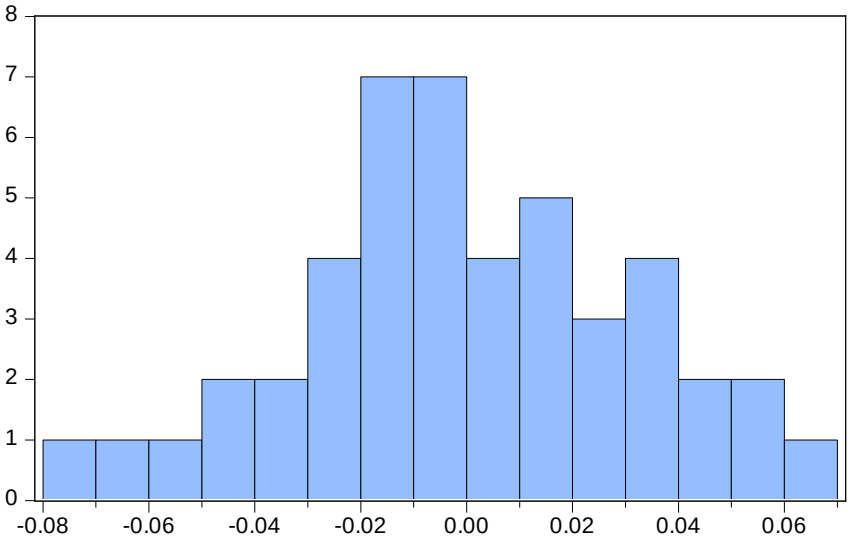
*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNFX) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 15 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-20.53315	0.0001
Test critical values:	1% level	-4.152511	
	5% level	-3.502373	
	10% level	-3.180699	

*MacKinnon (1996) one-sided p-values.

Appendix B: Normality tests



Series: Residuals
Sample 2009Q3 2020Q4
Observations 46

Mean	-1.44e-15
Median	-0.004512
Maximum	0.064933
Minimum	-0.071171
Std. Dev.	0.031224
Skewness	-0.044846
Kurtosis	2.689111
Jarque-Bera	0.200669
Probability	0.904535

Appendix D: NARDL

Dependent Variable: DLNGDP
Method: ARDL
Date: 06/02/23 Time: 15:44
Sample (adjusted): 2009Q2 2020Q4

Included observations: 47 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): DLNFX_POS
DLNFX_NEG
DLNM2
Fixed regressors: C
Number of models evalulated: 500
Selected Model: ARDL(4, 3, 1, 0)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
DLNGDP(-1)	0.075877	0.151563	0.500630	0.6198
DLNGDP(-2)	-0.215721	0.128950	-1.672902	0.1033
DLNGDP(-3)	-0.172575	0.131051	-1.316860	0.1964
DLNGDP(-4)	0.203489	0.133201	1.527682	0.1356
DLNFX_POS	0.087258	0.045928	1.899898	0.0657
DLNFX_POS(-1)	-0.051969	0.044471	-1.168615	0.2505
DLNFX_POS(-2)	0.172934	0.045339	3.814239	0.0005
DLNFX_POS(-3)	-0.092835	0.038293	-2.424337	0.0206
DLNFX_NEG	0.005935	0.046202	0.128461	0.8985
DLNFX_NEG(-1)	0.111625	0.063939	1.745803	0.0896
DLNM2	-0.127395	0.263674	-0.483154	0.6320
C	0.034200	0.030044	1.138332	0.2627

R-squared	0.517856	Mean dependent var	0.019021
Adjusted R-squared	0.366326	S.D. dependent var	0.054530
S.E. of regression	0.043408	Akaike info criterion	-3.220495
Sum squared resid	0.065950	Schwarz criterion	-2.748117
Log likelihood	87.68163	Hannan-Quinn criter.	-3.042736
F-statistic	3.417498	Durbin-Watson stat	2.177285
Prob(F-statistic)	0.002686		

*Note: p-values and any subsequent tests do not account for model selection.

Appendix E: Bounds Test

ARDL Bounds Test				
Date: 04/18/23 Time: 12:49				
Sample: 2009Q2 2020Q4				
Included observations: 47				
Null Hypothesis: No long-run relationships exist				
Test Statistic	Value	k		

F-statistic	4.463497	3		
Critical Value Bounds				
Significance	I0 Bound	I1 Bound		
10%	2.72	3.77		
5%	3.23	4.35		
2.5%	3.69	4.89		
1%	4.29	5.61		

Appendix E: NARDL (Stepwise Least Squares Model)

Dependent Variable: DLNGDP				
Method: Stepwise Regression				
Date: 04/18/23 Time: 15:41				
Sample (adjusted): 2009Q3 2020Q4				
Included observations: 46 after adjustments				
Number of always included regressors: 5				
Number of search regressors: 14				
Selection method: Stepwise forwards				
Stopping criterion: p-value forwards/backwards = 0.5/0.5				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
C	4.312942	2.151268	2.004837	0.0541
LNGDP(-1)	-0.277239	0.110104	-2.517970	0.0174
LNFX_POS(-1)	0.234539	0.094578	2.479859	0.0190
LNFX_NEG(-1)	0.600276	0.200633	2.991908	0.0055
LNM2(-1)	-0.157691	0.174025	-0.906143	0.3721
DLNFX_POS(-4)	-0.138840	0.046502	-2.985648	0.0056
DLNFX_POS(-3)	-0.23241	0.071722	-3.240514	0.0029

	6			
DLNFX_POS	0.184828	0.055625	3.322771	0.0024
DLNGDP(-3)	-0.232821	0.115863	-2.009450	0.0536
DLNFX_NEG(-3)	-0.194549	0.074743	-2.602926	0.0142
DLNGDP(-4)	0.093119	0.126088	0.738523	0.4659
DLNFX_POS(-1)	-0.328970	0.106719	-3.082584	0.0044
DLNFX_NEG(-4)	-0.159465	0.053885	-2.959334	0.0060
DLNFX_NEG(-2)	-0.247288	0.104276	-2.371480	0.0243
DLNFX_NEG(-1)	-0.242024	0.127325	-1.900842	0.0670
DLNFX_POS(-2)	-0.103627	0.088809	-1.166850	0.2525
R-squared	0.671566	Mean dependent var		0.020238
Adjusted R-squared	0.507348	S.D. dependent var		0.054484
S.E. of regression	0.038242	Akaike info criterion		-3.421558
Sum squared resid	0.043873	Schwarz criterion		-2.785508
Log likelihood	94.69582	Hannan-Quinn criter.		-3.183290
F-statistic	4.089497	Durbin-Watson stat		1.680032
Prob(F-statistic)	0.000504			
	Selection Summary			

APPENDIX F: VECM GRANGER CASAULITY TEST USING TEST STATISTICS

Vector Error Correction Estimates
Date: 06/09/23 Time: 08:59
Sample (adjusted): 2008Q4 2020Q4
Included observations: 49 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LNGDP(-1)	1.000000
LNFX_POS(-1)	-3.605957 (0.48156) [-7.48801]
LNFX_NEG(-1)	-3.870154 (0.59078) [-6.55094]
LNM2(-1)	1.269809 (0.79712) [1.59300]
C	-23.13564

Error Correction:	D(LNGDP)	D(LNFX_POS)	D(LNFX_NEG)	D(LNM2)
CointEq1	-0.027007 (0.01579) [-1.71044]	0.112859 (0.03461) [3.26046]	0.155582 (0.02994) [5.19661]	-0.022605 (0.01904) [-1.18706]
D(LNGDP(-1))	-0.173429 (0.14342) [-1.20920]	-0.321639 (0.31442) [-1.02296]	-0.338384 (0.27195) [-1.24428]	0.017391 (0.17298) [0.10054]
D(LNFX_POS(-1))	-0.124954 (0.06803) [-1.83674]	0.294841 (0.14914) [1.97697]	0.302390 (0.12899) [2.34423]	-0.012800 (0.08205) [-0.15600]
D(LNFX_NEG(-1))	0.045964 (0.07446) [0.61726]	-0.399545 (0.16324) [-2.44753]	0.032429 (0.14119) [0.22968]	-0.196813 (0.08981) [-2.19146]
D(LNM2(-1))	-0.195504 (0.12316) [-1.58744]	0.357695 (0.26999) [1.32485]	0.049409 (0.23352) [0.21159]	0.030692 (0.14853) [0.20664]
C	0.042879 (0.01445) [2.96804]	0.027945 (0.03167) [0.88235]	-0.112665 (0.02739) [-4.11285]	0.012641 (0.01742) [0.72547]
R-squared	0.152025	0.434976	0.461399	0.111990
Adj. R-squared	0.053423	0.369276	0.398771	0.008733
Sum sq. resids	0.119364	0.573652	0.429149	0.173625
S.E. equation	0.052687	0.115502	0.099901	0.063544

F-statistic	1.541806	6.620605	7.367297	1.084573
Log likelihood	77.89827	39.43705	46.54739	68.71763
Akaike AIC	-2.934623	-1.364778	-1.654996	-2.559903
Schwarz SC	-2.702972	-1.133126	-1.423344	-2.328252
Mean dependent	0.017193	0.098529	-0.089164	0.029944
S.D. dependent	0.054153	0.145435	0.128840	0.063823

Determinant resid covariance (dof adj.)	1.13E-09
Determinant resid covariance	6.69E-10
Log likelihood	239.4575
Akaike information criterion	-8.630918
Schwarz criterion	-7.549878

APPENDIX G: VECM GRANGER CASAULITY TEST P VALUES

System: UNTITLED
Estimation Method: Least Squares
Date: 05/27/23 Time: 14:33
Sample: 2008Q4 2020Q4
Included observations: 49
Total system (balanced) observations 196

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.027007	0.015790	-1.710438	0.0890
C(2)	-0.173429	0.143424	-1.209200	0.2282
C(3)	0.045964	0.074465	0.617259	0.5379
C(4)	-0.124954	0.068030	-1.836744	0.0680
C(5)	-0.195504	0.123156	-1.587441	0.1142
C(6)	0.042879	0.014447	2.968039	0.0034
C(7)	0.155582	0.029939	5.196615	0.0000
C(8)	-0.338384	0.271951	-1.244283	0.2151
C(9)	0.032429	0.141194	0.229677	0.8186
C(10)	0.302390	0.128993	2.344229	0.0202
C(11)	0.049409	0.233520	0.211585	0.8327
C(12)	-0.112665	0.027393	-4.112848	0.0001
C(13)	0.112859	0.034615	3.260459	0.0013
C(14)	-0.321639	0.314420	-1.022961	0.3078
C(15)	-0.399545	0.163244	-2.447532	0.0154
C(16)	0.294841	0.149138	1.976974	0.0496
C(17)	0.357695	0.269988	1.324855	0.1870
C(18)	0.027945	0.031671	0.882351	0.3788
C(19)	-0.022605	0.019043	-1.187061	0.2368
C(20)	0.017391	0.172978	0.100538	0.9200
C(21)	-0.196813	0.089809	-2.191460	0.0298
C(22)	-0.012800	0.082048	-0.156001	0.8762
C(23)	0.030692	0.148534	0.206636	0.8365

C(24)	0.012641	0.017424	0.725468	0.4692

Determinant residual covariance	6.69E-10

Equation: D(LNGDP) = C(1)*(LNGDP(-1) - 3.87015444333*LNFX_NEG(-1)
- 3.60595686349*LNFX_POS(-1) + 1.26980854201*LNM2(-1) -
23.1356372558) + C(2)*D(LNGDP(-1)) + C(3)*D(LNFX_NEG(-1)) +
C(4)*D(LNFX_POS(-1)) + C(5)*D(LNM2(-1)) + C(6)
Observations: 49

R-squared	0.152025	Mean dependent var	0.017193
Adjusted R-squared	0.053423	S.D. dependent var	0.054153
S.E. of regression	0.052687	Sum squared resid	0.119364
Durbin-Watson stat	1.765697		

Equation: D(LNFX_NEG) = C(7)*(LNGDP(-1) - 3.87015444333
*LNFX_NEG(-1) - 3.60595686349*LNFX_POS(-1) + 1.26980854201
*LNM2(-1) - 23.1356372558) + C(8)*D(LNGDP(-1)) + C(9)
*D(LNFX_NEG(-1)) + C(10)*D(LNFX_POS(-1)) + C(11)*D(LNM2(-1)) +
C(12)
Observations: 49

R-squared	0.461399	Mean dependent var	-0.089164
Adjusted R-squared	0.398771	S.D. dependent var	0.128840
S.E. of regression	0.099901	Sum squared resid	0.429149
Durbin-Watson stat	2.134881		

Equation: D(LNFX_POS) = C(13)*(LNGDP(-1) - 3.87015444333
*LNFX_NEG(-1) - 3.60595686349*LNFX_POS(-1) + 1.26980854201
*LNM2(-1) - 23.1356372558) + C(14)*D(LNGDP(-1)) + C(15)
*D(LNFX_NEG(-1)) + C(16)*D(LNFX_POS(-1)) + C(17)*D(LNM2(-1)) +
C(18)
Observations: 49

R-squared	0.434976	Mean dependent var	0.098529
Adjusted R-squared	0.369276	S.D. dependent var	0.145435
S.E. of regression	0.115502	Sum squared resid	0.573652
Durbin-Watson stat	2.013026		

Equation: D(LNM2) = C(19)*(LNGDP(-1) - 3.87015444333*LNFX_NEG(-1) - 3.60595686349*LNFX_POS(-1) + 1.26980854201*LNM2(-1) - 23.1356372558) + C(20)*D(LNGDP(-1)) + C(21)*D(LNFX_NEG(-1)) + C(22)*D(LNFX_POS(-1)) + C(23)*D(LNM2(-1)) + C(24)

Observations: 49

R-squared	0.111990	Mean dependent var	0.029944
Adjusted R-squared	0.008733	S.D. dependent var	0.063823
S.E. of regression	0.063544	Sum squared resid	0.173625
Durbin-Watson stat	1.953267		

Appendix I: Error correctional model

Dependent Variable: DLNGDP
Method: Least Squares
Date: 06/09/23 Time: 09:37
Sample (adjusted): 2009Q2 2020Q4
Included observations: 47 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLNGDP(-1)	0.208440	0.161332	1.291993	0.2048
DLNGDP(-2)	-0.145455	0.140205	-1.037442	0.3066
DLNGDP(-3)	-0.112225	0.136009	-0.825133	0.4149
DLNGDP(-4)	0.254066	0.135597	1.873684	0.0693
DLNFX_POS	0.102540	0.046312	2.214086	0.0334
DLNFX_POS(-1)	-0.065657	0.043923	-1.494814	0.1439
DLNFX_POS(-2)	0.159352	0.043226	3.686455	0.0008
DLNFX_POS(-3)	-0.107868	0.032642	-3.304592	0.0022
DLNFX_NEG	-0.011980	0.040464	-0.296064	0.7689
DLNFX_NEG(-1)	0.099714	0.061792	1.613717	0.1156
DLNM2	-0.174117	0.261747	-0.665212	0.5103
ECT(-1)	-0.111838	0.089507	-1.249494	0.2198

R-squared	0.521357	Mean dependent var	0.019021
Adjusted R-squared	0.370926	S.D. dependent var	0.054530
S.E. of regression	0.043250	Akaike info criterion	-3.227782
Sum squared resid	0.065471	Schwarz criterion	-2.755403
Log likelihood	87.85287	Hannan-Quinn criter.	-3.050022
Durbin-Watson stat	2.255419		

APPENDIX J: LONG RUN AND SHORT RUN ASYMMETRY

Long run asymmetry

Wald Test:			
Equation: Untitled			
Test Statistic	Value	df	Probability
t-statistic	2.470991	30	0.0194
F-statistic	6.105799	(1, 30)	0.0194
Chi-square	6.105799	1	0.0135
Null Hypothesis: C(4)=C(5)			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
C(4) - C(5)		0.757968	0.306746
Restrictions are linear in coefficients.			

Short run asymmetry

Wald Test:			
Equation: Untitled			
Test Statistic	Value	df	Probability
t-statistic	2.239072	30	0.0327
F-statistic	5.013442	(1, 30)	0.0327
Chi-square	5.013442	1	0.0252
Null Hypothesis: C(6)+C(7)+C(8)+C(12)+C(16)=C(10) +C(13)+C(14)+C(15)			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
C(6) + C(7) + C(8) - C(10) + C(12) - C(13) - C(14) - C(15) + C(16)		0.224302	0.100176

Restrictions are linear in coefficients.

APPENDIX K: Autocorrelation and heteroskedasticity test

Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:				
F-statistic	0.489692	Prob. F(2,22)		0.6193
Obs*R-squared	1.960526	Prob. Chi-Square(2)		0.3752

Heteroskedasticity Test: Breusch-Pagan-Godfrey

Heteroskedasticity Test: Breusch-Pagan-Godfrey				
F-statistic	1.002641	Prob. F(21,24)		0.4938
Obs*R-squared	21.49687	Prob. Chi-Square(21)		0.4290
Scaled explained SS	9.364201	Prob. Chi-Square(21)		0.9860

Ramsey Reset Test

Ramsey RESET Test		
Equation: NARDLMODEL		
Specification: DLNGDP C LNGDP(-1) LNFX_POS(-1) LNFX_NEG(-1)		
LNM2(-1) DLNFX_POS(-4) DLNFX_POS(-3) DLNFX_POS DLNGDP(		
-3) DLNFX_NEG(-3) DLNGDP(-4) DLNFX_POS(-1)		

DLNFX_NEG(-4)				
DLNFX_NEG(-2) DLNFX_NEG(-1) DLNFX_POS(-2)				
Omitted Variables: Squares of fitted values				
	Value	df	Probability	
t-statistic	1.155065	29	0.2575	
F-statistic	1.334176	(1, 29)	0.2575	
Likelihood ratio	2.069041	1	0.1503	
F-test summary:				
	Sum of Sq.	df	Mean Squares	
Test SSR	0.001930	1	0.001930	
Restricted SSR	0.043873	30	0.001462	
Unrestricted SSR	0.041944	29	0.001446	
LR test summary:				
	Value	df		
Restricted LogL	94.69582	30		
Unrestricted LogL	95.73034	29		

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LANGUAGE & COPY-EDITING CERTIFICATE

28th June 2023

RE: LANGUAGE, COPYEDITING AND PROOFREADING OF VISTORINA N SHITHIGONA's THESIS FOR THE MASTER'S DEGREE IN ECONOMICS OF THE UNIVERSITY OF NAMIBIA

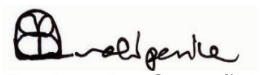
This certificate serves to confirm that I copyedited and proofread **VISTORINA N SHITHIGONA's** Thesis for the **THE MASTER'S DEGREE IN ECONOMICS** entitled: **EXAMINING THE ASYMMETRIC EFFECTS OF FISH EXPORTS ON ECONOMIC GROWTH IN NAMIBIA**

I declare that I professionally copyedited and proofread the thesis and removed mistakes and errors in spelling, grammar, and punctuation. In some cases, I improved sentence construction without changing the content provided by the student. I also removed some typographical errors from the thesis and formatted the thesis so that it complies with the University of Namibia's guidelines.

I am a trained language and copy editor and have edited many Postgraduate Diploma, Masters' Thesis, Dissertations and Doctoral Dissertations for students studying with universities in Namibia, Zimbabwe, Eswatini, South Africa and abroad. I have also copy-edited company documents for companies in the region and abroad.

Please feel free to contact me should the need arise.

Yours Sincerely,



The Rev. Dr. Greenfield Mwakipesile