

**AN ANALYSIS OF MANUFACTURED EXPORTS AND ECONOMIC GROWTH IN
SOUTHERN AFRICAN DEVELOPMENT COMMUNITY (SADC)**

BY

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**Thesis submitted for the degree of Doctor of Philosophy in Economics at the
(MAFIKENG CAMPUS) of the North West University**

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APRIL 2017

DECLARATION

I, the undersigned, hereby declare that the thesis “**AN ANALYSIS OF MANUFACTURED EXPORTS AND ECONOMIC GROWTH IN SOUTHERN AFRICAN DEVELOPMENT COMMUNITY**” is my own research work and conclusions herein are my own. This thesis is submitted for the degree of PhD at the North West University. This thesis has not been submitted for any other degree in any other university, and that all the sources I have used or quoted have been indicated and acknowledged by complete reference.

.....

T.J. Mosikari

ACKNOWLEDGEMENTS

Personally I wish to acknowledge a substantial number of people who contributed to the completion of this thesis. *First and foremost*, I would like to thank the all Mighty God for granting me the patience, wisdom and serenity I need to make this thesis work a success. Also I would like to deeply thank my supervisor Dr. Mamontsho C. Senosi and co-supervisor Professor J. Hinaunye Eita for providing guidance in their informative feedbacks and constructive comments during the writing of this thesis.

I would also like to thank my employer North West University, for allowing me to pursue my studies and also for their financial support through the years of my studies.

Also I would like to thank my life partner Refilwe for her emotional support throughout the completion of this thesis. To my daughter and son respectively, Katleho and Oatile thank you guys for making me strive for the best.

To my mother Tselane “*letebele le letle*” thanks for raising me up. My late father “Sepadi” rest in peace, you are always remembered.

LIST OF ACRONYMS

ADRL	Autoregressive Distribution Lag
AGOA	African Growth and Opportunity Act
DME	Department of Minerals and Energy
DTI	Department of Trade and Industry (South Africa)
ELG	Exports Led Growth
EU	European Union
FTA	Free Trade Agreement
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
IDC	Industrial Development Corporation of South Africa
ILG	Imports Led Growth
IMF	International Monetary Fund
LDCs	Less Developed Countries
OECD	Organisation for Economic Cooperation and Development
SACU	Southern African Customs Union
SADC	Southern African Development Community
SARB	South African Reserve Bank
TIPS	Trade and Industrial Policy Secretariat
UNCTAD	United Nations Conference on Trade and Development
VECM	Vector Error Correct Mechanism
WTO	World Trade Organisation

ABSTRACT

Countries have been strongly implementing regional trade agreements as a central objective of their trade policy. The economic literature have emphasised that countries with more diversified exports base are suitable trade contenders. The literature shows that low growth of manufactured exports has been identified as a major factor for poor economic performance in many SADC economies. Despite progress and increased trade policies in SADC, manufactured exports expansion remain a challenge. SADC still lags behind all other regions of the developing world in terms of manufacturing exports expansion. Hence, this study pursues to investigate the role of manufactured exports on economic growth of SADC countries. It is also the aim of the study to determine whether the relationship between manufactured exports and economic growth depends on the methodology used. Therefore, the findings of this analysis are expected to be relevant to SADC policy makers because stimulating economic growth through manufactured exports can create employment opportunities. In clarifying the kind of relationship between manufactured exports and economic growth in SADC context, this will help policy makers to design policies with a clear indication at sectoral level in contrast to aggregate level.

An analysis of manufactured exports and economic growth was investigated using the existing literature on trade and growth theories. The study reviewed various theories departing from the Solow-Swan neoclassical theory to endogenous theories emanated from the theory of the AK growth model, and followed by the Lucas growth theory. Lastly, discussed the innovation based growth theory. To carry out this analysis, time series and panel econometric methodologies were used. The analysis covered the period 1980 to 2012. To determine the long run equilibrium, the study used three econometric techniques under time series and panel analysis to ensure robustness

of results. The results under time series analysis provide that, by applying Engle-Granger method in 4 out of 13 SADC countries, there is long run relationship between economic growth and total manufactured exports. The results also prove that positive relationship between manufactured export and economic growth exists for countries such as Lesotho, Malawi, Seychelles and Zambia. In applying Johansen cointegration method it was found that 9 out of 13 SADC countries support the existence of cointegration. The confirmation of a positive relationship between manufactured exports and economic growth was witnessed on the following countries: Malawi, Seychelles, South Africa, Tanzania, Zambia and Zimbabwe. Lastly, in an application of ARDL cointegration method, it was found that 5 out of 13 SADC countries confirmed long run equilibrium among the variables. The results show that there is a positive relationship manufactured exports and economic growth for Madagascar, Malawi and Mauritius.

Moreover, the study finds that in all panel cointegration methods applied, the results confirmed the existence of long run equilibrium among the variables undertaken. In an effort to study the coefficients of parameters for variables of interest, it was found that both the method of DOLS and FMOLS are consistent. The results proved that there is a positive relationship between total manufactured exports and economic growth in SADC region. The study furthermore investigated the panel causality, and it was found that causality is running from economic growth to total manufactured exports at 5% significance level. In an overall analysis it is quite clear that irrespective of the econometric method applied to investigate the relationship between manufactured exports and economic growth. The results in both approaches on time series and panel data, majority support a positive impact of manufactured exports on economic growth. The study recommends for policy purpose that policy makers in SADC countries, in order to improve

economic growth they should increase total manufactured exports. In order for this strategy to be achieved they should revise policies regarding to access to foreign markets and within SADC region. And also diversify exports structure to manufactured exports.

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CHAPTER ONE: ORIENTATION OF THE STUDY

1.1 Background of the Study

A number of countries have been strongly implementing regional trade agreements as a central objective of their trade policy. Since 1980, Southern African Development Communities (SADC) was established as a loose alliance of seven states in Southern Africa. Currently SADC consist of 15 countries which are Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. One of the SADC aims is to achieve development and economic growth, alleviate poverty and support the socially disadvantaged through regional integration (Export-Import Bank of India¹, 2012)

SADC economies have been enjoying the benefits associated with trade. Over the past thirty years Gross Domestic Product (GDP) growth performance in SADC was moderate. In terms of GDP growth, SADC is the largest contributor in the African region. SADC contributes about 54.3% of the nominal GDP of Sub-Sahara Africa. GDP growth for SADC in 2009 stood at 2.3% and rebounded to 5.4% in 2010 (Reserve Bank of Zimbabwe², 2011). The growth in the region was mainly supported by increased mining activities as a result of favourable commodity prices, stimulus packages cushion economies against the global financial crisis and improved manufacturing activities. According to *Banco Nacional de Angola* (2012), SADC GDP growth was estimated at an average of 5.07% in 2011. All the economies in the region during this period recorded a positive growth rates except for Angola, South Africa and Mozambique.

¹ The bank also known as “EXIM Bank”

² The bank is also abbreviated as “RBZ”

Chauvin and Gaulier (2002) indicates that for the period 1981-1991, on average GDP growth for D.R Congo, South Africa, Zambia, and Mozambique was below 1%. Countries such as Angola, Malawi, Tanzania and Zimbabwe at average were between 1 to 3%. Lesotho, Seychelles, Botswana, Mauritius and Swaziland were about 4 to 10% at average. During the period 1991-1999 on average GDP growth for Angola, Malawi, Seychelles, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe and D.R Congo was around 3%. Meanwhile, average GDP growth for Botswana, Lesotho, Mauritius and Mozambique was around 4 to 7%. During the period 2000 to 2012 average GDP for Zimbabwe, Swaziland, South Africa, Seychelles, Madagascar and Lesotho was around 1 to 3%. On the other hand, average GDP for Botswana, D.R Congo, Malawi, Mauritius, Mozambique, Namibia, Tanzania and Zambia was around 4 to 7%.

The amount of exports of goods and services in the SADC region has also shown some promising signs, implying that SADC economies are increasing the exports in either goods form or services. Exports of goods and services are an important source of foreign exchange reserves and can improve balance of payments problems, and reduce unemployment by creating opportunities. Seetanah (n.d³) indicates that the average exports share of SADC was US\$17.5 million during 2000 to 2008. In the period 1980-1991 on average, exports of goods and service for Angola, D.R Congo, Lesotho, Madagascar, Mozambique, Namibia, South Africa and Swaziland was around 1 to 4%. During the period 1992-2000 the exports of SADC seemed to have improved where only few countries had average exports of goods and service around 1 to 4%, which are countries such D.R Congo, Malawi, Namibia and Zambia. The situation on exports during the period 2000-2012 deteriorated where most of SADC countries on average were trading at about 1 to 4%, that is

³ n.d means no date for that Author

countries such as Botswana, D.R Congo, Madagascar, Mauritius, Seychelles, South Africa and Swaziland.

The economic literature has emphasised that countries with more diversified exports base are suitable for trade competitiveness (Samen, 2010). According to the literature, SADC economies have recorded moderate or downward trend of their export diversification (Chauvin and Gaulier, 2002). Amakom (2012) explains that low growth of manufactured exports has been identified as a major factor for poor economic performance in many Sub-Saharan African economies. The main exports of the SADC region are mineral fuels, oils and their distillation products. These products account 37.5% of total exports of the region. This statistics confirm that SADC countries are strongly reliant on primary commodity exports.

Industrialisation is recognised as catalyst for poverty eradication, such an intention requires careful planning precisely in manufacturing industries. This implies that for a country to move from traditional economy is through economic development. One of the indicators for economic development is the percentage of manufacturing in total exports. According to Umlilo Wemfundo (2007), on an average level, economies such as South Africa and Swaziland manufacturing items comprise more than 50% of exports. For Namibia 41% of exports are manufactured goods. Manufactured goods constitute 20-28% of exports for Zimbabwe, Madagascar and Tanzania, and for economies Malawi, Zambia, and Mozambique manufactured goods constitute less than 16% of total export. It should be noted that the changes in GDP growth, percentage change of exports and manufactured exports in SADC area change considerable depending on each country's characteristics and trade policies adopted.

1.2 Problem Statement

At an international level, a large and growing literature of empirical research has consistently found success in manufactured exports and rapid economic growth (Frankel and Romer, 1999). This recognition comes from the fact that the spill-overs of exporters of manufacturing products can specialise their production to a far greater degree (Radelet, 1999). This implies that developing countries exports can join in the world production and distribution systems, even for a very sophisticated products based on their comparative advantage in labour intensive operations. Trade is seen as an important element to create productive employment and to reduce poverty. Poverty remains one of the challenges faced by the SADC region, as about 43.6% of the population in SADC earn below the international poverty line of US\$1 a day, whilst 70.3% earn less than US\$2 per day (Umlilo Wemfundo, 2007). Also average unemployment remains the concern in SADC, unemployment as reported by other independent organisations is still very high with some countries exceeding 70% (Reserve Bank of Zimbabwe, 2011).

Despite progress and increased trade policies in SADC, manufacturing exports expansion remains a challenge. In terms of manufactured exports as a percentage of GDP, SADC accounts 11.15%, which indicates that the region still falls far short meeting a target of 25% (SADC, 2009). SADC still lags behind all other regions of developing world such as Asia⁴ (30% of GDP) in terms of manufacturing exports expansion. SADC's exports are highly concentrated on a few products, mainly primary commodities. According to Shakouri and Yazdi (2012), an increase in exports means, increase in employment in exports sector industries which, in turn increase income and GDP, reallocating resources from less productive sectors to exports industry and enhancing capacity utilisation exports growth promotes GDP growth.

⁴ See the work of Sekkat (2012) when it show how manufacturing contributes to GDP

It is against this background on poverty and unemployment in the region that this study intends to investigate the role of manufactured exports on economic growth in the SADC region. This intention arises from the fact that few or no studies have investigated this relationship in the SADC region specifically. For instance, Bbaale and Mutenyo (2011) investigated export composition and economic growth among Sub-Saharan Africa countries and found a positive impact of manufactured exports on economic growth. Also the studies by Sinoha-Lopete (2006) and Seetanah (n.d) concentrated much on the aggregate level of total exports and economic growth of Southern African countries not manufactured exports *per se*. Additionally, these studies did not investigate whether the relationship between export and economic growth depends on the type of econometric method used. Hence, this study fills up this gap by investigating the relationship between manufactured exports and economic growth in SADC. Also investigate whether this relationship depends on the methodology applied.

1.3 Research questions

In this thesis the following research questions are provided:

- Is there a long run equilibrium between manufactured exports and economic growth in SADC economies?
- What is the causal relationship between manufactured exports and economic growth in SADC countries?
- Does the relationship between manufactured exports and economic growth depend on the method of investigation applied?

1.4 Aims and Objectives of the Study

In the light of such background and problem stated, the aims of this thesis are as follows:

- To determine the long run equilibrium relationship between manufactured exports and economic growth in SADC region.
- To test the direction of causality between manufactured exports and economic growth in SADC economies.
- To determine whether the relationship between manufactured exports and economic growth depends on the methodology (econometric technique) used.

To achieve the aims of the study, the following are objectives of the study:

- To use the tests of cointegration technique to determine long run equilibrium.
- To use the test of Granger causality procedure to determine the direction of causality.
- To apply different econometric techniques to establish convergence between manufactured exports and economic growth.

1.5 Research methodology

In order to investigate the relationship between manufactured exports and economic growth in SADC region the following is done. The study uses time series and panel data econometric techniques for the period 1980 to 2012. Variables to be used are gross domestic product, gross national saving, imports of goods and total manufactured exports. The study adopts conventional unit root test methods for time series analysis. Following, the study uses three cointegration methods which are Engle-Granger two step method, Johansen cointegration and ARDL Bounds

cointegration method. Also under panel data analysis tests such as panel unit root tests of Levin, Lin and Chu and Im, Pesaran and Shin are applied. Panel cointegration is also investigated for all SADC countries. Lastly, the study uses the Granger causality analysis to determine the causal effect between manufactured exports and economic growth.

1.6 Contribution of the study

It is generally accepted that countries with high performance of manufactured exports also perform well in terms of their economic growth. The existence of such relationship between manufactured exports and economic growth has been the focus of few researchers. This study intends to contribute in the body of knowledge in the following ways:

Firstly this study does not focus on total exports of goods, but the study decomposes export into manufactured exports separately. The reason is that some of the studies that used “aggregate” values of exports, were criticised that the approach shade the role of manufactured export on economic growth.

Secondly this study uses both time-series and panel data techniques to overcome the criticisms of the previous studies that only used panel data analysis. The reason is that panel data analyses assume common economic structures and similar production technologies across countries, whereas in real sense each country has its own characteristics (Herzer, Nowak-Lehmann and Siliverstovs, 2006). Furthermore, this study will use three techniques of cointegration which are Engle-Granger, Johansen and ARDL bounds for time series analysis, and for panel analysis the test of Petroni, Kao and Johansen-Fisher to overcome the limitations of just using one cointegration technique. The reason of using three cointegration test is to investigate the robustness of relation whether it depends on a method applied or not.

Lastly, according to the best knowledge of the study, it will be the first of kind to investigate manufactured exports and economic growth specifically in SADC region. The reason is that most of the studies existing they just concentrating in Southern region of Africa not in SADC as an official trade bloc.

1.7 Scope, limitation and delimitations

The scope of this study is only confined within SADC countries. Therefore, it cannot be generalised anywhere else. One crucial limitation of the study is from fact that the investigation could not have data from credibly sources such as World Bank and WTO⁵ for Mozambique and the Democratic Republic of Congo (DRC), therefore any generalisation of the findings should take that into account.

1.8 Outline of the study

Chapter 1 provides the background of the study, problem statement. It also explains the research questions, aims and objectives of the study, research methods of the study are also covered. The contribution of the study and the outline of the study is also explained in this chapter. Chapter 2 presents the overview for SADC countries. The chapter present the discussion on historical background of SADC and also provides regional GDP growth and country GDP share to SADC. The chapter also discusses the contribution by major sectors in SADC GDP. Lastly, the chapter reviews trade agreements and policies undertaken by SADC countries to promote its trade. Chapter 3 presents the theoretical and empirical literature. It includes all the key concepts that are relevant

⁵ World Trade Organisation

to the study. It also includes the critical evaluation of all previous studies involving manufactured exports and economic growth. The chapter defines the concepts used, and also critically reviews the theories and hypotheses that have been considered previously. Chapter 4 discusses the research methodology and the in-depth analysis of the method that the study uses. The chapter discusses the theoretical model specification and the data used. The chapter also explains on how the missing data was handled and the motivation for variables selected. Chapter 5 discusses time series empirical results, which involves the analysis of data and interpretation. Chapter 6 discusses the results for empirical panel data. It discusses the results for panel cointegration with various panel techniques. Chapter 7 discusses the summary and conclusions of the study and recommendations.

CHAPTER TWO: OVERVIEW OF SADC COUNTRIES

2.1 Introduction

The purpose of this chapter is to provide a general overview and analysis of the SADC economic growth and trade structure. The chapter is structured as follows: Section 2.2 discusses the background history of SADC. Section 2.3 presents an overview of SADC economies. Section 2.4 provides SADC GDP growth and each country's GDP share to SADC and Section 2.5 explains the contribution by major sectors in SADC GDP. Section 2.6 discusses the structure of SADC foreign trade. Section 2.7 discusses the main SADC trading partners. Section 2.8 reviews the trade agreements and policies. Section 2.9 provides a summary of the chapter.

2.2 History of SADC

The Southern African Development Coordination Conference (SADCC) was formed in 1980. The aim of the conference during the 1980s was mainly politically driven by frontline states, namely Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia and Zimbabwe to bring an end to colonial and white-minority rule in Southern Africa (Mupimpila and Funjika, 2010). SADCC was transformed into Southern African Development Community (SADC) in 1992, with the adoption by the founding members of SADCC and newly independent state of Namibia. The objectives of SADC are:

- To further liberalise intra-regional trade in goods and services
- To ensure that efficient production within SADC reflects the current and dynamic comparative advantages of its members.

- To contribute towards the improvement of the climate for domestic, cross-border and foreign investment.
- To enhance the economic development, diversification and industrialisation in the region

The region has the following members with their respective inaugural years (*see* Table 2.1).

Table 2.1: Inception of each country into SADC

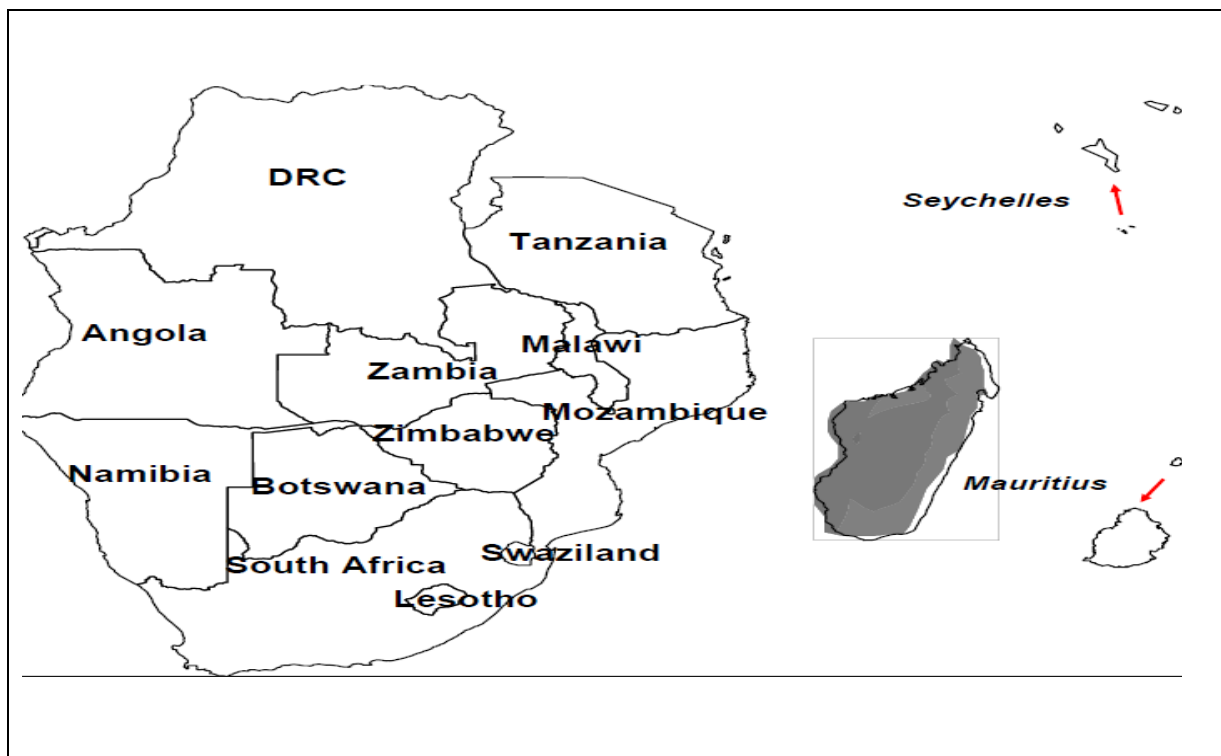
Country	Year of inception
Angola	1980
Botswana	1980
DRC	September 1997
Lesotho	1980
Madagascar	2005
Malawi	1980
Mauritius	August 1995
Mozambique	1980
Namibia	March 1990
Seychelles	September 1997
South Africa	August 1994
Swaziland	1980
Tanzania	1980
Zambia	1980
Zimbabwe	1980

Source: author's compilation

Although SADC countries strive to pursue the common goals, some countries' membership were suspended. Madagascar was suspended in 2009 on the basis of corruption and political crisis in the country. The country's suspension was then lifted in January 2014. Seychelles's membership was suspended in 2004. The suspension was lifted in 2008.

Geographically SADC block is formed by majority of Southern African countries. The largest country in the region is DRC which occupies 2.3 million square kilometres followed by South Africa and Angola with 1.2 million square kilometres each respectably. The smallest country in the region is Seychelles with a square kilometres of 455. Figure 2.1 presents geographical map of SADC countries.

Figure 2.1: Geographical position for SADC



Source: Institute for Security Studies

2.3 SADC economy: Overview

SADC trading bloc has a great economic growth potential based on regional production and international trade. Countries in SADC are at very different stages of economic development, and therefore the region is not without socio-economic problems such as unemployment, poverty and higher income inequality. Currently, the region has a population of 258 million and GDP of US\$471billion (Mashayekhi, Peter, Saygili and Vanzetti, 2011).

Table 2.2: SADC's selected macroeconomic indicators 1980 – 2012

	1980	1990	2010	2012
GDP growth	3.3%	4.8%	3.7%	5.4%
GDP per capita	1681.4	2011.7	2871.5	3249.0
Population growth	2.75%	2.53%	2.26%	2.18%
Gross Saving % GDP	7.78	10.14	15.09	13.37
Inflation rate ⁶	11.04	18.94	5.88	8.07

Source: Author's own calculations using data from WDI

Table 2.2 present selected macroeconomic indicators for the period 1980 to 2012. Averagely SADC GDP growth has been steadily growing at 3% over the years except for 1990 with 4.8% and in 2012 was at 5.4%. Average GDP per capita for SADC was growing over the years and peak at 3249.0 in 2012. Population growth on the other hand indicates that over the years it was decreasing from 2.75% in 1980 to 2.18% in 2012. Gross saving as a % of GDP has shown some steady growth over years, whereas in 2010 it peaked at 15.09% and decreased to 13.37% in 2012.

⁶ SADC average inflation rate calculation exclude Zimbabwe inflation,

Inflation rate during the 1980s and 1990s was at double digits. This was harmful to consumers, but in the year 2012 it was reduced to single digit at 8.07%.

2.4 GDP growth and each country's share of SADC GDP

Table 2.3 illustrates the contribution of individual countries' GDP to SADC as a trade bloc. From the table it can be observed that SADC countries differ greatly in their stages of economic development. During the 1980s countries such as Botswana, DRC, Swaziland and Zimbabwe were the driving forces of GDP growth in the region. These countries achieved double digit growth rates. Some countries (Lesotho, Mauritius and Seychelles) achieved negative GDP growth during the same period. Decade later, in the 1990s Swaziland was the only country in the SADC region that was operating with the highest GDP growth rate but was contributing the least 0.67% to regional (SADC) GDP. Countries such as Angola, South Africa and Zambia had a negative GDP growth for the year 1990. In terms of percentage contribution to SADC GDP, South Africa was the leading country in 1980 with 61.09%, followed by DRC by 10.92%. In 2012, Zimbabwe's GDP growth improved at 10.57% which was 3% higher compared to growth in 1990. All the countries in 2012 registered positive GDP growth with the least GDP growth by Malawi at 1.89%. In terms of contribution to SADC GDP, South Africa and Angola contributed more than 50% to SADC GDP.

Table 2.3: GDP growth and each country's share of SADC GDP

	GDP growth			% share of each country's GDP to SADC total GDP		
Country	1980	1990	2012	1980	1990	2012
Angola	2.40	-0.30	3.00	5.07	6.02	17.85
Botswana	11.99	6.77	4.83	0.80	2.28	2.10
DRC	17.64	1.00	3.80	10.92	5.62	3.91
Lesotho	-2.74	5.64	4.99	0.33	0.33	0.34
Madagascar	0.81	3.13	3.03	3.07	1.85	1.41
Malawi	0.41	5.69	1.89	0.94	1.13	0.60
Mauritius	-10.06	7.19	3.20	0.86	1.59	1.63
Mozambique	4.20	1.00	7.20	2.67	1.51	2.07
Namibia	2.50	2.05	5.06	1.85	1.68	1.85
Seychelles	-4.25	7.00	6.04	0.11	0.22	0.16
South Africa	6.62	-0.32	2.22	61.09	67.29	56.52
Swaziland	12.45	21.02	3.03	0.41	0.67	0.70
Tanzania	3.00	7.05	5.14	3.87	2.56	5.56
Zambia	3.04	-0.48	6.73	2.95	1.98	3.55
Zimbabwe	14.42	6.99	10.57	5.07	5.28	1.76

Source: Author's own calculations using data from ADI

2.5 Contribution by major sectors in SADC GDP

This section provides overview on major sectors which are classified as agriculture, manufacturing and service sector that are contributing to SADC GDP. Table 2.4 shows the contribution of each country and economic sectors for the years 1990 and 2012. Agricultural is regarded as primary sector which is a pillar of strength for most SADC countries. In the 1990s, agricultural sector played a very big role in most economies of SADC. In 1990 agricultural sector as % of GDP constituted an average of 22.01% in the region and slowed down to 13.85% in 2012.

Table 2.4: SADC sector contribution to GDP

	Agricultural sector		Manufacturing sector		Service sector	
	1990	2012	1990	2012	1990	2012
Angola	33.33	8.16	12.50	3.87	33.33	26.96
Botswana	4.85	3.02	5.12	6.65	34.13	60.98
DRC	30.96	23.12	11.30	17.36	40.04	43.24
Lesotho	24.75	7.53	14.50	11.47	41.13	60.82
Madagascar	28.58	28.20	11.15	14.35	58.60	55.75
Malawi	45.00	30.45	19.47	11.15	26.11	49.93
Mauritius	12.85	3.47	24.37	16.70	54.36	71.80
Mozambique	37.12	27.65	10.17	9.97	44.47	53.25
Namibia	9.79	8.68	11.24	13.14	58.69	58.93
Seychelles	4.81	1.95	10.10	7.83	78.93	67.91
South Africa	4.63	2.39	23.64	13.12	55.27	67.88
Swaziland	10.40	6.40	36.82	38.20	46.45	49.33
Tanzania	45.96	33.17	9.27	7.99	36.39	43.56
Zambia	20.60	10.35	36.06	8.33	28.12	55.26
Zimbabwe	16.48	13.15	22.76	13.57	50.42	55.24
SADC (simple average)	22.01	13.85	17.23	12.91	45.76	54.72

Source: Author's own calculations using data from WDI

Almost more than a decade later SADC economies showed a strong decrease in agricultural sector reliance. GDP of Malawi and Tanzania constitute almost 40% contribution of agriculture in the year 1990. In the same year, countries such as Botswana, Namibia, Seychelles and South Africa agriculture contributed less than 10% to its GDP. In 2012, only 7 countries' GDP relied much on agriculture compared to 11 countries in 1990.

The secondary sector which includes manufacturing seem to have gain momentum in SADC economies. During the year 1990 value added in manufacturing as a percentage of GDP was 17.23% in SADC region and it decreased to 12.91% in 2012. Only Botswana and Tanzania were operating below 10% of value added manufacturing as a percentage of GDP in the year 1990.

Leading countries in manufacturing as a contribution to GDP were Mauritius, South Africa, Swaziland, Zambia and Zimbabwe in 1990. However, in 2012 leading countries in terms of manufacturing as a share of GDP were Swaziland, DRC, Madagascar, Namibia and South Africa.

The tertiary sector which consist of services is one of fast growing sector in SADC. During the year 1990 value added service sector constitutes 45.7% and increased to 54.7% in 2012. The SADC growth shows general pattern of economic development process that as economies becoming industrialised they much rely on service sector. In 2012 Mauritius, Seychelles, South Africa, Lesotho and Botswana were the leading countries with more than 60% value added service sector. The least country in terms of service sector contribution is Angola with 26.9% of GDP valued added in 2012. In addition to the performance of service sector and to some of its sub-sectors such as the financial services and tourism, the transport, communications and energy sectors have also been prioritised as critical in the SADC trade in services agenda (SADC, 2009).

2.6 Structure of SADC foreign trade

This section provides an overview on the structure of foreign trade in SADC. The section consists of overall indicators of external sector, the country share of exports to SADC total exports, country's manufactured exports as a share of SADC total manufactured exports. The section also provides highlights on country's total imports and manufactured imports as a share of SADC total imports and manufactured imports.

2.6.1 Overall external sector for SADC

Table 2.5 provides an overall external sector which highlights selected foreign sector indicators, which are trade (% of GDP), exports ratio, imports ratio and terms of trade.

Table 2.5: SADC selected external indicators

	1980	1990	2010
Trade (% of GDP)	87.38	76.79	99.40
Export ratio	35.27	31.78	41.99
Imports ratio	53.95	46.29	57.90
Terms of trade	112.64	93.22	102.08

Source: Author's own calculations using data from WDI

Table 2.5 indicates that trade (% of GDP) on average in 1980 was 87.38% and 20 years later it stood at 99.4%. On average export as a percentage of GDP growth steadily grew in 1980 it was around 30%, but in 2010 grew by 41.99%. Averagely, imports of goods as a percentage of GDP in SADC has been growing since 1980 from 53.95% to 57.90% in 2010. Terms of trade measures the ratio of export prices to import prices. The ratio of terms of trade shows that it has been decreasing. It decreased from 112.64 in 1980 to 102.08 in 2012. This implies that import prices were increasing faster than exports prices over the period of 1980 to 2010.

2.6.2 Country's share of SADC total exports

Table 2.6 provides an overview of total exports as % of GDP and also countries export share of total SADC exports for the years 1980, 1990 and 2012.

Table 2.6: Total exports as percentage of GDP and total export as share of SADC total export

	Exports as % of GDP			% share of each country 's total exports to SADC total exports		
	1980	1990	2012	1980	1990	2012
Angola	50	33.33	57.11	7.86	7.60	28.35
Botswana	53.06	55.06	42.44	1.32	4.75	2.48
DRC	60.02	51.78	83.78	5.58	6.27	3.69
Lesotho	21.01	17.96	43.92	0.21	0.22	0.41
Madagascar	13.34	16.6	29.01	1.27	1.16	1.14
Malawi	24.84	23.78	37.25	0.72	1.02	0.62
Mauritius	50.95	64.96	54.57	1.36	3.92	2.47
Mozambique	10.86	8.17	26.41	0.90	0.47	1.52
Namibia	70.02	43.34	43.41	4.01	2.76	2.24
Seychelles	14.35	15.33	92.79	0.05	0.13	0.42
South Africa	35.38	24.24	29.73	67.04	61.73	46.72
Swaziland	74.6	59.02	44.44	0.95	1.50	0.87
Tanzania	12.62	12.62	21.29	1.26	1.22	3.29
Zambia	41.39	35.88	42.15	3.78	2.68	4.16
Zimbabwe	23.37	22.87	32.89	3.67	4.57	1.61

Source: Author's own calculations using data from WDI

As indicated in Table 2.6, during 1980s Namibia, DRC and Swaziland were leading countries in terms of exports as a percentage of GDP. Export as a percentage of GDP accounted for more than 60%. In the same year the countries (Namibia, DRC and Swaziland) contributed an average of 10.54% share to total SADC exports. In 1990 countries with more than 70% exports share to SADC total exports were South Africa, Angola and DRC⁷. The least performing countries in terms of

⁷ DRC does not form part of the main analysis

share of total exports to SADC were Lesotho, Mozambique⁸ and Seychelles in 1990. According to Maringwa (2009) total SADC exports increased by more than 100% between 2000 and 2006 from US\$50 billion to about US\$ 113 billion. In 2012, only two countries contributed (together) a share of double digit to SADC total export. These countries were South Africa and Angola.

2.6.3 SADC manufactured exports % of GDP

Table 2.7 provides an overview of manufactured exports and also a share to total manufactured exports in SADC over the years 1980, 1990 and 2012. Table 2.7 indicates that during 1980 Lesotho and Mauritius were there leading countries in terms of manufactured exports as a percentage of GDP in the region. Therefore, both countries' combined share to SADC total manufactured exports amounted to 5.08%. During the same year, the least performing country in region in terms of share of manufactured exports to SADC's total manufactured exports were Botswana, Madagascar, Malawi, Seychelles and Swaziland with a share of less than 1% in each country. In the year 1990, South Africa and Mauritius contributed more than 80% of manufactured exports to SADC. In the same year the least performing country was Angola, Lesotho, Madagascar, Malawi, Seychelles, Swaziland, Tanzania and Zambia with less than 1% share of manufactured exports to SADC.

⁸ It should be noted that Mozambique is not included for main empirical analysis.

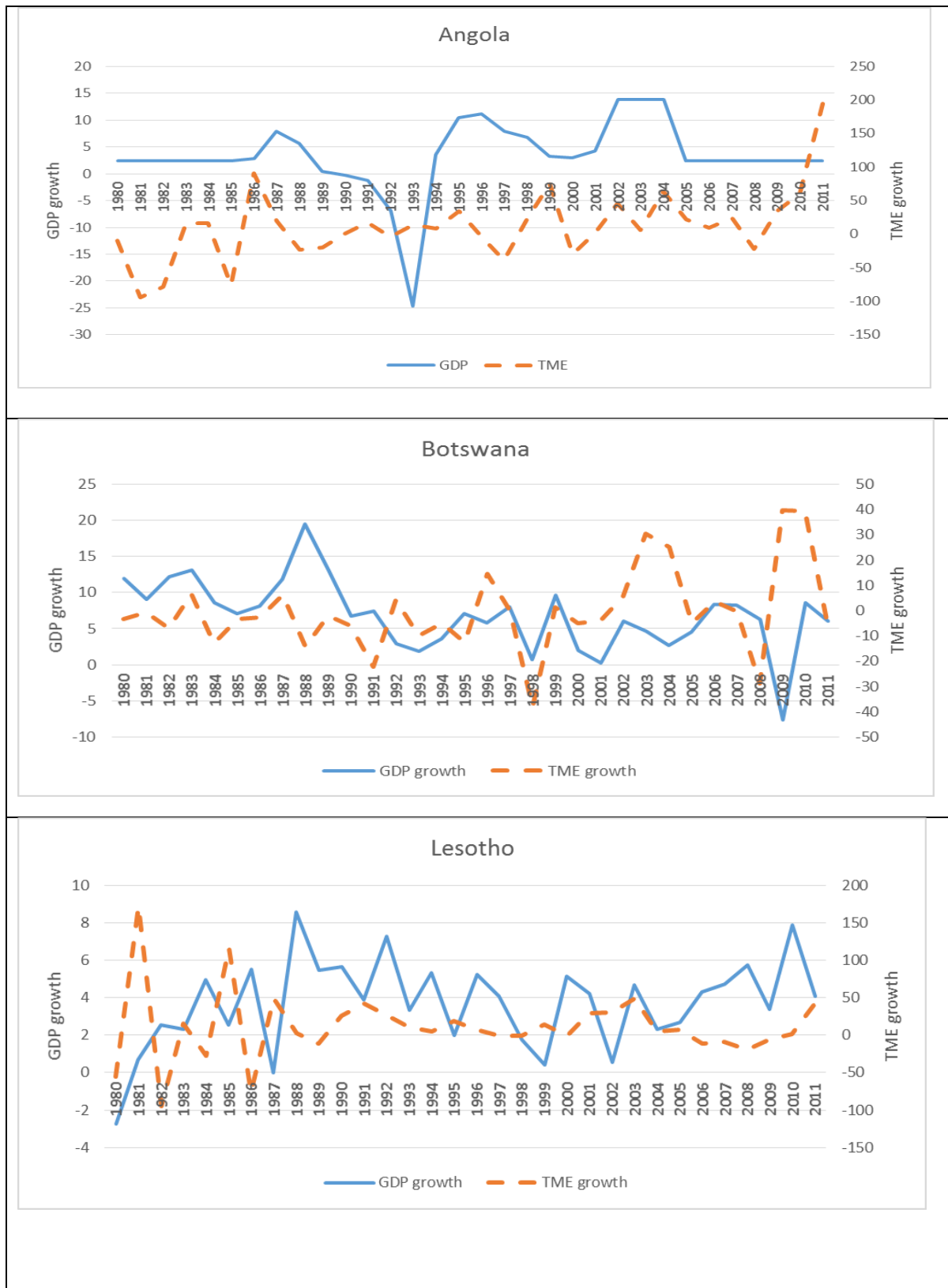
Table 2.7: Manufactured exports % of GDP and also a share to total manufactured exports in SADC

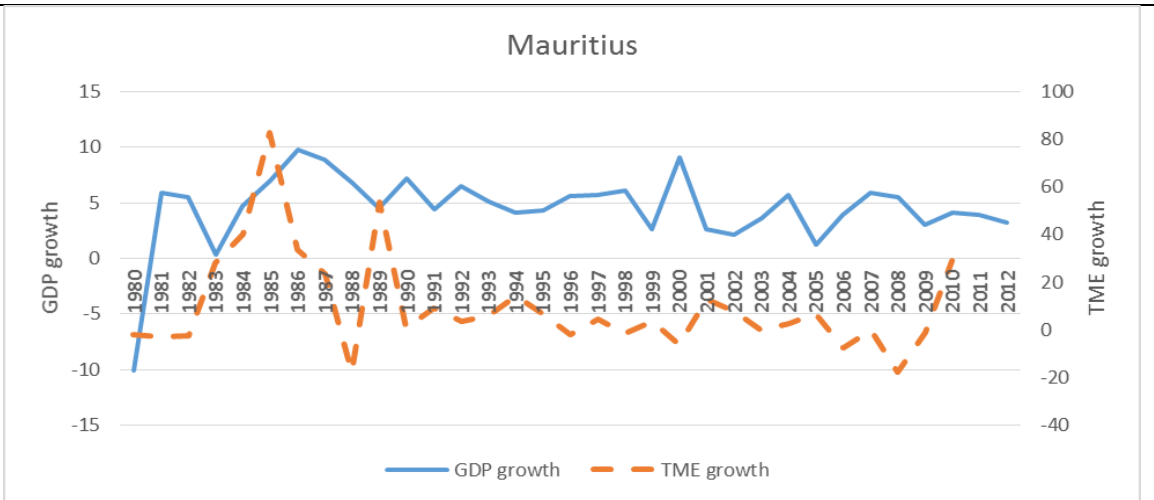
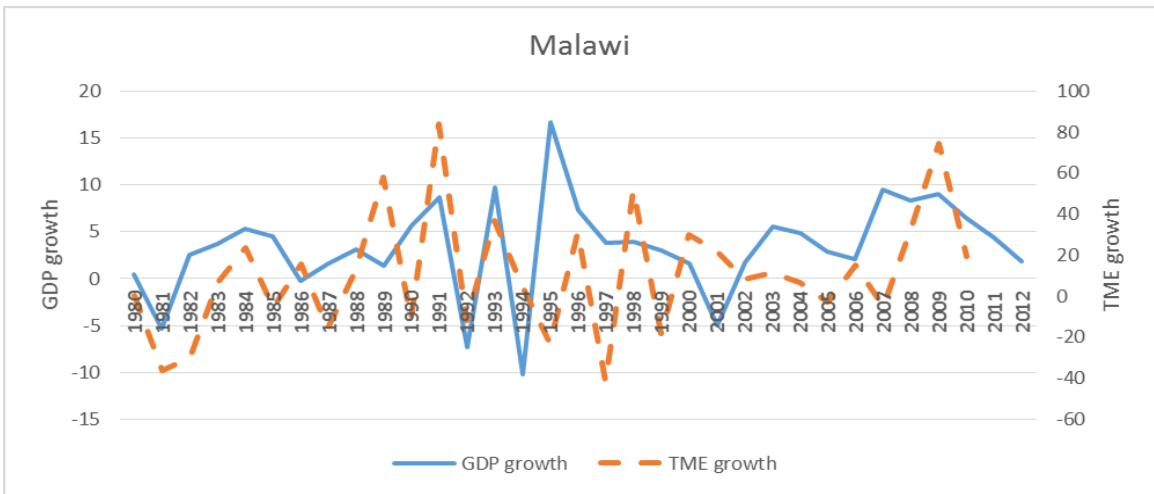
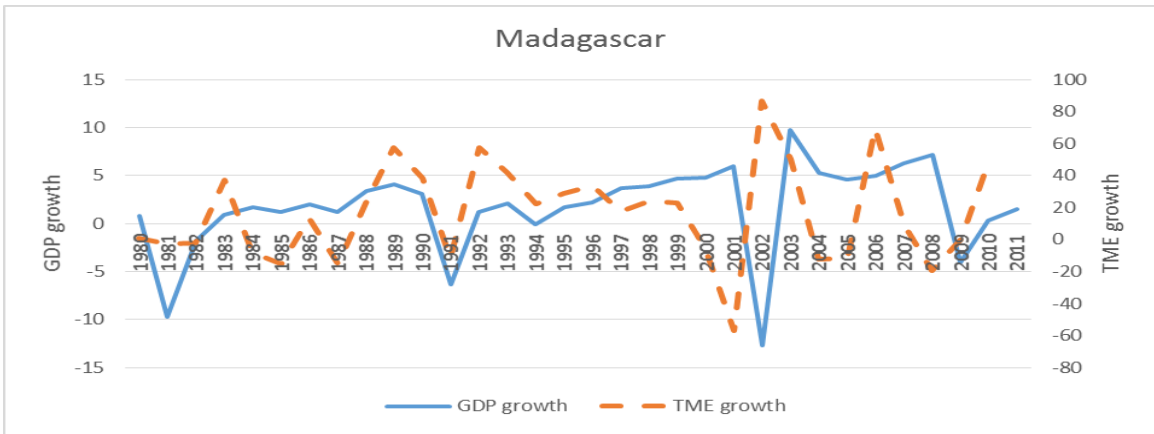
	manufactured exports as % of GDP			% share of each country in SADC manufactured exports		
	1980	1990	2012	1980	1990	2012
Angola	3.65	0.56	1.58	4.21	0.35	3.98
Botswana	7.92	1.54	0.33	0.00	0.55	0.68
Lesotho	39.29	9.91	20.89	2.93	0.34	1.00
Madagascar	2.42	1.54	6.33	0.42	0.29	1.88
Malawi	0.6	1.51	9.48	0.52	0.18	0.54
Mauritius	10.93	29.67	12.6	2.15	4.94	2.89
Namibia	6.47	7.54	0.32	2.72	1.33	0.08
Seychelles	0.41	4.01	1.06	0.01	0.09	0.02
South Africa	5.75	7.43	9.3	80.01	52.19	73.91
Swaziland	6.82	0.27	2.04	0.64	0.02	0.20
Tanzania	0.02	0.02	0.03	1.57	0.46	2.12
Zambia	3.2	2.03	2.77	2.15	0.42	1.38
Zimbabwe	2.32	5.16	9.36	2.68	2.84	2.32

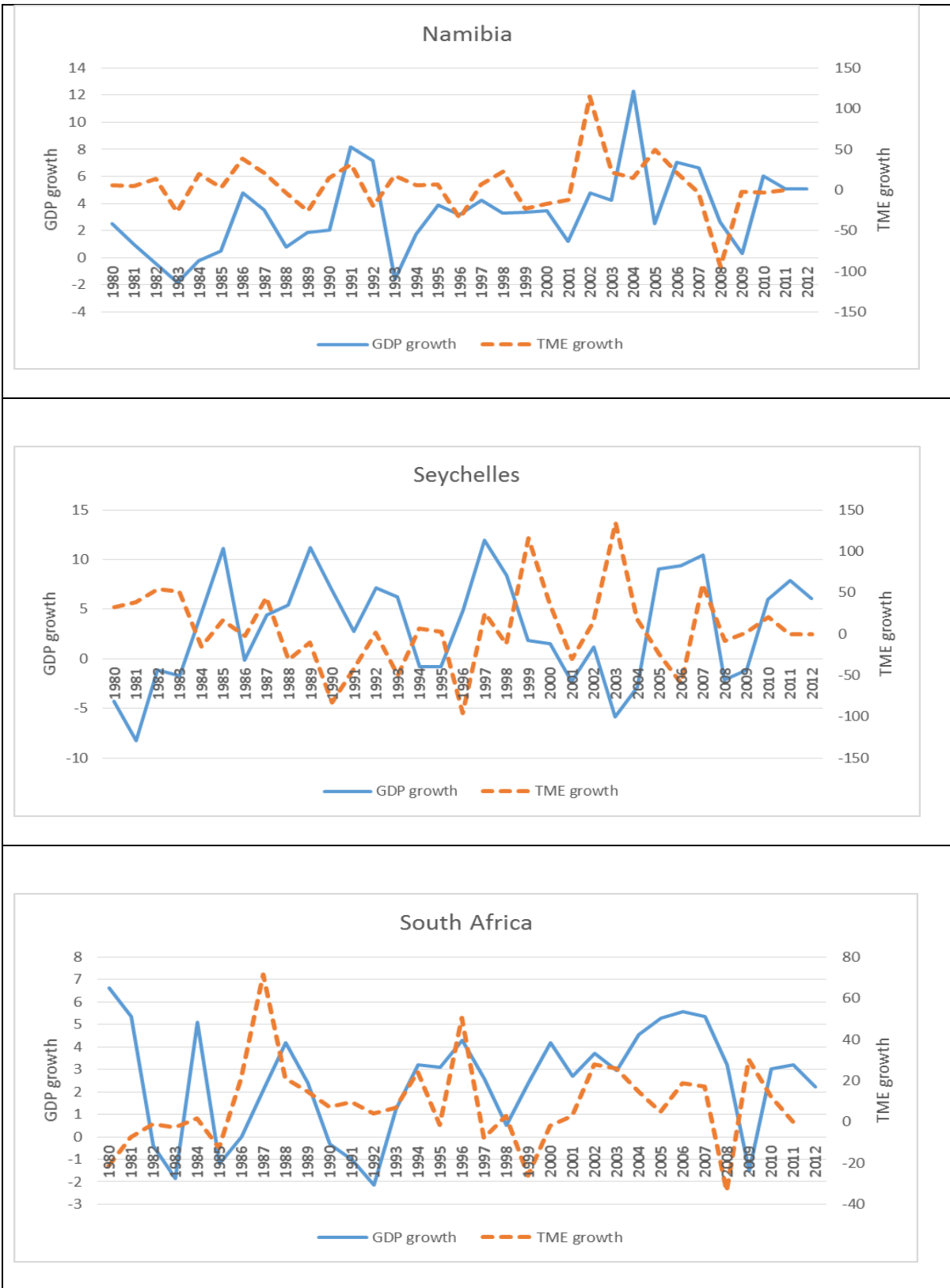
Source: Author's own calculations using data from WDI

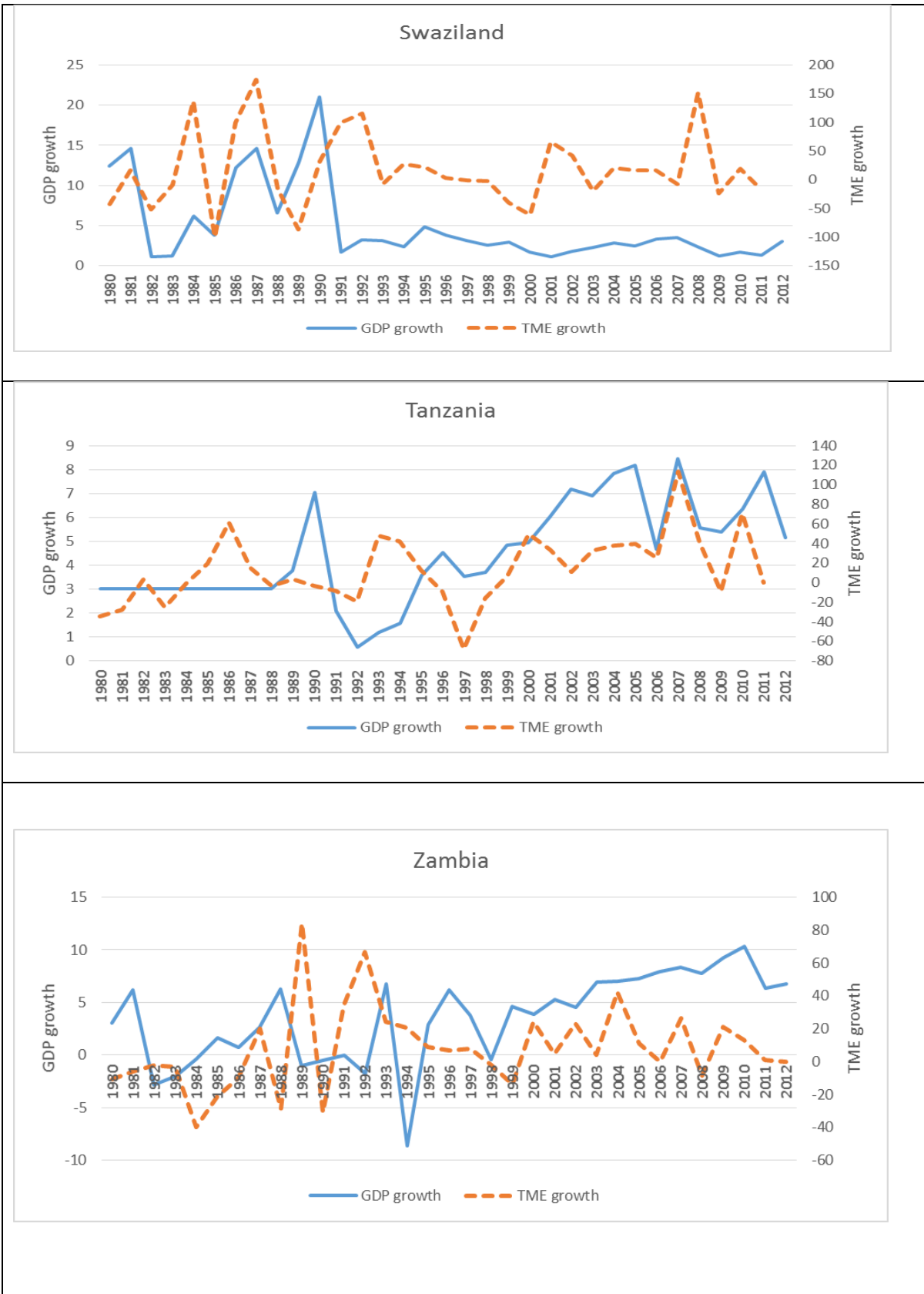
In addition, 2012 was the year of prosperity for some SADC countries which registered at least 1% share of manufactured exports to SADC compared to the year 1990. These countries include Angola, Lesotho, Madagascar, Malawi, Tanzania and Zambia. In terms of general performance of share of manufactured exports to SADC, South Africa is the leading country since 1980 to 2012. Figure 2.2 presents line graphs for all SADC countries on growth rates of manufactured exports and GDP.

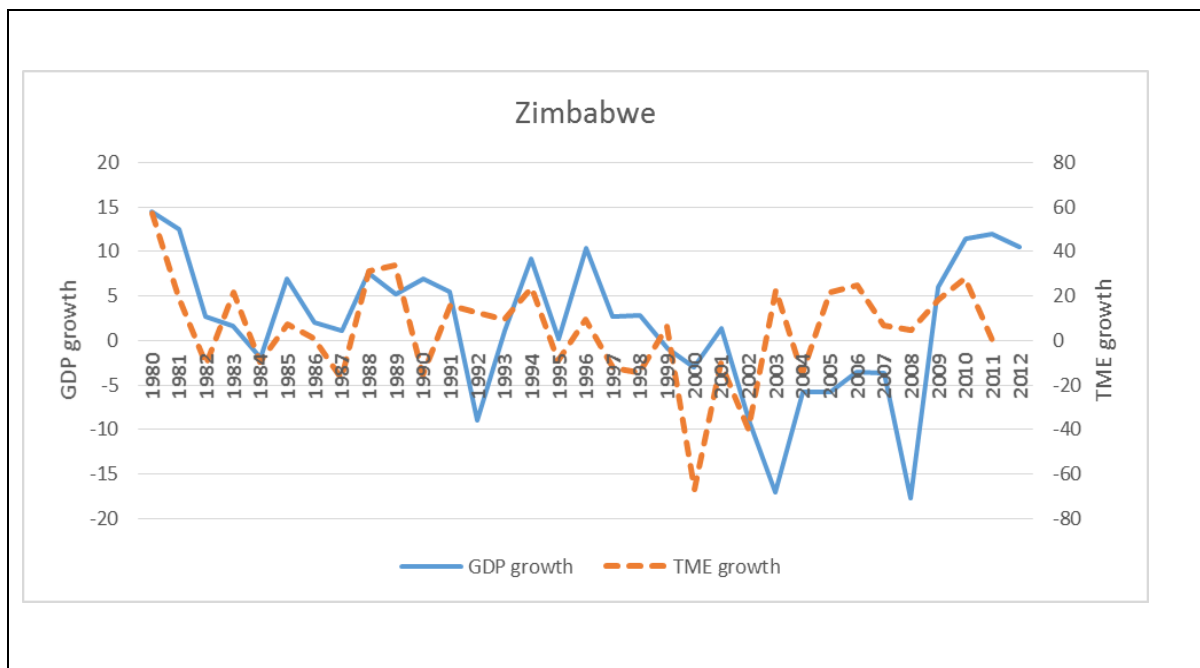
Figure 2.2: GDP growth and TME growth for each SADC country











Source: author's compilation using data from WTO and WDI

Figure 2.2 presents the line graphs for each SADC country's growth of manufactured export and GDP. The first figure presents the movement of manufactured export and GDP growth of Angola. The figure clearly shows that there was no clear movement between TME growth and GDP growth over the entire period. For Botswana, the figure indicates that TME growth and GDP growth were moving together since 1980 until 2011. The behavior of TME and GDP growth for Lesotho shows that from 1980 to 1987 the movement between the two variables was irregular in nature. A very stable and strong co-movement between TME and GDP growth was observed from the year 1991 to 2011.

In Madagascar, the trend between TME and GDP growth showed a strong co-movement since 1980 to 2011. The economy of Malawi also showed that TME and GDP growth were moving together since 1980 to 1988. In 1989 TME and GDP growth portrayed irregular movements which

became relatively stable from the year 2000 until 2011. The behavior of TME and GDP growth in Mauritius showed that although the two variables seemed to be moving in the same direction, figure 2.2 shows that TME growth was negative from 1990 to 2010. In Namibia and Seychelles the figure shows the strong co-movement between TME and GDP growth from 1980 to 2011. TME and GDP growth for economies of South Africa, Tanzania and Zimbabwe were moving in the same direction for the period 1980 to 2011. In Swaziland the trend pattern between TME and GDP growth is relatively different from other countries. TME and GDP growth were moving together since 1980 in a cyclical pattern until 1991. Since then TME was growing above GDP growth in a relatively stable pattern over time. In Zambia, TME and GDP growth were moving together from the year 1980 until 2011.

2.6.4 Country share of SADC total imports

Table 2.8 provides an overview of total imports and also country's import as a share of total SADC imports for the years 1980, 1990 and 2012. It indicates that in 1980 South Africa, Angola and DRC were the leading countries in terms of imports as a share of total SADC imports. Their combined share was more than 80%. For the year 1990, Seychelles was the least country that contributed less than 1% to total SADC imports.

In 2012, Angola and South Africa had the highest share of imports to SADC total imports. In the same year the countries with the least share of imports to SADC total imports were Lesotho, Malawi and Seychelles. Each country had an individual share of less than 1% each.

Table 2.8: Share to SADC total imports

	Imports as % of GDP			% share of imports in SADC total imports		
	1980	1990	2012	1980	1990	2012
Angola	50	33.33	36.61	8.59	8.12	17.77
Botswana	66.44	49.79	58.33	1.81	4.59	3.34
DRC	60.13	19.04	60.33	6.05	6.64	4.19
Lesotho	110.09	122.36	103.17	1.22	1.62	0.95
Madagascar	29.74	28.03	43.97	3.09	2.10	1.69
Malawi	38.8	33.42	51.97	1.23	1.53	0.85
Mauritius	61.17	72.16	66.7	1.79	4.65	2.95
Mozambique	27.36	36.07	77.82	2.48	2.20	4.37
Namibia	55.98	49.94	60.15	3.50	3.40	3.03
Seychelles	67.04	50.52	109.43	0.25	0.45	0.48
South Africa	27.35	18.76	31.01	56.59	51.09	47.67
Swaziland	114.05	68.88	56.78	1.59	1.87	1.09
Tanzania	37.45	37.45	33.11	4.10	3.88	5.01
Zambia	45.41	36.59	37.13	3.17	3.00	3.58
Zimbabwe	26.52	22.79	63.22	4.55	4.87	3.03

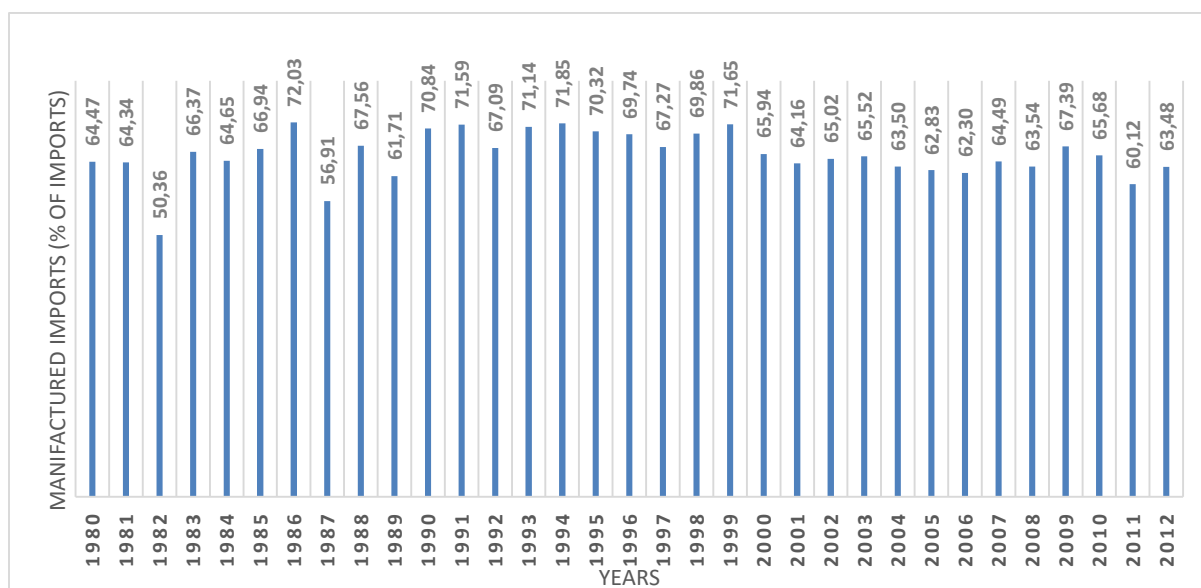
Source: Author's own calculations using data from WDI

2.6.5 SADC manufactured imports as a percentage of merchandise imports

Figure 2.3 below provides the behaviour of manufactured imports % of merchandise imports 1980 – 2012. It shows from the figure that SADC countries imports more than 50% manufactured items through the year 1980 to 2012. In 1986 it can be observed that SADC countries recorded the highest value on manufactured import at 72.03% of total merchandise imports. The study by

DPRU⁹ (2001) indicated that manufactured imports were particularly erratic throughout the 1980s. However, after 1993 these imports have stabilised in all countries except Zambia, which experienced peaks in 1995 and 1997. Throughout the years manufactured import as a percentage of import was decreasing, and since 1999 to 2012 the value of manufactured imports was averaging around 60% per year. At some point this decrease in manufactured imports could be a sign that most SADC countries are transiting from high dependence of manufactured goods from foreign world marks.

Figure 2.3: Manufactured imports % of merchandise imports 1980 - 2012



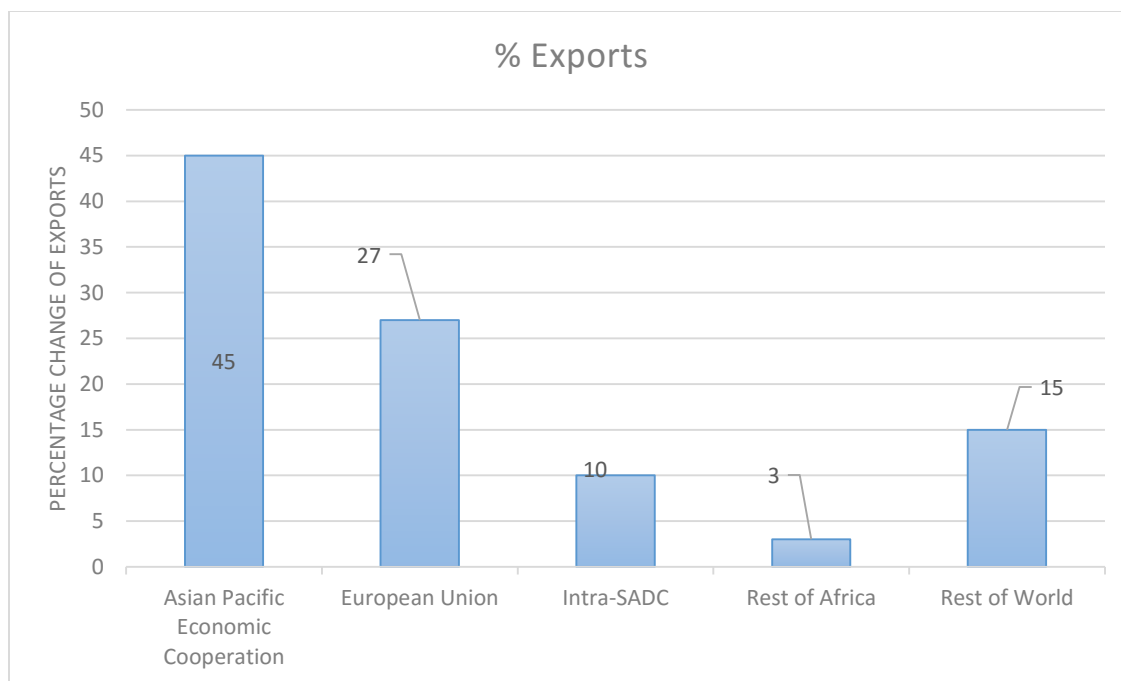
Source: own compilation using data from WDI

⁹ Development Policy Research Unit

2.7 SADC main trading partners

The construction of regional trade blocs has been a significant and well-documented feature of economic integration in parts of the world. In a recent study on African economies and regional economic communities it was revealed that 39% of respondents indicated that they joined regional blocs for economic reasons (UNCTAD, 2013). Therefore, it is very important to analyse the main trading partners of SADC in order to maintain a good trade relationship with those countries or regional blocks. Figure 2.3 provides analyses of SADC exports of goods to its main trading partners. The figure provides the data in average percentage change for the period 2000 to 2010.

Figure 2.3: Overall direction of SADC exports

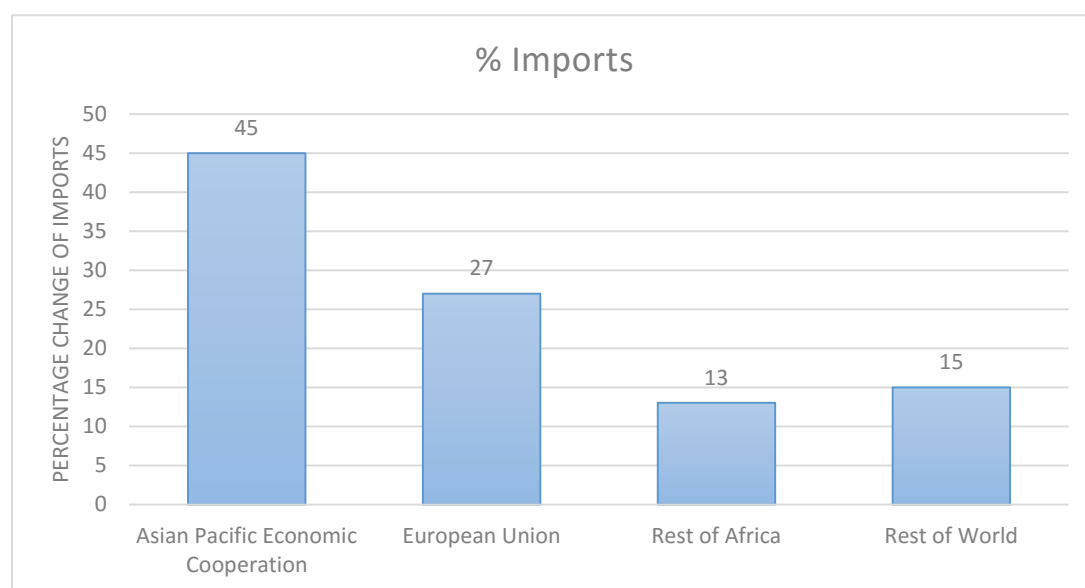


Source: own compilation using data from SADC

Figure 2.3 indicates that between 2000 and 2010, exports of SADC were destined to major parts of Asian Pacific Economic Cooperation (APEC) with an average of 45% followed by European Union (EU) that accounts 27% of SADC exports. The remaining 28% of SADC exports is shared by the rest of the world with 15% and Africa with the least of 3% and intra-SADC with 10%. The empirical work by DPRU (2001) indicates that South Africa, Botswana, Swaziland and Zimbabwe account for the bulk of intra-SADC exports with South Africa alone accounting for around 50%.

Figure 2.4 indicates that SADC imports are from many parts of the world. The figure shows that most SADC imports are from APEC with an average of 45%. The second largest source of imports is the EU with 27%, followed by the rest of the world with 15%.

Figure 2.4: Overall direction of SADC imports



Source: own compilation using data from SADC

2.8 Review of selected trade policies and agreements

The following section reviews the various trade agreements and trade policies adopted by SADC countries. In any country or a trade block it is imperative to have trade agreements with other countries in order to realise the benefits of free trade.

Table 2.9: Various agreements and trade policies among SADC countries

Countries	National trade policy	Trade objectives
Angola	reindustrialization strategy was formulated in 2002 updating an earlier Directive Plan of 1994	The strategy is based jointly on import substitution and export promotion, with four main pillars: “promotion of industries producing exportable goods that may have present or potential comparative advantage”
Botswana	Trade Act, 2003; Trade Regulations, 2008 National Trade Policy (NTP) Botswana does not have EPZs, free trade zones or free ports. IFSC special treatment for financial services.	“to facilitate the achievement of the broadest possible free and reliable access to markets for the country’s exports of goods”
DRC	Law of 2001 on the liberalization of trade. Common Market for Eastern and Southern Africa (COMESA), the Southern African Development Community (SADC), the Economic Community of Central African States (ECCAS), and the World Trade Organization (WTO)	“To enabling trade transactions to be expressed and conducted in dollars”
Namibia	Export Processing Zones Act(No.9 of 1995)	“to serve as a tax haven for export-oriented manufacturing enterprises” Any product legible for EPZ

Lesotho	Lesotho has no legal provisions for export processing zones but they have Industrialization Master Plan 2007-10 (IMP)	“Aiming to further promote the manufacturing sector”. The IMP envisages 29 specific measures to address obstacles: securing access to export markets through improvements in trade negotiating capacity
Madagascar	New frameworks for investment and for the industrial free zone (IFZ) are planned for 2008. SADC The Protocol on Trade, 2001	“To endeavouring to take better advantage of trade integration opportunities at the multilateral, regional and bilateral levels”. “Aimed at establishing a free trade area from 2008”
Mauritius	EPZ scheme was eliminated on 1 October 2006. In 2005, a new trade promotion organization	“To focus on manufacturing and non-financial, non-tourism, exportable services”
Malawi	African Growth and Opportunity Act (AGOA), the SADC Trade Protocol and preferential bilateral agreements between Malawi and South Africa.	Malawi's trade policy is directed towards maintenance of an open economy, The objective of the policy is to contribute to the achievement of economic growth.
South Africa	Motor Industry Development Programme (MIDP) established in September 1995. Duty Credit Certificate Scheme (DCCS)	“To assist the South African automotive industry, but the scheme is also available in other SACU countries”. “To encourage textile and clothing manufacturers to compete internationally”. Manufacturers and exporters of certain textiles and clothing can earn duty credit certificates based on the amount exported”.
Swaziland	Africa Growth and Opportunity Act (AGOA)	“To assist the economies of sub-saharan Africa and to improve economic relations between USA and the region”
Tanzania	Mainland Tanzania Export Processing Zones Act, 2002 Zanzibar Free Economic Zones Acts, 1992 (amended in April 1997)	“To promote export-oriented investment, mainly in manufacturing and value-added industries; stimulate international competitiveness; spur export-led economic growth”.

Zambia	In 2001 Full implementation of Export Processing Zone Act.	“To promote investment in export-oriented manufacturing companies” No export processing zones have yet been created. The full implementation of the Act is expected to promote investment in export-oriented manufacturing companies in Zambia.
Zimbabwe	Implementation of Export processing zone (EPZ) 1998-1999 Sign SADC protocol on Trade 2000	This new trade policy seeks promotion of exports and opening of new markets within the codified “look east policy”

Source: author’s compilation

2.9 Conclusion

The purpose of this chapter was to discuss the overview of SADC economy. The chapter outlines some economic characteristics of each SADC country. It was reviewed that most SADC economies transited from primary based economies to more secondary and tertiary economies, which seem to be growing at the fast rate. Average SADC export growth as a percentage of GDP is steadily growing but below import as percentage of GDP. The chapter also reviewed manufactured export as a ratio of GDP. It was observed that from 1980 to 2012 SADC countries have invested a lot in manufactured exports. The chapter also reviewed the trends between manufactured export and GDP growth for each country in SADC. The results of those trends indicate that there exist a strong co-movement between manufactured exports and GDP growth for SADC countries. In addition it was also revealed that much of SADC exports are consumed in Asian Pacific economies which constitute of more than 40%. The following chapter provides a review of trade and growth theories and studies related to manufactured exports and economic growth.

CHAPTER THREE: THEORETICAL AND EMPIRICAL LITERATURE

3.1 Introduction

In this chapter the relationship between manufactured exports and economic growth is examined in terms of the theoretical foundations and empirical literature. Medina-Smith (2001) points out that although the theoretical link between trade and economic growth has been discussed over the years, the topic is still far from being settled. In theoretical growth models, manufactured export is considered as a catalyst of economic growth. Exports being a component of aggregate expenditure it means that an increase in manufactured exports will thus increase in employment for manufacturing industries which ultimately increase national income. This chapter is divided into two sections. In the first section, the chapter reviews the theoretical foundations of trade and growth theories. The second section reviews empirical studies on the relationship between manufactured export and economic growth.

3.2 Theoretical framework

This section briefly explains the main theories related to trade and economic growth. This is done by reviewing the theories of trade through the contribution of classical economists in the development of trade theory. The second part under theoretical foundations reviews different growth theories emanating from the theory of AK growth model to innovation based theory. The recent conventional strategy is that economies that wish to be successful must be internationally competitive and insert themselves into the world economy through growth in international trade, (Du Plessis, 1987). International economics is concerned with the flow of commodities across

national boundaries. It analyses the nature and causes of consequences of the movement of commodities between countries. There are a number of reasons why countries are engaged in trade. According to Siliverstovs and Herzer (2007), there are reasons argued by them that export expansion through the supply side could promote economic growth by an increase in total factor productivity. This may be put as follows. An expansion in manufactured exports may promote specialisation in manufacturing sectors in which a country has a competitive advantage, and lead to a reallocation of resources to a more productive sector. Manufactured export expansion may indirectly affect economic growth by providing the foreign exchange that allows for increasing levels of capital imports and ultimately will stimulate economic growth by raising the level of real investment. This chapter discusses the trade theory starting from the classical theory of mercantilists followed by absolute advantage theory, comparative advantage theory and new trade theories and lastly are growth theories starting from neoclassical theory of Solow-Swan to endogenous theories.

3.2.1 Mercantilists Theory

Since the 16th to 18th centuries, mercantilism was the policy of Europe's Great Powers as they expanded their economies, and was regarded as the universal framework for international trade. During the 18th centuries a group of individuals in Europe wrote essays on international trade that advocated an economic philosophy known as mercantilism (Heckscher, 1955). The concept *mercantilism* designates a system of economic policy as well as epoch in the development of economic doctrines before the publication of Adam Smith book titled "The Wealth of Nations". The concept first appeared in the print of Marquis de Mirabeau's *Philosophie Rurale* in 1763 as a

system of mercantile, although it was used by other Physiocrats during the same period (Langdana and Murphy, 2014).

Mercantilists believed that one way for a country to accumulate economic growth, is to export more than it imports. The resulting export surplus would then be settled by an inflow of the precious metals: primary gold and silver. They believed that the more gold and silver the nation had, the richer and powerful it was. The government of that era had to do all in its power to stimulate the nation export and discourage and restrict imports (Salvatore, 1995). Criticism of mercantilist theory is that their views are not relevant to modern trade since countries do not use precious metals to facilitate trade, but money. Another criticism of mercantilism theory was that the theory view trade as a zero sum game. Whereas, critics such as Adam Smith and David Ricardo demonstrated that trade is a positive sum game in which all trading countries can gain even if some benefit more than others. However, the view on export surplus is supported in this study. This implies that more supply of manufactured exports to enhance economic growth is supported by the current study.

3.2.2 Absolute Advantage Theory

The theory presumes that each country could produce one or more products at a minimum cost than its trader. The theory claims that each country could benefit from export of specialisation in commodity in which it had an absolute advantage. Smith (1776) bases this theory on the amount of labour required to produce a product. The analysis is based on the opinion that labour is the only factor of production which is homogenous and it can move freely between countries. The reality

is that labour in the real world is heterogeneous and it cannot move freely between countries. It is also crowded by the dispute of trade unions.

In Table 3.1 the study explains the theoretical scenario on absolute advantage. Suppose that in SADC it takes 35 days to produce an ounce of gold and 100 days to produce a barrel of oil, whereas in MENA¹⁰ countries it takes 80 days to produce ounce of gold and 15 days to produce a barrel of oil. According to absolute advantage theory SADC producers have an absolute advantage in gold production. This means that SADC can produce an ounce of gold at a lower cost than producers in MENA block. On the other hand, MENA has an absolute advantage on producing a barrel of oil. Thus, that Smith (1776) proclaims that each country will gain if its production is based on commodities in which they have an absolute advantage. In the spirit of absolute advantage theory, it is clear that the economy can export only the commodity that it realises economies of scale in producing it. Therefore theory thus support exports of less prices inputs and import high price inputs commodities.

Table 3.1 An Absolute Advantage scenario

<i>Days of labour required to produce</i>	MENA	SADC
Ounce of Gold	80	35
Barrel of Oil	15	100

Source: Own compilation

¹⁰ Middle East North Africa

Critics of this theory alluded that there is a possibility that a country may not have any absolute advantage in any commodity to produce. Researcher such as Kennedy (1995) argued against absolute advantage theory and pointed the only way is by constantly cutting labour cost.

3.2.3 Comparative Advantage Theory

Following the theory of absolute advantage as proposed by Smith is the theory of comparative advantage. The classical economists showed that beneficial trade was possible even without absolute advantage and developed the theory of comparative advantage. Comparative advantage is the most important theory to emerge from Ricardo (1817). The theory demonstrates how it is possible for countries to benefit from trade without having an absolute advantage in any commodity (Deardorff, 1980). Ricardo claims that a country can produce a commodity at a lower opportunity cost than other country. Table 3.2 explains the hypothetical scenario of comparative advantage. The theory of comparative advantage is presented using an ounce of gold and barrel of oil between MENA and SADC countries. The hypothesis on this theory is that it is assumed that producers in SADC are more efficient than the MENA producers in producing both commodities. The cost of producing both an ounce of gold and barrel of oil in two trade blocs economies is measured in terms of opportunity cost. SADC countries are more efficient in producing ounce of gold in which they are 6.3 times better compared to MENA countries by 1.4 times better in producing oil.

Heckscher-Ohlin model was developed as an alternative to Ricardian model of comparative advantage. Ohlin (1967) reformulated the theory of comparative advantage. Comparative

advantage was no longer unexplained technological differences between trading economies but differs in their relative factor abundance and in the relative factor intensities of various goods. Eithne (2013) explained that “relative abundance of a factor led to a low market price for it, which explained why a good which incorporated a lot of that factor was relatively cheap”. Also further state that a country’s comparative advantage was in the production of a goods that used relatively intensively the country’s relatively abundant factor of production.

Table 3.2 Comparative Advantage scenario

<i>Maximum output per trade bloc</i>	MENA	SADC
Ounce of Gold	15	95
Barrel of Oil	35	50

Source: Own compilation

The theory of comparative advantage is not without the criticism in the literature. The study by Lin and Chang (2009) argued that in terms of comparative advantage principle, it means that since developing countries tend to specialize in agricultural products and developed countries specialised in high technology products. This suggests that developing countries will continue in the production of primary goods and lag behind that of developed countries with high technology.

3.2.4 New Trade Theories

It was until 1970s that the mechanism of neo-liberal theories of trade on comparative advantage and absolute advantage were questioned on their rigidness. Brander and Spencer (1985)

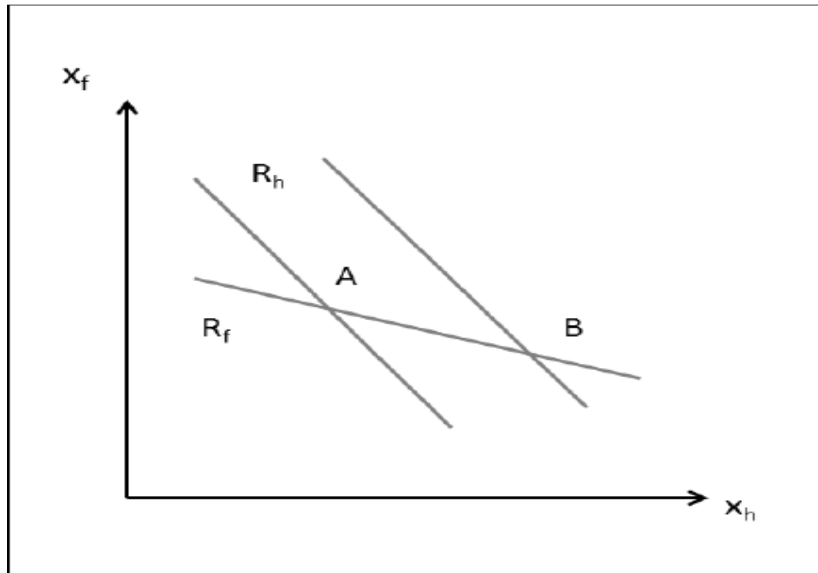
disregarded the work of classical theory such as comparative advantage that it is invalid in modern trade world. New trade theory advocates the assumption under comparative theory of constant returns to scale, same technology across trading partners and perfect competition. The work by scholars such as Brander and Spencer (1985) relaxed such assumptions and are based on economies of scale, heterogeneity in technology and imperfect competition. Recent literature has broadly categorised the new trade theories under three themes which are theory on neo-technological changes, theory on intra-industry trade and theory on strategic trade policy.

3.2.4.1 Brander – Spencer trade theory model

Brander and Spencer (1985) developed a trade theory model under the assumptions of economies of scale at the level of the individual firm and oligopolistic competition among limited firms. The model uses the idea of subsidies provided by government to a domestic firm to help them to compete with foreign markets. An export subsidy to a domestic firm is considered as a decrease in its production costs. In fact, firms can affect the world price of their own goods produced or those of others. Therefore, the firm will take into account its own strategic interactions in terms of how much to produce, price and investment in research and development. The model by Brander and Spencer (1985) used a simple well known simulation of two most leading aircrafts firms which are Airbus and Boeing. These two types of firms can be easily classified in to manufacturing cluster. The model undertakes that one firm (Boeing) is the domestic firm and second firm (Airbus) is a foreign firm. The framework assumes that if the domestic government gives subsidies to firm (Boeing) this will help in their strategic action to enter the world market and make profit. Alternatively, if the two firms enter the market this will increase goods in the world market and

therefore cause downward pressure on the price of goods. Figure 3.1 give the theoretical example on trade theory on strategic intervention.

Figure 3.1: Firms reaction function



Source: Medin (2014)

Figure 3.1 indicates each firm strategic reaction described by reaction function for both firms which is domestic firm (R_h) and foreign firm (R_f). As discussed earlier, the firm strategic action is influenced by other firm's reaction. The size of output production for both firms is measured by x_h and x_f axis. A point where the two reaction functions cross, is called equilibrium and is given by point A. Therefore, if the foreign firm decides to increase its output, the domestic firm will find it gainful to decrease its output production. Suppose, that the domestic government provides export subsidy to domestic firm. The outcome will be that the domestic firm will find it profitable to produce more. R_h shifts to the right, while R_f remains unchanged. Therefore, the new equilibrium is given by point B.

3.2.4.2 Kravies Trade theory of “availability”

Literature indicates that lack of production possibilities in certain goods could also give rise to trade for that good between trading countries. Kravis (1956) developed the trade theory on the notion that countries tend to import goods that are not available at home. Therefore, his theory acclaims that “availability” is determined by natural resources, technological progress and commodity differentiation. The determinants of availability theory of Kravis (1956) are explained as follows:

a) Unavailability of natural resource

Kravis (1956) explained that unavailability of natural resources in other parts of the world is the main cause of trade. This supply side trade theory is stated in terms of absolute supply. A raw material or agricultural product demanded but not available or not produced in a country will of course be imported. “Availability” theory may also be articulated in terms of relative availability of gifts of nature. An example may be the climate and fertility of land, forestry and mineral extraction.

b) Technological progress

Neo-classical trade theories assumed that the key to trade is based on labour as a factor endowment to production of goods. However, recently the technology gap theories of trade, tend to stress the essence of changes over time and differences among economies.

Lundberg (1992) explains that superior technology means a strong competitive position on the domestic and world markets. Therefore, it is generally claimed in the literature that R&D expenditure results in innovations in the form of new production processes which improve the competitiveness of the innovating firms.

c) Commodity differentiation

Krugman (1980) alluded that in recent years there has been extensive scepticism about the ability of comparative cost theory to explain the pattern of trade between countries. It is within those scepticism that formally Kravis (1956) also looked at international trade in the presence of product differentiation. Different economies produce identical commodities from the point of utility function such as German cameras, Belgian lace, Italian silk and Swedish furniture are what might be called “national” product differentiation. In other words, product differentiation is another basis for the operation of availability of factors of trade.

3.2.4.3 Vernon product life theory

Transfer of production techniques from the Northern manufactures to the Southern manufactures also plays a role in international trade. Vernon (1966) has contended that there is life cycle in a typical manufactured product. His model development was the response of the failure of Heckscher-Ohlin model in explaining the observed pattern of international trade. The impression behind the product cycle is that ‘new goods’ are developed in the advanced countries (North) and are exported to the less developed countries (South). Later, when commodities become old, production location changes and the comparative advantage ranking is reversed. The model also

is regarded as generalisation and extension of technological gap function. According to this theory of trade cycle many products follow a pattern which is divided into four stages.

1) Stage 1: introduction or initiation

During this stage of product life cycle the new goods are produced locally only and mostly to meet the domestic demand and partly exported to countries with similar preference, needs and income. At this early stages of product life the design is often in a constant state of flux. There is a real advantage that accrues to manufacturer who is close to the market for his products so that he can rapidly translate demands for design changes into more suitable products (Wells, 1968).

2) Stage 2: Foreign production starts

This stage explains that an identical product is produced elsewhere and introduced in the home country to capture growth in domestic market. During this stage also the potential foreign producer may have to invest less in product development as this part was done by the inventor of the product.

3) Stage 3: Foreign production competitive in exports markets

This phase is a period of stability. The foreign producer becomes larger and more experienced, therefore their operational costs are lowered. Later, the lowered costs may be such that foreign commodities became competitive with domestic goods in the third markets.

4) Import competition begins

During this final stage the Northern exports will be reduced to a trickle, supplying very special customers abroad, while import competition may become severe.

Therefore, almost all declining products are manufactured in developing communities. The bicycle is a product which has been in this phase for some time (Wells, 1968).

3.2.5 Solow- Swan growth model

Neoclassical theory of economic growth has its origins in the Harrod-Domar model that intends to explain the relationship between investment, growth rate and employment in an economy. Taking this neoclassical model as a starting point, Solow (1956) and Swan (1956) contributed to the development of theory by assuming that production was a function of capital and labour, as well as technology. The conventional Solow-Swan is augmented within the Cobb-Douglas production function and is presented as follows:

$$Y_t = A_t K_t^\alpha L_t^{1-\alpha} \quad 3.1$$

Where Y_t is GDP or output, K_t and L_t are capital stock and labour. Where t denotes time, $0 < \alpha < 1$ is the percentage change of output with respect to capital stock. A represents total factor productivity. The theory is under the assumptions that all the citizens work all the time, and also they save their income, hence invest a fixed portion of their income. Solow-Swan model alludes that there is no government, hence no taxation or subsidies. This model is a closed economy framework, and therefore there is no trade. The model assumes there is no existence of financial markets hence there is no prices and no money circulation.

Divide equation 3.1 by L with $Y / L = y$ and $K / L = k$, and rearranging terms in a way to have the capital output ratio on the right-hand side gives:

$$\frac{Y_t}{L_t} = A \frac{K_t^\alpha L_t^{1-\alpha}}{L_t} = A \frac{K_t^\alpha}{L_t} = AK_t^\alpha \quad 3.2$$

$$y_t = A_t k_t^\alpha \quad 3.3$$

From equation 3.3, $y = \frac{Y}{L}$ denotes output per labour and $k = \frac{K}{L}$ is the capital per labour. Equation 3.3 is normally known as production function in the intensive form and emphasis the role of capital per labour as the main driver of output. The production function from equation 3.3 exhibit constant returns to scale in labour and capital, also decreasing marginal returns to each of these inputs.

The extension from the model can be analysed from the demand side where household uses their income for consumption and certain portion for savings. In aggregate this can be expressed as follows:

$$Y_t = C_t + S_t \quad 3.4$$

C_t and S_t represents aggregate consumption and total savings. Therefore savings is assumed to be proportional to current income which is expressed as follows:

$$S_t = sY_t \quad \text{where } 0 < s < 1. \quad 3.5$$

Given the constant rate of saving, s , the flow equilibrium in the economy is given by $sY_t = I_t$, where I represents gross investment (footnote baba). In evolution of time capital stock wears out. Therefore, this process called depreciation denoted by δ . This implies that some investment is needed every time to replace depreciated capital. In Solow model it is assumed that depreciation is exogenous and constant over time. Hence:

$$\Delta K_t = I_t - \delta K_t \quad 3.6$$

Equation 3.6, explains that the change in net investment is equal to gross investment minus depreciation. However, though the Solow-Swan model made a phenomenal contribution in developments of growth theories, it is not without flaws. Dewan and Hussein (2001) explained that recent growth theorists dismiss the Solow-Swan model in favour of an endogenous growth model that assumes constant and increasing returns to capital. The critics allege that the standard neoclassical model fails to explain the observed difference in per capita income across countries (Dewan and Hussein, 2001).

3.2.6 Endogenous model of “AK growth theory”

The development of AK model originates from Frankel (1962), who claimed that total production function can show neither/nor increasing marginal product. This proposition can be realised when

corporations accumulates more capital. Some of the capital will be the intellectual capital that determines technological progress. This theory proclaims that as the process continues the technological progress will counterbalance the diminishing of marginal product of capital. The following equation gives the expression of AK growth model:

$$Y = AK \quad 3.7$$

From the equation 3.7, it is presumed that total production Y is proportional to total stock K . where A is described as positive fixed coefficient. The theory postulates that the long run economic growth relied on its saving rate. The model assumes that there is a constant fraction of saving from output/income is saved holding the rate of depreciation constant, and then total net investment is as follows:

$$\Delta k = sY - \delta K \quad 3.8$$

Where Y can be replaced by AK , therefore it will be written as:

$$\Delta k = sAK - \delta K \quad 3.9$$

Where equation (3.8) and (3.9) infers that growth rate of capital is given by:

$$g = \frac{\Delta k}{k} = sA - \delta \quad 3.10$$

From equation 3.10, it can be observed that since production output is proportional to capital stock; therefore, also g will be the growth rate of production output. Ultimately, increasing saving rate thus lead to sustainable higher economic growth rate. According to McGrattan (1998), there has been a heavy criticism of this model. It is claimed that, for the fact that the model assumes no diminishing returns, it has received little empirical support. In the vein of the current study this theory will be considered since the model of the study involve gross national saving as an independent variable and economic growth as endogenous variable. It is preserved by this study that an increase in national saving rate as a core factor of growing investment this will ultimately enhance economic growth.

3.2.7 Endogenous model of “Lucas growth theory”

According to Li (2002), one of the concerns of the AK model is that it relied on one sector production function and lacks transitional dynamics. Through the wake of this deficiency, Lucas (1988) extended the AK model to form a two sector model which is human capital and physical capital. Suppose the properties are used the following equation will be formed:

$$Y_t = AK^\alpha (uhl)^{1-\alpha} \quad 3.11$$

From the equation 3.11, it can be observed that Y_t is the production output, where k_t is described as physical capital, L_t is the input for human capital. Generally human capital can be described as skill acquired through formal education. Lastly, A_t represent the total factor productivity. The theoretical model assumes that all individuals are homogenous in nature, and they use the identical

human capital and u_t is fraction of their labour time per year on existing production. Following the above equation 3.11, the growth rates of physical and human capital can be derived. The accumulation in physical capital can be expressed as follows:

$$\Delta K = Y_t - C_t - \vartheta_k K_t, \quad 3.12$$

where ΔK describes the accumulation of physical capital, C_t is the consumption and lastly ϑ_k explains the depreciation of physical capital. Whereas, human capital accumulates as:

$$\Delta L = B(1-u_t)h_t - \vartheta_h h_t, \quad 3.13$$

where $1-u_t$ is explained as non-labour time that is devoted to “personal education”, B is the constant, and ϑ_h is the depreciation rate in this regard it will be the decay of human capital. Although the model seems to counter the deficiency of the AK model, it has its own shortcomings. Rebelo (1991) argues that since lifetime is a finite context therefore, there is maximum limit to the extent of human capital. Ultimately, it is better to contemplate Lucas growth model as approximation tools that can help to derive predictions about the phenomena interest.

3.2.8 Endogenous model of “Innovation based growth theory”

Following endogenous growth theory by Lucas (1988), the innovation” growth theory by Grossman and Helpman (1994) was developed. This theory argues that growth can be endogenous

through technological progress by concentrating on innovations, research and development (R&D). The following is the general production function with an element of technological effect:

$$Y = BK^{\alpha} L^{1-\alpha} \quad 3.14$$

For simplicity suppose $L=1$, then equation 3.14 will be as follows:

$$Y = BK^{\alpha} \quad 3.15$$

where B is seen as technological level. Grossman and Helpman (1994) explain that any growth theory that does not take recognition of technological progress is ignorant of modern economy and doubtful. According to Hartwig (2009) technological progress can be seen as specialisation of labour, which is devoted more on R&D. As a result of R&D, new innovative commodities will be created. Additionally, this theory also assumes that long-term economic growth occur due to spill-overs spill overs from research activities. Later on Jones (1995) engaged in a study in US using proxy for innovation as R&D expenditure to model growth. The findings were that innovation theory was just a flawed because it failed to accelerate growth. In view of the current study the idea of technological factor is considered since manufactured exports needs certain innovations to export continuously. It is argued by this study that technological investment in manufacturing is ideal for SADC countries in order to move away from primary exports commodities to high technological products. The adoption of innovation growth theory by this study comes from following empirical work of Pahlavani (2005).

3.3 Empirical literature

This section reviews the existing literature on manufactured exports and economic growth. The idea on reviewing relevant empirical studies helps to understand the expected empirical relationship among the concerned argument. This section is divided into two parts. The initial part reviews the studies on cross sectional and country specific studies on aggregate exports and economic growth, while the second part concentrate on country specific and cross sectional studies on manufactured exports and economic growth.

3.3.1 Aggregate exports and growth studies

This empirical review is concentrating on reviewing studies that mainly uses aggregate exports and economics growth variables. The section is divided into two parts which are the studies that used cross-sectional perspective followed by those that used country specific studies.

3.3.1.2 Cross sectional studies

Economic policy makers around the world baffled whether they should focus on formulating economic policies that are intended to encourage export or import substitution orientated. This has sparked researchers such as Konya (2006), Zestos and Tao (2002), Awokuse (2007), Xiao and Reed (2007), Bahmadi-Oskooee, Economidoe and Goswami (2005), Gutie'rrez de Pineres and Cantavella-Jorda (2007) and Sinoha-Lopete (2006) to investigate nexus between total export and economic growth. Xiao and Reed (2007) investigated the relationship between export and production growth for Australia, Canada and the United States. The study employs vector autoregressive moving average models (VARMA) to examine the relationships between the export

of wheat and wheat flour and domestic wheat production. The study reveals that in Australia, export leads to production growth. Moreover, Granger causality results show that Canada and the USA have bi-directional effects between exports and production. Awokuse (2007) followed by investigating the impact of export and import expansion on growth in Czech Republic, and Poland. The study reveals that in the case of Czech Republic, empirical evidence exists that Granger causality flows from both exports and imports to economic growth, thus providing empirical support for both ELG and ILG hypotheses. However for Poland and Canada such hypothesis is not supported. The interest to investigate ELG was also carried by Konya (2006) in OECD countries between 1960 and 1997. The result indicates a one-way causality from exports to GDP in Belgium, Denmark, Iceland, Ireland, Italy, New Zealand, Spain and Sweden, one-way causality from GDP to exports in Austria, France, Greece, Japan, Norway and Portugal, while in the case of Australia, Korea, Luxembourg, Switzerland, the UK and the USA there is no evidence of causality between these variables. In an effort to understand the nexus between exports and growth, Zestos and Tao (2002) investigated the causal relation for Canada and United States. The study finds that there is a positive relationship between Canadian GDP and both exports and imports. The study also shows a strong causality for Canada, but not an equally strong relationship is supported for the United States.

The study on the relationship between export and economic growth was undertaken by Gutierrez de Pineres and Cantavella-Jorda (2007) in Latin American. The study applied Granger-Causality tests to perform on the corresponding error correction model for sixteen Latin American countries varying the data source and the deflator. The study suggests that much of the debate regarding export-led growth, at least for Latin America, could be fuelled by both data choice and

methodology. Finally, the study conclude that ELG hypothesis receives weak support in Latin American countries. Bahmadi-Oskooee, Economidoe and Goswami (2005) embarked on a study to find the association between exports and output for developing countries. The results of the study showed that there is a long-term association between exports and output, when export is a dependent variable. However, the cointegration disappears when output is used as explanatory variable to estimate exports. The study further advice that developing countries must aim for policies that promote economic growth through export expansion. The study on Southern African countries by Sinoha-Lopete (2006) examined the validity of the ELG in the nine countries using annual data for the period 1980-2002. Causality tests results showed that in South Africa, Botswana and Namibia exports do not cause GDP either in the short-run or long-run, which implies that there is no evidence supporting the ELG hypothesis. The study further shows that in South Africa, GDP does not Granger cause exports, either in the short-run or in the long-run.

In summary, from the perspective of cross sectional studies it is quite clear that the over whelming existence of exports-led economic growth is experienced by most developed economies than developing economies. One concern with the existing empirical studies is that they used total export to explain long term economic growth rather than manufactured exports.

3.3.2.2 Country specific studies

The role of exports in the economies of developing and developed countries has been a subject of a wide range of empirical studies such as Beko (2003), Awokuse (2006), Balaguer and Cantavella-Jorda (2004), Jordaan and Eita (2007a), Jordaan and Eita (2007b), Sharma and Panagiotidis (2004), Deme (2002) Love and Chandra (2005) and Karagoz and Sen (2005). Sato and Fukushima (2007)

investigated the causal relationship between GNP, exports, and imports by estimating a vector autoregression (VAR) model in North Korea. The study also applied the causality test proposed by Toda and Yamamoto (1995). This test is applicable whether or not there are unit roots or cointegrating relationships between the variables. The study finds that after splitting the sample into periods, there was no evidence of ELG. Awokuse (2006) analysed the causal relationship between real exports and GDP growth in Japan using data set on a quarterly basis which covers the period 1960:1 to 1991:4. The evidence from Granger causality tests suggests that the causal relation between exports and productivity was bi-directional for the period 1960-1991. To understand how structural change may affect trade and growth pattern, this was confirmed by the study of Balaguer and Cantavella-Jorda (2004) in Spain. The study finds that there is a long-run relationship among output, aggregate export expansion, and export structural change. Moreover, it becomes apparent from the study that economic growth also reinforces export expansion. The study conclude that there exists a reverse causality between export expansion and economic growth.

Beko (2003) examined the nature of Granger causality between aggregate export and output growth in Slovenia for the period 1992-99. The study reveals that by using the conditional causality technique to explore the nature of relationship between export and real output from the analysis, a predominant pattern of a bi-directional nature between GDP and various export variables emerges. Medina-Smith (2001) investigates the relationship between export and output using data for Costa Rica. The study finds that ELG is valid in this particular case. The work of Karagoz and Sen (2005) investigated the dynamic relationship between export growth and economic growth in the Turkish economy using cointegration and error-correction models. The study was based on quarterly time

series data of export and GDP for Turkey during 1989Q1-2004Q4. The study showed that the error-correction model confirms a short-run relationship, that is, it gives evidence for short-run Granger causality running from export growth to economic growth, and evidence of short-run causality running from economic growth to export growth. The study also revealed that there is uni-directional causality from export growth to economic growth in Turkey. This implies that there is evidence of long-run Granger causality running from export to economic growth in Turkey. The study by Sharma and Panagiotidis (2004) analysing the relationship between exports and economic growth in India used a time series approach for the period 1971-2001. The causality test indicated that no evidence is found to suggest that real export Granger cause GDP. But there is weak evidence suggesting that the direction of causality runs from GDP to exports.

Since globalisation started, studies have tried to determine the impact of exports on GDP. This has led to studies such as Love and Chandra (2005) to investigate ELG in Bangladesh using VAR framework. The study uses annual data for the period 1972-2000. The results indicate that the direction of short-term and long-term causality runs from real income growth to real export growth. The reverse causality is insignificant in the short-run as well as in the long-run. The study by Deme (2002) examined the ELG hypothesis in Nigeria. The results of the study indicate bidirectional causality between export ratio and economic growth. Using time series data for the years 1970 to 2005, Jordaan and Eita (2007a) analysed the causal relationship between exports and GDP in Namibia. The results revealed that exports Granger cause GDP and GDP per capita. This proposes that the ELG strategy over several incentives has a positive stimulus on growth. Furthermore, Jordaan and Eita (2007b) analysed ELG in Botswana and to evaluate the relationship of these

variables for the period 1995 to 2005. The results show that there is evidence that GDP causes export, and evidence of bidirectional causality between export and economic growth in Botswana.

In providing synthesis on country specific studies regarding aggregate exports and economic growth, it is evident from these studies that ELG hypothesis exists for some countries such as Botswana and Namibia. However, the empirical evidence shows that country specific time-series studies most adopts bivariate models which are prone to model specification bias.

3.3.2 Manufactured exports and economic growth

This part of the empirical review concentrates on reviewing studies that mainly used manufactured exports and economic growth. The section is divided into two parts, which are the studies that used cross-sectional analyses and followed by country specific studies.

3.3.2.1 Cross sectional studies

In order to study the relationship between manufactured exports and economic growth in SADC region, studies began applying a number of different methodologies. Earlier cross sectional studies such as Amakom (2002), Kilavuz and Topeu (2012), Bbaale and Mutenyo (2011), Lee (2011), Parida and Sahoo (2007), Abu-Qarn and Abu-Bader (2004), Alam (2003), Soderbom and Teal (2002) and Abu-Qarn & Abu-Bader (2001) have found different results between manufactured exports and economic growth in cross sectional analyses. The study of 71 countries by Lee (2011) investigated export specialisation in respect of technological manufacturing and economic growth around the world. The findings show that countries which specialise in export of high technological

content experienced more rapid growth. Conversely, countries that have fallen behind have tended to increasingly specialize in exporting “traditional” or low-technology goods, such as textile and food products. Parida and Sahoo (2007) engaged in a study of four South Asian Countries specifically India, Pakistan, Bangladesh and Sri Lanka during 1980-2002. Their investigation used the Pedroni’s panel cointegration technique to determine the hypothesis of export-led growth in South Asia. Their study confirmed the existence of manufactured export led growth hypothesis. Abu-Qarn and Abu-Bader (2004) carried out the study using vector autoregressive and error correction models investigating the validity of the ELG hypothesis in the Middle East and North Africa (MENA) region. The study found that positive causality runs from manufactured export to economic growth for economies with a relatively high share of manufactured exports in total merchandise exports.

The question that manufactured exports are the key to economic success in Africa was investigated by Soderbom and Teal (2002). Their study found that in nine African countries, no evidence indicates the correlation between manufactured exports and higher economic growth. Recently a study by Amakom (2012) conducted in 10 Sub-Saharan Africa (SSA) recommends manufactured exports in SSA domestic markets. This sentiment rooted from the fact of small fraction of manufactured exports in total exports in SSA. The influence of diverse classifications of import and export on economic growth in 22 developing countries during 1998-2006 was studied by Kilavuz and Topcu (2012). Their study revealed that for developing economies with high-technology, manufactured exports have a positive and statistical significant impact on growth. In respect of the findings of their study, they suggested that foreign trade policy must be adopted. They suggested that foreign trade policies that encourage high-tech manufacturing exports are

important for sustained economic growth. Furthermore, Bbaale and Mutenyo (2011) carried a study to investigate exports composition and economic growth in Sub-Saharan African and economic growth. The study sampled 35 Sub-Saharan African economies. The technique of generalised methods of moments (GMM) estimator is used for analysis. The study revealed that manufactured exports are positively but not significantly linked to per capita income.

More generally a number of factors have been identified in this literature section. These factors relate to specifically to studies conducted in Africa and econometric methods applied. The literature indicates that most studies used different methodologies such as GMM, correlations analysis and time series techniques. The results of these studies are inconsistent and mixed regarding the relationship between manufactured exports and economic growth. The inconsistency in the results prompts further investigation between manufactured exports and economic growth specifically for SADC trade block.

3.3.2.2 Country specific studies

The hypothesis that manufactured exports causes economic growth for industrialised economies has being the subject of many studies recently. Some analysts believe that causality runs from manufactured exports to economic growth, which can be easily expressed ME-led- GDP growth. Studies such as those by Waithe, Lorde and Francis (2011), Herzer, Nowak-Lehmann and Siliverstovs (2006), Ciftcioglu and Nekhili (2005), Hossain and Karunaratne (2001), Torayeh and Neveen (2001) have supported the hypothesis that the manufactured exports Granger causes economic growth. Waithe, Lorde and Fancis (2011) examined export-led growth in Mexico during the period 1960 to 2003. The study used the technique of Johansen cointegration to determine the

long run relationship between exports and economic growth. The findings show that if Mexico is to succeed in achieving high and steady economic growth, it is imperative to promote technological innovation in manufacturing. Using time series data for the period 1960 to 2001, Herzer, Nowak-Lehmann and Silvestovs (2006) investigated export-led growth hypothesis in Chile. The study used the technique of Engle-Granger two-step estimation procedure and Johansen cointegration to assess the role of export composition in productivity growth. The results indicate that there is a long-run relationship between manufactured export and non-export GDP. In addition, the results show that causality runs from exports of manufactured products and primary products to non-export GDP.

In order to evaluate the relationship between manufactured exports and economic growth in Turkey, Ciftcioglu and Nekhili (2005) applied Engle and Granger's and Johansen procedure. The results show the evidence of bidirectional causality between shares of tradables in manufacturing and economic growth. In using the theoretical bases and econometrics methods for the economy of Bangladesh, Hossain and Karunaratne (2001) examined whether manufactured exports is a new engine of growth for Bangladesh. The study applied vector error correction modelling (VECM) in the analysis for the sample period of 1974Q1 to 1994Q4. The findings show that manufacturing exports have both long run and contemporaneous effects on the growth of GDP. Torayeh and Neveen (2001) investigated causality between manufactured exports and economic growth. The study was carried out in Egypt for the period of 1980-2008 applying cointegration analysis and error correction model (ECM). The findings show bi-direction long-run causality exists only between manufactured exports and economic growth.

The review above delivered quite a concrete literature between manufactured exports and economic growth. However, the literature does not provide a robust conclusion on the results between manufactured exports and economic growth by using panel and time series techniques combined in one study. In addition to the existing empirical literature there is no studies based on SADC countries. Therefore, this gap warrants an investigation between manufactured exports and economic growth in SADC.

3.4 Conclusion

The rationale of this chapter was to review the theories and studies related to the relationship between manufactured exports and economic growth. In this chapter, the first section examined the theories of trade starting from mercantilist theory to comparative advantage theory. The last part on trade theories reviewed new trade theories ranging from Brander and Spender trade theory to Product Life cycle theory. In the same section the study also considered various growth theories. The theories emanated from the theory of Solow-Swan growth model which is the neoclassical growth theory. The chapter also reviewed endogenous growth theories of AK growth model, followed by the Lucas growth theory which disputes the one sector reliant of the AK model. Lastly, the section discussed the innovation based growth theory which was pioneered by Grossman and Helpman (1994). The second section of this chapter paid attention to the empirical literature. The section was divided into various parts. The first part reviewed the studies that focused on the aggregated exports and economic growth, in which the review had two categories which are cross-sectional studies and country specific studies. In addition, the literature emanating from cross sectional studies and country specific studies was based on various econometric methods applied. General findings from the empirical evidence indicates that there is a generally positive

relationship between exports and economic growth. This positive association between export and economic growth was confirmed by the studies of Bahmadi-Oskooee, Economidoe and Goswami (2005) and Zestos and Tao (2002). Also most of the studies confirmed the existence of causality running from export to economic growth. In knowledge addition to existing literature, the study does not use aggregated data for export it will use disaggregated data on manufactured exports.

The other part of the empirical review was on manufactured exports and economic growth studies. The studies were divided into cross sectional and country specific. It is evident from the literature that most recent time series studies that have used the econometric methods of cointegration were able to find long run relationship between manufactured exports and economic growth. Studies such as Abu-Qarn and Abu-Bader (2004) have supported the hypothesis that manufactured exports granger cause economic growth. Some studies such as those of Bbaale and Mutenyo (2011) within the Sub-Saharan used cross-sectional technique. The current study wants to highlight that most panel data studies are criticised for assuming homogeneity among country's economic structure. It is thus the other intention of this study to use both time series and panel techniques to overcome such criticism. Hence the current investigation follows these recent approaches of time series and panel analysis to examine the relationship between manufactured exports and economic growth. In adapting from the literature, it is evident that economic growth is exogenous to other variables such savings and imports of goods and service. In this study all the above mentioned variables are considered in an attempt to examine the relationship between manufactured exports and economic growth.

CHAPTER FOUR: RESEARCH METHODOLOGY

4.1 Introduction

This chapter thoroughly provides the discussion of the framework methods adopted by this current study. In this chapter, the research methodology and all the procedures applied to determine the relationship between manufactured exports and economic growth in SADC countries are discussed. It consists of the following sections. Section 4.2 discusses the empirical model specification where section 4.3 describes the data used. Section 4.4 explains how the missing data was handled and section 4.5 discusses the motivation for variables selected. Section 4.6 discusses the econometric methods of the study, which consist of two approaches of the study. These are time series and panel data approaches. Section 4.7 provides conclusion of the chapter.

4.2 Empirical model for SADC

A review of the theoretical framework and empirical evidence on manufactured exports and economic growth shows that most studies adopts a production function form, where manufactured exports enter into the model together with capital and labour. The current study argues that manufactured exports as addition to the growth model can produce a positive externality to the rest of SADC countries through more efficient allocation of resources. The study adopts the endogenous growth theory framework on the basis that the theory holds that investment in human capital, innovation, and knowledge are significant contributors to economic growth. This study also adopts its empirical model which is linked to recent endogenous growth theory of innovation growth theory within the empirical framework of Abu-Qarn and Abu-Bader (2004), where they generally specified their model as follows:

$$LGDP_t = f(LM_t, LX_t, LMAN_t) \quad 4.1$$

where $LGDP_t$ natural log of real GDP for MENA countries at time t and $LM_t, LX_t, LMAN_t$ represent real imports, real total exports and real manufactured exports respectively. This growth function can be used for the purpose of the current study to investigate the relationship between manufactured exports and economic growth in SADC countries. The current study modifies equation 4.1 by assuming that economic growth model for SADC countries can be expressed as a function of gross national saving, imports of goods and service and total manufactured exports. It is important to mention that the current study acknowledges that there are many determinants of economic growth in the literature beside afore mentioned once. However, all other determinants are not included here because the focus of this study is mainly on manufactured exports and economic growth. The modification of the model emanates from an argument by current study that, the inclusion of total exports and manufactured exports variables in the model may lead to specification error. Therefore, this suspicion warrants this study to express SADC empirical model as follows:

$$GDP_t = f(GNS_t, MIM_t, TME_t) \quad 4.2$$

where:

GDP_t = is the economic growth

GNS_t = Gross national saving

MIM_t = imports of goods and service

TME_t = total manufacturing exports

Subsequently, the study can express the equation 4.2 into a more formal liner regression, where the parameters have to be estimated. Also parameters are expressed into natural logs in the equation for the convenience of interpretation as elasticities and to improve the model fit. Therefore, equation 4.2 is derived as follows:

$$\ln GDP_t = \beta_0 + \beta_1 \ln GNS_t + \beta_2 \ln MIM_t + \beta_4 \ln TME_t + \varepsilon_t \quad 4.3$$

Where β_1, β_2 and β_3 are now parameters for each variables explain above, where β_0 is a constant parameter and ε_t is the usual error term. Gujarati and Porter (2009) explain that the inclusion of an error term is because of the following reasons. *Firstly*; the vagueness of the theory, because some economic theory in explaining the behaviour of the dependent variable may be incomplete or unclear. *Secondly*; the unavailability of data: meaning that even the excluded variables are known, the tragedy may be that the quantitative information about them is not available. *Thirdly*; intrinsic randomness in human behaviour: implying that even the researcher succeeds in introducing all the relevant variables into the model, there is bound to be some “intrinsic” randomness in the dependent variable.

4.3 Data descriptions

To study the relationship between manufactured exports and economic growth, time series data for the period 1980-2012 is collected. Data for this study is obtained from the International Monetary Fund (IMF), World Bank Development Indicators and World Trade Organisation (WTO) websites. The study applies dual macro-micro level data to estimate manufactured exports

and economic growth in SADC countries. The variables to be used in this study are: gross domestic product per capita, gross national saving, imports of goods and service and lastly, total manufactured exports.

Table 4.1: SADC variables descriptions

Variable	Definition	Source
GDP	GDP per capita is gross domestic product divided by population.	World Bank national accounts data, and OECD National Accounts data files.
GNS	Gross national saving as the ratio of GDP	International Monetary Fund, World Economic Outlook Database, April 2013
MIM	Represents the imports of goods and service as a percentage of GDP	International Monetary Fund, World Economic Outlook Database, April 2013
TME	Manufactures exports as a percentage of merchandise exports	World Trade Organisation (WTO) websites

4.4 Missing data

Researchers unintentionally are faced with missing data in their statistical analysis, and this create a limitation in their studies to produce reliable results. Mittag (2013) describe that missing data occurs when some variables are partly missing because the essential information could not be obtained for some units. This problem was faced by studies such as King, Hopnaker, Joseph and Scheve (2001). In their study it is claimed that about 50% of the participants in political survey data have missing values. The problem of missing data set is largely experienced by emerging

economies at most. Specifically, this problem is faced by the current study where some countries variables have missing values. The phenomena at some point leave the researcher with a question of whether to leave out the variable with a missing data or not. According to Acock (2005), there are several types of missing values such as list-wise deletion, indicator variable and pair deletion.

In recent years the literature explains on how to deal with missing values in empirical research. Acock (2005) listed approaches to deal with missing values which are single imputation and multiple imputation. The current study uses the multiple imputation to impute the missing values. The reason for the use for this approach is that it does not underestimate the standard errors by allowing the pooling of the parameter estimates to obtain a better parameter estimate. Breitwieser and Wick (2013) highlighted that the technique was not much used in the field of economics. This approach of using multiple imputation can be seen as a contribution in this study. The technique it enables to address the problem of substantial reduction in sample size and potential bias which can be associated with missing data. Lastly, it should be noted that missing data measures like multiple imputation is not to precisely predict the missing values, but to cater for the empty spaces in the dataset. Therefore the results of the imputed data should be treated and interpreted with care.

4.5 Motivation for variables selected

After the formulation of the empirical model based on theoretical and empirical literature, this section provides the motivation for the explanatory variables adopted. This section presents a brief review.

4.5.1 Savings and economic growth

The importance of savings on economic growth especially for developing economies has caught international attention among the researchers and policy makers. According to Alomar (2013), saving is described as a sacrifice of current consumption to provide for the accumulation of capital stock, where ultimately contributes to aggregate output. The study by Solow (1956) pointed out that the association between saving and economic growth is not a direct one. The study explains that the higher the savings will lead to improvement to investment, which in turn lead to economic growth. The study by Alomar (2013) investigated the nexus between saving and economic growth in Cooperation Council for the Arab States of the Gulf (GCC). The study used the Johansen cointegration technique for a panel of 6 countries. It was found that cointegration between saving and economic growth exists for 4 countries in the sample. Recently, Sothan (2014) engaged in study to investigate the causal relationship between domestic saving and economic growth of Cambodia. The study found that although there is a conventional consent that saving may be related to economic growth, but for Cambodia it was found that there is no causality running between the variables. For the current study from theoretical and empirical evidence, it is expected that this study finds long run equilibrium between saving and economic growth.

4.5.2 Imports and economic growth

Theoretical literature recommends that the nexus between imports and economic growth might have a bidirectional causality. Imports can be referred to those goods and service that are produced internationally and are sold domestically. It is viewed from theoretical point that imports of intermediate inputs and foreign technology can be used to foster economic growth. The study by Kogid, Mulok, Ching, Lily, Ghazali and Loganathan (2011) investigated the causal link between

imports and economic growth in Malaysia. Their study applied cointegration test between the variables and it was found that there is cointegration between imports and economic growth for the period of investigation. Furthermore, their study found that there is bilateral causality running between the variables. Also, the study by Katircioglu (2011) found that in North Cyprus there is a long run equilibrium between imports and economic growth, but no causality was found running from imports to economic growth. It is expected from the empirical and theoretical grounds that the import variable included in the current study should have a positive impact on economic growth.

3.5.3 Manufactured exports and economic growth

Manufactured exports have been a key driver for job creation and a rising standard of living for the growing middle class in developing countries. The impact of manufactured exports in economies of developing world has been a rare analysis to empirical studies. From the theoretical perspective, it is believed that increased international trade brings about improved productivity through greater economies of scale in the exports sector. An empirical study indicates that high-tech manufacturing industry export have a positive and significant effect on GDP growth (Kilavuz and Topcu, 2012).

4.6 Econometric methods

The study adopts two approaches to data analysis which is time series and panel data approaches. Econometric methods section for the study is divided into two part. The first section is discussing time series methods and the second section discusses panel data methods.

4.6.1 Time series approach

It is important for time series data before any analysis to determine the order of integration for each series. If the variable contains a unit root in order to avoid the problem of spurious results, it needs to be stationary. Specifically, in order to test for stationarity of the variables the technique of Augment Dickey-Fuller (ADF) (1979), Phillips and Perron (PP) (1988) and Kwiatkowski, Phillips, Schmidt and Shin (KPSS) (1992) was adopted for time series analysis. In order to determine the long run relationship between manufactured exports and economic growth this study uses Engle-Granger cointegration, Johansen cointegration and Autoregression Distributive lags (ARDL) bounds cointegration test. The main advantage of using these methods is that the study can rely on the robust results of cointegration. Lastly, the study employs Granger causality test for time series which was developed by Granger (1969) where he defines the “arrow of time” to help us identify between cause and effect. According to this approach, a variable B is caused by A if B is better predicted from past values of A and B together rather than from past values of A alone. The econometric software package EViews 8 and SAS 9.0 will be used to run all necessary analysis of the study.

4.6.1.1 Unit root testing

A time series is an order of data points measured characteristically at successive times. Many economic time series variables display trending pattern or non-stationarity in nature. In the presence of non-stationary variables, there might be what is called spurious regression. An effort to solve this problem and to understand its possible effects is common to test for unit root. Unit root is referred to as feature of processes that evolve through time that can cause problems in statistical inference involve time series models.

Stationarity is vital for estimation especially when applying ordinary least squares (OLS) regressions on non-stationary series that can give spurious parameter estimates on the concerned variables. Also, investigating for stationarity is important in the sense that it will give indication about the order of integration of variables, (Diebold and Kilian, 1999). The current study will make use of ADF, PP and KPSS unit root tests for variables under the study. The decision to use three unit root tests is encouraged by Monte Carlo studies (Sjo, 2008). Unit root test techniques are standard tests, therefore one has to do more than one test to ensure the robustness of the results. Following sections will be explaining three methods of unit root by starting with ADF test.

4.6.1.1.1 Augmented Dickey-Fuller test

In econometrics an Augmented Dickey-Fuller test is a test for a unit root in a time series variables. The test was developed by Dickey and Fuller (1981), which is an augmented version of the Dickey-Fuller test for larger and more complicated set of time series models. Several time series require to be correctly differenced in order to attain stationarity. Testing for unit root using the ADF test involve the estimation of the following equation:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^m \alpha_i \Delta Y_{t-i} + \varepsilon_t \quad 4.4$$

where ε_t is a pure white noise error term, i the lag order of the autoregressive process and Δ is the difference operator defining a change as $\Delta Y_t = Y_{t-1} - Y_{t-2}$. Lastly, β_1 is constant and β_2 is the parameter on a time trend. The current study first examines the series properties using ADF

test that is based on both intercept and time trend and intercept only. The number of lagged differenced terms to include will be determined empirically, the option of lag length will be based on the Akaike Information Criterion (AIC) and Schwarz Information Criterion (SIC). The test was performed in using the following two regressions, with intercept only and intercept and time trend.

$$\Delta Y_t = \alpha_0 + \beta Y_{t-1} + \sum_{j=1}^p \gamma \Delta Y_{t-j} + \varepsilon_t \quad 4.5$$

$$\Delta Y_t = \alpha_0 + \delta t_1 + \beta Y_{t-1} + \sum_{j=1}^p \gamma \Delta Y_{t-j} + \varepsilon_t \quad 4.6$$

where equation 4.5 and 4.6 represent estimation of regressions with intercept only, and the other with intercept and time trend, p is the number of lags in the dependent variable, ε_t is the stochastic error term and lastly; the change in dependent variable explained as $\Delta Y_t = Y_t - Y_{t-1}$. ADF test uses the following hypothesis: the null hypothesis is that $\partial = 0$ (has a unit root) and the alternative is that $\partial \neq 0$ (meaning the series is stationary). In estimating the equation, if the ADF t-statistics value of the lagged coefficient is greater than the critical value, at the various levels of significance. Then the null hypothesis that the series has a unit root can be rejected and it can be concluded that the series is stationary.

4.6.1.1.2 Phillips-Perron test

Phillips and Perron (1988) developed unit root tests that have become popular in econometrics analysis of time series. The test is accustomed in such a way that the asymptotic distribution of the test value is not affected by serial correlation by using non-parametric approach. The test statistics

can be viewed as Dickey–Fuller statistics that have been made strong to serial correlation by using the Newey–West heteroskedasticity and autocorrelation-consistent covariance matrix estimator.

The test regression for P-P is as follows:

$$\Delta X_t = \alpha' \mathbf{Z}_1 + \pi y_{t-1} + \varepsilon_t \quad 4.7$$

where $\mathbf{Z}_1$ is the vector component of either constant or a trend. The P-P test is precise for any serial correlation and heteroskedasticity in the residuals ε_t by modifying the test statistics $t_{\pi=0}$. Under the null hypothesis that $\pi = 0$, the P-P test statistics have the same asymptotic distribution as the ADF test statistic and normalised bias statistics. In respect of the shortcoming experienced by ADF test, the P-P test has an advantage that is robust to general forms of heteroskedasticity in the residual. The P-P and ADF unit root tests have the same null hypothesis that a time series X_t is non-stationary.

4.6.1.1.3 Kwiatkowski, Phillips, Schmidt and Shin test

The literature critic on the use of ADF and P-P unit root tests show that they have low size properties (Maddala and Kim, 1998). Nevertheless, the strategy in literature is that most studies used more than one test of unit root seeing if they may provide the same outcome. Kwiatkowski, Phillips, Schmidt and Shin (1992) developed the unit root test technique that postulates that the null hypothesis assumes that the series is stationary. The hypothesis structure is different from those of ADF and P-P tests. KPSS test it is like other unit root tests, but the difference is that its

null hypothesis assume stationarity in the series. The functional model with a trend has the following form:

$$Y_t = \beta' x_t + \varepsilon_t \quad 4.8$$

where x_t contains deterministic components of either constant or constant plus trend. Also Y_t is the time series of interest, ε_t is an error term in the regression fit. The equation 4.8 may be estimated with an intercept or intercept plus trend. The KPSS is the Lagrange multiplier (LM), where the LM statistics can be formulated as:

$$LM = \sum s(t)^2 / (T^2 f_0) \quad 4.9$$

where f_0 , describe an estimator of the residual at frequency, and $s(t)$ is a cumulative residual function that is based on the residuals $\varepsilon_t = y_t - \beta' x_t$ (0). Lastly, this type of unit root test it also has the same limitation like the conventional test of ADF and P-P test which is the size and power problems of this tests. Conversely, Virmani (*n.d*) stated that KPSS is described to have improved size adjusted power properties than the former.

4.6.1.2 Time series estimation techniques

This study uses three estimation techniques of cointegration. Cointegration is an econometric term used for defining the co-movement of economic data measured over time (Engel and Granger, 1987). Alternatively, if the two or more series are individually integrated in the same higher order

of integration is said to be cointegrated. The main purpose of cointegration analysis is to determine whether variables under study are cointegrated or not, after knowing the degree of cointegration then Vector Error Correction (VEC) specification can be determined. The study considers a number of cointegration tests, namely the Engle-Granger method commonly known as the two-step estimation procedure, the Johansen cointegration test and the bounds cointegration test.

4.6.1.2.1 Engle-Granger (EG) two step approach

Previously before an estimation technique of cointegration, researchers within econometrics science were much relied on basic linear regressions when making the economic analysis. Until lately Granger and Newbold (1974) cautioned that this might lead to a dangerous approach that could produce spurious correlations. Engle and Granger (1987) developed the cointegration test which is normally known in the literatures as a two-step approach. This type of cointegration approach has an advantage that is intuitive and easy to compute. The first step in this test is to perform a normal OLS regression on levels form. The following equation gives the model specification of a test:

$$x_{1t} = \beta_1 + \beta_2 x_{2t} + \cdots + \beta_p x_{pt} + \mu_t \quad 4.10$$

where x_{1t} represent the dependent variable, $\beta_2 x_{2t} + \cdots + \beta_p x_{pt}$ describe independent variables included in the system and lastly, μ_t is an error term included. As this variables are cointegrated

which means they are stationary at the higher order, its stationary residual can be define as the followed equation:

$$\mu_t = x_{1t} - \beta_1 - \beta_2 x_{2t} - \cdots - \beta_p x_{pt} \quad 4.11$$

Equation 4.10 assumes economically significant long run equilibrium among the variables under study. Suppose that these variables are cointegrated, they will share a common trend. The second step after retrieving residuals, which is equation 4.11 then the study tested to identify the integrated order by using ADF test. The test is performed on the basis that the null hypothesis is “no cointegration” and the alternative is “cointegration”. According to Shimul, Abdullah and Siddiqua (2009), if the residual is less integrated order than the intergrated order of linear combination of the variables, then the variables are said to be cointegrated. Since its conventional when dealing with time series data after determining the long run equilibrium among the variables is to estimate error correction model (ECM). According to Verma (2007), error correction can be described as a speed of adjustment to restore equilibrium in a dynamic model following a disturbance. He further explains that error correction illustrates how slowly or quickly the variables return to equilibrium. An error correction model can be expressed as follows:

$$\Delta x_{1t} = \beta_0 + \beta_1 \Delta x_1 + \cdots + \beta_p \Delta x_p + \lambda_t ECM_{t-1} + e_t \quad 4.12$$

where λ is the speed of adjustment coefficient and ECM_{t-1} is the lagged residuals that are generated from the long run regression model. The expectation from the coefficient of this ECM is that it should be negative and significant. According to Ahmed, Muzib and Roy (2013), the value of the coefficient λ , which signifies the speed of adjustment usually ranges from -1 and 0. In which -1 implies perfect and quick convergence, where 0 means no convergence after a shock in process.

Engle and Yoo (1991) pioneered the third step method with the aim to overcome the shortcomings of two-step method by Engle and Granger (1987). Their study *firstly* identified that even though the long run estimation gives super consistency estimates but they may be not fully efficient. *Secondly*, prior to non-normality of the distribution of estimators, no vigorous judgement can be made about the significance of parameters. The third step method, firstly estimate the single cointegrating equation of the form:

$$Y_t = \beta_1 Z_t + \rho_t \quad 4.13$$

where ρ_t is the residuals from an estimated first step of Engle and Granger (1987), where estimates for Z_t are estimated as $\hat{Z}_t$. The second step is to estimate a dynamic model using the residuals from the long run as error correction term. Then the third step is the following expression:

$$\varepsilon_t = \theta(-\alpha)Z_t + \mu_t \quad 4.14$$

where θ is an error term coefficient from ECM model and μ_t is the residual term. Therefore, an appropriate correction for the first step estimates is $Z_{cor} = \dot{Z}_t + \theta_t$. Then the correct standard errors for Z_{cor} are provided by the standard errors for θ in the third step regression (Utkulu n.d). The current study also applied this method to correct the estimates of parameters to be fully efficient before embarking on the main shortcomings of Engle and Granger method. Even though Engle and Granger cointegration is well known and used in applied work of econometrics, it is not without drawbacks. Sjo (2008) discussed some of the disadvantages of using the E-G two step method. *Firstly*, the test assumes that there is a single cointegrating vector, in a case of more than two variables is no longer possible to show the uniqueness of the cointegrating vector. *Secondly*, since the method involves the use of ADF test in the process, this implies that all the drawbacks of ADF test are inherited especially the determination of lags. *Lastly*, the test presumes a common factor in a dynamic of a system, whereas if that restriction does not hold then the test can be invalid. Therefore; an alternative test will also be used to distinguish between more than one cointegrating vectors which is the Johansen cointegration approach.

4.6.1.2.2 Johansen cointegration approach

The approach to investigate cointegration using Johansen approach has received much attention recently (Cheung and Lai, 1993). Johansen (1988) expressed the general specification of the procedure into vector autoregression (VAR) of order p as follows:

$$Z_t = \alpha_p + \theta_1 Z_{t-1} + \dots + \theta_p Z_{t-p} + \epsilon_t \quad 4.15$$

where Z_p is the vector of series ($n \times 1$) that are integrated of higher order, and each of the θ_i is an ($n \times n$) matrix of parameters. Also ϵ_t is the error term with a vector of ($n \times 1$). The VAR in levels it can be converted to a vector error correction model (VECM):

$$\Delta Z_t = \alpha_p + \pi Y_{t-1} + \theta_1 \Delta Z_{t-1} + \dots + \theta_p \Delta Z_{t-p+1} + \epsilon_t \quad 4.16$$

where there π -matrix, π is the long term coefficient matrix, $\theta_i = -(I - A_1 - \dots - A_i)$, ($i = 1, \dots, p-1$) and the $\pi = \sum_{i=1}^p A_i - I$, where I is the identity matrix, and where $\Delta Z_t = (K \times 1)$ is the differenced vector of variables, ϵ_t is the independent and identically distributed n -dimensional vector with zero mean. According to Johansen (1988), the long run coefficient matrix can be defined as multiple of two vectors ($n \times r$). $\pi = \alpha \beta'$, where α represents the adjustment parameters in the VECM model, while β' is the long run coefficient matrix. The Johansen procedure relies on the rank of Π and its characteristics roots. If the rank (Π) = 0, the matrix is null (no cointegration) and equations in vector process is stationary and the equations in Y_t are modelled in levels $I(0)$. If the rank (Π) = 1, there is evidence of a single cointegrating vector in Johansen's cointegration procedure applied to the study. The Johansen method proposes two likelihood test ratios and these tests are trace test and maximum eigenvalue test:

Trace test

$$\lambda_{trace}(r) = -T \sum \ln(1 - \lambda_t), \text{ and} \quad 4.17$$

Maximum eigenvalue test

$$\lambda_{trace}(r, r+1) = -T \sum \ln(1 - \lambda_{t+1}), \quad 4.18$$

where $\lambda_{r+1} \dots \dots, \lambda_n$ are the $(k - r)$ smallest estimated eigenvalues. In both tests, λ represents the estimated values of the characteristics roots obtained from the estimated Π matrix, and T is the number of observations. The trace test attempts to determine the number of cointegrating vectors between the variables by testing the null hypothesis that $r = 0$ against the alternative that $r > 0$ or $r \leq 1$ (r equals the number of co-integrating vectors). The maximum eigenvalue tests the null hypothesis that the number of co-integrating vectors is equal to r against the alternative of $r + 1$ co-integrating vectors. If the value of the likelihood ratio is greater than the critical values, the null hypothesis of zero cointegrating vectors is rejected in favour of the alternatives. Given the drawback of EG approach which is presumed to be solved by the Johansen cointegration approach. It also subjected to shortcomings. *Firstly*, the test requires more number of observations in the system than it may be required in EG approach. Lastly, some additional problems occur if we do not have a unique cointegrating vector. It may results in problems in identifying (multiple) cointegration vectors with theoretical economic relationships, (Utkulu, 2012).

After the Johansen cointegration test it is important to estimate the effect of a shock of the exogenous variables to an endogenous variable (Sims, 1980). This analysis can be applied within the system of impulse response function (IRF). The IRF analysis is used in a dynamic model such as VAR to explain the impact of an exogenous shock in one variable on the other variables of the

system (Panagiotidis, Pelloni and Polasek, 2003). The impulse response function can be defined as follows:

$$IR(n, h, \Omega_{t-1}) = E(y_{t+n}|e_t = n, \Omega_{t-1}) - E(y_{t+n}|\Omega_{t-1}) \quad 4.19$$

where n represent the time, $h = (h_1 \dots, h_n)$ is a vector of $n \times 1$ which denotes the extent of a shock, where accumulative information is represented by Ω_{t-1} from the previous up to time $t - 1$. IRF is a random variable given by the difference between two conditional expectations which themselves are random variables. The first component of the conditional expectation for variable of interest is simulated with the model condition on a baseline profile, which the estimated simulation is provided on $E(y_{t+n}|\Omega_{t-1})$. The second component of conditional expectation uses the same variable of random shocks with an extra shock to a series of interest with an added time t to each shock sequence. This simulation is provided by $E(y_{t+n}|e_t, n, \Omega_{t-1})$ estimation (Calza and Sousa, 2006).

4.6.1.2.2 ARDL Bounds cointegration approach

To empirically determine the long run relationship between manufactured exports and economic growth in SADC economies, the method of bounds cointegration test which was developed by Pesaran, Shin and Smith (2001) is applied. The technique is adopted on the following validities: *Firstly*, the test procedure is simple, as opposed to other cointegration test such as Johansen cointegration test, it allows the long run equilibrium be established via OLS once the lag order of

the model is identified. *Secondly*, the bounds test allows a mixture of $I(0)$ and $I(1)$ variables as regressors, which means the order of integration of appropriate variables may not necessarily be the same. *Lastly*, this procedure is suitable for small or finite sample size. To build an ARDL bounds cointegration model this study expresses equation 3.3 as follows:

$$\Delta \ln GDP_t = \alpha_0 + \sum_{i=1}^n \beta_{1i} \Delta \ln GNS_{t-i} + \sum_{i=1}^n \beta_{2i} \Delta \ln MIM_{t-i} + \sum_{i=1}^n \beta_{3i} \Delta \ln TME_{t-i} + \sum_{i=1}^n \beta_{4i} \Delta \ln GDP_{t-i} + \gamma_1 \ln GNS_{t-1} + \gamma_2 \ln MIM_{t-1} + \gamma_3 \ln TME_{t-1} + \gamma_4 \ln GDP_{t-1} + \varepsilon_t \quad 4.20$$

where:

α_0 defines the constant, where β_i are short run coefficients, γ_i are long run parameters and Δ defines the first difference variable. All other properties are defined as the proceeded equations 4.2 and 4.3. To make decision in ADRL cointegration analysis, firstly is to run the OLS for equation 3.18 for series under investigation. Verma (2007) explains that the test uses the Wald test on the null hypothesis of no cointegration such as below.

$$H_0: \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = 0$$

$$H_1: \gamma_1 \neq \gamma_2 \neq \gamma_3 \neq \gamma_4 \neq 0$$

The alternative hypothesis explains that there is long run equilibrium among the variables under study. To decide whether there is an existence of long run cointegration two set of asymptotic critical values are provided by Pesaran *et al* (2001) and lately revised by Narayan (2004, 2005) to

accurately accommodate small sample. If the test statistics falls below the lower critical value the null hypothesis cannot be rejected. Conversely, if the test statistics is above the upper critical value, it means there is long run equilibrium. According to Ahmed, Muzib, and Roy (2013), after the estimation of ADRL long run equilibrium, then the final step is the estimation of the short run adjustment using the error correction model:

$$\Delta \ln GDP_t = \alpha_0 + \sum_{i=1}^n \beta_{1i} \Delta \ln GNS_{t-i} + \sum_{i=1}^n \beta_{2i} \Delta \ln MIM_{t-i} + \sum_{i=1}^n \beta_{3i} \Delta \ln TME_{t-i} + \sum_{i=1}^n \beta_{3i} \Delta \ln GDP_{t-i} + \phi ECM_{t-1} + \mu_t \quad 4.21$$

where ECM_{t-1} is an error term resulting from the confirmed long run equilibrium, and ϕ is the parameter of the error term.

4.6.1.3 Diagnostic tests

It is normal within the analysis of regression to determine whether all the necessary model assumptions are valid before performing inference. According to Cook and Weisberg (1983) the concept of diagnostic for a specific assumption has not received the degree of attention in the literature. The various tests are applied in this study to determine whether regression assumptions hold for models estimated. The following are considered normality, heteroscedasticity, serial correlation.

4.6.1.3.1 Normality test

The literature indicates that a range of normality tests have been invented by various statisticians. This type of test is used to determine whether a variable is normally distributed. According to Mantalos (2010), normality is the most widely used test and has been suggested and used to determine whether the distribution underlying a sample are normal. This study uses a test of Jargue-Bera which was developed by Jargue and Bera (1980). The statistical expression of the test is as follows:

$$JB = \frac{N-k}{6} \left[S^2 + \frac{(K-3)^2}{4} \right] \quad 4.22$$

where:

N = number of observations

k = number of estimated parameters

S = skewness of variable

K = kurtosis of variable

The test involves two hypotheses for decision making; the null hypothesis of the test is that the residuals are normally distributed. Conversely, the alternative hypothesis is that the residuals are not normally distributed. For decision rule the null hypothesis is rejected if the p-value is less than or equal to the level of significance¹¹.

¹¹ The level of significance depend on the interest of the researcher it may be either 1%,5% or 10%

4.6.1.3.2 Heteroscedasticity test

Among the assumptions of classical linear regression model (CLRM) is that of heteroscedasticity. White (1980) proposed the heteroscedasticity test which determines whether the variance of the residual term is not constant over differing values of the exogenous variables. The test is advantageous because it does not assume any form of heteroscedasticity. It can be described that one of the cause of this violation is due to measurement error of the variables used. The test hypothesis can be formulated as follows:

H_0 : No heteroscedasticity

H_1 : Heteroscedasticity of some unknown form

The test involves two hypothesis for decision making, the null hypothesis of the test is that no heteroscedasticity. In the contrary, the alternative hypothesis is that heteroscedasticity of some unknown form exist. For decision rule the null hypothesis is rejected if the p-value is less than or equal to the level of significance.

4.6.1.3.3 Serial correlation test

According to Pindyck and Rubinfeld (1991), serial correlation is explained most in time series when the errors related with a given time period carry over into future time trend. This study will used the test of Ljung-Box Q test for serial correlation. The violation of this assumption is that at some point data manipulation and non-stationarity of variables can cause it. Ljung-Box Q tests the assumption that the residuals contain no autocorrelation up to any order k. Its function is as follows:

$$Q_{LB} = T(T + 2) \sum_{j=1}^k \frac{r_j^2}{T-j} \quad 4.23$$

where: T is the number of observations k is the largest order of autocorrelation for which to test, r_j^2 is the j th autocorrelation. The test involves two hypotheses for decision making; the null hypothesis of the test is that no autocorrelation up to order k . In contrary, the alternative hypothesis is that there is autocorrelation up to order k . For decision rule the null hypothesis is rejected if the p-value is less than or equal to the level of significance.

4.6.1.4 Time series Granger causality test

One of the problems faced by policy makers is to understand what variables to influence so that they achieved a sustainable growth. In order to know those variables the technique of Granger causality can be applied to determine the causal variable. Granger (1969) developed a time series technique in order to conclude causality among the variables. Foresti (2006), explains that in Granger sense X is a cause of Y if it is useful in explaining Y . According to Foresti (2006) there are three categories where Granger causality can be applied. *Firstly*, it can be applied in a simple Granger causality where there are two variables and their lags. *Secondly*, it can be applied in a multivariate Granger causality where more than two variables can be employed. *Lastly*, it can be applied in a vector autoregressive (VAR) system. This current study will use Granger causality, in order to empirically determine the causality between manufactured exports and economic growth in SADC communities. The following equations can be used to represent the Granger causality specification:

$$GDP_t = \alpha_0 + \sum_{i=1}^m \alpha_{1i} GDP_{t-1} + \sum_{j=1}^n \alpha_{2j} TME_{t-1} + \mu_t \quad 4.24$$

$$TME_t = \delta_0 + \sum_{i=1}^m \varphi_{1i} GDP_{t-1} + \sum_{j=1}^n \varphi_{2j} TME_{t-1} + \varepsilon_t \quad 4.25$$

Based upon the estimated equations 4.24 and 4.25, four various hypothesis about the analysis between manufactured exports and economic growth can be tested. *First hypothesis*, it may be that causality runs from manufactured exports to economic growth which is then unidirectional causality. *Second hypothesis*, it may be that causality runs from economic growth to manufactured exports which is also called unidirectional causality. *Third hypothesis*, it may be that causality runs either ways, from manufactured exports to economic growth or vice versa which is called bidirectional granger causality. *Last hypothesis*, it may be that there is no causality between manufactured exports and economic growth. Jordaan and Eita (2007b) advocated for the use of simple F-statistics when determining the causality between variables of interest. They explain that the use of traditional Granger causality test is not appropriate if the variables are I(1) and cointegrated. In the case where the variables are I(1) an adequate statistical inference can be obtained by analysing causality on the basis of ECM. The following expression gives causality test within the ECM system:

$$\Delta GDP_t = \alpha_0 + \sum_{j=i}^m \alpha_{1i} \Delta GDP_{t-i} + \sum_{j=1}^n \alpha_{2i} \Delta TME_{t-i} + \phi_1 \pi_{1t-1} + \mu_t \quad 4.26$$

$$\Delta TME_t = \delta_0 + \sum_{i=1}^m \varphi_{1i} \Delta GDP_{t-1} + \sum_{j=1}^n \varphi_{2i} \Delta TME_{t-1} + \phi_2 \pi_{2t-1} + \varepsilon_t \quad 4.27$$

where π_{1t-1} and π_{2t-1} are the lagged values of the residuals extracted from the long run cointegration equation.

4.6.2 Panel data approach

Now since this study provided the theoretical framework in time series unit root and cointegration from the preceded sections, the same fashion can be applied to panel data analysis. According to Baltagi (2008), panel data refers to pooling of observations on a cross section over several time periods. Since that it is well documented that the investigation with univariate cointegration fails at some point due to limitations of time series. Gogas, Plakandaras and Papadimitriou (2014) argue that panel data analysis is set in order to allow for the use of more observations and more degrees of freedom on test statistics and appropriate power for the corresponding tests to reject the null hypothesis if possible. Also, the other right up for panel analysis is that it can reduce the multicollinearity in the system.

Under panel data analysis, the following panel unit root test are applied, Levin, Lin and Chu (LLC) and Im, Pesaran and Shin (IPS) panel unit root tests. Following is the use of Petroni's panel cointegration test, Kao panel cointegration test and Johansen-Fisher panel cointegration are applied under panel data analysis. Lastly, the study employs Granger causality test for panel data analysis and Medina-Smith (2001) explained that the issue of spurious results emerged after several Monte Carlo studies that considered the robustness of these tests showed that in general the most standard tests are not powerful. Moreover, most of the studies come to the conclusion that no one test predominates over the others, and it is better to have several tests.

4.6.2.1 Panel unit root test

The literature provides a wide range of tests for panel unit root frameworks. For the current study the tests are employed to investigate the order of integration in panel data set. The study employs Levin, Lin and Chu (LLC) (2002) and Im, Pesaran and Shin (IPS) (2003) panel unit root tests. These tests are generally based on the autoregressive AR(1) process.

$$\Delta y_{it} = \mu_i + \tau_i t + \beta \gamma_{it-1} + \sum_{j=1}^{\rho} \rho_{ij} \Delta \gamma_{it-1} + \varepsilon_{it} \quad 4.27$$

where $i = 1, \dots, N$ for each unit in the panel, $t = 1, \dots, T$ refers to the time period under study.

Also where:

Δ is the first difference operator

y_{it} is the series of investigation.

τ_i is an individual trend in panel equation.

μ_i is the unit specific fixed effect.

ρ_i is an autoregressive coefficient.

ε_{it} is an error term.

The LLC tests the following hypothesis;

$H_0: \rho^* = 0$ for all i (panel has a unit root)

$H_0: \rho^* < 0$ for all i (panel does not have a unit root)

On the other side:

The IPS tests the following hypothesis;

$H_0: \rho^* = 0$ for all i (panel has a unit root)

$H_0: \rho^* < 0$ for least one i (at least one variable in the panel does not have a unit root)

From equation 4.27, it is assumed that when there is a unit root in y_{it} if $|\rho_i| = 1$. The LLC test the null hypothesis of common homogenous unit root existence. Whereas, the IPS test examines the heterogeneous individual null hypothesis. The null hypotheses of both unit root tests are the same. After determining the panel order of integration in variables is to investigate if variables in the panel are cointegrated.

4.6.2.2 Panel cointegration framework

The analysis of long run cointegration has received much attention in time series. In this section the study employ the panel cointegration techniques that can be used to determine if economic growth, gross national saving, imports of goods and service and total manufactured exports in panel system. This study uses the Petroni's panel cointegration test, Kao panel cointegration test and Johansen-Fisher panel cointegration test. The two panel cointegration types which is Petroni's test and Kao test use residual based analysis for cointegration and assume one cointegrating vector,

whereas Johansen-Fisher panel cointegration test allows for more than one cointegrating vectors in the system.

4.6.2.2.1 Petroni's cointegration test

Engle and Granger (1987) cointegration test that builds in an assumption that when the residual of the regression of variables is $I(0)$ is said to be stationary. In the same sentiments of Engle and Granger (1987) the Petroni's cointegration proposes the residual based test on the following equation:

$$y_{it} = \gamma_i + k_{it} + \lambda_i \chi_{it} + \varepsilon_{it} \quad 4.28$$

$$\varepsilon_{it} = \psi_i \varepsilon_{it-1} + \omega_{it} \quad 4.29$$

where for $i = 1, \dots, N$ for each unit in the panel, $t = 1, \dots, T$. γ_i is the fixed effects and λ_i is the slope coefficient allowed to change across individual units. From equation 4.29 ψ_i is the autoregressive coefficient of the residual ε_{it} from equation 4.28. Petroni's cointegration proposed seven panel cointegration tests which are divided in two dimensions (Petroni, 1995). The first dimension examines the case where equation 4.29 $\psi_i = \psi = 1$ for all units, against the null statement of "no cointegration". The test statistics under the first category (within-dimension) are; panel v-statistics, panel rho-statistics, panel PP-statistics and panel ADF-statistics. Under the second category (between-dimension) is the group PP-statistics, group rho-statistics and group ADF statistics. The study used of all seven test statistics to make a decision whether there is

Petroni's cointegration between variables by looking at the majority test statistics that confirmed the existence of cointegration.

4.6.2.2.2 Kao panel cointegration

To confirm the robustness of panel cointegration from Petroni, the study used the Kao test also. The test uses the identical elementary approach as the Petroni test, but the Kao specifies cross-section specific constant and homogeneous coefficients on the first stage regressors. Kao (1999) specified a residual based test of cointegration within the panel data by applying the DF and ADF type tests. As Kao cointegration derives two types of panel cointegration, the first DF test type can be computed from residuals estimated as:

$$\mu_{it} = \rho\mu_{it-1} + \varphi_{it} \quad 4.30$$

where for ADF test type can be estimated in the following model:

$$\mu_{it} = \rho\mu_{it-1} + \sum_{j=1}^p \theta_j \Delta\rho\mu_{it-j} + \varphi_{it} \quad 4.31$$

Where the residuals μ_{it} are obtained from the long run equation. Now the null and alternative hypothesis may be written as follows:

$H_0: \rho = 1$ for all i (null hypothesis)

$H_1: \rho < 1$ for all i (alternative hypothesis)

From these hypothesis it can learned that the null hypothesis specifies that no cointegration (assuming existence of unit root in the residuals) against the alternative assuming stationarity in the residuals.

4.6.2.2.3 Johansen-Fisher panel cointegration

Fisher (1932) derives a combined test that uses the results of the individual independent tests. Maddala and Wu (1999) use Fisher's result to propose an alternative approach to testing for cointegration in panel data by combining tests from individual cross-sections to obtain a test statistic for the full panel. The Johansen-Fisher panel cointegration test is based on the aggregates of the p-values of the individual Johansen maximum eigenvalues and trace statistics. If the π is the p-value from an individual cointegration test for cross sectional i then, under null hypothesis for the entire panel,

$$-2 \sum_{i=1}^m \log (\pi_i)$$

is distributed as $\sim \chi^2_{2n}$. Where the χ^2_{2n} is a chi-square distribution with $2N$ degree of freedom. The χ^2 value is constructed on Mackinnon-Haug-Michelis (1999) p-value for Johansen cointegration. In these type of panel cointegration test the results heavily rely on the lag length of the VAR model. For the current study the SIC and HIC will be used to determine the lags for the variables under investigation.

4.6.2.3 Panel long run estimators

Once the study has confirmed that cointegration relationship exists among the variables, the following step is to determine the long run parameters. For that reason the current study uses the panel fully modified OLS (FMOLS) and panel OLS (DOLS). Kao and Chiang (2000) argued that these two estimators correct the standard pooled OLS for serial correlation and endogeneity of regressors that are normally present in the long run equilibrium.

4.6.2.3.1 Panel fully modified OLS (FMOLS)

FMOLS is a non-parametric system and it takes into consideration the possible correlation between error term and first difference of the regressors. The test also considers the presence of the constant term to deal with corrections of serial correlation. The panel FMOLS estimator for long run parameters is defined as follows:

$$\beta_{i.FMOLS} = N^{-1} \sum_{i=1}^N [\sum_{t=1}^T (x_{it} - \bar{x}_{it})^2]^{-1} (\sum_{t=1}^T (x_{it} - \bar{x}_{it}) y_{it}^* - T \tau_i^-) \quad 4.32$$

Where:

$y_{it}^* = (x_{it} - \bar{x}_{it}) - \frac{\bar{L}_{21i}}{\bar{L}_{22i}} \Delta x_{it}$, described as the transformed variable of y_{it} in order to achieve the endogeneity correction,

$\tau_i^- = \Gamma_{21} + \Omega_{21i}^0 - \frac{\bar{L}_{21i}}{\bar{L}_{22i}} (\Gamma_{21} - \Omega_{21i}^0)$ also described as the serial correlation term and L_i is

a lower triangular decomposition of Ω_i (i.e. long run covariance matrix) is explained as follows:

$$\Omega_i = \begin{bmatrix} \Omega_{11} & \Omega_{12} \\ \Omega_{21} & \Omega_{22} \end{bmatrix} \quad 4.33$$

4.6.2.3.2 Panel OLS (DOLS)

DOLS estimation approach is entirely parametric and it gives a computationally convenient alternative. One of the shortfalls of using the DOLS estimators is that degrees of freedom are lowered by leads and lags. The DOLS estimator is achieved from the following equation:

$$y_{it} = \alpha_i + \beta_i X_{it} + \sum_{k=q}^q c_{ik} \Delta X_{it+k} + \mu_{it}; \quad t = 1, \dots, T \quad i = 1, \dots, N \quad 4.34$$

where α_i denotes country specific effect and c_{ik} is the coefficient of a lead or lags of first differenced exogenous variables. Lastly, μ_{it} is the error term which assumed to be $I(0)$. The parameter estimates of DOLS is as follows:

$$\beta_{i.DOLS} = [N^{-1} \sum_{i=1}^N (\sum_{t=1}^T Z_{it} \dot{Z}_{it})^{-1} (\sum_{t=1}^T Z_{it} y_{it}^*)] \quad 4.35$$

where $Z_{it} = (x_{it} - \bar{x}_i, \Delta x_{it-k}, \dots, \Delta x_{it+k})$ is the $2(k+1) * 1$ vector of regressors.

4.6.3 Panel causality test

To study the panel causality relationship, a vector error correction (VEC) model is estimated. The current study uses panel causality proposed by Holtz-Eakin, Newey and Rosen (1988). Also

Pradhan (2009) argues that if variables are I(1) and not cointegrated, the study uses the following models to investigate the relationship:

$$\ln GDP_{it} = \theta_0 + \sum_{j=i}^p \beta_{1i} \ln GDP_{it-j} + \sum_{j=1}^p \beta_{2i} \ln TME_{it-j} + f_{yi} + \epsilon_{it} \quad 4.36$$

$$\ln TME_{it} = \delta_0 + \sum_{j=i}^p \gamma_{1i} \ln GDP_{it-1} + \sum_{j=1}^p \gamma_{2i} \ln TME_{it-1} + f_{xi} + \vartheta_{it} \quad 4.37$$

where $\ln GDP_{it}$ and $\ln TME_{it}$ it is a measure for economic growth and total manufactured exports respectively. $i = 1, 2, \dots, N$ are cross sectional panel data; ϵ_{it} and ϑ_{it} are error terms; f_{yi} and f_{xi} are individual fixed effects and p is the lag length. When the first difference is considered in order to remove the fixed effect, the models becomes as follows:

$$\Delta \ln GDP_{it} = \theta_0 + \sum_{j=i}^p \beta_{1i} \Delta \ln GDP_{it-j} + \sum_{j=1}^p \beta_{2i} \Delta \ln TME_{it-j} + ect_{yi-1} + \epsilon_{it} \quad 4.38$$

$$\Delta \ln TME_{it} = \delta_0 + \sum_{j=i}^p \gamma_{1i} \Delta \ln GDP_{it-1} + \sum_{j=1}^p \gamma_{2i} \Delta \ln TME_{it-1} + ect_{xi-1} + \epsilon_{it} \quad 4.39$$

where Δ indicate the first difference of the variables under study, ect_{yi} and ect_{xi} are respectively the residuals from the cointegrating equation. Where the above equations 4.38 and 4.39 are estimated in a case where variables under study I(1) and cointegrated.

4.7 Conclusion

The aim of this chapter was to present the data and econometric methods that are employed in this study. The study applied two types of econometric methods which is time series and panel data analysis. The chapter presented the data encompassed and the description of the empirical model for SADC, and the variables as well as the sample period. In addition, this chapter also included the motivation for the choice of variables. The chapter also indicated three time series methods of unit root to be used which are the ADF, P-P and KPSS. The chapter further on listed the cointegration techniques to be used and their drawbacks. The chapter also provided panel data framework. Under panel unit root framework the study adopted two types of tests which are LCC and IPS. In respect of panel cointegration analysis the study uses three panel cointegration tests, which are Petroni, Kao and Johansen-Fisher panel cointegration. The central role of this chapter was to provide the information needed for interpreting the results from the econometric analysis.

CHAPTER FIVE: TIME SERIES RESULTS

5.1 Introduction

This chapter presents results for time series analysis adopted in this investigation. The chapter consists of several sections concerning the interest of the study. Section 5.2 gives the results on graphical inspection of variables and unit root results for different tests employed. Section 5.3. After the determination of unit root results is the time series estimation results, Section 5.4 provides the conclusion for time series results.

5.2 Unit root results

Empirical research suggests that the conventional way to work with time series data is to examine the existence of time trend within the variables under study. For this purpose, the current study examines all the variables employed through the graphical illustration. The study uses the line graphs to examine the characteristics of each variable. Appendix A1 to A13 illustrates the behavior of variables for each country i.e. Angola, Botswana, Lesotho, Madagascar, Malawi, Mauritius, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe.

After the visual inspection of variables involved in the study, next is to do the formal unit root testing. For that reason this study implemented the ADF test, KPSS test and P-P unit root test to cross verify the results of each variables involved. Since it is well acknowledged in the literature that unit root tests method suffer from the same drawbacks of low power. Appendix B1 is the unit root results for Angola. The results indicate that for all the variables involved have different results for order of integration. It can be seen that GDP and MIM are stationary after being differenced

once base on the test of ADF and KPSS test respectively, where TME and GNS variables are stationary at levels since that is confirmed by results from KPSS and P-P test. Therefore in general, GDP and MIM are $I(1)$ where TME and GNS is $I(0)$. For Botswana, there is a sign that variables GDP, TME and GNS are stationary at first difference based on ADF and PP test. Variable MIM is stationationary at levels based on ADF and P-P tests. Generally, GDP, TME and GNS are $I(1)$ where MIM is $I(0)$. Appendix B3 for Lesotho shows that variables GDP, TME, MIM and GNS are stationary at first difference based on ADF, KPSS and PP test respectively, and generally GDP, TME, MIM and GNS are $I(1)$. For Madagascar, variable GNS is stationary at levels based on KPSS and P-P tests. The variables GDP, TME and MIM are stationary after first differencing. Simply it means that GNS is $I(0)$ and GDP, MIM and TME are $I(1)$.

For Malawi variables GDP, MIM and TME are stationary after first difference; this is confirmed by results from ADF and P-P tests. On the other hand, GNS there is a sense of stationary at levels based on all the tests. For simplicity, GDP, TME and MIM are $I(1)$ and GNS is $I(0)$. Unit root results for Mauritius in appendix B6 show that GDP, MIM and GNS are stationary at first difference base on ADF and PP tests. Specifically TME is also stationary at first difference based on KPSS and P-P tests. In general GDP, TME, MIM and GNS are $I(1)$. The results for Namibia show that GDP, TME and MIM are stationary at first difference based on the ADF and PP tests. The variable GNS is stationary at levels based on KPSS and ADF. This means that GDP, TME and MIM are $I(1)$ and GNS is $I(0)$. For Seychelles, variables GDP, MIM and TME are stationary after first difference; this is confirmed by results from ADF and P-P tests. On the other hand GNS there is stationary at levels based on KPSS and P-P tests. For simplicity, GDP, TME and MIM are $I(1)$ and GNS is $I(0)$.

Unit root result for South Africa shows that variables GDP, TME and MIM are stationary at first difference based on the ADF and PP tests. On the other hand GNS is stationary at levels based on all tests. This implies that GDP, TME and MIM are $I(1)$ and GNS is $I(0)$. The unit root results for Swaziland show that the variable GDP, TME, MIM and TME are stationary at first difference based on the ADF and PP tests. Therefore, all variables GDP, TME, MIM and GNS are $I(1)$. For Tanzania variables GDP, MIM and TME are stationary after first difference; this is confirmed by results from ADF and P-P tests. For simplicity, GDP, TME, MIM and GNS are $I(1)$. The unit root result for Zambia shows that the variable GDP, TME and GNS are stationary at first difference based on the ADF and P-P tests. The variable MIM is stationary at levels based on KPSS and ADF. This means that GDP, TME and GNS are $I(1)$ and MIM is $I(0)$. For Zimbabwe variables GDP, and P-P tests. Therefore; it implies that GDP, TME, MIM and GNS are $I(1)$. After determining order of integration for variables following is to estimate long run relationship between variables.

5.3 Estimation results

This part of the study is about three types of cointegration results adopted in the study. The first one will be the Engle-Granger followed by Johansen and ADRL bounds cointegration test.

5.3.1 Engle – Granger cointegration results

The following Tables 5.1 and 5.2 report the results for Engle-Granger cointegration test. Table 5.1 is the results for first step which is the estimation of the long run equation 3.10 for all SADC countries.

Table 5.1: Long run estimation for SADC countries

Dependent variable: LOGGDP				
SADC countries	Constant	LNGNS	LNMM	LNTME
Angola	-18.873	0.110 (0.058)*	0.982 (0.081)***	-0.022 (0.064)
Botswana	-13.641	0.521 (0.128)***	0.997 (0.037)***	-0.360 (0.062)***
Lesotho	-22.513	-0.055 (0.046)	1.045 (0.045)***	0.046 (0.024)*
Madagascar	-10.090	-0.004 (0.045)	0.626 (0.070)***	-0.070 (0.044)
Malawi	-14.136	-0.019 (0.031)	0.769 (0.095)***	-0.041 (0.074)
Mauritius	-19.357	-0.120 (0.086)	1.019 (0.094)***	-0.034 (0.085)
Namibia	-2.892	0.048 (0.187)	1.074 (0.040)***	0.098 (0.041)**
Seychelles	-8.290	0.101 (0.075)	-0.008 (0.056)	0.471 (0.080)***
South Africa	-10.948	-0.203 (0.204)	0.535 (0.077)***	0.153 (0.089)*
Swaziland	-16.481	-0.083 (0.027)***	0.827 (0.052)***	-0.0003 (0.0050)
Tanzania	-10.543	-0.169 (0.112)	0.647 (0.132)***	-0.032 (0.106)
Zambia	-15.384	0.026 (0.025)	0.728 (0.074)***	0.082 (0.061)
Zimbabwe	15.462	0.057 (0.016)***	0.380 (0.145)**	-0.051 (0.107)

Values in brackets () are standard errors, without brackets are coefficients,

* 10% statistically significant, ** 5% statistically significant, *** 1% statistically significant

Table 5.1 above shows that in the long run there is a positive relationship between economic growth and manufactured exports for countries such as Lesotho, Namibia, Seychelles, South Africa and South Africa except for Zimbabwe, Tanzania, Swaziland, Mauritius, Malawi, Madagascar, Botswana and Angola. A positive relationship between imports of goods and economic growth is also realized in all SADC countries except for Seychelles. The results indicate that most of SADC countries shows that there is negative relationship between gross national saving and economic growth for countries Lesotho, Madagascar, Malawi, Mauritius, South Africa,

Swaziland and Tanzania, except for Zimbabwe, Zambia, Seychelles, Namibia and Botswana¹².

The residuals of the above regressions are subsequently used in testing cointegration between economic growth, gross national saving, imports of goods and total manufactured exports. The results are indicated in Table 5.2 below.

Table 5.2: Engle-Granger cointegration results

SADC countries	Estimated ADF unit root equations		critical values ¹³ at 5% significance level		critical values at 10% significance level	
	Intercept	Intercept and trend	Intercept	Intercept and trend	Intercept	Intercept and trend
Angola	-2.245	-2.189	-4.10	-4.43	-3.81	-4.15
Botswana	-3.353	-3.316	-4.10	-4.43	-3.81	-4.15
Lesotho	-4.776**	-4.948**	-4.10	-4.43	-3.81	-4.15
Madagascar	-3.414	-3.340	-4.10	-4.43	-3.81	-4.15
Malawi	-5.982**	-5.827**	-4.10	-4.43	-3.81	-4.15
Mauritius	-2.833	-2.833	-4.10	-4.43	-3.81	-4.15
Namibia	-2.845	-2.916	-4.10	-4.43	-3.81	-4.15
Seychelles	-3.785	-5.950**	-4.10	-4.43	-3.81	-4.15
South Africa	-2.812	-2.767	-4.10	-4.43	-3.81	-4.15
Swaziland	-3.371	-3.040	-4.10	-4.43	-3.81	-4.15
Tanzania	-2.978	-1.779	-4.10	-4.43	-3.81	-4.15
Zambia	-3.995*	-3.919	-4.10	-4.43	-3.81	-4.15
Zimbabwe	-2.006	-1.828	-4.10	-4.43	-3.81	-4.15

* 10% statistically significant, ** 5% statistically significant, *** 1% statistically significant

¹² The interpreted long run results above will also be corrected especially the standard errors and the coefficients when applying test of Engle-Yoo test later on.

¹³ The above asymptotic critical values for cointegration test were adopted from Davidson and Mackinnon (1993).

The above results indicate that for Angola, Botswana, Madagascar, Mauritius, Namibia, South Africa, Swaziland, Tanzania and Zimbabwe no long run equilibrium is found for these economies. In opposite for countries such as Lesotho, Malawi, Seychelles and Zambia, long run equilibrium was found. This implies that for these economies, between 1980 and 2012 GDP, GNS, MIM and TME they move together. The existence of long run equilibrium for these countries is reached by comparing the ADF test statistics with the asymptotic critical values simulated by Davidson and Mackinnon (1993). The decision rule is that if the ADF t-statistics for the residual is less than the critical value then there is conclusion on cointegration existence. Since that cointegration is found for some countries (Lesotho, Malawi, Seychelles and Zambia), the next step is to perform the error correction model for each country that the study found the cointegration.

5.3.1.1 Error correction model results

Table 5.3 below shows results for error correct models for each country where cointegration was found within Engle-Granger cointegration. The interest of the study from the above is an error correction term for Lesotho, Malawi, Seychelles and Zambia. After the cointegration has been determined, now the study estimate the coefficient of error correction term. This indicates the speed of adjustment towards the long run equilibrium. For Lesotho the residual term it is 0.60% adjusted to the equilibrium. For Malawi it shows the coefficient of 0.75% adjusted to the equilibrium which is theoretically correct with a significant *t*- statistics of -2.233. Seychelles shows that the error correct term coefficient is -0.155 and is statistically significant with the adjusted R-squared of 47%. For Zambia the estimated residual parameter is 0.65% adjusted to the equilibrium with a *t*-statistics of -4.1904.

Table 5.3: Error correction model for Lesotho, Malawi, Seychelles and ZambiaDependent variable: ΔLOGGDP

Lesotho		Malawi		Seychelles		Zambia	
ΔLOGGNS	-0.019 (-0.580)	$\Delta \text{LOGGDP}(-2)$	-0.329 (-1.636)	$\Delta \text{LOGGNS}(-1)$	-0.009 (-0.285)	ΔLOGGNS	-0.014 (-0.721)
ΔLOGMIM	0.873 (8.812)	$\Delta \text{LOGGDP}(-3)$	-0.737 (-3.361)	$\Delta \text{LOGGNS}(-2)$	-0.052 (-1.258)	ΔLOGMIM	0.320 (2.563)
ΔLOGTME	-0.007 (-0.445)	$\Delta \text{LOGGDP}(-4)$	-0.650 (-3.541)	$\Delta \text{LOGGNS}(-3)$	-0.016 (-0.468)	ΔLOGTME	0.207 (1.814)
		$\Delta \text{LOGGNS}(-1)$	0.174 (4.331)	$\Delta \text{LOGGNS}(-4)$	-0.030 (-1.281)		
		$\Delta \text{LOGGNS}(-3)$	-0.075 (-1.439)	ΔLOGMIM	-0.023 (-1.310)		
		$\Delta \text{LOGMIM}(-2)$	0.364 (1.312)	$\Delta \text{LOGTME}(-1)$	-0.050 (-1.372)		
		$\Delta \text{LOGMIM}(-5)$	0.091 (0.366)	$\Delta \text{LOGTME}(-2)$	-0.007 (-0.206)		
		ΔLOGTME	0.057 (0.326)	$\Delta \text{LOGTME}(-3)$	-0.014 (-0.390)		
		$\Delta \text{LOGTME}(-1)$	0.458 (2.572)	$\Delta \text{LOGTME}(-4)$	-0.017 (-0.584)		
		$\Delta \text{LOGTME}(-2)$	-0.051 (-0.300)	$\Delta \text{LOGTME}(-5)$	-0.033 (-1.459)		
		$\Delta \text{LOGTME}(-7)$	0.059 (0.334)				
ECT_{t-1}	-0.601 (-3.397)	ECT_{t-1}	-0.751 (-2.233)	ECT_{t-1}	-0.153 (-2.121)	ECT_{t-1}	-0.651 (-4.190)
t-statistics		t-statistics		t-statistics		t-statistics	
standard error	0.176	standard error	0.336	standard error	0.072	standard error	0.155
R^2	0.763	R^2	0.799	R^2	0.539	R^2	0.533

* 10% statistically significant, ** 5% statistically significant, *** 1% statistically significant

5.3.1.2 Diagnostic test results

Since the study confirmed the short run adjustment from each growth model, therefore each model is subject to rigorous diagnostic testing for possible violation of classical liner regression assumptions.

Table 5.4: Diagnostic test for Lesotho error correction model

Test	Null hypothesis	Probability	Conclusion
Jargue-Bera	Normally distributed	0.217	Residuals are normally distributed
Breusch-Godfrey	No autocorrelation	0.509	No autocorrelation
White's test	No heteroscedasticity	0.969	Homoscedasticity
Ramsey RESET	No misspecification	0.423	No misspecification

Figure 5.1: Recursive residuals for Lesotho

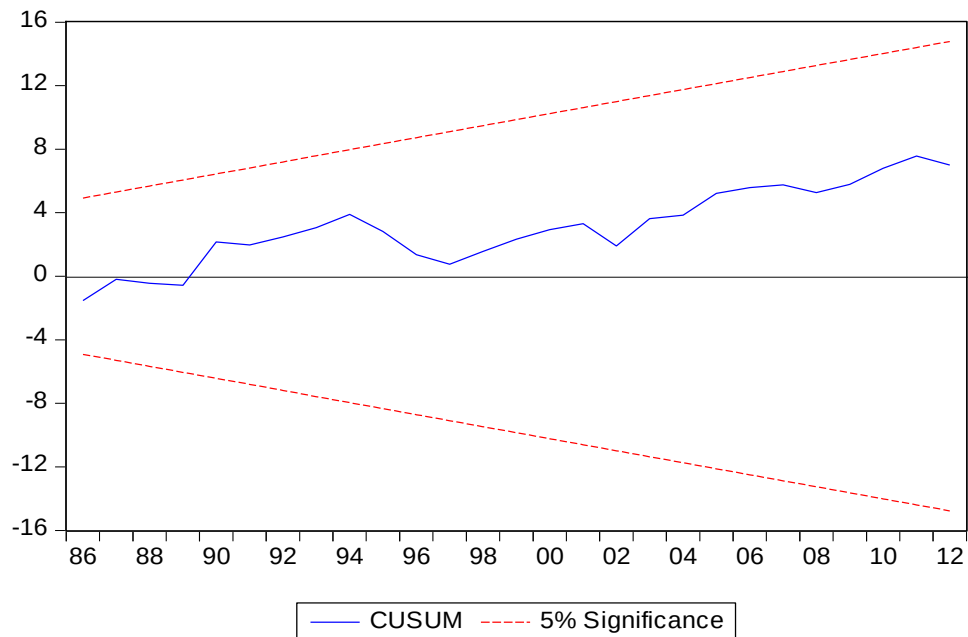


Table 5.4 and figure 5.1 above present results for diagnostic tests for Lesotho economic growth model under study. From the tables it is clear none of the residual test seem to violate the assumption of OLS. Also by observing the cusum residual figure, it shows that the residuals are within the band therefore the model seem stable.

Table 5.5: Diagnostic test for Malawi error correction model

Test	Null hypothesis	Probability	Conclusion
Jargue-Bera	Normally distributed	0.749	Residuals are normally distributed
Breusch-Godfrey	No autocorrelation	0.002	Autocorrelation
White's test	No heteroscedasticity	0.978	Homoscedasticity
Ramsey RESET	No misspecification	0.171	No misspecification

Figure 5.2: Cusum test for Malawi

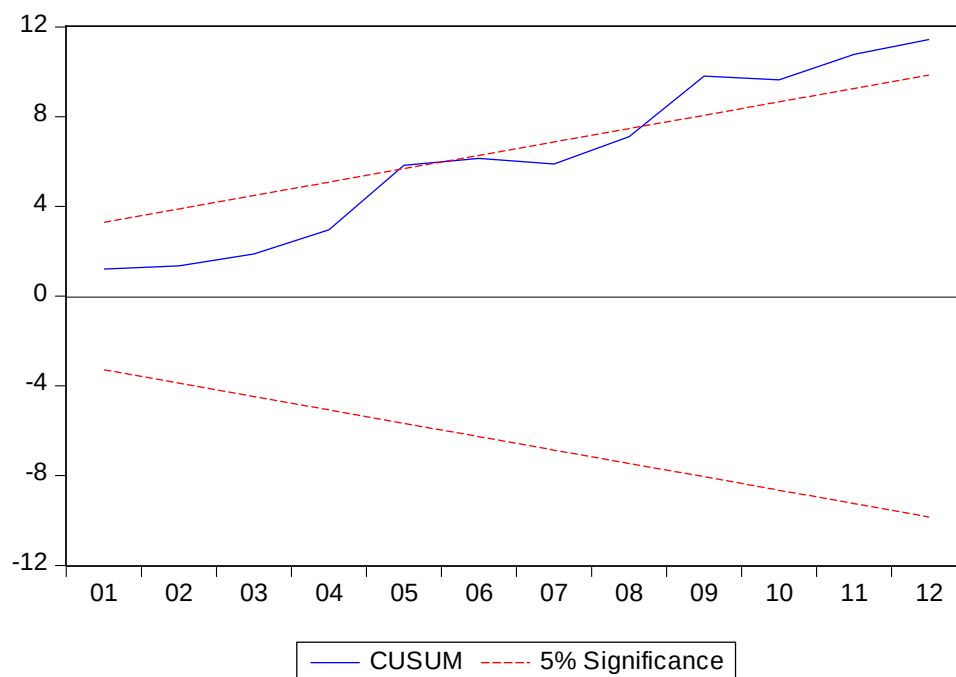


Table 5.5 and figure 5.2 presents results for diagnostic tests for Malawian economic growth model under study. From the table it is clear that short run model fails the test for Breusch-Godfrey which implies that the residuals have the problem of autocorrelation. It is also evident from the results that with at least one test there is no problem of misspecification in the model by using Ramsey RESET with a p-value of 0.171.

Table 5.6: Diagnostic test for Seychelles error correction model

Test	Null hypothesis	Probability	Conclusion
Jargue-Bera	Normally distributed	0.605	Residuals are normally distributed
Breusch-Godfrey	No autocorrelation	0.726	No autocorrelation
White's test	No heteroscedasticity	0.150	Homoscedasticity
Ramsey RESET	No misspecification	0.612	No misspecification

Figure 5.3: Cusum test for Seychelles

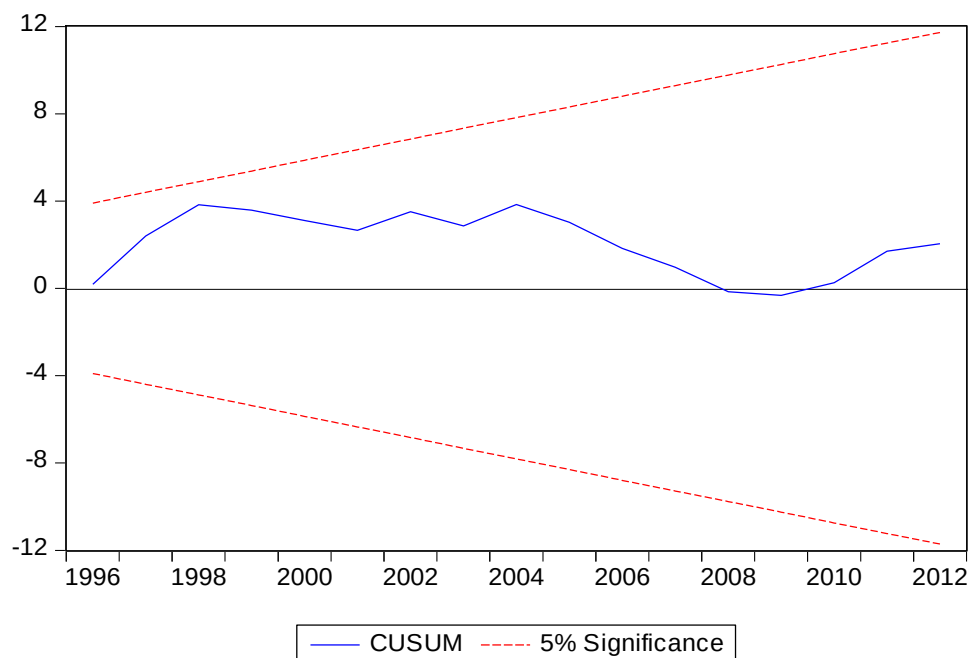


Table 5.6 and figure 5.3 present results for diagnostic tests for Seychelles economic growth model under study. From the table it is clear that none of the residual test seem to violate the assumption of OLS.

Table 5.7: Diagnostic test for Zambia error correction model

Test	Null hypothesis	Probability	Conclusion
Jargue-Bera	Normally distributed	0.782	Residuals are normally distributed
Breusch-Godfrey	No autocorrelation	0.649	No autocorrelation
White's test	No heteroscedasticity	0.796	Homoscedasticity
Ramsey RESET	No misspecification	0.077	No misspecification

Figure 5.4: Cusum test for Zambia

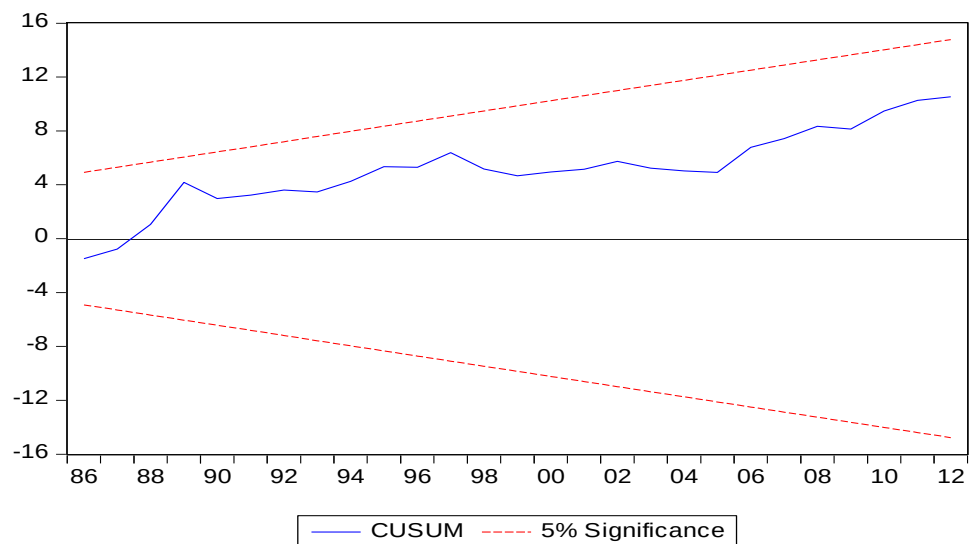


Table 5.7 and figure 5.4 present results for diagnostic tests for Zambian economic growth model under study. From the results above it is clear that none of the residual test seem to violate the assumption of OLS.

5.3.1.3 Engle – Yoo third step results

In this part the long run parameters from the Engle-Granger first step are corrected by applying the procedure of Engle-Yoo third step technique. The inference is only emphasized to countries where cointegration exists.

Table 5.8: Results for Engle- Yoo 3rd step estimation for Lesotho

Dependent variable: ECM_GDP

Variable	Coefficient	t-Statistic
0.601*LOGGNS	-0.074	-1.241
0.601*LOGMIM	-0.030	-0.508
0.601*LOGTME	0.026	0.797
C	0.237	0.384
R-squared	0.081	
Adjusted R-squared	-0.017	

Table 5.9: Adjusted parameters and t-statistics for Lesotho

Dependent variable: logGDP

Variable	Coefficient	t-statistics
LOGGNS	-0.129	-2.166
LOGMIM	1.014	16.693
LOGTME	0.072	2.202
R-squared	0.984	
Adjusted R-squared	0.982	

Table 5.8 and 5.9 show results for Lesotho on the third step for Engle-Yoo approach, as the focus is on adjusted parameters and t-statistics. The results show that adjusted coefficient on gross

national saving decreased to -0.12%, while the imports for goods and total manufactured exports increased to 1.01% and 0.07% respectively. Lastly, the t-statistics for all the variables they are significant.

Table 5.10: Results for Engle- Yoo 3rd step estimation for Malawi

Dependent variable: ECM_GDP

Variable	Coefficient	t-Statistic
0.751*LOGGNS	0.007	0.202
0.751*LOGMIM	0.007	0.066
0.751*LOGTME	0.009	0.100
C	-0.258	-0.329
R-squared	0.008	
Adjusted R-squared	-0.097	

Table 5.11: Adjusted parameters and t-statistics for Malawi

Dependent variable: logGDP

Variable	Coefficient	t-statistics
LOGGNS	0.013	0.473
LOGMIM	0.013	0.155
LOGTME	0.016	0.235
R-squared	0.937	
Adjusted R-squared	0.930	

Table 5.10 and 5.11 show results for Malawi on the third step on adjusted parameters and t-statistics. The results show that for adjusted coefficient on gross national saving and imports of goods have a positive sign with 0.013% and 0.013% respectively, and they are both not statistically

significant. Also the variable total manufactured export has a positive sign of 0.163% and is not statistically significant.

Table 5.12: Results for Engle- Yoo 3rd step estimation for Seychelles

Dependent variable: ECM_GDP

Variable	Coefficient	t-Statistic
0.155*LOGGNS	0.016	0.270
0.155*LOGMIM	0.026	0.718
0.155*LOGTME	-0.033	-0.577
C	0.067	0.513
R-squared	0.026	
Adjusted R-squared	-0.078	

Table 5.13: Adjusted parameters and t-statistics for Seychelles

Dependent variable: logGDP

Variable	Coefficient	t-statistics
LOGGNS	0.144	2.348
LOGMIM	0.017	0.468
LOGTME	0.348	6.062
R-squared	0.614	
Adjusted R-squared	0.575	

Table 5.12 and 5.13 show results for Seychelles on the third step for Engle-Yoo approach. The results show that for adjusted coefficient on gross national saving, imports of goods and total manufactured have a positive impact on economic growth with the coefficients 0.144, 0.017 and 0.348 respectively. Lastly, the t-statistics for all the variables they are significant.

Table 5.14: Results for Engle- Yoo 3rd step estimation for Zambia

Dependent variable: ECM_GDP

Variable	Coefficient	t-Statistic
0.651*LGNS	0.023	0.772
0.651*LOGMIM	0.050	0.574
0.651*LOGTME	-0.005	-0.074
C	-0.658	-0.999
R-squared	0.079	
Adjusted R-squared	-0.018	

Table 5.15: Adjusted parameters and t-statistics for Zambia

Dependent variable: logGDP

Variable	Coefficient	t-statistics
LOGGNS	0.050	1.636
LOGMIM	0.778	8.870
LOGTME	0.077	1.063
R-squared	0.942	
Adjusted R-squared	0.936	

Table 5.14 and 5.15 show results for Zambia on the third step adjusted parameters and t-statistics. It shows that for adjusted coefficient on gross national saving has a positive value of 0.05%. Also the coefficient for imports of goods has a positive sign of 0.77% and they are both statistically significant. In addition the variable total manufactured export has a positive sign of 0.77% and is not statistically significant.

Table 5.16: Granger causality results within Engle-Granger cointegration

Null hypothesis	Lesotho	Malawi	Seychelles	Zambia
$\Delta LGNS \nRightarrow \Delta LGDP$	0.320	0.000 ***	0.880	0.650
$\Delta LGDP \nRightarrow \Delta LGNS$	0.762	0.047 **	0.060 *	0.957
$\Delta LMIM \nRightarrow \Delta LGDP$	0.038 **	0.199	0.589	0.416
$\Delta LGDP \nRightarrow \Delta LMIM$	0.301	0.019 **	0.565	0.013 **
$\Delta LTME \nRightarrow \Delta LGDP$	0.071 *	0.034 **	0.136	0.641
$\Delta LGDP \nRightarrow \Delta LTME$	0.074 *	0.398	0.490	0.815
Jointly independent variables $\nRightarrow \Delta LGDP$	0.037 **	0.000 ***	0.000 ***	0.057 *

*10% statistically significant, ** 5% statistically significant, *** 1% statistically significant
 $\nRightarrow$ does not granger cause

Table 5.16 provides the results for granger causality within Engle-Granger method. The study shows that for Lesotho that imports of goods Granger cause economic growth at 5% significance level. Furthermore, it shows that between manufactured exports and economic growth shows there is bidirectional causality running at 10% significance level. For Malawi it can be seen from the results that there is bi-directional causality running between economic growth to gross national saving. From the results it is shown that causality is running from economic growth to imports of goods. Also there is causality running from total manufactured exports to economic growth at 5% significance level. Causality results for Seychelles show that causality is running from economic growth to gross national saving. Lastly, there is causality running from all independent variables to economic growth at 1% significance level. For Zambia, there is uni-directional causality from economic growth to imports of goods at 5% significance level. Lastly, there is causality running from all independent variables to economic growth at 10% significance level.

5.3.2 Johansen cointegration results

Since the order of integration is confirmed for each variable and country, at this stage is important to examine the long run equilibrium of the variable. It is important before embarking on cointegration to determine the optimal lag length to be used for analysis. This study is using most popular types of lag length selection base on Akaike Information Criterion (AIC), Hannan-Quinn information criterion (HQ) and Schwartz-Bayesian Criterion (SBC).

Table 5.17: Lag length selection

SADC countries	Lag length
Angola	Var (1)
Botswana	Var (1)
Lesotho	Var (1)
Madagascar	Var (1)
Malawi	Var (3)
Mauritius	Var (1)
Namibia	Var (1)
Seychelles	Var (1)
South Africa	Var (4)
Swaziland	Var (1)
Tanzania	Var (3)
Zambia	Var (1)
Zimbabwe	Var (1)

The above table 5.17 report the optimal lag length for each country, based on mentioned criterions. The final conclusion that for countries Angola, Botswana, Lesotho, Madagascar, Mauritius, Namibia, Seychelles, Swaziland, Zambia and Zimbabwe based on VAR lag length is 1. For Malawi and Tanzania the optimal lag length is 3, whereas for South Africa is 4 lags. Since the determination of lag length for each country the following is to find cointegration among the variables involved. See appendix C.

Table 4.18: Johansen cointegration results for SADC countries

SADC COUNTRIES	Unrestricted Cointegration Rank Test (Trace)			Unrestricted Cointegration Rank Test (Maximum Eigenvalue)		
	Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Hypothesized No. of CE(s)	Max-Eigen Statistic	0.05 Critical Value
ANGOLA	None At most 1 At most 2 At most 3	36.664 14.441 5.731 0.008	47.85613 29.79707 15.49471 3.841466	None At most 1 At most 2 At most 3	22.222 8.710 5.723 0.008	27.58434 21.13162 14.26460 3.841466
BOTSWANA	None At most 1 At most 2 At most 3	44.817 25.490 8.390 1.127	47.85613 29.79707 15.49471 3.841466	None At most 1 At most 2 At most 3	19.326 17.100 7.262 1.127	27.58434 21.13162 14.26460 3.841466
LESOTHO	None At most 1 At most 2 At most 3	49.316 * 25.173 9.518 0.003	47.85613 29.79707 15.49471 3.841466	None At most 1 At most 2 At most 3	24.143 15.654 9.514 0.003	27.58434 21.13162 14.26460 3.841466
MADAGASCAR	None At most 1 At most 2 At most 3	51.805 * 25.623 6.259 0.475	47.85613 29.79707 15.49471 3.841466	None At most 1 At most 2 At most 3	26.182 19.363 5.784 0.475	27.58434 21.13162 14.26460 3.841466
MALAWI	None At most 1 At most 2 At most 3	54.427 * 30.019 * 15.230 1.6415	47.85613 29.79707 15.49471 3.841466	None At most 1 At most 2 At most 3	24.408 14.789 13.589 1.641	27.58434 21.13162 14.26460 3.841466
MAURITIUS	None At most 1 At most 2 At most 3	32.473 16.438 5.800 0.508	47.85613 29.79707 15.49471 3.841466	None At most 1 At most 2 At most 3	16.035 10.638 5.291 0.508	27.58434 21.13162 14.26460 3.841466
NAMIBIA	None At most 1 At most 2 At most 3	53.463 * 21.186 5.412 0.032	47.85613 29.79707 15.49471 3.841466	None At most 1 At most 2 At most 3	32.276 * 15.774 5.380 0.032	27.58434 21.13162 14.26460 3.841466
SYCHELLES	None At most 1 At most 2 At most 3	65.643 * 30.082 * 11.887 3.431	47.85613 29.79707 15.49471 3.841466	None At most 1 At most 2 At most 3	35.561 * 18.194 8.455 3.431	27.58434 21.13162 14.26460 3.841466
SOUTH AFRICA	None At most 1 At most 2 At most 3	41.153* 20.503 7.362 0.258	47.85613 29.79707 15.49471 3.841466	None At most 1 At most 2 At most 3	30.650* 13.140 7.104 0.258	27.58434 21.13162 14.26460 3.841466
SWAZILAND	None At most 1 At most 2 At most 3	46.701 22.002 5.626 0.423	47.85613 29.79707 15.49471 3.841466	None At most 1 At most 2 At most 3	24.699 16.375 5.202 0.4235	27.58434 21.13162 14.26460 3.841466
TANZANIA	None At most 1 At most 2 At most 3	73.771* 37.171* 16.242* 0.1681	47.85613 29.79707 15.49471 3.841466	None At most 1 At most 2 At most 3	36.599* 20.928 16.074* 0.168	27.58434 21.13162 14.26460 3.841466
ZAMBIA	None At most 1 At most 2 At most 3	51.906* 24.405 4.552 0.210	47.85613 29.79707 15.49471 3.841466	None At most 1 At most 2 At most 3	27.501 19.852 4.342 0.210	27.58434 21.13162 14.26460 3.841466
ZIMBABWE	None At most 1 At most 2 At most 3	51.641 * 16.647 5.517 1.387	47.85613 29.79707 15.49471 3.841466	None At most 1 At most 2 At most 3	34.994 * 11.130 4.129 1.387	27.58434 21.13162 14.26460 3.841466

Model 3: intercept and no trend in cointegrating equation and test VAR

* denotes rejection of the hypothesis at the 0.05 level

Table 4.18 is the results for Johansen cointegration for 13 SADC countries. The table shows two results for the test which is the trace test and maximum eigenvalues. These tests help to determine the rank of cointegration between variables GDP, GNS, MIM and TME. The decision with respect to whether to accept that there is cointegration is that the study compares the trace statistics with critical value at 5% significance level. After the confirmation of cointegration for countries such as Lesotho, Madagascar, Malawi, Namibia, Seychelles, South Africa, Tanzania, Zambia and Zimbabwe. The next part is to estimate the vector error correction model within the Johansen cointegration.

Table 5.19 provides the results for long run and short run model for selected SADC countries that confirmed cointegration. In estimating the vector error correction the equation is normalized in such a way that GDP is the dependent variable and gross national saving, import of goods and total manufactured exports are exogenous variables. From the Table it indicates that for Lesotho in the long run there is a positive impact of imports of goods and total manufactured exports on economic growth. Also gross national saving has a negative association with economic growth. In the long run, for the economy of Madagascar there is a negative relationship between gross national saving and economic growth. A 1% increase in gross national saving that will decrease economic growth of Madagascar by 0.150%. Also there is a negative relationship between manufactured exports and economic growth, but the parameters seem not to be statistically significant. A 1% increase in manufactured exports will translate a decline in economic growth by 0.021%. The variable of imports of goods and services shows a positive impact to economic growth with a coefficient of 0.737 and is statistically significant.

Table 5.19: Vector error correction results for SADC countries
Dependent variable: logGDP

SADC COUNTRIES	LONG RUN ELASTICITIES			SHORT RUN ELASTICITIES			
	LOGGNS	LOGMIM	LOGTME	Error correction term	D(LOGGNS)	D(LOGMIM)	D(LOGTME)
Lesotho	-0.150 (0.043) [-3.436]	0.993 (0.043) [22.846]	0.084 (0.024) [3.477]	-0.080 (0.425) [-0.190]	-0.093 (1.265) [-0.074]	0.803 (0.388) [2.067]	2.633 (1.825) [1.442]
Madagascar	-0.148 (0.048) [-3.065]	0.737 (0.065) [11.187]	-0.021 (0.040) [-0.524]	-0.467 (0.182) [-2.566]	-0.645 (0.925) [-0.697]	0.643 (0.405) [1.586]	0.658 (0.451) [1.459]
Malawi Equation 1	0.0000 0.0000 0.0000	15.363 (4.882) [3.146]	-10.672 (3.413) [-3.126]	-1.762 (0.471) [-3.736]	0.000 (0.000) [NA]	-0.988 (0.538) [-1.835]	-0.045 (0.018) [-2.498]
Equation 2	1.000 1.000 1.000	105.490 (33.836) [3.117]	-76.965 (23.655) [-3.253]	0.253 (0.067) [3.750]	0.0174 (0.008) [2.121]	0.144 (0.077) [1.870]	0.000 (0.000) [NA]
Namibia	-31.209 (5.115) [-6.100]	4.400 (0.919) [4.785]	6.251 (1.026) [6.092]	-0.001 (0.008) [-0.125]	-0.030 (0.009) [-3.131]	-0.002 (0.010) [-0.277]	0.066 (0.039) [1.705]
Seychelles Equation 1	0.000 0.000 0.000	-0.788 (0.263) [-2.987]	1.642 (0.231) [7.094]	-0.087 (0.060) [-1.437]	2.716 (0.780) [3.481]	0.000 (0.000) [NA]	0.759 (0.160) [4.745]
Equation 2	1.000 1.000 1.000	-4.832 (0.914) [-5.283]	5.451 (0.802) [6.795]	0.009 (0.017) [0.557]	-0.886 (0.218) [-4.049]	0.000 (0.000) [NA]	0.000 (0.000) [NA]
South Africa	0.197 (0.442) [0.446]	0.792 (0.058) [13.488]	-0.003 (0.109) [-0.029]	-0.217 (0.260) [-0.835]	0.064 (0.129) [0.495]	0.545 (0.255) [2.131]	0.343 (0.324) [1.059]
Tanzania Equation 1	0.000 0.000 0.000	0.000 0.000 0.000	0.309 (0.121) [2.542]	-0.481 (0.114) [-4.190]	0.496 (0.352) [1.407]	0.000 (0.000) [NA]	0.000 (0.000) [NA]
Equation 2	1.000 1.000 1.000	0.000 0.000 0.000	0.164 (0.148) [1.105]	-0.113 (0.084) [-1.352]	-0.625 (0.257) [-2.426]	0.000 (0.000) [NA]	0.000 (0.000) [NA]
Equation 3	0.000 0.000 0.000	1.000 1.000 1.000	0.619 (0.074) [8.349]	0.526 (0.160) [3.272]	-0.539 (0.472) [-1.141]	0.000 (0.000) [NA]	1.142 (0.296) [3.855]
Zambia	0.065 (0.022) [2.888]	0.782 (0.062) [12.566]	0.047 (0.047) [1.004]	-0.787 (0.220) [-3.580]	1.703 (1.533) [1.110]	0.080 (0.294) [0.274]	0.327 (0.365) [0.897]
Zimbabwe	-0.043 (0.027) [-1.597]	1.495 (0.295) [5.060]	-1.425 (0.260) [-5.481]	-0.162 (0.072) [-2.256]	0.485 (0.443) [1.096]	-0.231 (0.057) [-4.045]	0.332 (0.157) [2.104]

T-statistics [], standard error ()

In Malawi since the results from trace statistics indicates two cointegrating vectors. This led the study to impose restriction on VECM to determine the unique cointegrating equation. Since there are two cointegrating vectors the VECM is visualised as follows:

$$\Pi z_{t-1} = \alpha \beta' z_{t-1} = \begin{bmatrix} \alpha_{11} & \alpha_{12} \\ 0 & \alpha_{22} \\ \alpha_{31} & \alpha_{33} \\ \alpha_{41} & 0 \\ \alpha_{51} & \alpha_{52} \end{bmatrix} \begin{bmatrix} 1 & \beta_{21} & \beta_{31} & \beta_{41} & \beta_{51} \\ 0 & 1 & \beta_{32} & \beta_{42} & \beta_{52} \end{bmatrix} \begin{bmatrix} \ln GDP_{t-1} \\ \ln GNS_{t-1} \\ \ln MIM_{t-1} \\ \ln TME_{t-1} \\ C_t \end{bmatrix} \quad 5.1$$

The first cointegrating relation is the long run of economic growth equation, while the second is the gross national saving equation. The results of the estimated long run economic growth equation shows that there is a positive impact of imports of goods. The results also show that there is a negative association between manufactured exports and economic growth in the long run. The results of the second cointegrating vector (gross national saving) also are reported in Table 5.19. It is prudent to mention that the second cointegrating vector is not the equation of interest. Its results show that there is a positive relationship between gross national saving and imports of goods. Also the results shows that there is a negative association between manufactured exports and gross national saving. For the economy of Namibia, it shows that in the long run there is a positive relationship between manufactured exports and economic growth. A 1% increase in gross national saving that will increase economic growth of Namibia by 4.40%, and the variable is statistically significant. Also there is a negative relationship between gross national saving and economic growth, and the parameter is statistically significant. A 1% increase in gross national saving will lead to 31.2% decrease in economic growth.

It shows in the long run the results from trace statistics indicates two cointegrating vectors for Seychelles. The study did not impose any restriction in the long run but in the short run. Therefore, Seychelles VECM visualization can also be presented as follows:

$$\Pi z_{t-1} = \alpha \beta' z_{t-1} = \begin{bmatrix} \alpha_{11} & \alpha_{12} \\ \alpha_{21} & \alpha_{22} \\ 0 & 0 \\ \alpha_{41} & 0 \\ \alpha_{51} & \alpha_{52} \end{bmatrix} \begin{bmatrix} 1 & \beta_{21} & \beta_{31} & \beta_{41} & \beta_{51} \\ 0 & 1 & \beta_{32} & \beta_{42} & \beta_{52} \end{bmatrix} \begin{bmatrix} \ln GDP_{t-1} \\ \ln GNS_{t-1} \\ \ln MIM_{t-1} \\ \ln TME_{t-1} \\ C_t \end{bmatrix} \quad 5.2$$

The results of the first equation shows that there is a negative relationship between imports of goods and economic growth in the long run. Whereas, there is a positive association between manufactured exports and economic growth. The results of the second equation are also presented in Table 5.19, but is important to explain that this equation is not equation of interest. Therefore, there is no discussion provided for it.

The results for South Africa show that in the long run there is a positive relationship between gross national saving and economic growth. A 1% increase in gross national saving that will increase economic growth by 0.19%. Also there is a positive relationship between imports of goods and economic growth. A 1% increase in imports of goods will lead to 0.79% increase in economic growth. The variable for manufactured exports shows a negative association with economic growth. For Tanzania, the results from cointegration indicates three cointegrating vectors. The study did not impose any restriction in the long run but in the short run. Therefore, Tanzania VECM visualization can also be presented as follows:

$$\Pi z_{t-1} = \alpha \beta' z_{t-1} = \begin{bmatrix} \alpha_{11} & \alpha_{12} & \alpha_{13} \\ \alpha_{21} & \alpha_{22} & \alpha_{23} \\ 0 & 0 & 0 \\ 0 & 0 & \alpha_{43} \\ \alpha_{51} & \alpha_{52} & \alpha_{53} \end{bmatrix} \begin{bmatrix} 1 & \beta_{21} & \beta_{31} & \beta_{41} & \beta_{51} \\ 0 & 1 & \beta_{32} & \beta_{42} & \beta_{52} \\ 0 & 0 & 1 & \beta_{43} & \beta_{53} \end{bmatrix} \begin{bmatrix} \ln GDP_{t-1} \\ \ln GNS_{t-1} \\ \ln MIM_{t-1} \\ \ln TME_{t-1} \\ C_t \end{bmatrix} \quad 5.3$$

In the long run there is a positive relationship between manufactured exports and economic growth. The results imply that a 1% increase in manufactured exports will increase economic growth of Tanzania by 0.309%, and the variable is statistically significant. In Zambian economy, it indicates that in the long run there is a positive relationship between gross national saving and economic growth. This can be inferred that 1% increase in gross national saving will increase economic growth by 0.065% and also the coefficient is statistically significant. Also imports of goods and services shows a positive impact on economic growth. A 1% increase in imports of goods and services will increase economic growth by 0.782%. In addition, for manufactured exports shows a positive relation with economic growth. A 1% increase in manufactured exports will lead to 0.047% increase in economic growth of Zambia, which also shown not to be statistically significant. Lastly, for Zimbabwe it shows that in the long run there is a negative relationship between gross national saving and economic growth. A 1% increase in gross national saving will decrease economic growth by 0.043%. Also there is a negative relationship between manufactured exports and economic growth. In which a 1% increase in manufactured exports will lead to 1.425% decrease in economic growth. The variable imports of goods and services shows a positive impact to economic growth, which implies that a 1% increase in imports of goods and service will lead to 1.37% increase to economic growth. In overall for Zimbabwe most all explanatory variables shows that they are statistically significant.

After estimating the coefficients for long run, the following is to estimate the short run error correction term. From table 5.19 the coefficients of error correct term are reported. The results for Lesotho show that the error correction coefficient is -0.08, imply that deviation from the long-term is corrected by 8% by the following year. For Madagascar it shows that 46% of the long run disequilibrium is adjusted in the short run. In the short run the study impose restrictions in Malawian model based on the insignificant role that these variables are expected to play in the adjustment towards the long run. In equation 1 $\Delta \log GNS$ and $\Delta \log TME$ in cointegrating equation 2 were restricted to 0. This implies that these variables they are weakly exogenous, which means that they do not play a role in bringing the normalised variable in the long run equation to equilibrium. The exogeneity test results indicate that likelihood ratio for binding restrictions is $LR=0.803$ (0.669). The p-value is given in parenthesis. Therefore, since the LR ratio does not reject the restrictions, it implies that the equations are well specified for Malawi. Namibia shows that 0.1% is adjusted from the long run equation; of which this seem to be a very slow adjustment.

The study impose restriction on short run VECM model for Seychelles since there are 2 cointegrating vectors in long run. From equation 1 zero restrictions are imposed on $\Delta \log MIM$ and on equation 1 are imposed on $\Delta \log MIM$ and $\Delta \log TME$. The results for exogeneity test indicates that likelihood ratio for binding restrictions is $LR=1.381$ (0.709). This results implies that the equations are well specified for Seychelles. The coefficient of error correction for South Africa is -0.217, which implies that 27% is adjusted in the long run. Long run VECM model for Tanzania indicates 3 cointegrating vectors in long run. Therefore, from equation 1 zero restrictions are imposed on $\Delta \log MIM$ and $\Delta \log TME$. On equation 2 also zero restrictions are imposed on $\Delta \log MIM$ and $\Delta \log TME$. Then from equation 3 zero restrictions are imposed on $\Delta \log MIM$. The

results for exogeneity test indicates that likelihood ratio for binding restrictions is $LR=8.636$ (0.124). This results implies that the equations are well specified for Tanzania. For Zambia it shows that 78% of the long run disequilibrium is adjusted in the short run, where for Zimbabwe is 16%. See appendix D.

5.3.2.1 VECM diagnostic results

All VECM models estimated were subjected to diagnostic testing. For diagnostic, the following tests were performed; normality, heteroscedasticity and roots inverse stability test. Table 5.20 below it shows VECM diagnostic results for Lesotho show that residuals are normally distributed with the p-value of 0.265. Also the study cannot reject the null hypothesis that the residuals are homoscedastic. For Madagascar, the result shows that residuals are normally distributed with the p-value of 0.940. As for heteroscedasticity, the study cannot reject the null hypothesis that the residuals are homoscedastic with a p-value of 0.138. For Malawi it shows that residuals are normally distributed with the p-value of 0.612. As for heteroscedasticity the study cannot reject the null hypothesis that the residuals are homoscedastic with a p-value of 0.138. The results for Namibia show that residuals are not normally distributed. As for heteroscedasticity the study cannot reject the null hypothesis that the residuals are homoscedastic. VECM diagnostic results for Seychelles show that residuals are normally distributed with at 5% significance level. As for heteroscedasticity the study cannot reject the null hypothesis that the residuals are homoscedastic with a p-value of 0.871. For South Africa it shows that residuals are normally distributed at 5% significance level. As for heteroscedasticity the study cannot reject the null hypothesis that the residuals are homoscedastic with a p-value of 0.325. Residuals are normally distributed with the

p-value of 0.655 for Tanzania. As for heteroscedasticity, the study cannot reject the null hypothesis that the residuals are homoscedastic with a p-value of 0.178.

Table 5.20: VECM diagnostic test for SADC countries

	Test	Null hypothesis	Probability
Lesotho	Jargue-Bera	Residuals normally distributed	0.265
	White's test/ARCH LM	No heteroscedasticity in residuals	0.182
Madagascar	Jargue-Bera	Residuals normally distributed	0.940
	White's test/ARCH LM	No heteroscedasticity in residuals	0.138
Malawi	Jargue-Bera	Residuals normally distributed	0.612
	White's test/ARCH LM	No heteroscedasticity in residuals	0.138
Namibia	Jargue-Bera	Residuals normally distributed	0.007
	White's test/ARCH LM	No heteroscedasticity in residuals	0.178
Seychelles	Jargue-Bera	Residuals normally distributed	0.014
	White's test/ARCH LM	No heteroscedasticity in residuals	0.871
South Africa	Jargue-Bera	Residuals normally distributed	0.028
	White's test/ARCH LM	No heteroscedasticity in residuals	0.325
Tanzania	Jargue-Bera	Residuals normally distributed	0.655
	White's test/ARCH LM	No heteroscedasticity in residuals	0.178
Zambia	Jargue-Bera	Residuals normally distributed	0.027
	White's test/ARCH LM	No heteroscedasticity in residuals	0.821
Zimbabwe	Jargue-Bera	Residuals normally distributed	0.033
	White's test/ARCH LM	No heteroscedasticity in residuals	0.290

Table 5.20 above shows VECM diagnostic results for Zambia. The result shows that residuals are normally distributed at 5% significance level. As for heteroscedasticity, the study cannot reject the null hypothesis that the residuals are homoscedastic with a p-value of 0.821. Lastly, for Zimbabwe the result shows that residuals are normally distributed at 5% level. As for heteroscedasticity the study cannot reject the null hypothesis that the residuals are homoscedastic with a p-value of 0.290.

To check for the dynamic stability of the model the inverse root test is performed. It shows that the AR polynomial have roots with modulus less than one and lie within the unit circle, demonstrating that the estimated VAR is stable. Appendix E reports the AR polynomial results for each country concerned. It shows that for all the countries concerned there is stable VAR models established. This is a very favorable result because if the VAR were not stable, certain results, such as impulse response standard errors, would not be valid making the model results and conclusions suspect.

The following section is the estimation of Granger causality, in which the results are based on the causality within the VECM. Since that there is confirmation by the study that most variables are integrated of $I(1)$ and $I(0)$ and they are cointegrated. Table 5.21 reports the results for causality within Johansen cointegration.

Table 5.21: VECM Granger causality results within Johansen cointegration

Null hypothesis	Lesotho	Madagascar	Malawi	Namibia	Seychelles	South Africa	Tanzania	Zambia	Zimbabwe
$\Delta LGNS \nRightarrow \Delta LGDP$ $\Delta LGDP \nRightarrow \Delta LGNS$	0.157 0.718	0.568 0.644	0.005*** 0.057*	0.040 ** 0.177	0.520 0.567	0.660 0.471	0.972 0.109	0.361 0.154	0.352 0.724
$\Delta LMIM \nRightarrow \Delta LGDP$ $\Delta LGDP \nRightarrow \Delta LMIM$	0.023 ** 0.061 *	0.188 0.829	0.086* 0.365	0.010 ** 0.035 **	0.285 0.040**	0.244 0.002**	0.004*** 0.752	0.404 0.081*	0.067* 0.724
$\Delta LTME \nRightarrow \Delta LGDP$ $\Delta LGDP \nRightarrow \Delta LTME$	0.008 *** 0.929	0.431 0.692	0.345 0.764	0.306 0.003 ***	0.040** 0.436	0.488 0.102	0.000*** 0.005***	0.610 0.940	0.039** 0.008***
Jointly independent variables $\nRightarrow \Delta LGDP$	0.035 **	0.074*	0.018**	0.086 *	0.073*	0.555	0.000***	0.789	0.084*

* 10% statistically significant

** 5% statistically significant

*** 1% statistically significant

Δ First difference operator

$\nRightarrow$ Does not Granger cause

Table 5.21 presents causality results for Lesotho shows that there is bi-directional causality running between imports of goods and economic growth. Also there is causality running from total manufactured export to economic growth at 1% significance level. The study also presents the results for Madagascar. It can be seen from the results that none of the exogenous variables seem to Granger cause economic growth or vice versa. The table generally shows that jointly (i.e. gross national saving, imports of goods & service and total manufactured exports) variables Granger causes economic growth at 10% significance level. For Malawi it can be seen from the results that there is causality running from gross national saving to economic growth. Also, there is causality running from economic growth to gross national saving. This means that between the two variables there is bi-directional causality running at 10% significant level. Further, causality is observed running imports of goods and service to economic growth at 10% significant level. Lastly, the result indicates that jointly the exogenous variables granger cause economic growth. Causality results for Namibia shows that there is bi-directional causality running between imports of goods and economic growth at 5% significance level. Also there is causality running from economic growth to total manufactured exports at 1% significance level. Lastly, there is causality running from gross national saving to economic growth.

For Seychelles, the results show that there is causality running from economic growth to imports goods and service. There is also causality running from total manufactured exports to economic growth at 5% significance level. Causality result for South Africa indicates there is uni-directional causality running from economic growth to imports of goods and service at 5% significance level. It can be seen from the results that there is causality running from imports of goods and service to economic growth with a probability of 0.0041 and is significant at 5% in Tanzania. Also there is

causality running from total manufactured exports to economic growth and vice versa. This concludes that there is bi-directional causality running at 5% significant level. Lastly the result indicates that jointly the exogenous variables granger cause economic growth at 10% significant level. Table 5.21 above also presents causality result for Zambia. It can be seen from the results that there is causality running from economic growth to imports of goods and service at 10% significance level. For Zimbabwe it can be seen from the results that there is causality running from imports of goods and service to economic growth with a probability of 0.067. Also, there is causality running from total manufactured exports to economic growth and vice versa. This concludes that between total manufactured exports and economic growth, there is bi-directional causality running at 5% significant level. Lastly the result indicates that jointly the exogenous variables granger cause economic growth at 10% significant level.

In order for this thesis to study the short term dynamics of the vector correction mechanism for SADC communities, it applies the Generalised Impulse Response Functions (GIRF). According to Eita (2007), it is imperative to order the variables based on their theoretical knowledge. The current study has ordered the variables as follows: economics growth (LGDP), gross national saving (LGNS), imports of goods and services (LMIM) and total manufactured exports (LTME). Appendix F.1 to F.8 is the results of impulse response graphs. The study reports the response of economic growth to shocks of various exogenous variables for Lesotho, it can be observed that due to a sudden shock to economic growth by gross national saving and imports of goods and service they have a negative shock to economic growth throughout the period. Whereas, the response of economic growth from a shock of total manufactured exports is positive throughout the period.

For Madagascar It can be observed that a sudden shock to economic growth by gross national saving has a negative shock throughout the period. For the variable of interest, economic growth seem to have a neutral response to a shock of total manufacturing exports. This result implies that in respect of total manufactured exports do not positively shock economic growth for Madagascar. For Malawi, it can be observed that due to a sudden shock to economic growth by gross national saving, imports of goods and service and total manufactured exports they have a positive shock to economic growth throughout the period. In Namibia the observation from the results due to a shock by gross national saving and total manufactured exports responded negative to economic growth throughout the period. Whereas the shock by imports of goods and service to economic growth remain positive throughout the period. Also the shock of total manufactured exports shown a positive shock to economic growth but remain very low throughout. For Seychelles it is observed that due to a shock by gross national saving, economic growth shows no respond throughout the period, whereas the response of economic growth to total manufactured exports indicates a positive shock throughout. The shock by imports of goods and service which started by sudden higher shock came down after five periods but remained positive throughout the period.

The study also reports the impulse responses of economic growth to shocks from gross national savings, imports of goods and service and total manufactured exports for South Africa. It can be observed from the figure above that due to a sudden shock to economic growth by gross national saving and imports of goods, they have a positive shock to economic growth throughout the period. Whereas the response of economic growth to a positive shock from total manufactured exports is negative since from the fifth period throughout the period. For Tanzania it shows that due to a shock by gross national saving and imports of goods and service, economic growth shows a

positive strong shock throughout the period, whereas the response of economic growth to total manufactured exports indicates a negative shock throughout. For Zambia estimation a shock by gross national saving and imports of goods and service to economic growth shows a positive strong shock throughout the period, whereas the response of economic growth to total manufactured exports indicates a negative shock throughout. From the results for Zimbabwe a shock by gross national saving, imports of goods and service and total manufactured exports to economic growth shows a positive strong shock throughout the period.

5.3.3 ARDL Bounds cointegration results

Since from the preceding cointegration results it was observed that for certain countries long run relationship was found and for others it was not found. The current study further on provides the results for cointegration using the ARDL bounds cointegration test. Table 5.22 below provides results for ADRL bounds cointegration for SADC countries. The test is based on the Wald F-statistics on the null hypothesis that there is “no cointegration”. From this study it can be reported that there is long run equilibrium between economic growth, gross national saving, imports of goods and service and total manufactured exports. This equilibrium is found from the following countries; Madagascar, Malawi, Mauritius, Tanzania and Zimbabwe. These results were concluded by comparing if the Wald F-stats falls above the upper bound critical values. For instance, the F-statistics for Madagascar is 13.075 which is above the upper bound critical value of 5.816 which concludes that cointegration exist for Madagascar at 1% significance level. It can be seen from the table that also for Malawi, Tanzania and Zimbabwe they are all significant at 1% level, whereas for Mauritius cointegration is significant at 5% level. Since the study has dealt with

the issue of confirming cointegration, the next step is to estimate the parameters of independent variables in the ARDL system.

Table 5.22: ARDL Bounds cointegration results for SADC countries

SADC country	Wald test F-statistics	Bounds critical values ¹⁴			
		1%		5%	
		I(0)	I(1)	I(0)	I(1)
Angola	3.300	4.428	5.816	3.164	4.194
Botswana	2.678	4.428	5.816	3.164	4.194
Lesotho	2.082	4.428	5.816	3.164	4.194
Madagascar	13.075 ***	4.428	5.816	3.164	4.194
Malawi	13.206 ***	4.428	5.816	3.164	4.194
Mauritius	4.811 **	4.428	5.816	3.164	4.194
Namibia	1.820	4.428	5.816	3.164	4.194
Seychelles	2.380	4.428	5.816	3.164	4.194
South Africa	3.007	4.428	5.816	3.164	4.194
Swaziland	0.910	4.428	5.816	3.164	4.194
Tanzania	9.870 ***	4.428	5.816	3.164	4.194
Zambia	3.322	4.428	5.816	3.164	4.194
Zimbabwe	6.004 ***	4.428	5.816	3.164	4.194

** 5% statistically significant, *** 1% statistically significant

One of the paramount issues in ARDL bounds testing is to determine the optimal lag length. For the current study the SBC is used to determine the lag length for each country model, following several studies such as those of Nayaran (2005) and Nanthakumar and Subramaniam (2010). The present study uses the dynamic ordinary least squares developed by Stock and Watson (1993).

¹⁴ Critical values adapted from the work of Narayan (2005)

According to Stock and Watson (1993), the DOLS estimator has the advantage that it allows for simultaneity bias and has introduces the dynamic specification of the OLS estimation model. Furthermore, DOLS estimation also able to provide evidence base on Monte Carlo simulations, where the estimators are more strong in small range of samples.

Table 5.23: Dynamic Ordinary Least squares (DOLS) for SADC countries

Dependent variable: LOGGDP

Independent variables	Madagascar	Malawi	Mauritius	Tanzania	Zimbabwe
LOGGNS	-0.1846 (-2.114) **	0.061 (0.770)	-0.185 (-1.924) **	-0.169 (-0.958)	0.066 (8.180) **
LOGMIM	0.581 (10.415) **	0.475 (1.670) *	0.790 (7.791) **	0.647 (3.118)	0.899 (3.447) **
LOGTME	0.061 (1.528)*	0.236 (1.125)	0.155 (1.996) **	-0.032 (-0.196)	-0.909 (-3.678) **
C	-11.259	-13.243	-18.199	-10.543	21.431
R-squared	0.979	0.973	0.997	0.773	0.986
Adjusted R ²	0.938	0.943	0.992	0.749	0.928
S.E. of regression	0.095	0.114	0.056	0.255	0.046
	ARDL(4,4,3,4)	ARDL(1,1,4,1)	ARDL(3,3,1,3)	ARDL(4,4,4,4)	ARDL(1,4,3,1)

/// 5% and 10% statistically significant

() statistical significant

Table 5.23 above provides the DOLS elasticities and t-statistics for Madagascar long run estimation. From the results it can be seen that there is a negative relationship between gross national saving and economic growth. 1% increase in savings will lead to 0.18% decrease in economic growth; also the association is statistically significant. For imports of goods and total manufactured exports, there is a positive association with economic growth. For Malawi from the results it can be seen that there is a positive relationship between imports of goods and economic

growth. Also for gross national saving and total manufactured exports, there is a positive association with economic growth. The results for the economy of Mauritius show that economic growth and imports of goods and service have a positive and significant relationship in the long run. Also, there is a positive relationship between total manufactured exports and economic growth. For gross national saving there is a negative association with economic growth. For Tanzania long run estimation, the results show that both gross national saving and total manufactured exports there is a negative association with economic growth. There is a positive relationship between imports of goods and economic growth. 1% increase in imports will lead to 0.64% increase in economic growth; also the coefficient is statistically significant. For Zimbabwe the results show that both gross national saving and imports of goods there is a positive association with economic growth. This implies that 1% increase in gross national saving will lead to 0.06 increases on economic growth, and also 1% increase on imports of goods will lead to 0.89% increase on economic growth. For total manufactured exports and economic growth there is a negative association. After estimating the long run parameters, the study estimated the error correction model under ARDL bounds model.

Table 5.24 below reports the coefficients of the short run model and also the results for diagnostic tests. For all individual countries the coefficient of the error correct term (ECTARDL(-1)) are negative as expected. The negative sign of the error correct term indicates how the independent variables return to equilibrium in the long run. For diagnostics test performed, it shows that for Tanzania there is a problem of mis-specification since the p-value show 0.012 which is less than 0.05 level. Since the study confirmed cointegration results within ARDL bounds in some countries,

now is necessary to test for the direction of causality. Below is the results for causality on table 4.26.

Table 5.24: ECM and Diagnostic test results within ARDL model

Dependent variable: ΔLOGGDP

Tests	Madagascar	Malawi	Mauritius	Tanzania	Zimbabwe
ΔLOGGNS	0.049922 (1.351362)	-0.042146 (-1.592365)	-0.050251 (-0.9558)	..... .....	0.025531 (0.342937)
$\Delta \text{LOGGNS}(-1)$	.....	.....	.....	-0.01845 (-0.204)	0.139533 (2.11857)
$\Delta \text{LOGGNS}(-2)$	.....	.....	.....	0.088521 (1.0593)	.....
ΔLOGMIM	0.331559 (-0.075842)	0.722932 (5.176893)	0.5647 (4.5911)	..... .....	.....
$\Delta \text{LOGMIM}(-1)$	.....	.....	.....	0.15155 (0.96835)	.....
$\Delta \text{LOGMIM}(-2)$	.....	.....	.....	-0.289676 (-1.96315)	0.264474 (1.56145)
$\Delta \text{LOGMIM}(-3)$	.....	.....	.....	0.16780 (1.02751)	-0.443329 (-2.494696)
ΔLOGTME	-0.075842 (-0.897338)	.....	-0.030296 (-0.336112)	-0.0070 (-0.0699)	.....
$\Delta \text{LOGTME}(-1)$	.....	0.156047 (1.60492)	.....	.....	0.11058 (1.21016)
$\Delta \text{LOGTME}(-2)$	.....	-0.217253 (-2.407124)	.....	.....	.....
$\Delta \text{LOGTME}(-3)$	.....	-0.076348 (-0.770358)	.....	.....	.....
$\Delta \text{LOGGDP}(-1)$	.....	.....	.....	.....	.....
ECT(-1)	-0.4886 (-3.5559)	-0.9603 (-4.55972)	-0.3214 (-2.8581)	-0.3027 (-2.0237)	-0.41798 (-2.07933)
R-squared	0.5366	0.7501	0.5905	0.5210	0.5032
J-B normality	[0.0768]	[0.6732]	[0.7069]	[0.3622]	[0.1975]
B-G LM test	[0.0510]	[0.4737]	[0.2167]	[0.1296]	[0.0594]
ARCH test	[0.9523]	[0.8040]	[0.9761]	[0.3242]	[0.4503]
Ramsey test	[0.5761]	[0.2617]	[0.8340]	[0.0125]	[0.5124]

Values in parenthesis [] are probabilities, in brackets () are t-statistics

Table 5.25: Granger causality results within ARDL bounds cointegration

Null hypothesis	Madagascar	Malawi	Mauritius	Tanzania	Zimbabwe
$\Delta LGNS \nRightarrow \Delta LGDP$	0.034 ***	0.441	0.054 **	0.337	0.032 ***
$\Delta LGDP \nRightarrow \Delta LGNS$	0.486	0.041 ***	0.256	0.309	0.000 ***
$\Delta LMIM \nRightarrow \Delta LGDP$	0.000 ***	0.094 **	0.000 ***	0.001 ***	0.048 ***
$\Delta LGDP \nRightarrow \Delta LMIM$	0.000 ***	0.001 ***	0.002 ***	0.000 ***	0.360
$\Delta LTME \nRightarrow \Delta LGDP$	0.126	0.260	0.045 ***	0.843	0.089 **
$\Delta LGDP \nRightarrow \Delta LTME$	0.236	0.043 ***	0.251	0.826	0.360
Jointly independent variables $\nRightarrow \Delta LGDP$	0.000 ***	0.000 ***	0.000 ***	0.000 ***	0.000 ***

* 10% statistically significant

** 5% statistically significant

*** 1% statistically significant

Δ First difference operator

$\nRightarrow$ Does not Granger cause

The above table 5.25 provides the results for granger causality within the ARDL bounds cointegration method. The study shows for Madagascar that gross national saving Granger cause economic growth at 1% significance level. The study shows that between imports of goods and economic growth shows that there is bidirectional causality, whereby, for total manufactured exports and economic growth there is no causality existing. For Malawi it can be seen from the results that there is causality running from economic growth to gross national saving. There is bi-directional causality running between imports of goods and economic growth. Also there is causality running from economic growth to total manufactured exports at 5% significance level.

Causality results for Mauritius show that causality is running from gross national saving to economic growth. There is bi-directional causality running between imports of goods and economic growth. Lastly, there is causality running from total manufactured to exports economic growth at 1% significance level. It can be seen from the results that there is bidirectional causality running between imports of goods and economic growth and is significant at 1% in Tanzania. For Zimbabwe there is bidirectional causality between gross national saving and economic growth. Unidirectional causality is observed running from imports of goods to economic growth at 1% significance level. Also there is causality running from total manufactured exports to economic growth.

5.4 Conclusion

This chapter it was about presentation of time series results for the current study. The chapter has presented the results of unit root for three different techniques which is ADF, KPSS and P-P test. From the results it was shown that more variable in each country they are stationary after

first differencing. After a clear order of integration among the variables the application of cointegration done. The study used three different types of cointegration, which is Engel-Granger cointegration, Johansen cointegration and lastly the ADRL bounds cointegration. It was found from the results that for each cointegration type different results were found. From the use of Engel-Granger cointegration the study went on to use the technique of Engel-Yoo test. The main intention of that test was to correct the long run parameters of the system involved. The study presented the parameters for each cointegration type used with the aim to find the robust results from the study.

The study also applied impulse response and causality results within time series analysis. The result shows impulse response for Madagascar shows that manufactured exports to economic growth have a neutral response shock throughout the period. Whereas, for Malawi, Mauritius, Seychelles and Zimbabwe shows that economic growth response positively throughout the period from a shock of total manufactured exports. As for South Africa and Seychelles shows a negative response of economic growth to the shock of total manufactured exports.

CHAPTER SIX: PANEL DATA RESULTS

6.1 Introduction

Now since this study confirmed time series unit root and cointegration results from the preceded chapter, the same principle is applied to panel data analysis. Since that it is well documented that the investigation with univariate cointegration fails at some point due to limitations of time series. Gogas, Plakandaras and Papadimitriou (2014) argues that panel data analysis is set in order to allow for the use of more observations and more degrees of freedom on test statistics and appropriate power for the corresponding tests to reject the null hypothesis if possible.

This chapter is divided as follows. Section 6.2 provides the results for panel unit root results, Section 6.3 discusses the results for panel cointegration with various panel techniques. Section 6.4 present the results for long run coefficients using FMOLS and DOLS, where Section 6.5 discusses the results on panel causality. Lastly is the conclusion of the study is provided in section 6.6.

6.2 Panel unit root results

For every econometric analysis is very important for a researcher before any in-depth analysis to first explore the moments of distribution in data. This section also gives the results for panel analysis for this study. The study first starts by descriptive analysis to unit root analysis. After understanding the order of integration for each variable the study continues to undertake panel cointegration and causality testing.

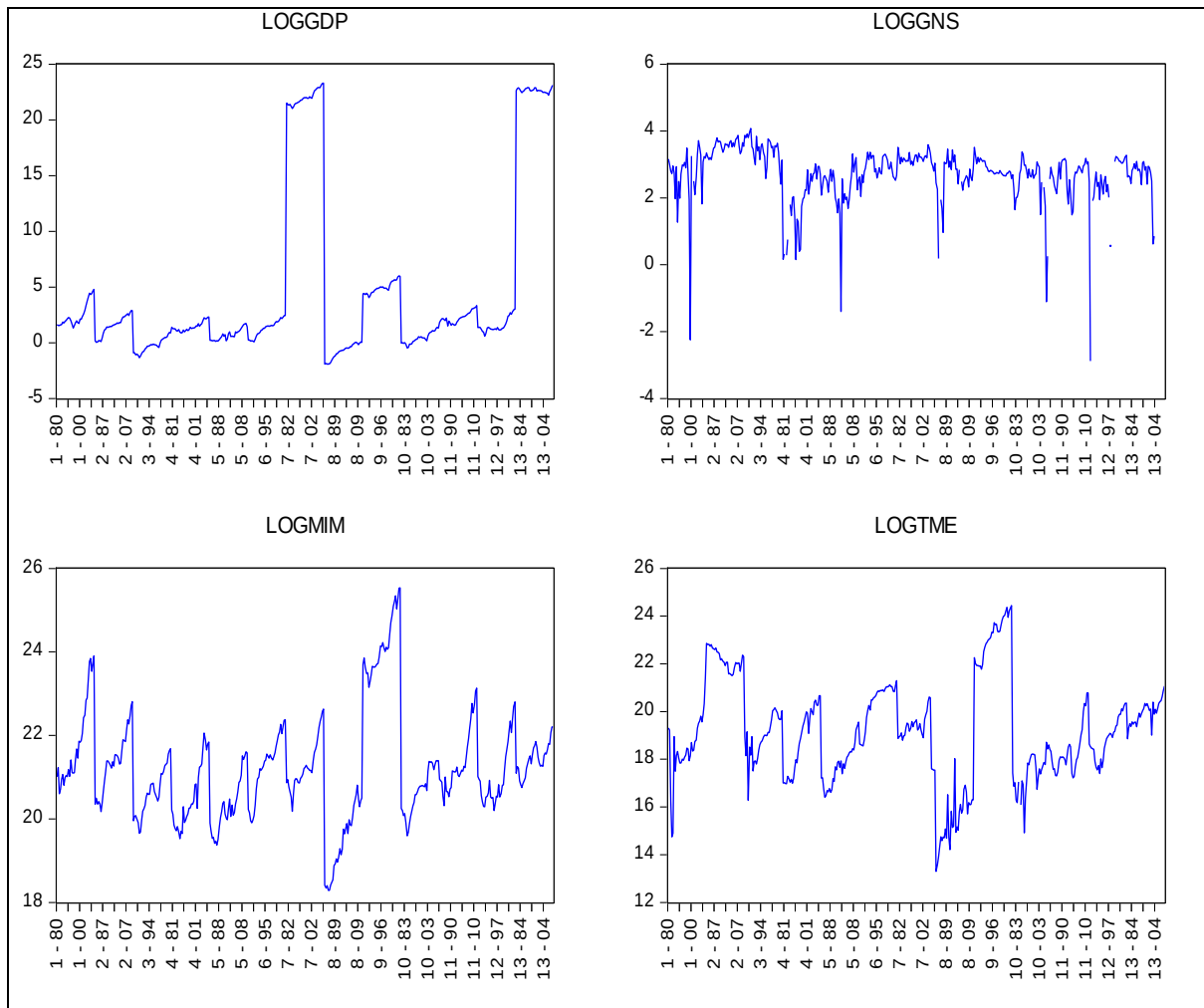
Table 6.1: Descriptive statistics for panel data for SADC

	GDP	GNS	MIM	TME
Mean	8.95E+08	17.77992	4.96E+09	1.80E+09
Median	4.614000	16.82500	1.38E+09	1.80E+08
Maximum	1.31E+10	59.00300	1.23E+11	4.10E+10
Minimum	0.147000	-21.46000	88000000	-96417.00
Std. Dev.	2.37E+09	11.21205	1.39E+10	5.25E+09
Skewness	2.748009	0.300958	5.770044	4.777503
Kurtosis	9.818997	3.868877	40.59532	28.37529
Jarque-Bera	1371.101	19.97085	27645.15	13141.76
Probability	0.000000	0.000046	0.000000	0.000000
Sum	3.84E+11	7627.585	2.13E+12	7.72E+11
Sum Sq. Dev.	2.41E+21	53803.91	8.30E+22	1.18E+22
Observations	429	429	429	429

Table 6.2: Correlation matrix for panel data SADC

	LOGGDP	LOGGNS	LOGMIM	LOGTME
LOGGDP	1.000000	-0.014853	0.236567	0.215139
LOGGNS	-0.014853	1.000000	0.163866	0.236661
LOGMIM	0.236567	0.163866	1.000000	0.733315
LOGTME	0.215139	0.236661	0.733315	1.000000

Figure 6.1: Levels Panel line graphs for GDP, GNS, MIM and TME



The above table 6.1 is the descriptive statistics of the variables under study. The following table 6.2 is the correlation matrix. It shows from the table that there is a positive correlation relation between imports of goods and economic growth with a coefficient of 0.23, where also the correlation between total manufactured exports and economic growth is positive. But considering gross national saving and economic growth, the correlation is negative. Figure 6.1 and 6.2 is the line graphs for each variable at levels and first difference.

Figure 6.2: differenced Panel line graphs for GDP, GNS, MIM and TME

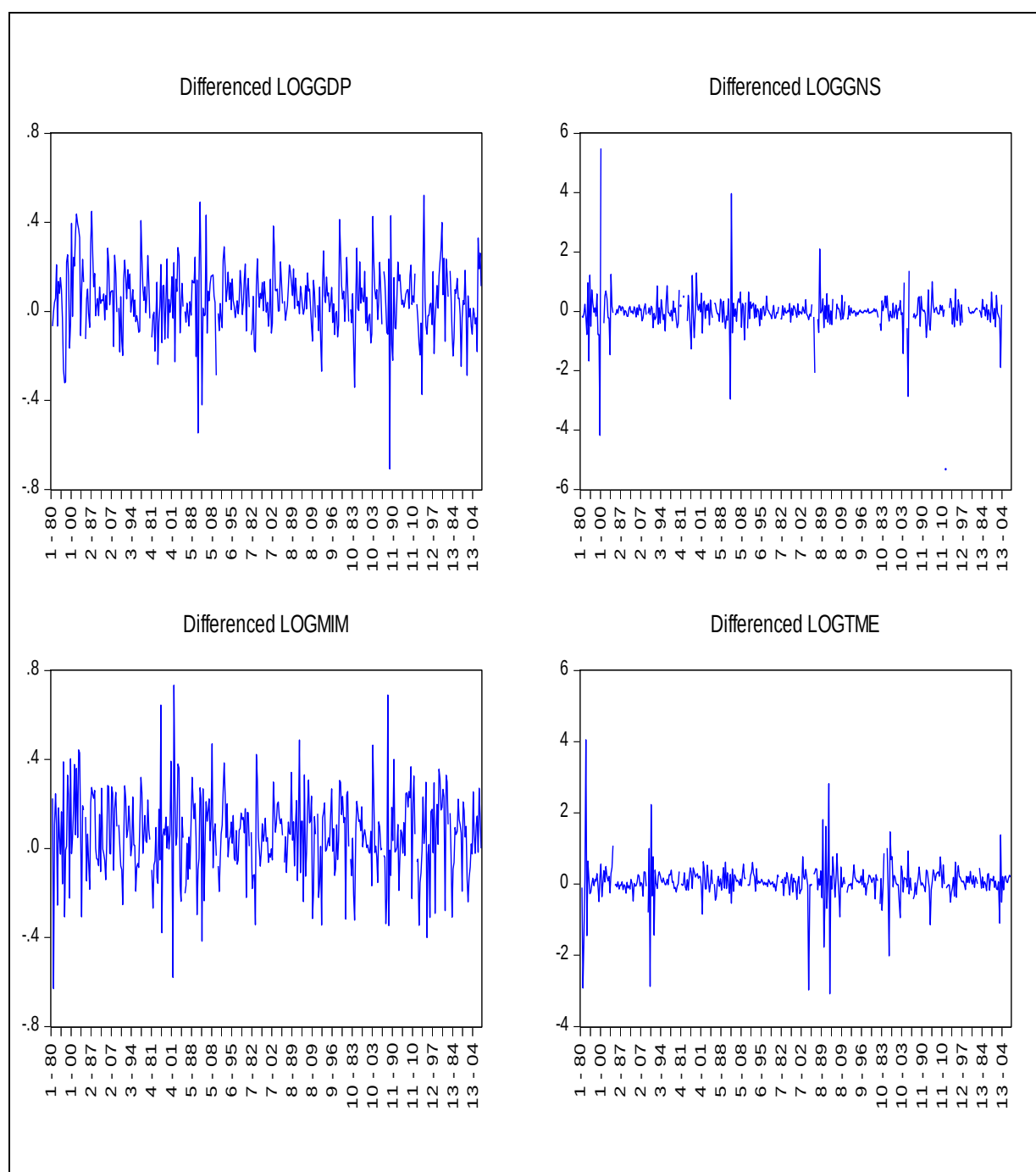


Table 6.3: Panel unit root results for variables GDP, GNS, MIM and TME

Levin, Lin & Chu Test	levels		First difference	
	Individual effect	Individual effect + trend	Individual effect	Individual effect + trend
LogGDP	2.165 (0.984)	-0.405 (0.342)	-13.579 (0.000) ***	-15.237 (0.000) ***
LogGNS	-1.704 (0.044) **	-2.874 (0.002) **	-19.531 (0.000) ***	-16.893 (0.000) ***
LogMIM	3.921 (1.000)	-1.404 (0.080)	-13.454 (0.000) ***	-11.104 (0.000) ***
LogTME	1.308 (0.904)	0.409 (0.659)	-14.774 (0.000) ***	-12.836 (0.000) ***
Im, Pesaran and Shin Test	Individual effect	Individual effect + trend	Individual effect	Individual effect + trend
LogGDP	5.508 (1.000)	0.600 (0.725)	-11.444 (0.000) ***	-12.500 (0.000) ***
LogGNS	-3.943 (0.000) ***	-3.426 (0.000) ***	-19.609 (0.000) ***	-18.159 (0.000) ***
LogMIM	6.975 (1.000)	-1.235 (0.108)	-14.177 (0.000) ***	-12.985 (0.000) ***
LogTME	1.818 (0.965)	-1.598 (0.054)	-16.146 (0.000) ***	-14.582 (0.000) ***

* 10% statistically significant, values in () is p-values

** 5% statistically significant

*** 1% statistically significant

To test the existence of unit root in panel data, Table 6.3 reports the results from two tests of LLC and IPS unit root test. The upper part is the results for LLC test and below is IPS test results. The equation type is based on individual effect and also individual effect plus trend. From the table it is indicated that both common and individual tests for the variables under

study except gross national saving variable they all stationary at first difference I(1). This implies that GDP I(1), MIM I(1), TME I(1) whereas GNS I(0).

6.3 Panel cointegration results

The results of the Petroni panel cointegration test are reported in Table 6.4. The table is divided into three columns, where the first column is the within and between dimension statistics, second column is the panel t-statistics and lastly is panel probability.

Table 6.4: Petroni panel cointegration results

Within-dimension statistics	Panel t-statistics	Panel p-value
Panel v-Statistic	2.204	0.013 **
Panel rho-Statistic	-0.818	0.206
Panel PP-Statistic	-2.144	0.016 **
Panel ADF-Statistic	-2.199	0.013 **
Between dimension statistics	Panel t-statistics	Panel p-value
Group rho-Statistic	-0.121	0.451
Group PP-Statistic	-3.072	0.001 ***
Group ADF-Statistic	-3.023	0.001 ***

* 10% statistically significant

** 5% statistically significant

*** 1% statistically significant

From the table it can be observed that under the first dimension category all the test statistics are significant at 5% significant level, except for panel rho-statistics which is not significant at 5%. The second category shows the results for between dimension statistics, from the results it can be observed that Group PP-statistics and Group ADF-statistics are statistically significant at 5% except for Group rho-statistics which is not. Eventually this results implies that with

majority of test statistics, the study concludes that there is long run panel cointegration between economic growth, gross national saving, imports of goods and services and total manufactured exports (5 out of 7 test statistics confirmed existence of cointegration).

Table 6.5: Kao panel cointegration results

Statistics methods	t-Statistic	P-value
ADF	-5.184	0.000 ***
Residual variance	0.018	
HAC variance	0.015	

* 10% statistically significant

** 5% statistically significant

*** 1% statistically significant

Table 6.5 reports the results for Kao panel cointegration results. The table shows that the first column reports the statistics methods, second column is t-statistics and the last column is the calculated probability values. According to the results, the Kao ADF t-statistics is -5.184 for panel analysis and it is significant at 1% significant level. This implies that the study rejects the null hypothesis that no panel cointegration existing among the variables in the study. This means that there is long term equilibrium between economic growth, gross national saving, imports of goods and service and total manufactured exports according to Kao panel test.

Table 6.6: Johansen-Fisher panel cointegration results

Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Probability
None	105.8	0.000 ***
$At \leq 1$	42.70	0.020 **
$At \leq 2$	28.38	0.340
$At \leq 3$	30.67	0.240
Hypothesized No. of CE(s)	Fisher Stat.* (from max-eigen test)	Probability
None	91.56	0.000 ***
$At \leq 1$	31.29	0.217
$At \leq 2$	25.66	0.481
$At \leq 3$	30.67	0.240

* 10% statistically significant

** 5% statistically significant

*** 1% statistically significant

Table 6.6 report the results for Johansen-Fisher panel cointegration. The first column of the table reports the hypothesized no of cointegrating vectors, second column is the fisher statistics for trace and max-eigenvalue and the last column is the probability values. This type of test is more superior to Petroni and Kao panel tests since it does not assume only one cointegrating vectors. It is indicated from the results that according to Fisher trace statistics there are two cointegrating vectors in the system at 1% and 5% significance level, whereas Fisher max-eigenvalue statistics reports one cointegrating vector at 5% significance level. In conclusion, since using this type of test was to confirm the existence of panel cointegration between economic growth, gross national saving, imports of goods and service and total manufactured exports.

6.4 Panel long-run coefficients

After the analysis confirming the long run equilibrium relation existing among variables under study, the long run impact of gross national saving, import of goods and total manufactured exports on economic growth is estimated. The study uses the two types of estimation methods which is fully modified ordinary least squares (FMOLS) and dynamic ordinary least squares (DOLS). According to Tintin (2009) in panel data analysis there is no general consensus in the literature which method between FMOLS and DOLS can be used instead of the other.

Table 6.7: Panel Fully Modified Least Squares (FMOLS)

Dependent variable: LOGGDP

Dependent variable: logGDP	Parameter coefficients
LogGNS	0.033 (1.660) *
LogMIM	0.780 (15.612) ***
LogTME	0.0015 (0.103)
Adjusted R-squared 0.999058	

* 10% statistically significant

** 5% statistically significant

*** 1% statistically significant

Table 6.7 reports the long run coefficients for FMOLS, where the dependent variable is economic growth. The first column records the independent variables and the second column is the parameter coefficients of the explanatory variables. From the table above the values in

the brackets are probabilities and others are coefficients. For FMOLS results, it shows that there is a positive relationship between gross national saving and economic growth. 1% increase in gross national saving will lead to 0.03% increase in economic growth. Also the results shows that there is a positive relationship between imports of goods and economic growth, the coefficient shows that it is statistically significant at 1%. Total manufactured exports show that there is positive impact on economic growth. It can be postulated that a 1% increase in total manufactured exports will lead to 0.0015% increase in economic growth.

Table 6.8: Panel Dynamic Ordinary Least Squares (DOLS)

Dependent variable: LOGGDP

Dependent variable: LogGDP	Parameter coefficients
LogGNS	0.025 (1.265)
LogMIM	0.709 (14.921) ***
LogTME	0.0026 (0.181)
Adjusted R-squared 0.999	

* 10% statistically significant

** 5% statistically significant

*** 1% statistically significant

Table 6.8 reports the long run coefficients for DOLS, where the dependent variable is economic growth. DOLS results show that there is a positive relationship between gross national saving and economic growth and is not statistically significant. The coefficient for imports of goods

is 0.70, suggesting that a 1% increase in imports will lead to 0.70% increase in economic growth. Also, there is a positive relationship between total manufactured exports and economic growth.

6.5 Panel causality test results

Following the results of the study from the three panel cointegration methods, the concept of causality is tested. According to Badalyan, Herzfeld and Rajcaniova (2014), it is very important to estimate causality within VEC since there is a confirmation of cointegration between the variables under study.

Table 6.9: Panel granger causality results

Null hypothesis	Chi-square	P-value
$\Delta LGNS$ does not Granger cause $\Delta LGDP$	1.006	0.604
$\Delta LGDP$ does not Granger cause $\Delta LGNS$	4.446	0.109
$\Delta LMIM$ does not Granger cause $\Delta LGDP$	10.462	0.005 ***
$\Delta LGDP$ does not Granger cause $\Delta LMIM$	35.104	0.000 ***
$\Delta LTME$ does not Granger cause $\Delta LGDP$	1.876	0.392
$\Delta LGDP$ does not Granger cause $\Delta LTME$	9.289	0.010 **
Jointly independent variables cause $\Delta LGDP$	14.377	0.027 **

* 10% statistically significant

** 5% statistically significant

*** 1% statistically significant

From table 6.9 above the study presents panel granger causality results for SADC communities. It can be seen from the results that there is causality running from imports of goods to economic growth and vice versa. This implies that there is bi-directional causality between imports of

goods and economic growth in SADC. Also there is causality running from economic growth to total manufactured exports. This means that between the two variables there is uni-directional causality running at 5% significant level. Lastly the result indicates that jointly the exogenous variables granger cause economic growth at 5% significant level.

6.6 Conclusion

This chapter presented about the panel data empirical results. The results shown that all the variables except gross national saving were stationary at first difference. The chapter also presented the results of panel cointegration, in which it was proved that there is a long run relationship between the variables under study. The application of panel cointegration was applied since there was an existence of cointegration and causality was found from economic growth to total manufactured exports. Also bi-directional causality was found between imports of goods and economic growth.

CHAPTER SEVEN: SUMMARY, CONCLUSION AND RECOMMENDATIONS

7.1 Introduction

The theory of international trade, especially comparative advantage contributed to the so-called export-led growth (ELG) hypothesis. In trade theory total exports can be disaggregated into several sectors, for the interest of this study is the manufacturing sector. The aim of this study was to analyse the relationship between total manufactured exports and economic growth in SADC region. The study consists of five chapters to investigate this relationship. Mainly the study intended to answer the following research questions: (1) is there a long run equilibrium relationship between manufactured exports and economic growth in SADC economies? (2) What is the causal relationship between manufactured exports and economic growth in SADC countries? (3) Does the relationship between manufactured exports and economic growth depend on the method of investigation applied? The rest of this chapter is arranged as follows: Section 7.2 of this chapter explains the summary of the literature and methodology. Section 7.3 presents the findings of the study. Section 7.4 is the policy recommendation to the findings. Lastly; section 7.7 provides suggestions for further research.

7.2 Summary of the Literature and Methodology

Continents and trade blocs around the globe have been promoting manufactured exports policies to consider manufacturing activity as a way through which economic growth can be attained. The investigation of total manufactured exports and economic growth is an emerging topic in the literature especially for developing economies. Chapter 2 discussed some economic characteristics of each SADC countries. It was also reviewed that SADC economies have most transited from primary based economy to a more secondary and tertiary economy which seem to be growing at the slow rate. The chapter also reviewed some trade policies and agreement

within SADC countries. Chapter 3 of this thesis was dedicated to review the theoretical and empirical evidence pertaining to the relationship between manufactured exports and economic growth. The first part reviewed the theoretical foundations about trade and growth theories. The chapter provided a good guidance that endogenous growth theories seem to be supporting the investigation between manufactured exports and economic growth. The second part reviewed the empirical literature between the variables of interest for the study. Therefore, the review reveals a gap that an investigation between manufactured exports and economic growth was mostly carried outside SADC context. In addition, the literature also proved with related studies that the analysis between the variables was done using panel data analysis only. Subsequent to literature gap, the general objective of this study was to investigate the analysis between manufactured exports and economic growth using both time series and panel data as opposed to previous studies that used only one technique.

In a sentiment to achieve the general objective of this study, the set of econometric techniques were discussed in Chapter 4. The methodology in this study is the approach of time series and panel data econometric analysis. The main econometric methods used under time series to determine long run equilibrium were Engle-Granger two step method, Johansen cointegration and ARDL bounds cointegration. Under panel data analysis the technique of Petroni panel cointegration, Kao panel test and Johansen-Fisher panel cointegration were used. One of the aims for study to use multiple econometric techniques was to investigate whether the relationship between manufactured export and economic growth is methodologically based.

7.3 Results of the study

The findings of this study are divided into twofold, which is the time series results and followed by panel data results.

7.3.1 Time series findings

In estimating the relationship between manufactured exports and economic growth the study uses three types of econometric techniques for time series analysis. The first technique was the Engle-Granger two step method. The findings from the technique shows that cointegration exist for countries such as Lesotho, Malawi, Seychelles and Zambia. This implies that for the period 1980 to 2012, economic growth, gross national saving, imports of goods and total manufactured exports have long term equilibrium. In applying this econometric method the coefficients of independent variables were also examined.

The results for Lesotho show that in the long run relationship between gross national saving and economic growth are negatively associated. Imports of goods and total manufactured exports have a positive impact on economic growth. The findings for Malawi shows that, between the years 1980 to 2012, it was established that gross national saving and total manufactured exports have a negative relationship with economic growth. The results show that imports of goods and economic growth have positive association. The results for Seychelles, in the long run indicates that all the variables gross national saving, imports of goods and total manufactured exports have a positive impact to economic growth. It was found that in Zambia the result shows all the variables gross national saving, imports of goods and total manufactured exports have a positive impact to economic growth. It is well documented in the literature that when using the technique of Engle-Granger it is very important to adjust parameters and their t-statistics with the application of Engle-Yoo test. The results for Lesotho show that all the variables have a positive impact to economic growth except for gross national saving with a negative sign. Lastly, for Malawi, Seychelles and Zambia all the explanatory variables that the positive impact to economic growth.

The current study also employed the Johansen cointegration to cater for limitations of Engle-Granger cointegration. The use of the multiple cointegration techniques was to prove that cointegration between variables might be highly dependent on the type of method used to investigate the relationship. In using the application of Johansen cointegration test, it was found that cointegration exist in the following economies: Lesotho, Madagascar, Namibia, South Africa, Zambia and Zimbabwe with 1 cointegrating vector. In addition, the result indicates that Malawi and Seychelles with 2 cointegrating vectors and Tanzania with 3 cointegrating vectors. After establishment of Johansen long run equilibrium, the sign and magnitude of the exogenous variables were studied. Empirically, for Lesotho it was established that imports of goods and total manufactured exports have a positive association with economic growth. On other results, gross national saving has a negative impact. In the long run for Madagascar, it was found that gross national saving and total manufactured exports have a negative impact on economic growth. However, imports of goods show a positive association with economic growth. The results for Malawi shows that imports of goods have a positive impact on economic growth, whereas total manufactured exports have a negative impact. The results for Namibia show that there is a positive relationship between imports of goods and total manufactured exports on economic growth. The results on gross national saving and economic growth shows a negative association.

The findings for Seychelles show that imports of goods have a negative impact on economic growth. However, total manufactured exports have a positive association with economic growth. Empirical results for South Africa indicate that gross national saving and imports of goods have a positive association with economic growth. On the other hand, total manufactured exports show a negative impact in the long run. In the long run Tanzania shows that total manufactured exports have a positive impact on economic growth and the coefficient is

statistically significant. In Zambia empirical results show that all the variables have a positive association with economic growth. The findings in the long run for Zimbabwe indicate a negative relationship between gross national saving and total manufactured exports on economic growth. Inversely, imports of goods show a positive association with economic growth. In an assessment of policy shocks in the study, the concept of impulse responses within the Johansen VAR system was employed. The main interest of the shocks from the study was to observe the response of economic growth to total manufactured exports. The application was based on the countries that showed the existence of cointegration in using the Johansen cointegration technique. The application of cholesky impulse response for Lesotho, Malawi, Seychelles and Madagascar shows that manufactured exports to economic growth have relative positive shock throughout the period. However, for Namibia, Tanzania, Seychelles, South Africa and Zambia it shows that economic growth responded negatively throughout the period from a shock of total manufactured exports.

The third technique the study used was ARDL the bounds cointegration. The following economies confirm the establishment of long run equilibrium: Madagascar, Malawi, Mauritius, Tanzania and Zimbabwe. In respect of the variables of interest which is total manufactured exports and economic growth, the sign and magnitude were studied using DOLS method. The empirical results for Madagascar, Malawi and Mauritius indicates a positive association between manufactured exports and economic growth. On the other hand, the results for Tanzania and Zimbabwe between manufactured exports and economic growth are contrary to expected theory.

In time series after establishing the existence of cointegration, this implies that there is causality running among the variables. The current study uses the concept of causality for cointegrated variables. The results for causality within Engle-Granger method, it shows that for Lesotho

between manufactured exports and economic growth there is bidirectional causality running at 10% significance level. The findings for Malawi indicates that there is causality running from total manufactured exports to economic growth at 7% significance level. However, for Seychelles and Zambia there is no causality running between economic growth and total manufactured exports. The following is causality findings within the VECM, the results shown that for Madagascar, Malawi, South Africa and Zambia there is no causality between manufactured exports and economic growth. The findings for Tanzania and Zimbabwe shows that there is bi-directional causality running between total manufactured exports and economic growth at 5% significance level. Empirically, for Seychelles and Lesotho there is causality running from total manufactured exports to economic growth. Whereas, for Namibia is causality is running from economic growth to total manufactured exports. Granger causality within ARDL bounds cointegration was also investigated. The study showed that for Madagascar and Tanzania there is no causality existing between total manufactured exports and economic growth. The results for Malawi indicate that there is causality running from economic growth to total manufactured exports at 7% significance level. Causality results for Mauritius and Zimbabwe show that there is causality running from total manufactured to exports economic growth at 1% significance level.

In conclusion for different cointegration methods applied, it was found that in using Engle-Granger technique, 4 out of 13 SADC countries established that there is long run relationship between economic growth, gross national saving, imports of goods and total manufactured exports. The results also prove that positive relationship between manufactured export and economic growth exist for countries such as Lesotho, Malawi, Seychelles and Zambia. In using Johansen cointegration method, it was found that 9 out of 13 countries finds the existence of cointegration among the variables under study with different cointegrating vectors. The

confirmation of positive relation between manufactured exports and economic growth was realized for the following countries: Lesotho, Namibia, Seychelles, Tanzania and Zambia. Lastly, in an application of ARDL bounds cointegration technique, it was found that 5 out of 13 countries confirmed long run equilibrium among the variables. The analysis between the variables of interest performed according to expected economic theory for Madagascar, Malawi and Mauritius.

7.3.2 Panel data findings

In the second section of results, the study applied panel analysis to rely on more robust results. The results indicate that in all panel cointegration methods applied they confirmed the existence of cointegration among the variables assumed. In an effort to study the parameters of variables of interest, it was found that both the method of Dynamic Ordinary Least Squares (DOLS) and Fully Modified Ordinary Least Squares (FMOLS) are consistent. The results from panel analysis also confirmed that there is a positive relationship between economic growth and total manufactured exports. This findings are consistent with the empirical work of Kilavuz and Topcu (2012). The study furthermore investigated panel causality, and it was found that causality is running from economic growth to total manufactured exports at 7% significance level.

In conclusion, based on panel econometric results above. Empirically there is an evidence of long run equilibrium between economic growth, gross national saving, imports of goods and total manufactured exports. Therefore, there is consistency between panel data and majority of time series results confirming the existence of cointegration between variables studied. In an overall analysis it is quite clear that irrespective of an econometric method applied to investigate the relationship between manufactured exports and economic growth. The results

in both approaches on time series and panel data, majority support a positive association between manufactured exports on economic growth.

7.4 Policy recommendation to the findings

It should be noted that the following policy recommendations are based on the outcome of both analysis of time series and panel data.

7.4.1 Since there is evidence of positive relationship between total manufactured exports and economic growth for both findings on time series and panel data, the study recommends that policy makers in SADC countries promote manufactured exports to accelerate economic growth. It appears that manufactured export promotion is a feasible economic growth strategy. In order for this strategy to be attained, policy makers should guide policies regarding to:

7.4.1.1 Access to foreign markets and within SADC region: This recommendation can be achieved when all SADC members remove trade barriers to international markets and within the bloc. The region should encourage intra-trade, therefore this will accelerate economic growth and generate needed jobs and alleviate poverty. In addition, the SADC region should be less protective to some industries such as textile and agriculture in order for economies of scales can be realized.

7.4.1.2 Diversify exports structure to manufacturing: It is well evident in the literature that most SADC economies are much more reliant on exports of primary commodities. Therefore, it is recommended to SADC economies to diversify their exports to manufacturing. This is viewed from a perspective that manufacturing is the heart of SADC Industrial development policy framework for a sustained economic growth.

7.4.2 The findings of the study also indicate that imports of goods are very crucial to economic growth of SADC economies. These results were confirmed by most of

countries in time series results such as Lesotho, Madagascar, Malawi, Mauritius, Seychelles Tanzania and Zambia. In addition, these findings were supported by panel data analysis. This implies that SADC economies should view imports of goods as economic growth enhancement. Therefore, policy makers should continue to relax import tariffs and quotas especially “imports of capital goods” in order to accelerate economic growth in the region.

7.7 Suggestions for further research

This study makes the following suggestions for future study:

- The study suggests that future research should take care of structural break impact on the relationship between manufactured exports and economic growth in SADC. Future research should take into account the political and economic events that happened in SADC. Although SADC was established in 1980 not all members joined during that particular year. The current study acknowledges that there are some economic and political events happened during the period 1980 to 2012. This might suggest that there were structural breaks in period under study.
- Lastly, it is suggested that future studies should disaggregate total manufactured exports in to a specific product sector. The idea for this suggestion is that it might help policy makers within manufacturing industry to have a directive policies instead of generalizing within total manufactured exports.

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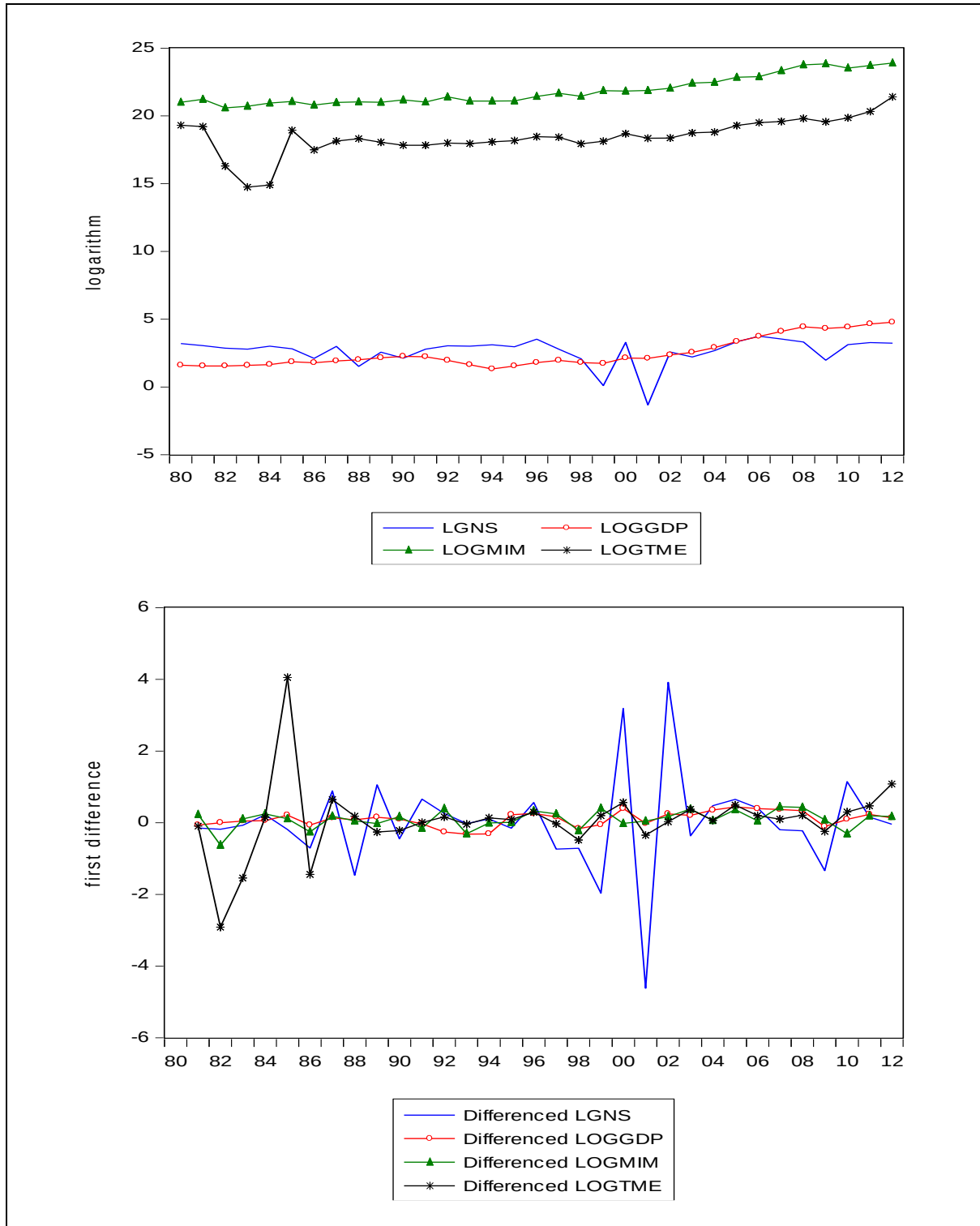
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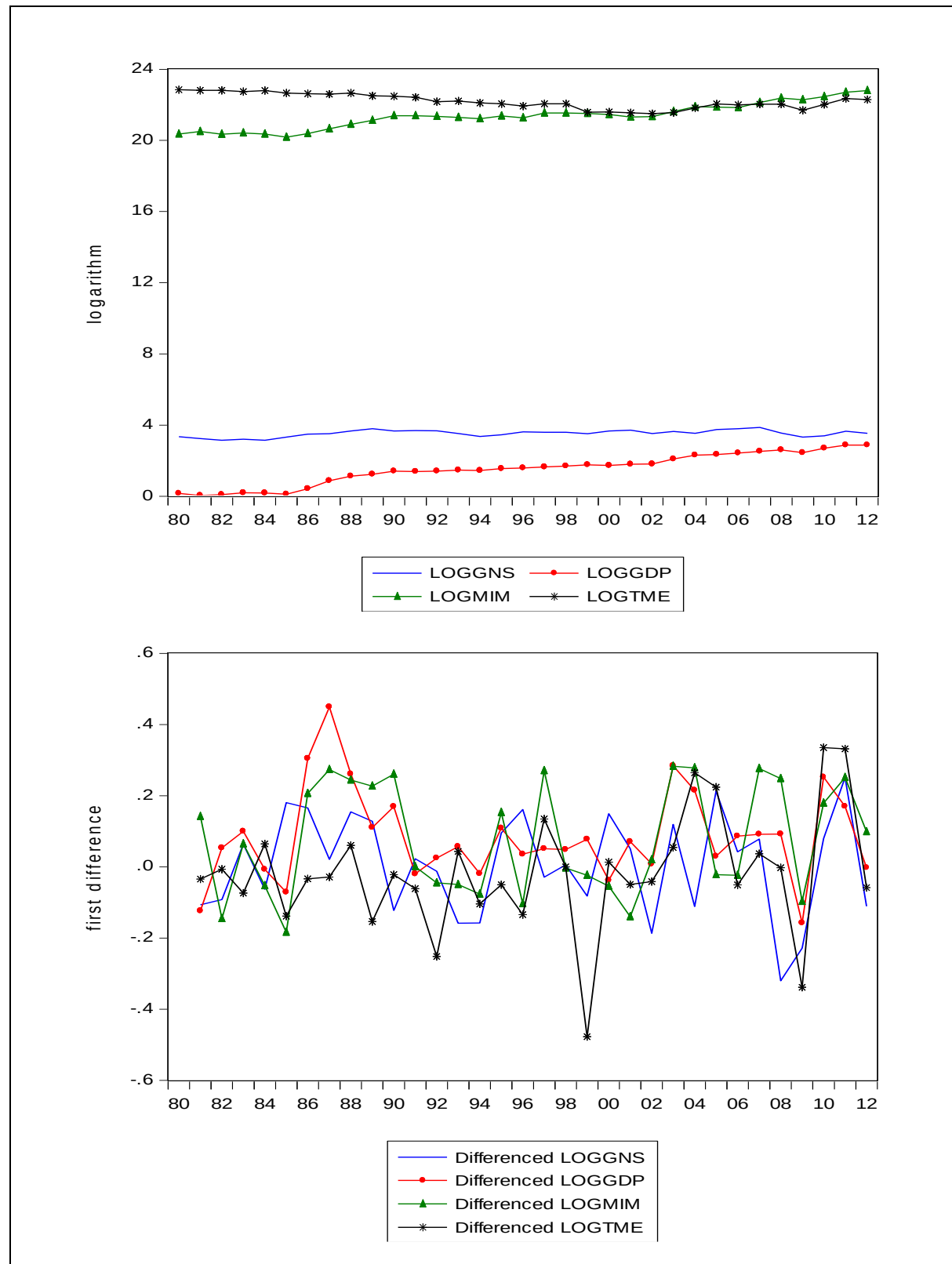
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APPENDIX A

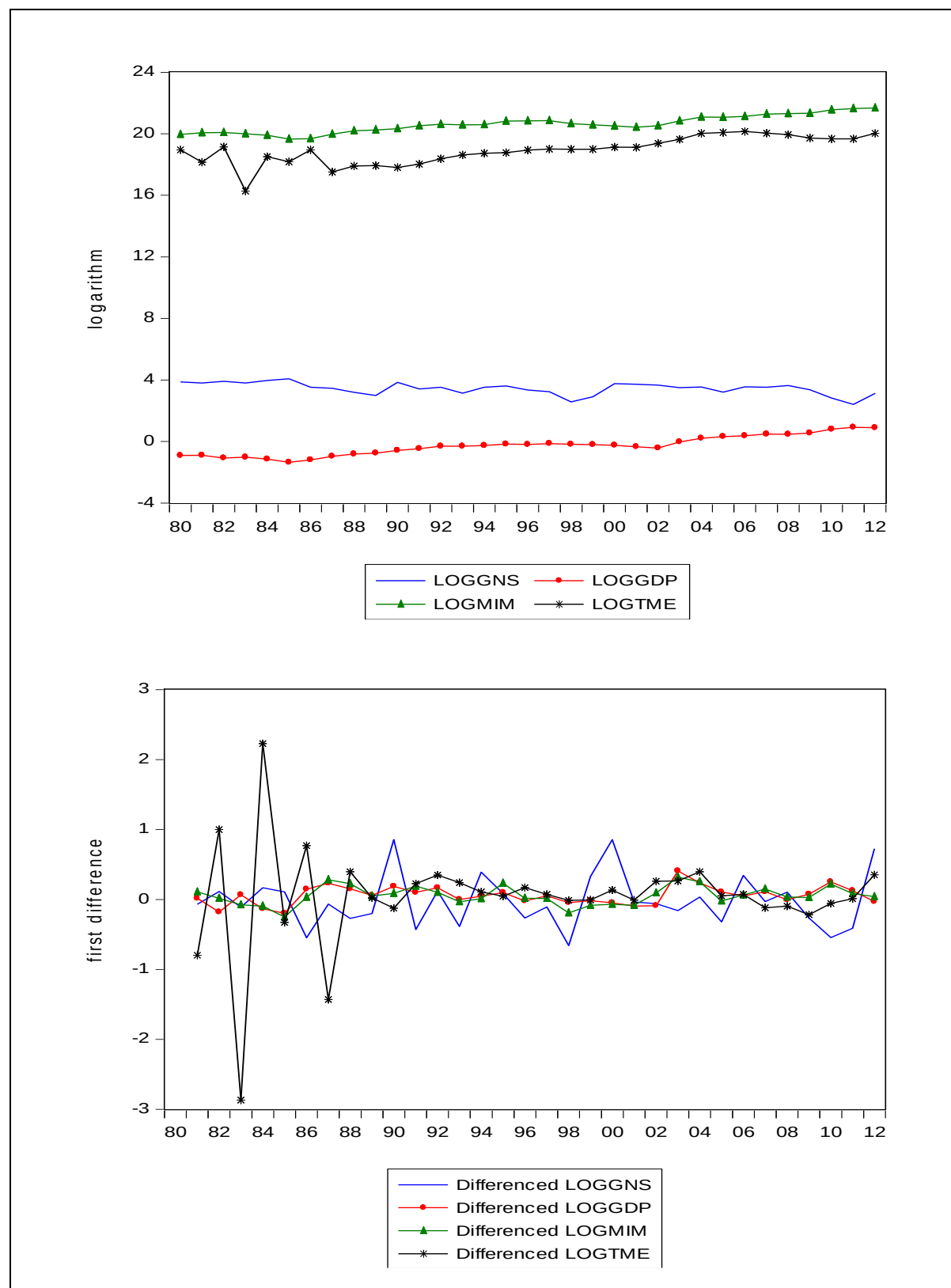
Appendix A.1: Line graphs at levels and first difference for Angola



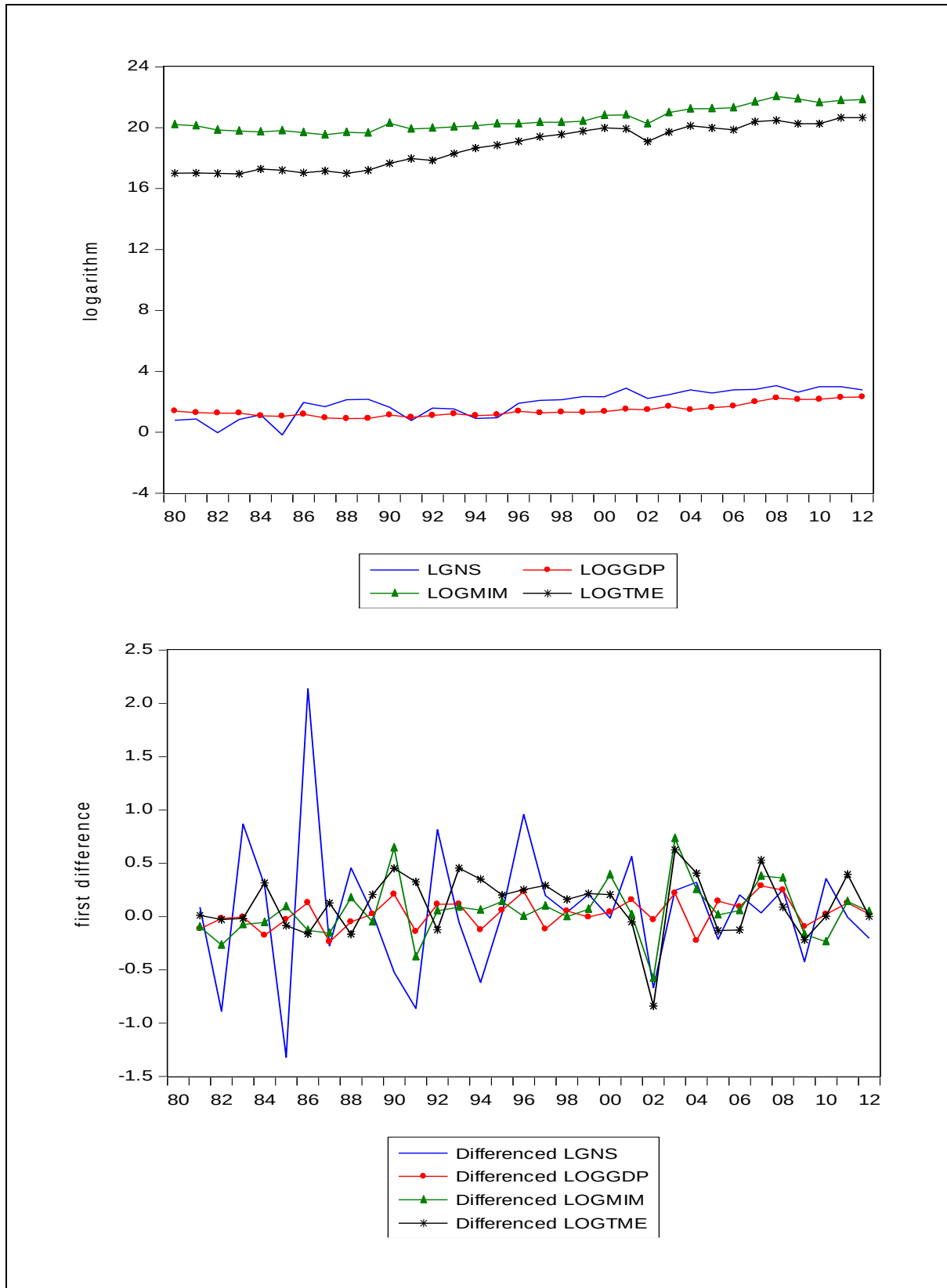
Appendix A.2: Line graphs at levels and first difference for Botswana



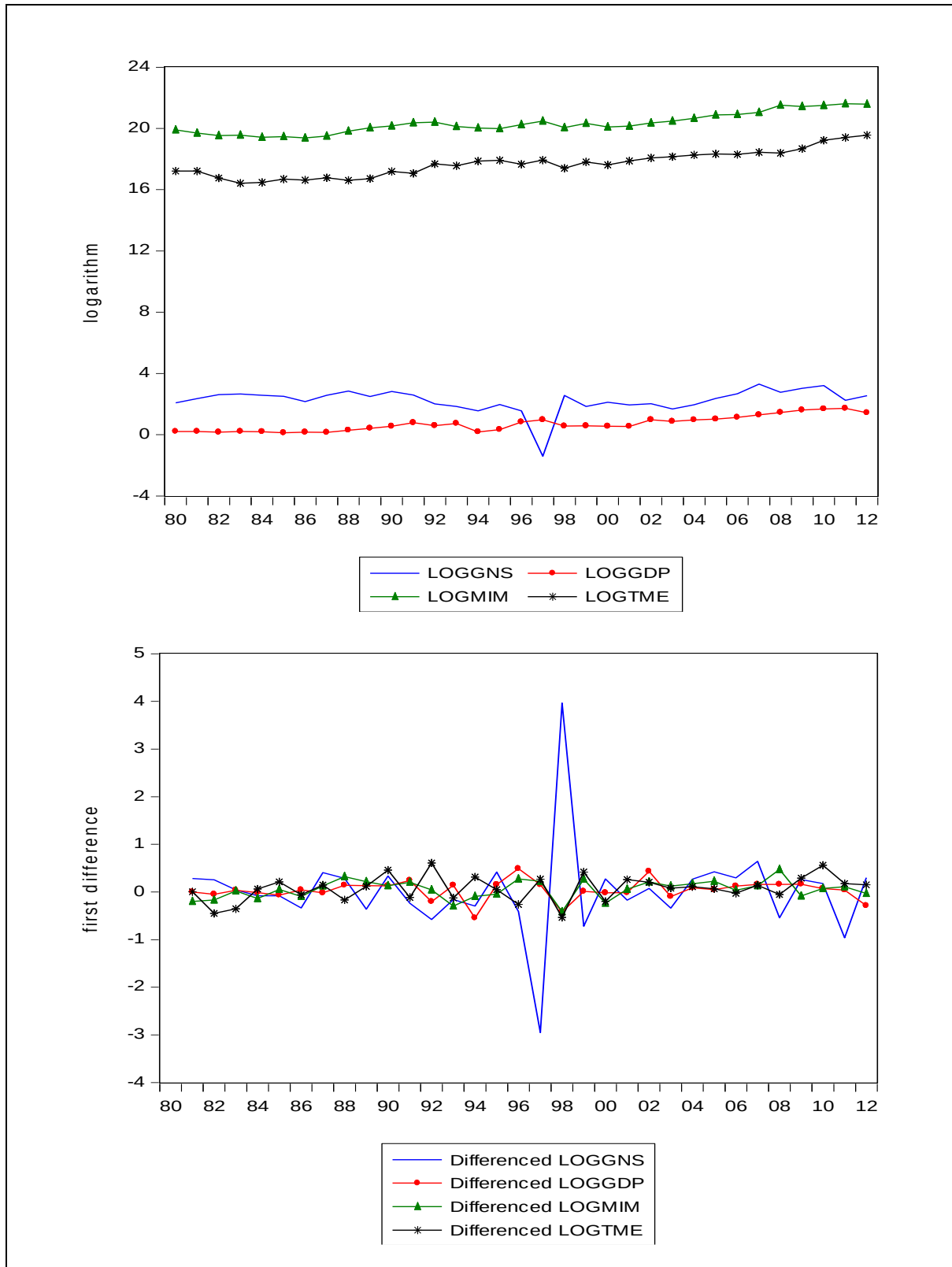
Appendix A.3: Line graphs at levels and first difference for Lesotho



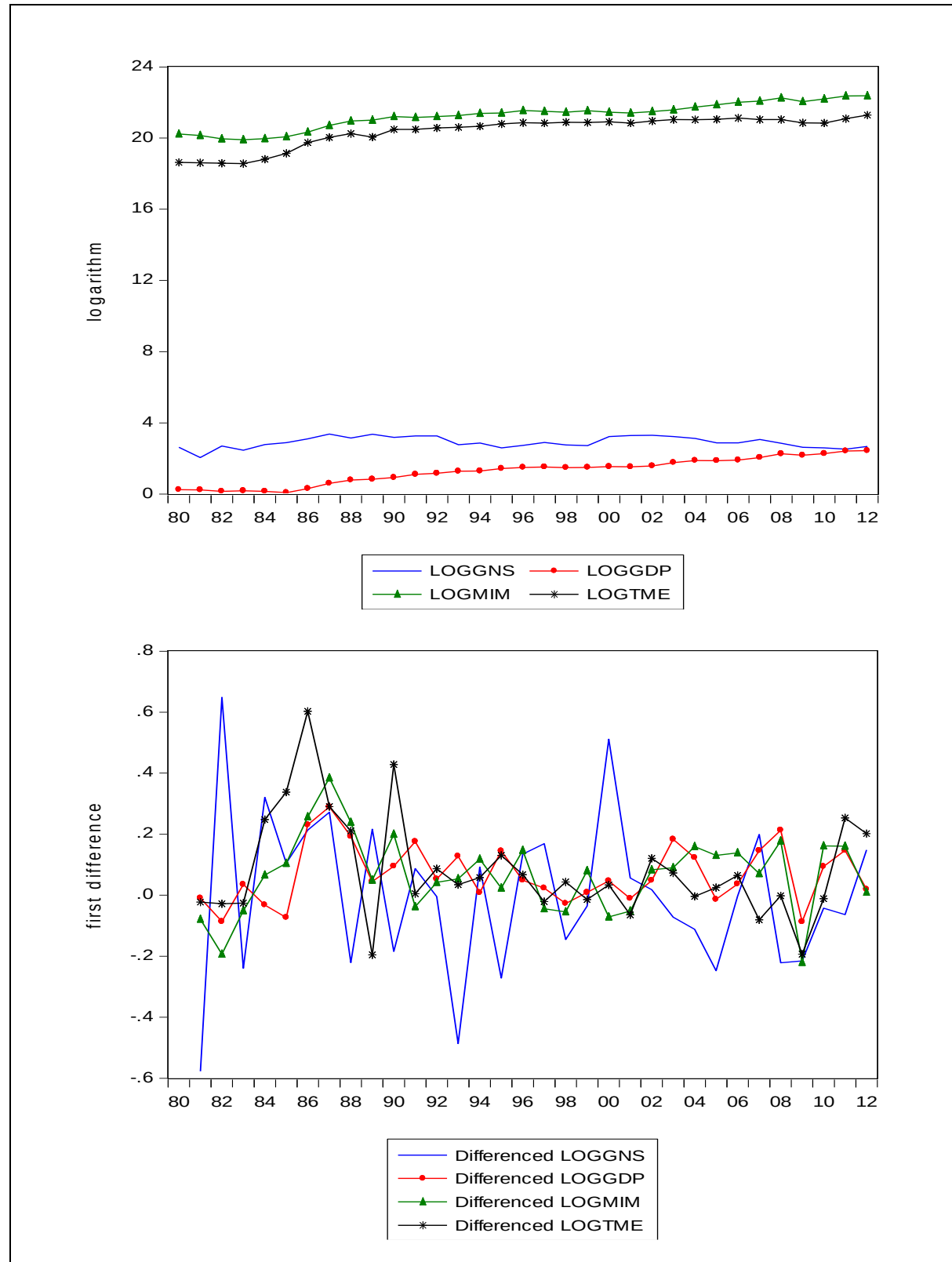
Appendix A.4: Line graphs at levels and first difference for Madagascar



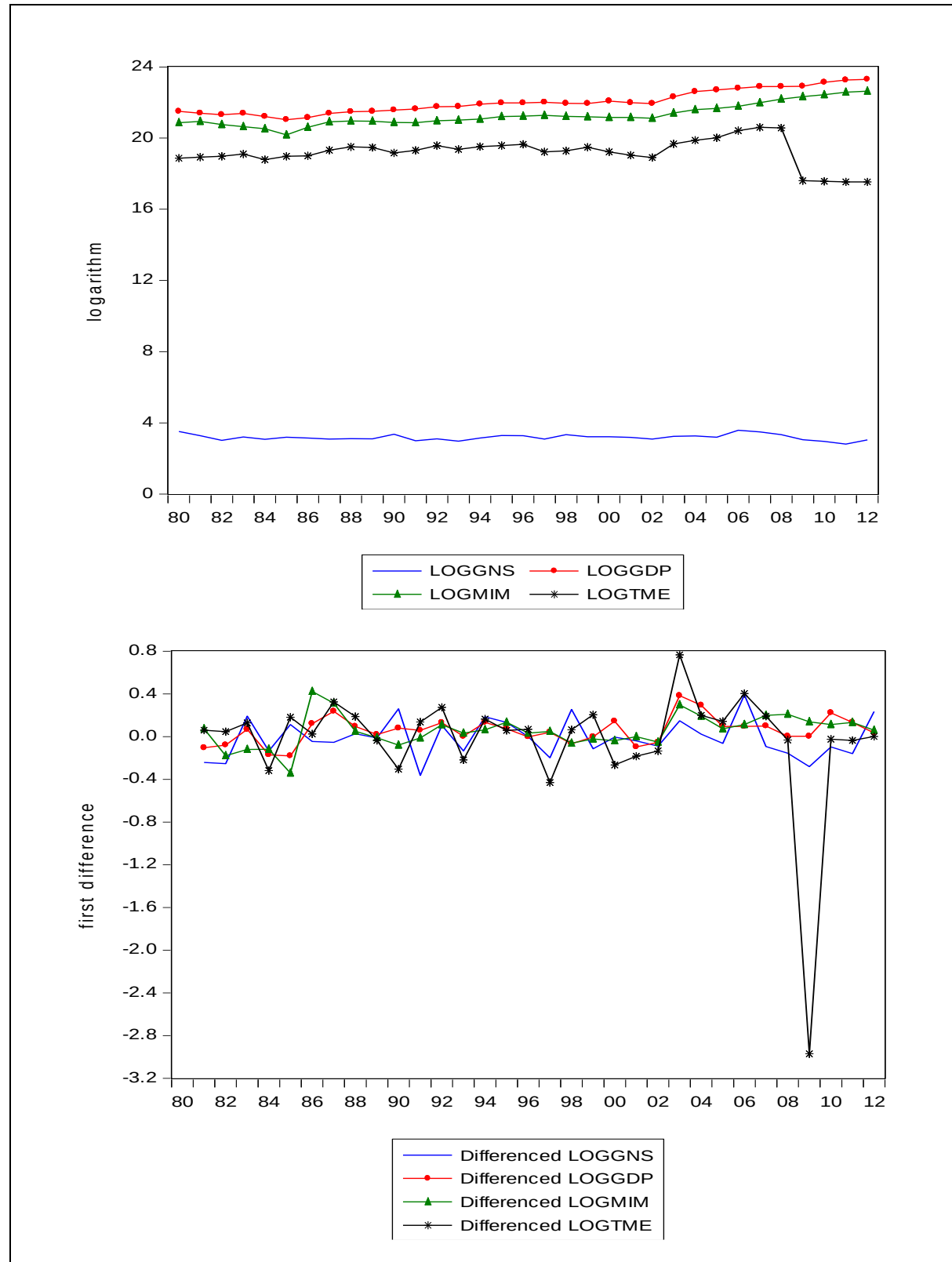
Appendix A.5: Line graphs at levels and first difference for Malawi



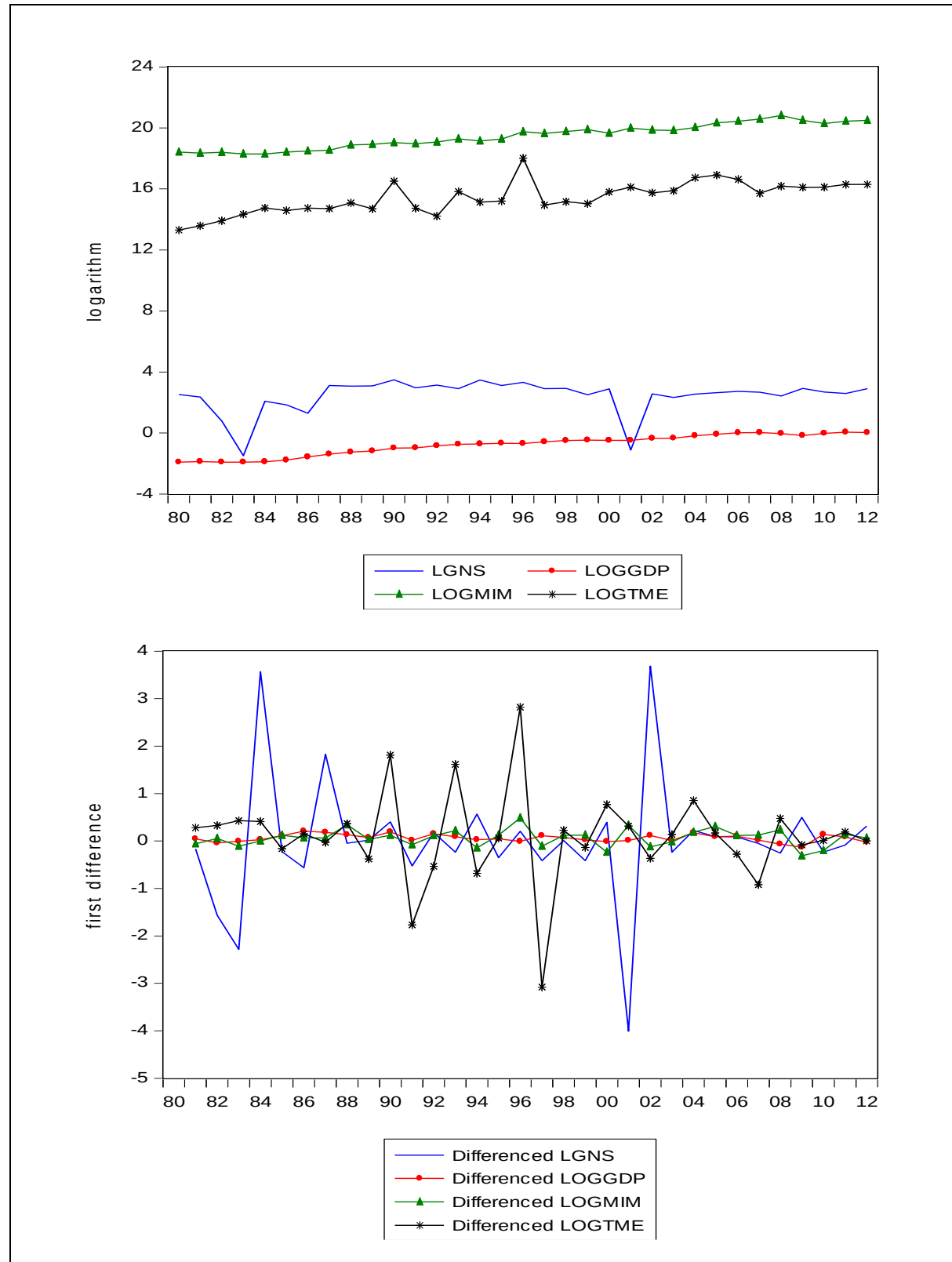
Appendix A.6: Line graphs at levels and first difference for Mauritius



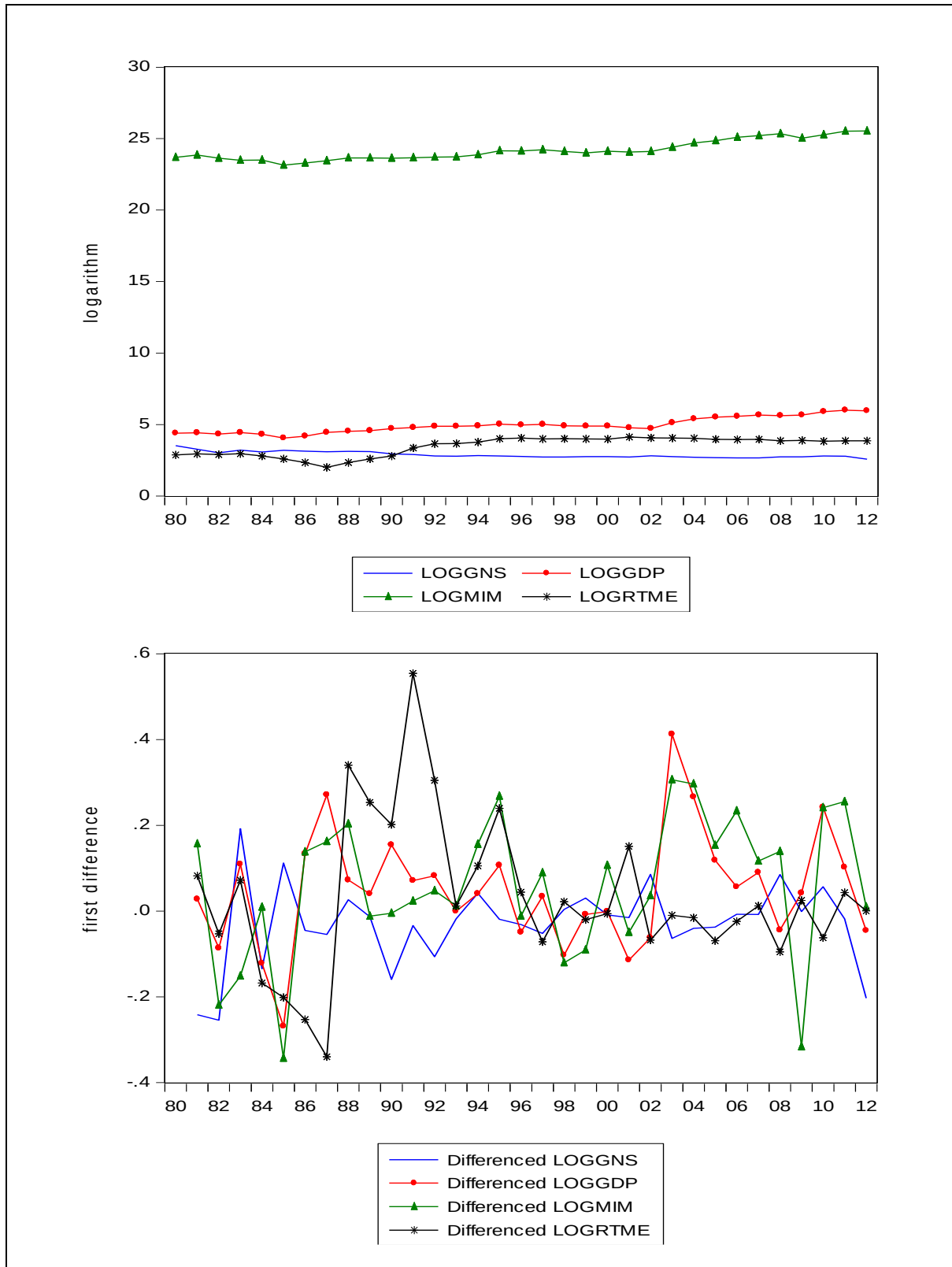
Appendix A.7: Line graphs at levels and first difference for Namibia



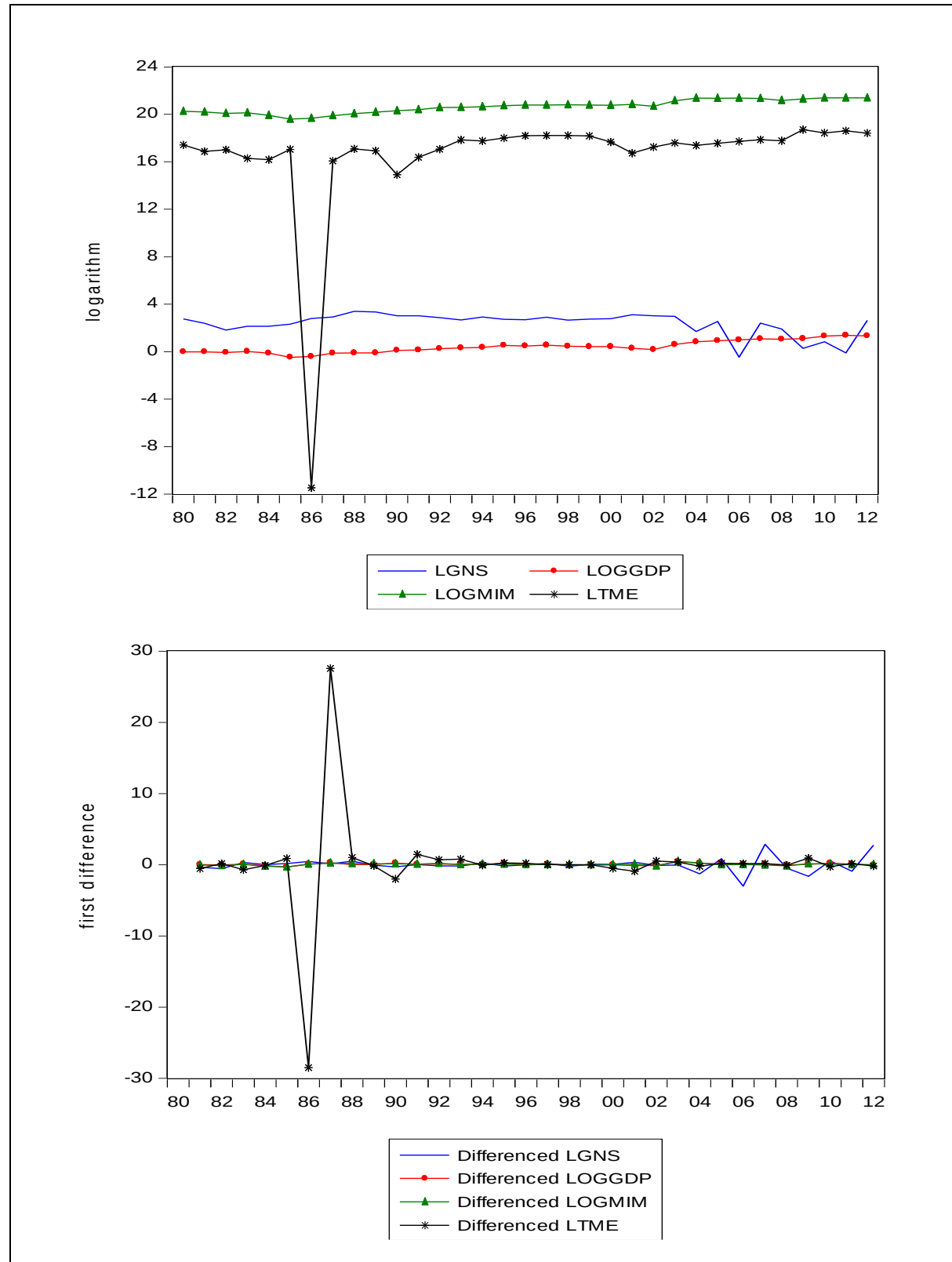
Appendix A.8: Line graphs at levels and first difference for Seychelles



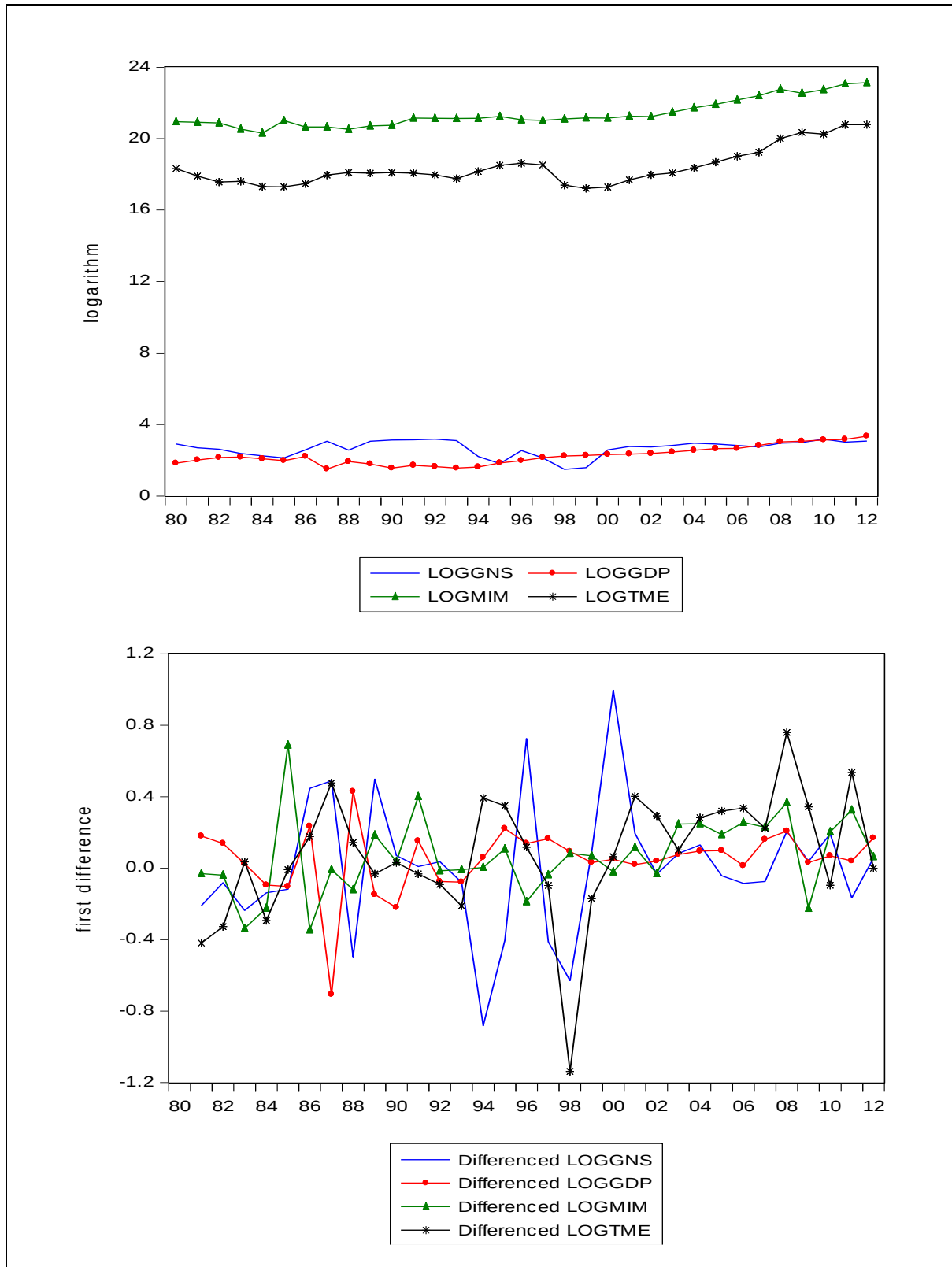
Appendix A.9: Line graphs at levels and first difference for South Africa



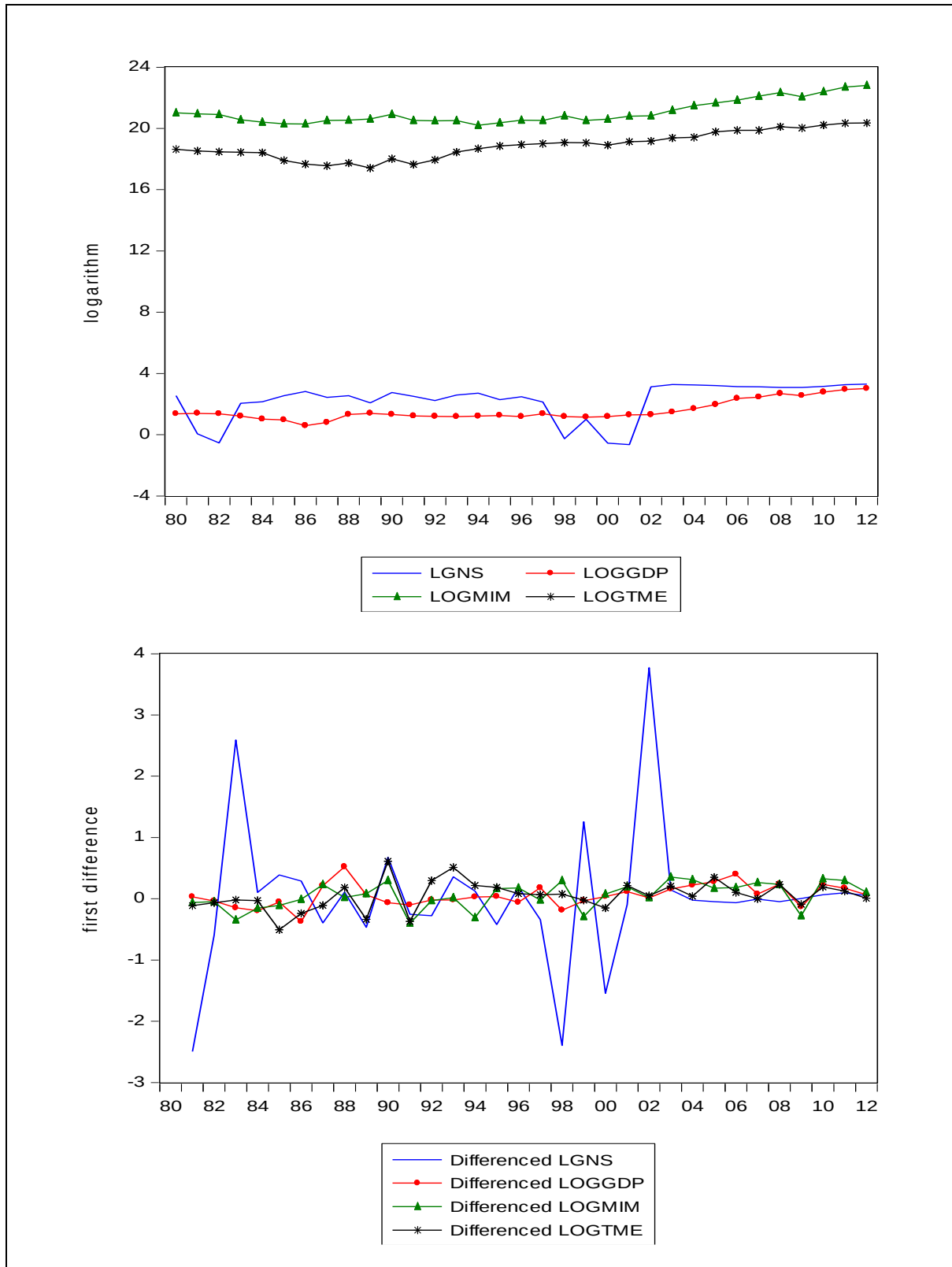
Appendix A.10: Line graphs at levels and first difference for Swaziland



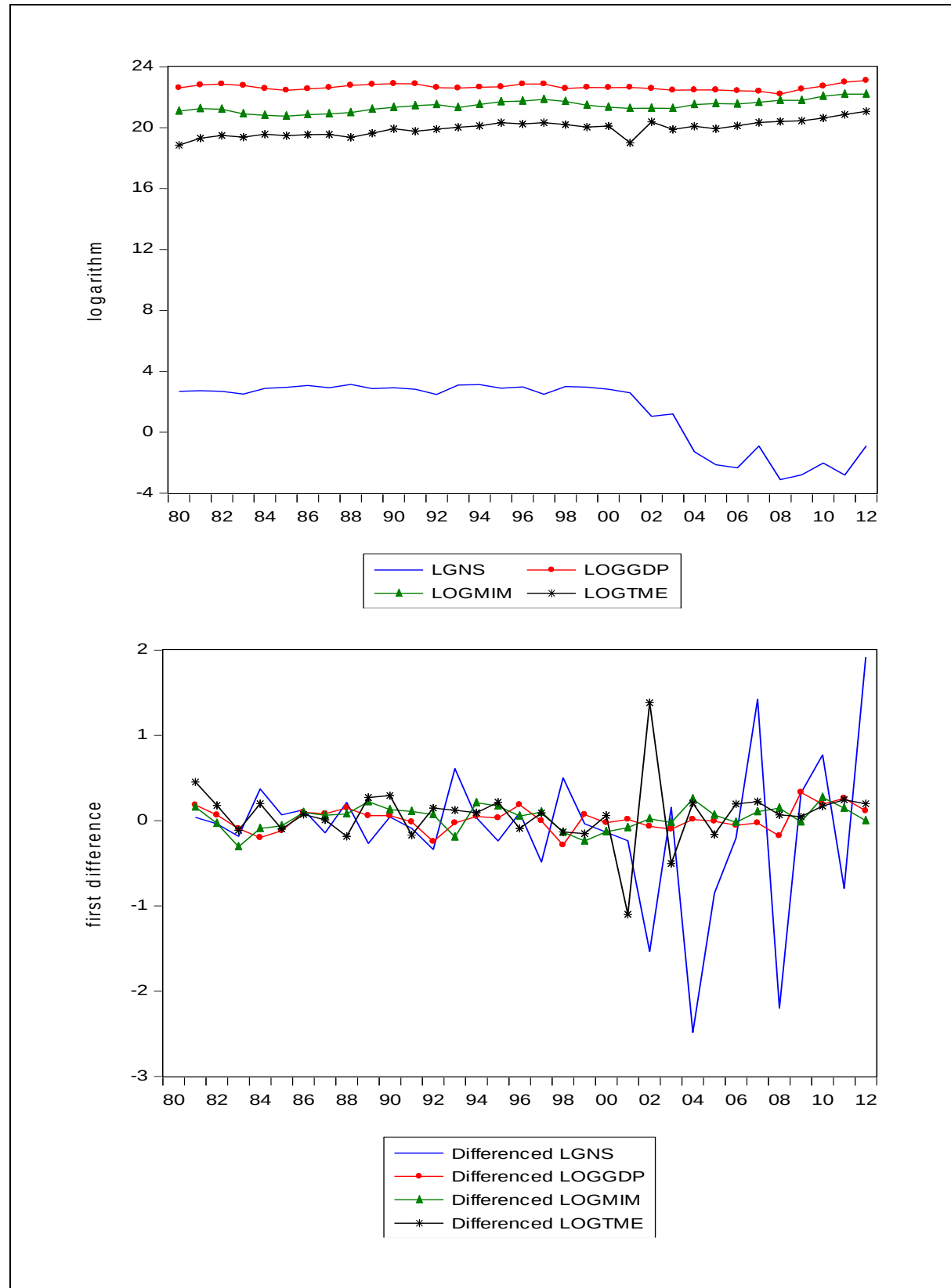
Appendix A.11: Line graphs at levels and first difference for Tanzania



Appendix A.12: Line graphs at levels and first difference for Zambia



Appendix A.13: Line graphs at levels and first difference for Zimbabwe



Appendix B

Appendix B1: ADF, KPSS and P-P unit results for Angola

SADC country	Variables	ADF in levels Intercept & trend	ADF in levels Intercept only	ADF in 1 st difference Intercept & trend	ADF in 1st difference Intercept only
	GDP	-1.136	0.245	-3.587**	-3.336**
	TME	-3.938**	-1.790	-5.637**	-5.472**
	MIM	-2.771	3.995	-5.796**	-5.676**
	GNS	-1.703	-1.746	-9.600**	-9.762**
SADC country	Variables	KPSS in levels Intercept & trend	KPSS in levels Intercept only	KPSS in 1 st difference Intercept & trend	KPSS in 1st difference Intercept only
	GDP	0.176	0.585	0.128**	0.363**
	TME	0.210	0.664	0.500	0.465
	MIM	0.145	0.601	0.056**	0.097**
	GNS	0.122**	0.126**	0.092**	0.092**
	Variables	P-P in levels Intercept & trend	P-P in levels Intercept only	P-P in 1 st difference Intercept & trend	P-P in 1st difference Intercept only
	GDP	-0.790	1.097	-3.555	-3.342**
	TME	-4.311**	-1.826	-8.182**	-6.403**
	MIM	-2.771	-0.565	-5.671**	-5.740**
	GNS	-3.081	-3.088**	-9.712**	-9.846**

//*/ 10% statistically significant

//**/ 5% statistically significant

//***/ 1% statistically significant

Appendix B2: ADF, KPSS and P-P unit results for Botswana

SADC country	Variables	ADF in levels Intercept & trend	ADF in levels Intercept only	ADF in 1 st difference Intercept & trend	ADF in 1st difference Intercept only
	GDP	-1.839	-0.457	-4.436**	-4.505**
	TME	-0.858	-1.676	-5.655**	-5.353**
	MIM	2.005	3.598**	-4.829**	-3.972**
	GNS	-2.555	-2.471	-4.616**	-4.352**
	Variables	KPSS in levels Intercept & trend	KPSS in levels Intercept only	KPSS in 1 st difference Intercept & trend	KPSS in 1st difference Intercept only
	GDP	0.176	0.738	0.128**	0.076**
	TME	0.165	0.539	0.279**	0.279**
	MIM	0.163	0.663	0.144**	0.530
	GNS	0.120	0.351	0.500	0.449**
	Variables	P-P in levels Intercept & trend	P-P in levels Intercept only	P-P in 1 st difference Intercept & trend	P-P in 1st difference Intercept only
	GDP	-2.111	-0.457	-4.376**	-4.467**
	TME	-0.868	-1.683	-5.692**	-5.353**
	MIM	1.708	4.287**	-4.874**	-3.884**
	GNS	-2.414	-2.184	-11.051**	-7.914**

/**/ 10% statistically significant

/***/ 5% statistically significant

/***/ 1% statistically significant

Appendix B3: ADF, KPSS and P-P unit results for Lesotho

SADC country	Variables	ADF in levels Intercept & trend	ADF in levels Intercept only	ADF in 1 st difference Intercept & trend	ADF in 1st difference Intercept only
	GDP	-3.041	0.485	-4.067**	-4.018**
	TME	-1.203	0.307	-3.759**	-3.692**
	MIM	-0.304	1.930	-4.171**	-3.658**
	GNS	-3.548	-2.956	-5.306**	-5.354**
SADC country	Variables	KPSS in levels Intercept & trend	KPSS in levels Intercept only	KPSS in 1 st difference Intercept & trend	KPSS in 1st difference Intercept only
	GDP	0.078**	0.709	0.083**	0.168**
	TME	0.146	0.647	0.178	0.261**
	MIM	0.146	0.669	0.108**	0.391**
	GNS	0.158	0.466	0.500	0.500
	Variables	P-P in levels Intercept & trend	P-P in levels Intercept only	P-P in 1 st difference Intercept & trend	P-P in 1st difference Intercept only
	GDP	-2.334	0.485	-4.028**	-3.972**
	TME	-6.021**	-2.055	-29.587**	-25.917**
	MIM	-0.573	1.930	-4.109**	-3.658**
	GNS	-3.345	-2.800	-14.856**	-15.350**

/**/ 10% statistically significant

/***/ 5% statistically significant

****/ 1% statistically significant

Appendix B4: ADF, KPSS and P-P unit results for Madagascar

SADC country	Variables	ADF in levels Intercept & trend	ADF in levels Intercept only	ADF in 1 st difference Intercept & trend	ADF in 1st difference Intercept only
	GDP	-2.258	0.322	-7.555**	-6.643**
	TME	-2.422	-0.452	-5.795**	-5.907**
	MIM	-2.043	0.553	-3.571**	-6.102**
	GNS	-4.295	-0.405	-6.417**	-6.557**
SADC country	Variables	KPSS in levels Intercept & trend	KPSS in levels Intercept only	KPSS in 1 st difference Intercept & trend	KPSS in 1st difference Intercept only
	GDP	0.192	0.604	0.193	0.557
	TME	0.099**	0.631	0.101**	0.101**
	MIM	0.180	0.605	0.500	0.311**
	GNS	0.120**	0.688	0.072**	0.072**
	Variables	P-P in levels Intercept & trend	P-P in levels Intercept only	P-P in 1 st difference Intercept & trend	P-P in 1st difference Intercept only
	GDP	-2.178	0.609	-13.375**	-6.664**
	TME	-2.350	-0.308	-5.943**	-6.079**
	MIM	-1.855	0.199	-9.925**	-5.191**
	GNS	-4.405**	-1.383	-9.691**	-9.865**

/**/ 10% statistically significant

/***/ 5% statistically significant

/***/ 1% statistically significant

Appendix B5: ADF, KPSS and P-P unit results for Malawi

SADC country	Variables	ADF in levels Intercept & trend	ADF in levels Intercept only	ADF in 1 st difference Intercept & trend	ADF in 1st difference Intercept only
	GDP	-3.039	-0.905	-5.670**	-5.767**
	TME	-2.180	0.545	-3.897**	-3.837**
	MIM	-1.201	0.840	-6.724**	-5.998**
	GNS	-3.127	-3.140**	-8.069**	-8.217**
SADC country	Variables	KPSS in levels Intercept & trend	KPSS in levels Intercept only	KPSS in 1 st difference Intercept & trend	KPSS in 1st difference Intercept only
	GDP	0.155	0.690	0.500	0.484
	TME	0.108**	0.706	0.057**	0.352**
	MIM	0.167	0.600	0.071**	0.369**
	GNS	0.131**	0.158**	0.065**	0.063**
	Variables	P-P in levels Intercept & trend	P-P in levels Intercept only	P-P in 1 st difference Intercept & trend	P-P in 1st difference Intercept only
	GDP	-2.870	-0.612	-10.952**	-9.405**
	TME	-2.714	0.472	-7.425**	-6.646**
	MIM	-1.134	1.092	-6.790**	-5.985**
	GNS	-3.254**	-3.266**	-8.386**	-8.560**

/**/ 10% statistically significant

/***/ 5% statistically significant

/***/ 1% statistically significant

Appendix B6: ADF, KPSS and P-P unit results for Mauritius

SADC country	Variables	ADF in levels Intercept & trend	ADF in levels Intercept only	ADF in 1 st difference Intercept & trend	ADF in 1st difference Intercept only
	GDP	-1.983	-0.048	-4.269**	-4.365**
	TME	-1.237	-4.131**	-4.332**	-4.011**
	MIM	-1.712	0.873	-6.874**	-6.424**
	GNS	-2.296	-2.343	-7.414**	-7.126**
SADC country	Variables	KPSS in levels Intercept & trend	KPSS in levels Intercept only	KPSS in 1 st difference Intercept & trend	KPSS in 1st difference Intercept only
	GDP	0.101**	0.641	0.098**	0.096**
	TME	0.181	0.630	0.082**	0.328**
	MIM	0.140**	0.722	0.062**	0.331**
	GNS	0.098**	0.098**	0.038**	0.123**
	Variables	P-P in levels Intercept & trend	P-P in levels Intercept only	P-P in 1 st difference Intercept & trend	P-P in 1st difference Intercept only
	GDP	-2.213	-0.048	-4.161**	-4.273**
	TME	-1.340	-2.004	-4.181**	-4.059**
	MIM	-1.563	1.200	-6.904**	-6.459**
	GNS	-2.254	-2.352	-7.339**	-6.987**

/**/ 10% statistically significant

/***/ 5% statistically significant

/***/ 1% statistically significant

Appendix B7: ADF, KPSS and P-P unit results for Namibia

SADC country	Variables	ADF in levels Intercept & trend	ADF in levels Intercept only	ADF in 1 st difference Intercept & trend	ADF in 1st difference Intercept only
	GDP	-2.563	1.056	-5.068**	-4.205**
	TME	-1.922	-2.210	-5.292**	-5.265**
	MIM	-1.622	1.059	-4.568 ***	-4.085***
	GNS	-3.961**	-3.993**	-6.974**	-7.099**
SADC country	Variables	KPSS in levels Intercept & trend	KPSS in levels Intercept only	KPSS in 1 st difference Intercept & trend	KPSS in 1st difference Intercept only
	GDP	0.150	0.715	0.068**	0.318**
	TME	0.111**	0.113**	0.137**	0.189**
	MIM	0.160**	0.670	0.079**	0.430
	GNS	0.123**	0.115**	0.151**	0.189**
	Variables	P-P in levels Intercept & trend	P-P in levels Intercept only	P-P in 1 st difference Intercept & trend	P-P in 1st difference Intercept only
	GDP	-2.570	0.849	-4.234**	-4.099**
	TME	-1.839	-1.722	-5.885**	-5.286**
	MIM	-1.687	0.936	-4.484**	-4.111**
	GNS	-4.022**	-4.013**	-8.977**	-9.165**

/**/ 10% statistically significant

/***/ 5% statistically significant

/***/ 1% statistically significant

Appendix B8: ADF, KPSS and P-P unit results for Seychelles

SADC country	Variables	ADF in levels Intercept & trend	ADF in levels Intercept only	ADF in 1 st difference Intercept & trend	ADF in 1st difference Intercept only
	GDP	-0.788	-1.429	-4.246**	-4.081**
	TME	-2.770	-1.465	-7.187**	-7.173**
	MIM	-2.771	3.995	-5.796**	-5.676**
	GNS	-1.703	-1.746	-9.600**	-9.762**
SADC country	Variables	KPSS in levels Intercept & trend	KPSS in levels Intercept only	KPSS in 1 st difference Intercept & trend	KPSS in 1st difference Intercept only
	GDP	0.165	0.632	0.069**	0.229**
	TME	0.105**	0.706	0.027**	0.054**
	MIM	0.145**	0.601	0.056**	0.097**
	GNS	0.122**	0.126**	0.092**	0.092**
	Variables	P-P in levels Intercept & trend	P-P in levels Intercept only	P-P in 1 st difference Intercept & trend	P-P in 1st difference Intercept only
	GDP	-0.788	-1.359	-4.067**	-4.073**
	TME	-2.726	-1.417	-19.351**	-15.678**
	MIM	-2.771	-0.565	-5.671**	-5.740**
	GNS	-3.081	-3.088**	-9.712**	-9.846**

/**/ 10% statistically significant

/***/ 5% statistically significant

/***/ 1% statistically significant

Appendix B9: ADF, KPSS and P-P unit results for South Africa

SADC country	Variables	ADF in levels Intercept & trend	ADF in levels Intercept only	ADF in 1 st difference Intercept & trend	ADF in 1st difference Intercept only
	GDP	-2.867	0.209	-4.228**	-4.203**
	TME	-2.770	-0.170	-5.249**	-5.361**
	MIM	-0.916	1.245	-6.209**	-5.280**
	GNS	-5.112**	-4.125**	-6.675**	-6.821**
SADC country	Variables	KPSS in levels Intercept & trend	KPSS in levels Intercept only	KPSS in 1 st difference Intercept & trend	KPSS in 1st difference Intercept only
	GDP	0.108**	0.697	0.057**	0.142**
	TME	0.087**	0.625	0.079**	0.091**
	MIM	0.189	0.629	0.133**	0.468
	GNS	0.196	0.688	0.090**	0.272**
	Variables	P-P in levels Intercept & trend	P-P in levels Intercept only	P-P in 1 st difference Intercept & trend	P-P in 1st difference Intercept only
	GDP	-2.230	0.112	-4.038**	-4.080**
	TME	-2.873	-0.232	-5.351**	-5.504**
	MIM	-0.500	2.080	-7.435**	-5.280**
	GNS	-4.878**	-4.099**	-10.148**	-8.294**

/**/ 10% statistically significant

/***/ 5% statistically significant

/***/ 1% statistically significant

Appendix B10: ADF, KPSS and P-P unit results for Swaziland

SADC country	Variables	ADF in levels Intercept & trend	ADF in levels Intercept only	ADF in 1 st difference Intercept & trend	ADF in 1st difference Intercept only
	GDP	-2.396	0.034	-4.529**	-4.493**
	TME	-3.056	-2.131	-4.070**	-4.136**
	MIM	-3.349	-0.160	-4.726**	-4.744**
	GNS	-2.604	-2.471	-7.052**	-7.165**
SADC country	Variables	KPSS in levels Intercept & trend	KPSS in levels Intercept only	KPSS in 1 st difference Intercept & trend	KPSS in 1st difference Intercept only
	GDP	0.102**	0.690	0.060**	0.139**
	TME	0.065**	0.344**	0.500	0.500
	MIM	0.122**	0.707	0.066**	0.129**
	GNS	0.137**	0.262**	0.079**	0.081**
	Variables	P-P in levels Intercept & trend	P-P in levels Intercept only	P-P in 1 st difference Intercept & trend	P-P in 1st difference Intercept only
	GDP	-2.460	-0.095	-4.415**	-4.409**
	TME	-2.726	-1.417	-28.903**	-28.664**
	MIM	-2.744	-0.204	-4.666**	-4.694**
	GNS	-2.604	-2.380	-7.158**	-7.132**

/**/ 10% statistically significant

/***/ 5% statistically significant

/***/ 1% statistically significant

Appendix B11: ADF, KPSS and P-P unit results for Tanzania

SADC country	Variables	ADF in levels Intercept & trend	ADF in levels Intercept only	ADF in 1 st difference Intercept & trend	ADF in 1st difference Intercept only
	GDP	-2.383	-0.031	-2.510	-2.167
	TME	-1.238	0.611	-4.108**	-3.946**
	MIM	2.577	4.407	-5.291**	-0.048
	GNS	-2.461	-2.269	-4.540**	-5.776**
	Variables	KPSS in levels Intercept & trend	KPSS in levels Intercept only	KPSS in 1 st difference Intercept & trend	KPSS in 1st difference Intercept only
	GDP	0.179	0.590	0.068**	0.274**
	TME	0.150	0.490	0.064**	0.384**
	MIM	0.183	0.567	0.178	0.641
	GNS	0.086**	0.134**	0.060**	0.095**
	Variables	P-P in levels Intercept & trend	P-P in levels Intercept only	P-P in 1 st difference Intercept & trend	P-P in 1st difference Intercept only
	GDP	-1.259	0.307	-9.036**	-7.771**
	TME	-1.238	0.611	-3.926**	-3.893**
	MIM	0.508	2.565	-6.696**	-4.972**
	GNS	-2.519	-2.343	-5.759**	-5.843**

/**/ 10% statistically significant

/***/ 5% statistically significant

/***/ 1% statistically significant

Appendix B12: ADF, KPSS and P-P unit results for Zambia

SADC country	Variables	ADF in levels Intercept & trend	ADF in levels Intercept only	ADF in 1 st difference Intercept & trend	ADF in 1st difference Intercept only
	GDP	-1.177	0.938	-4.754**	-4.147**
	TME	-0.201	0.374	-6.524**	-6.034**
	MIM	2.415	3.933**	-5.269**	0.139
	GNS	-2.624	-1.587	-5.752**	-5.889**
	Variables	KPSS in levels Intercept & trend	KPSS in levels Intercept only	KPSS in 1 st difference Intercept & trend	KPSS in 1st difference Intercept only
	GDP	0.178	0.554	0.073**	0.404**
	TME	0.134**	0.547	0.116**	0.305**
	MIM	0.195	0.538	0.157	0.690
	GNS	0.110	0.446	0.041**	0.084
	Variables	P-P in levels Intercept & trend	P-P in levels Intercept only	P-P in 1 st difference Intercept & trend	P-P in 1st difference Intercept only
	GDP	-1.217	0.938	-4.694**	-4.143**
	TME	-2.523	0.049	-6.441**	-6.033**
	MIM	2.667	4.683**	-5.969**	-4.326**
	GNS	-2.792	-1.672	-5.752**	-5.889**

/**/ 10% statistically significant

/***/ 5% statistically significant

/***/ 1% statistically significant

Appendix B13: ADF, KPSS and P-P unit results for Zimbabwe

SADC country	Variables	ADF in levels Intercept & trend	ADF in levels Intercept only	ADF in 1 st difference Intercept & trend	ADF in 1st difference Intercept only
	GDP	-1.242	-2.739	-4.347**	-4.193**
	TME	-1.692	-1.788	-5.630**	-5.632**
	MIM	-2.039	0.526	-4.176**	-3.916**
	GNS	-2.682	-0.592	-8.068**	-8.146**
	Variables	KPSS in levels Intercept & trend	KPSS in levels Intercept only	KPSS in 1 st difference Intercept & trend	KPSS in 1st difference Intercept only
	GDP	0.094**	0.153**	0.119**	0.143**
	TME	0.094**	0.662	0.142**	0.142**
	MIM	0.086**	0.558	0.094**	0.208**
	GNS	0.169	0.479	0.115**	0.135**
	Variables	P-P in levels Intercept & trend	P-P in levels Intercept only	P-P in 1 st difference Intercept & trend	P-P in 1st difference Intercept only
	GDP	-1.857	-1.917	-4.314**	-4.213**
	TME	-1.553	-2.058	-10.992**	-11.139**
	MIM	-1.317	0.097	-4.171**	-3.917**
	GNS	-2.606	-1.308	-8.326**	-8.189**

/**/ 10% statistically significant

/***/ 5% statistically significant

/***/ 1% statistically significant

APPENDIX C: LAG LENGTH SELECTION

ANGOLA

VAR Lag Order Selection Criteria Endogenous variables: LOGGDP LGNS LOGMIM LOGTME Exogenous variables: C Date: 04/07/16 Time: 19:45 Sample: 1980 2012 Included observations: 29						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-119.1118	NA	0.057216	8.490471	8.679064	8.549536
1	-48.73396	116.4875*	0.001364	4.740273	5.683236*	5.035597*
2	-29.90761	25.96738	0.001205*	4.545352	6.242685	5.076936
3	-17.23745	13.98087	0.001832	4.774996	7.226699	5.542839
4	4.179182	17.72411	0.001902	4.401436*	7.607509	5.405538
* indicates lag order selected by the criterion LR: sequential modified LR test statistic (each test at 5% level) FPE: Final prediction error AIC: Akaike information criterion SC: Schwarz information criterion HQ: Hannan-Quinn information criterion						

BOTSWANA

VAR Lag Order Selection Criteria Endogenous variables: LOGGDP LOGGNS LOGMIM LOGTME Exogenous variables: C Date: 04/07/16 Time: 19:53 Sample: 1980 2012 Included observations: 29						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	0.471483	NA	1.50e-05	0.243346	0.431939	0.302411
1	95.40518	157.1316*	6.57e-08*	-5.200357*	-4.257395*	-4.905033*
2	102.6159	9.945797	1.29e-07	-4.594199	-2.896866	-4.062615
3	109.1977	7.262643	2.99e-07	-3.944666	-1.492963	-3.176823
4	129.8675	17.10605	3.27e-07	-4.266722	-1.060649	-3.262620
* indicates lag order selected by the criterion LR: sequential modified LR test statistic (each test at 5% level) FPE: Final prediction error AIC: Akaike information criterion SC: Schwarz information criterion HQ: Hannan-Quinn information criterion						

LESOTHO

VAR Lag Order Selection Criteria Endogenous variables: LOGGDP LOGGNS LOGMIM LOGTME Exogenous variables: C Date: 04/07/16 Time: 19:59 Sample: 1980 2012 Included observations: 29						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-14.16843	NA	4.11e-05	1.252995	1.441587	1.312060
1	47.38512	101.8817*	1.80e-06*	-1.888629	-0.945666*	-1.593305*
2	63.44602	22.15297	1.93e-06	-1.892829*	-0.195497	-1.361246
3	73.17521	10.73565	3.59e-06	-1.460359	0.991344	-0.692516
4	85.64439	10.31932	6.91e-06	-1.216854	1.989219	-0.212752
* indicates lag order selected by the criterion LR: sequential modified LR test statistic (each test at 5% level) FPE: Final prediction error AIC: Akaike information criterion SC: Schwarz information criterion HQ: Hannan-Quinn information criterion						

MADAGASCAR

VAR Lag Order Selection Criteria Endogenous variables: LOGGDP LGNS LOGMIM LOGTME Exogenous variables: C Date: 04/07/16 Time: 20:06 Sample: 1980 2012 Included observations: 29						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-59.80970	NA	0.000958	4.400669	4.589261	4.459734
1	11.42470	117.9052*	2.15e-05*	0.591400*	1.534362*	0.886724*
2	26.51338	20.81197	2.46e-05	0.654249	2.351582	1.185833
3	39.82380	14.68736	3.58e-05	0.839738	3.291441	1.607581
4	50.43964	8.785521	7.83e-05	1.211059	4.417132	2.215161
* indicates lag order selected by the criterion LR: sequential modified LR test statistic (each test at 5% level) FPE: Final prediction error AIC: Akaike information criterion SC: Schwarz information criterion HQ: Hannan-Quinn information criterion						

MALAWI

VAR Lag Order Selection Criteria

Endogenous variables: LOGGDP LOGGNS LOGMIM

LOGTME

Exogenous variables:

Date: 04/07/16 Time: 20:33

Sample: 1980 2012

Included observations: 29

Lag	LogL	LR	FPE	AIC	SC	HQ
1	0.708948	NA	3.40e-05	1.054555	1.808925*	1.290815
2	24.24663	34.08905*	2.13e-05	0.534716	2.043456	1.007234*
3	43.63205	22.72774	1.96e-05*	0.301238*	2.564348	1.010016
4	57.09690	12.07193	3.29e-05	0.476076	3.493556	1.421113

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

MAURITIUS

VAR Lag Order Selection Criteria

Endogenous variables: LOGGDP LOGGNS LOGMIM

LOGTME

Exogenous variables:

Date: 04/07/16 Time: 20:55

Sample: 1980 2012

Included observations: 29

Lag	LogL	LR	FPE	AIC	SC	HQ
1	95.63961	NA	4.87e-08*	-5.492387	-4.738017*	-5.256128*
2	104.4128	12.70602	8.45e-08	-4.993987	-3.485247	-4.521469
3	123.7300	22.64776	7.83e-08	-5.222760	-2.959650	-4.513982
4	144.7869	18.87856	7.77e-08	-5.571509*	-2.554029	-4.626472

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

NAMIBIA

VAR Lag Order Selection Criteria

Endogenous variables: LOGGDP LOGGNS LOGMIM

LOGTME

Exogenous variables: C

Date: 04/07/16 Time: 20:57
Sample: 1980 2012
Included observations: 29

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-16.73037	NA	4.91e-05	1.429680	1.618273	1.488745
1	56.49015	121.1926*	9.62e-07*	-2.516562	-1.573599*	-2.221238*
2	64.43747	10.96182	1.80e-06	-1.961205	-0.263872	-1.429621
3	82.50226	19.93356	1.89e-06	-2.103604	0.348099	-1.335761
4	113.7425	25.85402	9.95e-07	-3.154657*	0.051416	-2.150555

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

SEYCHELLES

VAR Lag Order Selection Criteria Endogenous variables: LOGGDP LGNS LOGMIM LOGTME Exogenous variables: C Date: 04/07/16 Time: 20:58 Sample: 1980 2012 Included observations: 29						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-78.03756	NA	0.003367	5.657763	5.846355	5.716827
1	-4.724292	121.3461*	6.56e-05*	1.705124*	2.648086*	2.000448*
2	8.666387	18.46990	8.42e-05	1.885077	3.582410	2.416660
3	26.15639	19.29931	9.19e-05	1.782318	4.234021	2.550161
4	38.93528	10.57563	0.000173	2.004463	5.210536	3.008565

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

SOUTH AFRICA

VAR Lag Order Selection Criteria Endogenous variables: LOGGDP LOGGNS LOGMIM LOGTME Exogenous variables: C Date: 04/07/16 Time: 20:59 Sample: 1980 2012 Included observations: 29						
Lag	LogL	LR	FPE	AIC	SC	HQ

0	25.07365	NA	2.75e-06	-1.453355	-1.264763	-1.394291
1	108.9489	138.8281*	2.58e-08	-6.134410	-5.191447*	-5.839086
2	125.7898	23.22883	2.62e-08	-6.192403	-4.495070	-5.660819
3	141.2726	17.08438	3.28e-08	-6.156728	-3.705026	-5.388886
4	170.6942	24.34892	1.96e-08*	-7.082356*	-3.876283	-6.078254*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

SWAZILAND

VAR Lag Order Selection Criteria

Endogenous variables: LOGGDP LGNS LOGMIM LTME

Exogenous variables: C

Date: 04/07/16 Time: 21:00

Sample: 1980 2012

Included observations: 29

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-127.1595	NA	0.099668	9.045485	9.234078	9.104550
1	-59.68370	111.6841*	0.002903*	5.495428*	6.438390*	5.790752*
2	-46.51526	18.16337	0.003787	5.690707	7.388040	6.222291
3	-37.72748	9.696861	0.007527	6.188102	8.639805	6.955945
4	-24.50910	10.93935	0.013756	6.379938	9.586011	7.384040

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

TANZANIA

VAR Lag Order Selection Criteria

Endogenous variables: LOGGDP LOGGNS LOGMIM
LOGTME

Exogenous variables:

Date: 04/07/16 Time: 21:02

Sample: 1980 2012

Included observations: 29

Lag	LogL	LR	FPE	AIC	SC	HQ
1	1.945933	NA	3.12e-05	0.969246	1.723616*	1.205505
2	23.64927	31.43241*	2.22e-05	0.575913	2.084653	1.048431
3	44.49393	24.43857	1.85e-05*	0.241798*	2.504908	0.950576*
4	59.00951	13.01397	2.88e-05	0.344172	3.361652	1.289209

* indicates lag order selected by the criterion
 LR: sequential modified LR test statistic (each test at 5% level)
 FPE: Final prediction error
 AIC: Akaike information criterion
 SC: Schwarz information criterion
 HQ: Hannan-Quinn information criterion

ZAMBIA

VAR Lag Order Selection Criteria Endogenous variables: LOGGDP LGNS LOGMIM LOGTME Exogenous variables: C Date: 04/07/16 Time: 21:03 Sample: 1980 2012 Included observations: 29						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-82.07317	NA	0.004448	5.936081	6.124673	5.995145
1	-3.237173	130.4872*	5.92e-05*	1.602564	2.545526*	1.897888*
2	12.27991	21.40287	6.57e-05	1.635868	3.333201	2.167452
3	28.12947	17.48918	8.02e-05	1.646243	4.097946	2.414086
4	49.11265	17.36538	8.58e-05	1.302576*	4.508649	2.306678
* indicates lag order selected by the criterion LR: sequential modified LR test statistic (each test at 5% level) FPE: Final prediction error AIC: Akaike information criterion SC: Schwarz information criterion HQ: Hannan-Quinn information criterion						

ZIMBABWE

VAR Lag Order Selection Criteria Endogenous variables: LOGGDP LGNS LOGMIM LOGTME Exogenous variables: Date: 04/08/16 Time: 16:45 Sample: 1980 2012 Included observations: 29						
Lag	LogL	LR	FPE	AIC	SC	HQ
1	12.72787	NA	1.48e-05	0.225664	0.980035*	0.461924*
2	30.36694	25.54625	1.39e-05	0.112625	1.621365	0.585143
3	50.90725	24.08175	1.19e-05*	-0.200500*	2.062610	0.508278
4	65.13328	12.75437	1.89e-05	-0.078157	2.939323	0.866880
* indicates lag order selected by the criterion LR: sequential modified LR test statistic (each test at 5% level) FPE: Final prediction error AIC: Akaike information criterion SC: Schwarz information criterion HQ: Hannan-Quinn information criterion						

APPENDIX D: VECTOR ERROR CORRECTION MODEL

VECM: LESOTHO

Vector Error Correction Estimates Date: 04/25/16 Time: 14:38 Sample (adjusted): 1982 2012 Included observations: 31 after adjustments Standard errors in () & t-statistics in []				
Cointegrating Eq:	CointEq1			
LOGGDP(-1)	1.000000			
LOGGNS(-1)	0.150373 (0.04376) [3.43644]			
LOGMIM(-1)	-0.993162 (0.04347) [-22.8464]			
LOGTME(-1)	-0.084274 (0.02423) [-3.47771]			
C	21.83010			
Error Correction:	D(LOGGDP)	D(LOGGNS)	D(LOGMIM)	D(LOGTME)
CointEq1	-0.080856 (0.42511) [-0.19020]	-0.093807 (1.26594) [-0.07410]	0.803761 (0.38877) [2.06744]	2.633617 (1.82567) [1.44255]
D(LOGGDP(-1))	0.053720 (0.35661) [0.15064]	0.377352 (1.06193) [0.35534]	-0.143913 (0.32612) [-0.44129]	0.645882 (1.53146) [0.42174]
D(LOGGNS(-1))	-0.052812 (0.08837) [-0.59760]	-0.197536 (0.26317) [-0.75061]	-0.110916 (0.08082) [-1.37241]	-0.219257 (0.37952) [-0.57771]
D(LOGMIM(-1))	0.271676 (0.33804) [0.80368]	-0.935455 (1.00665) [-0.92927]	0.564081 (0.30914) [1.82466]	-0.425783 (1.45174) [-0.29329]
D(LOGTME(-1))	0.012054 (0.03815) [0.31599]	0.008030 (0.11359) [0.07069]	0.020564 (0.03488) [0.58948]	-0.501076 (0.16382) [-3.05872]
C	0.036973 (0.02679) [1.38012]	-0.002509 (0.07978) [-0.03145]	0.024333 (0.02450) [0.99322]	0.046820 (0.11505) [0.40696]
R-squared	0.153468	0.087967	0.310142	0.531471
Adj. R-squared	-0.015839	-0.094439	0.172170	0.437765
Sum sq. resids	0.451890	4.007282	0.377928	8.334245
S.E. equation	0.134446	0.400364	0.122952	0.577382
F-statistic	0.906450	0.482261	2.247868	5.671690
Log likelihood	21.55161	-12.27605	24.32202	-23.62607

Akaike AIC	-1.003330	1.179100	-1.182066	1.911360
Schwarz SC	-0.725784	1.456646	-0.904520	2.188906
Mean dependent	0.057680	-0.021513	0.052166	0.060494
S.D. dependent	0.133393	0.382701	0.135134	0.770024
Determinant resid covariance (dof adj.)	2.76E-06			
Determinant resid covariance	1.17E-06			
Log likelihood	35.77847			
Akaike information criterion	-0.501837			
Schwarz criterion	0.793378			

VECM: MADAGASCAR

Vector Error Correction Estimates Date: 04/10/16 Time: 12:24 Sample (adjusted): 1982 2012 Included observations: 31 after adjustments Standard errors in () & t-statistics in []				
Cointegrating Eq:	CointEq1			
LOGGDP(-1)	1.000000			
LGNS(-1)	0.148185 (0.04833) [3.06580]			
LOGMIM(-1)	-0.737317 (0.06590) [-11.1876]			
LOGTME(-1)	0.021325 (0.04069) [0.52411]			
C	13.03259			
Error Correction:	D(LOGGDP)	D(LGNS)	D(LOGMIM)	D(LOGTME)
CointEq1	-0.467503 (0.18219) [-2.56605]	-0.645566 (0.92540) [-0.69761]	0.643480 (0.40549) [1.58694]	0.658510 (0.45108) [1.45986]
D(LOGGDP(-1))	0.068410 (0.19618) [0.34871]	0.460144 (0.99648) [0.46177]	0.093912 (0.43663) [0.21508]	0.192305 (0.48572) [0.39591]
D(LGNS(-1))	-0.024129 (0.04232) [-0.57021]	-0.386963 (0.21494) [-1.80033]	-0.125314 (0.09418) [-1.33056]	-0.055810 (0.10477) [-0.53269]
D(LOGMIM(-1))	-0.186766 (0.14196) [-1.31567]	-0.197063 (0.72105) [-0.27330]	-0.099001 (0.31594) [-0.31335]	0.176140 (0.35147) [0.50116]
D(LOGTME(-1))	-0.080574 (0.10228)	-0.441643 (0.51954)	0.097951 (0.22765)	-0.086145 (0.25325)

	[-0.78774]	[-0.85006]	[0.43027]	[-0.34016]
C	0.052119 (0.02422) [2.15221]	0.138052 (0.12300) [1.12234]	0.055249 (0.05390) [1.02509]	0.117121 (0.05996) [1.95341]
R-squared	0.368021	0.247853	0.152389	0.112254
Adj. R-squared	0.241626	0.097424	-0.017133	-0.065295
Sum sq. resids	0.367339	9.477401	1.819610	2.251815
S.E. equation	0.121217	0.615708	0.269786	0.300121
F-statistic	2.911661	1.647640	0.898932	0.632244
Log likelihood	24.76251	-25.61840	-0.038936	-3.342207
Akaike AIC	-1.210485	2.039897	0.389609	0.602723
Schwarz SC	-0.932939	2.317443	0.667155	0.880269
Mean dependent	0.033377	0.061723	0.055552	0.117516
S.D. dependent	0.139194	0.648086	0.267504	0.290778
Determinant resid covariance (dof adj.)	9.71E-06			
Determinant resid covariance	4.11E-06			
Log likelihood	16.29539			
Akaike information criterion	0.755136			
Schwarz criterion	2.050350			

VECM: MALAWI

Vector Error Correction Estimates				
Date: 04/13/16 Time: 19:45				
Sample (adjusted): 1984 2012				
Included observations: 29 after adjustments				
Standard errors in () & t-statistics in []				
Cointegration Restrictions:				
B(1,1)=1, B(1,2)=0, B(2,1)=0, B(2,2)=1, A(2,1)=0, A(4,2)=0				
Maximum iterations (500) reached.				
Restrictions identify all cointegrating vectors				
LR test for binding restrictions (rank = 2):				
Chi-square(2)	0.803386			
Probability	0.669186			
Cointegrating Eq:	CointEq1	CointEq2		
LOGGDP(-1)	1.000000	0.000000		
LOGGNS(-1)	0.000000	1.000000		
LOGMIM(-1)	-15.36393 (4.88277) [-3.14656]	-105.4902 (33.8360) [-3.11769]		
LOGTME(-1)	10.67217 (3.41368) [3.12629]	76.96503 (23.6557) [3.25355]		
C	122.9987	782.1105		
Error Correction:	D(LOGGDP)	D(LOGGNS)	D(LOGMIM)	D(LOGTME)

CointEq1	-1.762418 (0.47166) [-3.73665]	0.000000 (0.00000) [NA]	-0.988576 (0.53871) [-1.83508]	-0.045105 (0.01806) [-2.49811]
CointEq2	0.253391 (0.06756) [3.75049]	0.017415 (0.00821) [2.12170]	0.144317 (0.07717) [1.87019]	0.000000 (0.00000) [NA]
D(LOGGDP(-1))	0.857068 (0.34960) [2.45154]	-3.363800 (1.86811) [-1.80064]	0.954615 (0.41114) [2.32186]	0.319839 (0.59577) [0.53685]
D(LOGGDP(-2))	0.460259 (0.39082) [1.17769]	-1.315068 (2.08833) [-0.62972]	0.542488 (0.45961) [1.18032]	0.168620 (0.66600) [0.25318]
D(LOGGDP(-3))	0.103321 (0.25950) [0.39816]	2.011472 (1.38662) [1.45063]	0.176436 (0.30517) [0.57815]	-0.273701 (0.44222) [-0.61893]
D(LOGGNS(-1))	-0.051542 (0.06625) [-0.77800]	-0.717270 (0.35400) [-2.02619]	0.072855 (0.07791) [0.93512]	0.073519 (0.11290) [0.65121]
D(LOGGNS(-2))	-0.077557 (0.05583) [-1.38911]	0.009972 (0.29834) [0.03342]	-0.002783 (0.06566) [-0.04239]	0.046809 (0.09514) [0.49197]
D(LOGGNS(-3))	-0.022754 (0.05019) [-0.45337]	0.238764 (0.26818) [0.89031]	0.023197 (0.05902) [0.39302]	-0.022804 (0.08553) [-0.26663]
D(LOGMIM(-1))	0.212981 (0.29046) [0.73327]	2.288901 (1.55205) [1.47476]	0.007905 (0.34158) [0.02314]	-0.924973 (0.49497) [-1.86873]
D(LOGMIM(-2))	0.269068 (0.24050) [1.11880]	2.681275 (1.28509) [2.08645]	0.043331 (0.28283) [0.15321]	-0.105894 (0.40984) [-0.25838]
D(LOGMIM(-3))	0.141092 (0.23849) [0.59161]	0.927757 (1.27436) [0.72802]	0.211136 (0.28047) [0.75280]	-0.053522 (0.40641) [-0.13169]
D(LOGTME(-1))	-0.258843 (0.19482) [-1.32864]	-0.785159 (1.04101) [-0.75423]	-0.278405 (0.22911) [-1.21516]	-0.112905 (0.33199) [-0.34008]
D(LOGTME(-2))	-0.399011 (0.10769) [-3.70526]	-1.084107 (0.57543) [-1.88400]	-0.067990 (0.12664) [-0.53686]	0.272362 (0.18351) [1.48416]
D(LOGTME(-3))	-0.084203 (0.14355) [-0.58659]	-0.548699 (0.76704) [-0.71535]	0.022531 (0.16881) [0.13347]	0.271264 (0.24462) [1.10891]
C	-0.013310 (0.03266) [-0.40757]	-0.075764 (0.17450) [-0.43419]	-0.002830 (0.03840) [-0.07369]	0.149671 (0.05565) [2.68952]
R-squared	0.843996	0.802722	0.736270	0.665116
Adj. R-squared	0.687992	0.605443	0.472540	0.330233

Sum sq. resids	0.199128	5.685670	0.275400	0.578276
S.E. equation	0.119262	0.637275	0.140255	0.203237
F-statistic	5.410099	4.068977	2.791755	1.986112
Log likelihood	31.07681	-17.52369	26.37479	15.61827
Akaike AIC	-1.108746	2.243013	-0.784468	-0.042639
Schwarz SC	-0.401524	2.950235	-0.077246	0.664583
Mean dependent	0.042642	-0.004043	0.069737	0.108501
S.D. dependent	0.213510	1.014546	0.193118	0.248337
Determinant resid covariance (dof adj.)	4.05E-06			
Determinant resid covariance	2.20E-07			
Log likelihood	57.32281			
Akaike information criterion	0.736358			
Schwarz criterion	3.942431			

VECM: NAMIBIA

Vector Error Correction Estimates				
Date: 04/10/16 Time: 12:48				
Sample (adjusted): 1982 2012				
Included observations: 31 after adjustments				
Standard errors in () & t-statistics in []				
Cointegrating Eq:	CointEq1			
LOGGDP(-1)	1.000000			
LOGGNS(-1)	31.20962 (5.11593) [6.10048]			
LOGMIM(-1)	-4.400405 (0.91953) [-4.78551]			
LOGTME(-1)	-6.251885 (1.02619) [-6.09232]			
C	92.91073			
Error Correction:	D(LOGGDP)	D(LOGGNS)	D(LOGMIM)	D(LOGTME)
CointEq1	-0.001045 (0.00834) [-0.12534]	-0.030654 (0.00979) [-3.13165]	-0.002876 (0.01037) [-0.27743]	0.066924 (0.03925) [1.70521]
D(LOGGDP(-1))	0.215531 (0.29000) [0.74321]	0.036367 (0.34046) [0.10682]	0.047536 (0.36062) [0.13182]	2.204652 (1.36505) [1.61508]
D(LOGGNS(-1))	-0.032072 (0.18958) [-0.16917]	-0.018405 (0.22257) [-0.08270]	0.194909 (0.23575) [0.82677]	-0.839871 (0.89237) [-0.94116]
D(LOGMIM(-1))	0.110058 (0.21724)	-0.386447 (0.25504)	0.233665 (0.27014)	-1.205015 (1.02255)

	[0.50662]	[-1.51526]	[0.86499]	[-1.17844]
D(LOGTME(-1))	-0.026929 (0.04584) [-0.58744]	-0.010986 (0.05382) [-0.20414]	-0.008265 (0.05700) [-0.14500]	0.067566 (0.21578) [0.31313]
C	0.041164 (0.02685) [1.53287]	0.010615 (0.03153) [0.33671]	0.043138 (0.03339) [1.29183]	-0.120424 (0.12640) [-0.95270]
R-squared	0.119369	0.404796	0.113974	0.160168
Adj. R-squared	-0.056758	0.285755	-0.063231	-0.007799
Sum sq. resids	0.399239	0.550254	0.617341	8.845632
S.E. equation	0.126371	0.148358	0.157142	0.594832
F-statistic	0.677745	3.400477	0.643178	0.953569
Log likelihood	23.47171	18.49902	16.71587	-24.54911
Akaike AIC	-1.127207	-0.806389	-0.691347	1.970910
Schwarz SC	-0.849661	-0.528843	-0.413801	2.248456
Mean dependent	0.061363	-0.007677	0.054555	-0.044986
S.D. dependent	0.122930	0.175545	0.152398	0.592526
Determinant resid covariance (dof adj.)	5.81E-07			
Determinant resid covariance	2.46E-07			
Log likelihood	59.95060			
Akaike information criterion	-2.061329			
Schwarz criterion	-0.766115			

VECM: SEYCHELLES

Vector Error Correction Estimates Date: 04/12/16 Time: 11:51 Sample (adjusted): 1982 2012 Included observations: 31 after adjustments Standard errors in () & t-statistics in []		
Cointegration Restrictions: B(1,1)=1, B(1,2)=0, B(2,1)=0, B(2,2)=1, A(3,1)=0, A(3,2)=0, A(4,2)=0 Convergence achieved after 152 iterations. Restrictions identify all cointegrating vectors LR test for binding restrictions (rank = 2): Chi-square(3) 1.381345 Probability 0.709913		
Cointegrating Eq:	CointEq1	CointEq2
LOGGDP(-1)	1.000000	0.000000
LGNS(-1)	0.000000	1.000000
LOGMIM(-1)	0.788370 (0.26393) [2.98708]	4.832762 (0.91476) [5.28310]
LOGTME(-1)	-1.642045 (0.23144) [-7.09492]	-5.451250 (0.80216) [-6.79572]

C	10.83042	-12.13421		
Error Correction:	D(LOGGDP)	D(LGNS)	D(LOGMIM)	D(LOGTME)
CointEq1	-0.087339 (0.06078) [-1.43703]	2.716804 (0.78043) [3.48114]	0.000000 (0.00000) [NA]	0.759987 (0.16014) [4.74568]
CointEq2	0.009504 (0.01704) [0.55765]	-0.886263 (0.21883) [-4.04996]	0.000000 (0.00000) [NA]	0.000000 (0.00000) [NA]
D(LOGGDP(-1))	0.216595 (0.18937) [1.14378]	0.555226 (2.63952) [0.21035]	0.857096 (0.43790) [1.95728]	1.219610 (1.93251) [0.63110]
D(LGNS(-1))	-0.010536 (0.01413) [-0.74552]	0.004523 (0.19698) [0.02296]	0.019397 (0.03268) [0.59355]	0.073882 (0.14422) [0.51230]
D(LOGMIM(-1))	-0.108881 (0.09751) [-1.11665]	2.412045 (1.35911) [1.77473]	-0.138274 (0.22548) [-0.61325]	-0.216812 (0.99506) [-0.21789]
D(LOGTME(-1))	-0.042802 (0.02074) [-2.06351]	-0.376890 (0.28912) [-1.30359]	-0.034137 (0.04797) [-0.71171]	0.167989 (0.21168) [0.79361]
C	0.058802 (0.01813) [3.24393]	-0.138791 (0.25266) [-0.54932]	0.027087 (0.04192) [0.64621]	0.007715 (0.18498) [0.04171]
R-squared	0.318045	0.534694	0.252322	0.544770
Adj. R-squared	0.147556	0.418368	0.065402	0.430962
Sum sq. resids	0.133735	25.98251	0.715129	13.92752
S.E. equation	0.074648	1.040483	0.172618	0.761783
F-statistic	1.865491	4.596497	1.349893	4.786765
Log likelihood	40.42410	-41.25036	14.43673	-31.58523
Akaike AIC	-2.156393	3.112926	-0.479789	2.489369
Schwarz SC	-1.832590	3.436730	-0.155985	2.813173
Mean dependent	0.061333	0.017732	0.069420	0.087675
S.D. dependent	0.080851	1.364302	0.178556	1.009859
Determinant resid covariance (dof adj.)		4.34E-05		
Determinant resid covariance		1.56E-05		
Log likelihood		-4.891247		
Akaike information criterion		2.638145		
Schwarz criterion		4.303420		

VECM: SOUTH AFRICA

Vector Error Correction Estimates
Date: 04/08/16 Time: 20:00
Sample (adjusted): 1983 2012
Included observations: 30 after adjustments
Standard errors in () & t-statistics in []

Cointegrating Eq:	CointEq1			
LOGGDP(-1)	1.000000			
LOGGNS(-1)	-0.197621 (0.44276) [-0.44634]			
LOGMIM(-1)	-0.792914 (0.05878) [-13.4884]			
LOGRTME(-1)	0.003264 (0.10954) [0.02980]			
C	14.75485			
Error Correction:	D(LOGGDP)	D(LOGGNS)	D(LOGMIM)	D(LOGRTME)
CointEq1	-0.217344 (0.26002) [-0.83586]	0.064376 (0.12994) [0.49542]	0.545219 (0.25583) [2.13114]	0.343569 (0.32437) [1.05918]
D(LOGGDP(-1))	0.551755 (0.29059) [1.89874]	-0.202534 (0.14522) [-1.39470]	0.569416 (0.28591) [1.99161]	0.096288 (0.36250) [0.26562]
D(LOGGDP(-2))	-0.526030 (0.31012) [-1.69620]	-0.020075 (0.15498) [-0.12953]	-0.554454 (0.30513) [-1.81714]	0.065807 (0.38687) [0.17010]
D(LOGGNS(-1))	0.204710 (0.35330) [0.57942]	-0.578344 (0.17656) [-3.27567]	0.581692 (0.34761) [1.67340]	-0.577702 (0.44074) [-1.31077]
D(LOGGNS(-2))	-0.044907 (0.32444) [-0.13841]	-0.085303 (0.16213) [-0.52612]	-0.073296 (0.31921) [-0.22961]	-0.361808 (0.40473) [-0.89395]
D(LOGMIM(-1))	-0.103722 (0.25284) [-0.41023]	-0.017999 (0.12635) [-0.14245]	-0.057411 (0.24876) [-0.23078]	0.116191 (0.31541) [0.36839]
D(LOGMIM(-2))	0.316072 (0.21542) [1.46722]	0.002899 (0.10765) [0.02693]	0.409630 (0.21195) [1.93266]	0.012770 (0.26873) [0.04752]
D(LOGRTME(-1))	4.04E-05 (0.17711) [0.00023]	-0.110149 (0.08851) [-1.24450]	-0.207142 (0.17426) [-1.18870]	0.314686 (0.22094) [1.42429]
D(LOGRTME(-2))	0.105194 (0.19079) [0.55135]	-0.115851 (0.09535) [-1.21505]	-0.119189 (0.18772) [-0.63493]	-0.129698 (0.23801) [-0.54493]
C	0.039547 (0.03103) [1.27462]	-0.006677 (0.01551) [-0.43066]	0.060798 (0.03053) [1.99163]	-0.006756 (0.03870) [-0.17456]
R-squared	0.288906	0.473807	0.525396	0.394176
Adj. R-squared	-0.031086	0.237020	0.311824	0.121555

Sum sq. resids	0.377023	0.094155	0.364971	0.586717
S.E. equation	0.137300	0.068613	0.135087	0.171277
F-statistic	0.902854	2.000982	2.460039	1.445875
Log likelihood	23.08153	43.89195	23.56886	16.44799
Akaike AIC	-0.872102	-2.259463	-0.904591	-0.429866
Schwarz SC	-0.405036	-1.792398	-0.437525	0.037200
Mean dependent	0.054051	-0.014727	0.063250	0.032392
S.D. dependent	0.135214	0.078551	0.162841	0.182744
Determinant resid covariance (dof adj.)	2.01E-08			
Determinant resid covariance	3.96E-09			
Log likelihood	119.9306			
Akaike information criterion	-5.062042			
Schwarz criterion	-3.006952			

VECM: TANZANIA

Vector Error Correction Estimates Date: 04/13/16 Time: 20:02 Sample (adjusted): 1984 2012 Included observations: 29 after adjustments Standard errors in () & t-statistics in []				
Cointegration Restrictions: B(1,1)=1, B(1,2)=0, B(1,3)=0, B(2,1)=0, B(2,2)=1, B(2,3)=0, B(3,1)=0, B(3,2)=0, B(3,3)=1, A(3,1)=0, A(4,1)=0, A(4,2)=0, A(3,3)=0, A(3,2)=0 Convergence achieved after 4 iterations. Restrictions identify all cointegrating vectors LR test for binding restrictions (rank = 3): Chi-square(5) 8.636453 Probability 0.124473				
Cointegrating Eq:	CointEq1	CointEq2	CointEq3	
LOGGDP(-1)	1.000000	0.000000	0.000000	
LOGGNS(-1)	0.000000	1.000000	0.000000	
LOGMIM(-1)	0.000000	0.000000	1.000000	
LOGTME(-1)	-0.309239 (0.12163) [-2.54239]	-0.164324 (0.14867) [-1.10531]	-0.619440 (0.07419) [-8.34929]	
C	3.435902	0.364031	-10.00803	
Error Correction:	D(LOGGDP)	D(LOGGNS)	D(LOGMIM)	D(LOGTME)
CointEq1	-0.481784 (0.11497) [-4.19048]	0.496525 (0.35285) [1.40718]	0.000000 (0.00000) [NA]	0.000000 (0.00000) [NA]
CointEq2	-0.113683 (0.08404) [-1.35270]	-0.625923 (0.25793) [-2.42673]	0.000000 (0.00000) [NA]	0.000000 (0.00000) [NA]
CointEq3	0.526726 (0.16096)	-0.539951 (0.47287)	0.000000 (0.00000)	1.142980 (0.29642)

	[3.27234]	[-1.14186]	[NA]	[3.85593]
D(LOGGDP(-1))	-0.307069 (0.18081) [-1.69826]	-0.707141 (0.51439) [-1.37473]	-0.329849 (0.42373) [-0.77844]	-0.874228 (0.41302) [-2.11666]
D(LOGGDP(-2))	0.292095 (0.20209) [1.44540]	-1.136666 (0.57490) [-1.97716]	-0.315687 (0.47358) [-0.66660]	-1.553254 (0.46161) [-3.36485]
D(LOGGDP(-3))	0.519503 (0.20928) [2.48239]	-0.142158 (0.59535) [-0.23878]	0.049451 (0.49043) [0.10083]	-0.711455 (0.47803) [-1.48829]
D(LOGGNS(-1))	0.035586 (0.09474) [0.37563]	0.417749 (0.26952) [1.55000]	-0.215029 (0.22202) [-0.96853]	0.035487 (0.21641) [0.16398]
D(LOGGNS(-2))	0.021998 (0.07119) [0.30902]	-0.291168 (0.20251) [-1.43780]	-0.126082 (0.16682) [-0.75580]	-0.465110 (0.16260) [-2.86039]
D(LOGGNS(-3))	0.004268 (0.09730) [0.04387]	0.281638 (0.27681) [1.01745]	-0.145225 (0.22802) [-0.63688]	-0.226295 (0.22226) [-1.01815]
D(LOGMIM(-1))	-0.073262 (0.19576) [-0.37424]	0.740107 (0.55691) [1.32895]	-0.453164 (0.45876) [-0.98779]	-0.992985 (0.44717) [-2.22060]
D(LOGMIM(-2))	-0.472595 (0.15846) [-2.98234]	0.909873 (0.45081) [2.01833]	-0.203317 (0.37136) [-0.54750]	-0.446666 (0.36197) [-1.23398]
D(LOGMIM(-3))	-0.267973 (0.16019) [-1.67285]	-0.045463 (0.45571) [-0.09976]	-0.154921 (0.37540) [-0.41268]	-0.196924 (0.36591) [-0.53817]
D(LOGTME(-1))	0.236520 (0.08066) [2.93249]	0.136793 (0.22945) [0.59618]	-0.147601 (0.18901) [-0.78091]	0.306791 (0.18424) [1.66521]
D(LOGTME(-2))	0.183829 (0.08760) [2.09841]	-0.095436 (0.24922) [-0.38294]	0.264905 (0.20530) [1.29035]	0.344484 (0.20011) [1.72149]
D(LOGTME(-3))	0.078347 (0.08239) [0.95094]	-0.099947 (0.23438) [-0.42643]	0.142221 (0.19308) [0.73661]	0.255867 (0.18820) [1.35958]
C	0.020409 (0.03437) [0.59372]	-0.014217 (0.09779) [-0.14539]	0.157054 (0.08056) [1.94964]	0.272448 (0.07852) [3.46981]
R-squared	0.880601	0.755280	0.469374	0.799461
Adj. R-squared	0.742834	0.472910	-0.142887	0.568069
Sum sq. resids	0.126569	1.024333	0.695096	0.660405
S.E. equation	0.098672	0.280704	0.231234	0.225389
F-statistic	6.391938	2.674789	0.766624	3.455016
Log likelihood	37.64760	7.327969	12.95029	13.69265
Akaike AIC	-1.492938	0.598071	0.210325	0.159127
Schwarz SC	-0.738567	1.352441	0.964695	0.913498

Mean dependent	0.040219	0.023816	0.089384	0.109418
S.D. dependent	0.194574	0.386640	0.216296	0.342947
Determinant resid covariance (dof adj.)	1.65E-06			
Determinant resid covariance	6.67E-08			
Log likelihood	70.69005			
Akaike information criterion	0.366203			
Schwarz criterion	3.949461			

VECM: ZAMBIA

Vector Error Correction Estimates				
Date: 04/08/16 Time: 19:38				
Sample (adjusted): 1982 2012				
Included observations: 31 after adjustments				
Standard errors in () & t-statistics in []				
Cointegrating Eq:	CointEq1			
LOGGDP(-1)	1.000000			
LGNS(-1)	-0.065028 (0.02251) [-2.88822]			
LOGMIM(-1)	-0.782261 (0.06225) [-12.5660]			
LOGTME(-1)	-0.047466 (0.04724) [-1.00475]			
C	15.93388			
Error Correction:	D(LOGGDP)	D(LGNS)	D(LOGMIM)	D(LOGTME)
CointEq1	-0.787798 (0.22002) [-3.58061]	1.703082 (1.53397) [1.11024]	0.080854 (0.29439) [0.27465]	0.327817 (0.36528) [0.89743]
D(LOGGDP(-1))	0.376723 (0.18398) [2.04764]	-1.829076 (1.28271) [-1.42594]	0.430054 (0.24617) [1.74699]	0.022918 (0.30545) [0.07503]
D(LGNS(-1))	-0.025840 (0.02833) [-0.91216]	0.033173 (0.19751) [0.16796]	0.054050 (0.03790) [1.42595]	0.009453 (0.04703) [0.20099]
D(LOGMIM(-1))	-0.169633 (0.20340) [-0.83398]	2.434065 (1.41814) [1.71638]	0.177621 (0.27216) [0.65263]	0.256295 (0.33770) [0.75894]
D(LOGTME(-1))	0.069508 (0.13619) [0.51039]	-0.346065 (0.94950) [-0.36447]	-0.426967 (0.18222) [-2.34312]	-0.202729 (0.22610) [-0.89662]

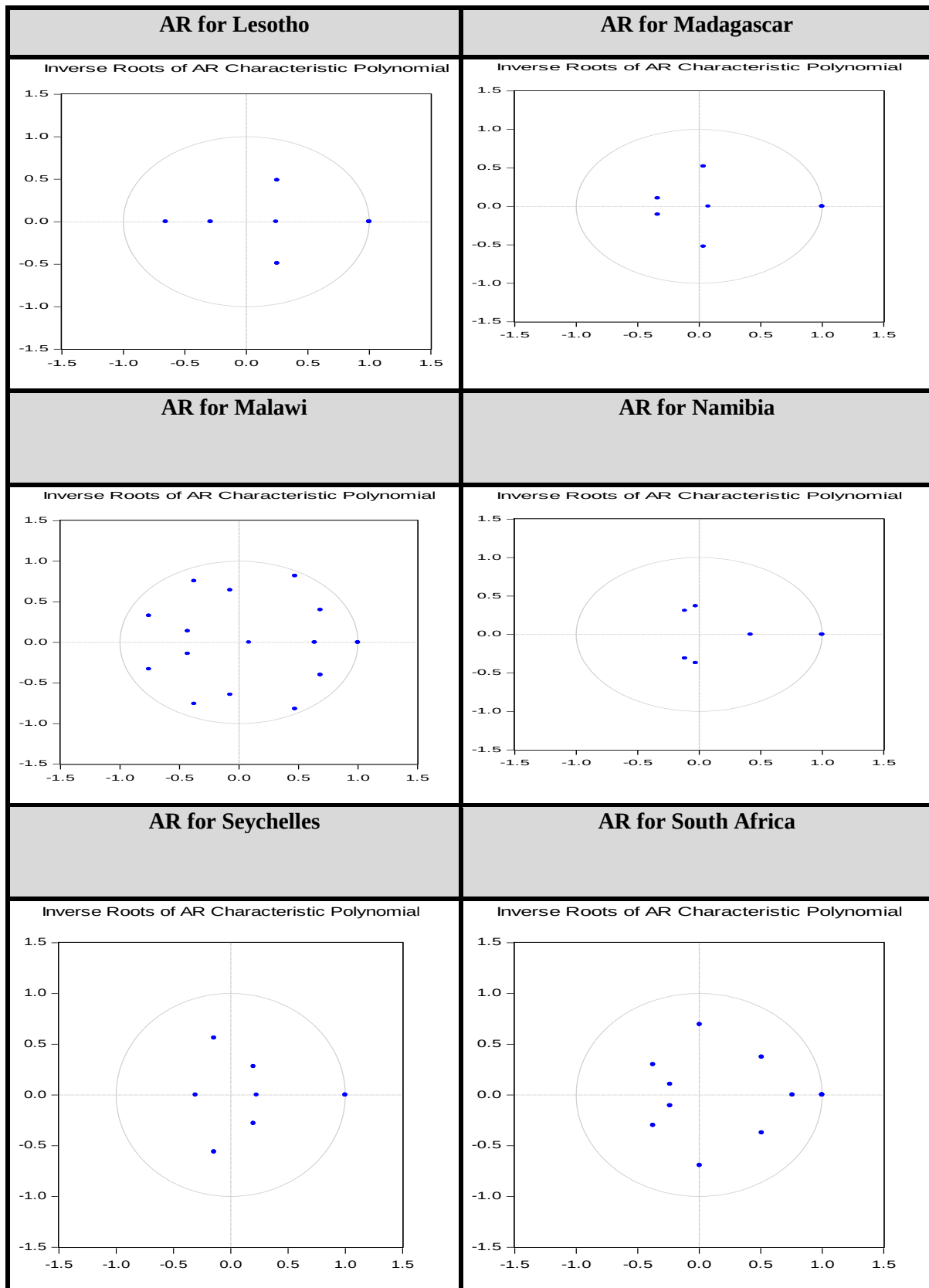
C	0.039076 (0.02888) [1.35316]	0.085495 (0.20134) [0.42464]	0.050124 (0.03864) [1.29723]	0.054743 (0.04794) [1.14182]
R-squared	0.436820	0.133683	0.275803	0.060654
Adj. R-squared	0.324184	-0.039580	0.130963	-0.127215
Sum sq. resids	0.577248	28.05976	1.033459	1.591144
S.E. equation	0.151954	1.059429	0.203318	0.252281
F-statistic	3.878151	0.771559	1.904194	0.322852
Log likelihood	17.75671	-42.44251	8.729587	2.040677
Akaike AIC	-0.758498	3.125323	-0.176102	0.255440
Schwarz SC	-0.480952	3.402869	0.101444	0.532986
Mean dependent	0.052476	0.105078	0.059598	0.058870
S.D. dependent	0.184840	1.039065	0.218101	0.237619
Determinant resid covariance (dof adj.)	2.54E-05			
Determinant resid covariance	1.07E-05			
Log likelihood	1.400442			
Akaike information criterion	1.716101			
Schwarz criterion	3.011315			

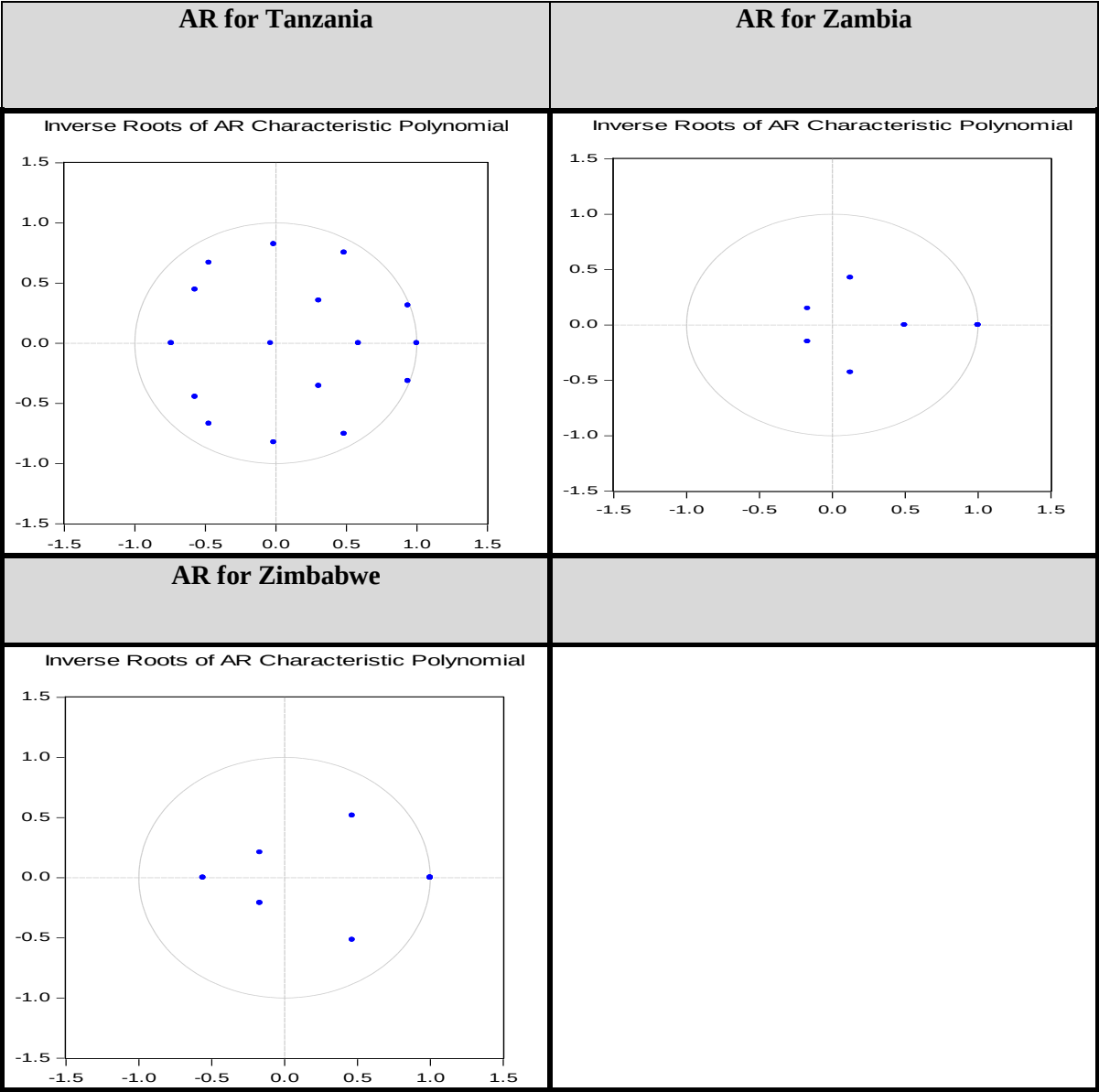
VECM: ZIMBABWE

Vector Error Correction Estimates				
Date: 04/13/16 Time: 21:23				
Sample (adjusted): 1982 2012				
Included observations: 31 after adjustments				
Standard errors in () & t-statistics in []				
Cointegrating Eq:	CointEq1			
LOGGDP(-1)	1.000000			
LGNS(-1)	-0.043944 (0.02751) [-1.59715]			
LOGMIM(-1)	1.495557 (0.29556) [5.06013]			
LOGTME(-1)	-1.425906 (0.26013) [-5.48150]			
C	-26.16475			
Error Correction:	D(LOGGDP)	D(LGNS)	D(LOGMIM)	D(LOGTME)
CointEq1	-0.162988 (0.07225) [-2.25604]	0.485764 (0.44300) [1.09652]	-0.231593 (0.05725) [-4.04559]	0.332373 (0.15797) [2.10406]
D(LOGGDP(-1))	0.349678 (0.19672) [1.77753]	1.041523 (1.20628) [0.86341]	0.509839 (0.15588) [3.27075]	0.000494 (0.43014) [0.00115]

D(LGNS(-1))	-0.019997 (0.03298) [-0.60635]	-0.303767 (0.20223) [-1.50211]	0.032606 (0.02613) [1.24773]	0.023601 (0.07211) [0.32729]
D(LOGMIM(-1))	0.320208 (0.19609) [1.63301]	-2.193396 (1.20238) [-1.82421]	0.439032 (0.15537) [2.82564]	0.345563 (0.42875) [0.80598]
D(LOGTME(-1))	-0.122491 (0.07914) [-1.54769]	1.181267 (0.48531) [2.43404]	-0.192184 (0.06271) [-3.06452]	-0.447038 (0.17305) [-2.58324]
C	-0.001562 (0.02432) [-0.06422]	-0.181315 (0.14912) [-1.21593]	0.027216 (0.01927) [1.41243]	0.077485 (0.05317) [1.45724]
R-squared	0.277027	0.297293	0.563660	0.507154
Adj. R-squared	0.132433	0.156752	0.476393	0.408584
Sum sq. resids	0.415537	15.62450	0.260902	1.986669
S.E. equation	0.128924	0.790557	0.102157	0.281899
F-statistic	1.915890	2.115344	6.458965	5.145148
Log likelihood	22.85154	-33.36732	30.06566	-1.400415
Akaike AIC	-1.087196	2.539827	-1.552623	0.477446
Schwarz SC	-0.809650	2.817373	-1.275077	0.754992
Mean dependent	0.009676	-0.116933	0.030753	0.056668
S.D. dependent	0.138415	0.860905	0.141178	0.366561
Determinant resid covariance (dof adj.)	5.42E-06			
Determinant resid covariance	2.29E-06			
Log likelihood	25.33432			
Akaike information criterion	0.171980			
Schwarz criterion	1.467194			

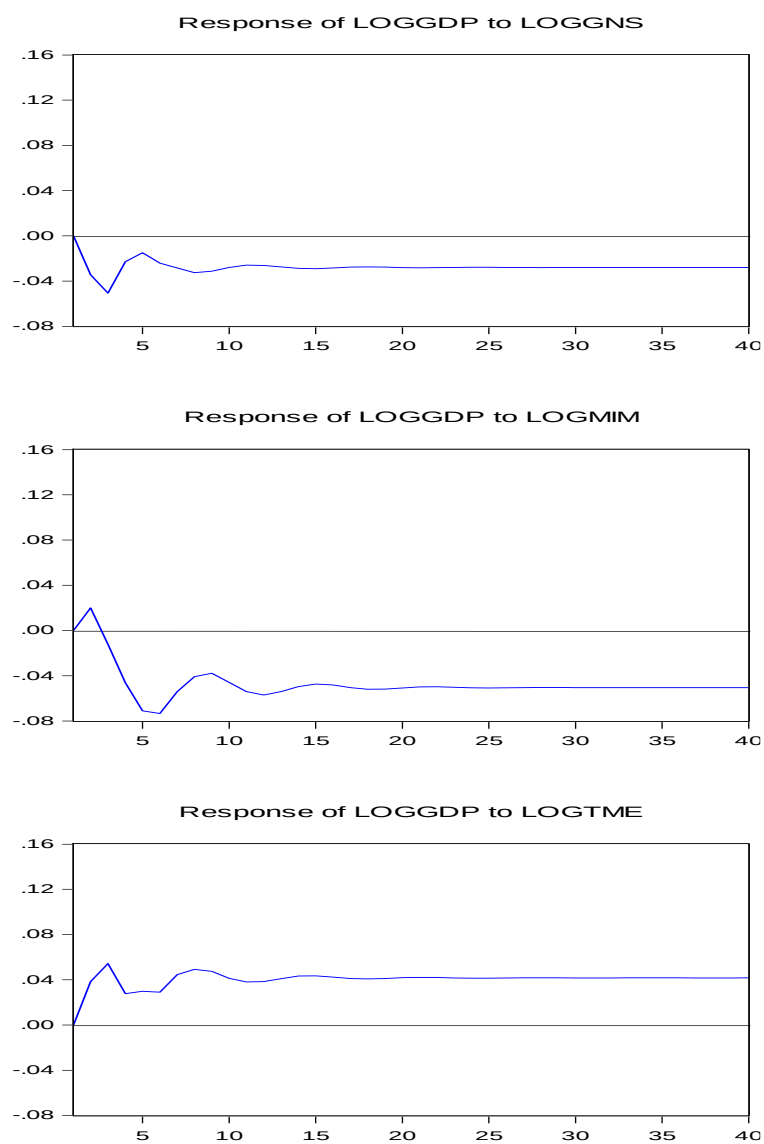
APPENDIX E: INVERSE ROOT OF AR CHARACTERISTICS POLYNOMIA



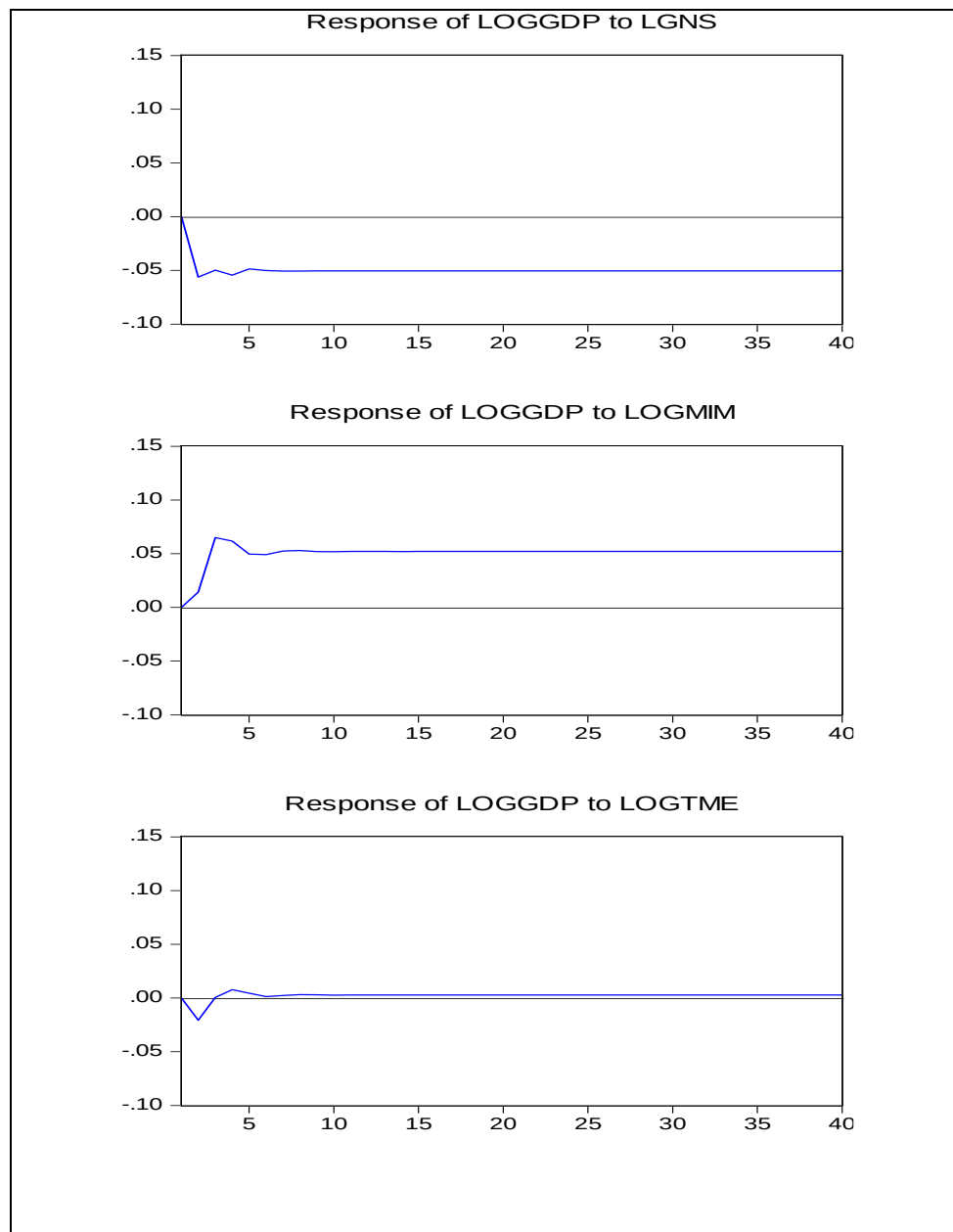


APPENDIX F: IMPULSE RESPONSE FUNCTIONS

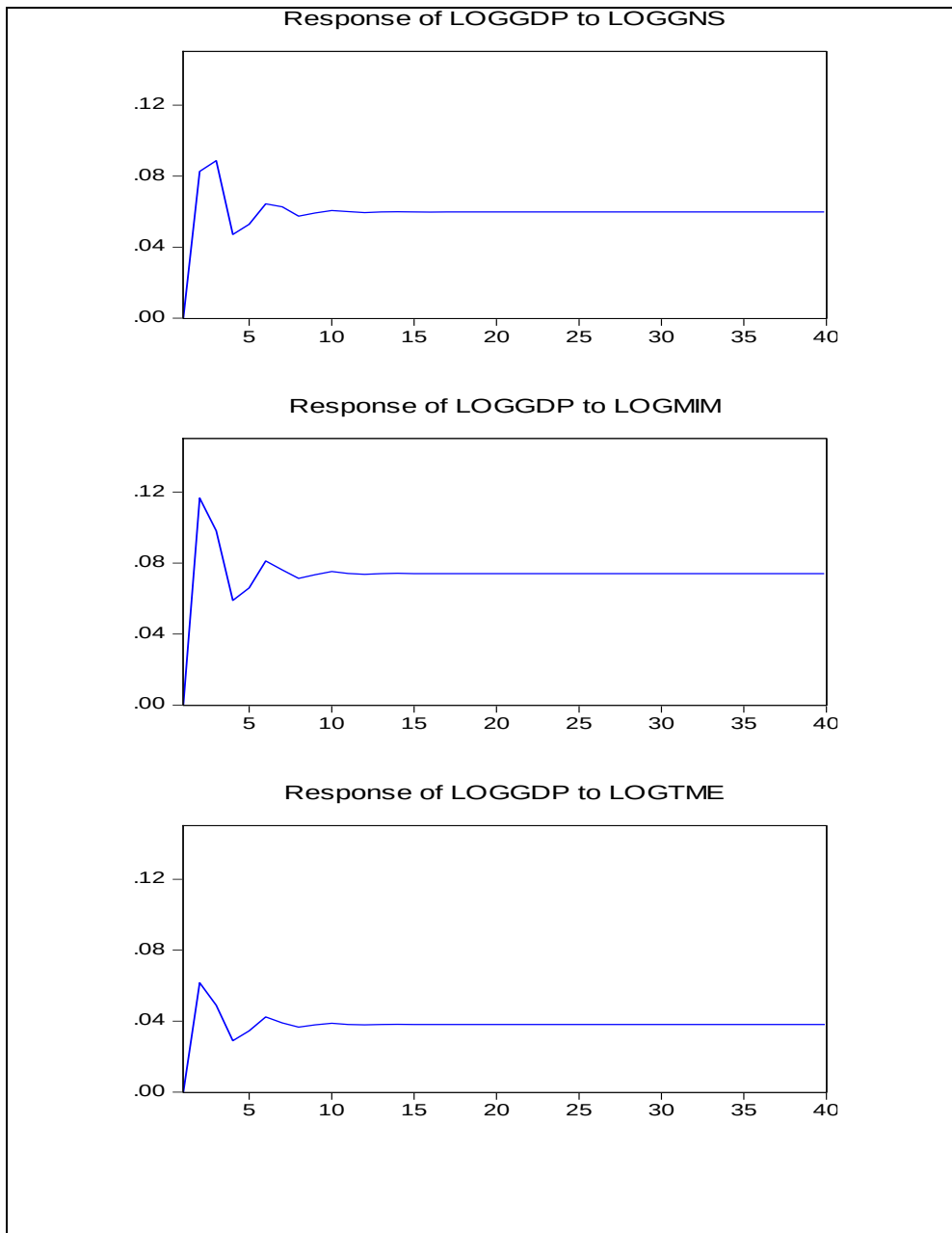
APPENDIX F.1: Cholesky Impulse response for Lesotho



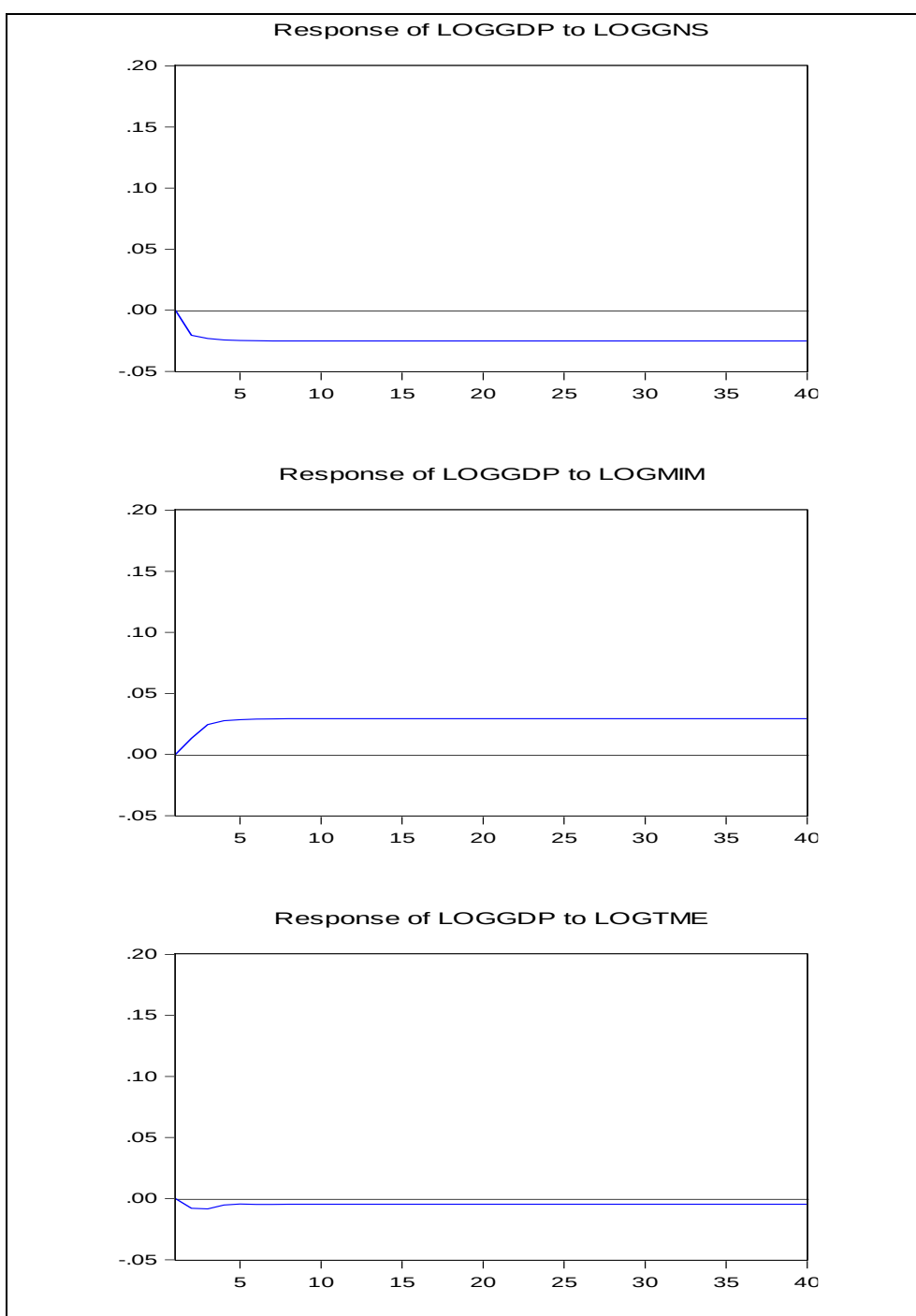
APPENDIX F.2: Cholesky Impulse response for Madagascar



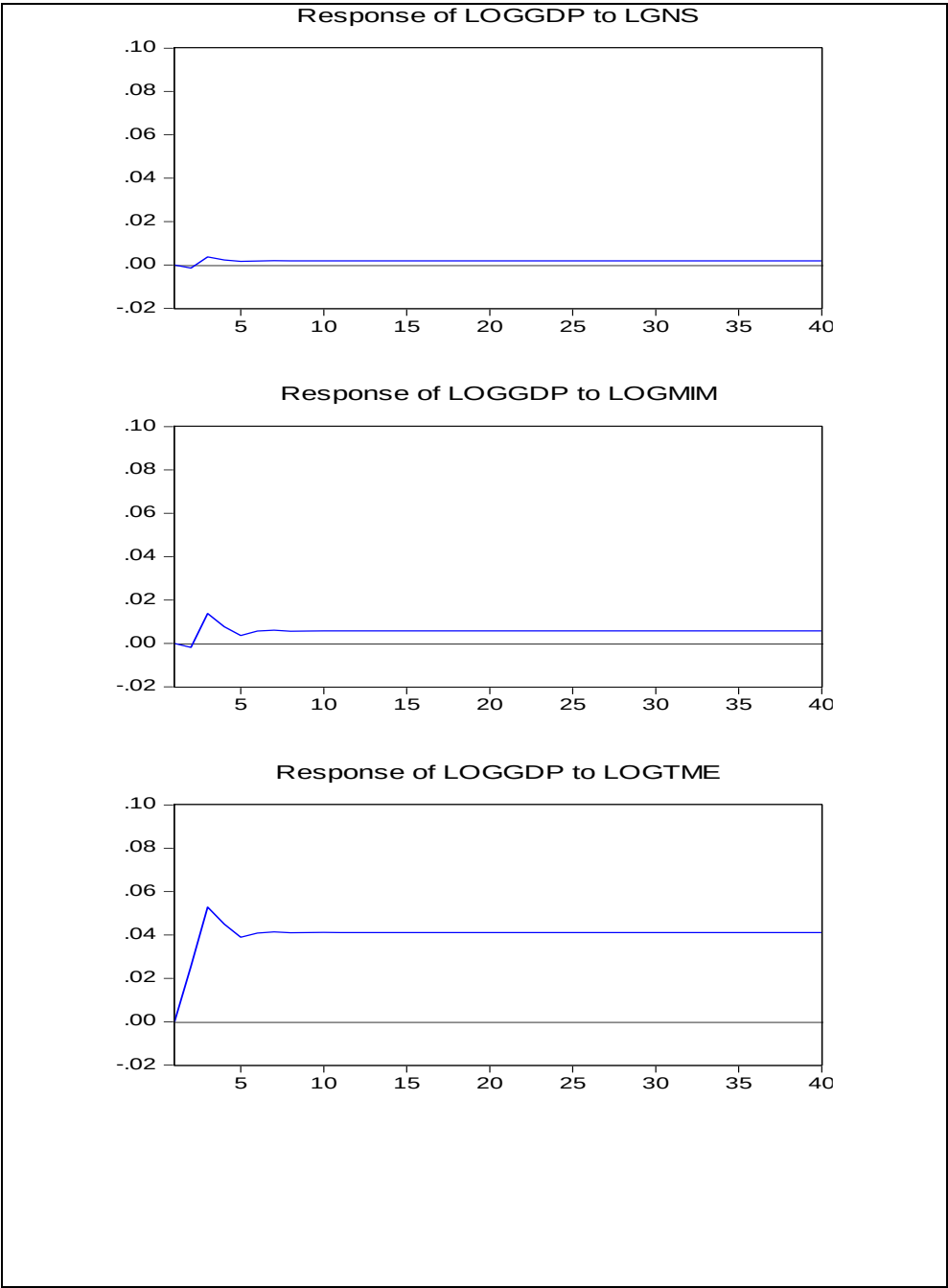
APPENDIX F.3: Cholesky Impulse response for Malawi



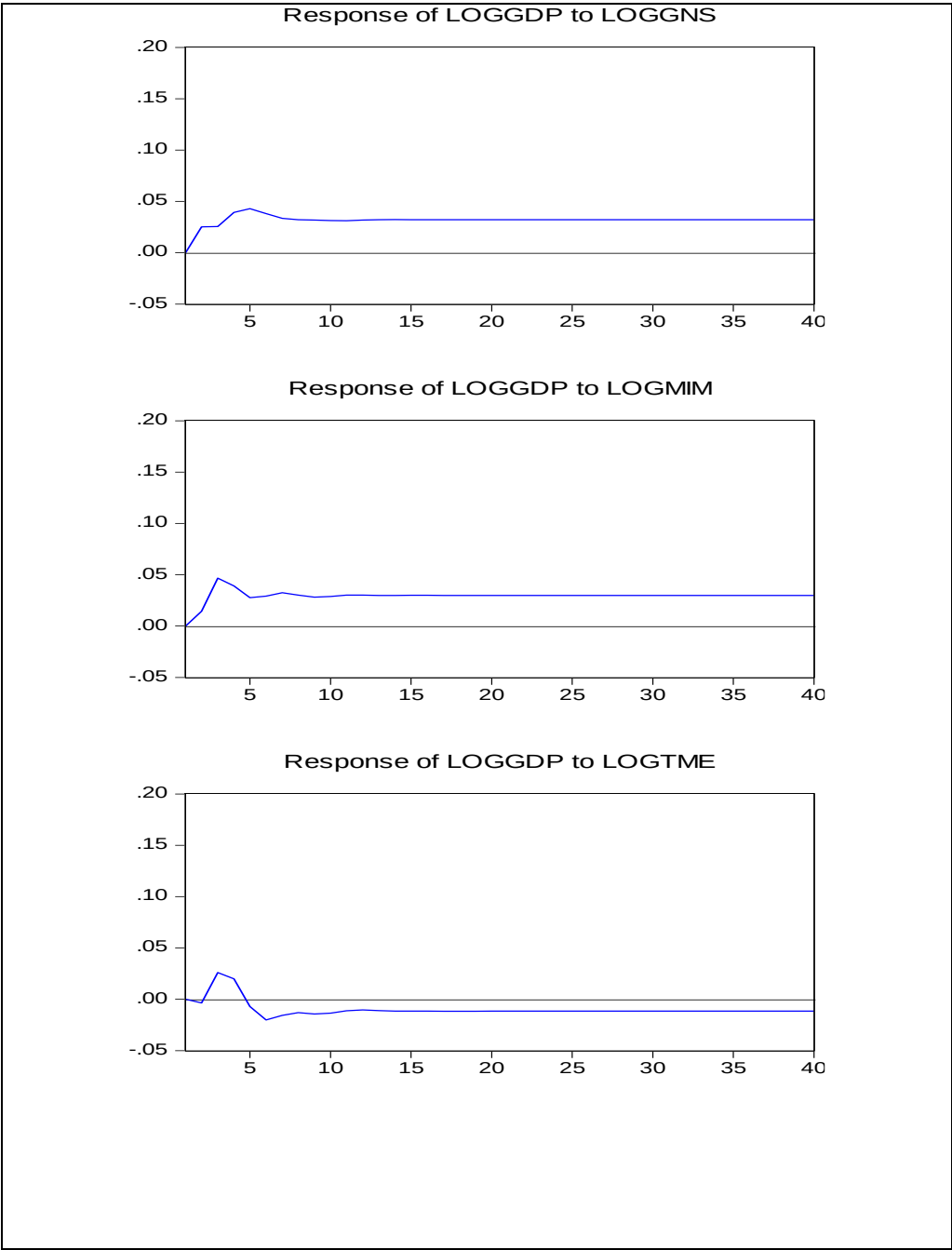
APPENDIX F.4: Cholesky Impulse response for Namibia



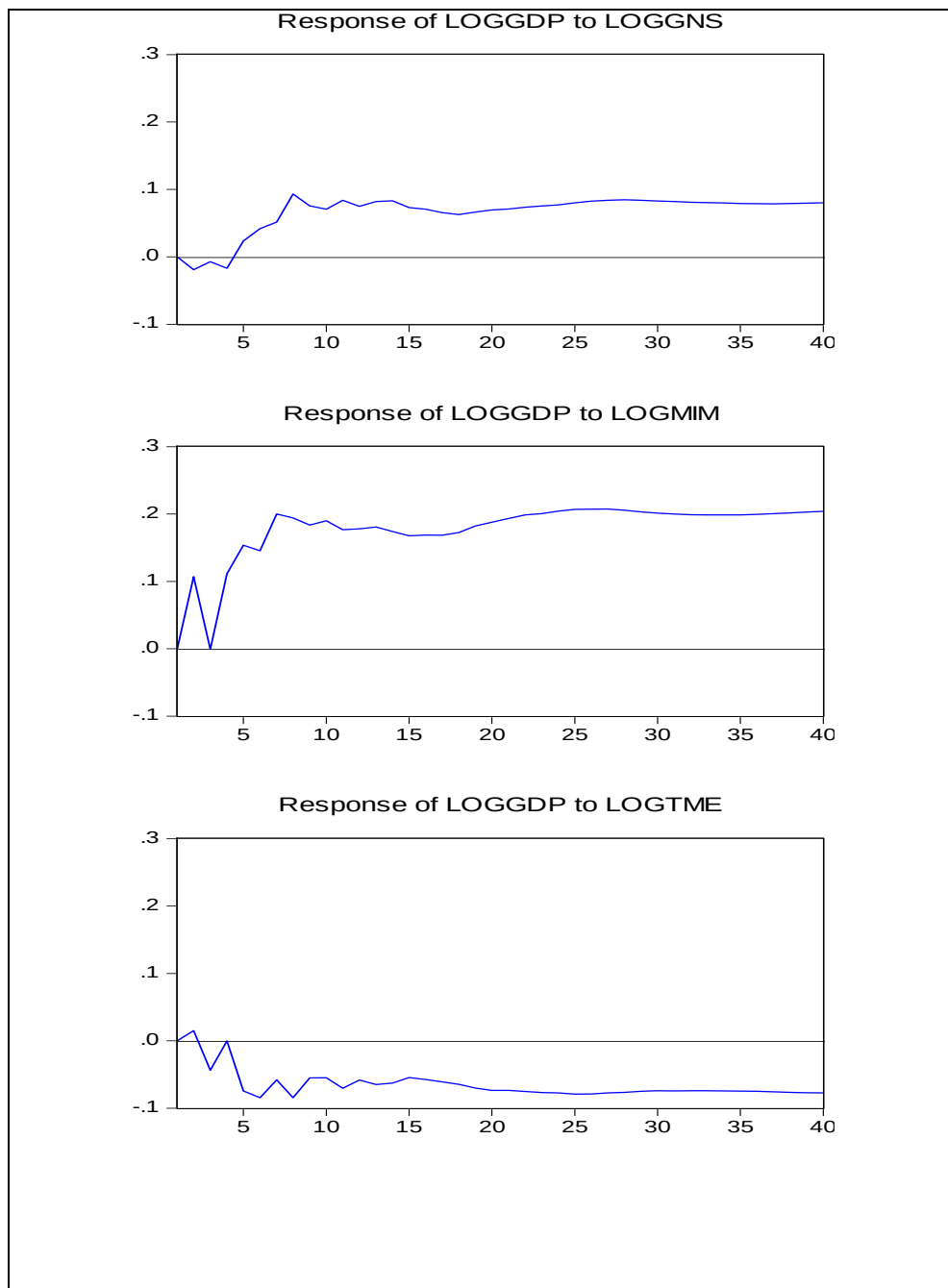
APPENDIX F.5: Cholesky Impulse response for Seychelles



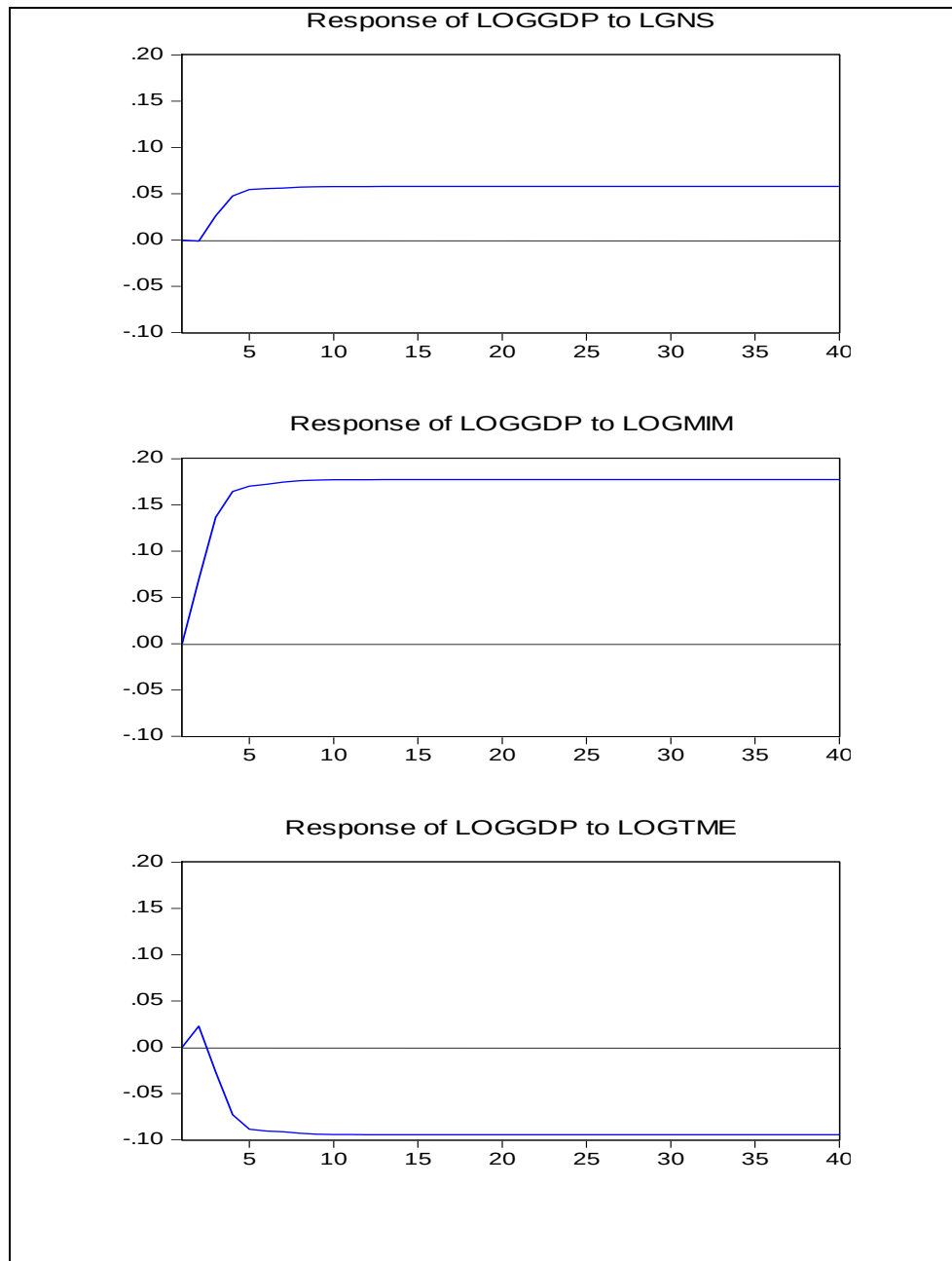
APPENDIX F.6: Cholesky Impulse response for South Africa



APPENDIX F.7: Cholesky Impulse response for Tanzania



APPENDIX F.8: Cholesky Impulse response for Zambia



APPENDIX F.9: Cholesky Impulse response for Zimbabwe

