THE IMPACT OF ECONOMIC COMPLEXITY AND EXCHANGE RATE ON CURRENT ACCOUNT BALANCE: A COMPARATIVE ANALYSIS OF SADC AND ECOWAS COUNTRIES

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THE IMPACT OF ECONOMIC COMPLEXITY AND EXCHANGE RATE ON CURRENT ACCOUNT BALANCE: A COMPARATIVE ANALYSIS OF SADC AND ECOWAS COUNTRIES

by

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DECLARATION

I declare that **"THE IMPACT OF ECONOMIC COMPLEXITY AND EXCHANGE RATE ON CURRENT ACCOUNT BALANCE: A COMPARATIVE ANALYSIS OF SADC AND ECOWAS"** is my work, and all the sources I have quoted have been identified and acknowledged with comprehensive references, and that the work has never been submitted for another degree at any other institution.

Phillip Tumelo Mogashwa	10 June 2022
Full names	**Date**

ACKNOWLEDGEMENTS

Undertaking an academic research project is not a walk in the park, particularly at the master's level. It requires mental strength, determination, discipline, and moral support. As such, I would like to extend my humble gratitude to the following wonderful people for their unwavering support during the study.

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- To my family, father, brothers, and sisters, I would like to thank them for their encouraging words whenever I encounter challenges in life.
- To my late mother, Onica Boshielo, I express my gratitude for the unconditional motherly love she showed me. I believe you are continuing to watch over me. Rest easy, *ngwetši ya ditau*, you are much loved.
- Finally, and most importantly, I thank the Almighty God for giving me the strength to continue studying despite all of life's trials and tribulations.

ABSTRACT

The study compares the impact of economic complexity and exchange rates on current account balances in the SADC and ECOWAS regions from 1997 to 2018. Due to data availability constraints, only five SADC countries and four ECOWAS member states represent the relevant regions. The study used the panel Autoregressive Distributed Lag (ARDL) technique, Granger causality, variance decomposition, and impulse response tests. Two variables, foreign direct investment and exports of goods and services were included as control variables in the models of the study. The empirical evidence revealed similar long-run results for both economic regions in terms of the impact of economic complexity, exchange rate, and foreign direct investment. The findings also revealed that both economic complexity and foreign direct investment have a negative impact on the current account, whereas the exchange rate has a positive relationship with the current account balance. Most notably, the exposition of the positive impact of the exchange rate, in the long run, is consistent with the long run proposition of the J-curve theory but was found to be contrary in the short run. Exports of goods and services, on the other hand, have been shown to have a negative impact on the SADC region's current account balance while having a positive impact on the ECOWAS region.

The short run estimates show contradictory results across regions. Granger causality test results revealed three one-sided causalities for the SADC grouping and two bidirectional causalities between exports and exchange rates and exports and foreign direct investment. Correspondingly, Granger causality tests for ECOWAS revealed bi-directional causality between exports and foreign direct investment. The generalised impulse response function results for each region are consistent with long run estimates, while variance decomposition revealed that the shocks from current account own innovations account for considerable fluctuations in both SADC and ECOWAS. The study recommends that the complexity of the local economy's structures and the productive capacity of the regions be improved to reap benefits from the products they export.

KEY CONCEPTS: Current account balance, Economic complexity, Exchange rate, SADC, ECOWAS

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ABBREVIATIONS AND ACRONYMS

AfCFTA – African Continental Free Trade Area

AIC – Akaike Information Criterion

ARDL – Autoregressive Distributed Lag

ECOWAS – Economic Community of West African States

FDI - Foreign Direct Investment

FPE – Final Prediction Error

HQ – Hannan-Quinn

NTT – New Trade Theory

PP – Phillips Perron

SADC – Southern African Development Community

SC – Schwarz Information Criterion

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CHAPTER 1

ORIENTATION TO THE STUDY

1.1 INTRODUCTION AND BACKGROUND

The current account balance of the balance of payment records a country's net trade transactions, net earnings on cross-border investments, and net transfer payments over a given period (Hakim and Sriyana, 2020). This balance is regarded as an essential predictor of a country's external economic stability and domestic economy's ability to compete actively in the international trade market. Muli and Ocharo (2018), for example, state unequivocally that a persistent current account balance deficit indicates external instability as well as the domestic economy's inability to compete in an increasingly globalised world. Consequently, the state of the current account balance for several countries has been meticulously studied, and numerous factors have been proposed by scholars as major determining factors of trends in current account balance. Recent studies in this area include the works of Francis, Paul, and Christophe (2020) and Bamogo (2020), both of which were conducted in the context of selected landlocked African countries and Sub-Saharan African countries, respectively. They both emphasised that most African countries have large and unsustainable current account deficits for a variety of reasons, including a weak financial system, stagnant economic growth, an uneasy political environment, and weak institutional developments, among others.

Accordingly, Ncanywa and Kaehler (2018) believe that large and unsustainable deficit risks tend to send the wrong signal to international investors and prevent the chance of smooth economic affluence. This is because long current account deficits imply that the concerned domestic economy is not developing, and investors may begin to wonder if the economy will be able to deliver returns on their investments. However, it is worth noting that a temporary current account deficit does not pose a significant threat to the economy's stability because it just represents a temporary misallocation of resources to countries with superior resource efficiency.

However, the African continent has made a concerted effort to increase its trade competitiveness. African countries, for example, have agreed to economic liberalisation through the implementation of the African Continental Free Trade Area (AfCFTA) in 2019. According to Songwe (2019), the primary goal of AfCFTA is to increase intra-African trade, hence improving the continent's trade competitiveness. As a result, it might be argued that by promoting intra-trade, the continent's persistent and unsustainable current account deficit will be reduced, if not eliminated. The AfCFTA agreement follows the footsteps of ECOWAS trade agreements, which aim to emancipate the region's external stability. Five ECOWAS member states founded the West African Monetary Zone (WAMZ). The WAMZ alliance's purpose is to create a single currency known as "Eco" that would act as a regional trading currency. This will serve to increase the ease with which these countries trade among themselves, as well as their competitiveness in the international trading arena. Similarly, the SADC grouping has various trade agreements targeted at increasing regional trade competitiveness, improving the level of their economic complexity, foreign exchange rate and reducing large current account deficits. In the case of the SADC region, one example is the SADC treaty and protocols, which were enacted in 1992. These accords are all aimed at bolstering the concerned regions' economic external stability, and they are particularly relevant to the study's focal point.

The current account balance of a country's balance of payment communicates a significant message about its competitiveness in the global market (Muli, and Ocharo, 2018). This is because the current account records international transactions such as exports, imports, and uniliteral transfers among others that the country makes with the rest of the world. As such, a surplus suggests that the country is competitive and can market its commodities and services actively, whereas a deficit suggests otherwise. Thus, the current study conducted a comparative analysis of the extent and nature of current account balance by studying the impact of economic complexity (ECI) and the exchange rate.

1.2 STATEMENT OF THE PROBLEM

The economic data from the World Bank database (2019) show that the current account deficit has been a consistent feature of most of the SADC and ECOWAS member states. Both Figures 1.1 and 1.2 depict a sampling trajectory of the current account balance for both the SADC and ECOWAS economic regions from 2008 to 2018. Figure 1.1 illustrates that the SADC area had a deficit throughout 11 years, with Mauritius having the worst. Similarly, Figure 1.2 reveals that most of the ECOWAS member states also experienced the current account deficit, with only Nigeria showing a surplus for most of the period. The two figures depict the status quo, which partially elucidates the problem statement and validates the study's undertaking.

Figure 1.1: Trajectory of the current account balance SADC region

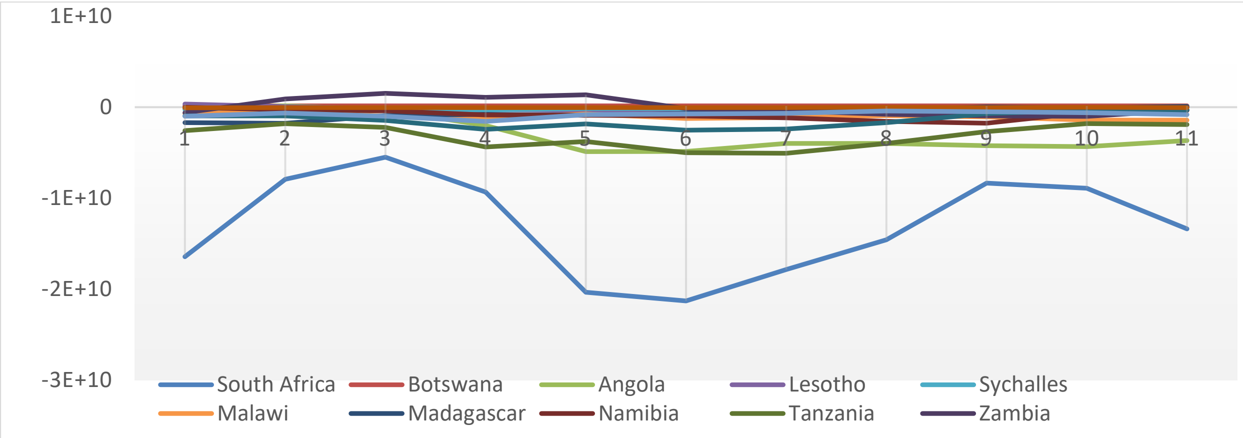
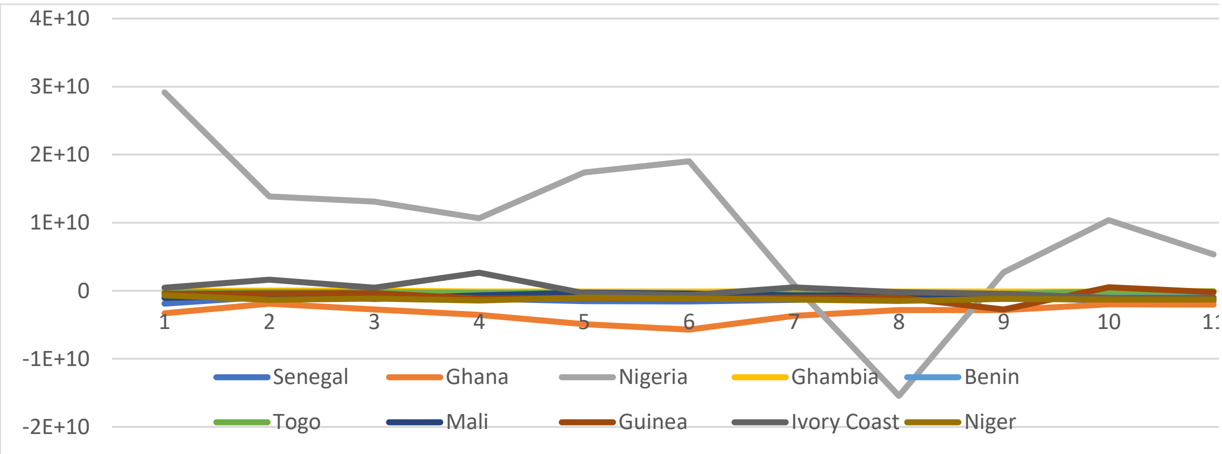


Figure 1.2: Trajectory of the current account balance ECOWAS region



Source: Author's computation based on data obtained from the World Bank database

Based on figure 1.2, only Nigeria experienced a surplus on its current account, while other countries recorded prolonged and unsustainable deficit. The trajectory is evidence that most countries in these two regions have a problem of unsustainable current account deficit. According to Moussa (2016), a large and unsustainable current account balance deficit tends to perpetuate the amount of the country's current and future debt burden and renders the country more vulnerable to a financial crisis.

Several researchers contend that multiple factors may cause a deficit in the current account. For instance, Eita, Manuel and Naimhwaka (2018) and Gebremariam (2018) identified budget deficit as the leading cause of the current account deficit in Namibia between 1990 and 2016. On the other hand, Lectard and Rougier (2018) contend that less export diversification and product sophistication are the negative determinants of a deficit in trade and current account balance in developing countries.

Furthermore, in terms of the Observatory of economic complexity (2019), the African countries are ranked low compared to more industrialised economies when it comes to the level of economic sophistication. Most of these countries have low level of both product and economic complexity. The reason is that these economies rely more on agricultural and extractive raw materials for exports and growth. Such commodities are exported as raw as they are with little knowledge/sophistication embedded in them. For this reason, these countries are not reaping the maximum benefits and exchange reserves that the global market can offer for their export commodities. Thus, the study incorporated economic complexity in the regression, which is relatively low for both SADC and ECOWAS member states, to evaluate how complexity affects the current account.

1.3 RESEARCH AIM AND OBJECTIVES

1.3.1 Aim

The study intends to provide a comparative analysis of the impact of economic complexity and exchange rate on current account balances in the SADC and ECOWAS regions from 1997 to 2018.

1.3.2 Objectives

The following objectives are derived from the aim of the study:

- To investigate the short run and long run relationships between current account balance, economic complexity, and exchange in the SADC and ECOWAS regions.
- To examine the existence and nature of causality among the current account balance, economic complexity, and the exchange rate.
- To forecast economic shocks of current account balance, economic complexity, and exchange rate for the next 10-year period.

1.4 RESEARCH QUESTIONS

- Is there a short-run and long run relationship between the SADC and ECOWAS regions' current account balance, economic complexity, and exchange rate?
- What is the nature of causality between current account balance, economic complexity, and exchange rate?
- What will be the forecast estimates of the current account balance, economic complexity, and exchange rate in the SADC and ECOWAS regions for the foreseeable 10-year period?

1.5 DEFINITION OF CONCEPTS

For the purpose of this study, model variables are defined as follows:

- **Current account balance**: One of the accounts in a country's balance of payments that indicates the country's net trade balance, net primary income, and net unilateral transfers for a given period (World Bank, 2019).
- **Economic complexity**: Refers to the measure of the sophistication, expertise, and technical capabilities contained in a country’s productive capability. It is an index that measures the knowledge embedded in a country’s productive processes (Mealy, Farmer, and Teytelboym, 2018).
- **Exchange rate:** The rate at which one currency of a country is exchanged for another; that is, the relative price of a nation’s currency in terms of another country’s currency (Yang and Zeng, 2014).
- **Foreign direct investment:** Net inflows of tangible investment in a long-term management interest (10% or more of voting stock) in a company that

operates in a different economy than that of the investor's home country (World Bank, 2019).

- **Exports:** Exports of goods and services are defined as the value of all goods and other market services provided to the rest of the world by the domestic economy and, among others, include transactions such as merchandise from the exporting country to the rest of the world, freight, insurance, transport, royalties, licence fees, and other services, personal and government services (World Bank, 2019).

1.6 ETHICAL CONSIDERATIONS

The author solemnly declares that protocols and ethics as stipulated by the University are followed. This study does not contain other person's data, pictures, graphs, or information without appropriate acknowledgement. Furthermore, the author adhered to the university's plagiarism standard of 15% as the similarity index obtained from Turnitin report is 15%.

1.7 SIGNIFICANCE OF THE STUDY

Exchange rate, foreign direct investment, and economic growth are all commonly identified factors. However, there are some inconsistencies on how these factors affect the current account balance. As such, the study aims to contribute to the regional comparative analysis debate (SADC and ECOWAS regions) by employing the panel ARDL methodology, to which few studies have employed in the context of SADC and ECOWAS region thus far. Pesaran, Shin and Smith (2001), state that the panel ARDL approach has several advantages over other econometric techniques. To begin, they claim that the panel ARDL technique can capture both short and long run estimates at the same time. Second, they contend that the technique can be used even with a relatively small sample size of at least 21 observations. Third, the ARDL method can be used on the model that integrates at different orders.

Thus, the novelty of the analysis is that it integrates economic complexity as one of the determining factors of the level of current account balance, thereby adding more importance to the current account balance evaluation literature. This seems to be critical because economic complexity is a relatively new economic concept that emphasizes the sophistication of products and knowledge as factors that could affect various sectors of the economy. The study also seems to be a pioneer in conducting a comparative analysis of SADC and ECOWAS economic integration.

It is believed that when completed, the study will provide some light on the importance and impact of economic complexity on current account balance for both SADC and ECOWAS regions. Therefore, the study's findings are expected to raise awareness among policymakers and further the debate among the academics about the importance and/or ways of maintaining a sustainable current account balance and improving the sophistication of the materials produced from the two regions as well as improving their economic structures.

1.8 STRUCTURE OF THE STUDY

The research is organised as follows. chapter 1 outlines the overall background and introduction to the study, as well as the study's intended aim. chapter 2 provides a brief overview of the two regions before delving deeper into the analysis of the two regions using econometrics models. The theoretical and empirical literature is presented in chapter 3. Theoretical literature explains the economic theories from which the study derives its conclusions.

Empirical literature, on the other hand, is organised in terms of the study's objectives and includes related evidence of results obtained by other scholars using various methods of estimation. The methodological procedure used in the study, as well as the findings and interpretation, are sketched out in chapters 4 and 5 respectively. Finally, chapter 6 concludes the study by summarising the key findings of the study, proposing policy recommendations as well as the study's limitations and areas for further research. The Appendix section contains all proof of the results.

CHAPTER 2

OVERVIEW OF THE SADC AND ECOWAS REGIONS AND ANALYSIS OF THE SELECTED COUNTRIES

2.1 INTRODUCTION

This chapter outlines brief background information on the two economic regions and further provides an overview of individual member states selected to represent each region by highlighting the linkages among variables of model regressions.

2.2 Background information on the southern african development community

SADC region is an intergovernmental grouping of 16 countries that are found in the Southern part of Africa and is headquartered in the capital city of Botswana, Gaborone. Generally, all countries in the region are classified as developing nations. According to Makochekanwa (2013), the region has been showing the prospect of economic developments which ranges between 5% and 8%. The tourism and agricultural sector were put forward by Makochekanwa (2013) as the primary contributing factors to economic growth in SADC. The betterment of economic growth will be instrumental to the overall current account stability of the region. Furthermore, several studies show that there is a positive economic relationship between economic growth and current account balance/external stability in the region. For instance, a study by Mavodyo, (2017) and Sissoko and Sohrabj (2010) flagged that stable economic growth had a positive impact on the current account balance for certain SADC countries. It then becomes appropriate to analyse the economic settings of the individual countries selected to represent each region before the actual estimation outlined in chapter 5. An overview of individual SADC countries selected in the study is provided below starting with South Africa, followed by Angola, Madagascar, Tanzania, and Zambia in that particular order.

2.2.1 South Africa

In the post-apartheid regime, the South African economy has shown growth potential and most arguably together with the Nigerian economy enjoyed economic dominance in the continent (Ebegbulem, 2013). The country's economy is undoubtedly the largest in the SADC region. However, despite its gigantic economic image in the continent, the country continued to face trials and tribulations in its quest of growing its economy and some of the challenges include political mishaps, high unemployment rates, and high levels of inequality. The country gained momentum in its early stages of democratic dispensation and portrayed not only domestic but also external stability as compared to its peers in the continent. Various studies have proven that sustainable economic growth is positively related to credible current account balance. For example, research by Sanni, Musa and Sani (2019) showed that growth measured by real GDP served to enhance the balance on the current account in Nigeria and many other developing nations in Africa. When the domestic economy shows sound production capabilities to meet both domestic and international demand, it can be expected that such an economy will be able to mitigate the exorbitant inflow of imports as compared to export. However, it is imperative to assess the composition of the country's exported products and services that a country produces and offers to the world and reflect on the sophistication or knowledge embedded in the production process of such commodities. Accordingly, the greater the sophistication embedded in the production process, the more likely it is that the country will have sustainable economic growth and current account balance. Table 2.1 shows the top five commodities that the South African economy exported to the rest of the world in 2018.

Table 2.1: Composite of South African exports

Product/service type	**Gross export value (in billions)**	**Percentage share of total exports**	**Product complexity index (PCI)**
1. Gold	$16.80	13.65%	-2.24
2. Travel and tourism	$10.90	8.83%	-0.694
3. Platinum	$8.19	6.65%	1.24
4. Coal	$5.85	4.75%	-1.33
5. Diamonds	$5.24	4.26%	-1.11
6. Iron ores and concentrates	$5.09	4.14%	-1.86

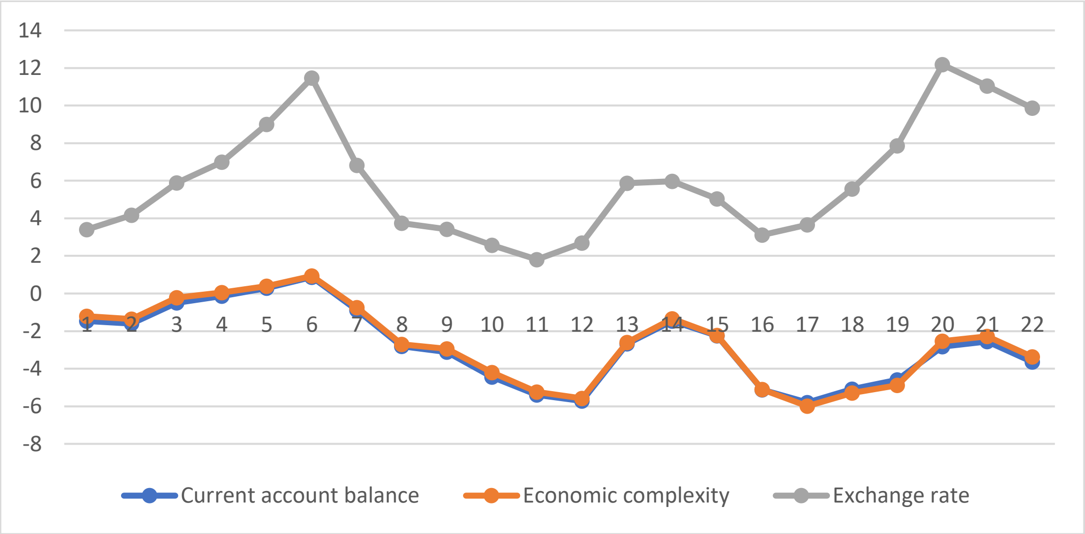
Source: Atlas of economic complexity (2020)

According to the Atlas of economic complexity (2020), the South African economy recorded total gross exports of $123 billion (measured in Us dollars). It is exposed in table 2.1 that gold accounted for a larger portion of total exports in South Africa followed by travel and tourism, platinum, coal, diamonds, and iron ores in that particular order. These products accounted for 42.285 of total exports in 2018. However, most notably only platinum shows a positive product complicity index value thus highlighting the low economic complexity of the composition of exports of the country.

2.2.1. The linkage between current account balance, economic complexity, and exchange rate in South Africa

This section offers the trajectory of current account balance, economic complexity, and exchange rate together with the linkage among the variables to gain insights into how these variables have been trending with one another over time. Figure 2.1 illustrates the trajectory of the current account balance as a percentage of gross domestic product, economic complexity, and exchange rate for South Africa for 22 years period starting from 1997 to 2018.

Figure 2.1: Trends in the current account, economic complexity, and exchange rate in South Africa



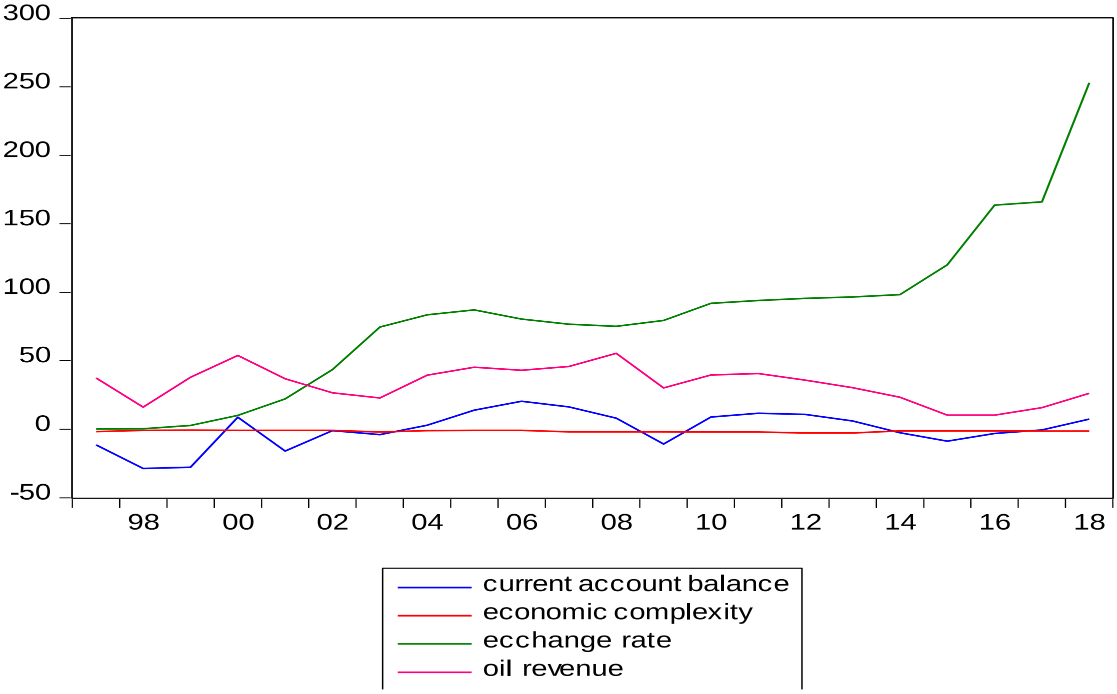
Source: Computation based on data obtained from the World Bank database

The trajectory of the ratio of the current account balance to GDP and economic complexity in figure 2.1 shows that they have taken the same shape between 1997 and 2018 as indicated by the movement of blue and orange lines moving together across the period. This suggests that there is a positive economic relationship between the current account and economic complexity. Exchange rates have also shown quite a similar positive relationship wherein appreciation of the South African currency (the Rand) was trailed by improvements in current account balance and depreciation was also occupied by worsening of the current account balance.

2.2.2 Angola

Angola is a country in southwestern Africa located on the Atlantic coast of central Africa between Namibia and the Republic of Congo. Like many other African countries, Angola is well-endowed with minerals/natural resources ranging from oil, diamonds, iron ore, manganese, and tin. Despite its wealth in resources, the country is still faced with some major economic challenges. The World Bank Database (2019) revealed that for the period spanning from 1997 to 2018, Angola has witnessed a deficit in its current account balance for most parts of the years, particularly between 1997 and 2004. However, from 2004 to 2018 the country has shown signs of sound external stability as it has recorded a surplus on its current account. Improvements in current account balance after 2004 in Angola could be associated with the results of several macroeconomic variables. Likewise, Da Rocha (2012) contemplates that several factors such as global economic growth, stable oil price, and staggering government policies have contributed positively to both Angolan economic growth and stable current account balance between 2002 and 2008. Da Rocha (2012), further states that the Angolan economy became more reliant on the international market and strong performance in the reference market helped the country to leverage public investment projects and stimulate both domestic and international private investments thereby allowing it to benefit from the international interaction with the rest of the world. Figure 2.2 illustrates the linkage between current account, economic growth, economic complexity, oil price, and exchange rate in an attempt to diagnose how these variables have been fluctuating together between 21997 and 2018 in Angola.

Figure 2.2: Trends in the current account, economic complexity, oil revenue, and exchange rate in Angola



Source: Computation based on data obtained from the World Bank database

According to Madakufamba, et.al (2017), Angola is considered to be the largest oil producer in the SADC regions with an estimated crude oil of 5.4 billion barrels of oil constituting 96% of SADC's total estimated proven crude oil reserves. The country's economic domestic and external stability is somehow tied up to the stability of the international oil market that is chiefly operated by the Organization of the Petroleum Exporting Countries (OPEC) grouping to which Angola is one of the member states. Figure 2.2 proves that the current account was also largely influenced by fluctuations in Angolan oil revenue. Trends in current account balance as a percentage of GDP shown by a blue line take the same trajectory of trends in oil revenue/rents (indicated by the pink line) throughout the period. For instance, from 1998 the data shows that oil revenue took upward trend reaching a peak in 2000 and current account showed a similar trend as well. Reading from figure 2.2 it is again unveiled that current account balance was not correlated to economic complexity and exchange rate as trends in these variables wander apart from each other.

2.2.3 Madagascar

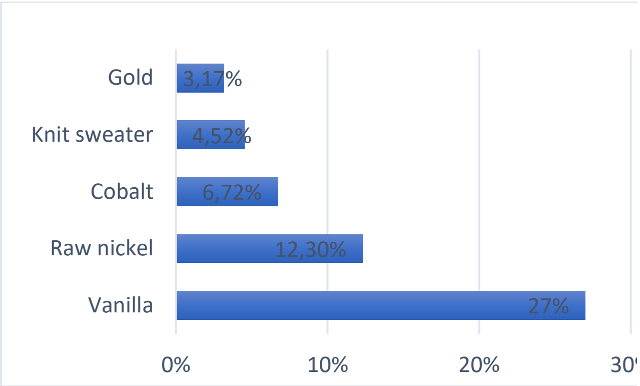
Madagascar is considered to be one of the less developed economies in the sub-Saharan region and for some years, the country continued to demonstrate a downward trend since its independence in 1960 (Razafindrakoto, Roubaud, and Wachsberger, 2020). In terms of international trade, the country is showing positive signs of positioning itself and participating in the global market. According to the Observatory of economic complexity (2021), Madagascar recorded total exports worth $3.5 billion in 2018 while total imports amounted to $4.21 billion thereby revealing that the country experienced a deficit in its trade balance. However, the country recorded a surplus on its overall current account balance as shown by the World Bank database (2019).

Figure 2.3 provides a graphical representation of the top five exports and imports commodities for the Malagasy economy together with the top five destinations and origins respectively of the concerned commodities in 2018. Vanilla constituted 27% of total exports with gold being the 5th most exported good accounting for 3.17%. The most imported good for Madagascar was rice recording 45.90% followed by cement, refined petroleum, bedspreads, and netting. Most notably is that the major trading partners for Madagascar are situated in Europe rather than in Africa or even in the SADC region itself. 20.3% of Malagasy exports were acquired by France while 23% of imports entering the borders of the country were from China.

Figure 2.3: Composite, destination and origin of Malagasy's exports and imports in 2018

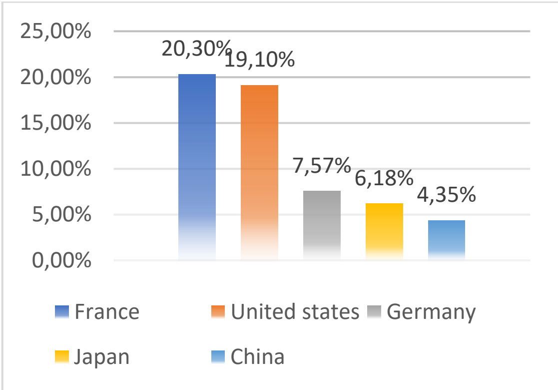
PANEL A

Top five export products



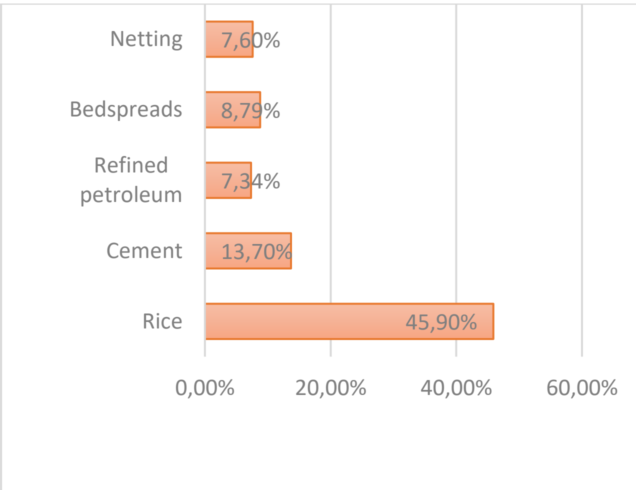
PANEL B

Top five export destinations



PANEL C

Top five import product



PANEL D

Origin of top five import products

Source: Computation based on data obtained from the World Bank database

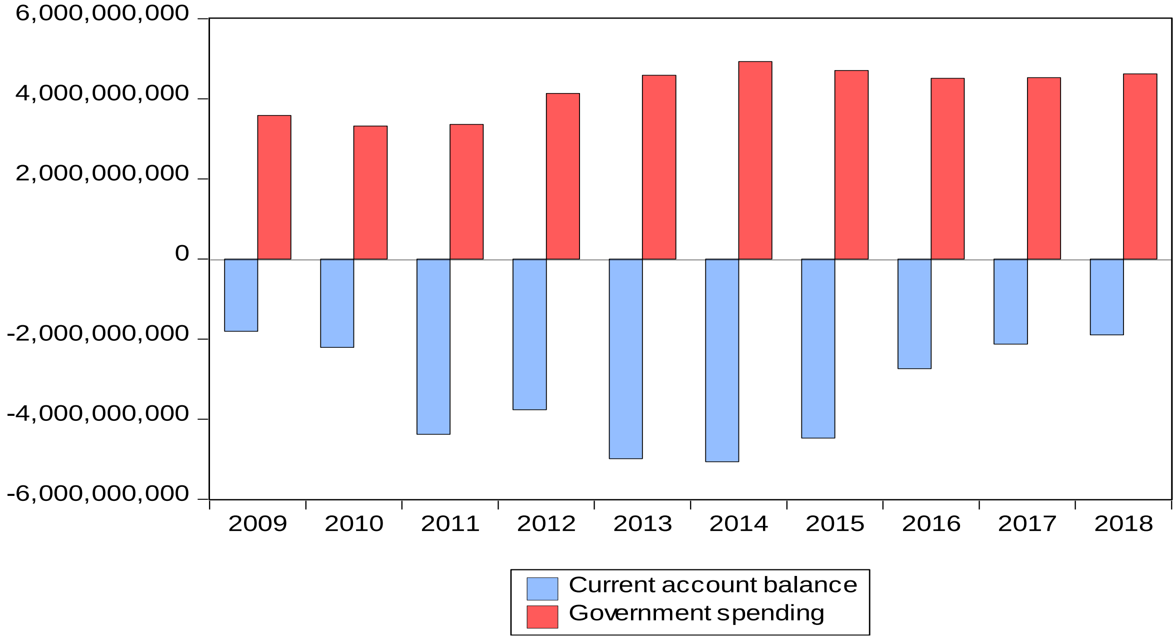
Moreover, throughout the period under review (1997 to 2018), Madagascar experienced a continuous deficit with exception of 2018. The deficit widened by an average of 49.24% between 1997 and 2017. This inexorable current account deficit was among others linked to a weak exchange rate, persistent political instability, and poor governance (World Bank, 2017). A report by International Development Association (2018), also hinted that a weak and continuous deteriorating currency led to excessive external debt which ultimately worsened Malagasy external stability.

2.2.4 Tanzania

Tanzania transited to a market economic system in the mid-1980s with the main objective of liberating the economy through the removal of constraints on private sector activities and obliterating controls on prices and exchange and interest rates (Utz, 2007). Utz (2007) orated that this transition has triggered increased foreign direct investment inflow and better economic development. Despite the transition to the market system and economic advancements, Tanzania continued to run a current account balance deficit as early as 1988 through to 2018. The country's current account deficit as a percentage of GDP was -6.99% in 1988 which amounted to 356 538 763 US dollars and the deficit continued to worsen thus reaching an all-time worst deficit mark of 21.01% ($894 801 998) in 1993. From 1994 the situation subsided, and the deficit started to lessen wherein in the last five years before 2018 it averaged at -6.485 and eventually reached a promising figure of -2.13% (amounting to $1 897 834 240) in 2018.

Mshangila (2017) attributes this unsustainable current account deficit mainly to the government budget deficit that is brought about by increasing government spending as compared to tax revenue. In the recommendations, Mshangila (2017) suggests that the Tanzanian government should seek new ways of strengthening government revenue through exploiting new sources of government revenue while curtailing its rising government spending to curb the deficit. Similarly, Saruni (2007) opines that excessive government expenditure together with a weak exchange rate was the major root course of the current account deficit between 1970 and 2002 in Tanzania. Figure 2.4 shows that the Tanzanian current account deficit worsens when government spending increases and also improve with a reduction of general government expenditure. For instance, in 2014 government spending was at its peak of $4 930 421 103, and the current account deficit also widened to $-5 061 997 449. This situation is shown by a blue bar for the current account balance and a red bar for government spending.

Figure 2.4: The link between current account balance and government spending in Tanzania



Source: Computation based on data obtained from the World Bank database

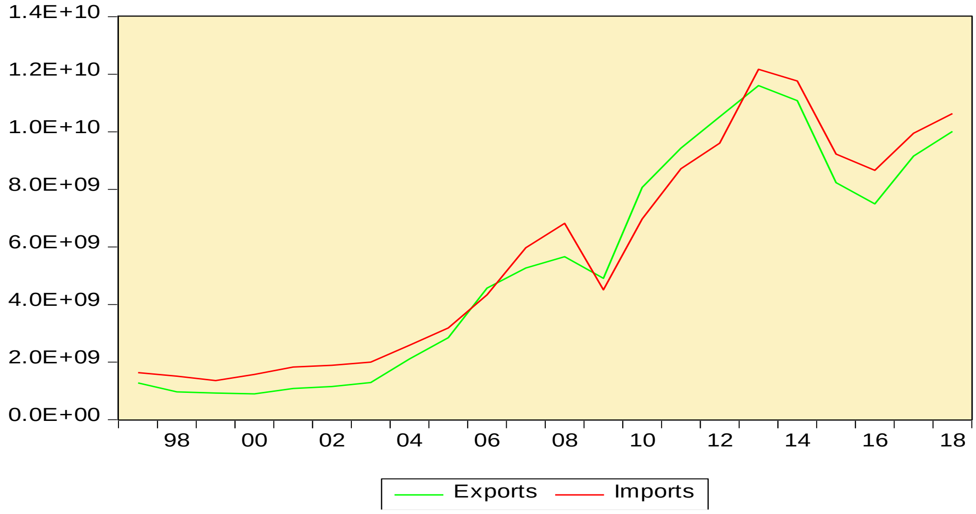
Intuitively, from an economic point of view, the study presumes that economic complexity has a positive economic effect on a country's external stability. Tanzania was ranked 68 in 2018 by the Atlas of economic complexity (2020) in terms of the most sophisticated economy in the world. This is an improvement of 37 positions from 105 in 2017. Most notably, this high level of economic complexity was concurrent with the improvement in the current account deficit of an all-time low of -3.33% in 2018 since 1988. As such, the concurrent positive relationship further substantiates the economic expectations made in the study that economic complexity is sought to advance economic development and better current account balance. Thus, it becomes relevant and equally necessary that policymakers should also give considerable attention to intensifying the sophistication of the economy to increase the value of the country's exports.

2.2.5 Zambia

Zambia's current account balance, like that of other SADC countries, is characterised primarily by periods of deficit. However, the country's current account balance was in surplus between 1997 and 2018. The country's largest current account deficit was -18.40% in 2001, and its largest surplus was 7.53% in 2010. External stability in

Zambia is also linked to economic growth patterns, strengthening when the economy prospers and deteriorating when the economy suffers. Aside from the country's economic quandary, other important factors may be contributing to Zambia's unsustainable current account balance. One distinguishing factor is the country's geographical location (landlocked country), which makes it difficult for it to integrate well into the international trade market, thereby negatively affecting its current account balance. This is because landlocked countries have limited options for importing and exporting goods. These countries lack the ability to receive or send goods via seaports, which is relatively the most convenient for large-scale exports and imports. As a result, these countries face high transportation costs in the international trade market. Furthermore, according to Faye, McArthur, Sachs, and Snow (2004), landlocked countries struggle to maintain external stability because they rely heavily on their neighbours' infrastructure, sound cross-border political relations, administrative practices, and peace and stability. To improve external stability and trade competitiveness, Zambia implemented trade liberal policies in the late 1990s, removing most the trade constraints such as exchange rate controls, lowering import duties, and eliminating export and import requirements, among other things (Mudenda,2009). As a result, according to the World Bank's Trade Tariff Restrictiveness Index, Zambia's trade regime is one of the most open in Sub-Saharan Africa. Figure 2.5 depicts how imports and exports have fared since Zambia's trade reforms.

Figure 2.5: Exports vs Imports for Zambian economy



Source: Computation based on data obtained from the World Bank database

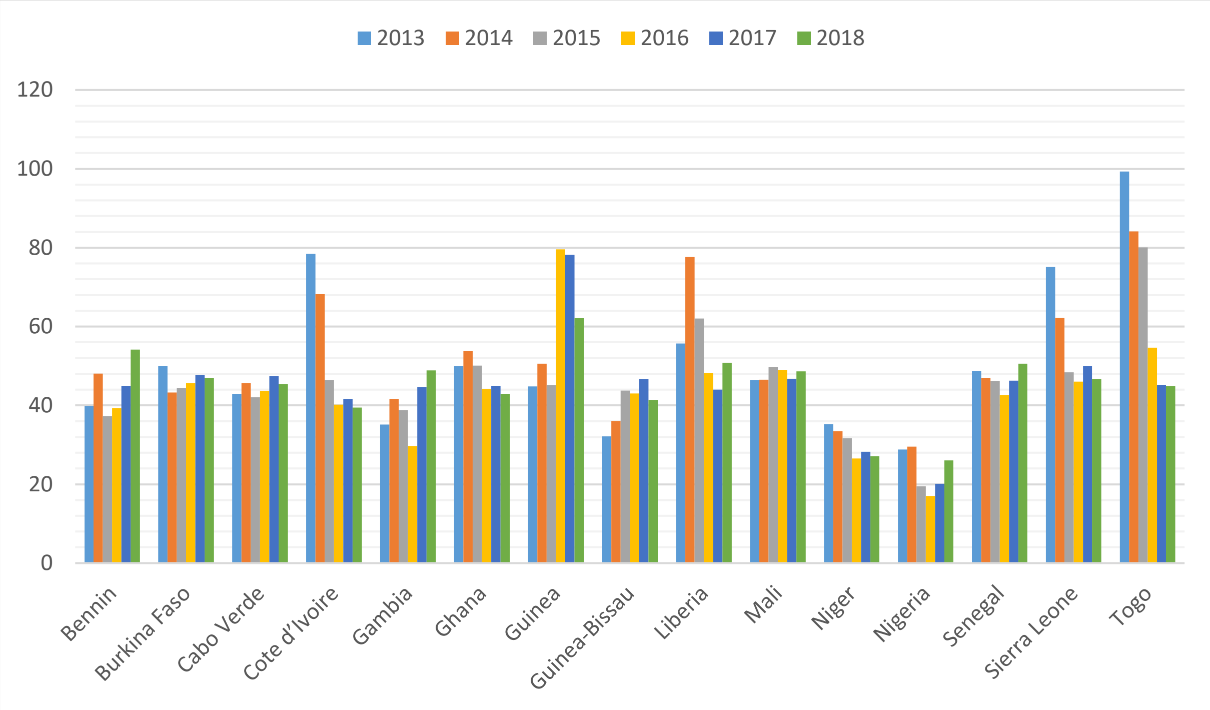
Even though the movement of exports and imports did not pick up immediately following Zambia's international trade reforms in 1991, figure 2.5 shows that over time, particularly in 2003, both exports and imports began to show an upward trend. Between 2008 and 2009, there was a sharp decline, which can be attributed to the global financial crisis of 2008, in which most industries/markets around the world were bearish, negatively affecting the flow of trade among countries. These two variables account for a larger portion of Zambia's current account balance. As a result, the current account balance followed the trajectory of these two variables, showing a surplus when exports exceeded imports and a deficit when imports exceeded exports.

2.3 Background information on the economic community of west african states

Senegal, Nigeria, Ghana, and Guinea have been selected to represent the ECOWAS region in the study. ECOWAS grouping is the west African union of 15 countries with the common goal of promoting economic cooperation and strengthening regional economic and political stability. Senegal, Benin, Cote d'Ivoire, Burkina Faso, Guinea-Bissau, and Ghana are union members. Cabo Verde, Guinea, Liberia, Mali, Niger, Nigeria, Sierra Leone, and Togo are among the countries represented. The majority of these countries were colonial arms of the French government. As a result, many of their economic policies, including international trade measures, are similar to those of France.

Furthermore, according to an empirical study conducted by Wanjuu and Le Roux (2017), economic growth and external stability are linked to economic institutions such as the development of physical and human capital in the region. They demonstrated that good economic institutions, private investments, and government intervention have aided ECOWAS's economic growth. They did, however, make an astonishing discovery in which they discovered that trade openness had an adverse effect on economic progress in the region. As a result, Banik and Yoonus (2012) discovered that a decrease in international trade flow caused by the global financial crises of early 2008 and late 2009 had a negative impact on various sectors of the ECOWAS region's economy. Figure 2.6 depicts trends in merchandise trade balance as a ratio of GDP for ECOWAS member states about these findings.

Figure 2.6: Trends in the merchandise trade balance for the ECOWAS region



Source: Computation based on data obtained from the World Bank database

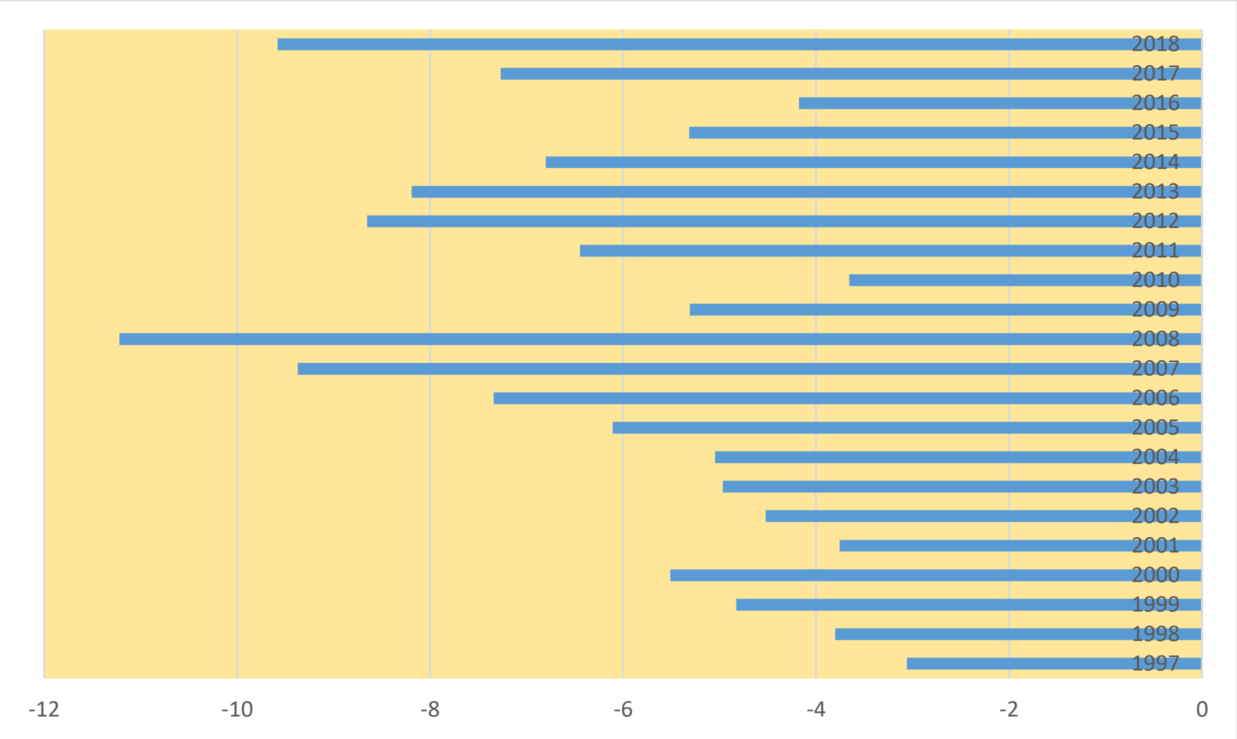
The merchandise trade accounts for a larger portion of a country's current account balance. As a result, it becomes necessary to assess trends in this variable to pinpoint the ECOWAS region's competitiveness. Most ECOWAS member states appear to be competitive in terms of trade. According to figure 2.6, all countries had a merchandise trade surplus from 2013 to 2018. However, the figure also shows that Côte d'Ivoire, Ghana, Liberia, Niger, Sierra Leone, and Togo had declining surpluses, while other countries recorded percentages that are well below 50%. This quandary clarifies, in part, that the region's trade competitiveness is declining over time, posing the potential threat of a regional current account deficit over time. The following sections provide an overview of the economic environments of the countries nominated to represent the region.

2.3.1 Senegal

The social context of agricultural production and its capital accumulation processes can help us better understand the political economy of Senegalese international relations (Chowdhry and Beeman, 1994). This is because the country has historically been overly reliant on agriculture for economic emancipation and international trade.

Senegal has a comparative advantage in the production of most agricultural products when compared to its peers, according to Brethenoux et al. (2011). The agricultural sector has also contributed to the creation of employment in the Senegalese economy. According to Brethenoux et al. (2011), the sector accounted for approximately 17% of the country's gross national income and employed approximately 60% of the total active labour force. As a result, the government and policymakers have focused heavily on protecting and growing the sector for export purposes, among other things. Peanuts, millet, rice, corn, and sorghum are the leading export commodities for Senegal. However, severe and frequent drought has been a frightening phenomenon that has harmed Senegal's economic stability as well as the country's international trade competitiveness (Sarr, Seiler, Sullivan, Diallo, and Strahm, 2021). Figure 2.6, which plots the current account balance as a ratio of GDP on the horizontal axis, depicts the trajectory of the current account balance from 1997 to 2018. Senegal recorded continuous current account deficit, as evidenced by the figure. The country's worst deficit was experienced in 2008, during the turmoil of the global financial crisis.

Figure 2.7: Trajectory of the current account balance for Senegalese economy



Source: Author’s computation based on data obtained from the World Bank database

2.3.2 Nigeria

Most notably, the Nigerian economy has been ranked first in the continent's economy since 2014, after South Africa had held the top spot for some time. According to World Bank Database (2019), Nigeria had a gross domestic product of approximately $492 billion. In 2018, Nigeria's economy outperformed South Africa's by $167 billion, demonstrating the superiority of the Nigerian economy over that of South Africa. Furthermore, panel B figure 1.1 revealed the Nigerian economy's external dominance, as it was discovered that it is the country that has recorded a current account surplus for the majority of the years when compared to its peers. However, there are other important aspects of the economy that provide insights into a country's economic development as well as its prospects for future growth. Such facets include the economy's diversity, which is directly related to the level of a country's economic complexity, and the country's political situation. Terrorist attacks, for example, frequently disrupt the Nigerian economy, which is exacerbated by political unrest. These constant attacks have the potential to frighten foreign investors, putting the country's economy in jeopardy. Furthermore, despite being the continent's largest economy, Nigeria's external stability is not as promising given the country's political and socio-economic challenges.

Nonetheless, despite the country's challenges, its economy has found ways to compete on a global scale. According to the Observatory of Economic Complexity (2021), Nigeria's total export value was $63.8 billion, ranking it as the world's 47th largest exporter. Crude petroleum was the Nigerian economy's most valuable export in 2019, with a total value of $46 billion, followed by petroleum gas, scrap vessels, flexible metal tubing, and cocoa beans, which accounted for $7.78 billion, $2.26 billion, $2.1 billion, and $715 million, respectively. The majority of these exports went to India, Spain, the United States of America, France, and Ghana (Observatory of economic complexity, 2021). The country will most likely be able to preserve a sustainable current account balance by increasing exports relative to imports and by also devoting attention to improving the level of productive sophistication of their produce.

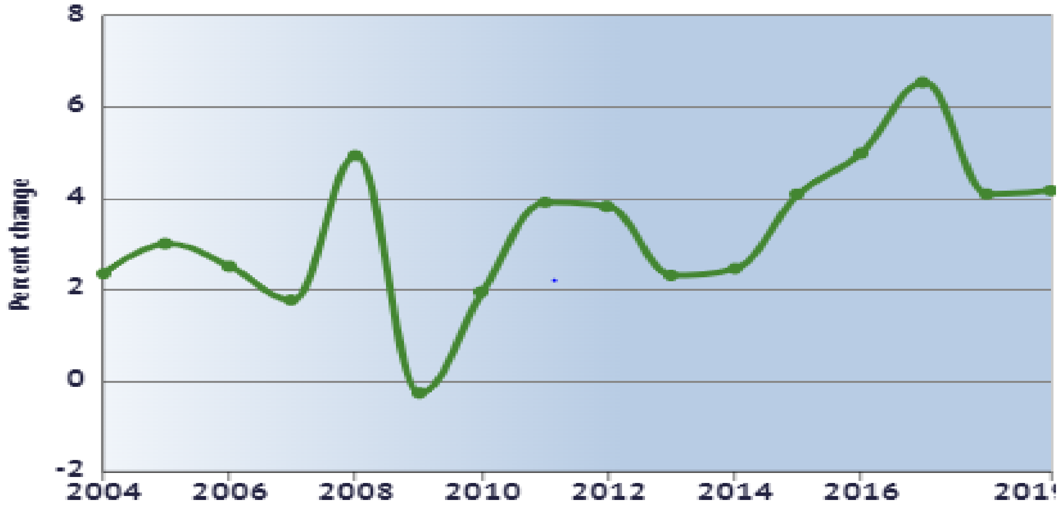
2.3.3 Ghana

Ghana's economy is reliant on agriculture, tourism, and service industries. Huq and Tribe (2018), state that the agricultural sector leads the way, accounting for a larger percentage of Ghana's total GDP year on year. Furthermore, Akrofi-Atitianti, Ifejika Speranza, Bockel, and Asare (2018) also contend that these sectors contribute roughly 45% of Ghana's economy. Furthermore, in terms of per capita GDP, the country is regarded as West Africa's fastest-growing economy. This implies that the productive capacity is efficient enough to meet domestic demand while also possibly having enough produce for global demand, thereby strengthening the country's current account balance through trade balance. Ghana's increased export value to the rest of the world demonstrates the government's efforts to improve the country's international trade competitiveness (Esaku, 2020). Economic data from the World Bank database (2019) revealed that Ghanaian exports increased by 36.76% between 2015 and 2018. This is a remarkable growth that has been supported by Ghana's economic environment as well as its international trade policies. Improvements in exports, according to Laryea, Akuoni, Ackah, and Aryeetey (2012), were the result of trade liberalisation and an export-led growth policy implemented in early 1993. Ghana was ranked 71st in the world in terms of total exports in 2018. (Observatory of economic complexity, 2018). Gold, crude petroleum, beans, cocoa paste, and manganese ore were the most common exports.

2.3.4 Guinea

Guinea's government, like that of other developing African nations, is battling to overcome several socioeconomic issues to improve the lives of its citizens. Guinea's economy is based on industries such as mining, agriculture, and manufacturing. Figure 2.8 depicts the real GDP growth trajectory from 2004 to 2019. The graph shows that real GDP fell to its lowest point between 2008 and 2009 when the global economy was hit by a financial crisis that caused a drop in various sectors of the economy. Despite the ups and downs in Guinea's real GDP growth, the trend appears to be upward since 2009.

Figure 2.8: Trend in real GDP in Guinea



Source: Nam (2019) - IMF World economic outlook.

Despite the above-mentioned growth potential of the Guinean economy, the country's current account balance has remained negative and has worsened in some years (World Bank, 2019). The country's inactivity in the international trade market is highlighted by an unsustainable current account balance deficit. To improve this, policymakers should reconsider international economic policies and modify them so that they are comparable to the international playground.

2.4 Summary

The chapter considered a brief overview of the economic settings of SADC and ECOWAS, as well as the individual countries sampled to represent each region. According to the analysis, the majority of the economies of the selected countries are reliant on agricultural and raw materials for growth, with little knowledge (economic complexity) embedded in the production process. The assumption is that this has had a negative impact on both regions' current account balances. Furthermore, it appears that the majority of the countries in the two regions' imports originate outside of their respective regions and continents, while the majority of their exports are made outside of Africa. This represents a lack of intra-trade, which could help to optimise beneficial trade for both regions if promoted. As a result of the development of AfCFTA, it can be expected that intra-trade will improve over time, thereby improving the external stability of both regions.

CHAPTER 3
LITERATURE REVIEW

3.1 Introduction

This chapter provides an overview of theories that seeks to explain the economic relationship between current account balance, economic complexity, and exchange rate. The second part of this chapter presents the empirical literature associated with the study.

3.2 Theoretical Framework

Given the study's intended model, inferences made in the study are based on the New Trade Theory, the Theory of Two Dimensions in Production, and the J-curve theory.

3.2.1 The new trade theory

It was hinted in chapter 1 that a country's current account balance records transactions, primarily in the trade market with the rest of the world, it is justifiable to base the theoretical framework of this study on trade-related theories. As a result, one of the leading theories relevant to this study is the New Trade Theory, famously abbreviated as 'NTT.' Brülhart (1995) argues that in the late 1970s, new trade theory fundamentally changed the way international trade theorists think about the flow and dynamics of international trade. This is because the NTT theory identified new economic issues for the study of international trade dynamics as opposed to neoclassical trade theories. Paul Krugman, Elhanan Helpman, James Brander, and Kelvin Lancaster are among the major contributors to the development of this theory.

The theory is based on the Heckscher-Ohlin model, but it also includes other modernised factors that are thought to be important in driving the effluent flow of trade, or more specifically intra-industry trade (Bergoeing and Kehoe, 2001). The NTT postulates the forward increasing returns scale, product differentiation, transportation costs, and market imperfections such as Oligopolistic behaviour in the industrialised world economy, in addition to factors that are primarily considered to be instrumental. Maneschi (2002) asserts that by accounting for these additional factors, NTT can successfully account for anomalies that the Heckscher-Ohlin and other traditional theories cannot explain. With changes in the global economic structure and the adoption of unified trade policies by economic regions around the world, including the SADC and ECOWAS regions, it is appropriate to base the study's analysis on the NTT.

3.2.2 The two dimensions of production

The study's second major theory is the two dimensions of production theory, which serves to explain and justify the inclusion of economic complexity in the regression. According to Inoua (2016), DavidGarvin formalised the theory of two dimension by, arguing that the economic sophistication/complexity index better explains a country's growth trends and competitiveness than traditional determinants of development such as human capital, investment, and market development. Furthermore, Inoua (2016) contends that an economy's output varies qualitatively when it produces new and sophisticated products, but for a fixed composition of product range, output only changes in quantity and does not allow a country to earn more on their products in international trade markets, thereby failing to do justice to the concerned economy's current account balance.

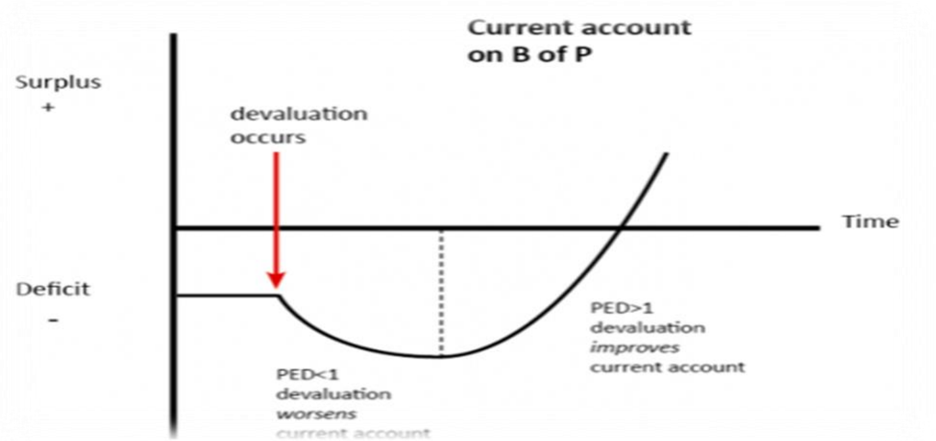
In the construction of the two dimensions of production, the theory adopts a detailed definition of the term production and further relates the definition to Hidalgo and Hausmann's economic complexity and (or) product complexity index. In the context of the two dimensions theory, production is defined as the application of a distinguished set of skills and technical knowledge to transform raw materials into valuable outputs produced by the economy. This description serves as the foundation for the theory's submissions, which state that a high level of economic complexity is positively related to long-term economic growth and external stability. Therefore, economic complexity is incorporated into the study's model regressions to assess the extent and nature of its effect on the overall current account balance for the two examined regions.

3.2.3 The J-curve theory

One of the fundamental theories used to explain the relationship between current account balance and the exchange rate is the J-Curve hypothesis. The J-curve theory, according to Bahmani-Oskooee and Ratha (2004), aids in anticipating and investigating the effect of exchange rate fluctuations on the trade balance and the overall current account balance. Because the current account balance is indirectly linked to exchange rate fluctuations via the imports and exports channel, the J-curve theory is adopted to assess and explain the impact of exchange rate fluctuations on the current account balance in the case of the SADC and ECOWAS groupings.

Furthermore, variations in a nation's currency with other currencies around the world have two effects on current account balance, the price effect and the volume effect (Mehmood (2012). In terms of the price effect, when a country's currency depreciates, imports become more expensive while exports become relatively cheaper in the short run for the domestic buyer, thus causing a country's current account balance to deteriorate. Volume, on the other hand, has a long-term positive effect because, it serves to gradually mitigate the negative impact caused by the price effect. Dornbusch and Krugman (1976) proposed that if the price and volume effects are plotted graphically over time, the resulting curve will have a "J" shape, hence the theory is known as the J curve theory (see Fig. 3.1).

Figure 3.1: J curve theory



Source: J curve graph - Bing (2020)

3.3 Empirical literature

For the sake of remaining relevant and avoiding going astray, the presentation of the empirical literature is arranged in line with the objectives of the study as stated in chapter 1.

3.3.1 Relationship between current account balance, economic complexity, exchange rate and related economic variables

De Chalendar and Giraud (2017) investigated the impact of economic complexity and product space on Visegrad countries' trade competitiveness and economic stability (Czech Republic, Hungary, Poland, and Slovakia). It was established that Visegrad countries have highly complex economic structures that have significantly contributed to their prosperity in maintaining external economic stability. Many of these countries have high levels of trade competitiveness and have had favourable trade terms for the majority of the years between 1990 and 2015. Hartmann, Guevara, Jara-Figueroa, Aristarán, and Hidalgo (2017) agree with De Chalendar and Giraud (2017) on the importance of ECI for growth and external stability. They claim that economic complexity serves to reduce the level of inequality for both Chile and Malaysia, as well as a significant contributor to stable domestic and external economic stability.

Furthermore, Ertan zgüzer and Ouş-Binatl (2016) investigated the impact of ECI on economic progress for a subset of European Union member states. According to the study, countries with higher economic complexity have more prosperous and sustainable economic growth, as well as a favourable current account balance. In other words, knowledge-based economic structures that are diverse and intense are considered to be strong pillars of economic development. Zhu and Li (2017) unvailed a positive relationship between ECI and human development. They used the reflection technique to assess this interaction for 210 Asian countries. Furthermore, Zhu and Li (2017) showed that there is a positive relationship between human development, economic complexity, and economic growth allowing countries to gain a comparative advantage in the trade market in both the short and long run. Similarly, Brito, Magud, and Sosa (2018) explored the effect of economic complexity at the firm level and discovered investment responds positively to changes in the real exchange rate and also varies systematically with the production structure of the economy. They demonstrate that when the domestic currency strengthens in certain emerging markets and emerging nations, the degree of structural economic complexity, corporate investment, and, ultimately, economic development rises in both short and long run.

Ousseini, Hu, and Aboubacar (2017) researched the factors that influence the current account balance. The study was carried out for member states of the West African Economic and Monetary Union (WAEMU), an economic region within ECOWAS, from 1980 to 2013. They identified money supply, real exchange rate, income, inflation rate, investment, and domestic consumption as the major contributing factors of the level of current account balance and trade balance in their analysis. Using panel VAR estimation methodology, their empirical findings revealed a significant adverse relationship between money growth, investment, and current account balance. Exchange rate, income, inflation, and consumption, on the other hand, were found to have a positive effect on the current account in both the short run and long run.

Similarly, Cantah, Brafu-Insaidoo, Wiafe, and Adams (2018) used the GMM approach to examine the relationship between trade openness, FDI, and current account balance in Sub-Saharan Africa. The study's findings revealed that trade openness has a stable positive relationship with FDI and trade balance and also serves to improve current account balance, particularly in South Africa, Nigeria, and Ghana. Furthermore, trade openness and FDI are the stimulus to economic growth and trade balance for Sub-Saharan Africa between 1980 and 2014 (Asongu, Nnanna, and Acha-Anyi 2020). The study by Asongu, Nnanna, and Acha-Anyi (2020), research found that trade openness and FDI contributed greatly to regional economic development. According to Latief and Lefen (2018), FDI and the exchange rate have a significant impact on the trade balance of OBOR-related (One Belt One Road) countries. They used Generalized Autoregressive Conditional Heteroscedasticity (GARCH) and Threshold-Generalized Autoregressive Conditional Heteroscedasticity (TCARCH) for analysis and both methods revealed similar results.

Ncanywa and Kaehler (2018) used autoregressive distributed lag to investigate major determining factors of the current account balance in the context of the South African economy. Among others, exchange rate, fiscal balance, savings-to-household-income ratio, net portfolio investment, and economic growth were identified as major contributing factors. The study found that from 1994 to 2017, household savings and economic growth had a progressive effect on the current account, whereas portfolio investment had a negative impact. Nonetheless, Iyoboyi and Muftau (2014) investigated the relationship between Nigeria's balance of payments, government spending, exchange rate, GDP, money growth, interest rate, and trade openness between 1961 and 2012. Their empirical findings established that exchange rate depreciation holds a positive impact on both the current account and financial account of the balance of payment in the long run.

Ebaidalla (2014) investigated the economic impact of exchange rate volatility on macroeconomic performance using the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model for the period 1979 to 2009. Ebaidalla (2014) discovered that exchange rate volatility had a positive impact on current account balance and foreign direct investment. Imoisi (2012) used the VECM model to dissect the trajectory of the current account balance in Nigeria from 1970 to 2010. The study's explanatory variables included the exchange rate, interest rate, inflation rate, and non-oil exports. Imoisi Empirical findings were similar to those of Iyoboyi and Muftau (2014), as the exchange rate was found to favourable impact current account of the balance of payment for the Nigerian economy while inflation and interest rates worsened it.

Olayungbo, Yinusa, and Akinlo (2011) used two different methods of estimation to conduct a broader analysis of the link between exchange rate and current account balance for selected Sub-Saharan African countries. Over 19 years, they used the gravity model and the generalized method of moments (from 1986 to 2005). Both methods established that exchange rate volatility had a positive impact on the trade balance. Utz (2007) used the ARDL technique to examine major determinants of the Turkish economy's current account balance from 1987 to 2008. The study's explanatory variables were exchange rate, private savings, and public savings. Both were expressed as a ratio of GDP for the period under consideration. In both the short and long run, the results revealed a sturdy positive relationship between current account balance and exchange rate.

Bhattarai and Armah (2013) used cointegration analysis and vector autoregressive models to scrutinize the relationship between Ghana's current account balance and the exchange rate from 1970 to 2000. According to their findings, there is a consistent long-run positive relationship between the exchange rate and both exports and imports. These findings by Bhattarai and Armah (2013) agreed with those of Kurtovic' (2015), who conducted a study in Albania from 1994 to 2015. Kurtovic (2015) discovered that real effective exchange rate depreciation had a positive relationship with both exports and imports in the short run and long run. However, Manual and San (2019) discovered that the exchange rate and trade balance were negatively related to one another throughout the sampled period using the ARDL methodology from 2000 to 2015. Similarly, exchange rate fluctuations had a long run negative impact on current account balances for the selected West African countries from 1980 to 2012, according to Oshota and Bedejo (2015). Using panel ARDL methodology, Aristovnik (2007) investigated the effects of GDP per capita, investment, money supply, and exchange rate on the current account balance and discovered that for the period spanning from 1971 to 2005, investment, government expenditure, and foreign interest rate negatively affected the current account balance in the short and long run for a selected Middle Eastern and North African countries. On the other hand, the findings show that trade openness, higher oil prices, and growth all have a positive impact on the current account balance. Furthermore, Aristovnik (2007) found that foreign direct investment has a positive impact on the current account in the case of Pakistan.

3.3.2 The nature of the relationship between current account balance, economic complexity, exchange rate and related economic variables

Using the Granger causality technique, Siddiqui and Ahmad (2012) evaluated the causal relationship between current accounts and FDI in Pakistan using sample data spanning from the first quarter of 1976 to the fourth quarter of 2005. Their empirical findings revealed long run unidirectional causality from FDI to current account balance. Similarly, in the case of the Indian economy, unidirectional causality between foreign direct investment and current account balance was established between 1979 and 2009 using The Toda-Yamamoto (T-Y) causality tests (Kaur, Yadav, and Gautam, 2012).

Bhowmik (2018) conducted a study titled "Financial crises and nexus between economic growth and foreign direct investment" that found bi-directional causality between FDI, inflation, exchange rate, interest rate, and economic growth, as well as unidirectional causality between FDI inflows and fiscal deficit. However, the study found no causal relationship between FDI inflows and financial crisis. Between 1997 and 2019, Rathnayaka, Epuran, and Tescașiu (2021) investigated the causal relationship between trade openness and FDI in Romania. They discovered unidirectional causality that runs from FDI to trade openness using the Granger causality test.

Iyoboy and Muftau (2014) used the Granger causality type of tests to assess the causal relationship between money supply, interest rate, and real GDP in Nigeria. The results revealed bidirectional causality between the variables used in the regression from 1961 to 2012. Panel granger causality tests conducted on selected west African countries by Onuoha, Okonkwo, Okoro, and Okere (2018) on the other hand revealed the absence of a causal relationship in the study spanning 1990 to 2016. Their empirical findings revealed that there was no evidence of a causal relationship between FDI, trade balance, and unemployment rate in the short run for selected West African Countries.

Aimon, Kurniadi, and Sentosa's (2020) empirical findings emphasised the presence of a causal relationship between current account balance and FDI for selected Association of Southeast Asian Nations (ASEAN) member states from 2000 to 2017 as opposed to the study by Onuoha, Okonkwo, Okoro, and Okere (2018). Khan, Sattar, and Rehman (2012) investigated the effectiveness of exchange in the economy using annual time series data from 1980 to 2009. The study used Granger causality tests for analysis, and the results revealed directional causality between the exchange rate and FDI. The findings also revealed a single causal link between the exchange rate and economic growth. Similarly, a study by Temitope, (2017) discovered unidirectional causality between exchange rate and trade balance in Sub-Saharan Africa using Pairwise Granger causality.

Evidence from the works of Anoke, Odo, and Ogbonna (2016) in the case of the Nigerian economy shows that FDI, trade openness, and exchange rate granger cause trade balance. The study recommends increased effort to diversify FDI to improve trade balance and achieve external stability. Jayachandran and Seilan (2010) also expand on the nature of the relationship between trade balance, exchange rate, real growth, and FDI. They demonstrate that there was a causal relationship between trade balance, economic growth and FDI. PachecoLópez (2005) studied the relationships between FDI, exports, and imports in Mexico. Empirical evidence established a bidirectional causality between FDI, exports, and imports and economic growth as well. However, the study found contrary results between FDI and economic growth. Dritsaki, Dritsaki, and Adamopoulos (2004) investigated the relationship between trade, FDI, and economic growth in Greece from 1960 to 2002. The Granger causality results also established a causal relationship between the variables.

3.3.3 Evidence of economic shocks between current account balance, economic complexity, and exchange rate

Using the impulse response function and variance decomposition, Sek and Chuanh (2011) discovered that nominal exchange rate and inflation rate shocks have no long run impact on current account balance but only have a minor temporal impact. Furthermore, their empirical findings show that shocks in the exchange rate have a positive effect on current account balance, whereas shocks in the inflation rate have a negative impact. Similarly, Wahyudi and Sari (2020) found that for the period 1986 to 2018, the trade balance in Indonesia significantly reacted to economic shocks in the exchange rate. The impulse response results also revealed that the Indonesian trade balance did not follow the J-curve theory propositions for the period under consideration.

In the case of the Ethiopian economy, evidence shows that from 1980 to 2018 the current account balance responded strongly to shocks caused by fiscal balance, government debt, and gross fixed capital formation (Melesse, 2020). In particular, the impulse response function and error variance decomposition results confirm that fiscal policy and investment have a significant impact on both government debt and current account balance. Fratzscher, Juvenal, and Sarno (2010) explored the dynamic effect of exchange rate shocks and related economic variables such as FDI and asset prices on the current account balance in the USA. Their empirical findings demonstrated that exchange rate shocks had a negligible effect, accounting for only 9% of fluctuations in the current account balance.

Using the impulse response function, Kaur, Yadav and Gautam (2012) provided an empirical literature overview of FDI economic shocks and major components of India's current account balance from 1975 to 2009. According to the study, FDI shocks harm exports in the short run, but they tend to improve over time. Furthermore, economic shocks in imports have been shown to have a positive impact on foreign FDI. Evidence from Turkey using the Generalized Impulse Response functions showed that in the long run, the current account balance responds negatively to shocks from foreign FDI and capital flow (Gümüşolu and Alçin, 2019).

In the case of the Nigerian economy, the variance decomposition analysis shows that the variance in the current account balance is better explained by its shocks, followed by economic shocks from oil prices, oil balances, and fiscal balance (Uneze and Ekor, 2012). Furthermore, results of the impulse response functions show that shocks to the oil price, oil price, and oil revenue are positively related to the current account balance, whereas shocks to oil wealth had a negative impact. The study by Udah's (2010) showed that current account balance shocks are a major source of variation in Nigeria. Udah (2010) goes on to state that forecast errors from the exchange rate, terms of trade, and per capita GDP all account for meaningful variations in the current account balance. For example, it was established that the exchange rate causes variations in the current account at approximately 99% in the short run and approximately 42% over a ten-year horizon.

3.4 Summary

Based on the elucidation of the theoretical empirical literature presented above, it is reasonable to assume that the higher the level of economic complexity index, the more likely the current account will be sustained without causing another external crisis. Thus, economic complexity is expected to have a positive relationship with current account balance, whereas the exchange rate is expected to have a negative impact in the short run and a positive impact in the long run, as proposed by the J-curve theory. Furthermore, Exchange rate, foreign direct investment, and economic growth are all commonly identified factors. However, there are some inconsistencies on how these factors affect the current account balance. As such, the study aims to contribute the existing literature by conducting comparative analysis (between SADC and ECOWAS regions) using the panel ARDL methodology, to which few studies have employed in the context of SADC and ECOWAS region thus far.

CHAPTER 4

RESEARCH METHODOLOGY

4.1 Introduction

The study employed econometric methodologies to conduct a comparative analysis of the impact of economic complexity and exchange rate on the current account balance in the SADC and ECOWAS regions. As such, this chapter explains the methodology used to achieve the study's aims and objectives. In addition, the chapter discusses data sources, model specifications, and estimation techniques.

4.2 Data

The study makes use of annual secondary panel data for the sampled period, which runs from 1997 to 2018. Five SADC countries were selected for analysis: namely, South Africa, Angola, Madagascar, Tanzania, and Zambia, and four ECOWAS member states are nominated: namely, Senegal, Nigeria, Ghana, and Guinea. It is worth noting that data availability acted as a major deterrent in terms of including all SADC and ECOWAS member states for analysis. As such, the selection of member states was based on the availability of data, in particular, data on economic complexity. The data set for both regions is determinating time series (shown by large T and small n), thus, the study employed the Panel ARDL for analysis. Current account balance, exchange rate, FDI, and export data are sourced from the World Bank database, while economic complexity data is sourced from the Atlas of Economic Complexity.

4.3 Model specification

Given the comparative nature of the study, two proposed linear models for SADC and ECOWAS are stated in equations 4.1 and 4.2, respectively as follows:

$$CAB_{it} = \alpha_{it} + \beta_1 ECI_{it} + \beta_2 EXR_{it} + \beta_3 FDI_{it} + \beta_3 EXPO_{it} + \varepsilon_{it} \qquad (4.1)$$

$$CAB_{it} = \alpha_{it} + \beta_1 ECI_{it} + \beta_2 EXR_{it} + \beta_3 FDI_{it} + \beta_3 EXPO_{it} + \varepsilon_{it} \qquad (4.2)$$

The coefficient parameters of economic complexity, exchange rate, FDI, and exports are estimated by equations 4.1 and 4.2. Current account balances, exchange rates, and exports are converted to logs so that coefficient estimates can be standardised for purposeful estimation. As a result of the addition of logs to the estimated variables, the linear regressions are modified and presented as follows:

$$LCAB_{it} = \alpha_{it} + \beta_1 ECI_{it} + \beta_2 LEXR_{it} + \beta_3 FDI_{it} + \beta_3 LEXPO_{it} + \varepsilon_{it} \qquad (4.3)$$

$$LCAB_{it} = \alpha_{it} + \beta_1 ECI_{it} + \beta_2 LEXR_{it} + \beta_3 FDI_{it} + \beta_3 LEXPO_{it} + \varepsilon_{it} \qquad (4.4)$$

In the transformed equations 4.3 and 4.4, where $LCAB, LEXR,$ and $LEXPO$ are the log of current account balance, exchange rate, and exports respectively. Economic complexity and foreign direct investment are represented by ECI and FDI accordingly. $\beta_1, \beta_2,$ and β_3 are model parameters while α denotes intercept which is the value that the current account balance will take if all explanatory variables take the value of zero. Moreover, ε_{it} signifies the disturbance error term. The disturbance error term is used to account for the effect of other unaccounted variables that have a direct or indirect economic relationship with the current account balance. Foreign direct investment and exports of goods and services are included as control variables in the study. Control variables, according to Brooks (2008), are included in the model regression because, firstly, they are presumed to have a theoretical economic relationship with the dependent variable and secondly to stabilise the model regressions.

4.4 Estimation techniques

To achieve the underlying objectives stated in chapter 1, the study employs panel data analysis. Panel data analysis is a hybrid of time series and cross-sectional data analysis (Brooks, 2008). The approach is supported in the study due to its ability to allow for the analysis of different categories over time as well as the freedom of observation it provides. The methodological procedure used begins with an examination of the existence of unit root in each data sample. The next important step is the selection of the appropriate lag length structure to be implemented in each model, followed by cointegration analysis and the determination of short run and long run estimates in that particular order. The study then employs panel Granger causality tests to assess the causality relationship(s) between variables, and finally, variance decomposition and generalised impulse response functions are used to forecast the impact of economic shocks. To determine the relevance and reliability of the empirical findings, normality tests and inverse roots of an autoregressive polynomial are performed to check if residuals are normally distributed and that all model regressions are stable. The methodological progression in this study is in line with methodology followed by Ncanywa and Mabusela (2019) when they investigated the impact of financial development on economic growth in the Sub-Saharan region. To obtain all of the study's results, a software package known as EViews 9.0 is used.

4.4.1 Stationarity/Unit root test

The panel date samples, like the time-series data set, are subject to unit root testing. According to Brooks (2008), examining the existence of unit root is critical in economic relationships for a variety of reasons. Brooks, for example, states that assessing stationarity aids in avoiding the problem of spurious and misleading regression. The use of a non-stationary data sample may falsely reveal the existence of a meaningful economic relationship between variables when such relationships do not exist thereby posing the risk of poor economic guidance (Harris and Judge 1998). Furthermore, according to Harris and Judge (1998), unit root testing assists in the selection of appropriate estimation techniques (for example between panel VECM and panel ARDL). For instance, Panel VECM is only compatible for model regression that integrates at order 1, while panel can accommodate models that has a mixture in terms of integration for as long the explained variables integrate at I (1) and no variable integrates at order I (2).

It is important to note that when evaluating the existence of unit roots, the results can be presented both informally and formally. Informal unit root tests are performed by visually inspecting graphs, whereas formal tests are performed using various types of tests. The study employs Fisher Phillip-Perron tests and confirms the findings with Breitung type of tests. Equation 4.5 present the general mathematical model for testing the stationarity of an autoregressive variable:

$Y_{it}(1 - P_1L - P_2L^2 - \cdots P_pL^p = \varepsilon_{it}$ or Ø(L) Y_{it}=ε_{it} ____________________________(4.5)

Thus, equation 4.5 can be re-formulated as:

$\sum_{i=1}^{n} Pit$<1____(4.6)

Where ε_{it} is white noise error term and P^* equals (P_1+P_2+…...+P_P)

The equation for unit root stated in equations 4.5 and 4.6 have the null hypothesis of non-stationarity shown by $H_0: P^*$=0 with the alternative null of stationarity indicated by $H_1: P^* < 0$. Most economic data are non-stationary in practice as they trend over time; thus, to de-trend the variable or remove the unit root, the variable must be differenced (Dolado, Ganzalo, and Marmal, 1999).

4.4.1.1. Fisher Philip-Perron tests

Perron (1988) and Phillips and Perron (1988) extend the Fisher Philip-Perron (1987) unit root test as an alternative to the Fisher Augmented Dickey-Fuller (Fisher ADF) tests (Martin, Hurn and Harris, 2013). In other words, the Fisher PP tests are modifications of the Fisher ADF tests that were created to address the shortcomings of the Fisher ADF type of tests. Hlouskova and Wagner (2005), have emphasised the advantages of the Fisher PP tests by stating that these tests do not require a balanced panel or similar lag lengths in the individual equation and can also produce non-negativity of estimates when compared to the Fisher ADF.

4.4.1.2. Breitung unit root tests

Breitung panel unit root tests were proposed by Breitung (2000) in an attempt to minimise the disadvantages of other panel unit root tests. According to Akhmat, Zaman, Shukui, Javed and Khan (2014), Breitung tests propose a model technique that can be used to estimate unbalanced panels that are effective in dealing with the problem of using average ADF statistics in panel unit root testing, which are effectively accommodated by other tests.

4.4.2 Selection of appropriate lag length structure

The determination of an appropriate lag length is as important in panel econometric analysis as it is in time series data sets (Asghar and Abid, 2007). Nonetheless, several lag length criteria can be used to choose the best lag structure for the proposed econometric models in equations 4.3 and 4.4. The commonly used criteria, according to Cavaliere, Phillips, Smeekes, and Taylor (2015) are final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SC), and Hannan-Quinn information criterion-HQ, each of which has a different strength depending on the number of observations and/or sample size. All of these statics are based on an autoregressive process, which is mathematically expressed as follows:

$$\gamma_{it} = \alpha 1 Y_{it-1} + \alpha 2 Y_{it-2} + \cdots + \alpha p Y_{it-p} + \varepsilon_{it} \qquad (4.9)$$

Where $\alpha 1, \alpha 2, \ldots, \alpha p$ are autoregressive parameters and ε_{it} represent normally distributed random error terms with a mean of zero and finite variance. Following the autoregressive process equation, a study by Liew (2004) provides a mathematical expression of the five criteria listed below, which the study will use to select suitable lag for estimation in chapter 5:

"Akaike information criterion" $AIC_P = -2\left[In\left(\acute{\sigma}_p^2\right)\right] + 2p$ *(4.9.1)*

"Schwarz information criterion" $SIC_P = In\left(\acute{\sigma}_p^2\right) + [pIn(T)]/T$ *(4.9.2)*

"Hannan-Quinn criterion" $HQC_P = In\left(\acute{\sigma}_p^2\right) + 2T^{-1}p\ In[In(T)]$ *(4.9.3)*

"The final prediction error" $FPE_P = \acute{\sigma}_p^2(T - P^{-1}(T + P)$ *(4.9.4)*

For each criterion, $\acute{\sigma}_p^2$ symbolise model parameters, and the cap (̋) denotes the estimated value or lag length while the letter "T" symbolises the sample size. Hanna-Quinn information criteria usually outperform other criteria in determining the appropriate lag length in the case of a large sample size that has 120 observations or high. Other criteria, on the other hand, are superior for a smaller sample size that has less than 120 observations. As a result, depending on the sample size, the study will select the information criterion that best fits each model.

4.4.3 Panel-Cointegration tests

Following the determination of the order of integration and the selection of an appropriate lag length structure, the next important task is to assess the existence of long run co-movement between the variables using cointegration tests. The study employs Kao cointegration tests to test cointegration and then uses Johansen cointegration tests and Pedroni type tests to validate the results. According to Ranjit (2006), cointegration is necessary for its intuitive appeal in dealing with obstacles that may arise from using a data sample with a unit root or where one of the variables in the estimated model is integrated at the order I(1) and is used in a long run economic relationship. The asymptotic properties of panel cointegration tests used in the study, which account for heterogeneous dynamic and slope coefficients in the estimated modules, follow the procedure of residuals from long run regression of the following form:

$Y_{it} = \propto_{it} + \delta_{it} + \beta_i X_{it} + e_{it}$ *(i=1,…,N,t,….T)* ______________________________(4.10)

Where, X_{it} is an m-dimensional column vector for each member *i* and β_i is an m-dimensional row vector for each member *i.* the symbols $\propto_{it}$ and δ_{it} are model parameter and they allow for the possibility of members' specific fixed effects and deterministic trends accordingly. Slope coefficients are represented by β_i are permitted to vary individually, so that the cointegrating vectors may be heterogeneous across pooled data vectors. Most importantly, variables symbolised by Y_{it} and X_{it} and the error term, e_{it} are assumed to be integrated at order one, I(1) under the null of no cointegration.

4.4.3.1. Panel Kao cointegration tests

Panel Kao tests (1999) establish a null hypothesis of no cointegration, which is tested against the alternative null hypothesis of long run association between current account balance, economic complexity, exchange rate, FDI, and goods and services export. Furthermore, Gutierrez (2003) has it that Kao cointegration tests propose four Dickey-Fuller statics, the first two assuming homogeneity of regressors and the last two assuming endogeneity of regressors for the errors in the equation. Kao tests are derived from the general panel cointegration tests stated in equation (4.10) and are presented mathematically as follows:

$\ddot{u}_{it} = \mathrm{P}\ddot{u}_{it-1} + \sum_{\hat{j}=1}^{\mathrm{P}} \emptyset_{\hat{j}} \, \Delta\ddot{u}_{it-\hat{j}} + \mu_{it}$ ______________________________________(4.11)

From the equation, where $\hat{u}_{it}$ is the disturbance error term obtained from equation 10 and the parameter $P\hat{u}_{it-1}$ are test statistics Dickey-Fuller type of tests.

4.4.3.2. Panel Johansen cointegration tests

According to Dwyer (2015), the Johansen cointegration test allows for testing of long run relationships when there are multiple cointegration equations. To assess the presence of a long run relationship in the model, the Johansen cointegration employs two types of tests, namely the trace test and the maximum eigenvalue (Hjalmarsson and Österholm, 2007). Dwyer (2015) again opines that the maximum eigenvalue test is a likelihood statistic which is expressed as $LR(ro, ro+1) = Tin(1-\lambda_{r0+1})$, where $LR(ro, ro+1)$ is the likelihood ratio statistic for testing the null hypothesis of cointegration and $Tin(1-\lambda_{r0+1})$ is the ratio statistic testing the alternative hypothesis of no cointegration in the estimated model.

4.4.3.3. Panel Pedroni cointegration tests

Pedroni (1999) computes seven-panel cointegration statics to test the null hypothesis of no long run relationship against the alternative null hypothesis using a system that allows for heterogeneity of long run covariance and slope parameters across all units. Ramirez (2006) defines the first category of four statistics as within dimension-based statistics, while the second category of three-panel cointegration is defined as between dimension-based statistics or group statistics. Chaiboonsri, Sriboonjit, Sriwichailamphan, Chaitip and Sriboonchitta (2010), orates that Pedroni cointegration autoregressive coefficients estimators of $y', N, T,$ is constructed as follows:

$$Y'\,N, T^{-1} = \left[\sum_{i=1} N \sum_{t=2} T\left(e'_{i,t-1} - \lambda'_i\right)\right] / \left[\sum_{i=1} N \sum_{t=2} T\left({e'^2}_{i,t-1}\right)\right] \qquad (4.12)$$

Where *N* in equation 4.12 is the cross-section data; T; $e'_{i,t-1}$; and λ'_i represent time series data, error series data and a scalar equivalent to a correction matrix.

4.4.4 Panel Auto Regressive Distributive Lag

The panel ARDL technique is used to obtain short and long run estimates, as well as an error correction model (ECM) that measures the rate of adjustment. These estimates aid in categorising the impact of economic complexity and exchange rate on the current account balance (as positive or negative). ARDL models are standard least-squares models that include lags of both independent and dependent variables as a regressor and are thought to be superior to traditional methods such as VECM and VAR (Pesaran and Pesaran 1997). Pesaran, Shin and Smith (2001), for example, argue that the panel ARDL approach has several advantages over other econometric techniques. To begin, they claim that the panel ARDL technique can capture both short and long run estimates at the same time. Second, they contend that the technique can be used even with a relatively small sample size of at least 21 observations. Third, the ARDL method can be used on the model that integrates at different orders. However, the explained variable must integrate in the order I (1), whereas I (2) variables are not allowed in the regression. The ARDL specification of the current account balance for two economic regions is stated in equation 4.13 as follows:

$$\Delta LCAB_{it} = \alpha_{it} + \beta_1 ECI_{it} + \beta_2 LEXR_{it} + \beta_3 FDI_{it} + \beta_4 LEXPO_{it} + \sum_{it=1}^{p} \beta_5 \, \Delta LCAB_{it-1} + \sum_{it=1}^{q} \beta_6 it \, \Delta LECI_{it-1} + \sum_{it=1}^{r} \beta_7 it \, \Delta LEXR_{it-1} + \sum_{it=1}^{s} \beta_8 it \, \Delta FDI_{it-1} + \sum_{it=1}^{t} \beta_9 \, \Delta LEXPO_{it-1} + \epsilon_{it} \qquad (4.13)$$

The symbol Δ represents the first difference in current account balance while α_{it} and ϵ_{it} represent the drift component and the disturbance error terms, respectively. The disturbance error terms are independently distributed across time series and cross-section units with zero mean and constant variance. Moreover, on the left-hand side of equation 4.13 betta $\beta_1$to betta β_4 denotes long run estimates and coefficients thereof. The remaining parameters (β_5 to β_9) represent short run relationships between the variables as well as the coefficients in the model. The Panel ARDL approach also creates the error correction model (ECM) which measures the speed of adjustment from short run to long run or how the model converges to equilibrium. To demonstrate convergence, the ECM value must be negative, and the probability value must be 0.05 or less.

4.4.5 Panel Granger causality tests

The study broadens the scope of the analysis by examining the possibility of casual relationships between model variables. Panel Granger causality tests are used to accomplish this. Wanjau, Olila, Pambo, Chimoita and Odipo (2016) define Granger causality as a statistical concept based on a prediction that seeks to assess the nexus between economic variables. A variable, say, X_1 is defined to Granger cause another variable, say X_2 if the past value of X_1 contains information that helps to predict X_2 over and above the information contained in the past values of X_2 alone. Moreover, the granger causality test has a null hypothesis of no causality, which is rejected with a probability of 5% or 0.05. In the study, for example, the null hypothesis is stated as follows: economic complexity does not granger cause current account balance. As a result, if the computed probability value is less than 5% or 0.05, this null will be rejected.

The general Granger model to evaluate causality among variables employed in the study is specified as:

$$Y_t = \beta_{1,0} + \sum_{1,i}^{p} ` \beta_{1,i} Y_{t-i} + \sum_{j=1}^{p} ` \beta_{1,p+j} X_{t-j} + \mathcal{E}_{it} \quad \text{\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_} (4.14)$$

$$X_t = \beta_{2,0} + \sum_{1,i}^{p} ` \beta_{2,i} Y_{t-i} + \sum_{j=1}^{p} ` \beta_{2,p+j} X_{t-j} + \mathcal{E}_{it} \quad \text{\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_} (4.15)$$

Wanjau, Olila, Pambo, Chimoita and Odipo (2016) further state that there are three main possible directions of causality:

- Unidirectional causality is the type of causality that is one-sided or runs from one variable to another and it is not reciprocal. In this instance, X_1 may granger cause Y_1 but Y_1 do not granger cause X_1.
- Bi-directional causality occurs when both the X and Y set's coefficients are statistically significant, and they granger cause one another.
- Neutrality is when both sets of X and Y coefficients are statistically insignificant and there is no existence of causality among the variables in such case.

4.4.6 diagnostic, stability and cross-sectional dependence

The diagnostic and stability tests ensure that the proposed linear regression estimates are correct and can be used to make economic inferences (Brooks, 2008). However, because panel analysis has more advantages, such as a larger number of observations and the ability to avoid heteroscedasticity, it is not necessary or mandatory to perform all the diagnostic and stability tests as is the case with time series. For example, Ncanywa and Mabusela (2019) and Ousseini, Hu and

Aboubacar (2017) conducted a study using a similar methodological procedure but only performed diagnostic and stability tests, as is done in this study. In line with these two studies, the study only evaluates the normality and inverse roots of an autoregressive polynomial. The study employs Jarque-Bera tests in conjunction with Kurtosis statistics for normality testing. Jarque-Bera compares the kurtosis and skewness of a variable to those formed by the normal distribution, as shown in Equation 4.16 (Brooks, 2008).

$$JB = \frac{N-K}{6}\left[S^2 + \frac{(K-3)^2}{4}\right] \qquad (4.16)$$

Where N= number of observations, K= number of estimated parameters, S=skewness of variable and K= Kurtosis. Furthermore, Jarque-Bera has a null of normality, which is rejected if the probability of this coefficient is significant or less than 5%. As previously stated, the residuals' normality can be determined using Kurtosis. According to Brooks (2008), a Kurtosis of approximately 3 suggests that residuals are normally distributed. Furthermore, Ouma and Muriu (2014) state unequivocally that if residuals are not normally distributed, the consistency of estimators is not guaranteed. The inverse roots of an autoregressive polynomial were used in the study to test stability. If the inverse roots fall within a polynomial circle, the model is said to be stable (Adamu & Audu, 2018).

In addition to normality and stability tests, the study employs cross-sectional dependence. According to Baltagi, and Pesaran (2007), cross sectional dependence may arise due to spill over effects or interdependence between cross sections of the data set observed. Testing for cross sectional dependence is essential because the use of data set that has the presence of CSD may lead to estimates that are misleading or that cannot be relied upon for policy recommendations (Baltagi, Feng, and Kao, 2012). Baltagi, Feng, and Kao, (2012) further argues that Ordinary least squares model or LM test for cross-equation for testing CSD in a SUR is more suitable for panel data set with large T and small N. Hence, CSD results presented in chapter 5 follows LM test that are based on SUR to assess the degree of CSD in the estimated models given that data set is has large T for both models.

4.4.7 Variance decomposition

The study employs variance decomposition and generalised impulse response functions which are based on VAR models to forecast the impact of economic shocks resulting from each economic variable included in the model on one another. The difference between variance decompositions and the generalised impulse response function is that the former only assesses the percentage of a variable's forecast error that is explained by another variable and does not indicate whether the shock has a positive or negative influence (Alam and Ahmed, 2010).

4.4.8 A generalised Impulse response function

The generalised impulse response function, on the other hand, employs a graphical representation to show whether the shock had a positive or negative impact but does not reveal the magnitude of the impact. As a result, the study employs both forecasting methodologies to determine whether economic shocks have a positive or negative impact.

4.5. Summary

The chapter described the quantitative panel analysis that would be used in the study. The chapter explained the model specifications for the two regions, data used for analysis, and econometrics estimation techniques to be used to obtain estimates presented in chapter 5.

CHAPTER 5

DISCUSSION / PRESENTATION / INTERPRETATION OF FINDINGS

5.1 Introduction

This chapter presents empirical results for all of the tests discussed in the previous chapter. According to the literature review, there are some contradictions about the impact of economic complexity, exchange rate, FDI, and exports on current account balance for different countries. Based on these contradictions and intuitive economic relationships of the variables used in the regression, this study aimed to comparatively assess the impact of economic complexity and exchange rate on current account balance between SADC and ECOWAS regions to identify major deviations to contribute to policymaking for the regions.

5.2 Empirical tests results

This subsection presents empirical findings in terms of the methodology explained in chapter 5. The section begins by presenting stationarity tests both informally and formally, then moves on to lag length selection, cointegration analysis, and short and long run analysis using the panel ARDL technique. The chapter also includes Granger causality results as well as forecasting results obtained through variance decomposition and generalised impulse response.

5.2.1 Stationarity/Unit root tests results

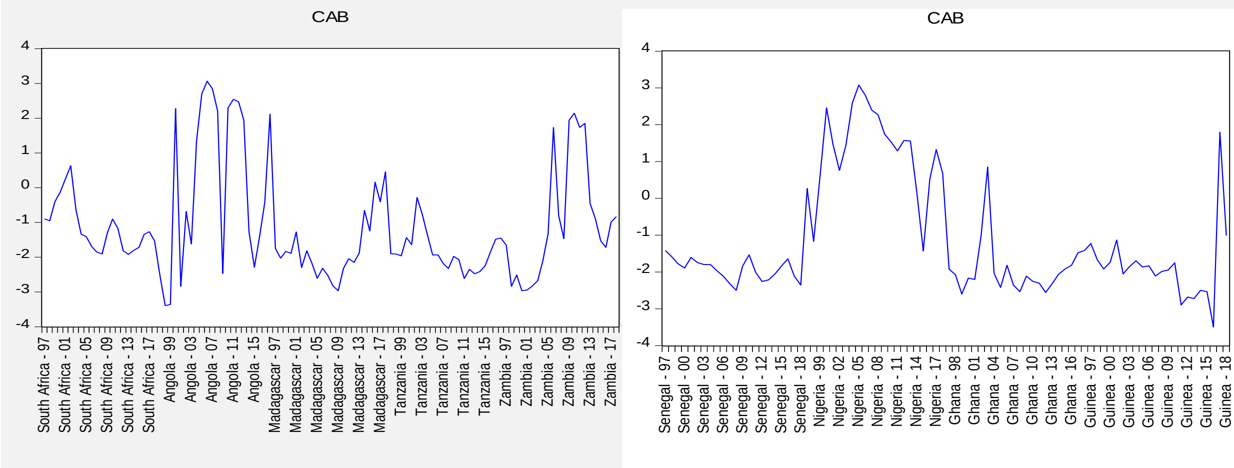
The informal and formal stationarity tests are presented in this subsection. Informal stationarity tests are performed by visually inspecting graphs, whereas formal tests are performed using various types of tests. The Fisher Phillip-Perron tests were used in the study, and the results were confirmed with Breitung tests.

5.2.1.1. Informal presentation of unit root

Figures 5.1–5.9 show informal stationarity tests for all variables in the study, both at the level and first differenced format. Figure 5.1 (panels (A) and (B)) depict the log of the current account balance at level for the two regional blogs. The log of the current account balance for the ECOWAS region does not appear to be hovering around zero mean. As a result, it is presumed that the variable has a unit root and will be subjected to differencing to remove the unit root or to de-trend the variable. Meanwhile, in the SADC region, the variable does not appear to stray or drift far from zero mean. As a result, from a visual standpoint, the data set appears to integrate at a level.

Figure 5.1: Current account balance - at level

Panel A (SADC) *Panel B (ECOWAS)*

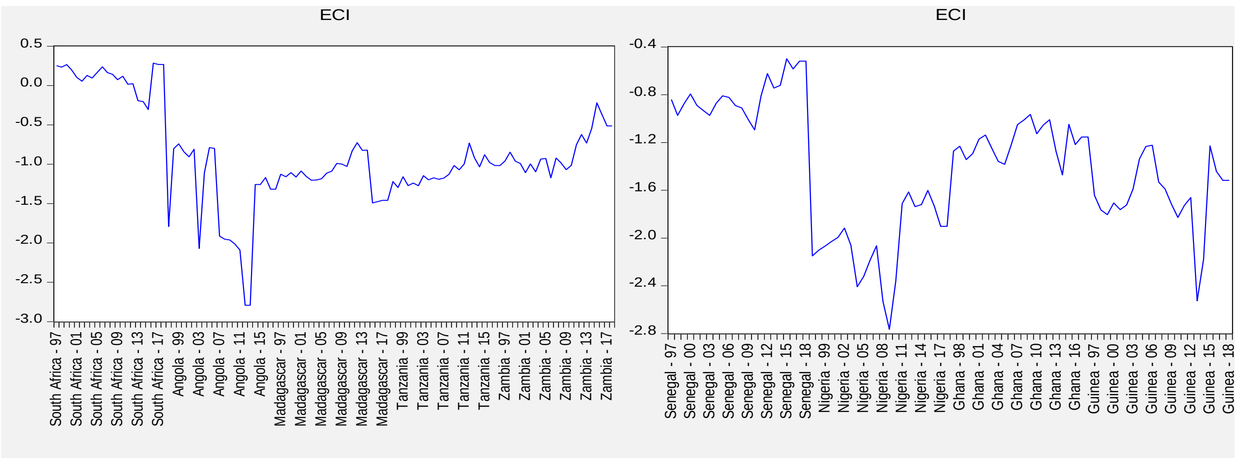


Source: Author’s calculations

Similarly, figure 5.2 has two panels, with panel A depicting an inspection of the unit root on economic complexity for the SADC region and panel B depicting a data set for ECOWAS grouping at a level. For both regions, the data sample does not appear to oscillate around the zero mean over time. As a result, the assumption is that the variable is non-stationary and will be differentiated to remove the unit root.

Figure 5.2: Economic complexity – at level

Panel A (SADC) *Panel B (ECOWAS)*

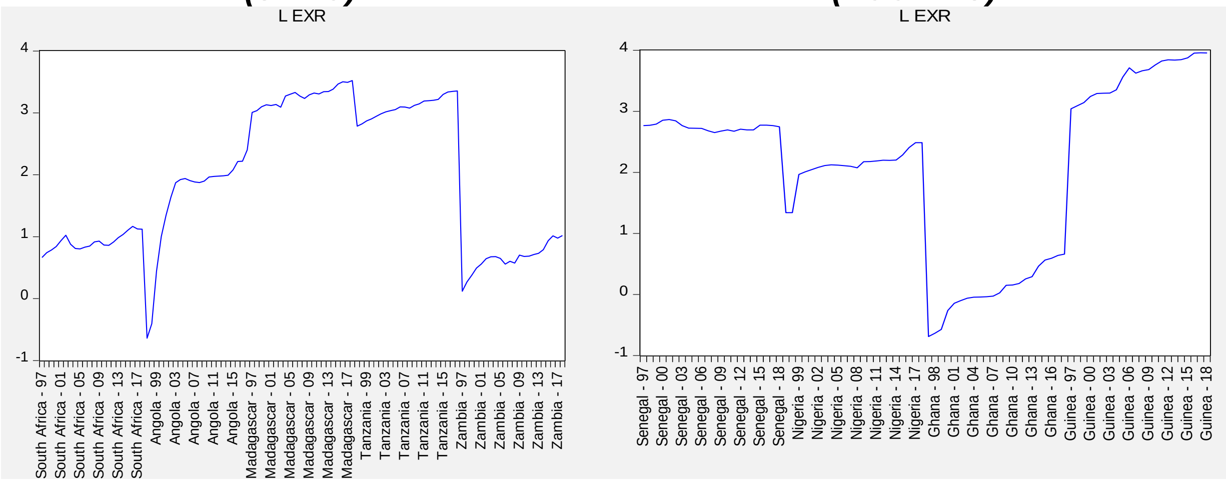


Source: Author’s calculation

Likewise, figures 5.3 and 5.4 show a visual examination of the unit root of the exchange rate and FDI, respectively. The data sample for the log of exchange rate seems to drift away from the zero mean over time, indicating that the variable is non-stationary in both regions. However, FDI appears to oscillate around a mean of zero, implying that the variable is stationary at level. This suggests that FDI integrate at order I(0), whereas the exchange rate must be differentiated to avoid a unit root problem.

Figure 5.3: Exchange rate - at level

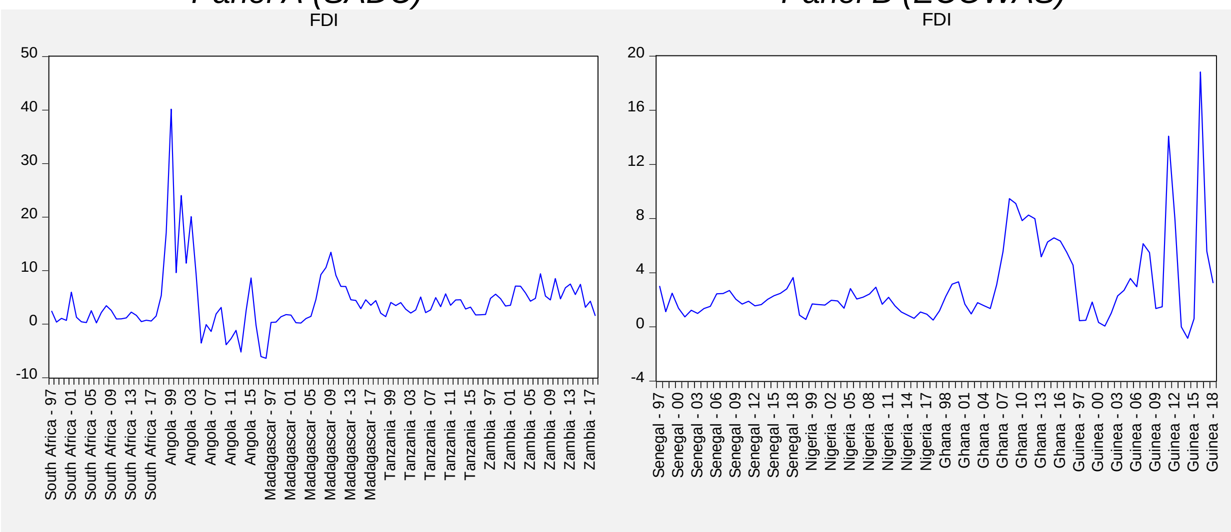
Panel A (SADC) ***Panel B (ECOWAS)***



Source: Author's calculations

Figure 5.4: Foreign direct investment - at level

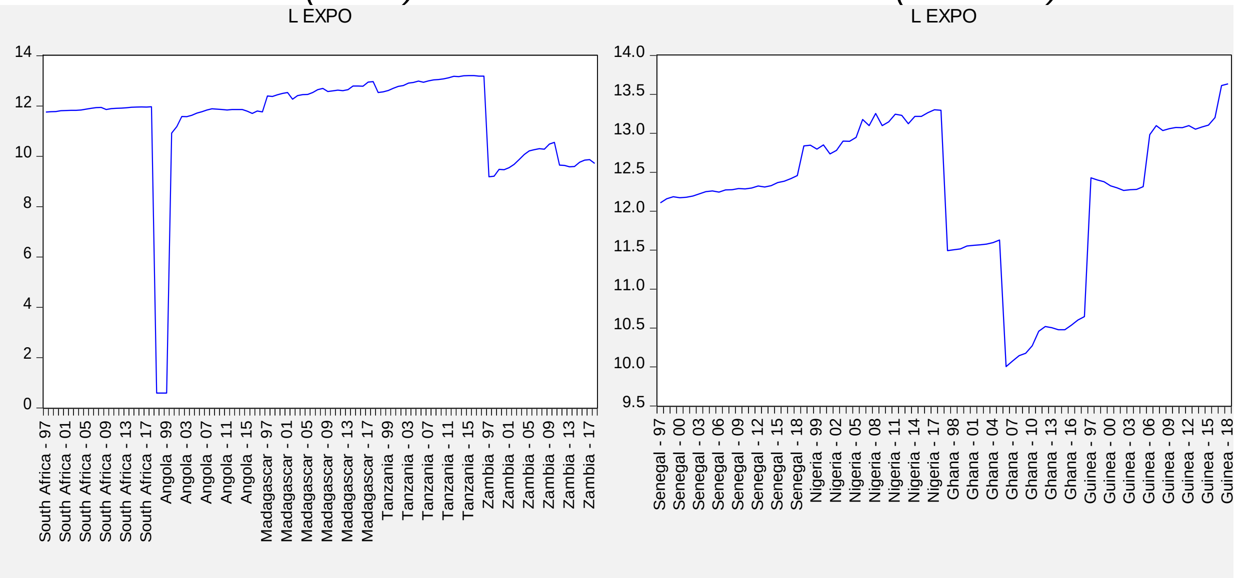
Panel A (SADC) *Panel B (ECOWAS)*



Source: Author's calculation

Figure 5.5: Exports - at level

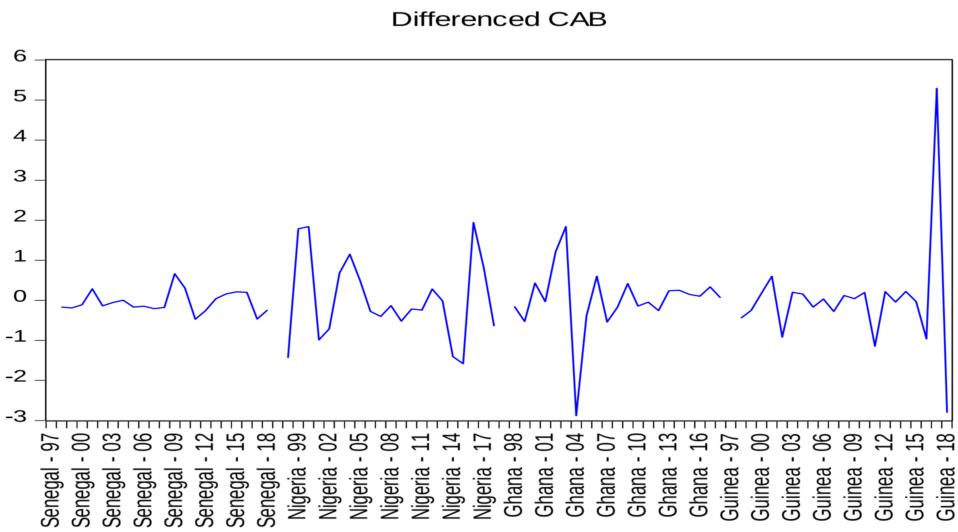
Panel A (SADC) *Panel B (ECOWAS)*



Source: Author's calculation

Correspondingly, panels (A) and (B) of figure 5.5 show the log of exports at level for the two economic regions. The data sets from SADC and ECOWAS appear to drift away from zero, implying that the sample is non-stationary at level and will be subjected to differencing to see if it integrates at the order I(1).

Figure 5.6: Current account balance - first differenced

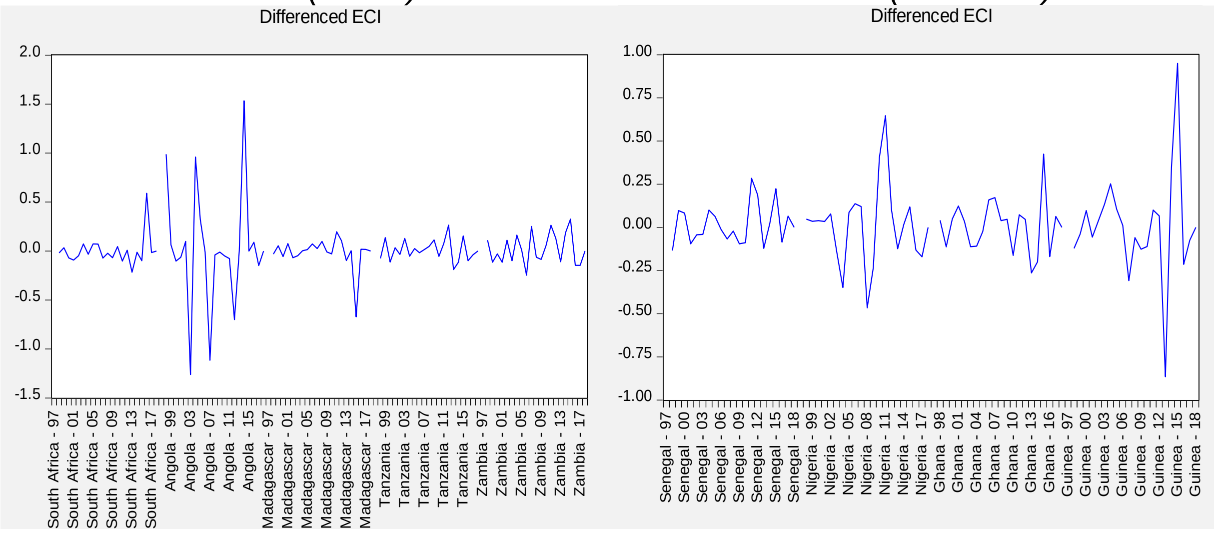


Source: Author's calculation

After first differencing, the data sample for ECOWAS's current account balance appears to hover around zero means. As a result, it is assumed that data will be integrated in order I(1). This assumption will be validated by employing a formal unit root test in the next section.

Figure 5.7: Economic complexity - First differenced

Panel A (SADC) *Panel B (ECOWAS)*

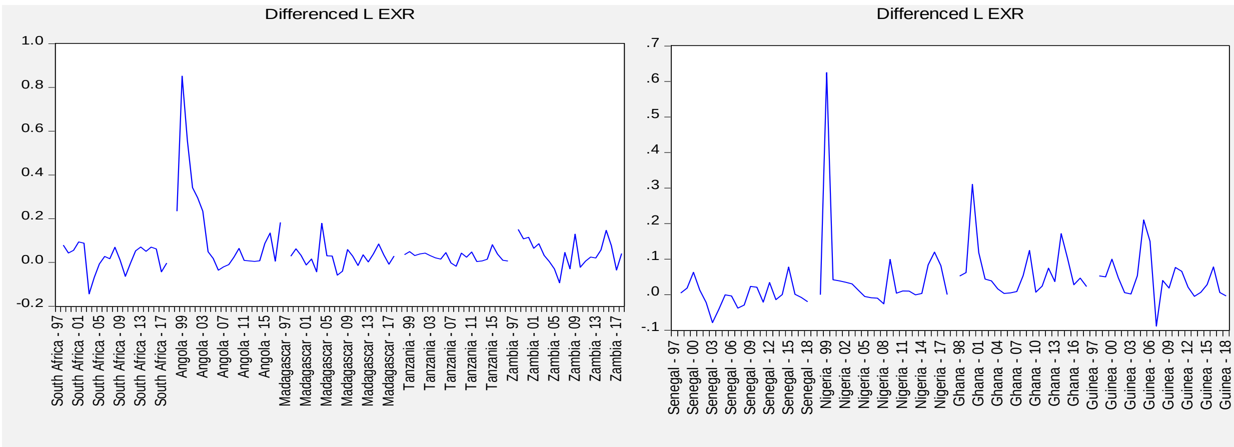


Source: Author's calculation

In contrast to figure 5.2, economic complexity for both economic groupings appear to become stationary after differencing as stated in figure 5.7 above. This means that there is a good chance that the data set contains only one unit root. Furthermore, figures 5.8 and 5.9 show a differentiated form of exchange rate and log of exports for the SADC and ECOWAS regions. All variables now appear to hover around zero mean, implying that these variables become stationary after first differencing or are integrating at the order I (1).

Figure 5.8: Exchange rate - first differenced

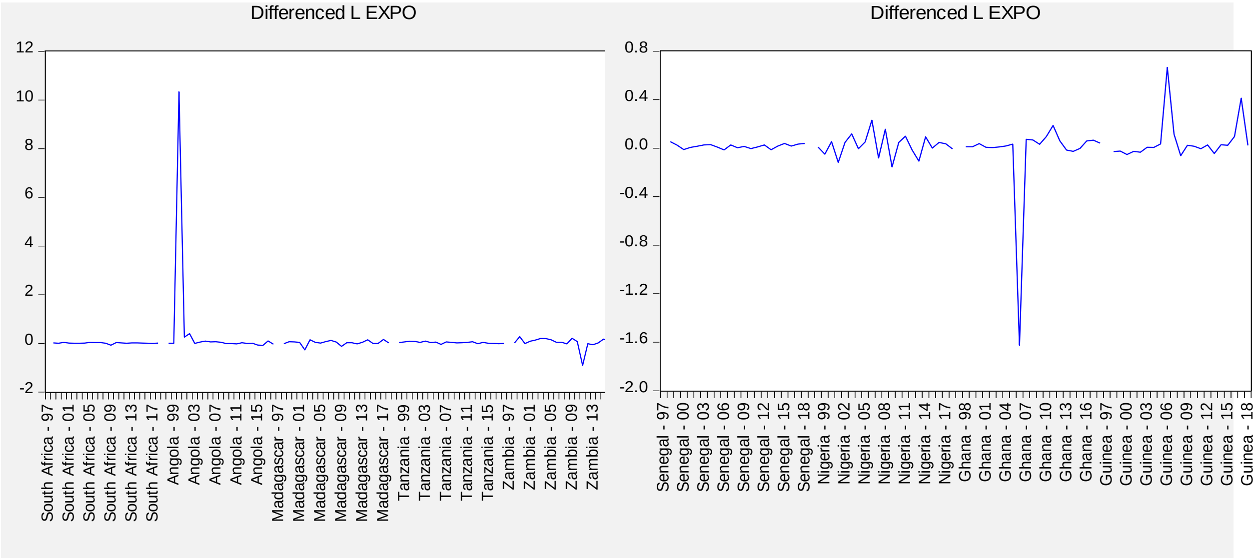
Panel A (SADC) *Panel B (ECOWAS)*



Source: Author's calculation

Figure 5.9: Exports - first differenced

Panel A (SADC) *Panel B (ECOWAS)*



Source: Author's calculations

5.2.1.2. Formal unit root tests

Table 5.1 shows formal unit root tests from Fisher Phillip-Perron and Breitung. Both tests have a null hypothesis of the unit root which indicates that the variable is non-stationary tested against the alternative hypothesis of no unit root.

Table 5.1: Formal unit root tests results

SADC model					
Variable	Order of integration	Fisher Phillip-Perron			Breitung
		Individual intercept	*Individual trend & intercept*	*None*	*Individual intercept & trend*
LCAB	Level	0.3431	0.7222	0.0205	0.7273
LCAB	1ST difference	0.0000	0.0000	-	0.0000
ECI	Level	0.3425	0.3827	0.1347	0.1884
ECI	1ST difference	0.0000	0.0000	0.0000	0.0000
LEXR	Level	0.0111	0.1116	1.0000	0.1344
LEXR	1ST difference	-	0.012	0.0000	0.0914
FDI	Level	0.0001	0.0003	0.0196	0.1461
LEXPO	Level	0.0003	0.4465	0.9997	0.8017
LEXPO	1ST difference	-	0.0000	0.0000	0.0000
ECOWAS model					

LCAB	Level	0.0032	0.0814	0.2981	0.5014
LCAB	1ST difference	-	0.0000	0.0000	0.1413
ECI	Level	0.1034	0.3611	0.5347	0.0008
ECI	1ST difference	0.0000	0.0000	0.0000	-
LEXR	Level	0.1127	0.4928	0.8906	0.2416
LEXR	1ST difference	0.0000	0.0001	0.0000	0.0842
FDI	Level	0.0352	0.0002	0.0986	0.8227
LEXPO	Level	0.9779	0.6005	0.9872	0.0371
LEXPO	1ST difference	0.0000	0.0000	0.0000	-

Source: Author's calculations

The rule of thumb for the stationarity of the variable is that the computed probability value should be 0.05 or less. Thus, the null hypothesis that the variable has a unit root is rejected at level for all the variables except for FDI for both SADC and ECOWAS models. This is because computed probability values in table 5.1 for these variables are greater than the critical value of 0.05 except for FDI. However, after first differencing, these variables become stationary implying that they integrate at the order I(1) with FDI integrating at the order I(0). Both of the models, therefore, have a mixture in the order of integration with the explained variable (current account integrating at the order I(1) thereby fulfilling the requirement that the explained variable is ought to integrate at the order I(1). Given that there is a mixture of integration and without a variable that integrates at I(2), the appropriate technique of estimation is panel ARDL.

5.2.2. Selection of lag length structure

The results of the appropriate lag length structure and analysis are presented in table 5.2 as follows,

Table 5.2: Selection of lag length structure

Lag	LogL	LR	FPE	AIC	SC	HQ
SADC model						
0	-518.0326	NA	2.126360	14.94379	15.10439	15.00758
1	-105.9646	753.4957	3.35e-05	3.884703	4.848344*	4.267473*
2	-75.86638	50.73699	2.93e-05	3.739040	5.505714	4.440784
3	-46.33169	45.56781	2.65e-05	3.609477	6.179186	4.440784
4	-19.42284	37.67239	2.65e-05	3.554938	6.927681	4.630196
5	25.65210	56.66564	1.63e-05	2.981369	7.157145	4.894633

6	62.61589	41.18822*	1.34e-05*	2.639546	7.618357	4.617190
7	92.46570	28.99696	1.44e-05	2.500980	8.282825	4.797599
8	129.6724	30.82841	1.39e-05	2.152217*	8.737096	4.767811
ECOWAS model						
0	-425.5039	NA	1.174403	14.35013	14.52466	14.41840
1	-107.2305	572.8922	6.69e-05	4.574349	5.621521*	4.983955*
2	-73.72047	54.73299	5.13e-05	4.290682	6.210498	5.041628
3	-40.24501	49.09734	4.05e-05	4.008167	6.800627	5.100451
4	-23.60659	21.62995	5.84e-05	4.286886	7.951989	5.720510
5	8.499467	36.38686	5.37e-05	4.050018	8.587764	5.824980
6	47.60991	37.80676	4.28e-05	3.579670	8.990060	5.695971
7	95.02362	37.93097*	2.97e-05*	2.832546*	9.115580	5.290186

Source: Author's calculations

The asterisk (*) indicates the lag length order selected by each criterion. Table 5.2 shows the lag length structure results from sequentially modified LR test statistic (each test at 5% level) – LR, final prediction error – FPE, Akaike information criterion – AIC, Schwarz information criterion – SC, and Hannan-Quinn information criterion – HQ. Both the Schwarz information criterion-SC and the Hannan-Quinn information chose lag order 1 as the appropriate length structure to implement in both models. Lag order 7 is selected as the relevant order for the ECOWAS model by sequential modified test statistics, final prediction error, and Akaike information, while orders 6 and 7 are selected for the SADC region.

According to Ncanywa and Masoga (2018), the Schwarz information criterion is better suited to correctly identifying the appropriate lag length for an econometrics model with a sample size of fewer than 120 observations. Thus, given that the number of observations for both models is less than 120, the study follows the lag length structure of 1 as selected by the Schwarz information criterion.

5.2.3. Panel cointegration test results

The cointegration tests developed by Kao, Johansen and Pedroni are used to determine the existence of a long-run relationship between current account balance, economic complexity, exchange rate, foreign direct investment, and exports. All of these tests have a null hypothesis of no cointegration tested against the alternative null of cointegration among the variables.

Table 5.3: Summary of Kao panel cointegration test results

	SADC model		ECOWAS model	
Variable	*t-statistics*	*Probability*	*t-statistics*	*Probability*
ADF	-2.566562	0.0051	-0.919435	0.1789
Residual variance	1.158526	-	0.752439	-
HAC variance	1.104823	-	0.155007	-

Source: Author compilation

Table 5.3 present the Abridge Kao cointegration test results for SADC and ECOWAS. The computed probability value influences whether the null hypothesis is accepted or rejected. If the probability value is less than the critical value of 0.05, the decision is to reject the null hypothesis and conclude that there is long run relationship. The cointegration of the variables in the SADC model is established using the Kao test. However, the Kao test results show that there is no long-run relationship in the case of ECOWAS. The discovery of no cointegration is not unusual in econometrics modelling. Daly and Siddiki (2009), for example, discovered that there was no long-run relationship between real interest rate, government budget deficit, and the current account balance.

Table 5.4: Summary of Johansen panel cointegration results

SADC MODEL					
Hypothesised No of CE (s)	Eigenvalue	Trace statistic	0.05 critical value	Max-Eigen statistic	0.05 critical value
None*	0.546894	121.7894	69.81889	79.16302	33.87687
At most 1	0.196941	42.62639	47.85613	21.93274	27.58334
At most 2	0.118488	20.69366	29.79707	12.61170	21.13162
At most 3	0.072314	8.081955	15.49471	7.506209	14.26460
At most 4	0.005741	0.575746	3.841466	0.575746	3.841466
ECOWAS MODEL					
Hypothesized No of CE (s)	Eigenvalue	Trace statistic	0.05 critical value	Max-Eigen statistic	0.05 critical value
None*	0.506867	94.69831	69.81889	56.55809	33.87687
At most 1*	0.291647	38.14023	47.85613	27.58497	27.58434
At most 2	0.072313	10.55526	29.79707	6.004898	21.13162
At most 3	0.054380	4.550361	15.49471	4.473119	14.2660
At most 4	0.000965	0.077242	3.841466	0.0077242	3.841466

Source: Author compilation

The panel Johansen cointegration test results confirm the Kao test results, as shown in table 5.4. For both models, the trace test reveals 1 cointegrating equation while the maximum eigenvalue indicates 1 cointegrating equation for SADC and 2 cointegrating equations for ECOWAS. Therefore, the null hypothesis of no cointegration shall be rejected given that the values of trace test at equation 1 and of maximum eigenvalue at equation 1 are greater than their respective critical values. As a result, the conclusion is that Johansen cointegration confirms Kao tests for SADC but disproves them for the ECOWAS region because they show a long run relationship. Ozdamar (2015) investigated the existence of a long-run relationship between the Turkish economy's current account balance, FDI, GDP, terms of trade, and exchange rate using Johansen cointegration. For the years 1994 to 2014, the study discovered one cointegrating equation using both trace tests and the maximum eigenvalue.

Table 5.5: Summary of Pedroni panel cointegration tests

SADC model		
	Probability	
Panel	Statistics	Weighted statistics
"-Panel v-Statistics"	0.5671	0.6833
"-Panel rho-statistics"	0.9020	0.8835
"-Panel PP-statistics"	0.0108	0.0069
"-Panel ADF-statistics"	0.0274	0.0618
Group		
"-Group rho-Statistics"	0.9508	-
"-Group PP-Statistics"	0.0044	-
"-Group ADF-Statistics"	0.1948	-
ECOWAS model		
	Probability	
Panel	Statistics	weighted statistics
-Panel v-Statistics	0.9837	0.9857
-Panel rho-statistics	0.9437	0.9319
-Panel PP-statistics	0.0000	0.0000
-Panel ADF statistics	0.0000	0.0000
Group		
-Group rho-Statistics	0.9962	-
-Group-PP-Statistics	0.0000	-
-Group ADF Statistics	0.0000	-

Source: Author's calculations

The Pedroni type of tests was also used in the study to further solidify the cointegration test results. Under the Pedroni type of test, the decision to accept or reject the null is based on eleven probability values. The null hypothesis is rejected when the majority of computed probability values are less than the critical value of 0.05. Thus, the results in table 5.5 show that the null is accepted for the SADC region as six competed probability values are greater than the critical threshold. For ECOWAS, on the other hand, six out of eleven computed probability values are less than the critical probability value of 0.05. As a result, the decision is made to reject the null hypothesis and conclude that ECOWAS has a long run relationship as determined by Pedroni tests. In general, despite the findings of no cointegration by the Kao tests for the ECOWAS region and Pedroni for the SADC region, it is concluded that there is a long run relationship or co-movement between the variables for both regions.

5.2.4. Panel autoregressive distributed lag results

The Panel ARDL estimates explain how each indicator of economic complexity, exchange rate, FDI, and exports affect current account balance in the short run and long run. The results also include ECM estimates for both models, which measures how quickly the model converges to equilibrium from short run to long run. This section contains only a summary of the results; full detailed results can be found in the Appendix section.

Table 5.6: Summary of panel ARDL results - SADC model

Variable	Long run coefficients	Probability(L)	Short run coefficients	Probability(S)
ECI	-0.734051	0.5417	-0.236806	0.5926
LEXR	0.934877	0.0491	1.215604	0.0448
FDI	-0.229967	0.0301	-0.028967	0.2738
LEXPO	-0.516609	0.4339	0.066582	0.9553
ECM	-0.232845			0.0228
Constant (β_0)	0.737356			0.0226

Source: Author compilation

Summary of results from panel ARDL tests in table 5.6 indicates that economic complexity, FDI, and export of goods and services have a negative long run impact on the current account balance for the SADC region with the exchange rate inflicting a positive effect. The results show that a 1% change in economic complexity worsens the current account balance by 73.41%. However, the coefficient estimate for economic complicity is statistically insignificant thereby its impact is negligible. Moreover, a 1% change in the exchange rate will lead to a 93.45% increase in the current account balance while FDI and export tend to worsen the current account balance by 22.10%, and 51.66% respectively. The results are partially in concurrence with a study by Ousseini and Aboubacar (2017) for the West African Economic and Monetary Union (WAEMU). They also established that the exchange rate had a positive impact on both current account balance and trade balance. Contrarily Aristovnik (2008) found that for the selected European countries, changes in the exchange rate were one of the major sources of current account deficit for the period spanning from 1992 to 2003.

It is again established that in the short run, economic complexity and FDI affect current account balance negatively while exchange rate and exports inflict a positive impact. Furthermore, the SADC model shows convergence at a speed of approximately 23.29% and such convergence is significant at a 5% level of significance. This implies that, if there are economic imbalances in the economy in one year, about 23.29% of those imbalances will be restored or corrected in the following year. The convergence is significant at a 5% level of significance.

Table 5.7. Summary of panel ARDL results - ECOWAS model

Variable	Long run coefficients	Probability(L)	Short run coefficients	Probability (S)
ECI	-0.745498	0.0810	-0.331413	0.2273
LEXR	0.976960	0.0414	1.148731	0.1912
FDI	-0.101903	0.0811	0.081937	0.2382
LEXPO	0.220021	0.4923	1.799154	0.0054
ECM	-0.611999			0.0000
Constant ($\boldsymbol{\beta_0}$)	-4.135003			0.0000

Source: Author compilation

Similar to the SADC region the results in table 5.6 reveal that economic complexity continues to negatively affect current account balance both in the long run and short run for the ECOWAS region. Estimates of economic complexity stand at -0.745 in the long run and -0.331 in the short run thereby showing greater magnitude compared to -0.734 and -0.236 in the SADC region.

The exchange rate again shows a positive relationship between the current account balance and exchange rate for the ECOWAS region in the long run and short run. The results are statistically significant for both regions thus showing that the exchange rate has been an important factor in determining the level of the current account balance. These results are contrary to the proposition of the J-curve theory in the short run which states that fluctuations or devaluation of the exchange rate will tend to worsen the current account balance. Moreover, estimates presented in table 5.7 show that the impact of FDI and exports are slightly different from those of the SADC region. In the long run, FDI still worsens the current account balance with a magnitude of 10.19% for the ECOWAS region. However, contrary to SADC grouping, in the short run FDI affect the current account balance positively by a magnitude of 8.19% in the case of the ECOWAS region. Furthermore, exports of goods and services tend to affect the current account balance positively both in the long run and short run as compared to the negative relationship in the case of the SADC region. ECOWAS model also indicates restoration to equilibrium at a speed of 61.20% when there is any disequilibrium encountered from one period to another. The probability value of ECM which measures the speed of adjustment stands at 0.00 and this means that it is admissible given that it is significant at a 1% level of significance.

5.2.5. Panel Granger causality test results

This section presents the findings and interpretations of Granger causality tests for the SADC and ECOWAS regions.

Table 5.8: Abridge results of Granger causality

Null hypothesis	Obs	F-statistics	P-value	Decision
SADC region				
ECI → LCAB	105	0.41882	0.5190	Accept Null
LCAB → ECI		1.65885	0.2007	Accept null
LEXR → LCAB	105	0.28799	0.5927	Accept null
LCAB → LEXR		8.88641	0.0036	Reject null
FDI → LCAB	105	7.00021	0.0094	Reject null
LCAB → FDI		0.01136	0.9153	Accept null
LEXR → ECI	105	4.45606	0.0372	Reject null
ECI → LEXR		2.77690	0.0987	Accept null
FDI → LEXR	105	45.3280	1.E-09	Reject null
LEXR → FDI		2.54449	0.1138	Accept null
LEXPO → EXR	105	88.1281	2.E-15	Reject null
LEXR → LEXPO		11.2404	0.0011	Reject null
LEXPO → FDI	105	14.9242	0.0002	Reject null
FDI → LEXPO		35.4939	4.E-08	Reject null
ECOWAS region				
ECI → LCAB	84	4.58551	0.0352	Reject null
LCAB → ECI		1.91895	0.1698	Accept null
LEXR → LCAB	84	2.8E-05	0.9958	Accept null
LCAB → LEXR		1.23372	0.2700	Accept null
FDI → LCAB	84	6.94239	0.0101	Reject null
LCAB → FDI		2.58633	0.1117	Accept null
LEXR → ECI	84	0.07274	0.7881	Accept null
ECI → LEXR		2.80327	0.0979	Accept null
LEXPO → EXR	84	0.92323	0.3395	Accept null
EXR → LEXPO		4.77275	0.0318	Reject null
LEXPO → FDI	84	5.70258	0.0193	Reject null
FDI → LEXPO		4.80144	0.0313	Reject null

Note: → represents null hypothesis of no Granger causality

Source: Author compilation

Panel Granger causality results computed using panel data for two regions are summarised in table 5.8. For causality that runs from current account balance to exchange rate in the SADC region, the null hypothesis of no causality is rejected. For causalities that run from FDI to current account balance, from exchange rate to economic complexity, and that run from FDI to exchange rate, are rejected once more. The type of causality found among these variables is known as unidirectional causality because it is one-sided and does not run from both sides. Akbas, Senturk and Sancar (2013) discovered unidirectional causality from FDI to current account deficit for G7 members using Dumitrescu-Hurlin panel granger causality tests. The findings in table 5.8 also revealed bidirectional causality between the exchange rate and exports, as well as between FDI and exports, for the SADC region.

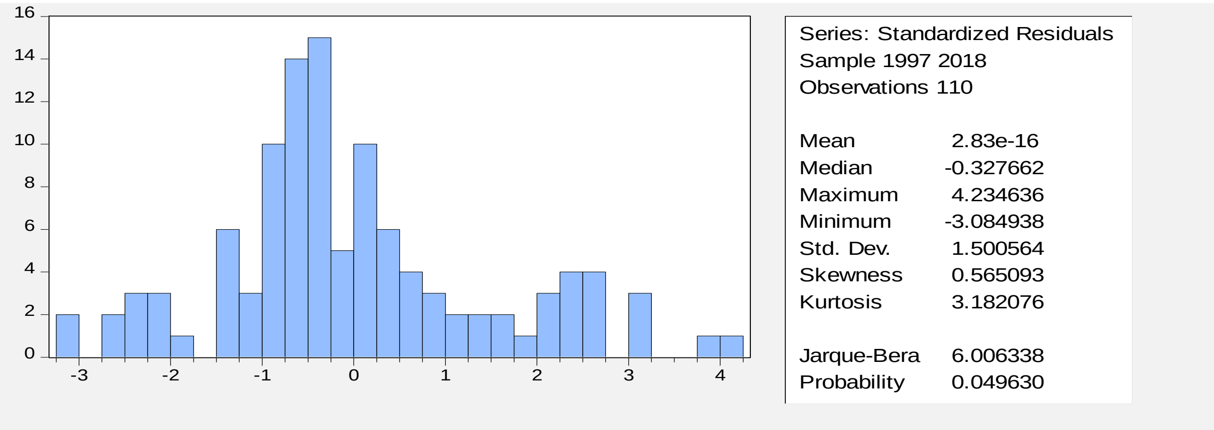
The ECOWAS region, like the SADC region, has established a bidirectional causality between exports and FDI. Okodua (2009) for the Nigerian economy and Aimon, Kurniadi, and Sentosa (2020) for lower-middle-income Asian countries support the discovery of bidirectional causality between export and FDI. Furthermore, in the case of ECOWAS groupings, the following unidirectional causality is revealed. Unidirectional causality runs from economic complexity and FDI to current account balance and from exchange rate to exports.

5.2.6. Normality, stability tests and cross-sectional dependence

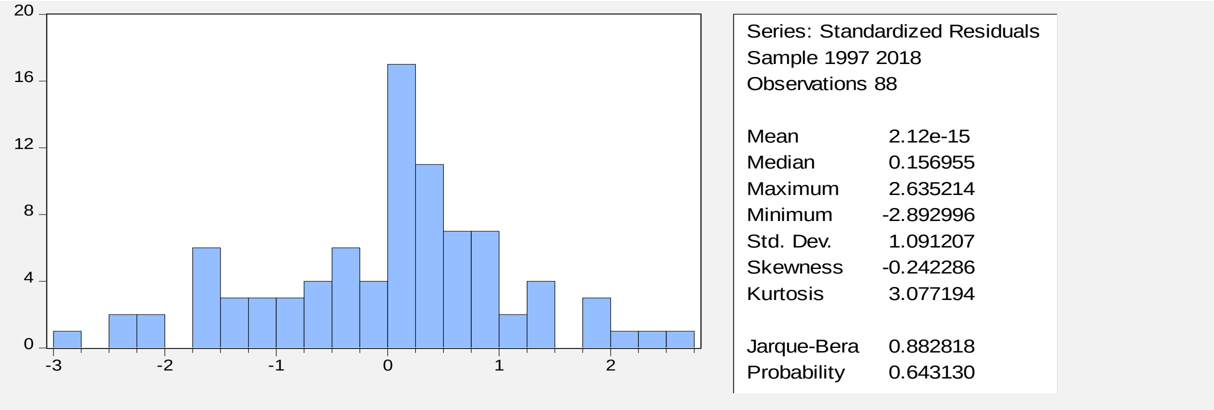
Normality and stability tests are carried out primarily to evaluate the dependability of the model regressions proposed in the study.

Figure 5.10: Normality test results

SADC model



ECOWAS model

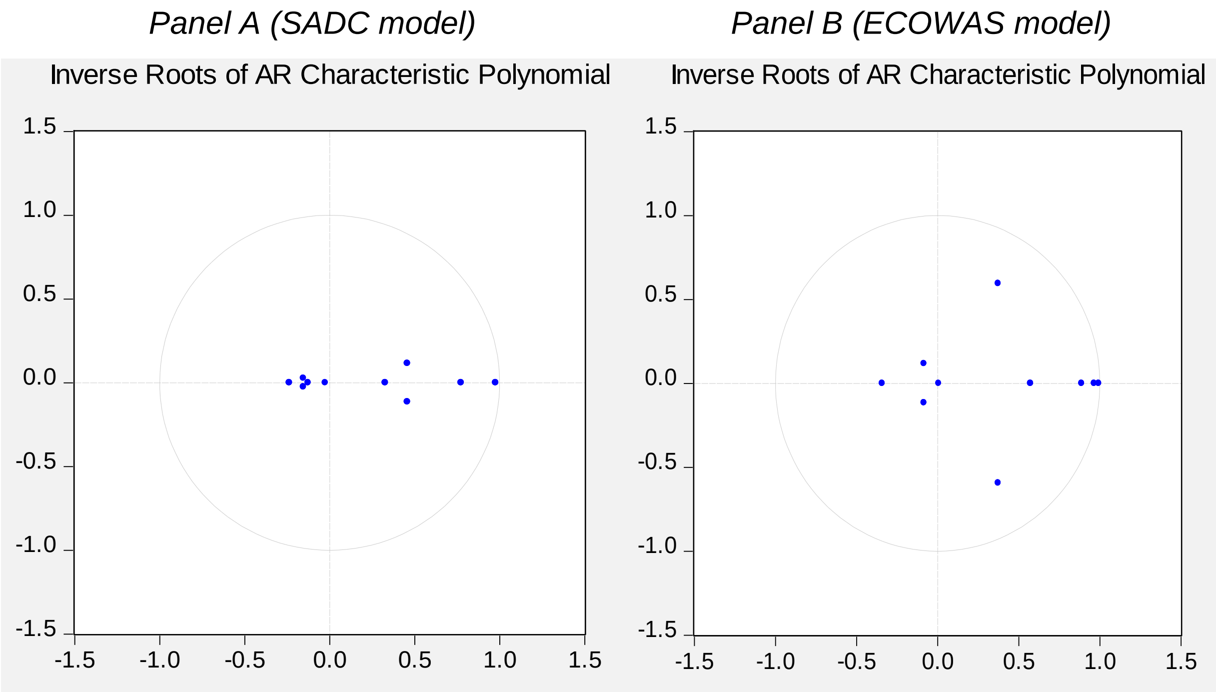


Source: Author's calculations

Normality tests are used to determine whether the residuals in the estimated model follow a normal distribution with a constant mean and variance over time (Ouma and Muriu 2014). Similarly, Brooks (2008) states that the normality of residual can be interpreted both informally and formally by inspecting the graph depicted in figure 5.10 and evaluating the probability value of Jarque-Bera and the value that Kurtosis takes. For normal residual distributions, the graph of the normal distribution must be bell-shaped, the probability of the Jarque-Bera must be insignificant, and Kurtosis must be approximately 3.

The normality graph in panel A of figure 5.10 for SADC countries appears to have a bell shape. Similarly, Kurtosis is assigned a value of 3.18, which is close to 3. As such, the conclusion for the SADC region is that residuals are normally distributed. Furthermore, the graph in panel B shows a bell shape, indicating that residuals are normally distributed in the arranged model for the ECOWAS grouping. Kurtosis and Jarque-Bera both support the claim that the ECOWAS economic region has a normal distribution. Kurtosis is 3.007, and the Jarque-Bera probability value is insignificant, as required.

Figure 5.11: Inverse roots of Autoregressive polynomial



Source: Author's calculations

The stability tests of the two models computed using the inverse roots of the autoregressive characteristic polynomial are shown in figure 5.11. All of the inverse roots must be within the polynomial circle for stability. Both panels A and B in figure 5.11 show that all models satisfy the requirements of a stability condition, implying that the results are reliable and can be used for interpretation and to make policy recommendations.

Table 5.9: Abridge results of cross-sectional dependence: SADC region

Test	Statistic	d.f.	P-value.
Breusch-Pagan LM	3.320979	10	0.9728
Pesaran scaled LM	-1.493475		0.1353
Pesaran CD	0.374805		0.7078

Source: Authors calculation

Table 5.9 shows abridged results of cross-sectional dependence calculated on ordinary least squares and cross section SUR weights for SADC region. The null of no cross-sectional dependence is accepted for all three types of tests as the computed probability are greater than the significant level of 0.05. Thus, the conclusion is that the there is no presence of cross-sectional dependence. Similar to

SADC region, the same conclusion is reached for ECOWAS regions as it is observed that probability values of three tests are greater the critical value of 0.05.

Table 5.10: Abridge results of cross-sectional dependence tests: ECOWAS region

Test	Statistic	d.f.	P-values
Breusch-Pagan LM	10.11402	6	0.1199
Pesaran scaled LM	1.187616		0.2350
Pesaran CD	-1.165543		0.2438

Source: Authors calculation

5.2.7. Variance decomposition and generalized impulse response functions

Following the study's third objective, this section presents the findings from variance decomposition and generalised impulse response functions computed based on VAR models, which attempt to forecast economic shocks of one variable on another. Figure 5.11 shows variance decomposition results based on Cholesky ordering. For each economic region, the results are presented for four different lagged time horizons: one quarter, two quarters, three quarters, and ten quarters. Furthermore, in the analysis, period 2 is chosen to represent the short run, while period 10 explains the long run.

Table 5.11: Abridge results of variance decomposition

SADC model						
Period	SE	LCAB	ECI	LEXR	FDI	LEXPO
1	1.094365	100.0000	0.000000	0.000000	0.000000	0.000000
2	1.417687	79.51115	4.037087	7.440536	1.091340	7.919887
3	1.487729	78.99840	4.284706	6.795711	1.645558	8.275628
10	1.647302	71.89641	7.171472	5.751761	7.653580	7.526775
ECOWAS model						
Period	SE	LCAB	ECI	LEXR	FDI	LEXPO
1	0.863407	100.0000	0.000000	0.000000	0.000000	0.000000
2	1.059135	91.59167	0.443800	0.130922	6.776819	1.056792
3	1.179378	83.13880	1.170053	0.247971	12.93423	2.508947
10	1.510237	60.06088	4.501174	0.558643	24.47922	10.40008

Source: Author compilation

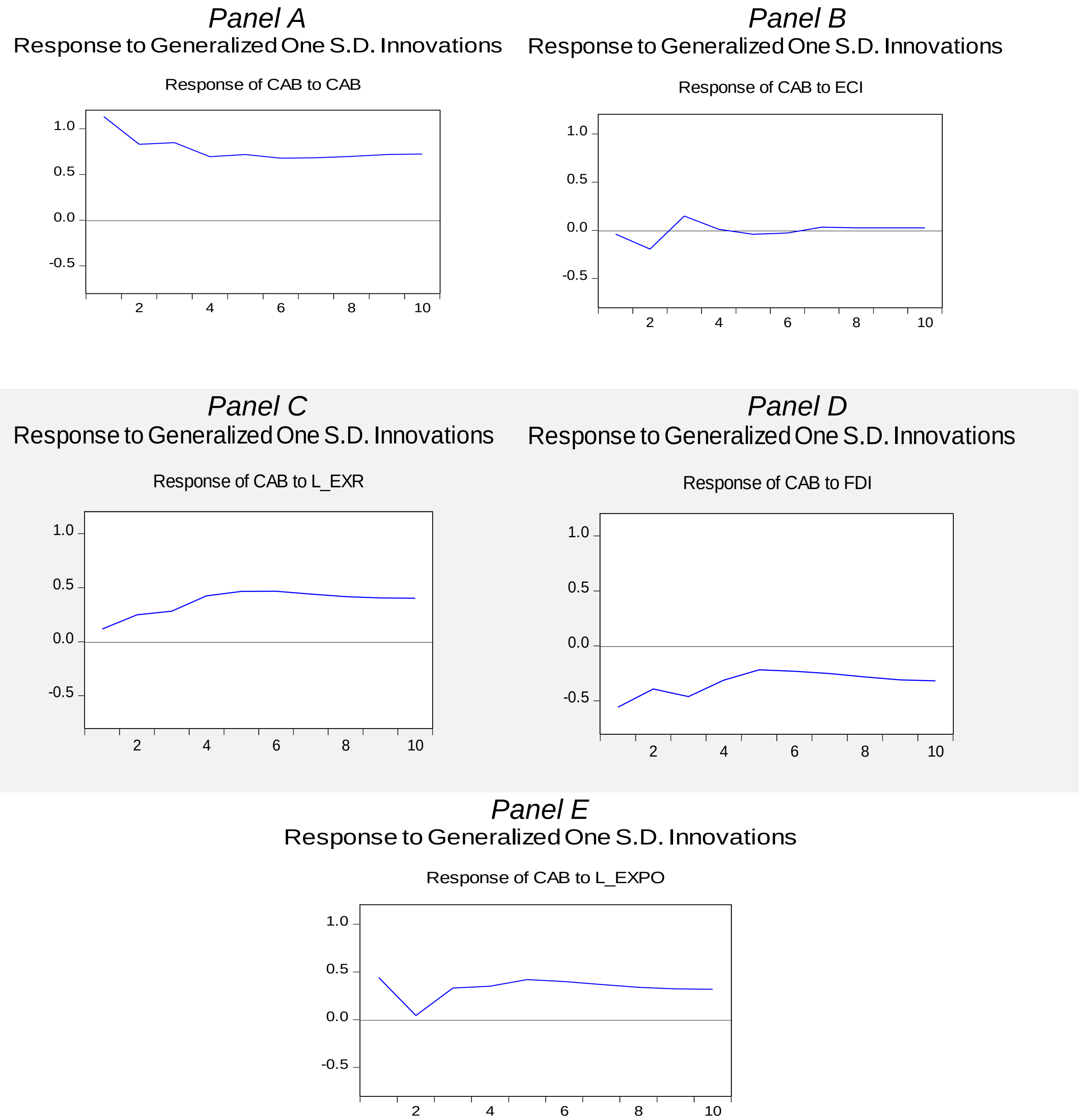
The results in table 5.11 show that variations in the current account balance are better explained by the current account's innovations. When the current account balance is shocked by its fluctuations, it accounts for approximately 79.51% for the SADC grouping and 91.59% for the ECOWAS grouping. However, in the tenth period, a shock caused by current account balance innovations accounts for 71.90% of fluctuations for SADC and 60.06% for ECOWAS. In the short run, a shock in economic complexity causes the current account balance to vary by 4.04% and 0.44%, respectively, for the two models. Similarly, variations in economic complexity will cause the current account balance to change by 7.17% for SADC and 4.50% for the ECOWAS region in the long run. Variations in economic complexity have a larger magnitude in the SADC region than in the ECOWAS region, both in the short and long run.

In the short run, the current account balance responds to exchange rate and FDI shocks by 7.44% and 0.13% for SADC, respectively, and 1.09% and 6.78% and 0.24% for ECOWAS. In the long run, economic shocks of these variables cause the current account balance to vary by 5.75% and 0.56% for the exchange rate and 7.65% and 24.48% for FDI, respectively. Finally, export shocks cause the current account balance to oscillate by 7.92% for SADC and 1.06% for ECOWAS in the short run. However, in the long run, these shocks cause a 7.53% vacillation for SADC and a 10.40% vacillation for ECOWAS.

When the magnitudes of shocks originating from current account own innovations are compared between the two economic regions using the variance decomposition, it is discovered that the magnitudes of shocks originating from current account own innovations are lower for SADC than for ECOWAS in the short run but higher in the long run. The extent to which shocks in economic complexity, exchange rate, FDI, and exports cause current account balances to fluctuate varies between models. In the long run, economic complexity and exchange rate account for larger percentages in the SADC region, whereas shocks from economic complexity and FDI cause the current account in the ECOWAS region to oscillate by larger magnitudes than in the SADC region.

The results of the generalised impulse response functions, as shown in figures 5.12 and 5.13, specify how one standard deviation shock to the residual causes variables to react to one another. Panel A of figure 5.12 describes the impact of shocks caused by current account balance innovations. Shocks from current account balance own innovations have a positive impact on it, with a slight decline from period 2 to 4 and thus remaining stable until period 10. Panel B shows a positive reaction of the current account balance to innovations in economic complexity for a shorter period between periods 2 and 4 but then turns negative in the long run. Similar to the short run and long run estimates in table 5.6, economic complexity continues to have a negative impact on the SADC region's current account balance.

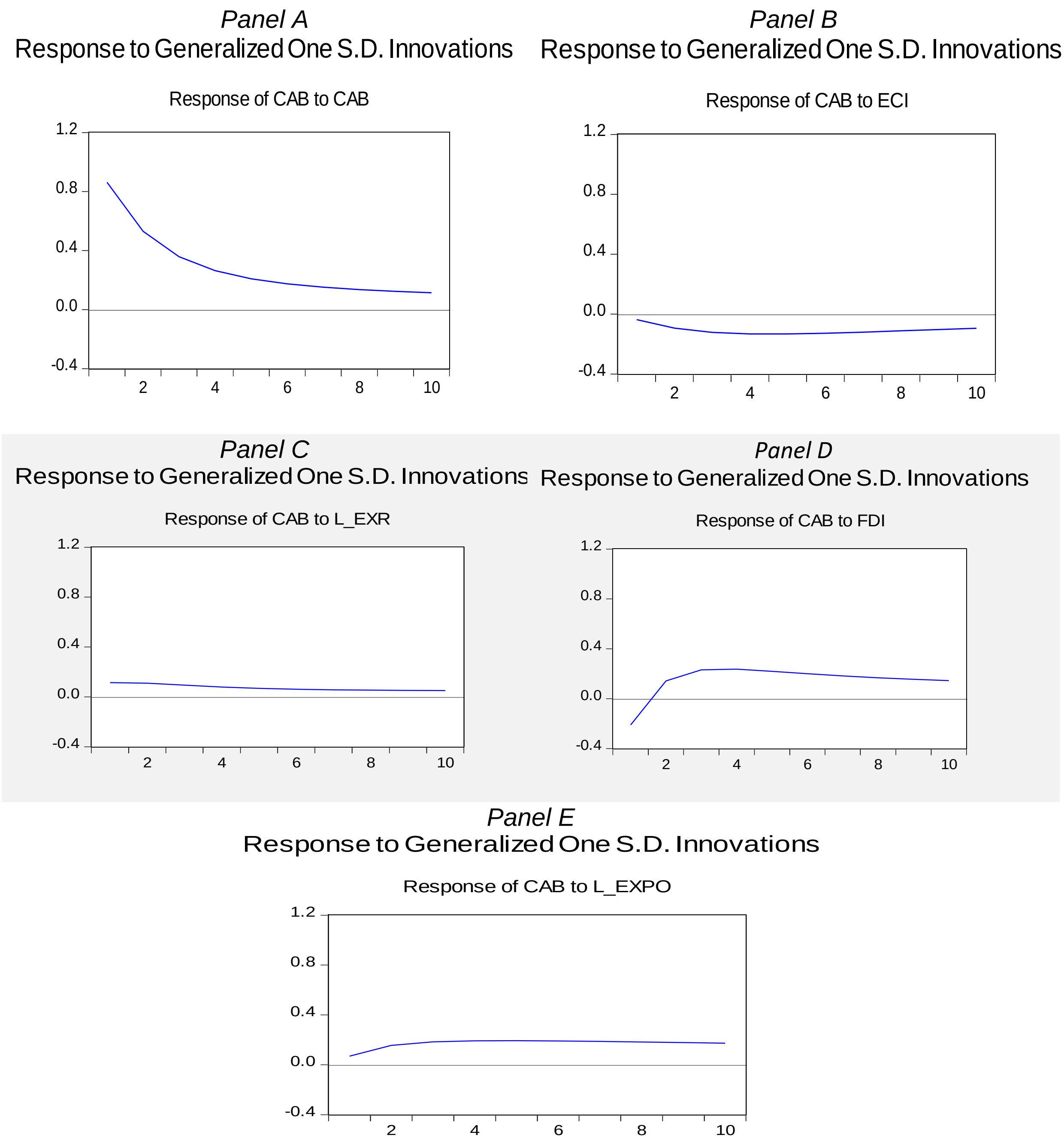
Figure 5.12: Generalized impulse response function - SADC model



Source: Author’s calculations

Panels C, D, and E depict the response of the current account balance to exchange rate, FDI, and goods and services exports-induced innovations, respectively. Exchange rate and export shocks have a positive impact on the current account balance over the entire 10-year period. Shocks caused by FDI, on the other hand, indicate a negative impact on the entire SADC region.

Figure 5.13: Generalized impulse response function results - ECOWAS model



Source: Author’s calculations

Figure 5.13 compares the ECOWAS grouping to the SADC region and shows shocks of standard error deviations from current account balance own innovations, as well as innovations from economic complexity, exchange rate, FDI, and exports. In terms of standard errors arising from current account balance innovations, the ECOWAS grouping's results are comparable to those of the SADC region. The variable responds positively to its innovations, and it also exhibits a continuous decline from the short run to the long run figure 5.13, panel A, depicts this exposition. Furthermore, economic complexity-related innovations have been found to have a negative impact on the ECOWAS region's current account balance. Economic shocks caused by the exchange rate, FDI, and exports of goods and services, on the other hand, have a positive impact on ECOWAS's current account balance. FDI results differ from those established for the SADC region.

5.3 Summary

Following the methodological procedure outlined in chapter 4, this chapter outlined the study's findings. Individual data variables were first tested for stationarity with Fisher PP and confirmed with Breitung type tests. These tests revealed a mix of integration orders with current account balance, economic complexity, exchange rate, and exports integrating at the order I(1) or after first differencing, and FDI was found to be stationary at level or order I(0). Secondly, the study used the Kao, Johansen, and Pedroni cointegration tests to evaluate long-run relationships between model variables and co-movement between the variables was established. The panel ARDL technique was used to obtain short and long run estimates. Finally, to test for causality and forecast economic shocks, Granger causality tests, variance decomposition, and generalised impulse response functions are used.

CHAPTER 6

SUMMARY, RECOMMENDATIONS AND CONCLUSION

6.1. Introduction

This chapter contains a summary and interpretation of the study, as well as a conclusion, contributions or policy recommendations, and limitations.

6.2. Summary and Interpretation of Findings

The study comparatively analysed the impact of economic complexity and exchange rates on current account balances in the SADC and ECOWAS regions. To do achieve this aim, three major objectives were set. The first objective was to investigate the short and long run relationships between current account balance, economic complexity, and exchange. The second objective was to determine whether there is a causal relationship between current account balance, economic complexity, and exchange rate, and the third and final objective was to forecast economic shocks caused by the aforementioned variables on one another. To help address these objectives, the panel ARDL method was used, as well as related econometrics tools as explained in chapter 4.

Empirical findings revealed that economic complexity had a negligible impact on SADC and ECOWAS current account balances. This revelation runs counter to expectations. Nonetheless, the countries selected to represent each region had relatively simpler economic structures or less sophisticated productive capacity. Thus, economic complexity is not found to be a significant explanatory variable of the current account balance level. The exchange rate, on the other hand, was found to be a significant determinant of the trajectory of the current account balance in both regions. A significant and long run positive relationship exists between current account balance and exchange rate. FDI and exports, which were included as control variables, have different effects on current account balances in the two regions. FDI has a statistically significant negative impact on the current account for the SADC region but estimates in the short run were found to be insignificant. On the other hand, a positive relationship is established for the ECOWAS region, but such impact is negotiable given that the estimates are statistically insignificant. Exports have proven to have a positive impact on the ECOWAS current account in both the short and long term, but only have a negative impact in the long run for the SADC region. Furthermore, Granger causality tests for both regions revealed a bi-directional causality between exports and FDI. The following unidirectional causalities have been discovered:

- Unidirectional causality that runs from current account balance to exchange rate for the SADC region,
- Unidirectional causality running from FDI to the current account balance for the SADC region,
- Unidirectional causality that runs from exchange rate to economic complexity for the SADC region,
- Unidirectional causality that runs from FDI to exchange rate for both the SADC region and Ecowas region,
- Unidirectional causality running from economic complexity to current account balance for the ECOWAS region, and;
- Unidirectional causality runs from the exchange rate to exports of goods and services for the ECOWAS region.

Unidirectional causality simply means that the relationship between variables is one-sided, which means that changes in one variable, say X, cause changes in another variable, Y, but changes in Y do not cause changes in X. The results of the Generalized Impulse Function conform to long run estimates for each economic region, whereas the results of the variance decomposition functions show that economic shocks from current account own innovations account for larger fluctuations in SADC and ECOWAS.

6.3. Conclusion

The study found that exchange rate and FDI were the significant determining factors of the SADC region's current account, whereas only exchange rate was established as a determining factor for ECOWAS. Accordingly, economic complexity and exports were found to have an insignificant impact on the current account balance for the two regions where the exchange rate had a long-run significant positive effect on the current account. The results indicate that the depreciation of exchange rates between 1997 and 2018 in both regions was appropriate and did not affect their current account balance. As a result, the study recommends that much emphasis should on increasing economic complexity, which is relatively low for both regions and managing the flow of foreign direct investment diligently.

6.4. Policy recommendations

The empirical findings of the study have a level of policy discussion. Since the results show that depreciation of the exchange rate is a significant predictor and has a positive impact on both regions' current account balances, the study recommends the manipulating the exchange rate as a policy path to improve the current account balance status quo. However, the exchange rate manipulation, should be handled with care not to affect the importation of capital goods required for development by these regions.

The empirical findings also revealed a significant long-run relationship between FDI and the SADC region's current account balance. The results imply that exorbitant inflows of foreign investors are not recommended for the concerned region, and there should be regulations on the ease with which the SADC allows multinational corporations to come and go in their economies. Finally, given the low level of economic complexity index for both regions, the study suggests that the SADC and ECOWAS should consider improving the complexity of the local economy's structures and productive capacity to reap the benefits from their exports.

6.5. Limitations of the study

For the two models, the data used in the study spans the years 1997 to 2018. As a result, based on the data available at the time of analysis, the study sampled five SADC countries and four ECOWAS member states to represent each region appropriately. Therefore, circumstances that may have affected the data set before and after the selected period cannot be accounted for in this study's regression analysis. Additionally, the author states that other studies may produce contradictory results for the two estimated models, either by employing similar or different methodological approaches or using different variables in the econometric system.

6.6. Areas for further research

This study has raised numerous areas where further research is warranted to continue expanding knowledge about the impact of economic complexity and exchange rate on current account balance. Several of these depend on greater availability of data for analysis. Some of areas include the following: -

- A more comprehensive analysis can be conducted in terms of the relationship between economic complexity and current account balance by including product complexity in the regression.
- Continued study may include terms of trade as one of the determining factors of current account balance for both region.
- Ongoing studies may also consider using other estimating methodologies on the stated regressions using other methods such as Generalised Methods of Moments (GMM) technique in order to check consistency of results.

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APPENDICES

Appendix A: Data

SADC MODEL: DATA					
COUNTRY	CAB	ECI	EXR	FDI	EXPO
South Africa - 97	-1.459725	0.252567	4.607962	2.497286	5.71E+11
South Africa - 98	-1.596175	0.233557	5.528284	0.399448	5.90E+11
South Africa - 99	-0.494207	0.266418	6.109484	1.100276	5.97E+11
South Africa - 00	-0.139744	0.195963	6.939828	0.710489	6.47E+11
South Africa - 01	0.281973	0.102827	8.609181	5.983101	6.62E+11
South Africa - 02	0.874059	0.055371	10.54075	1.281412	6.69E+11
South Africa - 03	-0.879609	0.128366	7.564749	0.446850	6.70E+11
South Africa - 04	-2.805786	0.094685	6.459693	0.306847	6.89E+11
South Africa - 05	-3.109490	0.166540	6.359328	2.530174	7.48E+11
South Africa - 06	-4.445465	0.237984	6.771549	0.229456	8.03E+11
South Africa - 07	-5.400936	0.165269	7.045365	2.199883	8.66E+11
South Africa - 08	-5.722656	0.142773	8.261223	3.447016	8.80E+11
South Africa - 09	-2.671796	0.074112	8.473674	2.576394	7.30E+11
South Africa - 10	-1.463234	0.119045	7.321222	0.983956	7.86E+11
South Africa - 11	-2.237850	0.016592	7.261132	0.994021	8.14E+11
South Africa - 12	-5.125730	0.023795	8.209969	1.167209	8.20E+11
South Africa - 13	-5.801068	-0.192079	9.655056	2.244236	8.53E+11
South Africa - 14	-5.079451	-0.204966	10.85266	1.650494	8.84E+11
South Africa - 15	-4.586558	-0.304549	12.75893	0.478917	9.09E+11
South Africa - 16	-2.818687	0.284770	14.70961	0.747512	9.13E+11
South Africa - 17	-2.549799	0.268797	13.32380	0.588916	9.06E+11
South Africa - 18	-3.634113	0.268797	13.23393	1.512253	9.30E+11
Angola - 97	-11.55199	-1.791750	0.229040	5.382318	3.864409
Angola - 98	-28.69757	-0.802829	0.392824	17.12159	3.882736
Angola - 99	-27.79833	-0.741165	2.790706	40.16725	3.890526
Angola - 00	8.715064	-0.843424	10.04054	9.623866	8.41E+10
Angola - 01	-16.01298	-0.906108	22.05786	24.00912	1.52E+11
Angola - 02	-0.981927	-0.808618	43.53021	11.40619	3.80E+11
Angola - 03	-4.039582	-2.069240	74.60630	20.08101	3.75E+11
Angola - 04	2.892477	-1.110000	83.54136	9.329241	4.24E+11
Angola - 05	13.89709	-0.787959	87.15914	-3.526655	5.21E+11
Angola - 06	20.40781	-0.798225	80.36807	-0.072001	5.96E+11
Angola - 07	16.21239	-1.913040	76.70614	-1.368762	6.94E+11
Angola - 08	8.125548	-1.951950	75.03335	1.896315	7.68E+11
Angola - 09	-10.76939	-1.962570	79.32817	3.136662	7.48E+11
Angola - 10	8.957040	-2.013090	91.90572	-3.851110	7.30E+11
Angola - 11	11.70469	-2.090870	93.93475	-2.704875	6.92E+11
Angola - 12	10.80896	-2.791360	95.46796	-1.143768	7.29E+11
Angola - 13	5.957924	-2.791360	96.51828	-5.208123	7.20E+11
Angola - 14	-2.571863	-1.257450	98.30242	2.510095	7.25E+11
Angola - 15	-8.841139	-1.257450	120.0607	8.630605	6.19E+11
Angola - 16	-3.050908	-1.168760	163.6564	-0.177523	5.05E+11
Angola - 17	-0.518218	-1.317700	165.9160	-6.057209	6.29E+11
Angola - 18	7.303770	-1.317700	252.8557	-6.369877	5.81E+11
Madagascar - 97	-4.734390	-1.127510	1018.177	0.328537	2.51E+12
Madagascar - 98	-6.573453	-1.159000	1088.280	0.377909	2.40E+12
Madagascar - 99	-5.247907	-1.105800	1256.755	1.364811	2.77E+12
Madagascar - 00	-5.626758	-1.162210	1353.496	1.791924	3.14E+12
Madagascar - 01	-2.575488	-1.086750	1317.699	1.711172	3.44E+12
Madagascar - 02	-8.913599	-1.155220	1366.391	0.273965	1.86E+12
Madagascar - 03	-5.146327	-1.203830	1238.328	0.202026	2.59E+12
Madagascar - 04	-7.877992	-1.200190	1868.858	1.044690	2.85E+12
Madagascar - 05	-12.53082	-1.185390	2003.026	1.458008	2.90E+12

Madagascar - 06	-9.155174	-1.113310	2142.302	4.607492	3.40E+12
Madagascar - 07	-11.49271	-1.087640	1873.877	9.260115	4.44E+12
Madagascar - 08	-15.91458	-0.988950	1708.371	10.57793	5.00E+12
Madagascar - 09	-18.39499	-0.998450	1956.206	13.44854	3.77E+12
Madagascar - 10	-9.182808	-1.028660	2089.950	9.138672	3.98E+12
Madagascar - 11	-6.713546	-0.831354	2025.118	7.059791	4.24E+12
Madagascar - 12	-7.581966	-0.726138	2194.967	7.036804	4.03E+12
Madagascar - 13	-5.533908	-0.823322	2206.914	4.554644	4.46E+12
Madagascar - 14	-0.922528	-0.820193	2414.812	4.433873	6.21E+12
Madagascar - 15	-2.477374	-1.492690	2933.508	2.897276	6.17E+12
Madagascar - 16	0.172893	-1.475360	3176.539	4.564608	6.11E+12
Madagascar - 17	-0.495765	-1.458820	3116.110	3.527972	8.89E+12
Madagascar - 18	0.578357	-1.458820	3334.752	4.417940	9.29E+12
Tanzania - 97	-5.677010	-1.219630	612.1225	2.054764	3.41E+12
Tanzania - 98	-5.740355	-1.295620	664.6712	1.404238	3.63E+12
Tanzania - 99	-6.113513	-1.159020	744.7591	4.064920	4.13E+12
Tanzania - 00	-3.202024	-1.271940	800.4085	3.464426	5.02E+12
Tanzania - 01	-4.150354	-1.238820	876.4117	4.044211	6.03E+12
Tanzania - 02	-0.323735	-1.273680	966.5828	2.797102	6.53E+12
Tanzania - 03	-1.144260	-1.145240	1038.419	2.091408	8.05E+12
Tanzania - 04	-2.898676	-1.198190	1089.335	2.653759	8.67E+12
Tanzania - 05	-5.938128	-1.172760	1128.934	5.084615	9.80E+12
Tanzania - 06	-5.909267	-1.191090	1251.900	2.161114	8.79E+12
Tanzania - 07	-7.850088	-1.176870	1245.035	2.662170	1.00E+13
Tanzania - 08	-9.223256	-1.129100	1196.311	4.950615	1.08E+13
Tanzania - 09	-6.223611	-1.016700	1320.312	3.275734	1.13E+13
Tanzania - 10	-6.905612	-1.071470	1395.625	5.663728	1.20E+13
Tanzania - 11	-12.64083	-0.995243	1557.433	3.547209	1.32E+13
Tanzania - 12	-9.493785	-0.730645	1571.698	4.538769	1.52E+13
Tanzania - 13	-10.91921	-0.919298	1597.556	4.569258	1.47E+13
Tanzania - 14	-10.13113	-1.033470	1653.231	2.834172	1.59E+13
Tanzania - 15	-8.395607	-0.879252	1991.391	3.178703	1.61E+13
Tanzania - 16	-5.353612	-0.978570	2177.087	1.735926	1.61E+13
Tanzania - 17	-3.401855	-1.017050	2228.857	1.758607	1.55E+13
Tanzania - 18	-3.259067	-1.017050	2263.782	1.820637	1.55E+13
Zambia - 97	-4.229330	-0.959230	1.314498	4.819577	1.53E+09
Zambia - 98	-16.12355	-0.846865	1.862069	5.596884	1.61E+09
Zambia - 99	-11.35031	-0.960927	2.388019	4.758671	3.01E+09
Zambia - 00	-18.39780	-0.990725	3.110844	3.379914	2.92E+09
Zambia - 01	-18.00061	-1.105730	3.610935	3.541352	3.53E+09
Zambia - 02	-15.81423	-0.996580	4.398595	7.114949	4.76E+09
Zambia - 03	-13.53005	-1.096530	4.733271	7.078975	7.51E+09
Zambia - 04	-7.148826	-0.934754	4.778875	5.851719	1.18E+10
Zambia - 05	-2.784984	-0.925683	4.465000	4.284032	1.65E+10
Zambia - 06	4.644745	-1.172740	3.601667	4.827129	1.82E+10
Zambia - 07	-1.238020	-0.921299	4.001667	9.418112	2.02E+10
Zambia - 08	-3.330579	-0.984426	3.745000	5.240508	1.90E+10
Zambia - 09	5.953428	-1.069160	5.045000	4.532780	3.07E+10
Zambia - 10	7.525491	-1.014190	4.797500	8.533196	3.60E+10
Zambia - 11	4.658237	-0.750633	4.861667	4.725162	4.45E+09
Zambia - 12	5.378985	-0.621731	5.147500	6.789381	4.31E+09
Zambia - 13	-0.575785	-0.731336	5.396483	7.487105	3.80E+09
Zambia - 14	-1.426584	-0.544915	6.154167	5.553442	3.94E+09
Zambia - 15	-3.613612	-0.219831	8.631667	7.450178	5.85E+09
Zambia - 16	-4.552483	-0.367271	10.30750	3.163072	7.08E+09
Zambia - 17	-1.681624	-0.514087	9.517500	4.281401	7.42E+09
Zambia - 18	-1.301135	-0.514087	10.45833	1.552281	5.25E+09

ECOWAS MODEL: DATA

COUNTRY	CAB	ECI	EXR	FDI	EXPO
Senegal - 97	-3.124473	-0.839209	583.6694	3.022867	1.28E+12
Senegal - 98	-3.885786	-0.973323	589.9518	1.116565	1.44E+12
Senegal - 99	-4.918153	-0.875810	615.6991	2.482828	1.53E+12
Senegal - 00	-5.623987	-0.793548	711.9763	1.378129	1.49E+12
Senegal - 01	-3.978679	-0.888731	733.0385	0.730108	1.51E+12
Senegal - 02	-4.714231	-0.931708	696.9882	1.224621	1.57E+12
Senegal - 03	-5.038821	-0.972446	581.2003	0.996171	1.67E+12
Senegal - 04	-5.029246	-0.872446	528.2848	1.353177	1.78E+12
Senegal - 05	-6.133821	-0.809369	527.4681	1.523605	1.82E+12
Senegal - 06	-7.275407	-0.821983	522.8901	2.446354	1.76E+12
Senegal - 07	-9.187529	-0.889482	479.2668	2.460167	1.87E+12
Senegal - 08	-11.15865	-0.910768	447.8053	2.688764	1.89E+12
Senegal - 09	-5.275716	-1.006210	472.1863	2.040064	1.95E+12
Senegal - 10	-3.631824	-1.094850	495.2770	1.676389	1.94E+12
Senegal - 11	-6.413644	-0.810511	471.8661	1.891733	1.98E+12
Senegal - 12	-8.572542	-0.622244	510.5271	1.549334	2.11E+12
Senegal - 13	-8.172012	-0.744196	494.0400	1.641747	2.05E+12
Senegal - 14	-6.802945	-0.721723	494.4150	2.036131	2.13E+12
Senegal - 15	-5.316195	-0.498182	591.4495	2.301949	2.33E+12
Senegal - 16	-4.178756	-0.583953	593.0082	2.481103	2.42E+12
Senegal - 17	-7.269140	-0.518687	582.0946	2.801854	2.62E+12
Senegal - 18	-9.533720	-0.518687	555.7178	3.648826	2.87E+12
Nigeria - 97	0.308935	-2.150150	21.88605	0.862276	6.88E+12
Nigeria - 98	-2.214412	-2.102670	21.88600	0.548616	7.03E+12
Nigeria - 99	0.851824	-2.067500	92.33810	1.692558	6.27E+12
Nigeria - 00	10.69430	-2.028910	101.6973	1.641739	7.10E+12
Nigeria - 01	3.346955	-1.994440	111.2313	1.608284	5.42E+12
Nigeria - 02	1.135505	-1.916390	120.5782	1.964727	6.06E+12
Nigeria - 03	3.231859	-2.059630	129.2224	1.911463	7.95E+12
Nigeria - 04	12.34770	-2.408360	132.8880	1.374086	7.88E+12
Nigeria - 05	20.73932	-2.321880	131.2743	2.828830	8.85E+12
Nigeria - 06	15.46673	-2.184900	128.6517	2.056024	1.51E+13
Nigeria - 07	10.03109	-2.064660	125.8081	2.189934	1.25E+13
Nigeria - 08	8.647519	-2.530770	118.5460	2.431219	1.80E+13
Nigeria - 09	4.751776	-2.764250	148.9017	2.931336	1.26E+13
Nigeria - 10	3.627344	-2.359510	150.2980	1.667213	1.40E+13
Nigeria - 11	2.634209	-1.711910	153.8616	2.183013	1.76E+13
Nigeria - 12	3.814318	-1.613480	157.4994	1.552115	1.70E+13
Nigeria - 13	3.744691	-1.737020	157.3112	1.093559	1.33E+13
Nigeria - 14	0.165827	-1.720010	158.5526	0.858612	1.65E+13
Nigeria - 15	-3.171433	-1.600880	192.4403	0.629447	1.65E+13
Nigeria - 16	0.672763	-1.732470	253.4920	1.099403	1.84E+13
Nigeria - 17	2.767622	-1.902680	305.7901	0.932277	2.00E+13
Nigeria - 18	0.976312	-1.902680	306.0837	0.502904	1.98E+13
Ghana - 97	-5.854679	-1.271410	0.204796	1.187002	3.11E+11
Ghana - 98	-6.974097	-1.230540	0.231166	2.237678	3.20E+11
Ghana - 99	-12.49198	-1.343440	0.266643	3.157000	3.28E+11
Ghana - 00	-7.754680	-1.294430	0.544919	3.329303	3.58E+11
Ghana - 01	-8.042806	-1.171010	0.716305	1.680555	3.65E+11
Ghana - 02	-1.706648	-1.137350	0.792417	0.955674	3.70E+11
Ghana - 03	1.332301	-1.249720	0.866764	1.791715	3.78E+11
Ghana - 04	-6.645240	-1.358630	0.899495	1.568114	3.94E+11
Ghana - 05	-10.28053	-1.382680	0.906279	1.349226	4.26E+11
Ghana - 06	-5.166479	-1.222880	0.916452	3.111459	1.01E+10
Ghana - 07	-9.581114	-1.050220	0.935248	5.571075	1.19E+10
Ghana - 08	-11.60244	-1.011480	1.057858	9.466664	1.39E+10
Ghana - 09	-7.283314	-0.965165	1.408800	9.108301	1.50E+10
Ghana - 10	-8.532834	-1.127360	1.431025	7.849578	1.87E+10
Ghana - 11	-9.002434	-1.054440	1.511850	8.255744	2.88E+10
Ghana - 12	-11.90114	-1.009070	1.795817	7.982660	3.31E+10

Ghana - 13	-9.140294	-1.272630	1.954050	5.171029	3.19E+10
Ghana - 14	-6.885113	-1.471840	2.899775	6.267924	3.01E+10
Ghana - 15	-5.814163	-1.047620	3.668025	6.573313	3.00E+10
Ghana - 16	-5.148266	-1.216820	3.909800	6.335849	3.44E+10
Ghana - 17	-3.394413	-1.153880	4.350742	5.517107	4.01E+10
Ghana - 18	-3.117806	-1.153880	4.586817	4.559482	4.42E+10
Guinea - 97	-2.407032	-1.643110	1095.325	0.457240	2.69E+12
Guinea - 98	-4.304631	-1.764580	1236.832	0.496325	2.52E+12
Guinea - 99	-5.808443	-1.803910	1387.401	1.833206	2.39E+12
Guinea - 00	-4.676905	-1.706850	1746.870	0.331913	2.12E+12
Guinea - 01	-2.103422	-1.762850	1950.558	0.059270	2.00E+12
Guinea - 02	-6.766547	-1.723830	1975.844	1.016881	1.85E+12
Guinea - 03	-5.375440	-1.590460	1984.931	2.291233	1.88E+12
Guinea - 04	-4.465737	-1.338300	2243.931	2.692921	1.91E+12
Guinea - 05	-5.459179	-1.233610	3644.333	3.574989	2.07E+12
Guinea - 06	-5.245237	-1.222190	5148.750	2.962072	9.60E+12
Guinea - 07	-7.236485	-1.530550	4197.752	6.143029	1.25E+13
Guinea – 08	-6.292342	-1.589970	4601.691	5.483489	1.09E+13
Guinea – 09	-6.005147	-1.716680	4801.083	1.355237	1.15E+13
Guinea – 10	-4.769702	-1.827340	5726.071	1.478813	1.19E+13
Guinea – 11	-17.11653	-1.726750	6658.031	14.09050	1.18E+13
Guinea – 12	-13.59798	-1.660770	6985.829	7.928206	1.25E+13
Guinea – 13	-14.20347	-2.525610	6907.878	0.002268	1.13E+13
Guinea – 14	-11.18277	-2.178280	7014.119	-0.840221	1.21E+13
Guinea – 15	-11.60080	-1.228350	7485.517	0.605768	1.27E+13
Guinea – 16	-31.93284	-1.442150	8959.716	18.82801	1.59E+13
Guinea – 17	5.030186	-1.516880	9088.320	5.594272	4.11E+13
Guinea – 18	-1.746275	-1.516880	9011.134	3.234189	4.32E+13

Appendix B: Unit root/Stationary test results

Appendix B1: Unit root test results for SADC model

Fisher Philips-Perron: current account balance @ level

- *Individual intercept*

Null Hypothesis: Unit root (individual unit root process)
Series: LCAB
Date: 01/06/21 Time: 20:11
Sample: 1997 2018
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 105
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	11.1874	0.3431
PP - Choi Z-stat	-0.26672	0.3948

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results LCAB

Cross

Section	Prob.	Bandwidth	Obs
South Africa	0.5628	0.0	21
Angola	0.0513	0.0	21
Madagascar	0.9378	2.0	21
Tanzania	0.3565	1.0	21
Zambia	0.3859	2.0	21

- *Individual intercept and trend*

Null Hypothesis: Unit root (individual unit root process)
Series: LCAB
Date: 01/06/21 Time: 20:16
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear
Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 105
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	7.03407	0.7222
PP - Choi Z-stat	0.52835	0.7014

** Probabilities for Fisher tests are computed using an
asymptotic Chi-square distribution. All other tests
assume asymptotic normality.

Intermediate Phillips-Perron test results LCAB

Cross Section	Prob.	Bandwidth	Obs
South Africa	0.6094	0.0	21
Angola	0.1501	0.0	21
Madagascar	0.9284	2.0	21
Tanzania	0.6417	1.0	21
Zambia	0.5448	1.0	21

- *None*

Null Hypothesis: Unit root (individual unit root process)
Series: LCAB
Date: 01/06/21 Time: 20:18
Sample: 1997 2018
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 105
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	21.0812	0.0205
PP - Choi Z-stat	-2.07476	0.0190

** Probabilities for Fisher tests are computed using an
asymptotic Chi-square distribution. All other tests
assume asymptotic normality.

Intermediate Phillips-Perron test results LCAB

Cross

section	Prob.	Bandwidth	Obs
South Africa	0.4994	0.0	21
Angola	0.0042	0.0	21
Madagascar	0.3215	2.0	21
Tanzania	0.4071	1.0	21
Zambia	0.0960	3.0	21

Breitung: Current account balance @ level

- *Individual intercept and trend*

Null Hypothesis: Unit root (common unit root process)
Series: LCAB
Date: 01/06/21 Time: 20:23
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 95
Cross-sections included: 5

Method	Statistic	Prob.**
Breitung t-stat	0.60466	0.7273

** Probabilities are computed assuming asympotic normality

Intermediate regression results on LCAB

Cross Section	S.E. of Regression	Lag	Max Lag	Obs
South Africa	0.44098	1	1	20
Angola	2.47379	1	1	20
Madagascar	0.44498	1	1	20
Tanzania	0.45506	1	1	20
Zambia	1.34788	1	1	20
	Coefficient	**t-Stat**	**SE Reg**	**Obs**
Pooled	0.02956	0.605	0.049	95

Fisher philips-perron: Current account balance at 1st difference

- *Individual intercept*

Null Hypothesis: Unit root (individual unit root process)
Series: D(LCAB)
Date: 01/06/21 Time: 20:31
Sample: 1997 2018
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 100
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	77.5225	0.0000
PP - Choi Z-stat	-7.18412	0.0000

** Probabilities for Fisher tests are computed using an
asymptotic Chi-square distribution. All other tests
assume asymptotic normality.

Intermediate Phillips-Perron test results D(LCAB)

Cross Section	Prob.	Bandwidth	Obs
South Africa	0.0579	3.0	20
Angola	0.0000	2.0	20
Madagascar	0.0000	2.0	20
Tanzania	0.0015	1.0	20
Zambia	0.0006	6.0	20

- *Individual intercept and trend*

Null Hypothesis: Unit root (individual unit root process)
Series: D(LCAB)
Date: 01/06/21 Time: 20:33
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear
Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 100
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	70.9413	0.0000
PP - Choi Z-stat	-6.53674	0.0000

** Probabilities for Fisher tests are computed using an
asymptotic Chi-square distribution. All other tests
assume asymptotic normality.

Intermediate Phillips-Perron test results D(LCAB)

Cross Section	Prob.	Bandwidth	Obs
South Africa	0.1936	3.0	20
Angola	0.0003	2.0	20
Madagascar	0.0000	1.0	20
Tanzania	0.0086	1.0	20
Zambia	0.0006	9.0	20

- *None*

Null Hypothesis: Unit root (individual unit root process)
Series: D(LCAB)
Date: 01/06/21 Time: 20:37
Sample: 1997 2018
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 100
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	106.651	0.0000

PP - Choi Z-stat	-8.95460	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results D(LCAB)

Cross Section	Prob.	Bandwidth	Obs
South Africa	0.0044	3.0	20
Angola	0.0000	2.0	20
Madagascar	0.0000	2.0	20
Tanzania	0.0001	1.0	20
Zambia	0.0000	6.0	20

Breitung tests: Current account balance @ 1st difference

- *Individual intercept and trend*

Null Hypothesis: Unit root (common unit root process)
Series: D(LCAB)
Date: 01/07/21 Time: 07:21
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 90
Cross-sections included: 5

Method	Statistic	Prob.**
Breitung t-stat	-4.32443	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate regression results on D(LCAB)

Cross Section	S.E. of Regression	Lag	Max Lag	Obs
South Africa	0.53215	1	1	19
Angola	3.36441	1	1	19
Madagascar	0.63576	1	1	19
Tanzania	0.56654	1	1	19
Zambia	1.89734	1	1	19
	Coefficient	t-Stat	SE Reg	Obs
Pooled	-0.66568	-4.324	0.154	90

Fisher Philips-Perron: Economic complexity @ level

- *Individual intercept*

Null Hypothesis: Unit root (individual unit root process)
Series: ECI
Date: 01/06/21   Time: 20:46
Sample: 1997 2018
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 105
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	11.1954	0.3425
PP - Choi Z-stat	-0.78815	0.2153

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results ECI

Cross Section	Prob.	Bandwidth	Obs
South Africa	0.1814	1.0	21
Angola	0.1629	0.0	21
Madagascar	0.4443	2.0	21
Tanzania	0.4069	4.0	21
Zambia	0.6934	4.0	21

- *Individual intercept and trend*

Null Hypothesis: Unit root (individual unit root process)
Series: ECI
Date: 01/06/21   Time: 20:51
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 105
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	10.6841	0.3827
PP - Choi Z-stat	-0.51948	0.3017

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results ECI

Cross Section	Prob.	Bandwidth	Obs
South Africa	0.5119	1.0	21
Angola	0.2600	0.0	21

Madagascar	0.7971	1.0	21
Tanzania	0.0959	1.0	21
Zambia	0.4706	5.0	21

- *None*

Null Hypothesis: Unit root (individual unit root process)
Series: ECI
Date: 01/06/21 Time: 21:02
Sample: 1997 2018
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 105
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	14.9278	0.1347
PP - Choi Z-stat	-1.37698	0.0843

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results ECI

Cross section	Prob.	Bandwidth	Obs
South Africa	0.0604	1.0	21
Angola	0.3047	3.0	21
Madagascar	0.7330	1.0	21
Tanzania	0.2185	13.0	21
Zambia	0.1945	18.0	21

Breitung: Economic complexity @ level

- *Individual intercept and trend*

Null Hypothesis: Unit root (common unit root process)
Series: ECI
Date: 01/06/21 Time: 21:06
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 95
Cross-sections included: 5

Method	Statistic	Prob.**
Breitung t-stat	-0.88392	0.1884

** Probabilities are computed assuming asympotic normality

Intermediate regression results on ECI

Cross Section	S.E. of Regression	Lag	Max Lag	Obs
South Africa	0.15030	1	1	20
Angola	0.58741	1	1	20
Madagascar	0.16489	1	1	20

Tanzania	0.10030	1	1	20
Zambia	0.15541	1	1	20

	Coefficient	t-Stat	SE Reg	Obs
Pooled	-0.06892	-0.884	0.078	95

Fisher Phillip-perron: Economic complexity @ 1st difference

- *Individual intercept*

Null Hypothesis: Unit root (individual unit root process)
Series: D(ECI)
Date: 01/06/21 Time: 21:12
Sample: 1997 2018
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 100
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	108.917	0.0000
PP - Choi Z-stat	-8.74892	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results D(ECI)

Cross section	Prob.	Bandwidth	Obs
South Africa	0.0009	0.0	20
Angola	0.0001	7.0	20
Madagascar	0.0028	1.0	20
Tanzania	0.0000	19.0	20
Zambia	0.0004	8.0	20

- *Individual intercept and trend*

Null Hypothesis: Unit root (individual unit root process)
Series: D(ECI)
Date: 01/06/21 Time: 21:15
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 100
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	108.049	0.0000
PP - Choi Z-stat	-8.72302	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results D(ECI)

Cross section	Prob.	Bandwidth	Obs
South Africa	0.0036	1.0	20
Angola	0.0000	9.0	20
Madagascar	0.0103	0.0	20
Tanzania	0.0000	19.0	20
Zambia	0.0000	19.0	20

- *None*

Null Hypothesis: Unit root (individual unit root process)
Series: D(ECI)
Date: 01/06/21 Time: 21:17
Sample: 1997 2018
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 100
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	113.325	0.0000
PP - Choi Z-stat	-9.41289	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results D(ECI)

Cross section	Prob.	Bandwidth	Obs
South Africa	0.0000	0.0	20
Angola	0.0000	6.0	20
Madagascar	0.0001	1.0	20
Tanzania	0.0000	14.0	20
Zambia	0.0000	6.0	20

Breitung: Economic complexity @ 1st difference

- *Individual intercept and trend*

Null Hypothesis: Unit root (common unit root process)
Series: D(ECI)
Date: 01/06/21 Time: 21:21
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 90
Cross-sections included: 5

Method	Statistic	Prob.**
Breitung t-stat	-4.40765	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate regression results on D(ECI)

Cross Section	S.E. of Regression	Lag	Max Lag	Obs
South Africa	0.19327	1	1	19
Angola	0.82844	1	1	19
Madagascar	0.20832	1	1	19
Tanzania	0.15071	1	1	19
Zambia	0.22176	1	1	19
	Coefficient	t-Stat	SE Reg	Obs
Pooled	-0.80989	-4.408	0.184	90

Fisher Philip-Perron: -Exchange rate @ level

- *Individual intercept*

Null Hypothesis: Unit root (individual unit root process)
Series: L_EXR
Date: 01/06/21 Time: 21:28
Sample: 1997 2018
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 105
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	22.8930	0.0111
PP - Choi Z-stat	-1.47850	0.0696

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results L_EXR

Cross section	Prob.	Bandwidth	Obs
South Africa	0.4903	1.0	21
Angola	0.0002	0.0	21
Madagascar	0.7878	2.0	21
Tanzania	0.5384	4.0	21
Zambia	0.2646	2.0	21

- *Individual intercept and trend*

Null Hypothesis: Unit root (individual unit root process)
Series: L_EXR
Date: 01/06/21 Time: 21:30
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear Trends

Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 105
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	15.6018	0.1116
PP - Choi Z-stat	-1.61308	0.0534

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results L_EXR

Cross section	Prob.	Bandwidth	Obs
South Africa	0.4859	1.0	21
Angola	0.0503	0.0	21
Madagascar	0.1896	1.0	21
Tanzania	0.3538	3.0	21
Zambia	0.2499	2.0	21

- *None*

Null Hypothesis: Unit root (individual unit root process)
Series: L_EXR
Date: 01/06/21 Time: 21:32
Sample: 1997 2018
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 105
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	0.75727	1.0000
PP - Choi Z-stat	5.55553	1.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results L_EXR

Cross section	Prob.	Bandwidth	Obs
South Africa	0.9554	0.0	21
Angola	0.7432	3.0	21
Madagascar	0.9998	4.0	21
Tanzania	1.0000	3.0	21
Zambia	0.9646	2.0	21

Breitung: Exchange rate @ level

- *Individual intercept and trend*

Null Hypothesis: Unit root (common unit root process)
Series: L_EXR
Date: 01/06/21 Time: 21:34
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 95
Cross-sections included: 5

Method	Statistic	Prob.**
Breitung t-stat	-1.10571	0.1344

** Probabilities are computed assuming asympotic normality

Intermediate regression results on L_EXR

Cross section	S.E. of Regression	Lag	Max Lag	Obs
South Africa	0.05797	1	1	20
Angola	0.15868	1	1	20
Madagascar	0.05123	1	1	20
Tanzania	0.02223	1	1	20
Zambia	0.06021	1	1	20
	Coefficient	t-Stat	SE Reg	Obs
Pooled	-0.02611	-1.106	0.024	95

Fisher Phillips-Perron: Exchange rate @ 1st difference

- *Individual intercept and trend*

Null Hypothesis: Unit root (individual unit root process)
Series: D(L_EXR)
Date: 01/06/21 Time: 21:37
Sample: 1997 2018
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 100
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	41.9417	0.0000
PP - Choi Z-stat	-4.44235	0.0000

** Probabilities for Fisher tests are computed using an
asymptotic Chi-square distribution. All other tests
assume asymptotic normality.

Intermediate Phillips-Perron test results D(L_EXR)

Cross section	Prob.	Bandwidth	Obs
South Africa	0.0518	4.0	20

Angola	0.3577	1.0	20
Madagascar	0.0003	4.0	20
Tanzania	0.0103	5.0	20
Zambia	0.0152	1.0	20

- *Individual intercept and trend*

Null Hypothesis: Unit root (individual unit root process)
Series: D(L_EXR)
Date: 01/06/21 Time: 21:40
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear
Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 100
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	29.1055	0.0012
PP - Choi Z-stat	-3.21244	0.0007

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results D(L_EXR)

Cross section	Prob.	Bandwidth	Obs
South Africa	0.1902	4.0	20
Angola	0.4058	1.0	20
Madagascar	0.0022	4.0	20
Tanzania	0.0377	5.0	20
Zambia	0.0746	1.0	20

- *None*

Null Hypothesis: Unit root (individual unit root process)
Series: D(L_EXR)
Date: 01/06/21 Time: 21:42
Sample: 1997 2018
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 100
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	47.4158	0.0000
PP - Choi Z-stat	-5.09207	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results D(L_EXR)

Cross section	Prob.	Bandwidth	Obs

South Africa	0.0051	4.0	20
Angola	0.1358	3.0	20
Madagascar	0.0005	0.0	20
Tanzania	0.0405	2.0	20
Zambia	0.0039	1.0	20

Breitung: Exchange rate @ 1st difference

- *Individual intercept and trend*

Null Hypothesis: Unit root (common unit root process)
Series: D(L_EXR)
Date: 01/06/21 Time: 21:45
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 90
Cross-sections included: 5

Method	Statistic	Prob.**
Breitung t-stat	-1.33196	0.0914

** Probabilities are computed assuming asympotic normality

Intermediate regression results on D(L_EXR)

Cross section	S.E. of Regression	Lag	Max Lag	Obs
South Africa	0.07316	1	1	19
Angola	0.07212	1	1	19
Madagascar	0.06834	1	1	19
Tanzania	0.02934	1	1	19
Zambia	0.06797	1	1	19
	Coefficient	t-Stat	SE Reg	Obs
Pooled	-0.12299	-1.332	0.092	90

Fisher Phillips-Perron: Foreign direct investment @ level

- *Individual intercept*

Null Hypothesis: Unit root (individual unit root process)
Series: FDI
Date: 01/06/21 Time: 22:14
Sample: 1997 2018
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 105
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	36.6676	0.0001
PP - Choi Z-stat	-3.87398	0.0001

** Probabilities for Fisher tests are computed using an

asymptotic Chi-square distribution. All other tests
assume asymptotic normality.

Intermediate Phillips-Perron test results FDI

Cross section	Prob.	Bandwidth	Obs
South Africa	0.0008	4.0	21
Angola	0.1816	2.0	21
Madagascar	0.4368	2.0	21
Tanzania	0.0163	1.0	21
Zambia	0.0112	0.0	21

- *Individual intercept and trend*

Null Hypothesis: Unit root (individual unit root process)
Series: FDI
Date: 01/06/21 Time: 22:17
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear
Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 105
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	32.4069	0.0003
PP - Choi Z-stat	-3.25368	0.0006

** Probabilities for Fisher tests are computed using an
asymptotic Chi-square distribution. All other tests
assume asymptotic normality.

Intermediate Phillips-Perron test results FDI

Cross section	Prob.	Bandwidth	Obs
South Africa	0.0016	5.0	21
Angola	0.0162	2.0	21
Madagascar	0.7890	2.0	21
Tanzania	0.0776	1.0	21
Zambia	0.0589	0.0	21

- *None*

Null Hypothesis: Unit root (individual unit root process)
Series: FDI
Date: 01/06/21 Time: 22:19
Sample: 1997 2018
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 105
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	21.2155	0.0196
PP - Choi Z-stat	-2.31282	0.0104

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results FDI

Cross section	Prob.	Bandwidth	Obs
South Africa	0.0157	1.0	21
Angola	0.0444	1.0	21
Madagascar	0.3509	2.0	21
Tanzania	0.3702	3.0	21
Zambia	0.2730	13.0	21

Breitung: Foreign direct investment @ level

- *Individual intercept and trend*

Null Hypothesis: Unit root (common unit root process)
Series: FDI
Date: 01/06/21 Time: 22:36
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 95
Cross-sections included: 5

Method	Statistic	Prob.**
Breitung t-stat	-1.05347	0.1461

** Probabilities are computed assuming asympotic normality

Intermediate regression results on FDI

Cross section	S.E. of Regression	Lag	Max Lag	Obs
South Africa	1.78714	1	1	20
Angola	10.0491	1	1	20
Madagascar	1.98933	1	1	20
Tanzania	1.29356	1	1	20
Zambia	2.25285	1	1	20
	Coefficient	t-Stat	SE Reg	Obs
Pooled	-0.07974	-1.053	0.076	95

Fisher Phillips-Perron: Exports @ level

- *Individual trend*

Null Hypothesis: Unit root (individual unit root process)
Series: L_EXPO
Date: 01/06/21 Time: 22:47
Sample: 1997 2018
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 105
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	32.5449	0.0003
PP - Choi Z-stat	-2.07968	0.0188

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results L_EXPO

Cross section	Prob.	Bandwidth	Obs
South Africa	0.5055	5.0	21
Angola	0.0000	20.0	21
Madagascar	0.9736	9.0	21
Tanzania	0.0205	1.0	21
Zambia	0.2971	0.0	21

- *Individual intercept and trend*

Null Hypothesis: Unit root (individual unit root process)
Series: L_EXPO
Date: 01/06/21 Time: 22:49
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 105
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	9.93185	0.4465
PP - Choi Z-stat	0.18181	0.5721

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results L_EXPO

Cross section	Prob.	Bandwidth	Obs
South Africa	0.3533	2.0	21
Angola	0.1058	20.0	21
Madagascar	0.2518	2.0	21
Tanzania	0.9773	1.0	21

Zambia	0.7580	1.0	21

- *None*

Null Hypothesis: Unit root (individual unit root process)
Series: L_EXPO
Date: 01/06/21   Time: 22:51
Sample: 1997 2018
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 105
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	1.13668	0.9997
PP - Choi Z-stat	4.83617	1.0000

** Probabilities for Fisher tests are computed using an
asymptotic Chi-square distribution. All other tests
assume asymptotic normality.

Intermediate Phillips-Perron test results L_EXPO

Cross section	Prob.	Bandwidth	Obs
South Africa	0.9990	5.0	21
Angola	0.7146	0.0	21
Madagascar	0.9991	20.0	21
Tanzania	0.9993	2.0	21
Zambia	0.7948	0.0	21

Breitung: Exports @ level

- *Individual intercept and trend*

Null Hypothesis: Unit root (common unit root process)
Series: L_EXPO
Date: 01/06/21   Time: 22:55
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 95
Cross-sections included: 5

Method	Statistic	Prob.**
Breitung t-stat	0.84772	0.8017

** Probabilities are computed assuming asympotic normality

Intermediate regression results on L_EXPO

Cross section	S.E. of Regression	Lag	Max Lag	Obs
South Africa	0.02439	1	1	20
Angola	2.11618	1	1	20
Madagascar	0.09052	1	1	20
Tanzania	0.02710	1	1	20

Zambia	0.23141	1	1	20

	Coefficient	t-Stat	SE Reg	Obs
Pooled	0.04642	0.848	0.055	95

Phillips-Perron: Exports: @ 1st difference

- *Individual intercept*

Null Hypothesis: Unit root (individual unit root process)
Series: D(L_EXPO)
Date: 01/06/21 Time: 22:59
Sample: 1997 2018
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 100
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	66.3177	0.0000
PP - Choi Z-stat	-6.57069	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results D(L_EXPO)

Cross Section	Prob.	Bandwidth	Obs
South Africa	0.0012	4.0	20
Angola	0.0029	0.0	20
Madagascar	0.0000	8.0	20
Tanzania	0.0118	2.0	20
Zambia	0.0078	1.0	20

- *Individual intercept and trend*

Null Hypothesis: Unit root (individual unit root process)
Series: D(L_EXPO)
Date: 01/06/21 Time: 23:01
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 100
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	75.0232	0.0000
PP - Choi Z-stat	-7.03066	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results D(L_EXPO)

Cross Section	Prob.	Bandwidth	Obs
South Africa	0.0020	5.0	20
Angola	0.0037	1.0	20
Madagascar	0.0000	14.0	20
Tanzania	0.0006	0.0	20
Zambia	0.0184	2.0	20

- *None*

Null Hypothesis: Unit root (individual unit root process)
Series: D(L_EXPO)
Date: 01/06/21 Time: 23:03
Sample: 1997 2018
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 100
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	76.3194	0.0000
PP - Choi Z-stat	-7.25535	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results D(L_EXPO)

Cross Section	Prob.	Bandwidth	Obs
South Africa	0.0004	1.0	20
Angola	0.0002	0.0	20
Madagascar	0.0000	3.0	20
Tanzania	0.0203	2.0	20
Zambia	0.0004	1.0	20

Breitung: Exports @ 1st difference

- *Individual intercept and trend*

Null Hypothesis: Unit root (common unit root process)
Series: D(L_EXPO)
Date: 01/06/21 Time: 23:05
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 90
Cross-sections included: 5

Method	Statistic	Prob.**
Breitung t-stat	-4.35436	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate regression results on D(L_EXPO)

Cross section	S.E. of Regression	Lag	Max Lag	Obs
South Africa	0.03337	1	1	19
Angola	2.93030	1	1	19
Madagascar	0.13159	1	1	19
Tanzania	0.03615	1	1	19
Zambia	0.29899	1	1	19
	Coefficient	t-Stat	SE Reg	Obs
Pooled	-0.61484	-4.354	0.141	90

Appendix B2: Unit root test results for ECOWAS model

Fisher Philips-Perron - Current account balance @ level

- *Individual intercept*

Null Hypothesis: Unit root (individual unit root process)
Series: LCAB
Date: 01/07/21 Time: 07:42
Sample: 1997 2018
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 84
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	23.1293	0.0032
PP - Choi Z-stat	-2.94875	0.0016

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results LCAB

Cross Section	Prob.	Bandwidth	Obs
Senegal	0.1847	6.0	21
Nigeria	0.2242	7.0	21
Ghana	0.0530	3.0	21
Guinea	0.0043	1.0	21

- *Individual intercept and trend*

Null Hypothesis: Unit root (individual unit root process)
Series: LCAB
Date: 01/07/21 Time: 07:44
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear
Trends
Newey-West automatic bandwidth selection and Bartlett kernel

Total (balanced) observations: 84
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	14.0129	0.0814
PP - Choi Z-stat	-1.49010	0.0681

** Probabilities for Fisher tests are computed using an
asymptotic Chi-square distribution. All other tests
assume asymptotic normality.

Intermediate Phillips-Perron test results LCAB

Cross Section	Prob.	Bandwidth	Obs
Senegal	0.3131	5.0	21
Nigeria	0.6458	14.0	21
Ghana	0.1869	3.0	21
Guinea	0.0240	0.0	21

- *None*

Null Hypothesis: Unit root (individual unit root process)
Series: LCAB
Date: 01/07/21 Time: 07:46
Sample: 1997 2018
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 84
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	9.54956	0.2981
PP - Choi Z-stat	-0.45316	0.3252

** Probabilities for Fisher tests are computed using an
asymptotic Chi-square distribution. All other tests
assume asymptotic normality.

Intermediate Phillips-Perron test results LCAB

Cross Section	Prob.	Bandwidth	Obs
Senegal	0.9306	9.0	21
Nigeria	0.1575	9.0	21
Ghana	0.3224	20.0	21
Guinea	0.1786	1.0	21

Breitung: Current account balance @ level

- *Individual trend and intercept*

Null Hypothesis: Unit root (common unit root process)
Series: LCAB
Date: 01/07/21 Time: 07:47
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear trends

User-specified lags: 1
Total (balanced) observations: 76
Cross-sections included: 4

Method	Statistic	Prob.**
Breitung t-stat	0.00339	0.5014

** Probabilities are computed assuming asympotic normality

Intermediate regression results on LCAB

Cross section	S.E. of Regression	Lag	Max Lag	Obs
Senegal	0.27361	1	1	20
Nigeria	0.98217	1	1	20
Ghana	0.87233	1	1	20
Guinea	1.09255	1	1	20
	Coefficient	t-Stat	SE Reg	Obs
Pooled	0.00027	0.003	0.079	76

Fisher Philips-Perron - Current account balance @ 1st difference

- *Individual intercept*

Null Hypothesis: Unit root (individual unit root process)
Series: D(LCAB)
Date: 01/07/21 Time: 07:48
Sample: 1997 2018
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	87.4476	0.0000
PP - Choi Z-stat	-7.94988	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results D(LCAB)

Cross Section	Prob.	Bandwidth	Obs
Senegal	0.0016	15.0	20
Nigeria	0.0034	9.0	20
Ghana	0.0000	19.0	20
Guinea	0.0000	1.0	20

- *Individual intercept and trend*

Null Hypothesis: Unit root (individual unit root process)

Series: D(LCAB)
Date: 01/07/21 Time: 07:50
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear
Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	72.4264	0.0000
PP - Choi Z-stat	-7.09461	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results D(LCAB)

Cross Section	Prob.	Bandwidth	Obs
Senegal	0.0161	15.0	20
Nigeria	0.0014	14.0	20
Ghana	0.0000	19.0	20
Guinea	0.0000	1.0	20

- *None*

Null Hypothesis: Unit root (individual unit root process)
Series: D(LCAB)
Date: 01/07/21 Time: 07:52
Sample: 1997 2018
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	96.0886	0.0000
PP - Choi Z-stat	-8.61073	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results D(LCAB)

Cross Section	Prob.	Bandwidth	Obs
Senegal	0.0004	15.0	20
Nigeria	0.0001	9.0	20
Ghana	0.0000	19.0	20
Guinea	0.0000	1.0	20

Breitung: Current account balance @ 1st difference

- *Individual intercept and trend*

Null Hypothesis: Unit root (common unit root process)
Series: D(LCAB)
Date: 01/07/21 Time: 07:53
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 72
Cross-sections included: 4

Method	Statistic	Prob.**
Breitung t-stat	-1.07440	0.1413

** Probabilities are computed assuming asympotic normality

Intermediate regression results on D(LCAB)

Cross section	S.E. of Regression	Lag	Max Lag	Obs
Senegal	0.36260	1	1	19
Nigeria	1.27378	1	1	19
Ghana	1.26559	1	1	19
Guinea	1.36505	1	1	19

	Coefficient	t-Stat	SE Reg	Obs
Pooled	-0.11623	-1.074	0.108	72

Fisher Philip-Perron: - Economic complexity @ level

- *Individual intercept*

Null Hypothesis: Unit root (individual unit root process)
Series: ECI
Date: 01/07/21 Time: 07:58
Sample: 1997 2018
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 84
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	13.2531	0.1034
PP - Choi Z-stat	-1.38294	0.0833

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results ECI

Cross section	Prob.	Bandwidth	Obs
Senegal	0.7162	5.0	21

Nigeria	0.3046	2.0	21
Ghana	0.0575	2.0	21
Guinea	0.1056	4.0	21

- *Individual intercept and trend*

Null Hypothesis: Unit root (individual unit root process)
Series: ECI
Date: 01/07/21 Time: 07:59
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear
Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 84
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	8.78082	0.3611
PP - Choi Z-stat	-0.71348	0.2378

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results ECI

Cross section	Prob.	Bandwidth	Obs
Senegal	0.4324	4.0	21
Nigeria	0.6034	3.0	21
Ghana	0.1535	2.0	21
Guinea	0.3094	4.0	21

- *None*

Null Hypothesis: Unit root (individual unit root process)
Series: ECI
Date: 01/07/21 Time: 08:01
Sample: 1997 2018
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 84
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	7.01805	0.5347
PP - Choi Z-stat	-0.35340	0.3619

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results ECI

Cross section	Prob.	Bandwidth	Obs
Senegal	0.2431	20.0	21
Nigeria	0.4954	6.0	21

Ghana	0.4584	20.0	21
Guinea	0.5420	20.0	21

Breitung: Economic complexity @ level

- *Individual intercept and trend*

Null Hypothesis: Unit root (common unit root process)
Series: ECI
Date: 01/07/21 Time: 08:03
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 76
Cross-sections included: 4

Method	Statistic	Prob.**
Breitung t-stat	-3.16152	0.0008

** Probabilities are computed assuming asympotic normality

Intermediate regression results on ECI

Cross section	S.E. of Regression	Lag	Max Lag	Obs
Senegal	0.11327	1	1	20
Nigeria	0.23403	1	1	20
Ghana	0.15383	1	1	20
Guinea	0.32936	1	1	20
	Coefficient	t-Stat	SE Reg	Obs
Pooled	-0.29146	-3.162	0.092	76

Fisher Philip-Perron: -Economic complexity @ 1st difference

- *Individual intercept*

Null Hypothesis: Unit root (individual unit root process)
Series: D(ECI)
Date: 01/07/21 Time: 08:06
Sample: 1997 2018
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	83.6561	0.0000
PP - Choi Z-stat	-7.75906	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results D(ECI)

Cross Section	Prob.	Bandwidth	Obs
Senegal	0.0000	14.0	20
Nigeria	0.0224	13.0	20
Ghana	0.0000	10.0	20
Guinea	0.0000	19.0	20

- *Individual intercept and trend*

Null Hypothesis: Unit root (individual unit root process)
Series: D(ECI)
Date: 01/07/21   Time: 08:08
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear
Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	71.1948	0.0000
PP - Choi Z-stat	-6.88869	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results D(ECI)

Cross section	Prob.	Bandwidth	Obs
Senegal	0.0000	19.0	20
Nigeria	0.1031	13.0	20
Ghana	0.0000	11.0	20
Guinea	0.0000	19.0	20

- *None*

Null Hypothesis: Unit root (individual unit root process)
Series: D(ECI)
Date: 01/07/21   Time: 08:10
Sample: 1997 2018
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	94.9594	0.0000
PP - Choi Z-stat	-8.52847	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results D(ECI)

Cross section	Prob.	Bandwidth	Obs
Senegal	0.0001	9.0	20
Nigeria	0.0013	13.0	20
Ghana	0.0000	10.0	20
Guinea	0.0000	19.0	20

Breitung: Economic complexity @ 1st difference

- *Individual intercept and trend*

Null Hypothesis: Unit root (common unit root process)
Series: D(ECI)
Date: 01/07/21 Time: 08:12
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 72
Cross-sections included: 4

Method	Statistic	Prob.**
Breitung t-stat	-7.33729	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate regression results on D(ECI)

Cross Section	S.E. of Regression	Lag	Max Lag	Obs
Senegal	0.15955	1	1	19
Nigeria	0.29985	1	1	19
Ghana	0.21832	1	1	19
Guinea	0.47209	1	1	19
	Coefficient	t-Stat	SE Reg	Obs
Pooled	-1.13730	-7.337	0.155	72

Fisher Phillips-Perron: Exchange rate @ level

- *Individual intercept*

Null Hypothesis: Unit root (individual unit root process)
Series: L_EXR
Date: 01/07/21 Time: 08:16
Sample: 1997 2018
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 84
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	12.9752	0.1127
PP - Choi Z-stat	-1.32508	0.0926

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results L_EXR

Cross section	Prob.	Bandwidth	Obs
Senegal	0.5095	1.0	21
Nigeria	0.0457	1.0	21
Ghana	0.5955	0.0	21
Guinea	0.1098	10.0	21

- *Individual intercept and trend*

Null Hypothesis: Unit root (individual unit root process)
Series: L_EXR
Date: 01/07/21 Time: 08:17
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 84
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	7.41284	0.4928
PP - Choi Z-stat	0.17477	0.5694

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results L_EXR

Cross section	Prob.	Bandwidth	Obs
Senegal	0.7770	1.0	21
Nigeria	0.0772	3.0	21
Ghana	0.4780	1.0	21
Guinea	0.8570	4.0	21

- *None*

Null Hypothesis: Unit root (individual unit root process)
Series: L_EXR
Date: 01/07/21 Time: 08:19
Sample: 1997 2018
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 84
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	3.60811	0.8906
PP - Choi Z-stat	2.49626	0.9937

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results L_EXR

Cross section	Prob.	Bandwidth	Obs
Senegal	0.6160	0.0	21
Nigeria	0.9594	0.0	21
Ghana	0.2786	3.0	21
Guinea	0.9998	5.0	21

Breitung: Exchange rate at level

- *Individual intercept and trend*

Null Hypothesis: Unit root (common unit root process)
Series: L_EXR
Date: 01/07/21 Time: 08:22
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 76
Cross-sections included: 4

Method	Statistic	Prob.**
Breitung t-stat	-0.70126	0.2416

** Probabilities are computed assuming asympotic normality

Intermediate regression results on L_EXR

Cross section	S.E. of Regression	Lag	Max Lag	Obs
Senegal	0.03455	1	1	20
Nigeria	0.13213	1	1	20
Ghana	0.07056	1	1	20
Guinea	0.06035	1	1	20

	Coefficient	t-Stat	SE Reg	Obs

Pooled	-0.03362	-0.701	0.048	76

Fisher Phillips-Perron: Exchange rate @ 1st difference

- *Individual intercept*

Null Hypothesis: Unit root (individual unit root process)
Series: D(L_EXR)
Date: 01/07/21 Time: 08:27
Sample: 1997 2018
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	33.6491	0.0000
PP - Choi Z-stat	-4.28840	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results D(L_EXR)

Cross section	Prob.	Bandwidth	Obs
Senegal	0.0422	3.0	20
Nigeria	0.0026	1.0	20
Ghana	0.0249	1.0	20
Guinea	0.0181	8.0	20

- *Individual intercept and trend*

Null Hypothesis: Unit root (individual unit root process)
Series: D(L_EXR)
Date: 01/07/21 Time: 08:29
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	31.4529	0.0001
PP - Choi Z-stat	-3.90477	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results D(L_EXR)

Cross section	Prob.	Bandwidth	Obs
Senegal	0.1575	3.0	20

Nigeria	0.0064	1.0	20
Ghana	0.0783	1.0	20
Guinea	0.0019	14.0	20

- *None*

Null Hypothesis: Unit root (individual unit root process)
Series: D(L_EXR)
Date: 01/07/21 Time: 08:30
Sample: 1997 2018
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	42.8580	0.0000
PP - Choi Z-stat	-5.10591	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results D(L_EXR)

Cross section	Prob.	Bandwidth	Obs
Senegal	0.0029	3.0	20
Nigeria	0.0005	1.0	20
Ghana	0.0309	2.0	20
Guinea	0.0105	3.0	20

Breitung: Exchange rate@ 1st difference

- *Individual intercept and trend*

Null Hypothesis: Unit root (common unit root process)
Series: D(L_EXR)
Date: 01/07/21 Time: 08:32
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 72
Cross-sections included: 4

Method	Statistic	Prob.**
Breitung t-stat	-1.37729	0.0842

** Probabilities are computed assuming asympotic normality

Intermediate regression results on D(L_EXR)

Cross section	S.E. of Regression	Lag	Max Lag	Obs
Senegal	0.04319	1	1	19
Nigeria	0.08821	1	1	19
Ghana	0.08925	1	1	19
Guinea	0.08225	1	1	19

	Coefficient	t-Stat	SE Reg	Obs
Pooled	-0.16438	-1.377	0.119	72

Fisher Phillips-Perron: Foreign direct investment @ level

- *Individual intercept*

Null Hypothesis: Unit root (individual unit root process)
Series: FDI
Date: 01/07/21 Time: 08:36
Sample: 1997 2018
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 84
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	16.5427	0.0352
PP - Choi Z-stat	-1.92289	0.0272

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results FDI

Cross section	Prob.	Bandwidth	Obs
Senegal	0.1430	2.0	21
Nigeria	0.3609	1.0	21
Ghana	0.4458	1.0	21
Guinea	0.0111	5.0	21

- *Individual intercept and trend*

Null Hypothesis: Unit root (individual unit root process)
Series: FDI
Date: 01/07/21 Time: 08:39
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 84
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	30.3943	0.0002
PP - Choi Z-stat	-2.37615	0.0087

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results FDI

Cross

section	Prob.	Bandwidth	Obs
Senegal	0.0653	0.0	21
Nigeria	0.5455	1.0	21
Ghana	0.8278	1.0	21
Guinea	0.0000	20.0	21

- *None*

Null Hypothesis: Unit root (individual unit root process)
Series: FDI
Date: 01/07/21 Time: 08:40
Sample: 1997 2018
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 84
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	13.4077	0.0986
PP - Choi Z-stat	-1.18298	0.1184

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results FDI

Cross section	Prob.	Bandwidth	Obs
Senegal	0.5003	0.0	21
Nigeria	0.4212	2.0	21
Ghana	0.5563	0.0	21
Guinea	0.0105	1.0	21

Breitung: Foreign direct investment @ level

- *Individual intercept and trend*

Null Hypothesis: Unit root (common unit root process)
Series: FDI
Date: 01/07/21 Time: 08:42
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 76
Cross-sections included: 4

Method	Statistic	Prob.**
Breitung t-stat	0.92565	0.8227

** Probabilities are computed assuming asympotic normality

Intermediate regression results on FDI

Cross section	S.E. of Regression	Lag	Max Lag	Obs
Senegal	0.50288	1	1	20

Nigeria	0.50069	1	1	20
Ghana	1.40838	1	1	20
Guinea	6.29899	1	1	20

	Coefficient	t-Stat	SE Reg	Obs
Pooled	0.05188	0.926	0.056	76

Fisher Phillips-Perron: exports @ level

- *Individual intercept*

Null Hypothesis: Unit root (individual unit root process)
Series: L_EXPO
Date: 01/07/21 Time: 09:02
Sample: 1997 2018
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 84
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	2.09809	0.9779
PP - Choi Z-stat	1.97666	0.9760

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results L_EXPO

Cross section	Prob.	Bandwidth	Obs
Senegal	0.9538	2.0	21
Nigeria	0.7958	1.0	21
Ghana	0.4982	0.0	21
Guinea	0.9262	1.0	21

- *Individual intercept and trend*

Null Hypothesis: Unit root (individual unit root process)
Series: L_EXPO
Date: 01/07/21 Time: 09:05
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 84
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	6.41814	0.6005
PP - Choi Z-stat	-0.01750	0.4930

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results L_EXPO

Cross section	Prob.	Bandwidth	Obs
Senegal	0.6675	0.0	21
Nigeria	0.1806	1.0	21
Ghana	0.6753	1.0	21
Guinea	0.4962	0.0	21

- *None*

Null Hypothesis: Unit root (individual unit root process)
Series: L_EXPO
Date: 01/07/21 Time: 09:07
Sample: 1997 2018
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 84
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	1.77366	0.9872
PP - Choi Z-stat	3.63555	0.9999

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results L_EXPO

Cross section	Prob.	Bandwidth	Obs
Senegal	0.9999	2.0	21
Nigeria	0.9686	4.0	21
Ghana	0.4438	1.0	21
Guinea	0.9583	1.0	21

Breitung: Exports @ level

- *Individual intercept and trend*

Null Hypothesis: Unit root (common unit root process)
Series: L_EXPO
Date: 01/07/21 Time: 09:09
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 76
Cross-sections included: 4

Method	Statistic	Prob.**
Breitung t-stat	-1.78586	0.0371

** Probabilities are computed assuming asympotic normality

Intermediate regression results on L_EXPO

Cross section	S.E. of Regression	Lag	Max Lag	Obs
Senegal	0.01550	1	1	20
Nigeria	0.08571	1	1	20
Ghana	0.37152	1	1	20
Guinea	0.17033	1	1	20
	Coefficient	t-Stat	SE Reg	Obs
Pooled	-0.15368	-1.786	0.086	76

Fisher Phillips-Perron: Exports @ 1st difference

- *Individual intercept*

Null Hypothesis: Unit root (individual unit root process)
Series: D(L_EXPO)
Date: 01/07/21 Time: 09:13
Sample: 1997 2018
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	54.4784	0.0000
PP - Choi Z-stat	-5.97742	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate Phillips-Perron test results D(L_EXPO)

Cross section	Prob.	Bandwidth	Obs
Senegal	0.0038	1.0	20
Nigeria	0.0000	1.0	20
Ghana	0.0023	1.0	20
Guinea	0.0116	2.0	20

- *Individual intercept and trend*

Null Hypothesis: Unit root (individual unit root process)
Series: D(L_EXPO)
Date: 01/07/21 Time: 09:14
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	42.1390	0.0000
PP - Choi Z-stat	-4.97372	0.0000

** Probabilities for Fisher tests are computed using an
asymptotic Chi-square distribution. All other tests
assume asymptotic normality.

Intermediate Phillips-Perron test results D(L_EXPO)

Cross section	Prob.	Bandwidth	Obs
Senegal	0.0099	4.0	20
Nigeria	0.0001	1.0	20
Ghana	0.0111	1.0	20
Guinea	0.0434	2.0	20

- *None*

Null Hypothesis: Unit root (individual unit root process)
Series: D(L_EXPO)
Date: 01/07/21 Time: 09:20
Sample: 1997 2018
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 4

Method	Statistic	Prob.**
PP - Fisher Chi-square	67.4750	0.0000
PP - Choi Z-stat	-6.87515	0.0000

** Probabilities for Fisher tests are computed using an
asymptotic Chi-square distribution. All other tests
assume asymptotic normality.

Intermediate Phillips-Perron test results D(L_EXPO)

Cross section	Prob.	Bandwidth	Obs
Senegal	0.0068	0.0	20
Nigeria	0.0000	1.0	20
Ghana	0.0001	1.0	20
Guinea	0.0015	1.0	20

Breitung: Exports @ 1st difference

- *Individual intercept and trend*

Null Hypothesis: Unit root (common unit root process)
Series: D(L_EXPO)
Date: 01/07/21 Time: 09:22
Sample: 1997 2018
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 72
Cross-sections included: 4

Method	Statistic	Prob.**
Breitung t-stat	-2.56270	0.0052

** Probabilities are computed assuming asympotic normality

Intermediate regression results on D(L_EXPO)

Cross Section	S.E. of Regression	Lag	Max Lag	Obs
Senegal	0.02112	1	1	19
Nigeria	0.11932	1	1	19
Ghana	0.48528	1	1	19
Guinea	0.21892	1	1	19
	Coefficient	t-Stat	SE Reg	Obs
Pooled	-0.34492	-2.563	0.135	72

Appendix C: Selection of appropriate lag length structure

Appendix C1: Selection of appropriate lad length structure for SADC model

VAR Lag Order Selection Criteria
Endogenous variables: LCAB ECI L_EXR FDI L_EXPO
Exogenous variables: C
Date: 01/06/21 Time: 23:08
Sample: 1997 2018
Included observations: 70

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-518.0326	NA	2.126360	14.94379	15.10439	15.00758
1	-105.9646	753.4957	3.35e-05	3.884703	4.848344*	4.267473*
2	-75.86638	50.73699	2.93e-05	3.739040	5.505714	4.440784
3	-46.33169	45.56781	2.65e-05	3.609477	6.179186	4.630196
4	-19.42284	37.67239	2.65e-05	3.554938	6.927681	4.894633
5	25.65210	56.66564	1.63e-05	2.981369	7.157145	4.640038
6	62.61589	41.18822*	1.34e-05*	2.639546	7.618357	4.617190
7	92.46570	28.99696	1.44e-05	2.500980	8.282825	4.797599
8	129.6724	30.82841	1.39e-05	2.152217*	8.737096	4.767811

* 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 C2: Selection of appropriate lad length structure for ECOWAS model

VAR Lag Order Selection Criteria
Endogenous variables: LCAB ECI L_EXR FDI L_EXPO
Exogenous variables: C
Date: 01/07/21 Time: 09:25
Sample: 1997 2018
Included observations: 60

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-425.5039	NA	1.174403	14.35013	14.52466	14.41840
1	-107.2305	572.8922	6.69e-05	4.574349	5.621521*	4.983955*
2	-73.72047	54.73299	5.13e-05	4.290682	6.210498	5.041628
3	-40.24501	49.09734	4.05e-05	4.008167	6.800627	5.100451
4	-23.60659	21.62995	5.84e-05	4.286886	7.951989	5.720510
5	8.499467	36.38686	5.37e-05	4.050018	8.587764	5.824980
6	47.60991	37.80676	4.28e-05	3.579670	8.990060	5.695971
7	95.02362	37.93097*	2.97e-05*	2.832546*	9.115580	5.290186

* 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: Cointegration tests results

Appendix D1: Cointegration tests results for SADC model

Kao cointegration tests

Kao Residual Cointegration Test
Series: LCAB ECI L_EXR FDI L_EXPO
Date: 01/06/21 Time: 23:10
Sample: 1997 2018
Included observations: 110
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

	t-Statistic	Prob.
ADF	-2.410302	0.0080
Residual variance	1.158526	
HAC variance	0.763248	

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RESID)
Method: Least Squares
Date: 01/06/21 Time: 23:10
Sample (adjusted): 1999 2018
Included observations: 100 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.431573	0.094697	-4.557408	0.0000
D(RESID(-1))	0.002472	0.103790	0.023822	0.9810

R-squared	0.211496	Mean dependent var	0.049585
Adjusted R-squared	0.203450	S.D. dependent var	1.147295
S.E. of regression	1.023957	Akaike info criterion	2.905023
Sum squared resid	102.7518	Schwarz criterion	2.957127
Log likelihood	-143.2512	Hannan-Quinn criter.	2.926110
Durbin-Watson stat	2.013460		

Johansen cointegration tests

Date: 01/06/21 Time: 23:13
Sample (adjusted): 1999 2018
Included observations: 100 after adjustments
Trend assumption: Linear deterministic trend
Series: LCAB ECI L_EXR FDI L_EXPO
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.546894	121.7894	69.81889	0.0000
At most 1	0.196941	42.62639	47.85613	0.1419
At most 2	0.118488	20.69366	29.79707	0.3770
At most 3	0.072314	8.081955	15.49471	0.4567
At most 4	0.005741	0.575746	3.841466	0.4480

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.546894	79.16302	33.87687	0.0000
At most 1	0.196941	21.93274	27.58434	0.2238
At most 2	0.118488	12.61170	21.13162	0.4886
At most 3	0.072314	7.506209	14.26460	0.4311
At most 4	0.005741	0.575746	3.841466	0.4480

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LCAB	ECI	L_EXR	FDI	L_EXPO
0.059585	-0.508035	-0.982009	0.110997	1.085338
0.673373	1.461086	0.918218	-0.132522	-0.256902
0.491299	0.535264	0.463145	0.259558	-0.249647
0.180380	-1.539805	-0.734362	-0.047761	0.146014
0.039051	-0.473488	0.864682	-0.005001	-0.124580

Unrestricted Adjustment Coefficients (alpha):

D(LCAB)	-0.059987	-0.309103	0.020084	-0.225525	0.010148
D(ECI)	0.000577	-0.065090	0.000266	0.048427	0.012601
D(L_EXR)	-0.045418	-0.010442	0.006948	0.004651	-0.003044
D(FDI)	-1.826357	0.205891	-0.922938	0.432579	-0.111401
D(L_EXPO)	-0.164431	0.080341	0.086298	-0.063539	0.031918

1 Cointegrating Equation(s): Log likelihood -364.1340

Normalized cointegrating coefficients (standard error in parentheses)

LCAB	ECI	L_EXR	FDI	L_EXPO
1.000000	-8.526256	-16.48089	1.862838	18.21504
	(3.21457)	(2.58423)	(0.49533)	(1.79440)

Adjustment coefficients (standard error in parentheses)

D(LCAB)	-0.003574
	(0.00680)
D(ECI)	3.44E-05
	(0.00176)
D(L_EXR)	-0.002706
	(0.00042)
D(FDI)	-0.108823
	(0.02386)
D(L_EXPO)	-0.009798
	(0.00366)

2 Cointegrating Equation(s): Log likelihood -353.1676

Normalized cointegrating coefficients (standard error in parentheses)

LCAB	ECI	L_EXR	FDI	L_EXPO
1.000000	0.000000	-2.256324	0.221016	3.390982
		(0.53586)	(0.12588)	(0.41745)
0.000000	1.000000	1.668325	-0.192561	-1.738636
		(0.19927)	(0.04681)	(0.15524)

Adjustment coefficients (standard error in parentheses)

D(LCAB)	-0.211716	-0.421151
	(0.07409)	(0.16955)
D(ECI)	-0.043795	-0.095395
	(0.01950)	(0.04462)
D(L_EXR)	-0.009738	0.007817
	(0.00469)	(0.01073)
D(FDI)	0.029819	1.228678
	(0.27035)	(0.61865)
D(L_EXPO)	0.044302	0.200921
	(0.04116)	(0.09420)

3 Cointegrating Equation(s): Log likelihood -346.8618

Normalized cointegrating coefficients (standard error in parentheses)

LCAB	ECI	L_EXR	FDI	L_EXPO
1.000000	0.000000	0.000000	1.065603	0.116265
			(0.29419)	(0.68678)
0.000000	1.000000	0.000000	-0.817048	0.682688
			(0.24001)	(0.56030)
0.000000	0.000000	1.000000	0.374320	-1.451351
			(0.14557)	(0.33984)

Adjustment coefficients (standard error in parentheses)

D(LCAB)	-0.201849	-0.410401	-0.215615
	(0.09158)	(0.17938)	(0.15583)
D(ECI)	-0.043664	-0.095252	-0.060209
	(0.02410)	(0.04721)	(0.04101)
D(L_EXR)	-0.006324	0.011536	0.038230
	(0.00577)	(0.01129)	(0.00981)
D(FDI)	-0.423620	0.734662	1.555098
	(0.32450)	(0.63562)	(0.55216)
D(L_EXPO)	0.086700	0.247113	0.275211
	(0.05034)	(0.09859)	(0.08565)

4 Cointegrating Equation(s):	Log likelihood	-343.1087		

Normalized cointegrating coefficients (standard error in parentheses)

LCAB	ECI	L_EXR	FDI	L_EXPO
1.000000	0.000000	0.000000	0.000000	0.212470
				(0.27869)
0.000000	1.000000	0.000000	0.000000	0.608923
				(0.19223)
0.000000	0.000000	1.000000	0.000000	-1.417556
				(0.15646)
0.000000	0.000000	0.000000	1.000000	-0.090282
				(0.63468)

Adjustment coefficients (standard error in parentheses)

D(LCAB)	-0.242529	-0.063136	-0.049998	0.050289
	(0.09153)	(0.24060)	(0.17134)	(0.03378)
D(ECI)	-0.034929	-0.169820	-0.095772	0.006446
	(0.02428)	(0.06383)	(0.04545)	(0.00896)
D(L_EXR)	-0.005485	0.004375	0.034815	-0.002076
	(0.00588)	(0.01547)	(0.01101)	(0.00217)
D(FDI)	-0.345592	0.068575	1.237428	-0.490221
	(0.32975)	(0.86681)	(0.61729)	(0.12169)
D(L_EXPO)	0.075238	0.344951	0.321872	-0.003464
	(0.05119)	(0.13455)	(0.09582)	(0.01889)

Pedroni cointegration tests

Pedroni Residual Cointegration Test
Series: LCAB ECI L_EXR FDI L_EXPO
Date: 01/06/21 Time: 23:22
Sample: 1997 2018
Included observations: 110
Cross-sections included: 5
Null Hypothesis: No cointegration
Trend assumption: Deterministic intercept and trend
User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-0.041925	0.5167	-0.477025	0.6833
Panel rho-Statistic	1.293113	0.9020	1.192457	0.8835
Panel PP-Statistic	-2.296584	0.0108	-2.463991	0.0069
Panel ADF-Statistic	-1.919833	0.0274	-1.539557	0.0618

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	1.652439	0.9508
Group PP-Statistic	-2.617717	0.0044
Group ADF-Statistic	-0.860524	0.1948

Cross section specific results

Phillips-Peron results (non-parametric)

Cross ID	AR(1)	Variance	HAC	Bandwidth	Obs
South Africa	0.386	0.090658	0.036448	6.00	21
Angola	0.122	1.594984	1.066241	3.00	21
Madagascar	-0.544	0.109868	0.150792	2.00	21
Tanzania	0.319	0.138352	0.138352	0.00	21
Zambia	0.140	0.895462	0.394013	5.00	21

Augmented Dickey-Fuller results (parametric)

Cross ID	AR(1)	Variance	Lag	Max lag	Obs
South Africa	0.048	0.064853	1	--	20
Angola	-0.145	1.508663	1	--	20
Madagascar	-0.081	0.104078	1	--	20
Tanzania	0.186	0.137017	1	--	20
Zambia	-0.138	0.849019	1	--	20

Appendix D2: Cointegration tests results for ECOWAS region

Kao cointegration tests

Kao Residual Cointegration Test
Series: LCAB ECI L_EXR FDI L_EXPO
Date: 01/07/21 Time: 09:28
Sample: 1997 2018
Included observations: 88
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

	t-Statistic	Prob.
ADF	-0.919435	0.1789
Residual variance	0.752439	
HAC variance	0.155007	

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RESID)
Method: Least Squares
Date: 01/07/21 Time: 09:28
Sample (adjusted): 1999 2018
Included observations: 80 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.737376	0.126685	-5.820544	0.0000
D(RESID(-1))	0.174433	0.122439	1.424650	0.1582

R-squared	0.345857	Mean dependent var	0.017126
Adjusted R-squared	0.337470	S.D. dependent var	0.911750
S.E. of regression	0.742127	Akaike info criterion	2.266090
Sum squared resid	42.95871	Schwarz criterion	2.325640
Log likelihood	-88.64359	Hannan-Quinn criter.	2.289965

Durbin-Watson stat	1.962860

Johansen cointegration tests

Date: 01/07/21 Time: 10:06
Sample (adjusted): 1999 2018
Included observations: 80 after adjustments
Trend assumption: Linear deterministic trend
Series: LCAB ECI L_EXR FDI L_EXPO
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.506867	94.69831	69.81889	0.0002
At most 1	0.291647	38.14023	47.85613	0.2959
At most 2	0.072313	10.55526	29.79707	0.9709
At most 3	0.054380	4.550361	15.49471	0.8545
At most 4	0.000965	0.077242	3.841466	0.7811

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.506867	56.55809	33.87687	0.0000
At most 1 *	0.291647	27.58497	27.58434	0.0500
At most 2	0.072313	6.004898	21.13162	0.9828
At most 3	0.054380	4.473119	14.26460	0.8063
At most 4	0.000965	0.077242	3.841466	0.7811

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LCAB	ECI	L_EXR	FDI	L_EXPO
0.581093	1.856260	0.237865	0.405248	0.402655
0.662668	0.566789	1.318822	-0.190949	-1.838131
-0.321112	-2.068410	0.594919	0.122355	-0.569553
-0.508767	1.008713	-0.086775	-0.040055	1.044605
0.119789	0.122190	-0.306999	-0.012611	1.272932

Unrestricted Adjustment Coefficients (alpha):

D(LCAB)	-0.018486	-0.188454	0.098782	0.141650	-0.000492
D(ECI)	-0.088389	0.025610	0.032160	-0.019192	0.002966
D(L_EXR)	-0.021672	-0.028089	0.005545	-0.005909	-0.001579
D(FDI)	-1.525484	0.715446	-0.294764	0.035559	-0.033368
D(L_EXPO)	0.063002	0.054818	0.029032	-0.003675	-0.003431

1 Cointegrating Equation(s):		Log likelihood	-154.2945	

Normalized cointegrating coefficients (standard error in parentheses)

LCAB	ECI	L_EXR	FDI	L_EXPO
1.000000	3.194427	0.409341	0.697388	0.692928
	(0.51814)	(0.25568)	(0.09118)	(0.46033)

Adjustment coefficients (standard error in parentheses)

D(LCAB)	-0.010742
	(0.05382)
D(ECI)	-0.051362
	(0.01361)
D(L_EXR)	-0.012593
	(0.00561)
D(FDI)	-0.886448
	(0.17203)
D(L_EXPO)	0.036610
	(0.01330)

2 Cointegrating Equation(s):		Log likelihood	-140.5021	

Normalized cointegrating coefficients (standard error in parentheses)

LCAB	ECI	L_EXR	FDI	L_EXPO
1.000000	0.000000	2.568211	-0.648522	-4.041478
		(0.45238)	(0.17259)	(0.69557)
0.000000	1.000000	-0.675824	0.421331	1.482083
		(0.17147)	(0.06542)	(0.26366)

Adjustment coefficients (standard error in parentheses)

D(LCAB)	-0.135624	-0.141128
	(0.07929)	(0.17460)
D(ECI)	-0.034391	-0.149557
	(0.02047)	(0.04508)
D(L_EXR)	-0.031207	-0.056149
	(0.00801)	(0.01763)
D(FDI)	-0.412345	-2.426188
	(0.25026)	(0.55111)
D(L_EXPO)	0.072936	0.148017
	(0.01937)	(0.04266)

3 Cointegrating Equation(s):		Log likelihood	-137.4996	

Normalized cointegrating coefficients (standard error in parentheses)

LCAB	ECI	L_EXR	FDI	L_EXPO
1.000000	0.000000	0.000000	-93.52679	-145.7053
			(24.3146)	(68.0612)
0.000000	1.000000	0.000000	24.86221	38.76085
			(6.41034)	(17.9437)
0.000000	0.000000	1.000000	36.16458	55.16049
			(9.44598)	(26.4411)

Adjustment coefficients (standard error in parentheses)

D(LCAB)	-0.167344	-0.345449	-0.194167
	(0.08368)	(0.25304)	(0.13081)
D(ECI)	-0.044718	-0.216077	0.031883
	(0.02150)	(0.06501)	(0.03361)
D(L_EXR)	-0.032988	-0.067619	-0.038901
	(0.00850)	(0.02570)	(0.01328)

D(FDI)	-0.317692	-1.816494	0.405326	
	(0.26438)	(0.79943)	(0.41325)	
D(L_EXPO)	0.063613	0.087968	0.104553	
	(0.02037)	(0.06159)	(0.03184)	

4 Cointegrating Equation(s): Log likelihood -135.2630

Normalized cointegrating coefficients (standard error in parentheses)

LCAB	ECI	L_EXR	FDI	L_EXPO
1.000000	0.000000	0.000000	0.000000	-1.312603
				(0.77036)
0.000000	1.000000	0.000000	0.000000	0.376976
				(0.21123)
0.000000	0.000000	1.000000	0.000000	-0.672704
				(0.38870)
0.000000	0.000000	0.000000	1.000000	1.543864
				(0.64821)

Adjustment coefficients (standard error in parentheses)

D(LCAB)	-0.239411	-0.202565	-0.206459	0.034906
	(0.09354)	(0.26389)	(0.12875)	(0.04086)
D(ECI)	-0.034954	-0.235436	0.033548	-0.036006
	(0.02434)	(0.06867)	(0.03350)	(0.01063)
D(L_EXR)	-0.029981	-0.073579	-0.038388	-0.002504
	(0.00964)	(0.02720)	(0.01327)	(0.00421)
D(FDI)	-0.335784	-1.780625	0.402240	-0.792303
	(0.30073)	(0.84839)	(0.41393)	(0.13136)
D(L_EXPO)	0.065483	0.084261	0.104872	0.018763
	(0.02317)	(0.06535)	(0.03189)	(0.01012)

Pedroni cointegration test

Pedroni Residual Cointegration Test
Series: LCAB ECI L_EXR FDI L_EXPO
Date: 01/07/21 Time: 10:10
Sample: 1997 2018
Included observations: 88
Cross-sections included: 4
Null Hypothesis: No cointegration
Trend assumption: Deterministic intercept and trend
User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-2.137644	0.9837	-2.188987	0.9857
Panel rho-Statistic	1.586525	0.9437	1.489743	0.9319
Panel PP-Statistic	-4.469010	0.0000	-4.567678	0.0000
Panel ADF-Statistic	-4.718970	0.0000	-4.474831	0.0000

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	2.667564	0.9962
Group PP-Statistic	-5.370432	0.0000
Group ADF-Statistic	-5.079062	0.0000

Cross section specific results

Phillips-Peron results (non-parametric)

Cross ID	AR(1)	Variance	HAC	Bandwidth	Obs
Senegal	0.388	0.031551	0.012078	4.00	21
Nigeria	0.186	0.466914	0.130540	10.00	21
Ghana	-0.035	0.347660	0.026245	20.00	21
Guinea	-0.058	0.600980	0.260705	7.00	21

Augmented Dickey-Fuller results (parametric)

Cross ID	AR(1)	Variance	Lag	Max lag	Obs
Senegal	0.028	0.020637	1	--	20
Nigeria	-0.239	0.311388	1	--	20
Ghana	-0.595	0.258890	1	--	20
Guinea	-0.764	0.494914	1	--	20

Appendix E: Panel ARDL results (short run and long run estimates)

Appendic E1: Panel ARDL results for SADC model

Dependent Variable: D(LCAB)
Method: ARDL
Date: 01/06/21 Time: 23:27
Sample: 1998 2018
Included observations: 105
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): ECI L_EXR FDI L_EXPO
Fixed regressors: C
Number of models evalulated: 1
Selected Model: ARDL(1, 1, 1, 1, 1)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
		Long Run Equation		
ECI	-0.734051	1.197526	-0.612973	0.5417
L_EXR	0.934877	2.110995	0.442861	0.0491
FDI	-0.229967	0.129648	-1.773773	0.0301
L_EXPO	-0.516609	0.656640	-0.786747	0.4339
		Short Run Equation		
COINTEQ01	-0.232845	0.100182	-2.324218	0.0228
D(ECI)	-0.236806	0.440666	-0.537382	0.5926
D(L_EXR)	1.215604	1.771827	0.686074	0.0448
D(FDI)	-0.028967	0.026277	-1.102401	0.2738
D(L_EXPO)	0.066582	1.183999	0.056235	0.9553
C	0.737356	0.316796	2.327543	0.0226

Mean dependent var	0.071301	S.D. dependent var	1.359996
S.E. of regression	0.981620	Akaike info criterion	2.441429
Sum squared resid	73.23198	Schwarz criterion	3.276123

Log likelihood	-100.2786	Hannan-Quinn criter.	2.779986

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

Appendix E2: Panel ARDL results for ECOWAS model

Dependent Variable: D(LCAB)
Method: ARDL
Date: 01/07/21 Time: 10:15
Sample: 1998 2018
Included observations: 84
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): ECI L_EXR FDI L_EXPO
Fixed regressors: C
Number of models evalulated: 1
Selected Model: ARDL(1, 1, 1, 1, 1)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
		Long Run Equation		
ECI	-0.745498	0.420105	-1.774554	0.0810
L_EXR	0.976960	0.468700	2.084403	0.0414
FDI	-0.101903	0.057445	-1.773940	0.0811
L_EXPO	0.220021	0.318485	0.690836	0.4923
		Short Run Equation		
COINTEQ01	-0.611999	0.117874	-5.191982	0.0000
D(ECI)	-0.331413	0.271713	-1.219717	0.2273
D(L_EXR)	1.148731	0.868983	1.321926	0.1912
D(FDI)	0.081937	0.068776	1.191355	0.2382
D(L_EXPO)	1.799154	0.623594	2.885137	0.0054
C	-4.135003	0.865332	-4.778515	0.0000

Mean dependent var	0.002376	S.D. dependent var	0.973321
S.E. of regression	0.797495	Akaike info criterion	2.051408
Sum squared resid	38.15989	Schwarz criterion	2.839652
Log likelihood	-62.26197	Hannan-Quinn criter.	2.368972

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

Appendix F: Granger causality test results

Appendix F1: Granger causality test results for SADC model

Pairwise Granger Causality Tests
Date: 01/07/21 Time: 07:05
Sample: 1997 2018
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
ECI does not Granger Cause LCAB	105	0.41882	0.5190
LCAB does not Granger Cause ECI		1.65885	0.2007
L_EXR does not Granger Cause LCAB	105	0.28799	0.5927
LCAB does not Granger Cause L_EXR		8.88641	0.0036
FDI does not Granger Cause LCAB	105	7.00021	0.0094
LCAB does not Granger Cause FDI		0.01136	0.9153
L_EXPO does not Granger Cause LCAB	105	1.48965	0.2251
LCAB does not Granger Cause L_EXPO		1.81273	0.1812
L_EXR does not Granger Cause ECI	105	4.45606	0.0372
ECI does not Granger Cause L_EXR		2.77690	0.0987
FDI does not Granger Cause ECI	105	0.13957	0.7095
ECI does not Granger Cause FDI		0.07335	0.7871
L_EXPO does not Granger Cause ECI	105	3.09581	0.0815
ECI does not Granger Cause L_EXPO		0.02487	0.8750
FDI does not Granger Cause L_EXR	105	45.3280	1.E-09
L_EXR does not Granger Cause FDI		2.54449	0.1138
L_EXPO does not Granger Cause L_EXR	105	88.1281	2.E-15
L_EXR does not Granger Cause L_EXPO		11.2404	0.0011
L_EXPO does not Granger Cause FDI	105	14.9242	0.0002
FDI does not Granger Cause L_EXPO		35.4939	4.E-08

Appendix F2: Granger causality test for ECOWAS model

Pairwise Granger Causality Tests
Date: 01/07/21 Time: 10:22
Sample: 1997 2018
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
ECI does not Granger Cause LCAB	84	4.58551	0.0352
LCAB does not Granger Cause ECI		1.91895	0.1698
L_EXR does not Granger Cause LCAB	84	2.8E-05	0.9958
LCAB does not Granger Cause L_EXR		1.23372	0.2700

FDI does not Granger Cause LCAB	84	6.94239	0.0101
LCAB does not Granger Cause FDI		2.58633	0.1117
L_EXPO does not Granger Cause LCAB	84	1.61119	0.2080
LCAB does not Granger Cause L_EXPO		0.01554	0.9011
L_EXR does not Granger Cause ECI	84	0.07274	0.7881
ECI does not Granger Cause L_EXR		2.80327	0.0979
FDI does not Granger Cause ECI	84	2.30639	0.1327
ECI does not Granger Cause FDI		1.37525	0.2443
L_EXPO does not Granger Cause ECI	84	1.50960	0.2228
ECI does not Granger Cause L_EXPO		0.20695	0.6504
FDI does not Granger Cause L_EXR	84	0.12919	0.7202
L_EXR does not Granger Cause FDI		0.86339	0.3556
L_EXPO does not Granger Cause L_EXR	84	0.92323	0.3395
L_EXR does not Granger Cause L_EXPO		4.77275	0.0318
L_EXPO does not Granger Cause FDI	84	5.70258	0.0193
FDI does not Granger Cause L_EXPO		4.80144	0.0313

Appendix G: Cross-sectional dependence

Appendix G1: Cross-sectional dependence results for SADC region

Residual Cross-Section Dependence Test
Null hypothesis: No cross-section dependence (correlation) in
weighted residuals
Equation: Untitled
Periods included: 22
Cross-sections included: 5
Total panel observations: 110
Note: non-zero cross-section means detected in data
Cross-section means were removed during computation of
Correlations

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	3.320979	10	0.9728
Pesaran scaled LM	-1.493475		0.1353
Pesaran CD	0.374805		0.7078

Appendix G2: Cross-sectional dependence results for ECOWAS region

Residual Cross-Section Dependence Test
Null hypothesis: No cross-section dependence (correlation) in residuals
Equation: Untitled
Periods included: 22
Cross-sections included: 4
Total panel observations: 88
Note: non-zero cross-section means detected in data
Cross-section means were removed during computation of correlations

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	10.11402	6	0.1199
Pesaran scaled LM	1.187616		0.2350
Pesaran CD	-1.165543		0.2438

Appendix H: Variance decomposition results

Appendix H1: Variance decomposition results for SADC region

Variance Decomposition of LCAB: Period	S.E.	LCAB	ECI	L_EXR	FDI	L_EXPO
1	1.094365	100.0000	0.000000	0.000000	0.000000	0.000000
2	1.417687	79.51115	4.037087	7.440536	1.091340	7.919887
3	1.487729	78.99840	4.284706	6.795711	1.645558	8.275628
4	1.548157	76.98916	5.096048	6.427732	3.448635	8.038427
5	1.583379	75.65917	5.690358	6.168718	4.644728	7.837025
6	1.607952	74.39124	6.167398	6.006407	5.734132	7.700824
7	1.623571	73.48645	6.506809	5.892281	6.493996	7.620460
8	1.634450	72.78482	6.777772	5.814957	7.046013	7.576438
9	1.641930	72.27443	6.993111	5.771819	7.411617	7.549028
10	1.647302	71.89641	7.171472	5.751761	7.653580	7.526775

Variance Decomposition of ECI: Period	S.E.	LCAB	ECI	L_EXR	FDI	L_EXPO
1	0.290022	1.616185	98.38381	0.000000	0.000000	0.000000
2	0.376136	5.220449	93.42929	0.965023	0.115660	0.269581
3	0.436200	6.617973	90.00451	2.148873	0.137910	1.090733
4	0.477082	7.652032	87.84279	2.592370	0.143184	1.769624
5	0.508933	8.422972	86.14851	2.896857	0.126403	2.405255
6	0.533675	8.977219	84.91753	3.075742	0.117894	2.911617
7	0.553387	9.365827	83.98629	3.221812	0.127269	3.298800
8	0.569184	9.629167	83.26939	3.352442	0.153259	3.595743
9	0.581977	9.793567	82.69547	3.480899	0.192830	3.837235
10	0.592390	9.882932	82.22822	3.603981	0.239938	4.044925

Variance
Decomposition

of L_EXR: Period	S.E.	LCAB	ECI	L_EXR	FDI	L_EXPO
1	0.070275	0.117703	0.353617	99.52868	0.000000	0.000000
2	0.116946	3.129430	0.224070	96.12583	0.158393	0.362276
3	0.152982	5.942153	0.368682	90.91701	0.229428	2.542728
4	0.182657	8.829113	0.337196	83.84816	0.252607	6.732922
5	0.206757	11.52194	0.263584	76.80952	0.253799	11.15116
6	0.226753	13.63918	0.351318	70.99184	0.257523	14.76013
7	0.243882	15.09933	0.741831	66.56563	0.261143	17.33206
8	0.259245	15.96461	1.441066	63.28160	0.263240	19.04948
9	0.273594	16.36135	2.364767	60.82104	0.261979	20.19086
10	0.287369	16.42272	3.413641	58.91345	0.257594	20.99260

Variance Decomposition of FDI: Period	S.E.	LCAB	ECI	L_EXR	FDI	L_EXPO
1	3.941064	20.87859	0.810017	13.87745	64.43394	0.000000
2	4.362852	22.50297	1.982851	15.57007	59.02394	0.920178
3	4.647377	22.99876	1.795074	13.74003	59.33408	2.132066
4	4.800295	24.19635	1.703225	14.58752	56.89586	2.617044
5	4.890320	24.61470	1.709982	14.95541	55.85593	2.863973
6	4.937154	24.73540	1.785751	15.52443	55.10010	2.854310
7	4.958200	24.74440	1.935668	15.69987	54.78939	2.830676
8	4.967450	24.72387	2.058864	15.75918	54.62999	2.828106
9	4.971468	24.70250	2.152406	15.75655	54.55619	2.832363
10	4.973331	24.68754	2.211892	15.74866	54.51744	2.834471

Variance Decomposition of L_EXPO: Period	S.E.	LCAB	ECI	L_EXR	FDI	L_EXPO
1	0.611090	7.201756	0.839046	11.32444	16.34002	64.29474
2	0.772928	9.312187	0.526958	25.85710	10.30746	53.99629
3	0.854460	8.202648	3.172913	30.39752	9.813551	48.41337
4	0.904688	7.317178	5.831035	34.55735	8.975234	43.31920
5	0.932614	7.137619	8.503967	34.72535	8.706375	40.92668
6	0.950501	7.408696	10.09976	34.12508	8.459086	39.90737
7	0.961652	7.866866	10.98002	33.46686	8.305064	39.38120
8	0.968446	8.323121	11.37960	33.05689	8.199992	39.04039
9	0.972865	8.716849	11.55588	32.82041	8.130443	38.77642
10	0.976225	9.040517	11.62034	32.70510	8.076745	38.55730

Cholesky Ordering: LCAB ECI L_EXR FDI L_EXPO

Appendix H2: Variance decomposition for ECOWAS model

Variance Decomposition of LCAB: Period	S.E.	LCAB	ECI	L_EXR	FDI	L_EXPO
1	0.863407	100.0000	0.000000	0.000000	0.000000	0.000000
2	1.059135	91.59167	0.443800	0.130922	6.776819	1.056792
3	1.179378	83.13880	1.170053	0.247971	12.93423	2.508947
4	1.264082	76.73937	1.936533	0.327599	17.03362	3.962881
5	1.327802	72.01967	2.627436	0.382792	19.65310	5.317000
6	1.378155	68.45008	3.203232	0.424923	21.37025	6.551513
7	1.419459	65.66358	3.662354	0.460674	22.54496	7.668423
8	1.454271	63.42753	4.019214	0.493701	23.38379	8.675763
9	1.484184	61.59292	4.292755	0.525994	24.00523	9.583101
10	1.510237	60.06088	4.501174	0.558643	24.47922	10.40008

Variance Decomposition of ECI: Period	S.E.	LCAB	ECI	L_EXR	FDI	L_EXPO
1	0.208883	0.183371	99.81663	0.000000	0.000000	0.000000
2	0.277124	0.393335	95.78762	0.085680	3.347870	0.385497
3	0.322613	0.740609	91.04096	0.186257	7.030830	1.001344
4	0.356199	1.175604	86.70352	0.277969	10.11194	1.730968
5	0.382283	1.648050	82.90551	0.359257	12.56333	2.523852
6	0.403250	2.121885	79.58957	0.432489	14.50623	3.349820
7	0.420548	2.575086	76.68136	0.500092	16.05678	4.186682
8	0.435110	2.995793	74.11864	0.563944	17.30447	5.017155
9	0.447565	3.378674	71.85218	0.625415	18.31575	5.827983
10	0.458354	3.722341	69.84247	0.685498	19.14025	6.609442

Variance Decomposition of L_EXR: Period	S.E.	LCAB	ECI	L_EXR	FDI	L_EXPO
1	0.080166	1.739682	0.040102	98.22022	0.000000	0.000000
2	0.112848	1.771424	1.632010	96.16426	0.206189	0.226112
3	0.139692	3.650796	3.624084	91.54903	0.628515	0.547572
4	0.163465	5.597860	5.466602	86.98436	1.061594	0.889588
5	0.184905	7.149884	7.036392	83.18036	1.397065	1.236300
6	0.204393	8.275969	8.349072	80.17405	1.613814	1.587099
7	0.222226	9.051786	9.450255	77.82596	1.728233	1.943770
8	0.238656	9.561962	10.38363	75.98100	1.765917	2.307494
9	0.253900	9.876413	11.18421	74.51034	1.750545	2.678494
10	0.268136	10.04810	11.87866	73.31613	1.700858	3.056257

Variance Decomposition of FDI: Period	S.E.	LCAB	ECI	L_EXR	FDI	L_EXPO
1	2.716791	5.969574	0.102922	2.063452	91.86405	0.000000
2	2.890529	6.422817	0.271899	1.999801	90.48523	0.820255
3	2.928675	6.702815	0.447138	1.951493	88.82131	2.077247
4	2.954248	6.875798	0.585216	1.925316	87.29021	3.323460
5	2.977963	7.001947	0.678008	1.917111	85.99866	4.404270
6	2.999571	7.105721	0.732895	1.921982	84.93393	5.305471
7	3.018698	7.193845	0.760649	1.936432	84.05664	6.052437
8	3.035422	7.267819	0.770963	1.958134	83.32809	6.674995

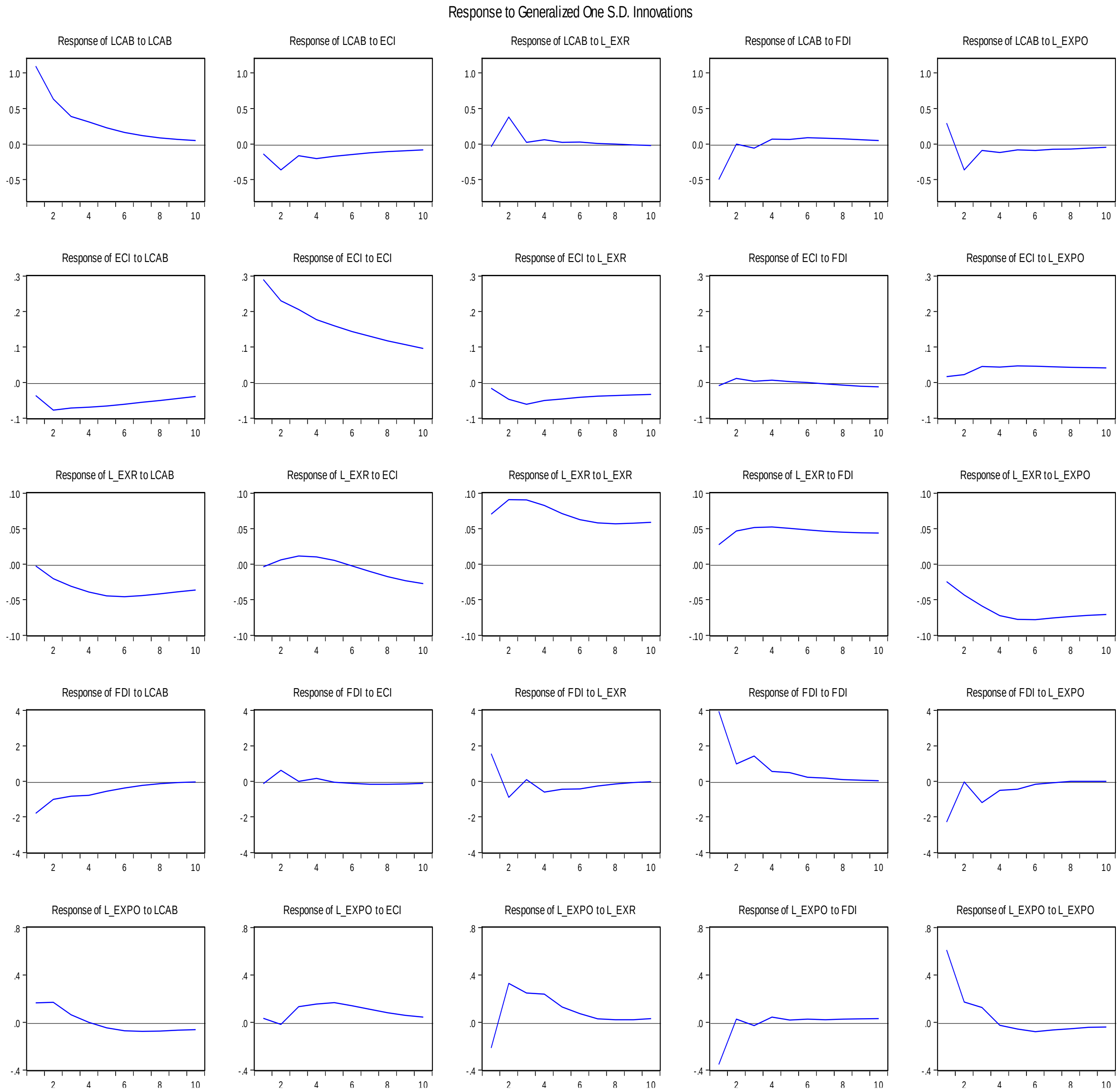
9	3.050022	7.328456	0.771300	1.985500	82.71619	7.198556
10	3.062818	7.376893	0.766949	2.017392	82.19566	7.643102

Variance Decomposition of L_EXPO: Period	S.E.	LCAB	ECI	L_EXR	FDI	L_EXPO
1	0.198414	0.645762	0.006253	2.760259	0.000179	96.58755
2	0.277417	2.018624	0.048560	3.745108	2.190455	91.99725
3	0.336495	3.291349	0.054290	4.566517	4.701296	87.38655
4	0.384042	4.291991	0.042830	5.285907	6.822881	83.55639
5	0.423470	5.020392	0.041582	5.942860	8.495426	80.49974
6	0.456801	5.524178	0.068642	6.559692	9.792578	78.05491
7	0.485419	5.855651	0.132377	7.148728	10.79748	76.06577
8	0.510331	6.059277	0.234299	7.716859	11.57809	74.41148
9	0.532285	6.169678	0.371835	8.268035	12.18598	73.00447
10	0.551848	6.212816	0.540327	8.804599	12.65964	71.78262

Cholesky Ordering: LCAB ECI L_EXR FDI L_EXPO

Appendix I: Generalized impulse response function

Appendix I1: Generirilized impulse response function for SADC model



Appendix I2: Generilized impulse response function for ECOWAS model