EXPLORING THE LINKAGES AMONG FOREIGN DIRECT INVESTMENT, FINANCIAL DEVELOPMENT, ECONOMIC COMPLEXITY AND ECONOMIC GROWTH IN SELECTED SADC COUNTRIES

by

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DISSERTATION

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DECLARATION

I declare that the dissertation **"EXPLORING THE LINKAGES AMONG FOREIGN DIRECT INVESTMENT, FINANCIAL DEVELOPMENT, ECONOMIC COMPLEXITY AND ECONOMIC GROWTH IN SELECTED SADC COUNTRIES"** hereby submitted to the University of Limpopo, for the degree of Master of Commerce in Economics has not previously been submitted by me for a degree at this or any other university; that it is my work in design and in execution, and that all material contained herein has been duly acknowledged.

Malope, Z 30/03/2023

Surname & Initial Date

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DEDICATION

This study is dedicated to my mother (Dorah Khomotso Malope), grandmother (Christinah Skhosana), aunt (Esther Kagiso Malope), uncles (Sipho Malope and Late Uncle Obed Malope), siblings (Anastacia Malope, Nomhlekhabo Beauty Malope, Tshepo Jeffrey Mphela, Thabang Joy Malope, and my Late brother Kabelo Daniel Malope), and finally, nieces (Lerato Malope, Kgontse Malope, Kemiso Malope, Khutsiso Malope and Lesedi Malope).

ABSTRACT

Nations across the world are striving to achieve and maintain sustainable rates of growth. This study investigated the linkages between foreign direct investment, financial sector development, economic complexity and economic growth in five SADC member states namely, Angola, South Africa, Mozambique, Zimbabwe and Zambia. The study made use of the Pooled Mean Group (PMG) method to explore the long run association between the chosen variables namely, foreign direct investment, financial sector development, economic complexity and economic growth in SADC. Annual panel data spanning from 2000 to 2017 was employed. The results indicated the existence of a significant long run association between foreign direct investment inflows, financial sector development as measured by broad money growth; domestic credit to the banking sector, economic complexity as measured by economic complexity index and economic growth as measured by GDP in the long run. On the contrary, the results indicated an insignificant relationship between domestic credit to the private sector and economic growth in the short run. In addition, the results reflected the non-existence of causality between FDI and economic growth as well as between economic complexity and economic growth. With that being emphasized, the present study suggests that the selected SADC member states should enforce growth-oriented macroeconomic policies through fiscal policies, monetary policies, and policies that attract FDI that will on average lead to economic growth. It is also imperative to place more focus on reforms that widely contribute to the maintenance and development of the financial system since improved economic growth implies the need for financial services will rise thereby leading to the development of the financial sector.

Keywords: Economic growth, Foreign Direct Investment, Economic Complexity, Financial Sector Development, Pooled Mean Group, SADC

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LIST OF ACRONYMS

ADF	-	Augmented Dickey-Fuller
AIC	-	Akaike Information Criteria
ARDL	-	Autoregressive Distributed Lag
DCBS	-	Domestic Credit to Banking Sector
DCPS	-	Domestic Credit to Private Sector
ECI	-	Economic Complexity Index
ECM	-	Error Correction Model
ECOWAS	-	Economic Community of West African States
ECT	-	Error Correction Term
DFE	-	Dynamic Fixed Effects
FDI	-	Foreign Direct Investment
FSD	-	Financial Sector Development
GDP	-	Gross Domestic Product
GIRF	-	Generalized Impulse Response Function
GMM	-	Generalized Methods of Moments
GMME	-	General Methods of Moments Estimation
IRF	-	Impulse Response Function
MG	-	Mean Group
MNCs	-	Multi-National Corporations
NAICS	-	North American Industry Classification System
OEC	-	Observatory of Economic Complexity
OECD	-	Organisation for Economic Co-operation and Development

OLS	-	Ordinary Least Squares
PARDL	-	Panel Autoregressive Distribution Lag
PMG	-	Pooled Mean Group
RCA	-	Revealed Comparative Advantage
RE	-	Random Effects
SADC	-	Southern African Development Community
SITC	-	Standard International Trade Classification
SSA	-	Sub-Saharan Africa
STATS SA	-	Statistics South-Africa
TFP	-	Total Factor Productivity
UNCTAD	-	United Nations Conference on Trade and Development
VAR	-	Vector Autoregressive
VECM	-	Vector Error Correction Model

CHAPTER 1

ORIENTATION OF THE STUDY

1.1 INTRODUCTION AND BACKGROUND

Comparable to other countries in the Southern Hemisphere and major emerging economies, countries in the South African Development Community (SADC) strive to achieve and sustain long-term growth rates (Seleteng and Motelle, 2016). The global consolidation of the worldwide economy as well as the recent rise in anti-globalization sentiment elsewhere makes it difficult for small Southern economies to understand what determines economic growth (Seleteng and Motelle, 2016). However, the wide range of discussions on economic growth suggests that there are many factors at play in the extensive economic literature.

Factors beyond the domestic economy, such as foreign domestic investment inflows, have become increasingly important in recent years for boosting economic growth, particularly in emerging economies (Chen and Jayaraman, 2016; Azman-Saini, Law and Ahmed, 2010; Barajas, Chami, Gapen, Fullenkamp and Montiel, 2009). According to Nourzad and Powel (2003), sustainable growth rates of an economy are vital, since a healthy expanding economy has enormous potential for poverty alleviation and lower unemployment rates as compared to a sluggish economy. As a result, social and economic research indicates that excellent economic growth is necessary for better delivery of goods and services.

It is very difficult to measure the growth rate of a country because there are countless dimensions of development that concurrently contribute to the gross domestic product, as several factors simultaneously contribute to a nation's sustainable economic growth (Apharn, Khaled and Fatimah, 2015). As a result, the suggested research will examine the link among foreign direct investment (FDI), financial sector development (FSD), economic complexity and economic growth in the SADC region. This is because the importance of globalization and the push of the world economy towards the integration of trade in the past few years have made FDI a major driving vehicle for several evolving countries, especially Southern African Development nations (Regimana, 2012). The growing importance of FDI in transnational corporations (TNCs) as a catalyst for development has witnessed alarming levels over the past 30 years (Wan, 2010). In 1980, global FDI flows were US$50 billion, which has since risen to US$1.8 trillion in 2015. This signifies a 40 percent increase. This is the highest level of FDI inflow after the commencement of the worldwide economic and financial crisis in 2008 (United Nations Conference on Trade and Development, 2016).

However, recent studies employing different approaches and data sets in different countries have shown that development in the finance sectors is associated with growth (Sanchez and Yu, 2011; Wang and Wang, 2012; Greenwood, Sanchez and Wang, 2013). One of the most important factors is that the finance segment is responsible for distributing capital in comparison to those with excess capital and possibilities for investment to countries and institutions with less capital (Fishman and Love, 2013). Following Fishman and Love (2013), a nation with a finance sector that is completely well-endowed can allocate resources to the companies and projects that generate the most profits. They also argue that while developments in the financial sector influence business investments through their ability to finance externally, SMEs are more disadvantaged in republics with less developed financial systems than big corporations. Since the financial industry has a significant impact in promoting economic growth through mobilizing savings, facilitating payment and exchange of products and services, together with efficient resource allocation, good development and sound finance systems are essential to maintaining financial sustainability. This could be the key economic stability in terms of reducing risks to the real GDP (Sehrawat, Giri, Alon, and Hobdari, 2016).

Economic complexity can be described as a measure of productive capabilities by indirectly looking at the mix of sophisticated products that countries export, measured in Economic Complexity Index (ECI) (Lapatinas, 2019). Hausmann & Hidalgo (2011) , defines it as a measure of an economy's relative knowledge intensity, and it can be used as a proxy for economic diversity and global manufacturing capabilities On the contrary, has been identified as an essential aspect in boosting the expansion of the economy by policymakers and experts. Indeed, recent research reveals that economic complexity can provide a country with a variety of key benefits. Economic complexity boosts the growth of the economy (Hausman, Cunning, Matou, Osire, and Wyett, 2014), diminishes volatility of output (Hvidt, 2013; Manama, 2016; Akhtar and Freire, 2014), and reduces income inequality (Qurens, 2012; Zhu and Li, 2017; Hartmann, Guevara, Jara-Figueroa, Aristarán, and Hidalgo, 2017). In addition, economic complexity can also assist countries to avoid the middle-income trap (Felipe, Kumar, Abdon, and Bacare, 2012; Fortunato and Razo, 2014). These findings highlight the importance of policy formulation and implementation in creating a more diversified and dynamic economy. However, only a few studies are examining the factors of economic complexity. Gabrielczak and Serwach (2017), for example, argue that the integration of trade may boost economic complexity, while Javorcik, Beate, Turco and Maggioni (2017) conclude that FDI can assist with product improvement.

Pursuing economic transformation and inclusive growth is very important in terms of boosting an economy. To achieve that, economic growth must be accompanied by a reduction in inequality. However, the starting point should be an economy that grows. A deterioration in investor confidence, intensified by political and policy uncertainty, institutional weaknesses, and unresolved regulatory conflicts have contributed to a low-growth environment (National Treasury 2017). Low growth restricts the ability of the economy to transform because it threatens the sustainability of critical social spending by government as well as the overall progressivity of tax and fiscal policy.Furthermore, low growth limits the counter-cyclicality of fiscal and tax policy, which could otherwise be deployed as an additional measure to boost aggregate demand. Ultimately, low growth may also threaten the overall long-term potential growth rate of the economy if it translates into the inability of a country to implement critical growth-enhancing interventions such as productive infrastructure or quality education and skills training (National Treasury, 2017). Putting the country on a higher growth path can be the result of structural transformation (i.e. moving into higher productivity areas) or by expanding existing activities where a comparative advantage clearly exists (such as the export of services and certain high-value agricultural products).

Given that SADC is made up of various countries, each with its financial industry that has struggled to keep up with the world economy's rapid transformation. The motive for this study is to highlight and provide a relative analysis of what can stimulate economic transformation in the selected SADC countries, taking into account that South-Africa forms part of the Southern sphere.

1.2 STATEMENT OF THE PROBLEM

Economically, African countries have not achieved the same level of performance as other emerging market economies in the past two decades. Growth rates in Africa lag behind other emerging economies due to economic stagnation and declining production inherent in the experiences of Africa’s numerous countries (Okurut, Olalekan and Mangadi, 2011). However, the most essential driver of economic growth has long been recognized as an investment (Chirwa, 2017). Also, technological advancements and economic development in various Southern countries are based primarily on external finance through aid and external borrowing (Ayadi, 2008). As a result of this phenomenon, most countries in the SADC region have accumulated unacceptable amounts of external debt, resulting in a chronic debt crisis (Teles and Cesar Mussolini, 2014; Kourtellos, Stengos and Ming Tan, 2013 ; Ahmed, 2012)

Nevertheless, there are other factors in the literature on economic growth as to why Africa's record is so dismal. Some state that rather than capitalising on Africa's industrialization processes, the majority of aid and loan proceeds have been put in ineffective programs (Ahmed, 2012). Some stated that the absence of institutional development is a result of poor performance (Andersen and Jensen, 2014). As a result, nations that rely on endowments of natural resources, such as wealth, have hampered economic progress in the SADC region by either favouring non-democratic or authoritarian economic systems (Tsui, 2010). South Africa, for example, is a developing country consisting of income per person in real terms of US$6,086 as of 2014 (World Bank, 2015). The South African government has depended on national programs to develop the economy since the mid-1990s, albeit with mixed results. Consequently, the economy of South Africa continues to face social and economic issues (National Planning Commission, 2012). In agreement with the World Bank (2015), the economic growth rates from 1994 to 2013 were disappointing, where real per capita growth rates of 3.1 percent per year on average were witnessed. Rates of growth slowed even more in 2015, dropping from US$351 billion in 2014 to US$318 billion (Stats SA, 2016).

Thus, for these economies to recover, it is critical to grasp the relationship between foreign direct investment, financial sector expansion, economic complexity, and economic growth. Furthermore, knowing which policy guidelines or methods may be used to reduce poverty and achieve a greater rate of sustainable growth is critical.

1.3 RESEARCH AIM AND OBJECTIVES

1.3.1 Aim of the study

The study aims to examine the relationship between FDI, development of the finance sector, economic complexity, and economic growth in five SADC member countries: Angola, South Africa, Mozambique, Zimbabwe, and Zambia.

1.3.2 Objectives of the study

To achieve the aim, the following objectives are set as:

- To investigate the impact of economic complexity on the link between FDI and Economic growth
- To determine the impact of financial sector development on economic growth.
- To examine the relationship between economic complexity and economic growth.

1.3.3. RESEARCH QUESTIONS

- What is the nature of the relationship between foreign direct investment and economic growth?
- How does financial development pose an impact on economic growth?
- Is there a causal link between economic complexity and economic growth?

1.4. DEFINITION OF CONCEPTS

In light of the recent literature that will be discussed in the preceding chapter 2, the following control variables will be included in this study.

- Foreign direct investment

Foreign direct investment is interpreted as net inflows of investment that aid in attaining a long-term management stake (ten percent or more of the voting stock) within a company that operates in a different economy than the investor's (World Bank, 2013). Furthermore, FDI occurs when a local corporation is involved in foreign direct investment within a company based in another country with the primary goal of acquiring a long-term stake in that company (OECD, 2013).

- Financial sector development

A financial market, according to Marx et al., (2009), is a venue where financial products including servitudes, treasury notes, shares, deposit certificates that can be negotiated, and acceptances from bankers are exchanged. A financial market, on the contrary, is defined by Chipeta (2012) as a place where financial assets are bought and traded. Financial development has been measured using a variety of proxies. Three substitutions will be utilized to measure financial development in this study. Among them are the following:

(i) Except for credit to the federal government provided by the banking sector as a proportion of GDP, domestic credit furnished by the banking segments comprises all credit to other divisions on a gross basis (Alfaro, Kalemli-Ozcan, Sayek, 2009).

(ii) Domestic credit to the private sector is the second indicator, which refers to financial resources delivered to the private sector in the form of advances, credit exchange, and other account receivables with a repayment claim expressed as a percentage of GDP (Ismail and Masih, 2015).

(iii) Finally, we have the monetization ratio, which is also known as broad money growth. It focuses more on the finance sector's financial depth or liquidity (Mokhoele, 2016).

- Economic complexity

The term “economic complexity” refers to the various forms of goods that have been generated as a result of the abundance of available knowledge. Individuals from several work-related disciplines, in particular human resources, finance, marketing, operations law, and technology, for example, must interact and combine their skills to create innovative products in a complicated economy. As a result, governments seem to be unable to generate products and wealth without this expertise (Hausmann et al, 2014).

Economic growth

Todaro and Stephen (2011) describe “economic growth” as a continuous procedure in which the economy's volume of output appreciates over time, ensuing in rising levels of national income. According to Markiw (2011), economic growth means the rise in the number of goods and services in an economy through time.

1.5. ETHICAL CONSIDERATIONS

The analysis draws on secondary data from a variety of sources, including the World Bank and the Observatory of Economic Complexity (OEC). As a result, the planned study does not require ethical approval, does not include human beings, and plagiarism is avoided.

1.6. SIGNIFICANCE OF THE STUDY

The study is critical to the economy of SADC as a whole, as these nations have experienced varying rates of economic growth throughout the years. To explain these variations, investigating the linkage between FDI, development of the finance sector, economic complexity, and economic growth are necessary. Furthermore, this research will contribute significantly to the existing body of knowledge in this field of study. Furthermore, utilizing this study as a starting point, more research can be done.

Finally, this research is expected to be utilized as input for a more cohesive approach to policy proposal involving financial variables, economic complexity, and economic growth, and may be used to broaden the outlook for policymaking. The work on the relationship between FDI, FSD, economic complexity, and economic growth in less established nations is scarce, especially in SADC. As a result, this research is likely to add to the existing body of knowledge.

1.7. STRUCTURE OF THE STUDY:

This study is organised as follows: The first chapter provides an overview of the research and emphasizes the problem statement. This chapter also looks at the study's goals and objectives, as well as the questions it aims to address. Finally, the chapter discusses the study's ethical implications and relevance. A review of relevant studies is presented in the second chapter. The review of literature gives the study's theoretical and empirical underpinning. The third chapter focuses on the data utilized in the modelling as well as certain methodological features of the estimations. The empirical data and their interpretations are presented in the fourth chapter. The study is concluded in Chapter five with a brief statement, final observations, suggestions for policy, and limitations of the study.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter presents the theoretical framework governing the linkages between foreign direct investment, financial sector development, economic complexity index and economic growth. The section will also outline the reviews of empirical literature which support the study, and aimed at providing guidance related to the selection of variables and relevant methodology.

2.2 Theoretical Literature

The theoretical literature provides an insight into how different factors influence the dynamics of the chosen dependent variables and growth in general. The theories which are deemed relevant to this study in particular the exogenous growth model and endogenous growth model are discussed as follows;

2.2.1 The exogenous growth model

Solow devised the exogenous growth model, often known as the neoclassical growth model or the Solow-swan growth model (1956 and 1957). This theory is motivated by the assumption that an expansion of the economy is generated through an accumulation of exogenous factors of production, such as capital and labour stock. The total output function pioneered by Cobb and Douglas is used in most empirical investigations against the progress of the economy using the exogenous growth model (1982). The Cobb–Douglas function of production is modelled against capital input (national together with foreign), labour input, and the rate of technical progress which varies over time, as proposed by Hicks (1932). To add to that, it was demonstrated that capital accumulation directly adds to the growth rate in proportion to capital's share of national output using this framework. Furthermore, economic growth is dependent on labour force expansion and technological advancement. As a result, FDI raises the capital stock in the country of residence, and in turn, has an impact on economic growth. De Jager (2004) goes on to say that if FDI introduces new technology, which will result in improved labour and capital-output. It is bound to result in higher and more consistent returns on investments, as well as exogenous labour growth.

2.2.2 Endogenous growth theory

Unlike neoclassical growth models, which assume that technological advancement is exogenous, the endogenous growth model assumes that economic growth is driven by two fundamental factors: technological change and human capital stock (Romer, 1986, 1990, and 1994; Lucas, 1988). The "new endogenous growth" model, just as and congruent with Nair-Reichert and Weinhold (2001), considers durable growth in the form of technological advancement and provides such background within which FDI can continuously increase the rate of economic growth in the country of residence through technology transfer, diffusion, and spillover effects. Although both exogenous and endogenous growth theories maintain that capital accumulation is an imperative component of economic growth, their approaches to the progression of technology diverges. Initially, the former expect technological development to be exogenous to the model, whereas the latter dispute that technological progress is enriched endogenously (Al Nasser, 2010; Borensztein et al, 1998; de Mello, 1999; & Elboiashi, 2011).

2.2.3 Financial sector development theory

The published works on the relationship between finance and growth may be traced back to Schumpeter (1911), who established the concept that financial sector expansion is critical for economic progress. According to Schumpeter's view, the financial sector development is vital for economic growth. His argument centred on the idea that the development of the finance sector influences economic growth by giving sufficient funding to enterprises that make the most efficient use of resources. This viewpoint was later reinforced by Goldsmith (1969), Mc Kinnon (1973), and Shaw (1955).

In contrast to "Neo-classical theorists", Gurley and Shaw (1955) argued that the role of the financial sector is over-stressed by economists who emphasize the significance of finance for growth. In essence, Patrick (1966) advocated for two key assumptions: supply-leading hypothesis and demand-following hypothesis. Patrick claims that the financial system stimulates economic growth within the early stages of a country's economic development. However, since a country progress towards achieving the status of a developed country, the need for the financial sector to develop grows. Levine (1997) added to the theoretical framework on the finance-growth nexus by proposing that finance serves as a primary engine of economic growth.

2.2.4. The theory of economic complexity

According to the economic complexity theory, a country's economic structure that is productive, as well as its complexity, is imposed by its capabilities. Capabilities are imparted upon economies, and diverse goods necessitate a specific collection of skills. The more complex a product is, the more production capabilities are required. (Hildago, 2009). Physical capital, human capital, as well as institutions, norms, and social networks, all contribute to these capabilities. Revealed comparative advantage (RCA) was used by Hausman, Hidalgo, Bustos, Coscia, Chung, and Jimenez (2011) to establish product networks and distil the competencies required for their production. The following formula is used to determine the RCA:

$$R_{ep} = [(X_{cp} / \sum_{p} X_{cp}) / (\sum_{c} X_{cp} / \sum_{c,p} X_{cp})] \qquad (1)$$

Where R_{ep} is the network connecting countries to the product they export, c is the country c, p is the product p, and X_{ep} is the matrix of countries exports (Hildago, 2009). A country has an RCA in producing a product if $R_{ep} \geq R^{*}$; where in most cases $R^{*} = 1$.

As a result, if an economy has a wide range of skills, it can be classified as a sophisticated economy, and it is frequently diversified and rich (Hildago, 2009). Furthermore, these economies are equipped with rare qualities that enable them to produce relatively unique products. Therefore, both ubiquity and diversity constitute complexity. For example, if product ubiquity is low, only a small number of republics have the capabilities to create it. Yet, if a country's diversity is great, it produces a large number of products.

2.2.5 Harold-Domar Growth Model

According to Goodman (2014), this theory is mostly focusing on the relationship between the productivity of capital, the rate of saving and economic growth. Todaro (1997) also argues that the model takes into account the importance of savings and investments during the process of economic growth. However, this model assumes that the rate in which a country's level of income increases is positively related to savings and has an inverse relationship with capital output ratio. Todaro (1994) further argues that this model attributes the reduction of economic growth in numerous economies to be relatively low in terms of the new capital formation that exist in those economies.

2.3 Empirical literature

In line with the objectives of this study, this research highlights the observations and findings of other researchers. The attempt has been made to focus on the published work reports focusing on studies in both developed and developing countries. Also, studies from countries under investigation have been considered.

2.3.1 Foreign Direct Investment and Economic Growth

Alvadaro et al. (2017) looked into the link between FDI and economic growth in 19 Latin American countries. The authors discovered that the influence of FDI is not an adequate mechanism statistically significant in aggregated form for utilizing panel data econometric methods. They also argue that, aside from high-income nations, FDI is insufficient to promote economic growth in Latin America. Ubeda and Perez-Hernadez (2017) investigated how FDI affects productivity growth in Spain's manufacturing industry. From 1993 to 2006, the authors developed a theoretical model to explore non-linear correlations between inward FDI and productivity growth in domestic enterprises. Their findings suggest that foreign direct investment has a detrimental influence on increased productivity.

In the same lines, Gui-Diby (2014) observed the association between FDI and economic growth in 50 African countries from 1980 to 2009. The results from the system-generalized methods of moments (GMM) technique revealed that FDI has diverse effects across the sample. For example, while FDI shows negative inflows and consists of large economic growth implications from 1980 to 1994, it had a good impact on growth from 1995 to 2009. Agbloyer et al. (2014) used the GMM instrumental variable technique to examine the relations among foreign direct investment and economic growth in 14 African nations from 1990 to 2007. Based on the findings, foreign direct investment possesses a detrimental influence on economic growth in the 14 African countries. However, these countries may turn the negative impact of FDI into a positive impact by strengthening their local financial markets.

By the same token, Ahmed (2012) examined the impact of FDI inflows and GDP on Malaysia's productivity development from 1999 to 2008. The findings, which were built on time series and quarterly data, revealed how FDI inflows and inputs adversely affect the productivity of all factors (TFP). Bellomia (2014) also analyzed the association amongst FDI, trade openness, and economic growth in host countries from 1970 to 2008. Within the short run, the findings of Granger causality revealed that there is no significant association between foreign direct investment and economic growth, growth of the economy and foreign direct investment, trade and economic growth, and economic growth and trade. Abbes (2015) used co-integration and causality analyses as defined by granger to investigate the empirical relationship among FDI economic growth in 65 countries. Nevertheless, findings revealed a disparity in terms of the relationship between a panel study's co-integration, which demonstrated unidirectional causality from FDI to GDP.

Although some studies have discovered a negative link between FDI and growth, others have discovered a positive link. Afghanistan, Wami, and Rehman (2017) evaluated the connection between foreign direct investment and expansion of the economy over the period 2005-2015 on a new study concerning the link between FDI and economic growth. Using the OLS approach, they discovered that FDI contributes towards the expansion of the economy in a beneficial way.

To study the extent to which FDI positively influence economic growth, Alshehry (2015) used Johansen cointegration along with Granger causality methods towards investigating the influence of foreign direct investment inflows on Saudi Arabia's economic growth from 1970 to 2012. An influx of capital, acquisition of technology, coaching and individual abilities, employment, and spillover effects to local enterprises, according to Alshehry (2015), could all be seen as crucial factors in the country's success. Alshehry (2015) adopted the endogenous growth theory of foreign direct investment, which claims that FDI has a major impact on the host country's economic growth. These findings backed up the growth model's hypothesis by demonstrating how FDI both over the long and short run has a favourable association with GDP.

Furthermore, Azman-Saint et al. (2010) discovered how foreign direct investment possesses a beneficial effect on economic growth, which appears to occur when financial sector development exceeds a particular threshold. Tiwari and Mutascu (2011) found that FDI increases economic growth in twenty-three Asian nations during the period 1986-2008 using the random effect technique. Apergis and Arusha (2017) further confirm that FDI is strongly connected with economic growth in host nations, implying that to witness profit on inflows of capital over time, host countries must have sufficient human capital, economic stability, and market liberalization.

Iamsiroj (2016) finds a favourable relation among FDI as well as economic expansion using a sample of 124 countries from 1971 to 2010. Iamsiraroj and Ulubasoglu (2015) go on to say FDI consists of beneficial impacts on the expansion of the economy. Trade openness and financial development appear to be proper absorptive capacity metrics for growth, according to both writers. Furthermore, Adams and Opoku (2015) revealed that FDI only affects economic growth in the presence of strong restrictions such as credit markets, business, and labour market regulations. Outcomes were revealed when utilizing the generalized method of moments procedure for estimations within the research of 22 SSA countries with data from 1980 to 2011. Liu et al. (2014) investigated the impact of FDI on economic growth in China by looking at different elements of the economy. The findings revealed that FDI both boosts and hinders economic development as a result of domestic investment being crowded out, lowering revenue for local governments, as well as raising the economic price of technological advancement, and innovations on a national level. The author’s also stated that FDI has reduced the inter-regional (eastern, coastal, and interior) growth inequality by influencing industrial channels, trade balances, openness, and human capital accumulation. FDI, on the other hand, drives regional growth inequality by way of aggregate factor productivity and accumulation of physical mechanisms.

Gokmen and Temiz (2014), on the other hand, used information gathered quarterly from 1992 to 2007 to investigate the FDI-growth nexus in Turkey. Their data imply how foreign direct investment and the growth of the economy have a positive association. Nonetheless, remains insignificant in the short and long run. Gomes Neto and Veiga (2003) examined the influence of FDI and economic growth through the transmission of technology and innovation using a panel data set spanning 139 nations from 1970 to 2009. The two methods which were discovered had a favourable impact in terms of production and gross domestic product.

During the same period, Biekpe and Gossel (2013) investigated the causal relationships between FDI and economic growth in South Africa for the period 1995-2011 utilizing domestic investment liabilities and real GDP as proxies for foreign direct investment and growth of the economy, respectively. Their findings advocate that FDI is significantly influenced by the growth of the economy. Hussain and Haque (2016) discovered a favourable relationship amongst FDI, trade, and GDP per capita in their research. Their findings also demonstrate how trade and FDI variables have a major influence on the progress of the economy. Sakyi, Commodore, and Opoku (2015) also studied the connection between FDI and economic growth in Ghana from 1997 to 2011. Their findings reveal that an increase in foreign investments inflows leads to long-term beneficial monetary growth.

2.3.2 Financial Sector Development and Economic Growth

Over the period 1976-2015, Nasir, Majeed, and Aleem (2018) explored the relationship between financial development and economic growth in three developing Asian economies. Their research revealed that in Korea and Thailand, financial development accelerates economic growth. For the period 1985-2014, Amin and Hossain (2017) investigated the causal relationships between financial development and economic growth in Bangladesh. Their findings demonstrated that the two factors have a substantial positive relationship. Likewise, Esso (2010 analyzed the relationship between financial development and economic growth in ECOWAS countries from 1960 to 2005. Esso discovered that the development of the finance sector and economic growth are favourably associated with using co-integration analysis.

Rafindadi and Aliyu (2017) investigated the relationship between financial development and economic growth in Ghana using the autoregressive distributed lag bound testing approach. According to the study, financial development has a robust favourable impact on Ghana’s economic growth. Johannes et al., (2011) employed Johansen co-integration to study the association between financial sector development and economic growth in

Cameroon from 1970 to 2005. During the short and long term, their findings revealed a favourable relationship between the development of the financial sector and economic growth. This implies that if the finance sector improves, the economy will grow as well, and vice versa. If finance segments do not develop, the economy will suffer as well. Furthermore, their research shows a long-term unidirectional connection between the finance sector and economic growth, with a 5% level of significance.

In essence, Cavenaile et al. (2011) used a data collection from 1977 to 2007 for five emerging nations (Malaysia, Mexico, Nigeria, the Philippines, and Thailand). The study discovered a long-term link between economic growth and financial development. This means that weak bi-directional causality originating from financial development to economic expansion was detected through evidence. They concluded that boosting the growth of the financial sector could, in some situations, assist long-term economic growth. The findings support Colle's (2010) analysis, which found cointegration and a significant long-run link between the development of the finance sector and economic growth. The evidence suggests that as the financial industry grows, so does the economy grow. Therefore, since the economy expands, so does the finance division. However, in some of the countries studied, bi-directional causality was discovered. This demonstrates that finance promotes growth while simultaneously having an impact on finance.

Jenkins and Katricioglu (2010) used annual data directed towards investigating the link between finance expansion and economic growth in Cyprus from 1960 to 2005, using the ARDL technique and the Granger causality test. The findings of their research show a long-term stable connection between financial development (determined by M2) and economic growth.

Between 1994 and 2014, Abueida and Zibda (2015) investigated the role of commercial banks on economic growth. Their research examines the influence of the total amount of credit from banks extended towards the economy on economic growth concerning other macroeconomic variables, using credit facilities as a measure of commercial banks. Their studies revealed that bank credit facilities, as well as economic growth in Palestine, are linked. For the period 1970-2005, Oluitan (2010) looked at the relationship between bank credit and economic growth in Nigeria. The study found a substantial co-integration relationship between finance growth proxies along with economic growth using the

Johansen technique. However, the results of the causality test demonstrated short run causation between GDP per capita in actual terms and finance development.

Consequently, Bangake and Eggoh (2010) examined the association between the development of finance and progress of the economy, as well as causality direction, for 71 developed and developing nations from 1960 to 2004. For all of the countries, the co-integration method revealed a statistically significant long term link between the variables. The data also shows how the relationship is significantly more powerful within high-income economies than it is in low-income economies. The panel VECM results, on the other hand, which were based on GMME, revealed statistically significant short-term and long-term causation in the direction of finance to economic growth in all of the nations studied, with long-term causality dominating over the short run causality. Furthermore, the findings demonstrated considerable continued causation between economic growth and financial development. As a result, these findings indicate significant bi-directional causation amongst finance and economic growth. Similarly, Chakraborty and Ghosh (2011) examined the finance-growth nexus in five Asian countries (Indonesia, Korea, Malaysia, Philippines, and Thailand) using panel data from 1989 to 2006. The series was integrated and co-integrated, demonstrating a significant long run link between financial development and economic growth, according to their findings. They also discovered that economic progress is linked to financial development. As a result, they concluded that economic expansion plays a role in aiding the finance sector to grow.

For the period 1986-2012, Mishra and Narayan (2015) investigated the relationship between financial sector development and economic growth in 43 developed and developing nations. They discovered that, when a republic's degree of financial development exceeds its cross-sectional averages, financial sector development positively correlates with economic growth. Zhang et al. (2013) used cross-sectional regressions and the GMM framework to study the association between financial development and economic growth in China from 2001 to 2006. They discovered that economic growth is accelerated by financial development.

Contrarily, Akinlo and Egbentunde (2010) investigated the link between financial development and economic growth in ten Sun-Saharan African countries. Their findings revealed the different directions of causality in these nations by means of the VECM technique to determine whether there are any co-integrating linkages. In nations like Chad, Kenya, Sierra Leone, and South Africa, the study found bi-directional causality. The growth of the economy gives rise to the expansion of finance in Zambia, while financial development causes growth in the Central Africa Republic, Congo Republic, Gabon, and Nigeria. This was based on multivariate co-integration and error correction modelling (ECM). Pradhan et al. (2014) underline the importance of emerging financial sectors in the process of driving economic growth in 35 Asian countries. The results show a bi-directional link between banking and the stock market for most economies. This was based on the use of numerous econometric methods on the banking arena, stock of exchange, and four other components of the economy.

Recent exploration on finance-growth nexus, in contrast, have revealed an undesirable link between the development of finance segments and the growth of the economy. Over the years 1980-2008, Samargandi, Fidrmuc, and Ghosh (2015) looked into the relationship among a progress of finance segments together with economic growth in a panel of 52 middle-income nations. They discovered the existence of a reverse linkage (U-shape) among the two variables in the long run and a narrow relationship in the short run using the dynamic heterogeneous panel model. This statement demonstrates how the development of the finance sector plays a detrimental impact on economic growth in middle-income countries. For 21 African nations, Menyah et al. (2014) explored the links between financial development and economic growth. Their findings demonstrated how financial sector development and commercial liberalization do not promote economic growth when using the panel Granger causality technique.

Soltani, Ochi, and Saidi (2014) applied the GMM approach to analyze the linkage between financial development and economic growth in 11 MENA nations from 1995 to 2011. The results of their research demonstrated how the development of the finance sector and economic growth possesses a negative association. For the period 1968-2010, Mahran (2012) investigated the links between economic growth and financial intermediation in Saudi Arabia. Utilizing ARDL co-integrating techniques and the ECM model, the results show how financial intermediation negatively impact real GDP in the long run.

Nonetheless, Al-Jarra, Al-Zu'bi, Jaara, and Ashurideh (2012) examined the correlation between the development of the finance sector and economic growth in Jordan from 1992 to 2002, using four finance sector measures including the ratio of private sector credit as a percentage of the total banking sector, ratio of currency outside banks as a percentage of narrow money, ratio of banking sector assets as a percentage of GDP, and M2 as a ratio of GDP). According to the findings, there are no links between Jordan's financial sector development and economic expansion.

2.3.3 Economic complexity and economic growth

Hidalgo and Hausmann (2009) are pioneers in presenting an economic growth and development perspective that includes economic complexity as a key component. They created a method for quantifying a country's complexity, which they promote as a valuable indicator of the economy's structure in relation to the items it exports. The information needed for this strategy came from three separate sources and classifications. The first was a 4-digit classification from the Standard International Trade Classification (SITC), followed by a 4-digit classification from the COMTRADE Harmonized System, then a six number classification from the North American Industry Classification System (NAICS). They defined the structure of the bipartite networks, which are made up of nations and products, using the Method of Reflection. However, in their concept, exists a positive correlation between a county's diversity and the talents it possesses. Meanwhile, there’s an adverse correlation between a country's quantity of capabilities and the extent to which its products are distributed. The term 'capabilities' in this analysis refers to single activities that result from the division of labour. Furthermore, they demonstrate that countries with greater diversification develop more complex goods. Their main findings show that economic complexity measures are related to per capita income and can be used to predict the complexity of future exports and the growth potential of a republic.

Felipe, Kumar, Abdon, and Bacate (2012) looked into the association between product complexity and economic progress. They reported the link between the expansion of the economy and the manufacturing of additional complex goods. Economic complexity is measured in their study using the method of reflections approach, which was first proposed by Hidalgo and Hausmann (2009). They also utilize data related to trade from the Harmonized System six-digit level, which contains 5132 items from 176 countries, to estimate complexity measures. The most complex products involve machinery, chemicals, and metals, according to the results of using the method of reflections. Raw materials, commodities, and agricultural goods, on the other hand, have the lowest level of complexity. Again, they discover that more complex products are primarily exported by wealthy countries, whilst products with lesser complexity are primarily exported by economies that are less developed. They also ran cross-country regressions on each country's export share for 5107 different products. Their findings revealed that for high complexity products, exports grow with income, whereas for low complexity products, exports drop with income.

Another contribution in this area of research was made by Cristelli, Gabrielli, Caldarelli, and Pietronero (2013) who proposed a novel methodology intending to generate meaningful information about a product complexity and country competitiveness. They used a non-monetary measure that was not based on income in their model. Their measure's main purpose is to uncover a republic's untapped growth potential. They offer a statistical method based on non-linear maps for correlating countries and product complexity. The authors then contrast their methods to Hidalgo and Hausmann's Method of Reflections, claiming that the fundamental difference is how they apply a relation that is not linear between product complexity and the fitness of the countries that produce these products.

Cristelli et al., (2013) analysed the export basket's diversity and concluded by stating that change plays a significant part in a country’s competitive advantage. Using extensive trade information, it was discovered that advanced nations have a high level of diversification, meaning they export a wide range of products, whereas less developed countries export only the most widely traded products. They, however, claim the fact that sophisticated countries export the majority of their products means that information on complexity is associated with less competitive countries and that this fact explains the non-linear link between country fitness and product complexity. Finally, they assert that their methodology is critical for estimating a country's competitiveness, prospective growth, and even the development of financial markets due to its capacity to forecast long-term growth trends.

While Cristelli, Tacchella, and Pietronero (2015) investigated how a non-monetary measure may be used in a study related to a country's potential growth, they concluded by highlighting how a nation's productive basket contains all of the information about its assets that is difficult to incorporate into a model. They utilised data from the BACI dataset upon exportations from 1995 to 2010 for at least 200 countries and 5000 products. The Revealed Comparative Advantage (RCA) is the most important factor for determining whether or not a country can be classified as a producer. Given the organizations and laws of modern economies, Cristelli, Tacchella, and Pietronero (2015) further state that economic systems are at least a subject of monetary information. It would therefore be uninformed to exclude the monetary dimension when attempting to analyze a country's development and prosperity. Furthermore, they demonstrated that regression analysis is not the best way for making predictions because heterogeneity is of vital importance. They suggest using a strategy akin to the analogues method for forecasting the diverse changing aspects of economic complexity.

Lapatina (2016) looked empirically into the impact of economic complexity on human development. He specifically investigated if there is a link between economic diversification and social growth. He analyzed data on human development and economic complexity in order to achieve this. He uses the Prados de la Escosura (2015) Human Development Index and the ECI values from MIT's Observatory of Economic Complexity. In his concept, the Human Development Index (HDI) is calculated as a function of the Economic Complexity Index's lagged value, while also accounting for other factors that influence human development. He discovers a positive association between economic diversification and human development using pooled OLS with fixed effects. However, there is no evidence that economic complexity has a causal effect on human development.

2.4. Chapter summary

This chapter revised findings from studies that empirically investigated the linkage between foreign direct investment, financial sector development, economic complexity, and growth of the economy. Three main FDI-growth theories were debated in the preceding units particularly: the exogenous growth theory, endogenous growth theory and Harold-Domar growth theory. The development of a financial sector and the complexity of the economy were also discussed as sources of economic growth over an extended period. The theoretical inspection confirmed that foreign direct investment is a key determinant of economic growth in the host country. In addition, the section revealed that through both exogenous and endogenous growth analysis, FDI contributes directly and indirectly to economic growth and that the host country's growth may attract more FDI.

Evidence-based research exploration, on the other hand, reviewed previous studies on the association between FDI, financial sector development, economic complexity, and economic growth. After all, different scholars found mixed results, despite the fact that the majority of studies reviewed found a favourable link between the four variables and economic growth. However, in spite of the positive relations to African countries, to the best of our knowledge, specific studies to date that have examined an empirical investigation on the dynamic link of FDI and financial development on economic growth using economic complexity as a transmission channel for SADC countries are rare. Most of the studies have extensively focused on analysing the relationship between one or two factors and have not extended their research further to encompass other variables. For instance, many scholars focused on examining how each variable impact economic growth. Thus, this study sought to fill the gap by adding to the debate on the linkages between FDI, financial sector development, economic complexity, and economic growth by means of utilizing panel data for the SADC region for the period 2000-2017.

CHAPTER 3

RESEARCH METHODOLOGY

3. Introduction

This chapter focuses on discussing the different econometric techniques that were employed to meet the aim of the study. It explicitly discusses the model specification, nature of the data and sources in detail. This section also focuses on discussing the estimation strategy, including the tests for stationarity, the analysis of co-integration as well as the error correction techniques. It’s also worth noting that various diagnostic and stability tests are applied in this section to ensure that the estimates are reliable and valid.

3.1 Data

A panel dataset of five SADC nations is sourced for the period 2000 to 2017 to meet the aim of the study and provide answers to research questions. The nations were selected purely on the availability of data. This study formulates an economic growth model based on the influx of foreign direct investment, financial sector development as measured by domestic credit through segments of the bank (DCBS), domestic credit to the private sector (DCPS), and broad money growth (M2G), economic complexity as measured by economic complexity index, and economic growth as measured by GDP per capita growth. The data was acquired using reliable sources like the World Bank database and the Observatory of Economic Complexity (OEC).

3.2 Model specification

This study uses a straightforward model initiated by Abduroluman (2003), De Gregorio, and Guidotti (1995) to analyze the links among foreign direct investments, development of the finance sector, economic complexity, and economic growth in the five SADC member nations. The model demonstrates how economic growth is influenced by indicators through economic relationships. With that being said, Equations 3.1 and 3.2 show the functional and linear relationships of the SADC growth model for the selected five economies, respectively. Furthermore, the descriptions of the variables and the apriori expectations of the association between the dependent variable and independent variables are presented in Tables 3.1 and 3.2 respectively.

The growth model of the five selected economies in the SADC region is presented as follows,

$$Growth = f(FDI, M2G, DCBS, DCPS, ECI) \quad \text{...(3.1)}$$

The linear equation of the proposed study is written as:

$$LGDP_{it} = \beta_1 LFDI_{it} + \beta_2 LM2G_{it} + \beta_3 LDCBS_{it} + \beta_4 LDCPS_{it} + \beta_5 LECI_{it} + \mu_{it} \quad \text{............... (3.2)}$$

Where the description of the main variables adopted is made available in table 3.1 below:

Table 3.1 Description of variables and sources

Variable	Description & Sources
GDP	gross domestic product per capita growth expressed as a percentage extracted from the World Development Indicators.
FDI	foreign direct investment inflows are expressed as a percentage of GDP extracted from World Development Indicators.
M2G	broad money growth expressed as a percentage of GDP extracted from the World Development Indicators.
DCBS	domestic credit provided by the banking sector is expressed as a percentage of GDP extracted from the World Development Indicators.
DCPS	domestic credit to the private sector expressed as a percentage of GDP extracted from the World Development Indicators.
ECI	economic complexity index expressed as a percentage of GDP extracted from the Observatory of Economic Complexity Database.
μ_t	Signifies the error term

Source: Author's Compilation

Table 3.2 Apriori expectations in relation to literature evidence

Dependant (Y)	Independent (X)	Expected Sign	Sources for empirical association
GDP	FDI	+	Prgkas (2015), Mehic et al (2013), Masipa (2018)'Koojarroenprasit (2012), Tiwari & Mutascu (2011)
GDP	M2G	+	Gatawa, Abdul, Gafar, Olarinde (2017); Ihsan & Njum (2013); Ehigiamusoe, (2013)
GDP	DCBS	+	Adu et al, 2013; Caporalea, Robe, Lopa (2016)
GDP	DCPS	+	Wang et al (2019), Ibrahim & Alagidede (2018), Hassan et al (2016), Abosedra (2016), Karmal (2013) Samargandi & Kutan (2016)
GDP	ECI	+	Hong, Lu & Huang (2015); El-Ghalayini (2017)

Source: Author's Compilation

3.3 Estimation techniques

The study examined the long run relationship among FDI, development of the finance sector, economic complexity, and economic growth in a dynamic setting utilizing panel data for a group of five SADC member states. According to Kelly and Mavrotas (2008), this will make it easier to avoid using typical statistic co-integration tests inappropriately. Furthermore, using the panel data approach alleviates the problem of cointegration tests sensitivity towards stationary tests with low power, which is well-known in time series analysis. Finally, panel data analysis is a useful tool for allowing heterogeneity in coefficients of any dynamics across countries.

3.3.1 Pre-Diagnostic Tests

This subsection aims to introduce a general overview of the preliminary diagnostic test estimators. The section begins by describing the descriptive statistics of pre-diagnostic test evaluations. Following this, the correlation analysis technique was utilized towards determining the linear association amongst the variables. Both methods are useful for describing the basic features of the study's data and how the variables are linked to one another.

3.3.1.1 Descriptive statistics

Descriptive statistics explains the relationship among variables in a sample or population to summarize data in an orderly manner. When carrying out research, calculating descriptive statistics is a compulsory initial step that should always be completed before making inferential statistical comparisons. Descriptive statistics include measures of frequency, central tendency, dispersion/variation, and position, as well as several types of variables (nominal, ordinal, interval, and ratio) (Kaur P, Stoltzfus, & Yellapu, 2018). Descriptive statistics (Bland, Whitson, Harris, Edmiaston, Connor, Fucetola, & Lang, 2015) are unique information presented in just a few words to characterize the essential aspects of the data in a study, such as the mean and standard deviation (SD) (Sundaram, Dwivedi, Sreenivas, & 2014).

In addition, descriptive statistics remains an important aspect of the initial data analysis process because they lay the groundwork for comparing variables using inferential statistical tests (Altman and Bland, 1995). Consequently, as part of effective research practice, giving the most relevant descriptive statistics methodically is highly recommended. Meaning caution should be exercised to decrease the risk of presenting misleading results (Altan,1990).

The other method that is usually distinguished against the descriptive statistic is known as inferential statistics. Inferential statistics are a type of statistical procedure that differs from descriptive statistics in that it focuses on drawing inferences from information that is prone to random variation such as observational mistakes and sample variation. Most predictions within inferential statistics are for the future, and generalizations about a population are made by studying a smaller sample (Campbell, Machin and Walters, 2010). Statistical approaches derive inferences from the study participants in terms of distinct groupings, etc. continuous data normalcy is one of the assumptions made by these statistical approaches. However, there are various ways for determining the normality of data, together with numerical and visual methods, each with its own set of advantages and disadvantages (Altman & Bland, 1995). In the scientific study of data, both descriptive and inferential statistics are used, and each plays an equally significant part in statistics.

Thus, to get a better understanding of descriptive statistics, the research further explains other major forms of descriptive statistics:

• Frequency Measures

The frequency within which each variable appears, such as the number of males and females in the sample or population, is counted in frequency statistics. Frequency analysis is a branch of statistics that focuses on the number of occurrences (frequency) and the percentages of those occurrences (Mishra, Pandey, Singh, Gupta, Sahu, & Keshri, 2019).

- Measures of Central Tendency
  - Mean

The mathematical average value of a set of data can be referred to as the mean. A sum in the observations divided by a number of observations can be used to compute the mean. It is a well-known measure that is also quite easy to calculate. It is a unique number for one group, implying that only one answer exists, which is helpful when comparing all groups. All observations are considered in the mean computation (Sundaram, Dwivedi, & Sreenivas, 2014); and (Altman, & Bland,1995) one drawback related to the average value is that it is influenced by extreme values (outliers).

  - Median

On a condition that information is organized in ascending or descending order of magnitude, the median is interpreted as the middle observation. As a result, it is regarded as one of the observations that occupy the middle position in the distribution (data). The positional average is another name for this. Outliers (extreme values) have no bearing on the median. It is extraordinary, in the sense that there is just one median for one data set exists, which is helpful when comparing groups. However, there is one drawback of median over mean, which is that it is not well known such as the mean (Altman, 1990).

  - Mode

The most common value in a series of observations is called the mode. As a result, the observation with the highest frequency is referred to as the mode. There are likely to be numerous modes in a data set or none at all. In a case where various modes are being available for a single data set, the mode is not utilized to compare the groups (Mishra, Pandey, Singh, Gupta, Sahu, & Keshri, 2019).

Computation of Measures of Central Tendency

- Measures of Dispersion

A measure of dispersion, also known as the measure of variations, is an alternate technique utilized to indicate how to spread out a variation in a data set. It is also known as a population's or a sample's quantitative degree of variance or dispersion of values. It shows the scarce representation of measures of central tendency, which is frequently the case for mean or median. These dispersion measurements are used as guides to determine if the data is homogeneous or heterogeneous (Sundaram, Dwivedi, & Sreenivas, 2014; Altman, 1990).

Computation of Measures of Dispersion

- Standard deviation and variance

The standard deviation (SD) is responsible for measuring how spread-out values are from their mean values. It is usually represented by the symbol σ (the Greek letter sigma) or s. It is termed SD because a standard value (mean) has been taken to measure the dispersions (Mishra, Pandey, Singh, Gupta, Sahu, & Keshri, 2019).

- Standard error

The standard error represents differences between the sample mean and the population mean. When a larger number of models from the same population with the same sample size have been drawn using a random sampling approach, it simply means that the SD amongst the model means is labelled the standard error (Mishra, Pandey, Singh, Gupta, Sahu, & Keshri, 2019). As a result, assuming the sample size and SD are known, the standard error for this sample can be calculated using the formula below.

$$Standard\ error = sample\ SD / \sqrt{}sample\ size$$

- Quartiles and interquartile range

When it comes to the collection of data values sorted either by ascending or descending order, quartiles will be the three points dividing the set of information into four equal groups, each group containing a quarter of the information. For instance, Q1, Q2, and Q3 denote the values of the first, second, and third quartiles, respectively (Indrayan & Sarmukaddam, 2000)

- Percentile

In the case of each set of data values structured in either ascending or descending order, percentiles are defined as ninety-nine percent that divides the data set into 100 equal groups, each group containing one percentage of the data (Mishra, Pandey, Singh, Gupta, Sahu, & Keshri, 2019). For example, if the first quartile is approximately 25% of the total, the second quartile is 50% of the total, also known as the median value, and the third quartile is 75% of the total, then

For ith percentile = $[i^*(n+1)/100]th$ observation, where i = 1, 2, 3.,99.

- Coefficient of Variation

The interpretation of SD without taking into account the sample or a population's mean magnitude might be deceptive. The coefficient of variation offers a solution to this difficulty. The coefficient of variation expresses the outcome as a fraction of SD to its mean value, which is represented in percentages.

$CV = hundred \times (SD/mean)$.

- Range

This is the difference obtained from subtracting the largest observation from the smallest observation (Mishra, Pandey, Singh, Gupta, Sahu, & Keshri, 2019). For instance, if observation A and observation B denote the lowest and greatest values within a set of data, the range (R) is equal to the difference between them., indicated by, $R = A - B$.

- Normality of data and testing

This remains the most important ongoing probability distribution, with a bell-shaped density curve defined by the mean, standard deviation, and extreme values within a set of information, and no significant effect on the mean value. As a result, if a constant data set follows a normal distribution, sixty-eight percent, ninety-five percent, and hundred percent of observations fall among mean 1 SD, mean 2 SD, and mean 3 SD, respectively (Sundaram, Dwivedi, & Sreenivas, 2014). (Campbell, Machin, & Walters, 2010).

3.3.1.2 Correlation analysis

A covariance matrix is a type of correlation analysis. A correlation analysis is a calculation of covariance on variables that have been previously normalized towards a zero mean and a standard deviation of 1.0. (Carey, 1998). A generic formula for the correlation coefficient among the explanatory variables (X) and a response variable (Y) may be calculated utilizing the following formula:

$$Corr(X,Y) = \frac{cov(X,Y)}{s_\chi s_y} \qquad (3.3)$$

Where s_χ and s_y represents the standard deviation of variables X and Y respectively. Because correlation is a specific sort of covariance matrix, it has two properties: magnitude and sign (-). The relationship's direction is shown by these symbols. A direct relationship is implied by a positive correlation, while an inverse relationship is implied by a negative correlation. Correlations that are close to 0, on the other hand, show the absence of statistical linkages or predictability between the two variables. Stronger statistical linkages and predictability are shown by correlations that differ from zero in either direction (positive or negative). In addition, the correlation coefficient has one distinguishing feature that sets it apart from other types of covariances. The correlation coefficient consists of a mathematical lower and upper bound of -1.0 and 1.0, respectively. These features allow the correlation coefficient to be contrasted, although ordinary covariance cannot be typically compared. For example, if X and Y have a correlation of.77 but X and Z have a correlation of.23, it can be concluded that X is more closely related to Y than to Z. (Carey, 1998). However, if variables A and B have a variance of 204 and A and C have a covariance of 18.2, we cannot draw any conclusions about the degree of the link. The size of covariance is determined by the measuring scale of the variables. That is, if variable C's measurement scale has a lower variance than variable B's, it is assumed that variable A is more strongly related to variable C than variable B. As a result, the correlation coefficient avoids the interpretation issue by putting all variables on the same measuring scale, namely the Z score with a zero mean and 1.0 standard deviation (Carey, 1998).

3.3.2. Dynamic Panel model

In line with Pesaran et al. (1999), the dynamic heterogeneous panel regression can be incorporated into the error-correction model using the autoregressive distributed lag ARDL(p,q) method of analysis, where p denotes the response variable's lag and q denotes the explanatory variables' lag. Below are the estimated equations as suggested by Loayza and Ranciere (2006).

$$\Delta(\gamma_i)_t = \sum_{j=1}^{q-1} \gamma_j^i \Delta(y_i)_{t-j} - + \sum_{j=0}^{q-1} \delta_j^i \Delta(X_i)_{t-j} + \varphi^i \left[(\gamma_i)_{t-1} - \left\{ \beta_0^i + \beta_1^i (X_i)_{t-1} \right\} \right] + \varepsilon_{it} \text{ ………………… (3.4)}$$

Where:

y= dependent variable

X = signal a group of independent variables

γ and δ = coefficients of the lagged dependent and independent factors over a short term, respectively

β = Coefficients in the long run

φ = Coefficients of the speed of adjustment to the long-run equilibrium which is expected to remain negative and significant

i and t = country and time

$$(\gamma_i)_t = \beta_0^i + (X_i)_t + \mu_{i,t} \sim I \text{ ……………………………………………………………….. (3.5)}$$

Considering the assumption that equation (3.5) can be assessed utilizing three dissimilar estimators precisely the mean group, pooled mean group, and the dynamic fixed estimator, it should be noted that all of the above-mentioned measurements contemplate the long-run equilibrium and the presence of heterogeneity of the dynamic adjustment process (Demetriades & Law, 2006). Pesaran (1997) and Pesaran and Shin (1999) also show that the autoregressive distributed lag (ARDL) model in error correction form can be used as a new cointegration test. In this instance, the aim to maintain consistent and efficient estimates of the parameters in a long-run association is more important.

Moreover, Johansen (1995) and Philipps and Bruce (1990), argue that a long-term relationship is present only among variables with the same order of integration. On the other hand, Pesaran and Shin (1999) indicate that panel ARDL can be adopted although it contains factors through different orders of integration regardless of whether they are

I(0) or I(1) or a combination of the two. This is recognized as an important benefit of the ARDL model, as it makes it inessential to test for unit root. Another important factor is that short-term and long-term effects can be estimated simultaneously from a data set comprising of large cross-section and time dimensions. Irrespective of the probable existence of endogeneity, the ARDL model specifically the PMG and MG yield a consistent coefficient mainly because it lags consisting of the regressor and regressand variables (Pesaran et al., 1999). Thus, it is imperative to give a short background about the main attributes of the various estimators involved in the dynamic panel structure to get a better picture of the main attributes relating to three distinctive estimators involved in the dynamic panel structure.

3.3.2.1 Pooled Mean Group (PMG)

The PMG is a model that allows for country-by-country variation in short-run coefficients, such as intercepts, the rate at which long-term equilibrium values adjust, and error variances, but long-run slope coefficients stay consistent across nations. It is therefore considered to be exceptionally beneficial if reasons to anticipate that the long-run equilibrium association among given variables are homogenous across republics or somewhat a subdivision of the variables. Also, due to the vast different influence of vulnerability in the direction of financial crises and external shocks, stabilization policies, monetary policy, and so on, the short term adjustment is not limited to be country-specific.

However, various necessities for the validity, steadiness and efficiency of this methodology do exist. First, the presence of a long-run association between the response and explanatory variables requires the coefficient of the error-correction term to be negative and not lower than two. Second, the speculation of consistency of the ARDL model highlights that the resulting residuals of the error-correction model should not in any way be serially correlated and that the response variables should be managed as exogenous. Thirdly, the relative size of T and N is very imperative in the sense that they require to be large to apply the dynamic panel technique as well as to elude the bias within the average estimators. Correspondingly, Eberhardt and Teal (2011) postulate that the key to grasping the process of growth is through the treatment of heterogeneity. Therefore, failure to carry out these conditions will result in an inconsistent estimation of PMG.

3.3.2.2 Mean Group (MG)

Pesaran and Smith developed the second method, known as the mean group (MG) (1995). The coefficients are calculated by way of unweighted means of the estimated coefficients using this procedure, which entails calculating separate regressions for each country. This approach, unlike the DFE, does not impose any constraints. In the long and short term, the MG agrees that all coefficients can differ and be heterogeneous. Nonetheless, having a sufficiently large time-series dimension of data is a necessary prerequisite meant for the consistency and validity of this approach. That means the cross-country dimension must include at least 30 countries. Last but not least, it is worth noting that the MG estimator is sensitive to outliers and small model permutations for small N (Favara, 2003).

3.3.2.3 Dynamic Fixed Effects

Ultimately, the dynamic fixed effects estimator (DFE) is comparable to the PMG estimator in that it does not allow for equal slope coefficients and error variances across all nations in the long run. In the same manner, the DFE model sets a constraint on the speed of adjustment coefficient and the short-run coefficient to remain equal. However, the model works as a tool for country-specific intercepts. With that being pointed out, Blackburne and Frank (2007) are of the view that the cluster option in DFE can be used for estimating intra-group correlation using the standard error. Nonetheless, Baltagi, Griffin, and Xiong (2000) point out that because of endogeneity between the error term and the lagged dependent variable in the case of small sample size, this model is easily affected by simultaneous-equation prejudice.

3.3.2.4 Choosing between the method of analysis

The Hausman test, developed by Hausman (1978), is used to analyze whether there is a significant difference between these three estimators in order to determine which method of analysis is preferred. The following outcomes will be used to make the final decision: In the event that the null hypothesis cannot be rejected, the PMG estimator is recommended since it is efficient. If the P-value is insignificant at the 5% level, the PMG will be used. Utilization of MG or DFE estimator is appropriate if the PMG contains a significant P-value.

3.3.2.5 Motives for using Panel data

Under Wooldridge (2010), Panel data is characterized by repeated observations on the same cross-section of, say, individuals, households, enterprises, or cities, over time. In micro-oriented research, panel data is also referred to as longitudinal or multilevel. Panel data are commonly applied in macroeconomic research, and essential econometric texts devote entire chapters to panel data analysis (see., Greene, 2018; Verbeek, 2008).

Using panel data has various advantages, according to Hsiao (2003) and Klevmarken (1989). These involve the following:

i. Individual heterogeneity is taken into account.

persons, firms, states, and countries are heterogeneous, according to panel data. Time-series and cross-section studies that do not account for this heterogeneity risk producing skewed results.

ii. Panel data provide more useful information, more variability, less collinearity among variables, more degrees of freedom, and greater efficiency.

Multicollinearity plagues time-series investigations;

iii. Panel data are better suited to studying adjustment dynamics.
iv. Cross-sectional supplies that appear to be reasonably steady conceal a plethora of variables.
v. Panel data are better at detecting and quantifying impacts that are difficult to detect in pure cross-section or pure time-series data.
vi. Panel data models allow us to construct and test more complex behavioural models than pure cross-section or time-series data.
vii. Micro panel data gathered on persons, businesses, and families may be more accurate when measured than macro-level data on equivalent factors. Biases caused by the aggregation of data from different firms or persons can be addressed or avoided.
viii. Macro panel data, on the other hand, have a longer time series and, unlike unit roots tests in time-series analysis, do not suffer from non-standard distributions.

Limitations

i. Design and data collection problems

ii. Distortions of measurement errors - measurement errors may arise because of faulty responses due to unclear questions, memory errors, deliberate distortion of responses (e.g. prestige bias), improper informants, misrecording of responses, and interviewer effects.

iii. Selectivity issues involve the following:

(a) Self-selectivity - as the reservation wage is higher than the offered wage, individuals choose not to work.

higher than the offered wage.

(b) Nonresponse - as a result of an unwillingness to participate, no one at home, an untraced sample unit, and other factors, this can happen during the first wave of the panel.

(c) Attrition - nonresponse happens within cross-section studies as well, but it is a more serious problem with panels because nonresponse occurs in succeeding waves of the panel.

iv. Short time-series dimension - annual data covering a short period for each individual is typical of micro panels. As a result, asymptotic arguments rely on the number of persons approaching infinite.

v. Cross-section dependence - macro panels on nations or regions with long time series that do not account for cross-country dependence can result in erroneous conclusions.

The study will employ the following panel unit root tests in order to successfully acquire consistent results:

3.3.3. Informal Panel data unit root

This strategy is the quickest way to understand what the data is telling us about our analysis. The informal unit root analysis which is referred to as visual inspection can be illustrated through graphical outputs obtained from the tests performed. Different shapes, such as bar graphs and line charts of the normal distribution tests, can also be used to represent it. Although the visual inspection is only a preliminary finding that can be contested by more tests, it can be useful in identifying or forecasting potential outcomes.

As a result, it is noted that researchers can also spot patterns of a fluctuating variable or a continuous trend line of the variables by visual inspection (Gujarati& Porter, 2009).

In to the bargain, an introductory visual inspection of the economic data can be very insightful before examining the panel data properties. According to Gujarati and Porter (2009), a graphical illustration of the series gives us an initial idea of the expected character of the series based on whether or not the model includes a trend, a constant, or both.

3.3.4 Formal panel unit root tests

Following the graphical presentations of the informal panel unit root tests, the second step in the PARDL analysis is the formal unit root analysis. Since the panel unit root tests play a significant role in informing us about the degree of each variable, necessary formal panel unit root tests are conducted before performing the main estimations to check whether the tests are non-stationary. Several tests are conducted to satisfy the PARDL test assumption that each variable must either be I (0) or I (1):

3.3.4.1. Levin, Lin and Chu test (2002) panel unit root

The Levin, Lin and Chu (LLC) test is based on the following equation:

$$\Delta\gamma_{i,t} = P_i \ \gamma_{i,t-1} + \sum_{L=1}^{P_i} \theta_{iL} \Delta\gamma_{i,t-L} + \propto_{mi} \ d_{mt} + \varepsilon_{i,t}$$, for m=1, 2, 3 ……………………………..…. (3.6)

Where d_{mt} symbolises the vector of deterministic variable, P_i is the lag-order that is allowed to vary across cross-sections and is determined by choosing a P-max and then applying a t-statistic of θ_{iL}; ε_{it} is assumed to be independently distributed across i and t, i=1, …., N, t=1,…., T. once appropriately normalised, the normalised bias and pseudo-t-ratio that corresponds to the pooled ordinary least squares valuation of δ in equation (3,6) converge to a standard normal limit distribution as N$\rightarrow\infty$ in a manner that $\sqrt{N}/T \rightarrow 0$.

The null hypothesis can be constructed as follows:

$H_0 : P = 1$, This suggests that all series in the panel level have a unit root

$H_1 : P < 0{,}05$, the alternative hypothesis is of the view that all series in the panel level is stationary.

The LLC test adjusted t-statistic is as follows:

$$t^*_p = \frac{t_p - N\tilde{T}\hat{S}_{N^{\sigma-2}\varepsilon}\hat{\sigma}\left(\hat{P}\right)^{\upsilon^*} MF}{\sigma^* M\tilde{T}} \sim N(0{,}1) \quad (3.7)$$

As T and N turns to infinity, t^*_p approaches a normal distribution. Using a one-tail test, we reject the null hypothesis if the t-statistic is smaller than the critical value (-1,645) or if p<0,05.

The LLC test has its restrictions, which includes its dependence upon the independence assumption across sections. This makes the test unsuitable in the presence of cross-section correlation. Also, the assumption that all cross-section is non-stationary is limiting (Baltagi, 2008).

3.3.4.2. Im, Pesaran and Shin (2003) panel

The Im, Pesaran and Shin (IPS) (2003) takes into account the heterogeneous coefficient of $\gamma_{i,t-1}$ (see equation 3.6) and recommends a substitute to the one for LLC. Individual Augmented-Dickey Fuller (ADF) unit root statistics are averaged in the IPS testing technique. In addition, the IPS give consent for simultaneous stationarity and non-stationary data series, it has proven to work on well-adjusted panels and make use of likelihood tests framework (Ndoricimpa, 2009). The IPS test is also equivalent to the LLC model in that it executes distinct ADFs for each cross-section (that is for each i).

According to Baltagi (2008), the IPS t-bar statistic is defined as the average of the single ADF statistic as demonstrated in equation (3.8) below

$$\bar{t} = \frac{1}{4}\sum_i^N = 1 \ t_{pi} \quad (3.8)$$

Where t_{pi} is an individual t-statistic for testing $H_0 : Pi = 0$. The IPS assumes that t_{pi} are autonomous and identically distributed, and have finite mean and variance. The null hypothesis and alternative hypothesis under the IPS are written as follows:

H_0: Which states that each series in the panel contains a unit root (($P_i = 0 \forall i$)

H_1: States that some (but not all) of the individual series have unit root ($P_i < 0$ for at least one i).

In line with Baltagi (2008) a standardised final test statistic under the IPS is shown as follows,

$$t_{IPS} = w_{t-bar} = \frac{\sqrt{N}\left(\bar{t} - \frac{1}{N}\sum_{i=1}^{N} E\left[\frac{t_{iT} = 0}{P_I}\right]\right)}{\frac{1}{n}\sum_{i=1}^{N} var\left[\frac{t_{iT} = 0}{P_i}\right]} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.9)$$

Where $E\left[\frac{t_{iT}}{P_i} = 0\right]$ and var $\left[\frac{t_{iT}}{p_i} = 0\right]$ are the means and variance, respectively. These IPS means and variances are taken based on the Monte Carlo simulated, or experiments based on different lag orders (P_i), different values of T and the deterministic structure of the ADF test performed per Im, et al., (2003) table. The IPS test assumes that $T \longrightarrow \infty$ followed by the $N \longrightarrow \infty$ chronologically, and$t_{IPS \Rightarrow N(0,1)}$. In a left or lower tail test, the null hypothesis is rejected if the t-statistic is smaller than the critical value (-1.645) or if P<0, 05.

According to Baltagi (2008), the advantage of using the IPS is that it has been proven to generate better small sample properties as well as to be more intuitive in its construction. However, in the event that the null hypothesis is rejected, the IPS test will provide no information on the extent of the standard deviation (σ) or the identities of the specific individuals in the panel whose null hypothesis was rejected. Furthermore, Ndoricimpa (2009) argues that special care should be exercised when interpreting the results because a null hypothesis rejection does not always imply that the unit root null is rejected for all individuals (i), but simply for certain members of the group (which is $N_1 < N$).

3.3.4.3. Fisher-ADF and Fischer-PP tests

The Fischer-ADF and Fischer-PP tests, like the Breitung tests, focus on the shortcomings of the LLC and IPS's. Madala and Wu (1999) and Choi (2001) proposed a non-parametric Fischer-type test based on a combination of the p-values for each cross-sectional unit's t-statistic (Ndoricimpa, 2009). Madala and Wu (1999) presented a Fischer (1932)- based test that integrates data from the unit root and p-value tests (Breitung, 2000). According to Baltagi (2008) and Greene (2012), the proposed Fischer-type test is as follows:

$$P = -2\sum_{i=Z}^{N} \ln pi \qquad \sim \chi^2\, 2N \ldots\ldots \quad (3.10)$$

Where P_i is the p-value for the unit root test performed on the cross-section i. The benefit of using the Madala and Wu (1999) test is that it is an exact test and that it does not rely on the asymptotic for distribution like other tests. In addition to that, the test is very straightforward when provided with the p-values. However, it might be challenging to determine the p-value and a simulation post-testing might be necessary (Baltagi, 2008).

As $T_i \rightarrow \infty$ for finite N, the Madala and Wu (1999) test statistic $(\bar{t}_p) \Rightarrow \chi^2\, 2N$, therefore, the null hypothesis of non-stationary is rejected if $P > P$ the critical value or if $P < 0{,}05$.

The null hypothesis and alternative hypothesis are defined like IPS, as follows:

H_0 : Suggest that each series in the panel encompasses a unit root ($P_i = 0 \forall i$)

H_1 : Suggest that some (but not all) of the individual series have unit root ($P_i < 0$ for at least one i)

Moreover, Choi (2001) establishes that:

$$Z = \frac{1}{\sqrt{N}} \sum_{i=1}^{N} \phi^{-1}(P_i) \qquad \sim N(0,1) \ldots\ldots \quad (3.11)$$

Where ϕ^{-1} is the opposite of the standard normal cumulative function. Both the asymptotic $\chi^2\, 2N$ and the normal $[N(0,1)]$ distribution statistics of the Fischer-ADF and Fischer-PP individual unit root are conveyed in E-views.

Certain characteristics of the Fischer-ADF and Fischer-PP test as noted by Baltagi, (2008) are as follows:

- they assume very restricted possible dependence across individuals (i)
- They can be twisted to work with less stringent cross-correlation assumptions (bootstrap techniques)
- The Fischer-ADF test does not require a balanced panel
- They can accommodate heterogeneity across cross-sections
- While the IPS and LLC are primarily concerned with the ADF test, the Fischer-ADF and PP can handle a variety of unit root tests. Individual cross-sections can also be tested using the Phillips Perron (PP) tests (Phillips and Perron, 1988).

3.3.5 Lag Order Selection Criteria

The appropriate lag length, also known as the lag order or lag length for the pair of Y_t and χ_t must be specified before conducting the cointegration test to establish the presence of cointegration or before fitting a vector error correction model. According to Hacker and Hatemi-J (2008), the choice of the lag length requires careful consideration because inferences drawn from a multivariate model rely on its accuracy. The Akaike's information criterion (AIC) (Akaike 1973), the Hannan and Quinn information criterion (HQIC) (Hannan and Quinn 1979), and the Final Prediction Error criterion (FPE) are the three criteria used to determine the appropriate lag length (Ljung 1999). These lag lengths selection methods can be applied if variables are differenced of order one (Nielsen, 2006). The ideal model is chosen based on one of the criteria as the one that consistently lowers the following score:

$$FPE = \det\left(\frac{1}{N}\sum_{1}^{N} e\left(t,\hat{\theta}_N\right)\left(e\left(t,\hat{\theta}_N\right)\right)T\right)\left(\frac{1+\frac{k}{N}}{1-\frac{k}{N}}\right) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (3.12)$$

$$AIC = -2.L_m + 2.\kappa \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (3.13)$$

$$HQIC = -2.L_m + 2.\kappa.In\left(In(N)\right) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (3.14)$$

Where:

$N =$ represents the size of the sample

$e(t)$= signal the $nx1$ vector or prediction errors

$\hat{\theta}_N$= shows the estimated parameters

κ= displays how many estimated parameters are there in the model

L_m= indicates the maximum log-likelihood of the model

Because the number of lags is recommended by a greater number of the Information Criteria, the best lag length is decided based on the results of the three scores.

3.3.6 Panel data co-integration test

In general, panel co-integration models are employed to investigate long-run macroeconomic linkages (Baltagi, 2008). According to Ndoricimpa (2008), co-integration is defined as the existence of a long-term relationship between economic variables. As a result, if variables are co-integrated, it means they move together overtime to ensure that short-term turbulences are addressed in the long term. Economic theories that suggest equilibrium linkages between time series variables are frequently associated with co-integration.

Furthermore, when testing for co-integration, issues such as heterogeneity in the parameters of the cointegrating relationships, heterogeneity in the number of cointegrating relationships across countries, and the possibility of co-integration between series from different countries are all factors to consider, according to Verbeek (2004). As a result, the study will use the following tests to tests for co-integration in the variables:

3.3.6.1. Pedroni panel co-integration test

Pedroni (1991) proposed a group of seven tests for the null hypothesis of cointegration in a panel data model with significant heterogeneity. The Pedroni test can be classified into two groups: The residual-based LM test, which involves calculating an average of the test statistic for co-integration in time series within cross-sections, is the first group. Panel-v, panel-rho(r), panel non-parametric (PP), and panel parametric (ADF) statistics belong to this category, which is sometimes known as within dimensions. These tests are similar to the ADF-test for individual equations.

"Between Dimensions" is the name given to the second group. The statistics group-rho, group-PP, and group-ADF are all found in this group. The test statistic entails piecewise averaging, with limiting distributions based on piecewise numerator and denominator term limitations (Baltagi, 2008), and is equivalent to the IPS (2003) group mean panel unit root tests. Overall, the Pedroni (2004) test is a panel extension of Engle Granger's (1987) two-step method of testing for co-integration, and it is based on the ADF and PP principles as follows:

H_0: No co-integration ($H_0 : P_i = 1, \forall i$)

H_1: Co-integration ($H_1 : P_i < 1, \forall i$)

The null hypothesis is whether P_i is unity ($P_i = 1$), and each of the seven test statistics is normally distributed. The test statistics can be compared to the standardised normal distribution table's relevant critical values (Gutjarati, 2004). The null hypothesis of no co-integration is rejected if the t-statistic is greater than the critical values (or p-value is smaller than α). This shows that the two variables have a long-term association. The panel-vi, however, is an outlier among the seven tests in that it rejects the null of co-integration when it has a big positive value (the others reject the null of no co-integration when the calculated test statistic is large and negative). According to Pedroni (2004), smaller samples cause the rho and PP tests to under-reject the null hypothesis of no co-integration.

Furthermore, the Pedroni (1999, 2004) tests state that enough of the individual cross-sections exhibit statistics far away from the means projected by the theory where they are to be created by null when the null hypothesis is rejected (Baltagi, 2008). Panel-v statistics diverge to positive infinity under the alternative hypothesis. As a result, the panel-v is a one-sided test that rejects the null hypothesis of no co-integration with large positive values.

3.3.6.2. Residual-based DF and ADF tests (Kao, 1999)

Kao (1999) developed a residual-based panel co-integration test that assumes a common co-integrating vector and is based on a homogeneous panel. The test contains the ADF residual error correction coefficient (p) and t-statistics, as well as the Dickey-Fuller (DF) test (Dickey & Fuller, 1979; 1981). Smith (2008), Baltagi (2008), and Greene (2008) provide in-depth analyses (2012).

The residuals are non-stationary in the null hypothesis, implying that there is no co-integration. The residuals are stationary in the alternative hypothesis, which means there is no co-integrating relationship between the variables, and they are reported as follows.

H_0 : Suggest No co-integration ($P = 1$)

H_1 : Suggest co-integration

3.3.6.3. Johansen and Fischer panel co-integration tests

A Johansen-type panel co-integration test was invented by Madala and Wu (1999). The Johansen-Fischer test is named after Madala and Wu (1999), who used the Fischer (1932) finding. To get a test statistic for the entire panel, the testing method combines tests from individual cross-sections. The p-values for Johansen's co-integration trace test and the maximum eigenvalue test are used in Madala and Wu's (1999) tests (Baltagi, 2008). The null hypothesis of no co-integration, at most one co-integration relationship, at most two co-integration relationships, and so on is estimated by these tests.

3.3.8 Hausman Specification Model

To suggest which model best fit the data, the study considers applying the panel regression model that takes into account the individual effects. Two methods are considered: the Fixed Effect model and the Random Effect model. These two methods of testing will be helpful when accounting for individual heterogeneity. Based on Bevan & Danbolt (2004), the heterogeneity of countries under consideration for analysis has an impact on the measurements of the estimated parameters. Serrasqueiro & Nunes (2008) further point out that LDCs differ in terms of colonial history, political regimes, ideologies, and religious affiliations, geographical locations and climatic conditions, and a wide range of other country-specific elements. However, regardless of sample size, ignoring heterogeneity will almost likely result in skewed results (Tiwari & Mutascu, 2010). The panel regression model is estimated below:

$$GDP_{i,t} = \beta 1 InFDI_{i,t-1} + \beta 2 M2G_{i,t-1} + \beta 3 DCBS_{i,t-1} + \beta 4 DCPS_{i,t} + \beta 5 ECI_{i,t} + \eta i + \varepsilon_{i,t} \quad (3.15)$$

symbol ηi and $\varepsilon_{i,t}$ represent the decomposition of the disturbance term in the Fixed Effects model. Again ηi stands for unobservable individual country time-invariant specific effect and $\varepsilon_{i,t}$ stands for the remaining disturbance term, which varies with individual countries and time. As a result, when using the Random Effects model, equation (3.15) remains unchanged. Symbol ηi on the other hand is considered to have the property of having a zero mean, being independent of the individual observation error term $\varepsilon_{i,t}$, having constant variances $\sigma\varepsilon 2$, and being independent of the independent variables. The Hausman specification test is used to determine which of the two models should be used.

According to the Hausman Specification test, a correlation may exist between a countries' unobserved individual effects and determinants of growth (Tiwari & Mutascu 2011). In the absence of a correlation between unobservable individual effects and growth determinants, a panel model of random effects is the most appropriate technique to conduct the research. In contrast, if there is a link between individual country effects and growth factors, a panel model with fixed effects is the most effective technique to conduct the research. As a result, the study employs the Hausman specification test to determine the significance of the fixed effects and random effects methods of panel data analysis, which aids in determining which model best fits the data. The test aids in comparing fixed and random effects model parameters, as well as drawing conclusions about the relationship between errors and regressors.

$H0$: The Random Effects model is a good fit

$H1$: Fixed Effects model is a good fit, or H_0 is not true

The test relies on two coefficients, one from the fixed effects model and the other from the random effects specification. Under the H0 hypothesis, the fixed effects coefficient is consistent, inefficient, and inconsistent under H1, but the random effect estimator is consistent, efficient and inconsistent under H1.

3.3.9 Panel Autoregressive Distributed Lag Model (ARDL)

The PARDL technique is used in this study to look into the model's long and short run dynamics. It will also assist in determining the short run dynamics using the Error Correction Model (ECM) version of the panel characteristics. Alternative co-integration methods such as Johansen and Juselius (Johansen, 1998) and traditional Johansen (Johansen, 1990) can produce similar results; nevertheless, the panel ARDL method was chosen because of the added benefits it provides. According to Sulaiman and Osman (2015) and Sheng (2016), one of the benefits of the ARDL approach is that both the short run and long run parameters of the specified model are evaluated simultaneously. Regardless matter whether the underlying variables are I(0), I(1), or both, the method works. Third, unit root pre-testing is not required with the PARDL technique. Fourth, PARDL allows for varied optimal lags for the variables. Finally, the PARDL approach estimates the long run association within a context of system equations, whereas the other cointegration processes estimate the long run association within a context of system equations using a single reduced form of an equation (Bildirici & Ersin, 2015 and Narayan, 2005).

Therefore, to investigate the long-term and short-term cointegrating associations between all the variables and focus on the error correction model of the panel qualities to identify the short-term dynamics, the main model of the panel ARDL approach can be written as follows:

$$\Delta Y_{1;it} = \alpha_{1i} + \gamma_{1i} Y_{1;it-1} + \sum_{I=1}^{p} \gamma_{1i} \chi_{1;it-1} \sum_{I=1Iij}^{p-1} \Delta Y_{1;it-j} \sum_{I=1}^{p-1} \sum_{I=2}^{k} \delta_{1ij} \Delta X_{1;it-j} + \varepsilon_{1;it} \ldots\ldots\ldots\ldots\ldots\ldots \text{(3.16)}$$

Where Y_1 represents the dependent variable, and X_1 designate the exogenous variable, similar to I=1,2,3,4,5,6,7. The random disturbance term is shown by the symbol ε_{it}, whereas the first difference operator is shown by the symbol Δ. Therefore, GDP is the dependent variable in this study.

By reparameterising Equation (3.16)

$$\Delta InGDP_{1;it} = \alpha_{1i} + \gamma_{1i} InGDP_{1;it-1} + \gamma_{2i} InFDI_{1;it-1} + \gamma_{3i} InM2G_{1;it-1} + \gamma_{4i} InDCBS_{1;it-1} + \gamma_{5i} InDCPS_{1;it-1} + \gamma_{6i} InECI_{1;it-1}$$

$$+ \sum_{I=1}^{p-1} \delta_{1ij} \Delta InGDP_{1;it-j} + \sum_{I=0}^{k} \delta_{2ij} \Delta InFDI_{1;it-j} + \sum_{I=0}^{k} \delta_{3ij} \Delta InM2G1_{1;it-j} + \sum_{I=0}^{k} \delta_{4ij} \Delta InDCBS_{1;it-j}$$

$$+\sum_{I=0}^{k}\delta_{5ij}\Delta InDCPS_{1;it-j}+\sum_{I=0}^{k}\delta_{6ij}InECI_{1;it-j}\varepsilon_{1;it} \quad (3.17)$$

Based on equation 3.13, the panel ARDL method can be used with the concentrated factors paying less attention to whether they are classified as I (0), I (1) or both (Sulaiman, Bala, Tijani Waziri, & Maji, 2015). Equation 3.17 however shows that the Panel ARDL with different variables can incorporate different lags which are not applicable in utilizing the standard cointegration test. This is in line with Sheng and Guo (2016), who argues that utilizing panel ARDL can result in double co-efficient both in the long and short run.

Therefore, the study uses the Pooled Mean Group (PMG) ARDL method to explore the long run association between FDI, FSD, ECI and economic growth in SADC. According to Peseran et al., (1999), the PMG estimation is applicable for examining the panel dynamics. To determine the long run correlation between variables, the PMG approach adopts the heterogeneous dynamic adjustment technique. In addition, the PMG method overlooks the assumption of common limitations across the countries, which is seen as a significant assumption in both fixed and random effects methods. The PMG method is usually preferred over the GMM in instances where the period of the cross-section is longer, and the size is small. Furthermore, the PMG method accommodates variables that are stationary at level I(0) as well as variables that are stationary when differenced the first time I(1). However, that is not the case with large time-series data (Gujarati & Sangeetha, 2007; Sharma et al., 2018; Peseran et al., 1999).

Overall, the PMG is an estimating technique that takes into consideration pooling and averaging. Irrespective of the short run and long run effects that are accounted through the variables of a model, the PMG additionally examines the dynamic effects of the independent variables on the dependent variables. The general model of the PMG can be expressed as follows,

$$Y_{\mathrm{it}} = \sum \quad (3.18)$$

3.3.10 ARDL error correction model (ECM)

The study aims to create the ECM to assess the speed of adjustment and how the variables in the model assemble towards equilibrium in the long run, in addition to identifying aspects of short run dynamics. As a result, the following is how the ARDL error correcting model is created:

$$\Delta Y_{1:it} = \alpha_{1i} + \sum_{j=1}^{p-1} \beta_{1ij} \Delta Y_{1;it-j} + \sum_{J=1}^{p-1} \sum_{1=2}^{K} \beta_{1ij} \Delta X_{1;it-j} + \mu_{1i} ECT_{1;it-1} + \varepsilon_{1it} \quad \text{……………………. (3.19)}$$

Where residuals ε_{1it} (1=1,2,3,4,5,6,7) are independently and normally distributed with a zero mean constant variance, and ECM, and $_{t-1}$= (1,2,3,4,5,6,7) is the error correction term (ECT) usually defined by the long-term relationship. The parameter μ_{1i} indicates the speed of adjustment to the equilibrium level. Since GDP is the dependent variable, the ECM model of the study can be estimated as follows:

$$\Delta InGDP_{1;it} = \alpha_{1i} + \sum_{j=1}^{p-1} \beta_{1ij} \Delta InGDP_{1;it-j} + \sum_{j=0}^{p-1} \beta_{2j} \Delta InFDI_{1;it-j} + \sum_{j=0}^{p-1} \beta_{3ij} \Delta InM2G_{1;it-j} + \sum_{j=0}^{p-1} \beta_{4ij} \Delta InDCBS_{1;it-j}$$

$$+ \sum_{j=0}^{p-1} \beta_{5ij} \Delta InDCPS_{1;it-j} + \sum_{j=0}^{p-1} \beta_{6ij} \Delta InECI_{1;it-j} + \mu_{1i} ECT_{1;it-1} + \varepsilon_{1it} \quad \text{………………………. (3.20)}$$

Where Δ reflect the 1st difference of variables operator; α_{1i} is the fixed country effects; and $\Delta InGDP_{1;it}$ is the lagged dynamic variables.

Asteriou (2007) is of the view that ECM is fundamental and well known for many reasons:

- Firstly, it is seen as a suitable tool for estimating the convergence of disequilibrium for the previous period which seems to have a very good economic implication.
- Secondly, in the presence of cointegration, ECM models can be expressed in terms of 1st difference which characteristically disregard trends from involved variables and tend to resolve the issue of spurious regressions.
- The third feature of applying the ECM model is the ease with which they can fit into the general-to-specific (also known as the Hendry) approach to econometric modelling which is regarded as an exploration for identifying the best ECM that fits the proposed set of data.
- Finally, and most importantly, the benefit of employing the ECM is derived from the fact that the disequilibrium of the error term automatically becomes a stationary variable.

3.3.11 Panel Causality Test

After constructing the panel ECM model to examine the linkage between FDI, broad money growth, domestic credit to banking sector, domestic credit to private sector, and economic complexity index to estimate the model of this study, the second step is to now perform the granger causality tests to detect if causality exists between the predictor and response variables (Bildirici & Bohur, 2014). The Engle and Granger (1987) two-step procedure is very crucial for determining the direction of causality and can further be estimated as follows,

$$Y_{i,t} = \alpha_i + \sum_{\kappa=1}^{K} \delta_{ik} Y_{i,t-k} + \sum_{\kappa=1}^{K} \pi_{ik} D_{i,t-k} + \varepsilon_{i,t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.21)$$

$$D_{i,t} = \alpha_i + \sum_{\kappa=1}^{K} \delta_{ik} D_{i,t-k} + \sum_{k=1}^{K} \pi_{ik} Y_{i,t-k} + \varepsilon_{i,t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.22)$$

With i =1 and N and $\mathrm{t} = 1, \ldots, \mathrm{T}$

Where $D_{i,t}$ and $\mathrm{Y}_{i,t}$ showcase the observations of the independent variables and dependent variable for county i in period t. Equation (3.21) indicates the tests for significant effects of *D* accounted for the present values of *Y* while equation (3.22) shows the effect of *Y* on the present values of *D* in that order. With that being highlighted, the null hypothesis is specified as follows,

$$\mathrm{H}_0: \pi_{i1} = \cdots = \pi_{iK} = 0 \forall i = 1, \ldots, \mathrm{N}$$

Which emphasize the notion that there is no evidence of causality for all the countries in the panel. Further, it is presumed that the presence of causality for all countries in the panel may exist although it is unclear that such causality do exists across all countries. Thus, the alternative hypothesis is estimated as follows,

$$\mathrm{H}_1: \pi_{i1} \neq 0 \; or \ldots \pi_{iK} \neq 0 \forall i = \mathrm{N}_1 + 1, \ldots, \mathrm{N}$$

If $\mathrm{N}_1 = 0$ it means causality for all individuals in the panel does exist. Whereas, if N_1 is not strictly smaller than N it means there is no causality for all countries and H_1 decreases to H_0.

3.3.12 Diagnostic Tests

The diagnostic tests are used to determine how valid and dependable the ECM is for the planned investigation. Diagnostic tests, according to Yihua (2010), help to check the nature of the data and to identify the model that will be used in the study to ensure that the regression findings are impartial, consistent, and efficient. Before moving on to model estimate, this study performs the necessary diagnostic tests. The diagnostic tests are intended to verify the assumptions behind the OLS panel regression model. The diagnostic tests that are important to this research are those that look for violations of panel error assumptions related to normality, heteroskedasticity, and serial correlation.

3.3.12.1 The Normality test

To establish whether the residuals are distributed normally, the study performs a normality test. The null hypothesis of the normality test is constructed as follows:

H_0: Suggests that residuals are normally distributed

The Jaque-Bera (JB) test is the most widely utilized. The JB makes use of the fact of a normally distributed random variable that the first two moments, namely the mean and variance, categorize the entire distribution. The null hypothesis of normality would not be accepted if the residuals obtained were significantly skewed (Majavu, 2015).

3.3.12.2 The Lagrange Multiplier (LM) test

The Lagrange Multiplier test is used in this study to confirm the existence of serial correlation in the model. The serial correlation Breusch-Godfrey is chosen. If the R-squared p-value is significant, it means the study fails to reject the null hypothesis and that the model shows no signs of correlation. If the p-value is insignificant, however, we cannot accept the null hypothesis and conclude that serial correlation exists in the model.

3.3.12.3 Heteroscedasticity Test

To check whether the residuals are homoscedastic, a heteroscedasticity test is employed. Greene (2008) defines Heteroskedasticity as a regression disturbance whose variances are not constant across observations. Heteroskedasticity comes in different forms. For instance, it may arise in either cross-section or time-series data. Thereby, leading to estimation outcomes being inefficient (Baltagi, 2005). For this study, the Breusch- Pagan test for heteroskedasticity is applied. Hence, the null hypothesis of homoscedasticity is written as follows,

H_0 :Suggest that the variance of the residuals is constant

3.3.13 Stability tests

To validate the stability of the model, the AR root stability test is performed. The AR roots graph illustrates the inverse roots of the characteristics AR polynomial. If all roots consist of a modulus that is smaller than one and lies inside the unit circle, it implies that the estimated VAR is stationary and stable. The modulus must lie inside the unit circle because if the AR inverse roots are not stable, it may mean that certain results such as the impulse response are not valid.

3.3.14 Generalised Impulse Response Function

The relationship between the several variables is investigated after the Granger causality test, taking into consideration the impulse response function and variance decomposition. The impulse response function (IRF), according to Stock and Watson (2001), is primarily responsible for drawing out the influence of a single variable of one standard deviation shock on the other variables in the system. In essence, The impulse response function shows how responsive the dependent variables are to shocks in the other variables (Peseran and Shin, 1998). It specifies how an expected change in one variable influences the other variable. It is also a vital econometric technique when analysing how a system responds to transients. Furthermore, Stock and Watson (2001) claimed that the IRF is a tool that identifies whether a causal relationship discovered by the granger causality test is positive or negative, as well as providing a clear indicator of the relationship's size. Several authors have suggested that generalized impulse response analysis gives superior findings with the VAR framework than with other standard methodologies (Engle and Granger, 1987; Ibrahim, 2005). Therefore, The generalized impulse response function (GIRF) procedures developed by Koop, Pesaran, and Potter (1996), as well as Pesaran and Shin (1998), will be used in this work.

The GIRFs as suggested by Pesaran and Shin (1998) is as pursues:

$$\varphi_{ji}^{g}(n) = e_j^I \sigma_{ii}^{-1/2} A_n \sum_e e_i, \qquad n = 0,1,2,\ldots \quad (3.23)$$

Where σ_{ii} represent the $iith$ element of $\sum_e$

Dissimilar to the standard impulse response method, the generalized impulse response analysis holds important advantages and disadvantages one needs to consider:

The first benefit is that the generalized impulse response method does not necessitate shock orthogonalization. This means that the outcomes of impulse responses are invariant to the order of the variables in the VAR, making this analysis unique and robust (Serwa, D; and Wdowinski, P, 2017). The second is that the GIRFs are very convenient in the case of large systems where structural associations are difficult to identify. Implying that they cannot be interpreted as structural impulse responses, but they demonstrate an accurate picture of the historic development of the variable.

Despite the positive points made regarding the GIRFs, this approach also has its disadvantages. The first issue with impulse response functions that are incorporated using the Cholesky decomposition is that their values may heavily rely on the order of equations. Another problem identified with the GIRF is that it treats all the responses that are larger and more frequently statistically significant than ordinary IRFs. Therefore, adopting GIFRs may lead to inferences that are misleading because of the extreme identification schemes (Kim, 2013).

3.3.15 Variance decomposition

The variance decomposition test is used to determine how much a shock contributes towards the forecast error variance of the dependent variable for each of the independent variables. The variance decomposition, like the impulse response, is highly advantageous in determining how shocks to economic variables resonate across certain systems (Den Haan, 2011).

3.4 Chapter Summary

This section outlined the research methodology executed in this study through the model specification, analysis of variables and estimation techniques involved in examining the linkages between FDI, FSD, economic complexity and economic growth from a SADC perspective. A panel co-integration is carefully chosen and discussed as an econometric tool to examine the long run relationship between the four variables. Taking into account the presence of co-integration, a panel ARDL test is utilized to estimate and analyse the short run relationship. Also, the granger causality test will be employed to identify the causal relationships among the four variables. The model will also be taken through, a series of diagnostic and stability tests to determine its validity and robustness. Finally, the impulse response function and variance decomposition analysis will be used to check reliability, stability as well as response to shocks. In short, this section gives a basis for the actual estimations of the study, which will be discussed in the next chapter.

CHAPTER 4

Estimations, Presentation and discussion of findings

4.1 Introduction

The aforementioned chapter thoroughly explained the different methods and econometric tools adopted to further evaluate the overall research model by carefully identifying the nature and different sources of information. This section, on the other hand, will focus more on the presentation, discussion, analysis and interpretation of results. Firstly, pre-estimation diagnostics are performed to get a further understanding of the type and characteristics of the data being utilised before the examination of secondary data. This chapter also presents the analyses of the outcomes as revealed from the LLC, IPS, and Fischer ADF-PP panel unit root tests. Secondly, the chapter presents the VAR and co-integration findings from the Pedroni, Johansen, and Kao co-integration tests, executed based on the estimated VAR to depict a continuing link between the variables chosen for this study. Outcomes obtained from analysing the diagnostic tests carried out in this research are also presented, specifically to confirm the normality and validate whether the model used in this study is stable. Ultimately, this chapter presents and discuss the dynamics of Panel ARDL which arise from examining the long existence and short existence association, as well the outcomes concerning the impulse response analysis and projected results arising from the variance decomposition

4.2 Empirical findings

This subsection presents the empirical findings of all the econometric techniques performed in the study. The empirical examination was executed using the EViews statistical software. The preferred software package was selected for the pre-estimation diagnostics as Rykov, Balakrishnan, and Nikulin (2010) are of the notion that the software is not difficult to use and it is suitable for use without requiring some form of program design to be implemented. The empirical findings are presented as follows,

4.2.1 Pre-Diagnostic Tests

This subsection focuses more on the descriptive statistics and correlation analysis as the different kinds of pre-estimation diagnostics which are performed for the present study.

4.1.1 Descriptive Statistics

To determine the variability and distribution of the variables, it was essential to study the descriptive statistics before investigating the data series as displayed in table 4.1

Table 4.1: Summary Statistics of selected variables

	GDP	FDI	M2G	DCBS	DCPS	ECI
Mean	2.1664	5.9651	25.5053	26.7035	42.0676	0.9079
Median	1.8336	3.1499	19.6189	16.9728	18.1702	0.8813
Maximum	18.066	41.8096	303.7355	84.0523	160.1248	2.7913
Minimum	-18.491	0.0561	-58.1724	1.9665	2.0136	0.0166
Std. Dev	5.3677	8.2558	49.5082	23.6442	51.5781	0.6438
Sum	194.9770	536.8599	2295.481	2403.315	3786.085	81.7149
Sum Sq. Dev	2564.317	6066.101	218144.2	49755.19	236767.2	36.8859
Observations	90	90	90	90	90	90

Source: Author's compilation

Table 4.1 above displays the descriptive information of control variables incorporated within the empirical sample in relation to the mean, median, maximum, minimum, and standard deviation. According to the findings, economic growth as represented by GDP is the most valuable variable with a high value of 18.0659 and a low value of -18.4911, alongside a standard deviation of 5.3677 and a mean with a given utility of 2.1664. In essence, FDI has the highest value 41.8096 and a lower value of 0.0561 alongside a standard deviation of 8.2558 and a mean with a value of 5.965110. Likewise, the broad money growth (M2G) contains the highest value of 303.7355 and a lower value of -58.1724 alongside a standard deviation of 49.5082 and a mean with a value of 25.50534. Further, DCBS shows a maximum value of 84.0523 and a lower value of 1.9665 including a standard deviation of 23.6442 and a mean with a value of 26.7035. Whereas, the DCPS has the highest value of 160.1248 and a minimum value of 2.0136 alongside a standard deviation of 51.5782 and a mean with the value of 42.0676. Ultimately, the ECI has a maximum value of 2.7914 and a low value of 0.0166 alongside a standard deviation of 0.643777 and a mean with a value of 0.907943.

4.1.2 Correlation Analysis

Succeeding to outline the descriptive information of the mean, standard deviation, minimum and maximisation of data, this research demonstrated the outlook and the character of the connection between the key explanatory variables by adopting the correlation analysis, where findings are portrayed in table 4.2. Table 4.2 below exhibits that GDP has a favourable correlation with domestic credit within the banking sector, and domestic credit within the private sector which is in line with the apriori expectation. Both variables have a relatively strong connection with GDP. However, FDI, broad money growth and economic complexity index have a weak and negative correlation as shown by the unpredicted signs.

Outcomes in Table 4.2, reveal a favourable correlation between (1) FDI and broad money growth, and (2) FDI and economic complexity index. An unfavourable correlation was observed between FDI and the finance sector. Again, findings support a beneficial correlation between broad money growth and the economic complexity index. Alternatively, domestic credit within the banking segment and domestic credit within the private sector is negatively related to broad money growth. A strong positive correlation is discovered between domestic credit within the banking division and domestic credit within the private sector. Finally, economic complexity is negatively correlated with both domestic credit within the banking sector and domestic credit within the private sector.

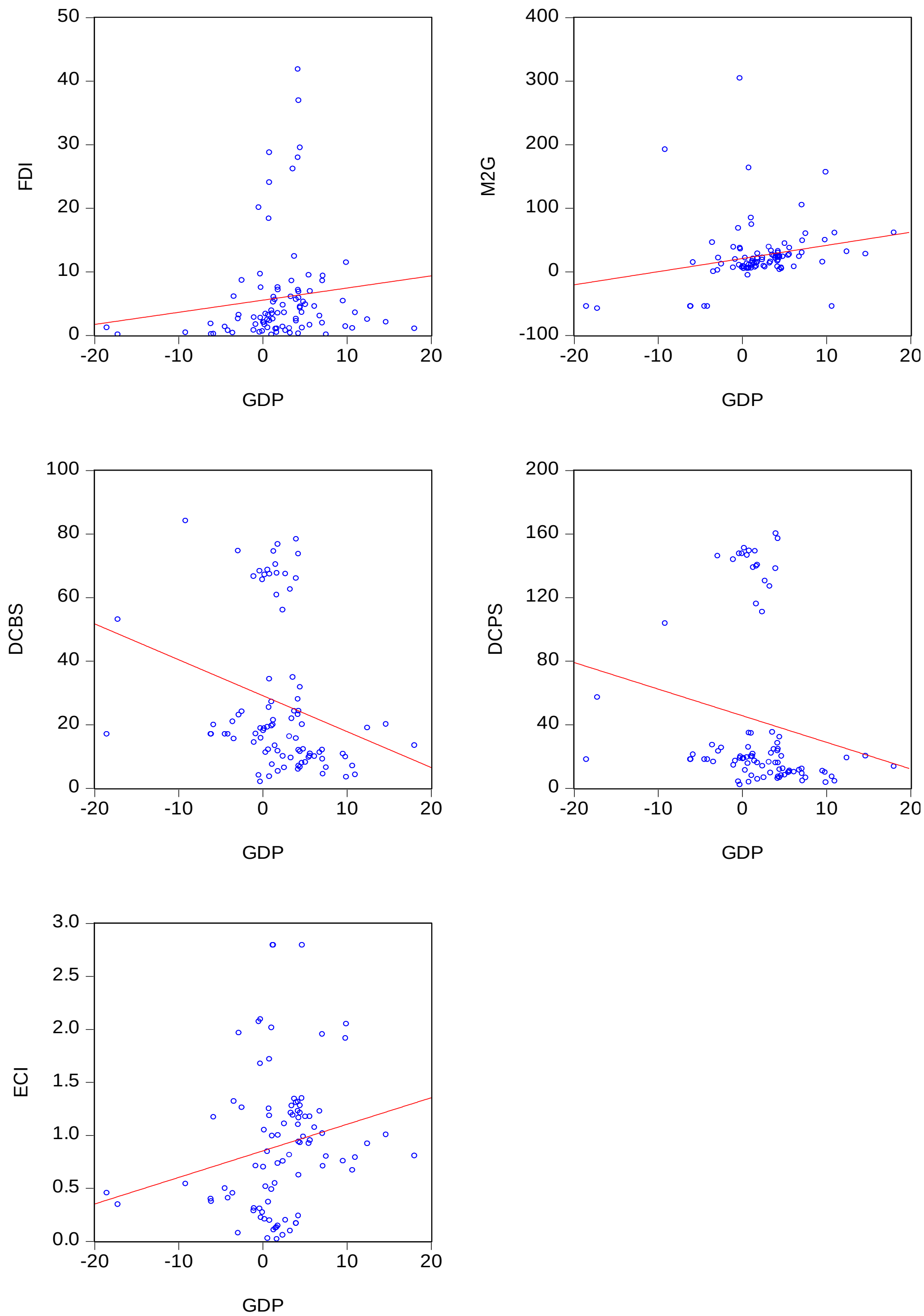
Table 4.2: Correlation Matrix of selected variables

	GDP	FDI	M2G	DCBS	DCPS	ECI
GDP	1.0000					
FDI	0.1242	1.0000				
M2G	0.2242	0.1586	1.0000			
DCBS	-0.2564	-0.1716	-0.1318	1.0000		
DCPS	-0.1742	-0.2357	-0.1277	0.9708	1.0000	
ECI	0.208972	0.3019	0.2964	-0.5559	-0.5937	1.0000

Source: Author’s compilation

Furthermore, to grasp the concept relating to the association amongst independent and dependent variables, an alternative method suggested is to plot the independepent variables against the annual GDP per capita. The resulted are shown on figure 4.1 below.

Figure:4.1 Scatter Plot Graph for FDI,M2G,DCBS,DCPS, ECI and Economic growth in SADC, 2000-2017



Source: Author’s compilation

Based on the outcomes shown below, it is observable that there is a significant weak connection between FDI and GDP in the SADC region. Similarly, the results for broad money growth and GDP does not suggest an apparent strong relationship between the two variables. As expected, there is a weak negative link between DCBS and GDP, as well as a weak negative connection between DCPS and GDP shown by the downward sloping. Finally, what emerges from the findings exits as the weak advantageous relationship between ECI and the expansion of an economy. Thus, the correlation analysis illustrated in Figure (4.1) and Table (3.4) indicates a low level of association among the variables, and, therefore, diminish the possibility of collinearity between regressors.

4.2.2 Panel unit root test results

This subsection presents the outcomes in terms of informal and formal unit root tests results. Before conducting VAR estimations and finding causality between independent and dependant variables of the model, it is of vital importance to run unit root tests to verify whether the panel data series had a stationarity trend and if not, to develop orders of integration. This is recommended to eliminate the possibility of spurious regressions and erroneous inferences. Accordingly, the visual inspection in the form of graphical analysis and the formal stationary tests established by Levin, Lin & Chu, Im, Pesaran & Shin, and the Fischer ADF-PP were executed. Both methods of analysis are essential as they give the direction of whether variables will have to be differenced once or twice. In simple terms, this step indicates if variables contain unit root or does not have any. The unit root tests on panel are therefore presented below including the informal and formal unit root tests.

4.2.2.1 Informal panel unit root test results performed using panel

Informal panel Unit root in level and differenced form

Figure 4.2 Graphical representation of FDI at level and differenced form, 2000-2017

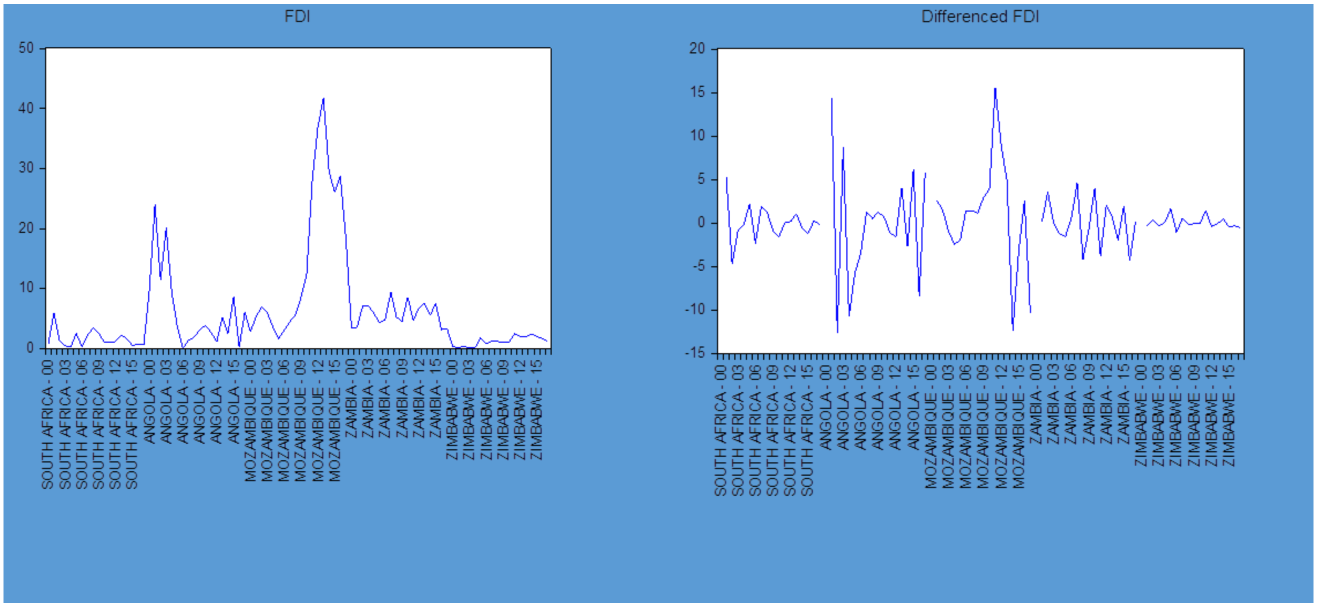
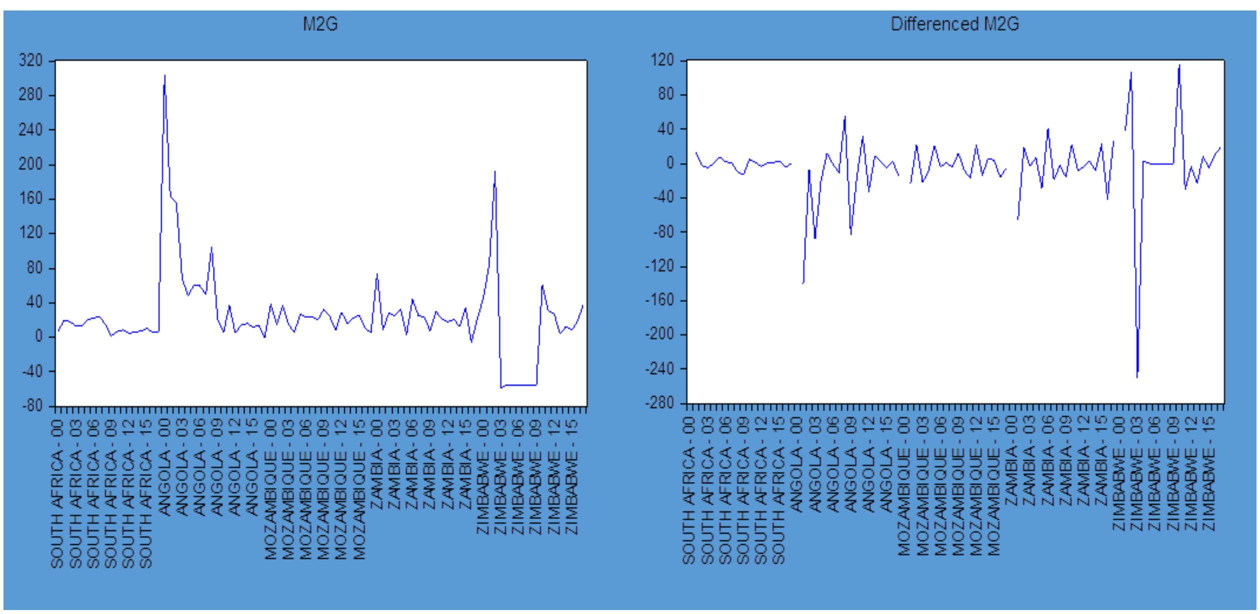


Figure 4.2 Selected SADC Log of FDI (2000-2017)

Source: Author's compilation

Figure 4.2 shows the graphical analysis of FDI at level form and FDI (DFDI) at first difference. In the first panel, there is a slight pattern of an upward trend whereas in the second panel differenced FDI line is suggesting stationarity because in most of the sample periods FDI seems to be oscillating around the mean of zero

Figure 4.3 Graphical representation of M2G at level and differenced forms, 2000-2017

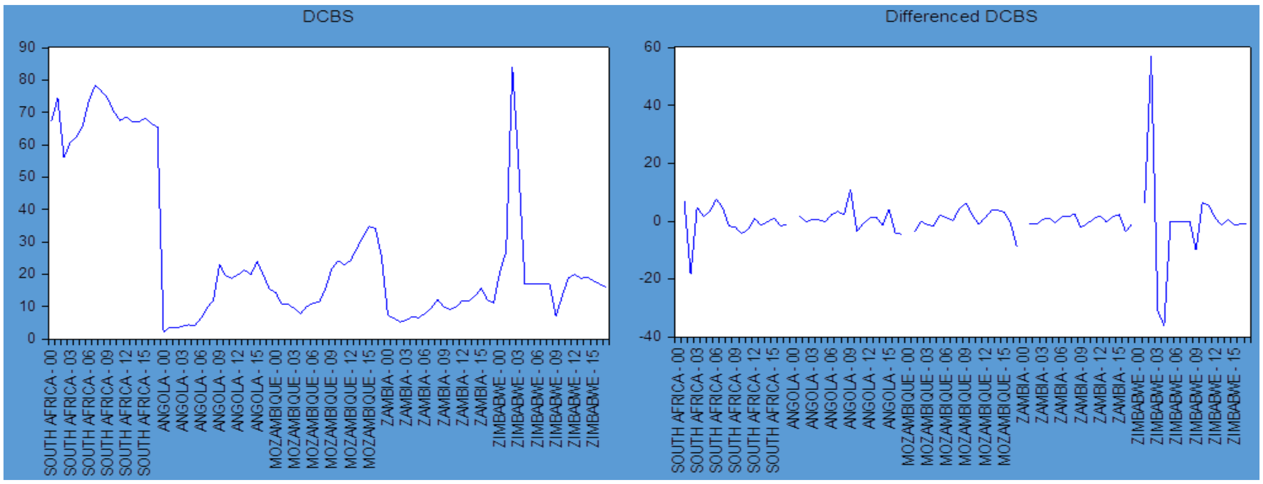


Selected SADC Log of Broad Money (2000-2017)

Source: Author's compilation

Figure 4.3 displays the graphical analysis of broad money (M2G) at level form and broad money (DM2G) at 1st differenced. In panel (a), most of the sample periods of M2G seem to be oscillating around the mean of zero. This suggests that M2G might be stationary at level.

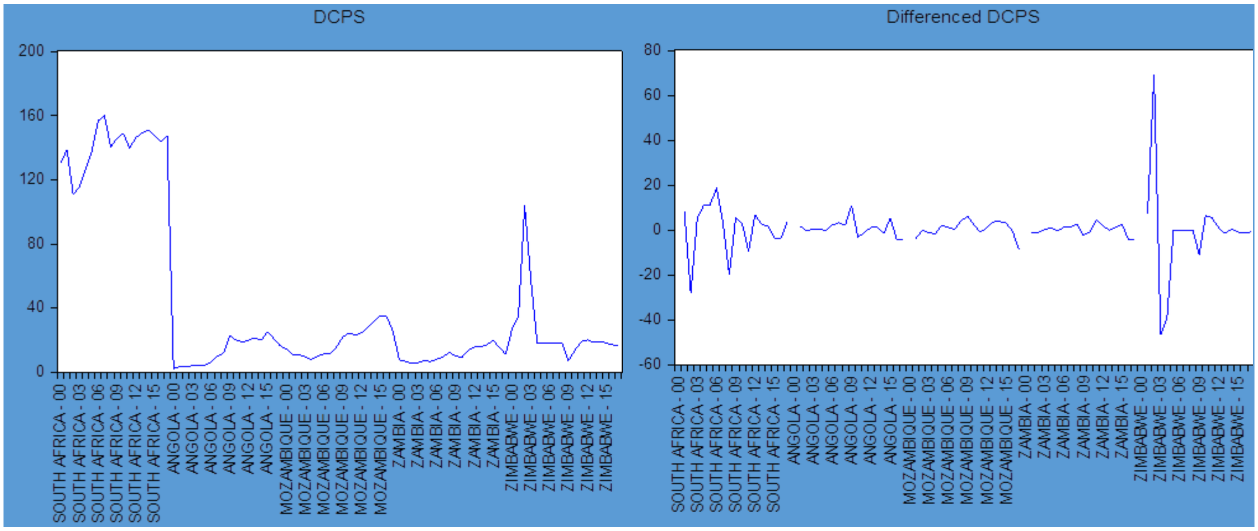
Figure 4.4 Graphical representation of DCBS at level and differenced form, 2000-2017



Selected SADC Log of Domestic credit of Banking Sector (2000-2017)
Source: Author's compilation

Figure 4.4 indicates the graphical analysis of local credit within the banking division (DCBS) at a level form and domestic credit within the banking division (DDCBS) at 1st differenced. Based on visual inspection, stationarity of data is expected after 1st difference, with the mean strongly oscillating around the mean of zero as indicated in panel b.

Figure 4.5 Graphical representation of DCPS at level and 1st difference, 2000-2017

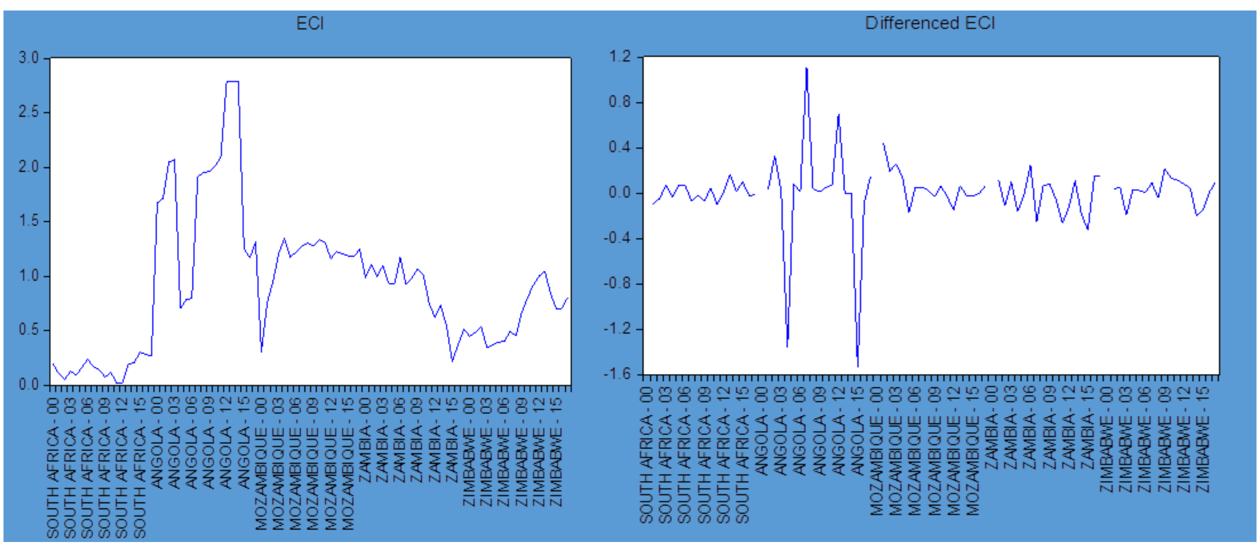


Selected SADC Log of Domestic Credit of Private Sector (2000-2017)

Source: Author's compilation

Figure 4.5 indicates the graphical analysis of domestic credit within the private sector (DCPS) at a level form and domestic credit within the private sector (DDCPS) at 1st difference. In panel (a), the variable displays a downward slope and in panel (b) the differenced DCPS suggests the possibility of stationarity, as shown by the oscillations around the zero mean.

Figure 4.6 Graphical representation of ECI at level and differenced forms, 2000-2017



Selected SADC Log of Economic Complexity (2000-2017)

Source: Author's compilation

Figure 4.6 indicates the graphical analysis of economic complexity index (ECI) at level and economic complexity index (DECI) at first difference. Panel (a) reveals that the model begins with an upward trend which is followed by a downward trend towards the end of the period. Therefore, this suggests that ECI is nonstationary at level. Conversely, panel (b) indicates that FDI oscillates perfectly around the mean of zero after 1st difference hence the possibility of stationary.

4.2.2.2 Formal Panel unit root test results

The first phase prior to tests for the existence of cointegrating relationships amongst the variables in SADC is to establish and verify whether economic data are stationary or integrated of the same order. It is of potential importance that the variables be stationary to avoid the potential spurious relationships among the variables (Bayar, 2014). For stationarity to exist, Ncanywa and Mabusela (2019) argue the fact that p-values ought not to be greater than 0.05. Also, the test statistics ought to be smaller than all levels combined with values labelled critical. Therefore, to confirm stationarity and the order of integration in this case, the study examined the common unit process by examining stationarity which is in conjunction with Im et al., (2003), Fischer (1999) and Levin et al. (2002). Thus outcomes are displayed below in table 4.3.

Table 4.3: Summary of panel unit root test results

VARIABLES	TEST	TEST EQUATION	LEVEL	RESULTS	1st DIF	RESULTS
GDP	Levin, Lin & Chu	Individual intercept	0.6004	-	0.0007***	I (1)
		Individual intercept & trend	0.0139**	I (0)	0.0452**	I (1)
		None	0.0023***	I (0)	0.0000***	I (1)
	Im, Pesaran & Shin	Individual Intercept	0.5229	-	0.0000***	I (1)
		Individual Intercept & Trend	0.2243	-	0.0001***	I (1)
	Fischer-ADF	Individual Intercept	0.6693	-	0.0000***	I (1)
		Individual Intercept & Trend	0.2551	-	0.0005***	I (1)
		None	0.0214**	I (0)	0.0000***	I (1)
	Fischer- PP	Individual Intercept	0.0136**	I (0)	0.0000***	I (1)
		Individual Intercept & Trend	0.0014***	I (0)	0.0000	I (1)
		None	0.0069***	I (0)	0.0000***	I (1)
FDI	Levin, Lin & Chu	Individual Intercept	0.0077***	I (0)	0.0252**	I (1)
		Individual Intercept & Trend	0.3305	-	0.1996	-

		None	0.0026***	I (0)	0.0000***	I (1)
	Im, Pesaran & Shin	Individual Intercept	0.0011***	I (0)	0.0000***	I (1)
		Individual Intercept & Trend	0.1910	-	0.0014***	I (1)
	Fischer-ADF	Individual Intercept	0.0014***	I (0)	0.0001***	I (1)
		Individual Intercept & Trend	0.1121	-	0.0025***	I (1)
		None	0.0104**	I (0)	0.0000***	I (1)
	Fischer- PP	Individual Intercept	0.0008***	I (0)	0.0000***	I (1)
		Individual Intercept & Trend	0.0045***	I (0)	0.0000***	I (1)
		None	0.1074	-	0.0000***	I (1)
M2G	Levin, Lin & Chu	Individual Intercept	0.0404**	I (0)	0.000***	I (1)
		Individual Intercept & Trend	0.3780	-	0.0001***	I (1)
		None	0.0000***	I (0)	0.000***	I (1)
	Im, Pesaran & Chu	Individual Intercept	0.0022***	I (0)	0.000***	I (1)
		Individual Intercept & Trend	0.0098***	I (0)	0.0000***	I (1)
	Fischer-ADF	Individual Intercept	0.0049***	I (0)	0.0000***	I (1)
		Individual Intercept & Trend	0.0144***	I (0)	0.0000***	I (1)
		None	0.0005***	I (0)	0.0000***	I (1)
	Fischer- PP	Individual Intercept	0.0000***	I (0)	0.0000***	I (1)
		Individual Intercept & Trend	0.0000***	I (0)	0.0000***	I (1)
		None	0.0000***	I (0)	0.0000***	I (1)
DCBS	Levin, Lin & Chu	Individual Intercept	0.0236**	I (1)	0.0000***	I (0)
		Individual Intercept & Trend	0.6355	-	0.0000***	I (1)
		None	0.2408	-	0.0000***	I (1)
	Im, Pesaran & Chu	Individual Intercept	0.2352	-	0.0000***	I (1)
		Individual Intercept & Trend	0.3857	-	0.0000***	I (1)
	Fischer-ADF	Individual Intercept	0.3507	-	0.0000***	I (1)
		Individual Intercept & Trend	0.2617	-	0.0001***	I (1)
		None	0.6014	-	0.0000***	I (1)
	Fischer- PP	Individual Intercept	0.5051	-	0.0000***	I (1)
		Individual Intercept & Trend	0.6147	-	0.0000***	I (1)
		None	0.8213	-	0.0000***	I (1)
DCPS	Levin, Lin & Chu	Individual Intercept	0.0161**	I (0)	0.0000***	I (1)
		Individual Intercept & Trend	0.7230	-	0.0000***	I (1)
		None	0.3373	-	0.0000***	I (1)
		Individual Intercept	0.2573	-	0.0000	I (1)

	Im, Pesaran & Chu	Individual Intercept & Trend	0.4351	-	0.0000***	I (1)
	Fischer – ADF	Individual Intercept	0.3979	-	0.0000***	I (1)
		Individual Intercept & Trend	0.4189	-	0.0001***	I (1)
		None	0.5921	-	0.0000***	I (1)
	Fischer – PP	Individual Intercept	0.6057	-	0.0000***	I (1)
		Individual Intercept & Trend	0.6346	-	0.0006***	I (1)
		None	0.8068	-	0.0000***	I (1)
ECI	Levin, Lin & Chu	Individual Intercept	0.2866	-	0.0029***	I (1)
		Individual Intercept & Trend	0.2326	-	0.0604*	I (1)
		None	0.3418	-	0.0000***	I (1)
	Im, Pesaran & Chu	Individual Intercept	0.1892	-	0.0004***	I (1)
		Individual Intercept & Trend	0.2851	-	0.0373**	I (1)
	Fischer-ADF	Individual Intercept	0.1564	-	0.0012***	I (1)
		Individual Intercept & Trend	0.3330	-	0.0424**	I (1)
		None	0.6806	-	0.0000***	I (1)
	Fischer- PP	Individual Intercept	0.0000***	I (0)	0.0000***	I (1)
		Individual Intercept & Trend	0.0071***	I (0)	0.0000***	I (1)
		None	0.5851	-	0.0000***	I (1)

Notes: the following asterisk *** denotes the rejection of the null hypothesis at 1% level of significance, **denotes the rejection of the null hypothesis at 5% level of significance, and lastly *denotes the rejection of the null hypothesis at 10% level of significance

Source: Author's compilation

The results in table 4.3 above indicates that domestic credit to banking sector, domestic credit to private sector and economic complexity are stationary at first difference. This means that the mentioned variables are integrated of order one I(1). The outcomes of these variables are confirmed under the LLC, IPS, Fischer-ADF and Fischer-PP panel unit root tests. Although, FDI is stationary using Fischer-PP panel unit root test but not for LLC, IPS and Fischer-ADF at level form, it is differenced once to assume a first difference stationary. The same applies to GDP confirmed by the LLC and Fischer-PP tests. As for broad money growth, it is stationary at level for IPS, Fischer-ADF and Fischer-PP but differenced once to have it stationary at first difference. This entails that variables such as domestic credit to banking sector, domestic credit to private sector and economic complexity follows the I(1) process, whereas GDP, FDI and broad money growth are I(0).

It is therefore, concluded that the unit root results indicates that the variables are of mixed stationary. That is to say variables are of I(0) and I(1) nature which fits the PMG/ARDL model.

Lag Order Selection Criteria

Choosing the correct lag length is of potential importance when carrying out any further tests such as the ARDL and granger causality tests which has repercussions for co-integration. This research used the VAR lag order selection criteria to obtain a suitable lag for our model. Based on selected length criteria, the optimised lag order that diminishes the Aike Information Criterion (AIC) and the Schwarz Bayesian Criterion (SBC) is one. The table below presents the results of the chosen lag order criterion estimated.

Table 4.4: Summary of the Lag length criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1648.816	NA	3.73e+10	41.3704	41.5491	41.4420
1	-1298.098	640.0619	14330026	33.5024	34.7530*	34.0038*
2	-1260.567	62.8635*	13997028*	33.4642*	35.7867	34.3953

Notes: * 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
Source: Author's compilation

In this research, the selection criteria used no more than two lags to allow the sample to adjust and achieve residuals that are behaving well. The results in table 4.4 confirm the lag length carefully chosen by various criteria for obtaining information. Altogether these information extracting criteria including the Likelihood Ratio (LR) test, FPE, AIC, SIC, and Hannan-Quinn Information Criterion (HQI) preferred two lags, implying that the information criteria approach yielded consistent outcomes when using two lags. Therefore, the panel co-integration tests will be performed considering that VAR is being applied with two lags. Although it's much easier to avoid opposing outcomes, only a few lags may result in certain parameter flaws and omit the significant lag dependencies (Asteriou et al., 2007).

4.2.3 Panel data Cointegration

Since stationarity has been confirmed, the next step involved the determination of co-integration among the variables. As mentioned in Chapter 3, the study employed the Pedroni, Kao and the Johansen-Fisher panel methods to verify the presence of cointegration within this framework. A summary of results is presented in Tables 4.3 to 4.5 and full details of the tests are presented in Appendix B.

4.2.4.1 Pedroni panel co-integration test results

Table 4.5: Summary of Pedroni panel co-integration test results

Panel Statistics				
	Statistic	Probability	Weighted Statistic	Probability
Panel v-Statistic	-1.9266	0.9730	-1.6645	0.9520
Panel rho-Statistic	0.7964	0.7871	0.9059	0.8175
Panel PP-Statistic	-2.6791	0.0037	-3.3196	0.0005
Panel ADF-Statistic	-1.9135	0.0278	-2.6220	0.0044
Group Statistics				
		Statistic		Probability
Group rho-Statistic		1.8792		0.9699
Group PP-Statistic		-6.1615		0.0000
Group ADF-Statistic		-4.8451		0.0000

Source: Author's compilation

Table 4.5 above suggests that there are four co-integrating equations at Panel PP-Statistic and Panel ADF-Statistic and two co-integrating equations at Group PPP-Statistic and Group ADF-Statistic at 5% significance. This means that the study fails to reject the null hypothesis that cointegration does not exist because the probability values are less than 0.05.

4.2.4.2 Kao panel co-integration test results

Table 4.6: Summary of Kao panel cointegration test results

	t-Statistic	Probability
ADF	-1.8761	0.0303
Residual Variance	21.8285	

HAC Variance	6.4887	

Source: Author's compilation

Centred on the Kao ADF test, the probability value should be less than five percent significant to reject the null hypothesis that cointegration does not exist in support of the alternate assumption that cointegration exists. The results under table 4.6 indicate that the probability value of ADF is equal to 0.0303, therefore, following the rule of the Kao ADF test, implies we reject the null hypothesis that co-integration is non-existent and accept the null hypothesis since 0.0303 is less than 0.05%. Thus, the variables have a long-run correlation.

4.2.4.3 Johansen Fischer panel co-integration test results

Table 4.7: Summary of Johansen Fisher panel co-integration test results

Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Probability	Fisher Stat.* (from max-eigen test)	Probability
None	6.931	0.7319	6.931	0.7319
At most 1	56.65	0.0000	75.07	0.0000
At most 2	92.10	0.0000	92.10	0.0000
At most 3	72.88	0.0000	58.17	0.0000
At most 4	39.51	0.0000	31.74	0.0004
At most 5	27.66	0.0020	27.66	0.0020

Source: Author's compilation

The outcomes of the Johansen-Fischer panel co-integration test display that there are five co-integrating equations on both the trace test and max-Eigen test achieved at a 5% significance level. This implies that entirely the probabilities are not more than 0.05 consequently rejecting the null hypothesis that there is the absence of cointegration between these variables. In short, co-integration exists and there is a long run correlation between the variables.

4.2.4 Hausman Tests

In this subsection, the study applies fixed effects as well as the random effects estimations to analyse the linkage between FDI, M2G, DCBS, DCPS, ECI and economic growth.

According to Baltagi, Bresson and Pirotte (2003), the random effect estimation technique should be applied if it is assumed that the country-specific effects are uncorrelated. While Angrist and Pischke (2009) are of the view that this assumption is relaxed by the fixed-effects estimation technique, which permits the exact effects of a republic and the error term to be corrected. Therefore, in selecting the most suitable model between the two methods of analysis, a Hausman specification test developed by Hausman (1978) was carried out in this study. The outcomes of this test indicate that the fixed-effects estimation technique is preferable to the random effects. Therefore, the outcomes of the fixed effects are portrayed in this study. The Hausman outcomes are thus depicted in table 4.8.

Table 4.8: Fixed Effect results

Variable	Coefficient	Std.error	T-statistic	Probability	Observations
C	5.1873	2.2356	2.3203	0.0229	90
FDI	0.0107	0.0775	0.1384	0.8903	90
M2G	0.0277	0.0111	2.5072	0.0142	90
DCBS	-0.2096	0.1499	1.3976	0.1661	90
DCPS	-0.0219	0.1161	0.1894	0.8503	90
ECI	3.0064	1.4124	2.1286	0.0364	90

Source: Author's compilation

Table 4.8 above outlines the regression findings of economic growth coefficient with FDI, M2G, DCBS, DCPS, and ECI for a full sample. The estimated fixed effects show a negative significant link between domestic credit within the banking segment, domestic credit within the private segment together with the southern African economies growth during the study period. Accurately, the FE coefficient estimator specifies that DCBS is statistically significant as -0.20 is less than the preferred probability of 0.05. Correspondingly, DCPS is significantly shown by (β-0.02, $p<0.05$). Therefore, this implies that both variables harm economic growth, which signals that lack of credit booms is detrimental to economic growth.

The effect of the Hausman test demonstrates that the null hypothesis in the absence of correlation among distinct effects of companies that are not observable and controlled variables fails to be rejected. As a result, it can be agreed upon that the applicable mechanism to execute the estimation of the interrelation between economic growth and its factors is through the analysis of a fixed-effects panel model. However, as a result of the few observations (n=90), Clark and Linzer (2015) hold the thought that the coefficients of the model are inefficient. Clark and Linzer (2015), argue to say random effects estimators are further effective compared to fixed estimators when conducting a study that involves a very small set of data or specifically conducting a study with less than 200 of the total observations. Thus, taking into account that this study has fewer cross-sections and observations, the study also presents the outcomes of the PMG ARDL dynamic estimator. The results are presented in Table 4.9.

Before estimating the model, the findings of the PMG and dynamic fixed effect estimation in conjunction with the Hausman test is used to assess the effectiveness and consistency comparisons amongst variables as illustrated in table 4.8 above and table 4.9 below. The results report that FDI, M2G, DCBS, DCPS, and ECI has a favourable strong significant influence in the long term on economic growth which agrees with the PMG estimator. Contrary to the PMG estimator, the DFE proposes a beneficial and significant impact of M2G and ECI in the long run, and further reports the insignificant positive influence of FDI, DCBS, and DCPS in the long run. As anticipated, the Hausman test fails to reject the null hypothesis of homogeneity constraints, particularly on regressors in the long term, indicating that PMG is a more effective tool than the DFE.

4.2.5 Estimated long run and short run relationship

Table 4.9: Summary of PMG/ARDL long run results

Variables	Coefficients	Probability
FDI	0.0856	0.0000
M2G	0.1204	0.0000
DCBS	0.8601	0.0288
DCPS	-1.0502	0.0069
ECI	5.3358	0.0185
SPEED OF ADJUSTMENT	-0.5548	

Source: Author’s compilation

4.2.6.1 Long run equation

Table 4.9 displays the outcomes of the long run relationship of dependent and independent variables undertaken to formulate the coefficients of variables of the model as indicated in equation 4.1.

$$GDP = 0.86FDI + 0.12M2G + 0.86DCBS - 1.05DCPS + 5.33ECI \dots\dots\dots\dots\dots\dots\dots.\dots\dots\dots\dots\dots\dots (4.1)$$

Based on equation 4.1 a long term inverse relationship among broad money growth (M2G), domestic credit to the banking sector (DCBS) and economic complexity index (ECI) is observed. At the same time, a negative relationship was found between doemstic credit within the private sector and economic growth (GDP). A positive association between FDI-GDP means that as FDI increases by 1% GDP is expected to increase by an estimation of 0.08%. This outcome is in line with Masipa (2018), Apergis and Arusha (2018), Lechman and Ksur (2015). The Masipa (2018) study which discovered a favourable connection between FDI and economic growth in South Africa utilized annual data with 34-years spanning from 1980-to 2014. To account for this relationship, Lechman and Ksur (2015) postulate that an inverse effect of FDI on economic growth is caused by FDI shifting resources related to FDI spillover effects and the improvement relating to productivity. Similarly, Apergis and Arusha (2017) argue that FDI positively influences the development of an economy particularly countries that are hosting and necessitates satisfactory human capital, economic security and liberalisation of markets to capitalise on long-term capital flows.

Likewise, the long run equation confirms the existence of a favourable association amongst (M2G) and the growth of the economy. The same conclusion was reached by Ingabire, Uwineza, Benimana, Musafiri, Berimana, Ishimwe, Nshizirungu (2020); Chaitip, Chokethaworn, Chaiboonsri, Khounkhalax (2015); Goridko (2015); Dhungang (2014), Zapodeanu and Coiba (2010) and Bednarik (2010). The coefficient of M2G indicates how a one percent increment in broad money growth, leads to a 0.12 percent rise in economic growth.

Again, findings disclose a desirable connection between domestic credit to banking (DCBS) and economic growth. Specifically, 1% increment in domestic credit to the banking sector led to a 0.86% appreciation of economic growth in the long run.

Furthermore, the long run results incorporate an unfavourable association between domestic credit within the private sector (DCPS) and economic growth. The results obtained imply that a 1% increment in DCPS results in a decline of 1.05% in GDP. The results are not coherent and do not align with the apriori expectation.

Finally, outcomes presented in table 4.9 and long run equation as shown in equation 4.1, indicate a beneficial association between (ECI) and economic growth in the long term. This suggests that a 1% increase in the economic complexity index would integrate a 1% increase in economic growth in the South African economy.

4.2.6.2 Outcomes of the short-term

The (ECM) clarifies how explanatory variables converge to equilibrium in the long term after a short term shock within a respective framework. By so doing, it aids in confirming the short run relationship between the predicted and response variables within the framework of SADC. Table 4.7 presents the ECM.

Table 4.10 Summary of PMG/ARDL short run results

Variables	Coefficients	Probability
D(GDP)	-0.2193	0.2123
D(FDI)	0.2814	0.4940
D(M2G)	0.0663	0.4155
D(DCBS)	-2.7507	0.2520
D(DCPS)	2.7414	0.2488
D(ECI)	6.5427	0.4508
Cointegrating Eq:	-0.5548	
C	0.0969	0.9501

Source: Author’s compilation

As suggested by Puatwoe and Piabuo (2017) the rule for the presence of a short run association among variables states how coefficients within the error correction model should be unfavourable and significant. Reflected in Table 4.10, the rate at which the equilibrium adjust is represented by the coefficient of the cointegrating equation and has a negative sign of -0.554885 and shows a statistical significance of ten percent. Therefore, hints that in the event of disequilibrium, the system will be capable to adjust back to equilibrium at a rate of 55%. This implies that approximately, 55% of the errors in terms of prior fiscal year shocks are modified in the present year.

Furthermore, the outcomes in Table 4.10 show that in the short run, a one-year lag of economic growth will lessen economic growth in the current year by 0.21%, suggesting that approximately 21% of distortions caused by shocks in the preceding year can be restored in the current calendar year. The statement is consistent with Alex and Calvin (2016) who postulates that values of real GDP per capita that have lag are advantageous and consistent in explaining current values, implying that development in the previous period has an impact on development in the period that still has to come. In their study, they further argue that this may be as a result that alternate variables have little impact on real GDP in the short term.

Again, short run outcomes show a favourable association between FDI and economic growth. This designates that a one percent increment in FDI results in a 0.28 percent increment in economic growth. As expected, outcomes suggest that inflows of foreign investments are one of the most important factors for economic growth. The assumption is consistent with prior studies by Emmanuel (2014), Olawumi and Olufemi (2016) and Zekarias (2016) who suggests that foreign direct investment remains a critical vehicle for economic growth.

In essence, the coefficient of broad money growth (M2G) had an advantageous influence on economic growth. Therefore, one percent appreciation of broad money growth leads to a 0.06 increment in economic growth at 5% significance in the short run. These results support earlier works of Hussia (2017), Chaitip (2015), Ogunmuyiwa (2010), Babatude (2011), Chude (2016), Muhammad (2009), Hameed (2011), Ihsan (2013), Zapodeanu (2010), Maitra (2011) and Aslam (2016).

On the contrary, the coefficient of domestic credit to the banking sector indicates an inverse association alongside economic growth. Specifically, a one percent increment in domestic credit to the banking sector causes a 2.75% decline in economic growth. Theoretically, McKinnon and Shaw (1973), are of the notion that when government officials interfere with a nation’s financial structure by means of utilizing interest rates ceilings, high reserve requirements, and credit control programmes, it hinders the progress of the financial sector and as a result higher rates of economic growth are sacrificed. For instance, La Porta, Lopez and Shleifer (2002) indicated how the state's banks with a disproportionate amount of ownership reduce the expansion of banks while slowing economic growth, typically in emerging countries.

Furthermore, the results from the short run confirm a positive but not significant linkage between domestic credit within the banking segment (DCBS) and expansion of the economy in the short run. Although, this effect remains favourable and statistically significant in the long run. The results showed how a one percent increase in domestic credit to the private division led to a 2.74% appreciation of economic growth. That is to say, the availability of credit towards the private sector in the form of credit rationing amongst other policies over the years has led to improvements in the growth rate of the economy. The positive results confirm the findings by Ndlovu (2011) and Tyavambiza and Nyangara (2015). Lastly, the results obtained from Table 4.10 show that economic complexity possesses a positive influence on economic growth in the short run. Thus, a one percent increment in economic complexity causes a 6.54% increment in economic growth in the short run.

4.2.6 Engel-Granger Causality Test Results

The granger causality test is normally conducted to determine directional links between the regressors and the regressand. The concluding rule for granger causality states that the null hypothesis should be rejected at five percent significance if the p-value is not greater than 0.05 and vice versa. However, a rejection of the null hypothesis means the first series granger causes the second series. Therefore, Table 4.11 displays the outcomes of the granger causality test.

Table 4.11 Engle-Granger Causality test results

Null Hypothesis	Observations	F-statistic	P-value	Decision
FDI does not Granger Cause GDP	80	0.6969	0.5013	Accept the null hypothesis
GDP does not Granger Cause FDI		0.6965	0.5015	Accept the null hypothesis
M2G does not Granger Cause GDP	80	4.9015	0.0100	Reject the null hypothesis
GDP does not Granger Cause M2G		18.3202	3.E-07	Accept the null hypothesis
DCBS does not Granger Cause GDP	80	3.7117	0.0290	Reject the null hypothesis
GDP does not Granger Cause DCBS		7.1392	0.0015	Reject the null hypothesis
DCPS does not Granger Cause GDP	80	2.0758	0.1326	Accept the null hypothesis
GDP does not Granger Cause DCPS		6.0587	0.0036	Reject the null hypothesis
ECI does not Granger Cause GDP	80	0.0430	0.9579	Accept the null hypothesis
GDP does not Granger Cause ECI		0.7261	0.4872	Accept the null hypothesis

Source: Author's compilation

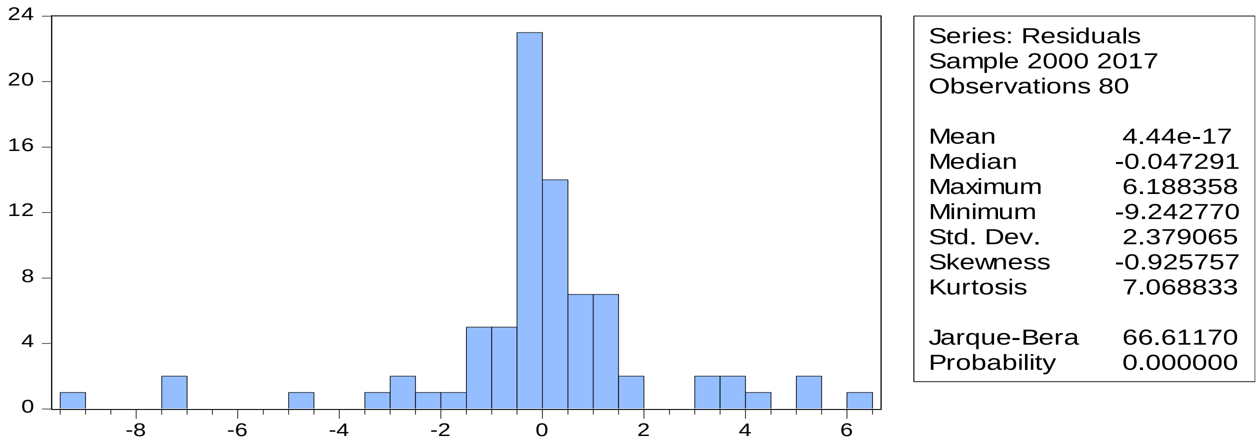
In Table 4.11, the outcomes show that FDI has no effect on GDP and GDP does not cause FDI either. This means that granger causality does not exist in either direction. The discoveries are consistent with outcomes found by Belloumi (2014) for Tunisia. The granger causality test also shows that M2G does granger cause GDP but GDP does not granger M2G. This indicates a unidirectional Granger causality running from M2G to GDP. This implies that increasing the monetary resources through the banking division would aid in the financing of the economy. It is also evident that domestic credit to the banking sector (DCBS) does granger cause GDP at 5% level of significance and GDP does granger cause DCBS. In this case, a bi-directional Granger causality between GDP and DCBS exists. Again, the results show that domestic credit to the private sector (DCPS) does not granger cause GDP meanwhile GDP does granger cause DCPS at a 5% significance level, suggesting a one-way causality from GDP to DCPS. The results support the view of the demand-following hypothesis, which states that an improvement in economic growth results in high demand for additional financial services by economic agents. Lastly, the granger causality test indicates no direction of causality betweenthe economic complexity index (ECI) and GDP.

4.2.7 Diagnostic tests results

Below is the summary of the outcomes for diagnostic tests employed to check the consistency of the outcomes.

4.2.1.1. Normality test results

Figure 4.7: Normality test results



Source: Author's compilation

According to Figure 4.7 above, the test statistic of the Jarque-Bera equal 66.6 and the probability value is 0.00. This means the null hypothesis of normality in residuals is rejected at a 5% significance level and there is no normal distribution. Yet, Harris (1995) hypothesize that normalcy is not an issue since it can occur as a result of other variables being weakly exogenous. Although the skewness and kurtosis rely on the probability value, the bell shape of the histogram illustrates that residuals of the model are normally distributed.

4.2.1.2. Serial Correlation LM Test

The outcomes of the Breusch-Godfrey serial correlation LM test is reported in table 4.9 below.

Table 4.12: Serial-correlation LM test results3

Lags	LM-Stat	Probability Value
1	63.1356	0.0034
2	40.4633	0.2797

3	18.6505	0.9925

Source: Author's compilation

According to outcomes reported in table 4.12, there is no indication of serial correlation since our probability values in both cases are statistically insignificant. This means our sample remains good and to further verify this, the stability test is performed to check whether our model is stable in the long run.

4.2.1.3. Heteroskedasticity Tests

Table 4.13 Summary of Heteroscedasticity test

Joint test		
Chi-sq	Df	Probability Value
664.4019	504	0.0000

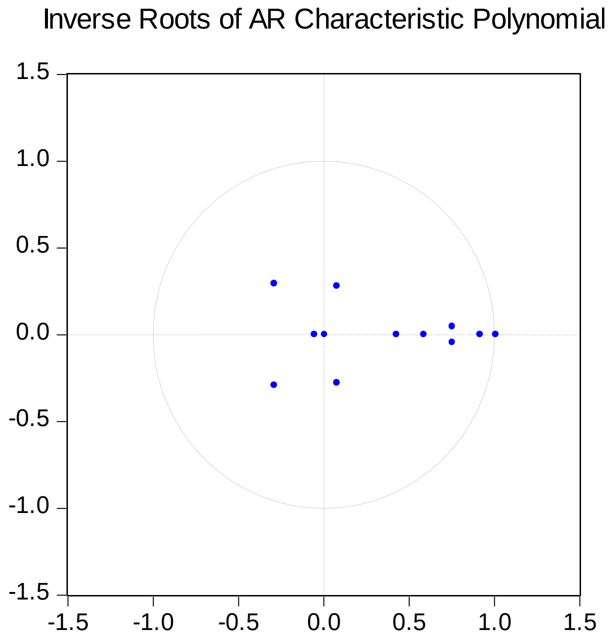
Source: Author's compilation

Table 4.13 suggest the existence of heteroscedasticity as evidenced by a significant odds value. This means that the insignificant theorem under the heteroscedasticity assumption cannot be rejected.

4.2.8 Stability tests results

To further establish the robustness of the dependant and independent variables within the long term and short term, the inverse roots of AR graph is applied. The outcomes obtained are reported in Figure 4.8.

Figure 4.8: Inverse Roots of AR graph



Source: Author's compilation

As reflected in Figure 4.8, it is evident that all unit matrix roots lie inside the unit circle and have less than one modulus. This proves the existence of stability in our model. Therefore, it is concluded that the model of this study is well specified to the goodness of fit and that selected SADC countries may consider using this model when making policy decisions and recommendations.

4.2.9 Generalised Impulse Response Function tests results

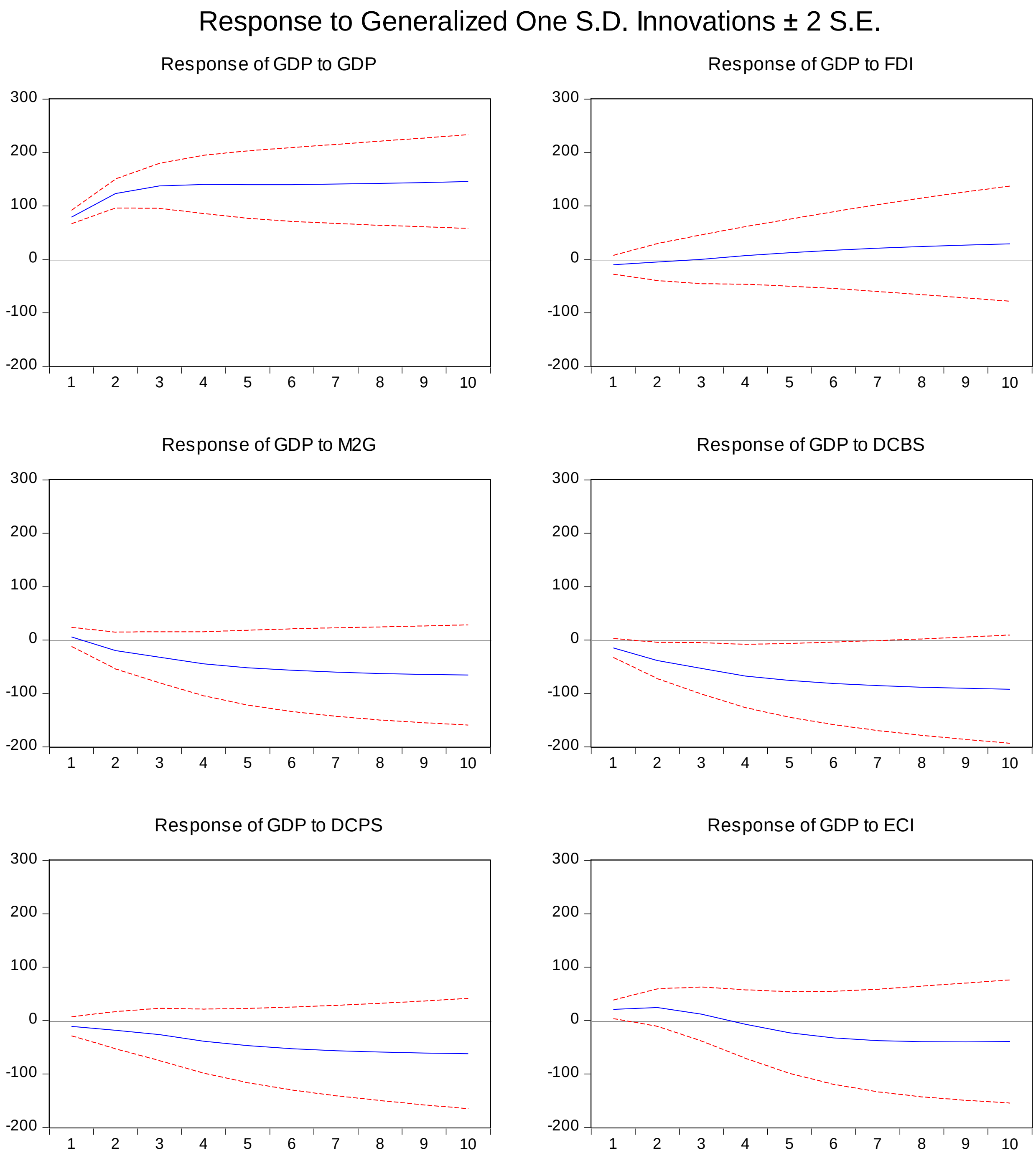
The findings of the impulse response function are displayed as follows:

The GIRF tests results displayed below in Figures 4.9 to 4.14 illustrate how each standard deviation shock to the residual encourages the reaction of variables towards one another from the first period to the tenth period.

4.2.10.1 Response of gross domestic product to one standard deviation

As shown in Figures 4.9, the outcomes illustrate the response of economic growth (GDP) to itself. It shows that against one standard deviation shock from GDP, GDP responds to this shock positively from the first to the last period implying that any innovations in GDP will generate a positive effect towards GDP.

Figure 4.9: Impulse Response Function of Gross Domestic Product (GDP)



Source: Author's compilation

Moreover, the generalised response of GDP on FDI appears to be insignificant at the beginning of the first three years. Afterwards, a positive response is seen throughout the remaining periods. This implies that in a one standard deviation shock from economic growth, FDI reacts positively to the shock. Therefore, any innovations in economic growth will have a beneficial effect on FDI. As a result, FDI attraction related policies should be prioritised during the process of economic growth and development to maximize the positive results of FDI in these selected SADC states.

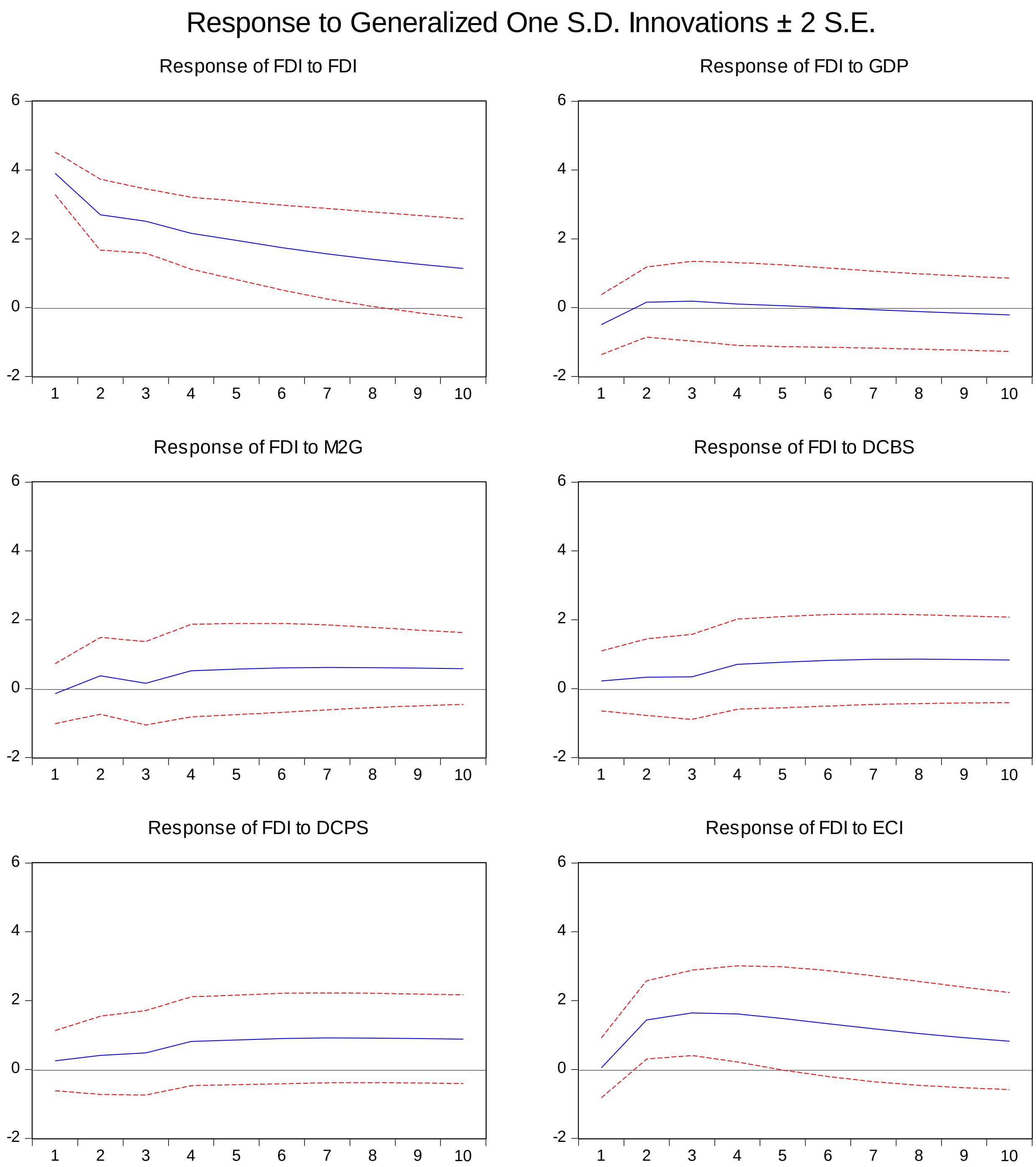
However, the response of GDP to shocks in broad money starts significantly negative from the first period to the observed second period. The response of gross domestic product to broad money continues to be negative from the third period to the fourth year of the observed period and remains consistently negative throughout all the remaining periods. In short, any innovations in economic growth will negatively affect broad money growth. Policy creators should revise their strategies and formulate monetary policies that are flexible enough to encourage economic growth in these countries.

Likewise, the response of GDP to domestic credit within the banking division and domestic credit to private segment starts significantly negative in the first three periods and remains consistently negative until the last observed period. Meaning, a standard shock from gross domestic product to domestic credit within the banking division, and domestic credit by private segment report a negative response from period one until the tenth period as shown by the blue line. Therefore, any innovations in economic growth will harm DCBS and DCPS. Policies aimed at improving financial services, financial instruments and payment systems in the selected SADC countries should be revised. Specifically, policy creators should be conscious of the effect their policies place on the performance of the bank as these banks have a continuous influence on the economy.

On the other hand, shocks to the economic complexity index report a significant positive response in the first and third periods. Afterwards, a negative response is witnessed from the fourth until the tenth period. In simple terms, any innovations in economic growth will negatively influence ECI after a positive reaction in the third period. Thus, policy creators should adopt appropriate education and policy reforms that contribute to improving labour and productivity of capital, thereby providing expertise and a wide range of sophisticated skills to move in the direction of establishing markets and directing the economy towards the production of complex goods.

4.2.10.2 Response of foreign direct investment to one standard deviation

Figure 4.10 Generilsed Impulse Response of FDI



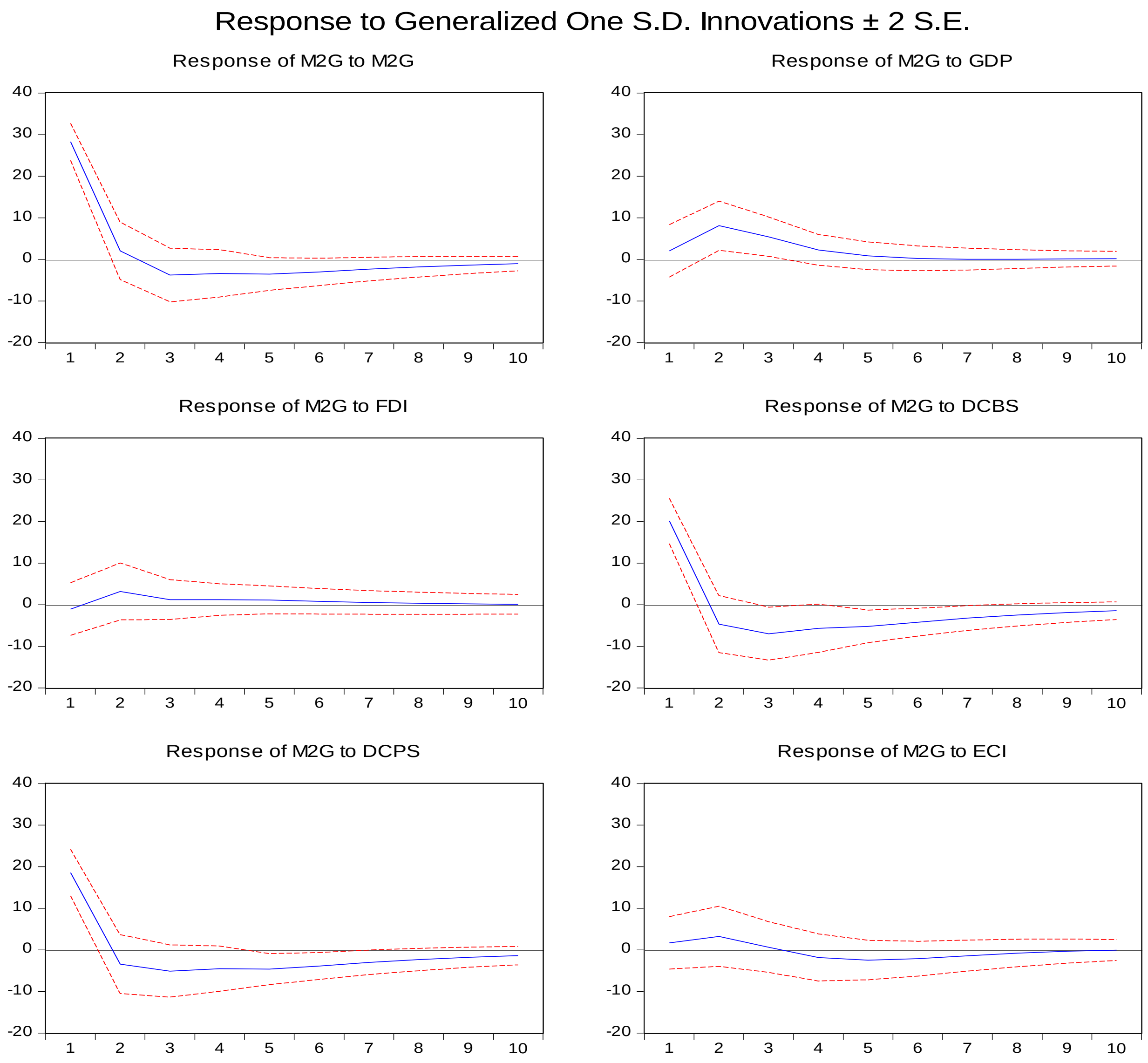
Source: Author's compilation

Figure 4.10 depicts the response of FDI to innovations to all the independent variables. The response of FDI to its shock seems to be positive as well as to shocks to M2G growth, domestic credit within the banking segment, domestic credit to the private sector, and economic complexity index. All of the above-mentioned responses fluctuate positively throughout the observed periods. However, FDI responds positively in the second and third years where it gradually responds negatively throughout the remaining periods.

4.2.10.3 Response of Broad Money Supply to one standard deviation

Similarly, Figure 4.11 illustrate the response of broad money growth to innovation to all independent variables. The response of GDP to innovation in broad money growth starts positively in the first year where it reaches a peak in the second year and slightly deteriorate in the fourth and fifth period. The response is negatively insignificant from the sixth period until the last observed period. This implies that shocks to GDP negatively impact broad money growth in the long-run

Figure 4.11 Generalised Impulse Response of Broad Money Supply

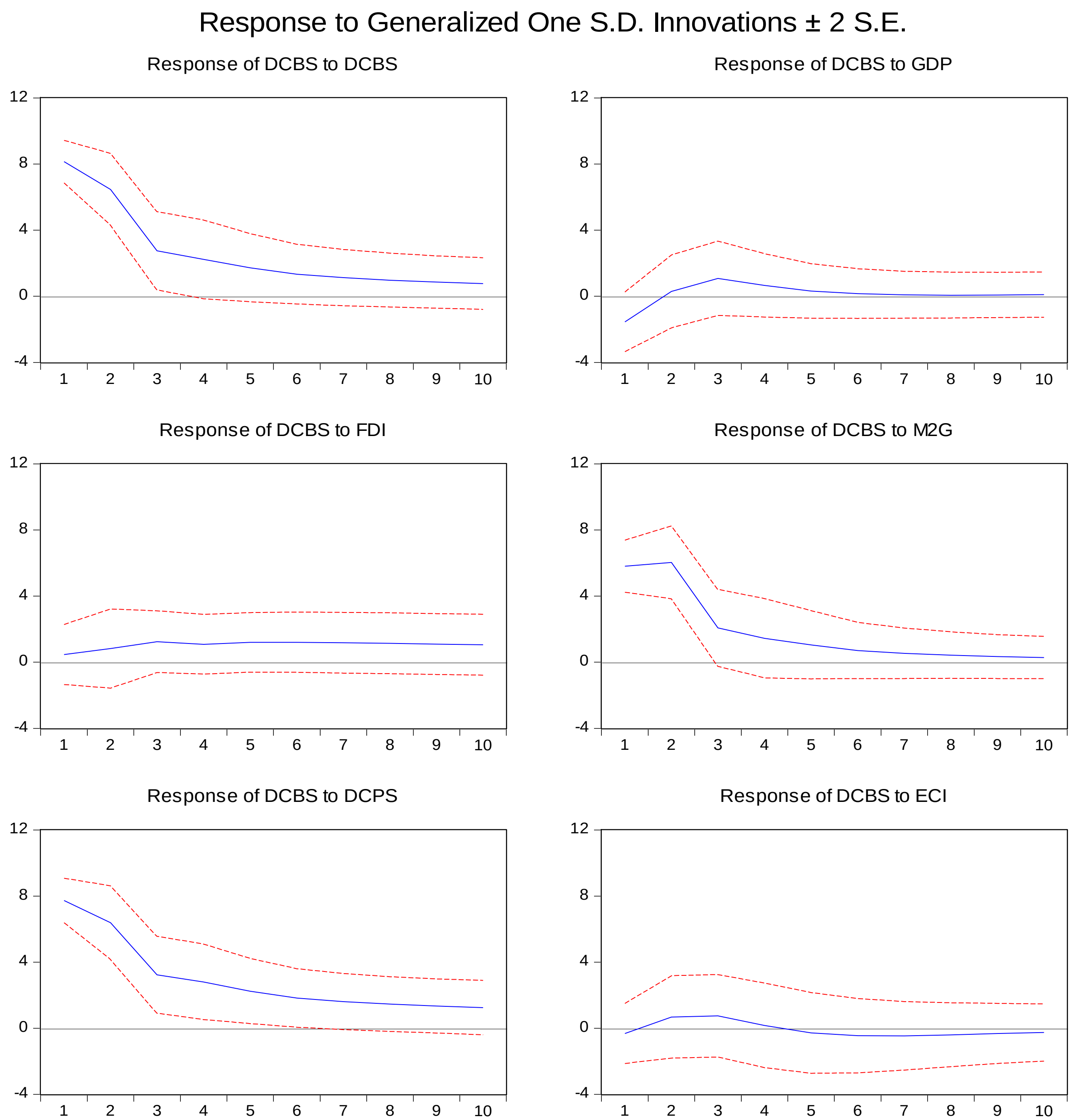


Source: Author's compilation

4.2.10.4 Response of Domestic Credit to Banking Sector to one standard deviation

The response of GDP to innovation in domestic credit within the banking sector shows a positive response throughout the observed period. Moreover, domestic credit within the banking sector responds positively to its shock as well the rest of the variables.

Figure 4.12 Generilsed Impulse Response of Domestic Credit to Banking Sector

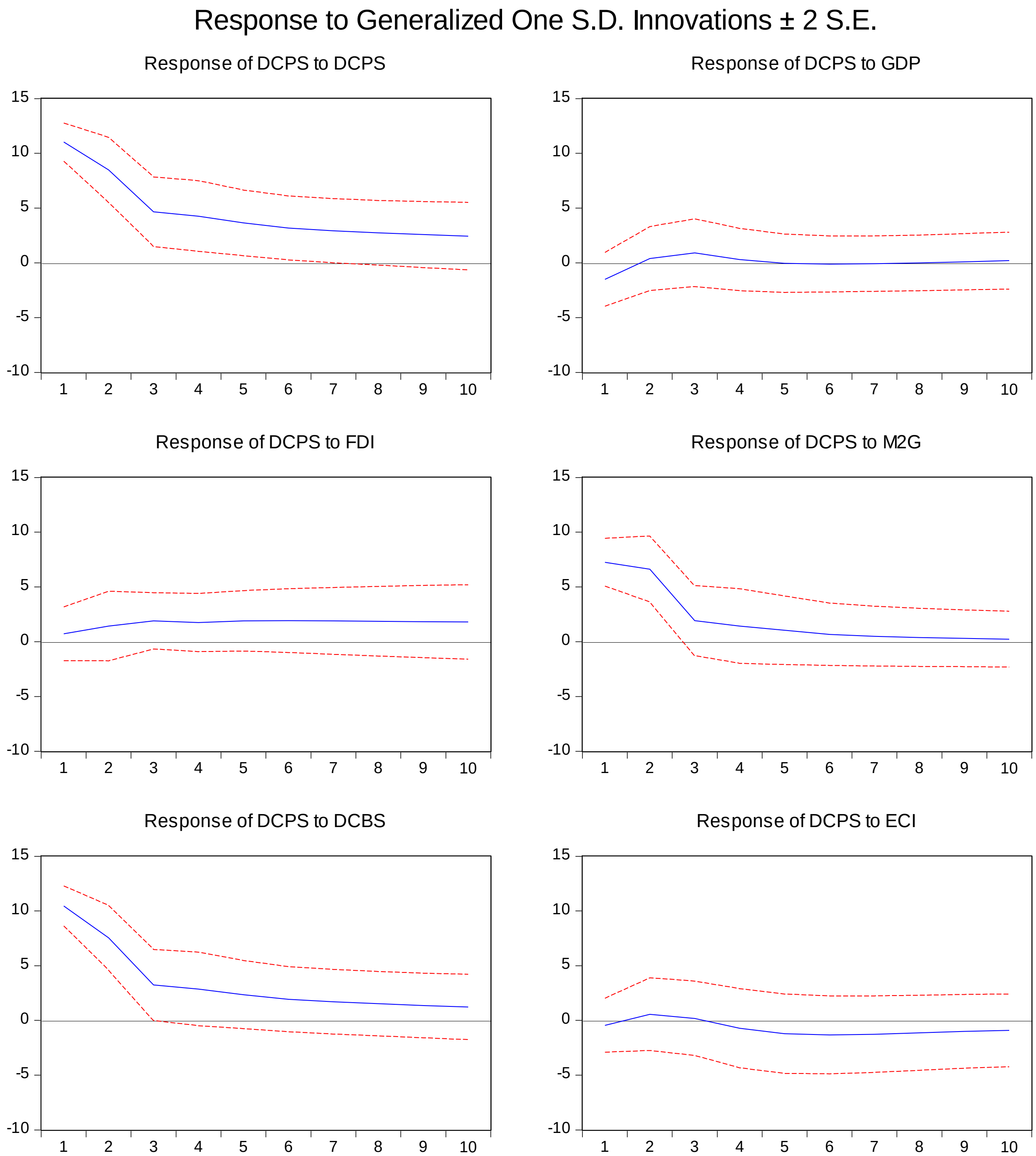


Source: Author's compilation

4.2.10.5 Response of Domestic Credit to Private Sector to one standard deviation

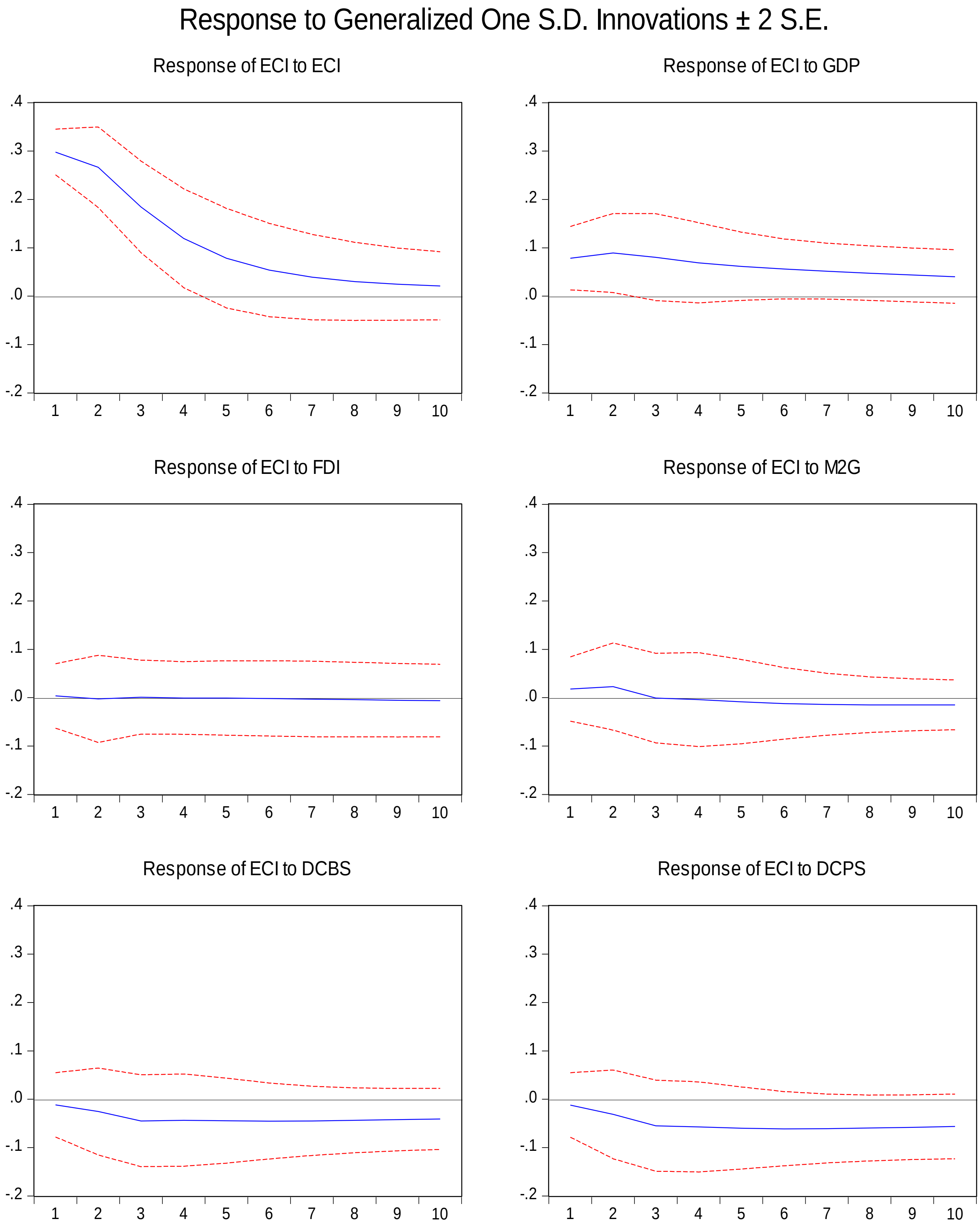
The below illustrations display the response of domestic credit to the private sector given its shocks to gross domestic product, foreign direct investment, M2G growth, domestic credit within the banking sector, and economic complexity index. Domestic credit to the private sector reacts positively to shocks in all variables and DCPS itself.

Figure 4.13 Impulse Response of Domestic Credit to Private Sector



Source: Author's compilation

Figure 4.14 GIRF of Economic Complexity Index



Source: Author's compilation

4.2.10.6 Response of Economic Complexity Index to one standard deviation

The response of the economic complexity index to shocks on all the variables is demonstrated in figure 4.14 which shows that ECI responds positively to its shock as well as shocks to of GDP, FDI, local credit towards the banking sector, and the national credit to the private sector. All these responses fluctuate positively throughout the ten years.

4.2.10 Variance Decomposition

Campbell (1991) is of the view that variance decomposition is reverted to determine the degree of involvement of each type of shock to the expected error variance. Table 4.11 below presents the results of the variance decomposition. The main outcomes of the variance decomposition show which of the independent variables best explains the variability of the dependent variable over a time frame of ten years.

Table 4.14: Results of the variance decomposition of GDP

Period	SE	GDP	FDI	M2G	DBCS	DCPS	ECI
1	4.4348	100.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	5.2934	84.10354	1.1208	12.5288	0.5542	1.6606	0.0319
3	5.5446	77.94524	1.2425	16.6665	1.6495	2.4187	0.0775
4	5.7100	74.46642	1.4622	19.0751	2.1928	2.5939	0.2096
5	5.7885	72.64405	1.6699	20.2379	2.4539	2.6911	0.3030
6	5.8270	71.75792	1.8445	20.7227	2.5907	2.7181	0.3660
7	5.8479	71.27325	2.0022	20.9506	2.6484	2.7203	0.4051
8	5.8588	71.01624	2.1335	21.0371	2.6712	2.7156	0.4265
9	5.8650	70.87000	2.2433	21.0614	2.6776	2.7102	0.4374
10	5.8688	70.77790	2.3351	21.0603	2.6777	2.7071	0.4419

Source: Author’s compilation

All the variance in economic growth shown in the first period are explained by its innovations or shocks. That is to say, 100% of the forecast error variance in real GDP is clarified through real GDP itself in the first period. However, contributions from FDI, M2G, DCBS, DCPS and ECI are weakly exogenous. This implies that the independent variables have a very weak influence when it comes to predicting GDP in the future. Moving on to the fifth period, GDP indicates 72.6% of its variation while 27.4% of the remaining part is explained by the independent variables. Out of the remaining 27.4%, 1.7% was explained by FDI, 20.2% by M2G, 2.4% by DCBS, 2.7% by DCPS, and 0.3% by ECI. However, at period ten GDP explains about 70.8% of its variation and 29.2% for the independent variables. The influence of FDI increased from 2.3%, M2G increased to 21.1%, DCBS increased to 2.7, DCPS remained unchanged, and ECI increased to 0.4. Therefore, it can be confirmed entirely that variables have an important impact on economic growth although the impact of ECI is low compared with all the other variables.

4.3. Chapter summary

Chapter four outlined the results of the econometric procedures discussed in Chapter three. Firstly, the chapter began by providing a background on the descriptive data and whether variables are correlated. Secondly, the researchers analysed the characteristics of data by means of different approaches for executing the unit root of all variables in the sample. Subsequently to determining the sequence of integration, the next step was to determine the lag length criteria to estimate the presence of co-integration amongst components in the model. Again, the long-run and short-run link among variables was observed. The granger causality analysis was conducted to establish the outlook of causality amongst the variable, and the reliability of the model was established through the use of diagnostic and stability techniques. Eventually, the response function and variance decomposition tests are performed to forecast and to determine how variables respond to shocks and innovations.

CHAPTER 5

SUMMARY, CONCLUSION AND POLICY RECOMMENDATION

5.1 Introduction

The main purpose of this chapter is to provide a summary of what has been discussed in Chapter 4, outline the policy inferences and offer policy recommendations.

5.2 Summary of the study

The research aimed at exploring the linkage between FDI, financial sector development, economic complexity, as well as economic growth in SADC. Before all the econometric tests were performed, the panel unit root tests were run to investigate if all variables are stationary. By employing different panel unit root tests such as the Levin Lin Chutest, the IPS, and the Fischer ADF –PP tests, the results demonstrated that some of the variables were not stationary at level and the likelihood of stationary could be witnessed after being differenced. Proceeding to cointegration, the panel co-integration tests in the form of the Pedroni, Kao and Johansen-Fischer revealed a long run co-integrating link amongst the variables at the 5% significance level.

Furthermore, the study discovered a positive link between FDI and economic growth both in the long run and short run. This serves as confirmation that FDI is a fundamental factor in improving the development of growth in the short run and long run, especially in emerging economies such as South Africa, Angola, Zimbabwe, Mozambique, and Zambia. According to Iamsiraroj and Ulubasoglu (2015), the positive link can be explained as a result of the fact that FDI inflows are seen as a vital source of savings and capital accumulation for African countries, thus developing human capital and creating positive spillovers, furnishing African economies with access to technologies that are more advanced thereby leading to rising economic growth. Theoretically, this statement is directly supported by the endogenous growth theory which augments that FDI helps to boost economic growth by generating capital, transferring technology, and increasing knowledge levels through training and acquiring certain skills.

A favourable link between broad money growth and economic growth was discovered both in the long run and short run. This collaborates with studies such as Trang, Duc, Anh and Thang (2019), who argue that the supply of money has always had a favourable impact in enhancing the growth of an economy in the short run and long run. In some other vein, the study also found a positive effect between domestic credit to the banking sector and economic growth in the long term, and an undesirable relationship in the short term.

An adverse relationship was observed between domestic credit to the private sector in the long term, and maintained a positive relation in the short term. This is in line with Nacure et al., (2013) who examined the association between the financial sector and growth rates of the economy employing a sample of the Northern and Southern Mediterranean economies from 1985 to 2009. They also found a negative correlation between domestic credit to the banking sector and economic growth. Their study argues that the inverse association arises because of the problems related to the allocation of credit in the region as well as weak financial regulations and supervision. Likewise, Madukwa and Onwuka (2013) hold the thought that increases in non-performing loans and interest rates contributes negatively to the growth of a country.

Finally, a positive effect between the economic complexity index and economic growth was revealed in the long run and short run. This implies that the production of a wide range of unique commodities in the SADC economies as well as the diversification of exports goods can contribute to improved economic complexity and growth in these countries for an extensive period.

Furthermore, the granger causality test disclosed a unidirectional chain of cause and effect moving from M2G to GDP, where lags of broad money growth are identified to granger cause economic growth while economic growth has no causal relationship. In addition, causation in one direction from GDP to DCPS is witnessed, implying that economic growth is the driving force for domestic credit to the private sector in the SADC region. The findings of the granger causality test also report causality in both directions between GDP and DCBS suggesting that the lags of domestic credit to the banking segment granger cause economic growth while lags of economic growth also granger cause domestic credit to the banking sector. Thus, the study seeks to make recommendations based on these findings.

5.3 Recommendations

According to the findings of the study, FDI stimulates the development and prosperity of the selected SADC countries. Based on the findings reported, it is recommended that SADC officials should continue to encourage the improvement of some sectors to maximize the benefits of FDI inflows into the region. To drive increased growth and absorb the most FDI advantages, authorities ought to consider policies focusing on personnel resources, the supply of money, domestic investment as a whole, and credit is given to the private sector as a whole.

The individual governments should also aim at attaining a stable financial system or sound financial development, diminish spending by the government, and encourage the private sector to contribute more to investment and economic growth. According to Levine and Beck (2002), a well-developed financial sector can boost investment, which in turn can boost the progress of the economy. Conclusively, Mulu (2015) postulates that the costs of completing a transaction are associated with every investment. As a result, a developed financial sector can reduce transaction costs and credit limits, both of which can hinder a nation's economic progress. Mulu (2015) goes on to state that a poorly operating financial sector can result in minimal economic activity and growth due to its multifunctionality. The lack of well-functioning markets, in particular, may limit credit demand for projects that boost economic growth. Because allocated credit is important for technological progress and capital accumulation is viewed as a pathway to drive economic growth, prospective loan rationing could have a detrimental impact.

Further, the broad money growth and domestic credit within the banking industry have indicated an unfavourable influence on GDP. Consequently, it is suggested that policies should be formulated and implemented to sustain and regulate their respective growth since they hold an important role to play in growing the economy. Governments in the region should identify new areas that require monetary expansion as well as areas that require measures of restraint in the SADC financial sector.

Concerning the economic complexity index, policymakers should seek new knowledge and superior technology to upgrade and integrate knowledge to progress in the direction of greater economic complexity to decrease unemployment and improve the welfare of the public to attain higher growth rates. Because of low rates of literacy among youth in African economies, the lack of access to business opportunities, scarcity of technical skills development, and insufficient entry within technology and markets are some of the trials and tribulations currently facing market participants. Investing in basic education and skills development is a critical consideration for African governments. The SADC government must strive for reforms in education that will give young people an opportunity to freely participate in their countries socio-economic development, and the African Continental Free Trade Area (ACFTA) is regarded as a welcomed socio-economic plan that represents an important milestone for strengthening the skills of the African labour force by means of technical and vocational education, stemming-based education, as well as achieving an economically unified African continent.

Finally, governments in the region should enhance macroeconomic policies including fiscal and monetary policies, financial system guidelines, and FDI policies that will in general result in economic expansions.

5.4 Limitations and future research

The research had limitations concerning the availability of recent data. The study used data for over 18 years for the period 2000 to 2017, which can be observed as average when studying the variables. This constraint may have an impact on the study's validity, even though it was imposed as a result of limited data. Again, this study used data collected from the World Bank Indicators (for FDI, M2G, DCBS, DCPS) and Observatory of Economic Complexity for economic complexity index (ECI) variables. Therefore, the study suggests a sequel study using a dataset extracted from a diverse yet reliable institution.

In addition, the research focused on five SADC countries namely; South Africa, Angola, Mozambique, Zambia and Mozambique. It is further proposed that future researchers contemplate applying the methodology used in this research to further study other SADC countries to augment and enrich the findings and provide more room for generalizability. Lastly, the study recommends that future researchers explore the link between FDI, financial sector development, economic complexity index, and economic growth in SADC using alternative measures for financial sector development that leads to economic growth. Nonetheless, these restrictions make a momentous contribution to the policymakers in SADC

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APPENDICES

APPENDIX A: Data

YEAR	COUNTRIES	GDP	FDI	M2G	DCBS	DCPS	ECI
2000	SOUTH AFRICA	2.742091	0.710489	7.215057	67.3355	130.3122	0.195963
2001	SOUTH AFRICA	1.339791	5.983088	20.18988	74.43265	138.7925	0.102827
2002	SOUTH AFRICA	2.397943	1.281417	18.28619	56.03039	110.7184	0.055371
2003	SOUTH AFRICA	1.696827	0.446853	13.3506	60.77204	115.8622	0.128366
2004	SOUTH AFRICA	3.289033	0.306847	13.153	62.50478	126.9323	0.094685
2005	SOUTH AFRICA	3.982017	2.530185	20.69745	65.90211	138.1594	0.16654
2006	SOUTH AFRICA	4.277783	0.229458	22.62301	73.62445	156.9762	0.237984
2007	SOUTH AFRICA	4.0085	2.199873	23.93114	78.29413	160.1248	0.165269
2008	SOUTH AFRICA	1.823488	3.447025	14.73821	76.68677	140.3499	0.142773
2009	SOUTH AFRICA	-2.89873	2.576386	1.761086	74.59646	145.9412	0.074112
2010	SOUTH AFRICA	1.551073	0.983959	6.93403	70.3518	148.9814	0.119045
2011	SOUTH AFRICA	1.720714	0.994025	8.341285	67.5855	139.6023	0.016592
2012	SOUTH AFRICA	0.607949	1.167218	5.17173	68.6289	146.4798	0.023795
2013	SOUTH AFRICA	0.852685	2.245366	5.916591	67.27128	149.2337	0.192079
2014	SOUTH AFRICA	0.247279	1.65175	7.279488	67.05985	150.974	0.204966
2015	SOUTH AFRICA	-0.34168	0.479227	10.32365	68.23917	147.5125	0.303549
2016	SOUTH AFRICA	-1.06087	0.747553	6.079449	66.60169	143.8161	0.28477
2017	SOUTH AFRICA	-0.00314	0.589766	6.425536	65.56686	147.4725	0.268797
2000	ANGOLA	-0.26794	9.623866	303.7355	1.96654	2.013643	1.67367
2001	ANGOLA	0.822114	24.00912	163.0031	3.618374	3.781287	1.71443
2002	ANGOLA	9.943764	11.40619	156.3407	3.435114	3.540243	2.04759
2003	ANGOLA	-0.43185	20.08101	68.09831	3.976135	4.088375	2.06924
2004	ANGOLA	7.187036	9.329241	48.55197	4.399056	4.55887	0.705732
2005	ANGOLA	11.03084	3.526655	60.70599	4.20355	4.294901	0.787959
2006	ANGOLA	7.582329	0.072001	59.85093	6.425598	6.501748	0.798225
2007	ANGOLA	9.890012	1.368762	49.42144	9.774761	9.837921	1.91304
2008	ANGOLA	7.116873	1.896315	104.5661	12.01045	12.05789	1.95195
2009	ANGOLA	-2.80863	3.136662	21.47568	22.99582	23.05224	1.96257
2010	ANGOLA	1.079169	3.85111	5.287801	19.55293	19.89537	2.01309
2011	ANGOLA	-0.22085	2.704875	37.14696	18.78511	18.7942	2.09087
2012	ANGOLA	4.706459	1.143768	4.898187	20.00368	20.05231	2.79136
2013	ANGOLA	1.292086	5.208123	14.1466	21.34117	21.36958	2.79136
2014	ANGOLA	1.219833	2.510095	16.1892	19.88676	19.91114	2.79136
2015	ANGOLA	-2.46872	8.630605	11.77631	24.01078	25.22379	1.25745
2016	ANGOLA	-5.81624	0.177523	14.30269	19.86433	21.02138	1.16876
2017	ANGOLA	-3.4099	6.057209	-0.10915	15.42708	16.50057	1.3177
2000	MOZAMBIQUE	-1.00664	2.77486	38.31705	14.38426	14.38426	0.308848
2001	MOZAMBIQUE	9.566337	5.358088	14.89744	10.73481	10.73481	0.754133
2002	MOZAMBIQUE	5.650008	6.908162	37.16404	10.75671	10.75861	0.949386
2003	MOZAMBIQUE	3.377143	6.015306	15.29426	9.503389	9.507173	1.20899

2004	MOZAMBIQUE	4.673583	3.581831	5.910358	7.861918	7.894423	1.34734
2005	MOZAMBIQUE	5.625863	1.584881	26.98408	10.04484	10.08591	1.1731
2006	MOZAMBIQUE	6.796373	3.021406	23.34153	11.18091	11.31885	1.2241
2007	MOZAMBIQUE	4.485773	4.448605	24.2473	11.46383	11.59104	1.27774
2008	MOZAMBIQUE	3.981855	5.579891	20.30454	15.61026	15.75016	1.30539
2009	MOZAMBIQUE	3.480668	8.523883	32.64385	21.83263	21.97394	1.27566
2010	MOZAMBIQUE	3.799814	12.39338	24.59658	24.18244	24.33055	1.34061
2011	MOZAMBIQUE	4.212806	27.9026	7.787865	23.04678	23.2905	1.3111
2012	MOZAMBIQUE	4.287151	36.91447	29.3538	24.21258	24.52223	1.16195
2013	MOZAMBIQUE	4.215587	41.80964	16.34935	27.91815	28.19437	1.22607
2014	MOZAMBIQUE	4.478859	29.47211	22.19935	31.68311	31.99914	1.2084
2015	MOZAMBIQUE	3.614625	26.14033	26.08796	34.82162	35.10839	1.18598
2016	MOZAMBIQUE	0.82546	28.7068	10.10656	34.26408	34.60695	1.18114
2017	MOZAMBIQUE	0.771155	18.32981	5.087504	25.36047	25.64272	1.24908
2000	ZAMBIA	1.150423	3.379914	73.76266	7.370214	7.689139	0.990725
2001	ZAMBIA	2.595847	3.541352	8.713283	6.359769	6.647937	1.10573
2002	ZAMBIA	1.843714	7.114949	28.16651	5.298506	5.574176	0.99658
2003	ZAMBIA	4.236897	7.078975	24.9776	5.850616	6.000673	1.09653
2004	ZAMBIA	4.309021	5.851719	31.95664	6.931283	7.046257	0.934754
2005	ZAMBIA	4.471509	4.284032	3.254967	6.529001	6.632026	0.925683
2006	ZAMBIA	5.091501	4.827129	44.04809	8.080419	8.169716	1.17274
2007	ZAMBIA	5.497427	9.418112	25.26646	9.624809	9.704924	0.921299
2008	ZAMBIA	4.875226	5.240508	23.22862	12.17331	12.23645	0.984426
2009	ZAMBIA	6.190402	4.53278	7.661231	9.953457	10.00855	1.06916
2010	ZAMBIA	7.129784	8.533198	29.85908	9.148021	9.197936	1.01419
2011	ZAMBIA	2.423934	4.725044	21.70198	10.01172	13.69262	0.750633
2012	ZAMBIA	4.310372	6.789299	17.85943	11.93316	15.85883	0.621731
2013	ZAMBIA	1.811958	7.48713	20.79158	11.64177	15.81703	0.731336
2014	ZAMBIA	1.478424	5.553462	12.61809	13.33064	17.08819	0.544915
2015	ZAMBIA	-0.18863	7.481503	35.19247	15.67778	19.76482	0.219831
2016	ZAMBIA	0.687321	3.163072	-5.70227	12.05943	15.44212	0.367271
2017	ZAMBIA	0.39574	3.347373	21.35615	11.14195	11.17738	0.514087
2000	ZIMBABWE	-3.5386	0.346788	45.66668	20.877	27.11122	0.450373
2001	ZIMBABWE	1.078594	0.056069	84.32734	27.11921	34.52131	0.48607
2002	ZIMBABWE	-9.12553	0.408381	191.8041	84.05232	103.6323	0.53834
2003	ZIMBABWE	-17.1886	0.066346	-58.1724	52.98784	57.02995	0.343785
2004	ZIMBABWE	-6.10288	0.149855	-54.6852	16.92688	18.02473	0.373302
2005	ZIMBABWE	-6.15445	1.786206	-54.6852	16.92688	18.02473	0.395862
2006	ZIMBABWE	-4.08726	0.734768	-54.6852	16.92688	18.02473	0.404289
2007	ZIMBABWE	-4.44284	1.301978	-54.6852	16.92688	18.02473	0.495619
2008	ZIMBABWE	-18.4911	1.168557	-54.6852	16.92688	18.02473	0.452638
2009	ZIMBABWE	10.7013	1.086305	-54.6852	6.951474	7.159107	0.66792
2010	ZIMBABWE	18.06597	1.018022	61.07299	13.43123	13.54363	0.803228
2011	ZIMBABWE	12.45286	2.441511	31.1928	18.88449	18.98324	0.918402

2012	ZIMBABWE	14.70117	2.044131	27.47967	20.08229	20.14062	1.00205
2013	ZIMBABWE	0.192501	1.95406	4.551321	18.71355	18.73191	1.04674
2014	ZIMBABWE	0.596198	2.425173	12.58116	19.18737	19.21037	0.844104
2015	ZIMBABWE	0.100456	1.999687	8.201895	18.04435	18.31569	0.697917
2016	ZIMBABWE	-0.79357	1.669274	19.04805	17.01864	17.09856	0.707958
2017	ZIMBABWE	3.186399	1.083538	38.64649	16.19098	16.30397	0.811801

APPENDIX B: FORMAL PANEL UNIT ROOT TEST RESULTS

APPENDIX B1: Levin, Lin & Chu unit root tests

<u>GDP at Level</u>

Individual Intercept

Null Hypothesis: Unit root (common unit root process)
Series: GDP
Date: 10/09/20 Time: 11:46
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	0.2543 1	0.6004

** Probabilities are computed assuming asympotic normality

Intermediate results on GDP

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-0.49856	2.6623	0.3016	1	1	14.0	16
ANGOLA	-0.42239	21.344	8.8893	1	1	6.0	16
MOZAMBIQUE	-0.52029	1.3862	3.3777	1	1	11.0	16
ZAMBIA	-0.14419	2.2046	1.5887	1	1	1.0	16
ZIMBABWE	-0.53421	77.709	16.723	1	1	9.0	16

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.39635	-3.516	1.014	-0.554	0.919		80

Individual Intercept and Trend

Null Hypothesis: Unit root (common unit root process)
Series: GDP
Date: 10/09/20 Time: 12:54
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1

Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-2.19974	0.0139

** Probabilities are computed assuming asympotic normality

Intermediate results on GDP

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-0.95151	1.8731	0.2955	1	1	14.0	16
ANGOLA	-0.89952	12.860	2.5060	1	1	12.0	16
MOZAMBIQUE	-0.97916	1.0554	0.9043	1	1	16.0	16
ZAMBIA	-0.28225	1.5182	0.7711	1	1	4.0	16
ZIMBABWE	-0.79367	64.968	16.893	1	1	9.0	16
	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.66565	-5.753	1.047	-0.703	1.003		80

NONE

Null Hypothesis: Unit root (common unit root process)
Series: GDP
Date: 10/09/20 Time: 12:57
Sample: 2000 2017
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-2.82710	0.0023

** Probabilities are computed assuming asympotic normality

Intermediate results on GDP

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-0.29057	2.8752	0.7177	1	1	11.0	16
ANGOLA	-0.29641	21.914	8.8336	1	1	5.0	16
MOZAMBIQUE	-0.14128	1.5901	3.1830	1	1	12.0	16
ZAMBIA	-0.06280	2.2314	1.5957	1	1	1.0	16
ZIMBABWE	-0.53292	77.735	19.447	1	1	9.0	16
	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.15237	-2.953	1.026	0.004	1.049		80

GDP at 1ST Difference

Individual intercept

Null Hypothesis: Unit root (common unit root process)
Series: D(GDP)
Date: 10/09/20 Time: 12:58
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-3.21093	0.0007

** Probabilities are computed assuming asympotic normality

Intermediate results on D(GDP)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-1.54959	3.1584	0.6800	1	1	12.0	15
ANGOLA	-1.73102	17.580	4.3002	1	1	15.0	15
MOZAMBIQUE	-1.21530	1.0362	7.8874	1	1	6.0	15
ZAMBIA	-1.21881	2.3683	1.3342	1	1	4.0	15
ZIMBABWE	-1.47372	93.435	18.508	1	1	10.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-1.40180	-9.098	1.012	-0.554	0.919		75

Individual intercept and Trend

Null Hypothesis: Unit root (common unit root process)
Series: D(GDP)
Date: 10/09/20 Time: 12:59
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-1.69376	0.0452

** Probabilities are computed assuming asympotic normality

Intermediate results on D(GDP)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-1.57775	3.1287	0.6803	1	1	12.0	15
ANGOLA	-1.88753	16.626	3.7266	1	1	15.0	15
MOZAMBIQUE	-1.24937	0.8912	7.1853	1	1	5.0	15
ZAMBIA	-2.05059	1.6505	1.2857	1	1	4.0	15

ZIMBABWE	-1.47433	93.001	18.986	1	1	10.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-1.51185	-9.716	1.023	-0.703	1.003		75

NONE

Null Hypothesis: Unit root (common unit root process)
Series: D(GDP)
Date: 10/09/20 Time: 13:00
Sample: 2000 2017
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-8.43591	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on D(GDP)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-1.51684	3.2249	0.7286	1	1	12.0	15
ANGOLA	-1.69343	18.905	4.2272	1	1	15.0	15
MOZAMBIQUE	-1.14762	1.0935	8.8444	1	1	5.0	15
ZAMBIA	-1.20246	2.3850	1.3121	1	1	3.0	15
ZIMBABWE	-1.47260	94.160	18.515	1	1	10.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-1.35514	-8.804	1.013	0.004	1.049		75

Foreign Direct Investment (FDI)

Levin, Lin and Chu

Individual Intercept

Null Hypothesis: Unit root (common unit root process)
Series: FDI
Date: 08/09/21 Time: 21:35
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-2.42106	0.0077

** Probabilities are computed assuming asympotic normality

Intermediate results on FDI

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-1.14025	0.8029	0.3478	1	1	16.0	16
ANGOLA	-0.38750	12.226	23.468	1	1	2.0	16
MOZAMBIQUE	-0.18273	30.886	50.015	1	1	1.0	16
ZAMBIA	-1.75343	2.3969	1.3139	1	1	11.0	16
ZIMBABWE	-0.35116	0.3086	0.1522	1	1	6.0	16

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.41894	-4.891	1.164	-0.554	0.919		80

Individual Intercept and Trend

Null Hypothesis: Unit root (common unit root process)
Series: FDI
Date: 08/09/21 Time: 21:38
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-0.43861	0.3305

** Probabilities are computed assuming asympotic normality

Intermediate results on FDI

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-1.19074	0.7884	0.2560	1	1	16.0	16
ANGOLA	-0.32534	12.082	22.610	1	1	2.0	16
MOZAMBIQUE	-0.39042	27.687	49.368	1	1	1.0	16
ZAMBIA	-1.69445	2.3682	0.7995	1	1	8.0	16
ZIMBABWE	-0.86739	0.2850	0.0850	1	1	10.0	16

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.66871	-5.452	1.100	-0.703	1.003		80

None

Null Hypothesis: Unit root (common unit root process)
Series: FDI
Date: 08/09/21 Time: 21:40

Sample: 2000 2017
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-2.80025	0.0026

** Probabilities are computed assuming asympotic normality

Intermediate results on FDI

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-0.42575	1.4276	0.3515	1	1	16.0	16
ANGOLA	-0.29936	12.703	23.934	1	1	2.0	16
MOZAMBIQUE	-0.07568	34.401	52.158	1	1	1.0	16
ZAMBIA	-0.05797	5.8407	1.3137	1	1	11.0	16
ZIMBABWE	-0.03246	0.3824	0.1791	1	1	5.0	16
	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.13827	-2.926	1.051	0.004	1.049		80

Foreign Direct Investment at 1st DIFFERENCE

Individual Intercept

Null Hypothesis: Unit root (common unit root process)
Series: D(FDI)
Date: 08/09/21 Time: 21:41
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-1.95583	0.0252

** Probabilities are computed assuming asympotic normality

Intermediate results on D(FDI)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-1.43094	1.3317	2.6906	1	1	6.0	15
ANGOLA	-0.98491	15.587	42.828	1	1	1.0	15
MOZAMBIQUE	-0.71573	38.285	13.809	1	1	10.0	15
ZAMBIA	-2.20283	3.9448	1.2702	1	1	7.0	15

ZIMBABWE	-1.80815	0.3765	0.1091	1	1	11.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-1.37411	-7.865	1.070	-0.554	0.919		75

Individual Intercept and Trend

Null Hypothesis: Unit root (common unit root process)
Series: D(FDI)
Date: 08/09/21 Time: 21:44
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	- 0.84319	0.1996

** Probabilities are computed assuming asympotic normality

Intermediate results on D(FDI)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-1.41988	1.3259	3.0701	1	1	5.0	15
ANGOLA	-1.22482	13.958	41.749	1	1	1.0	15
MOZAMBIQUE	-0.70456	37.165	5.6122	1	1	14.0	15
ZAMBIA	-2.35225	3.4277	1.2717	1	1	7.0	15
ZIMBABWE	-1.90056	0.3345	0.0793	1	1	10.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-1.46131	-8.321	1.083	-0.703	1.003		75

None

Null Hypothesis: Unit root (common unit root process)
Series: D(FDI)
Date: 08/09/21 Time: 21:47
Sample: 2000 2017
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**

Levin, Lin & Chu t*	-7.38663	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on D(FDI)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-1.40308	1.3467	2.7642	1	1	6.0	15
ANGOLA	-0.88463	16.146	42.990	1	1	1.0	15
MOZAMBIQUE	-0.69707	38.378	16.098	1	1	9.0	15
ZAMBIA	-2.21125	3.9594	1.2693	1	1	7.0	15
ZIMBABWE	-1.69579	0.3925	0.1126	1	1	11.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-1.31671	-7.706	1.076	0.004	1.049		75

BROAD MONEY GROWTH (M2G) at Level

Individual Intercept

Null Hypothesis: Unit root (common unit root process)
Series: M2G
Date: 08/09/21 Time: 22:28
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-1.74636	0.0404

** Probabilities are computed assuming asympotic normality

Intermediate results on M2G

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-0.40309	18.992	17.688	1	1	7.0	16
ANGOLA	-0.49155	634.62	1751.4	1	1	1.0	16
MOZAMBIQUE	-1.44286	81.698	26.520	1	1	11.0	16
ZAMBIA	-1.54194	109.68	266.31	1	1	2.0	16
ZIMBABWE	-0.69329	3602.7	1085.8	1	1	8.0	16

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.59237	-5.820	1.065	-0.554	0.919		80

Individual Intercept and Trends

Null Hypothesis: Unit root (common unit root process)
Series: M2G
Date: 08/09/21   Time: 22:31
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	- 0.31079	0.3780

** Probabilities are computed assuming asympotic normality

Intermediate results on M2G

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-0.68295	15.784	17.142	1	1	6.0	16
ANGOLA	-0.73738	551.02	1216.0	1	1	1.0	16
MOZAMBIQUE	-1.57478	70.127	26.656	1	1	11.0	16
ZAMBIA	-2.13514	70.393	257.66	1	1	2.0	16
ZIMBABWE	-0.66905	3512.9	462.94	1	1	14.0	16

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.91248	-6.983	1.093	-0.703	1.003		80

NONE

Null Hypothesis: Unit root (common unit root process)
Series: D(M2G)
Date: 08/10/21   Time: 18:05
Sample: 2000 2017
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	- 9.06496	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on D(M2G)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-1.21965	20.980	15.179	1	1	15.0	15
ANGOLA	-0.92290	1226.0	1217.6	1	1	15.0	15
MOZAMBIQUE	-2.21387	98.194	91.817	1	1	7.0	15
ZAMBIA	-2.28814	168.70	700.53	1	1	1.0	15

ZIMBABWE	-1.64076	4197.8	837.19	1	1	15.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-1.54681	-9.464	1.078	0.004	1.049		75

Broad Money Growth at 1st Difference

Null Hypothesis: Unit root (common unit root process)
Series: D(M2G)
Date: 08/09/21 Time: 22:35
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	- 4.28031	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on D(M2G)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-1.23512	20.668	11.387	1	1	15.0	15
ANGOLA	-1.07795	1152.1	752.28	1	1	15.0	15
MOZAMBIQUE	-2.25105	90.471	91.224	1	1	7.0	15
ZAMBIA	-2.33428	163.88	687.03	1	1	1.0	15
ZIMBABWE	-1.66155	4038.6	842.62	1	1	15.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-1.63211	-9.959	1.069	-0.554	0.919		75

Individual Intercept and Trends

Null Hypothesis: Unit root (common unit root process)
Series: D(M2G)
Date: 08/09/21 Time: 22:36
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**

		Statistic	Prob.**
Levin, Lin & Chu t*		-3.78879	0.0001

** Probabilities are computed assuming asympotic normality

Intermediate results on D(M2G)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-1.23823	20.633	5.3875	1	1	15.0	15
ANGOLA	-1.31828	1062.9	517.35	1	1	9.0	15
MOZAMBIQUE	-2.25085	90.414	73.390	1	1	7.0	15
ZAMBIA	-2.31870	160.45	664.60	1	1	1.0	15
ZIMBABWE	-1.81260	2786.1	754.87	1	1	15.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-1.73394	-10.856	1.055	-0.703	1.003		75

NONE

Null Hypothesis: Unit root (common unit root process)
Series: D(M2G)
Date: 08/09/21 Time: 22:38
Sample: 2000 2017
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-9.06496	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on D(M2G)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-1.21965	20.980	15.179	1	1	15.0	15
ANGOLA	-0.92290	1226.0	1217.6	1	1	15.0	15
MOZAMBIQUE	-2.21387	98.194	91.817	1	1	7.0	15
ZAMBIA	-2.28814	168.70	700.53	1	1	1.0	15
ZIMBABWE	-1.64076	4197.8	837.19	1	1	15.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-1.54681	-9.464	1.078	0.004	1.049		75

Domestic Credit to Banking Sector (DCBS) at Level

Individual Intercept

Null Hypothesis: Unit root (common unit root process)
Series: DCBS
Date: 08/11/21 Time: 02:34
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	- 1.98402	0.0236

** Probabilities are computed assuming asympotic normality

Intermediate results on DCBS

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-0.49813	22.793	24.572	1	1	1.0	16
ANGOLA	-0.15439	11.323	11.197	1	1	1.0	16
MOZAMBIQUE	-0.18280	7.0616	11.650	1	1	0.0	16
ZAMBIA	-0.22292	2.4305	1.0070	1	1	6.0	16
ZIMBABWE	-0.69303	238.58	37.264	1	1	16.0	16
	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.22368	-3.897	1.034	-0.554	0.919		80

Individual intercept and trend

Null Hypothesis: Unit root (common unit root process)
Series: DCBS
Date: 08/11/21 Time: 02:36
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	0.3463 3	0.6355

** Probabilities are computed assuming asympotic normality

Intermediate results on DCBS

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-0.52919	22.209	24.552	1	1	1.0	16
ANGOLA	-0.34204	11.069	10.019	1	1	1.0	16
MOZAMBIQUE	-0.42271	6.5310	11.639	1	1	0.0	16

ZAMBIA	-1.29113	1.3204	0.9890	1	1	6.0	16
ZIMBABWE	-1.03118	178.13	37.973	1	1	16.0	16

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.69073	-5.553	1.052	-0.703	1.003		80

NONE

Null Hypothesis: Unit root (common unit root process)
Series: DCBS
Date: 08/11/21 Time: 02:37
Sample: 2000 2017
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	- 0.70361	0.2408

** Probabilities are computed assuming asympotic normality

Intermediate results on DCBS

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-0.01076	28.651	24.631	1	1	1.0	16
ANGOLA	0.00261	13.378	12.754	1	1	0.0	16
MOZAMBIQUE	-0.02921	9.1452	16.307	1	1	1.0	16
ZAMBIA	0.01104	2.8891	2.1274	1	1	4.0	16
ZIMBABWE	-0.22490	313.08	40.352	1	1	16.0	16

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.01175	-0.734	1.015	0.004	1.049		80

Domestic Credit to Banking Sector (DCBS) at 1st Difference

Individual intercept

Null Hypothesis: Unit root (common unit root process)
Series: D(DCBS)
Date: 08/11/21 Time: 02:38
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 75

Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	- 7.42884	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on D(DCBS)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-0.90021	10.043	7.9625	1	1	11.0	15
ANGOLA	-1.16334	13.511	2.2593	1	1	15.0	15
MOZAMBIQUE	-0.66847	7.7778	11.333	1	1	2.0	15
ZAMBIA	-1.65562	2.3100	0.7210	1	1	12.0	15
ZIMBABWE	-1.56194	71.720	72.435	1	1	9.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-1.28629	-10.501	1.062	-0.554	0.919		75

Individual intercept and trend

Null Hypothesis: Unit root (common unit root process)
Series: D(DCBS)
Date: 08/11/21 Time: 02:38
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	- 10.0769	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on D(DCBS)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-0.88203	6.7706	9.7389	1	1	9.0	15
ANGOLA	-1.19288	12.073	1.3685	1	1	15.0	15
MOZAMBIQUE	-0.52439	7.6199	3.5504	1	1	7.0	15
ZAMBIA	-1.60669	2.2819	0.3760	1	1	10.0	15
ZIMBABWE	-1.53508	33.998	69.323	1	1	9.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-1.33199	-13.661	1.083	-0.703	1.003		75

NONE

Null Hypothesis: Unit root (common unit root process)
Series: D(DCBS)
Date: 08/11/21   Time: 02:39
Sample: 2000 2017
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-8.80860	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on D(DCBS)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-0.91229	10.458	8.8942	1	1	11.0	15
ANGOLA	-0.93160	14.209	3.3307	1	1	15.0	15
MOZAMBIQUE	-0.58931	7.8478	11.414	1	1	2.0	15
ZAMBIA	-1.36730	2.7428	0.7206	1	1	12.0	15
ZIMBABWE	-1.55063	93.806	73.000	1	1	9.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-1.15885	-9.214	1.064	0.004	1.049		75

Domestic Credit to Private Sector (DCPS) at Level

Individual intercept

Null Hypothesis: Unit root (common unit root process)
Series: DCPS
Date: 08/11/21   Time: 02:57
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-2.14190	0.0161

** Probabilities are computed assuming asympotic normality

Intermediate results on DCPS

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-0.41201	102.75	34.586	1	1	6.0	16
ANGOLA	-0.15142	11.891	10.475	1	1	2.0	16
MOZAMBIQUE	-0.18143	7.0822	11.697	1	1	0.0	16

ZAMBIA	-0.22419	4.3877	5.1236	1	1	3.0	16
ZIMBABWE	-0.64259	379.45	52.112	1	1	16.0	16

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.21802	-3.947	1.026	-0.554	0.919		80

Individual intercept and trend

Null Hypothesis: Unit root (common unit root process)
Series: DCPS
Date: 08/11/21 Time: 02:58
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	0.5917 1	0.7230

** Probabilities are computed assuming asympotic normality

Intermediate results on DCPS

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-0.74879	81.596	31.044	1	1	6.0	16
ANGOLA	-0.45053	11.279	9.4554	1	1	2.0	16
MOZAMBIQUE	-0.41588	6.5798	11.687	1	1	0.0	16
ZAMBIA	-1.04614	3.1082	5.0937	1	1	3.0	16
ZIMBABWE	-1.01304	288.69	53.831	1	1	16.0	16

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.70300	-5.564	1.028	-0.703	1.003		80

None

Null Hypothesis: Unit root (common unit root process)
Series: DCPS
Date: 08/11/21 Time: 02:59
Sample: 2000 2017
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**

	Statistic	Prob.**
Levin, Lin & Chu t*	- 0.41978	0.3373

** Probabilities are computed assuming asympotic normality

Intermediate results on DCPS

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	0.00140	126.90	45.462	1	1	5.0	16
ANGOLA	0.00726	14.066	13.443	1	1	0.0	16
MOZAMBIQUE	-0.02952	9.1732	16.407	1	1	1.0	16
ZAMBIA	-0.01764	5.2790	5.5755	1	1	3.0	16
ZIMBABWE	-0.25351	466.40	62.650	1	1	16.0	16

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.00726	-0.436	1.017	0.004	1.049		80

Domestic Credit to Private Sector (DCPS) at 1st Difference

Individual intercept and trend

Null Hypothesis: Unit root (common unit root process)
Series: D(DCPS)
Date: 08/11/21 Time: 03:00
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	- 7.26715	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on D(DCPS)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-1.22616	69.728	21.601	1	1	12.0	15
ANGOLA	-1.29627	13.929	2.4119	1	1	15.0	15
MOZAMBIQUE	-0.65669	7.8521	11.364	1	1	2.0	15
ZAMBIA	-1.58403	4.0474	2.3133	1	1	11.0	15
ZIMBABWE	-1.60380	122.11	103.49	1	1	10.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-1.38596	-10.562	1.040	-0.554	0.919		75

Individual intercept and trend

Null Hypothesis: Unit root (common unit root process)
Series: D(DCPS)
Date: 08/11/21 Time: 03:01
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	- 10.6307	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on D(DCPS)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-1.23554	59.273	19.099	1	1	13.0	15
ANGOLA	-1.29186	12.729	1.5056	1	1	15.0	15
MOZAMBIQUE	-0.50016	7.6693	3.5752	1	1	7.0	15
ZAMBIA	-1.51077	3.9898	1.0672	1	1	8.0	15
ZIMBABWE	-1.58647	54.359	98.534	1	1	10.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-1.46052	-14.123	1.044	-0.703	1.003		75

None

Null Hypothesis: Unit root (common unit root process)
Series: D(DCPS)
Date: 08/11/21 Time: 03:01
Sample: 2000 2017
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	- 8.61963	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on D(DCPS)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs

SOUTH AFRICA	-1.19474	77.047	22.124	1	1	12.0	15
ANGOLA	-0.99903	15.006	3.5072	1	1	15.0	15
MOZAMBIQUE	-0.57907	7.9175	11.447	1	1	2.0	15
ZAMBIA	-1.28278	4.6201	2.4734	1	1	11.0	15
ZIMBABWE	-1.58251	161.69	104.09	1	1	10.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-1.21998	-9.015	1.054	0.004	1.049		75

Economic Complexity Index (ECI) at Level

Individual intercept

Null Hypothesis: Unit root (common unit root process)
Series: ECI
Date: 08/11/21 Time: 03:15
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-0.56331	0.2866

** Probabilities are computed assuming asympotic normality

Intermediate results on ECI

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-0.37798	0.0042	0.0048	1	1	1.0	16
ANGOLA	-0.54680	0.2785	0.3649	1	1	1.0	16
MOZAMBIQUE	-0.58527	0.0045	0.0313	1	1	2.0	16
ZAMBIA	-0.15998	0.0252	0.0044	1	1	16.0	16
ZIMBABWE	-0.15798	0.0109	0.0149	1	1	1.0	16

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.32943	-4.415	1.046	-0.554	0.919		80

individual intercept and trend

Null Hypothesis: Unit root (common unit root process)
Series: ECI
Date: 08/11/21 Time: 03:15
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	- 0.73027	0.2326

** Probabilities are computed assuming asympotic normality

Intermediate results on ECI

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-0.48914	0.0038	0.0040	1	1	2.0	16
ANGOLA	-0.61247	0.2716	0.3566	1	1	1.0	16
MOZAMBIQUE	-0.57398	0.0042	0.0159	1	1	1.0	16
ZAMBIA	-0.66277	0.0190	0.0041	1	1	12.0	16
ZIMBABWE	-0.45232	0.0084	0.0149	1	1	1.0	16

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.54637	-6.376	1.004	-0.703	1.003		80

None

Null Hypothesis: Unit root (common unit root process)
Series: ECI
Date: 08/11/21 Time: 03:16
Sample: 2000 2017
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	- 0.40743	0.3418

** Probabilities are computed assuming asympotic normality

Intermediate results on ECI

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-0.01282	0.0050	0.0053	1	1	0.0	16
ANGOLA	-0.06338	0.3667	0.3660	1	1	1.0	16
MOZAMBIQUE	0.00503	0.0095	0.0372	1	1	2.0	16
ZAMBIA	-0.05990	0.0258	0.0160	1	1	16.0	16
ZIMBABWE	0.00575	0.0124	0.0157	1	1	1.0	16

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.00720	-0.421	1.014	0.004	1.049		80

Economic Complexity Index (ECI) at 1st Difference

Individual intercept

Null Hypothesis: Unit root (common unit root process)
Series: D(ECI)
Date: 08/11/21 Time: 03:17
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	- 2.75334	0.0029

** Probabilities are computed assuming asympotic normality

Intermediate results on D(ECI)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-1.20599	0.0049	0.0014	1	1	10.0	15
ANGOLA	-1.08016	0.3935	0.3713	1	1	2.0	15
MOZAMBIQUE	-0.72325	0.0093	0.0074	1	1	15.0	15
ZAMBIA	-1.92964	0.0209	0.0113	1	1	8.0	15
ZIMBABWE	-0.80193	0.0129	0.0073	1	1	4.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-1.03107	-6.902	1.050	-0.554	0.919		75

Individual Intercept and Trend

Null Hypothesis: Unit root (common unit root process)
Series: D(ECI)
Date: 08/11/21 Time: 03:17
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	- 1.55155	0.0604

** Probabilities are computed assuming asympotic normality

Intermediate results on D(ECI)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-1.25051	0.0049	0.0009	1	1	11.0	15
ANGOLA	-1.09432	0.3925	0.3721	1	1	2.0	15
MOZAMBIQUE	-0.82932	0.0091	0.0027	1	1	8.0	15

ZAMBIA	-2.34470	0.0161	0.0077	1	1	7.0	15
ZIMBABWE	-0.79363	0.0128	0.0098	1	1	3.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*	Obs
Pooled	-1.18175	-6.983	1.074	-0.703	1.003	75

None

Null Hypothesis: Unit root (common unit root process)
Series: D(ECI)
Date: 08/11/21 Time: 03:18
Sample: 2000 2017
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-6.36808	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on D(ECI)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
SOUTH AFRICA	-1.14394	0.0051	0.0015	1	1	10.0	15
ANGOLA	-1.07229	0.3961	0.3707	1	1	2.0	15
MOZAMBIQUE	-0.70314	0.0093	0.0125	1	1	14.0	15
ZAMBIA	-1.58970	0.0258	0.0113	1	1	8.0	15
ZIMBABWE	-0.77349	0.0131	0.0072	1	1	4.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*	Obs
Pooled	-0.95458	-6.647	1.031	0.004	1.049	75

APPENDIX B2: IM, Pesaran and Shin unit root tests

GDP
Individual Intercept

Null Hypothesis: Unit root (individual unit root process)
Series: GDP
Date: 10/09/20 Time: 13:01
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**

Im, Pesaran and Shin W-stat	0.0573 6	0.5229

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
SOUTH AFRICA	-1.7344	0.3966	-1.506	0.992	1	1	16
ANGOLA	-1.2832	0.6103	-1.506	0.992	1	1	16
MOZAMBIQUE	-1.8388	0.3500	-1.506	0.992	1	1	16
ZAMBIA	-0.6289	0.8378	-1.506	0.992	1	1	16
ZIMBABWE	-1.9149	0.3177	-1.506	0.992	1	1	16
Average	-1.4801		-1.506	0.992			

Individual Intercept and Trend

Null Hypothesis: Unit root (individual unit root process)
Series: GDP
Date: 10/09/20 Time: 13:04
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	- 0.75779	0.2243

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
SOUTH AFRICA	-2.9569	0.1727	-2.170	0.949	1	1	16
ANGOLA	-2.8521	0.2013	-2.170	0.949	1	1	16
MOZAMBIQUE	-2.8031	0.2159	-2.170	0.949	1	1	16
ZAMBIA	-1.3655	0.8308	-2.170	0.949	1	1	16
ZIMBABWE	-2.5212	0.3149	-2.170	0.949	1	1	16
Average	-2.4997		-2.170	0.949			

NONE

Null Hypothesis: Unit root (individual unit root process)
Series: D(GDP)
Date: 10/09/20 Time: 13:05
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	- 4.79587	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
SOUTH AFRICA	-3.6011	0.0194	-1.503	1.011	1	1	15
ANGOLA	-4.2782	0.0055	-1.503	1.011	1	1	15
MOZAMBIQUE	-4.3844	0.0046	-1.503	1.011	1	1	15
ZAMBIA	-2.5299	0.1284	-1.503	1.011	1	1	15
ZIMBABWE	-3.5042	0.0232	-1.503	1.011	1	1	15
Average	-3.6595		-1.503	1.011			

GDP at 1st Difference
Individual intercept and trend

Null Hypothesis: Unit root (individual unit root process)
Series: D(GDP)
Date: 10/09/20 Time: 13:06
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	- 3.79260	0.0001

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
SOUTH AFRICA	-3.4620	0.0808	-2.169	0.975	1	1	15
ANGOLA	-4.1415	0.0266	-2.169	0.975	1	1	15
MOZAMBIQUE	-4.6324	0.0118	-2.169	0.975	1	1	15
ZAMBIA	-3.6188	0.0628	-2.169	0.975	1	1	15
ZIMBABWE	-3.3641	0.0942	-2.169	0.975	1	1	15
Average	-3.8438		-2.169	0.975			

Foreign Direct Investment at Level

Individual Intercept

Null Hypothesis: Unit root (individual unit root process)

Series: FDI
Date: 08/09/21 Time: 21:48
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	- 3.06012	0.0011

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
SOUTH AFRICA	-4.4180	0.0039	-1.506	0.992	1	1	16
ANGOLA	-2.3282	0.1756	-1.506	0.992	1	1	16
MOZAMBIQUE	-1.5302	0.4932	-1.506	0.992	1	1	16
ZAMBIA	-4.3989	0.0040	-1.506	0.992	1	1	16
ZIMBABWE	-1.6672	0.4278	-1.506	0.992	1	1	16
Average	-2.8685		-1.506	0.992			

Individual Intercept and Trend

Null Hypothesis: Unit root (individual unit root process)
Series: FDI
Date: 08/09/21 Time: 21:50
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	- 0.87433	0.1910

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
SOUTH AFRICA	-4.1478	0.0246	-2.170	0.949	1	1	16
ANGOLA	-1.3673	0.8302	-2.170	0.949	1	1	16
MOZAMBIQUE	-1.8413	0.6370	-2.170	0.949	1	1	16
ZAMBIA	-3.8467	0.0413	-2.170	0.949	1	1	16
ZIMBABWE	-1.5495	0.7669	-2.170	0.949	1	1	16
Average	-2.5505		-2.170	0.949			

<u>Foreign Direct Investment at 1st Difference</u>

Individual Intercept

Null Hypothesis: Unit root (individual unit root process)
Series: D(FDI)
Date: 08/09/21 Time: 21:51
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-4.21414	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
SOUTH AFRICA	-4.0802	0.0080	-1.503	1.011	1	1	15
ANGOLA	-2.1573	0.2276	-1.503	1.011	1	1	15
MOZAMBIQUE	-1.9716	0.2945	-1.503	1.011	1	1	15
ZAMBIA	-5.2946	0.0009	-1.503	1.011	1	1	15
ZIMBABWE	-3.4860	0.0240	-1.503	1.011	1	1	15
Average	-3.3980		-1.503	1.011			

Individual Intercept and Trend

Null Hypothesis: Unit root (individual unit root process)
Series: D(FDI)
Date: 08/09/21 Time: 21:53
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-2.99161	0.0014

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
SOUTH AFRICA	-3.8483	0.0433	-2.169	0.975	1	1	15
ANGOLA	-2.4573	0.3404	-2.169	0.975	1	1	15
MOZAMBIQUE	-1.8834	0.6132	-2.169	0.975	1	1	15
ZAMBIA	-5.5827	0.0025	-2.169	0.975	1	1	15
ZIMBABWE	-3.6785	0.0571	-2.169	0.975	1	1	15
Average	-3.4901		-2.169	0.975			

Broad Money Growth (M2G) at Level

Individual Intercept

Null Hypothesis: Unit root (individual unit root process)
Series: M2G
Date: 08/10/21 Time: 18:09
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	- 2.84361	0.0022

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
SOUTH AFRICA	-2.0100	0.2799	-1.506	0.992	1	1	16
ANGOLA	-3.2684	0.0345	-1.506	0.992	1	1	16
MOZAMBIQUE	-2.7510	0.0875	-1.506	0.992	1	1	16
ZAMBIA	-3.5211	0.0214	-1.506	0.992	1	1	16
ZIMBABWE	-2.3099	0.1807	-1.506	0.992	1	1	16
Average	-2.7721		-1.506	0.992			

Individual Intercept and trend

Null Hypothesis: Unit root (individual unit root process)
Series: M2G
Date: 08/10/21 Time: 18:10
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-2.33457	0.0098

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
SOUTH AFRICA	-2.6127	0.2796	-2.170	0.949	1	1	16
ANGOLA	-3.1594	0.1270	-2.170	0.949	1	1	16
MOZAMBIQUE	-3.0615	0.1476	-2.170	0.949	1	1	16
ZAMBIA	-4.9524	0.0061	-2.170	0.949	1	1	16
ZIMBABWE	-2.1473	0.4838	-2.170	0.949	1	1	16
Average	-3.1867		-2.170	0.949			

Broad Money Growth (M2G) at 1st difference

Individual Intercept

Null Hypothesis: Unit root (individual unit root process)
Series: D(M2G)
Date: 08/10/21 Time: 18:11
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-6.31183	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
SOUTH AFRICA	-3.8497	0.0123	-1.503	1.011	1	1	15
ANGOLA	-2.8244	0.0784	-1.503	1.011	1	1	15
MOZAMBIQUE	-5.2951	0.0009	-1.503	1.011	1	1	15
ZAMBIA	-5.6094	0.0005	-1.503	1.011	1	1	15
ZIMBABWE	-4.1275	0.0073	-1.503	1.011	1	1	15
Average	-4.3412		-1.503	1.011			

Individual Intercept and Trend

Null Hypothesis: Unit root (individual unit root process)
Series: D(M2G)
Date: 08/10/21 Time: 18:12
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-5.10391	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
SOUTH AFRICA	-3.6900	0.0561	-2.169	0.975	1	1	15
ANGOLA	-2.8821	0.1943	-2.169	0.975	1	1	15
MOZAMBIQUE	-5.0708	0.0057	-2.169	0.975	1	1	15
ZAMBIA	-5.3765	0.0035	-2.169	0.975	1	1	15
ZIMBABWE	-5.0949	0.0055	-2.169	0.975	1	1	15
Average	-4.4228		-2.169	0.975			

Domestic Credit to Banking Sector (DCBS) at Level

Individual intercept

Null Hypothesis: Unit root (individual unit root process)
Series: DCBS
Date: 08/11/21 Time: 02:40
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-0.72190	0.2352

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
SOUTH AFRICA	-1.8634	0.3393	-1.506	0.992	1	1	16
ANGOLA	-1.2804	0.6115	-1.506	0.992	1	1	16
MOZAMBIQUE	-2.0564	0.2626	-1.506	0.992	1	1	16
ZAMBIA	-1.4308	0.5411	-1.506	0.992	1	1	16
ZIMBABWE	-2.5046	0.1326	-1.506	0.992	1	1	16

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Average	-1.8271		-1.506	0.992			

Individual intercept and trend

Null Hypothesis: Unit root (individual unit root process)
Series: DCBS
Date: 08/11/21 Time: 02:41
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-0.29063	0.3857

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
SOUTH AFRICA	-1.8889	0.6135	-2.170	0.949	1	1	16
ANGOLA	-0.9038	0.9299	-2.170	0.949	1	1	16
MOZAMBIQUE	-1.6336	0.7325	-2.170	0.949	1	1	16
ZAMBIA	-3.6175	0.0607	-2.170	0.949	1	1	16
ZIMBABWE	-3.4372	0.0816	-2.170	0.949	1	1	16
Average	-2.2962		-2.170	0.949			

Domestic Credit to Banking Sector (DCBS) at 1st Difference

Individual intercept

Null Hypothesis: Unit root (individual unit root process)
Series: D(DCBS)
Date: 08/11/21 Time: 02:44
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-5.40009	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
SOUTH AFRICA	-3.5335	0.0220	-1.503	1.011	1	1	15
ANGOLA	-2.1609	0.2264	-1.503	1.011	1	1	15
MOZAMBIQUE	-1.6563	0.4316	-1.503	1.011	1	1	15
ZAMBIA	-3.7499	0.0148	-1.503	1.011	1	1	15
ZIMBABWE	-8.5557	0.0000	-1.503	1.011	1	1	15
Average	-3.9312		-1.503	1.011			

Individual intercept and trend

Null Hypothesis: Unit root (individual unit root process)
Series: D(DCBS)
Date: 08/11/21 Time: 02:45
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	- 5.20336	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
SOUTH AFRICA	-4.0343	0.0319	-2.169	0.975	1	1	15
ANGOLA	-2.2416	0.4362	-2.169	0.975	1	1	15
MOZAMBIQUE	-1.0183	0.9095	-2.169	0.975	1	1	15
ZAMBIA	-3.3667	0.0938	-2.169	0.975	1	1	15
ZIMBABWE	-11.673	0.0000	-2.169	0.975	1	1	15
Average	-4.4667		-2.169	0.975			

Domestic Credit to Private Sector (DCPS) at Level

Individual intercept

Null Hypothesis: Unit root (individual unit root process)
Series: DCPS
Date: 08/11/21 Time: 03:02
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1

Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-0.65177	0.2573

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
SOUTH AFRICA	-1.7359	0.3959	-1.506	0.992	1	1	16
ANGOLA	-1.2449	0.6274	-1.506	0.992	1	1	16
MOZAMBIQUE	-2.0596	0.2614	-1.506	0.992	1	1	16
ZAMBIA	-1.6379	0.4416	-1.506	0.992	1	1	16
ZIMBABWE	-2.3011	0.1831	-1.506	0.992	1	1	16
Average	-1.7959		-1.506	0.992			

Individual intercept and trend

Null Hypothesis: Unit root (individual unit root process)
Series: DCPS
Date: 08/11/21 Time: 03:03
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-0.16346	0.4351

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
SOUTH AFRICA	-2.5696	0.2959	-2.170	0.949	1	1	16
ANGOLA	-1.1533	0.8854	-2.170	0.949	1	1	16
MOZAMBIQUE	-1.5972	0.7478	-2.170	0.949	1	1	16
ZAMBIA	-2.6908	0.2520	-2.170	0.949	1	1	16
ZIMBABWE	-3.1931	0.1205	-2.170	0.949	1	1	16
Average	-2.2408		-2.170	0.949			

Domestic Credit to Private Sector (DCPS) at 1st Difference

Individual intercept

Null Hypothesis: Unit root (individual unit root process)
Series: D(DCPS)
Date: 08/11/21 Time: 03:04
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	- 5.33703	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
SOUTH AFRICA	-4.0413	0.0086	-1.503	1.011	1	1	15
ANGOLA	-2.3792	0.1631	-1.503	1.011	1	1	15
MOZAMBIQUE	-1.6135	0.4517	-1.503	1.011	1	1	15
ZAMBIA	-3.4013	0.0281	-1.503	1.011	1	1	15
ZIMBABWE	-8.0790	0.0000	-1.503	1.011	1	1	15
Average	-3.9029		-1.503	1.011			

Individual intercept and trends

Null Hypothesis: Unit root (individual unit root process)
Series: D(DCPS)
Date: 08/11/21 Time: 03:05
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	- 5.02951	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
SOUTH AFRICA	-4.2276	0.0231	-2.169	0.975	1	1	15
ANGOLA	-2.3746	0.3754	-2.169	0.975	1	1	15
MOZAMBIQUE	-0.9627	0.9189	-2.169	0.975	1	1	15
ZAMBIA	-2.9235	0.1831	-2.169	0.975	1	1	15
ZIMBABWE	-11.461	0.0000	-2.169	0.975	1	1	15
Average	-4.3900		-2.169	0.975			

<u>Economic Complexity Index (ECI) at Level</u>

Individual Intercept

Null Hypothesis: Unit root (individual unit root process)
Series: ECI
Date: 08/11/21 Time: 03:19
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	- 0.88089	0.1892

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
SOUTH AFRICA	-1.4622	0.5261	-1.506	0.992	1	1	16
ANGOLA	-2.1855	0.2181	-1.506	0.992	1	1	16
MOZAMBIQUE	-3.7764	0.0132	-1.506	0.992	1	1	16
ZAMBIA	-0.8658	0.7717	-1.506	0.992	1	1	16
ZIMBABWE	-1.1998	0.6471	-1.506	0.992	1	1	16
Average	-1.8979		-1.506	0.992			

Individual Intercept and Trend

Null Hypothesis: Unit root (individual unit root process)
Series: ECI
Date: 08/11/21 Time: 03:20
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	- 0.56770	0.2851

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross						Max	

section	t-Stat	Prob.	E(t)	E(Var)	Lag	Lag	Obs
SOUTH AFRICA	-1.7933	0.6599	-2.170	0.949	1	1	16
ANGOLA	-2.1619	0.4766	-2.170	0.949	1	1	16
MOZAMBIQUE	-3.6491	0.0576	-2.170	0.949	1	1	16
ZAMBIA	-2.1809	0.4673	-2.170	0.949	1	1	16
ZIMBABWE	-2.2994	0.4109	-2.170	0.949	1	1	16
Average	-2.4169		-2.170	0.949			

Economic Complexity Index (ECI) at 1st Difference

Individual Intercept

Null Hypothesis: Unit root (individual unit root process)
Series: D(ECI)
Date: 08/11/21 Time: 03:21
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-3.36163	0.0004

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
SOUTH AFRICA	-2.9944	0.0583	-1.503	1.011	1	1	15
ANGOLA	-2.7070	0.0958	-1.503	1.011	1	1	15
MOZAMBIQUE	-2.7243	0.0930	-1.503	1.011	1	1	15
ZAMBIA	-4.4290	0.0042	-1.503	1.011	1	1	15
ZIMBABWE	-2.2183	0.2081	-1.503	1.011	1	1	15
Average	-3.0146		-1.503	1.011			

Individual Intercept and Trend

Null Hypothesis: Unit root (individual unit root process)
Series: D(ECI)
Date: 08/11/21 Time: 03:21
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**

Im, Pesaran and Shin W-stat	-1.78235	0.0373

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
SOUTH AFRICA	-2.7453	0.2350	-2.169	0.975	1	1	15
ANGOLA	-2.5765	0.2934	-2.169	0.975	1	1	15
MOZAMBIQUE	-2.2718	0.4221	-2.169	0.975	1	1	15
ZAMBIA	-5.0956	0.0055	-2.169	0.975	1	1	15
ZIMBABWE	-2.0911	0.5092	-2.169	0.975	1	1	15
Average	-2.9561		-2.169	0.975			

APPENDIX B3: ADF FISCHER unit root tests

GDP at Level

Individual Intercept

Null Hypothesis: Unit root (individual unit root process)
Series: GDP
Date: 10/09/20 Time: 13:07
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	7.58470	0.6693
ADF - Choi Z-stat	0.06418	0.5256

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

Intermediate ADF test results GDP

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.3966	1	1	16
ANGOLA	0.6103	1	1	16
MOZAMBIQUE	0.3500	1	1	16
ZAMBIA	0.8378	1	1	16
ZIMBABWE	0.3177	1	1	16

Individual Intercept and Trend

Null Hypothesis: Unit root (individual unit root process)
Series: GDP
Date: 10/09/20 Time: 13:08
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	12.4662	0.2551
ADF - Choi Z-stat	-0.93535	0.1748

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

Intermediate ADF test results GDP

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.1727	1	1	16
ANGOLA	0.2013	1	1	16
MOZAMBIQUE	0.2159	1	1	16
ZAMBIA	0.8308	1	1	16
ZIMBABWE	0.3149	1	1	16

NONE

Null Hypothesis: Unit root (individual unit root process)
Series: GDP
Date: 10/09/20 Time: 13:09
Sample: 2000 2017
Exogenous variables: None
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	20.9578	0.0214
ADF - Choi Z-stat	-2.42807	0.0076

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

Intermediate ADF test results GDP

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.1362	1	1	16
ANGOLA	0.1965	1	1	16
MOZAMBIQUE	0.0512	1	1	16
ZAMBIA	0.4295	1	1	16
ZIMBABWE	0.0478	1	1	16

GDP at 1st Difference

Individual Intercept

Null Hypothesis: Unit root (individual unit root process)
Series: D(GDP)
Date: 10/09/20 Time: 13:11
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	40.6869	0.0000
ADF - Choi Z-stat	-4.62370	0.0000

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

Intermediate ADF test results D(GDP)

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.0194	1	1	15
ANGOLA	0.0055	1	1	15
MOZAMBIQUE	0.0046	1	1	15
ZAMBIA	0.1284	1	1	15
ZIMBABWE	0.0232	1	1	15

Individual Intercept and Trend

Null Hypothesis: Unit root (individual unit root process)
Series: D(GDP)
Date: 10/09/20 Time: 13:12
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	31.4276	0.0005
ADF - Choi Z-stat	-3.77628	0.0001

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

Intermediate ADF test results D(GDP)

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.0808	1	1	15
ANGOLA	0.0266	1	1	15
MOZAMBIQUE	0.0118	1	1	15
ZAMBIA	0.0628	1	1	15
ZIMBABWE	0.0942	1	1	15

NONE

Null Hypothesis: Unit root (individual unit root process)
Series: D(GDP)
Date: 10/09/20 Time: 13:13
Sample: 2000 2017
Exogenous variables: None
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	67.6999	0.0000
ADF - Choi Z-stat	-6.75752	0.0000

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

Intermediate ADF test results D(GDP)

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.0012	1	1	15
ANGOLA	0.0004	1	1	15
MOZAMBIQUE	0.0003	1	1	15
ZAMBIA	0.0130	1	1	15
ZIMBABWE	0.0013	1	1	15

Foreign Direct Investment at Level

Individual Intercept

Null Hypothesis: Unit root (individual unit root process)
Series: FDI
Date: 08/09/21 Time: 21:54
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	28.7434	0.0014
ADF - Choi Z-stat	-2.88303	0.0020

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

Intermediate ADF test results FDI

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.0039	1	1	16

ANGOLA	0.1756	1	1	16
MOZAMBIQUE	0.4932	1	1	16
ZAMBIA	0.0040	1	1	16
ZIMBABWE	0.4278	1	1	16

Individual Intercept and Trends

Null Hypothesis: Unit root (individual unit root process)
Series: FDI
Date: 08/09/21 Time: 21:58
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	15.5861	0.1121
ADF - Choi Z-stat	-0.74596	0.2278

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

Intermediate ADF test results FDI

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.0246	1	1	16
ANGOLA	0.8302	1	1	16
MOZAMBIQUE	0.6370	1	1	16
ZAMBIA	0.0413	1	1	16
ZIMBABWE	0.7669	1	1	16

None

Null Hypothesis: Unit root (individual unit root process)
Series: FDI
Date: 08/09/21 Time: 21:59
Sample: 2000 2017
Exogenous variables: None
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	23.0817	0.0104
ADF - Choi Z-stat	-2.24082	0.0125

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

Intermediate ADF test results FDI

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.0127	1	1	16
ANGOLA	0.0096	1	1	16
MOZAMBIQUE	0.3020	1	1	16
ZAMBIA	0.4646	1	1	16
ZIMBABWE	0.5691	1	1	16

Foreign Direct Investment at 1st Difference

Individual Intercept

Null Hypothesis: Unit root (individual unit root process)
Series: D(FDI)
Date: 08/09/21 Time: 22:00
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	36.5904	0.0001
ADF - Choi Z-stat	-3.93586	0.0000

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

Intermediate ADF test results D(FDI)

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.0080	1	1	15
ANGOLA	0.2276	1	1	15
MOZAMBIQUE	0.2945	1	1	15
ZAMBIA	0.0009	1	1	15
ZIMBABWE	0.0240	1	1	15

Individual Intercept and Trend

Null Hypothesis: Unit root (individual unit root process)
Series: D(FDI)
Date: 08/09/21 Time: 22:01
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	27.1257	0.0025
ADF - Choi Z-stat	-2.78374	0.0027

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

Intermediate ADF test results D(FDI)

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.0433	1	1	15
ANGOLA	0.3404	1	1	15
MOZAMBIQUE	0.6132	1	1	15
ZAMBIA	0.0025	1	1	15
ZIMBABWE	0.0571	1	1	15

Broad Money Growth (M2G) at Level

Individual Intercept

Null Hypothesis: Unit root (individual unit root process)
Series: M2G
Date: 08/10/21 Time: 18:14
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	25.2611	0.0049
ADF - Choi Z-stat	-2.99449	0.0014

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

Intermediate ADF test results M2G

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.2799	1	1	16
ANGOLA	0.0345	1	1	16
MOZAMBIQUE	0.0875	1	1	16
ZAMBIA	0.0214	1	1	16
ZIMBABWE	0.1807	1	1	16

Individual intercept and Trend

Null Hypothesis: Unit root (individual unit root process)
Series: M2G
Date: 08/10/21 Time: 18:15

Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	22.1417	0.0144
ADF - Choi Z-stat	-2.37759	0.0087

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

Intermediate ADF test results M2G

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.2796	1	1	16
ANGOLA	0.1270	1	1	16
MOZAMBIQUE	0.1476	1	1	16
ZAMBIA	0.0061	1	1	16
ZIMBABWE	0.4838	1	1	16

NONE

Null Hypothesis: Unit root (individual unit root process)
Series: M2G
Date: 08/10/21 Time: 18:16
Sample: 2000 2017
Exogenous variables: None
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	31.2981	0.0005
ADF - Choi Z-stat	-3.47126	0.0003

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

Intermediate ADF test results M2G

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.1324	1	1	16
ANGOLA	0.0014	1	1	16
MOZAMBIQUE	0.2716	1	1	16
ZAMBIA	0.1607	1	1	16
ZIMBABWE	0.0198	1	1	16

Broad Money Growth (M2G) at 1ST DIFFRENCE

Individual intercept

Null Hypothesis: Unit root (individual unit root process)
Series: D(M2G)
Date: 08/10/21 Time: 18:17
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	52.9920	0.0000
ADF - Choi Z-stat	-5.60056	0.0000

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

Intermediate ADF test results D(M2G)

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.0123	1	1	15
ANGOLA	0.0784	1	1	15
MOZAMBIQUE	0.0009	1	1	15
ZAMBIA	0.0005	1	1	15
ZIMBABWE	0.0073	1	1	15

Individual intercept and trend

Null Hypothesis: Unit root (individual unit root process)
Series: D(M2G)
Date: 08/10/21 Time: 18:17
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	41.1000	0.0000
ADF - Choi Z-stat	-4.57150	0.0000

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

Intermediate ADF test results D(M2G)

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.0561	1	1	15

ANGOLA	0.1943	1	1	15
MOZAMBIQUE	0.0057	1	1	15
ZAMBIA	0.0035	1	1	15
ZIMBABWE	0.0055	1	1	15

None

Null Hypothesis: Unit root (individual unit root process)
Series: D(M2G)
Date: 08/10/21 Time: 18:18
Sample: 2000 2017
Exogenous variables: None
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	81.0796	0.0000
ADF - Choi Z-stat	-7.56302	0.0000

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

Intermediate ADF test results D(M2G)

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.0007	1	1	15
ANGOLA	0.0095	1	1	15
MOZAMBIQUE	0.0000	1	1	15
ZAMBIA	0.0000	1	1	15
ZIMBABWE	0.0004	1	1	15

None

Null Hypothesis: Unit root (individual unit root process)
Series: D(FDI)
Date: 08/09/21 Time: 22:02
Sample: 2000 2017
Exogenous variables: None
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	62.5875	0.0000
ADF - Choi Z-stat	-6.20434	0.0000

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

Intermediate ADF test results D(FDI)

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.0004	1	1	15
ANGOLA	0.0379	1	1	15
MOZAMBIQUE	0.0386	1	1	15
ZAMBIA	0.0000	1	1	15
ZIMBABWE	0.0018	1	1	15

Domestic Credit to Banking Sector (DCBS) at Level

Individual intercept

Null Hypothesis: Unit root (individual unit root process)
Series: DCBS
Date: 08/11/21 Time: 02:46
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	11.0883	0.3507
ADF - Choi Z-stat	-0.79481	0.2134

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

Intermediate ADF test results DCBS

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.3393	1	1	16
ANGOLA	0.6115	1	1	16
MOZAMBIQUE	0.2626	1	1	16
ZAMBIA	0.5411	1	1	16
ZIMBABWE	0.1326	1	1	16

Individual intercept and trend

Null Hypothesis: Unit root (individual unit root process)
Series: DCBS
Date: 08/11/21 Time: 02:47
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 80

Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	12.3598	0.2617
ADF - Choi Z-stat	-0.25008	0.4013

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

Intermediate ADF test results DCBS

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.6135	1	1	16
ANGOLA	0.9299	1	1	16
MOZAMBIQUE	0.7325	1	1	16
ZAMBIA	0.0607	1	1	16
ZIMBABWE	0.0816	1	1	16

NONE

Null Hypothesis: Unit root (individual unit root process)
Series: DCBS
Date: 08/11/21 Time: 02:47
Sample: 2000 2017
Exogenous variables: None
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	8.28082	0.6014
ADF - Choi Z-stat	-0.06303	0.4749

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

Intermediate ADF test results DCBS

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.4761	1	1	16
ANGOLA	0.6806	1	1	16
MOZAMBIQUE	0.4257	1	1	16
ZAMBIA	0.7422	1	1	16
ZIMBABWE	0.1555	1	1	16

Domestic Credit to Banking Sector (DCBS) at 1st difference

Individual intercept

Null Hypothesis: Unit root (individual unit root process)
Series: D(DCBS)
Date: 08/11/21 Time: 02:48
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	44.8424	0.0000
ADF - Choi Z-stat	-4.24834	0.0000

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

Intermediate ADF test results D(DCBS)

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.0220	1	1	15
ANGOLA	0.2264	1	1	15
MOZAMBIQUE	0.4316	1	1	15
ZAMBIA	0.0148	1	1	15
ZIMBABWE	0.0000	1	1	15

Individual intercept and trend

Null Hypothesis: Unit root (individual unit root process)
Series: D(DCBS)
Date: 08/11/21 Time: 02:49
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	35.3225	0.0001
ADF - Choi Z-stat	-2.73966	0.0031

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

Intermediate ADF test results D(DCBS)

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.0319	1	1	15
ANGOLA	0.4362	1	1	15
MOZAMBIQUE	0.9095	1	1	15
ZAMBIA	0.0938	1	1	15
ZIMBABWE	0.0000	1	1	15

NONE

Null Hypothesis: Unit root (individual unit root process)
Series: D(DCBS)
Date: 08/11/21 Time: 02:49
Sample: 2000 2017
Exogenous variables: None
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	63.0824	0.0000
ADF - Choi Z-stat	-6.12061	0.0000

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

Intermediate ADF test results D(DCBS)

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.0013	1	1	15
ANGOLA	0.0383	1	1	15
MOZAMBIQUE	0.0587	1	1	15
ZAMBIA	0.0029	1	1	15
ZIMBABWE	0.0000	1	1	15

Domestic Credit to Private Sector (DCPS) at Level

Individual intercept

Null Hypothesis: Unit root (individual unit root process)
Series: DCPS
Date: 08/11/21 Time: 03:06
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	10.4990	0.3979
ADF - Choi Z-stat	-0.72831	0.2332

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

Intermediate ADF test results DCPS

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.3959	1	1	16
ANGOLA	0.6274	1	1	16
MOZAMBIQUE	0.2614	1	1	16
ZAMBIA	0.4416	1	1	16
ZIMBABWE	0.1831	1	1	16

Individual intercept and trend

Null Hypothesis: Unit root (individual unit root process)
Series: DCPS
Date: 08/11/21 Time: 03:07
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	10.2495	0.4189
ADF - Choi Z-stat	-0.22687	0.4103

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

Intermediate ADF test results DCPS

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.2959	1	1	16
ANGOLA	0.8854	1	1	16
MOZAMBIQUE	0.7478	1	1	16
ZAMBIA	0.2520	1	1	16
ZIMBABWE	0.1205	1	1	16

None

Null Hypothesis: Unit root (individual unit root process)
Series: DCPS
Date: 08/11/21 Time: 03:07
Sample: 2000 2017
Exogenous variables: None
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	8.37693	0.5921
ADF - Choi Z-stat	-0.06588	0.4737

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

Intermediate ADF test results DCPS

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.6893	1	1	16
ANGOLA	0.7025	1	1	16
MOZAMBIQUE	0.4223	1	1	16
ZAMBIA	0.5508	1	1	16
ZIMBABWE	0.1347	1	1	16

Domestic Credit to Private Sector (DCPS) at 1st difference

Individual intercept

Null Hypothesis: Unit root (individual unit root process)
Series: D(DCPS)
Date: 08/11/21 Time: 03:08
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	44.8377	0.0000
ADF - Choi Z-stat	-4.31730	0.0000

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

Intermediate ADF test results D(DCPS)

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.0086	1	1	15
ANGOLA	0.1631	1	1	15
MOZAMBIQUE	0.4517	1	1	15
ZAMBIA	0.0281	1	1	15
ZIMBABWE	0.0000	1	1	15

Individual intercept and trend

Null Hypothesis: Unit root (individual unit root process)
Series: D(DCPS)
Date: 08/11/21 Time: 03:09
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 75

Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	35.0671	0.0001
ADF - Choi Z-stat	-2.66856	0.0038

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

Intermediate ADF test results D(DCPS)

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.0231	1	1	15
ANGOLA	0.3754	1	1	15
MOZAMBIQUE	0.9189	1	1	15
ZAMBIA	0.1831	1	1	15
ZIMBABWE	0.0000	1	1	15

None

Null Hypothesis: Unit root (individual unit root process)
Series: D(DCPS)
Date: 08/11/21 Time: 03:09
Sample: 2000 2017
Exogenous variables: None
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	63.1387	0.0000
ADF - Choi Z-stat	-6.14102	0.0000

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

Intermediate ADF test results D(DCPS)

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.0007	1	1	15
ANGOLA	0.0291	1	1	15
MOZAMBIQUE	0.0629	1	1	15
ZAMBIA	0.0045	1	1	15
ZIMBABWE	0.0000	1	1	15

Economic Complexity Index (ECI) at Level

Individual Intercept

Null Hypothesis: Unit root (individual unit root process)
Series: ECI
Date: 08/11/21 Time: 03:22

Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	14.3777	0.1564
ADF - Choi Z-stat	-0.81048	0.2088

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

Intermediate ADF test results ECI

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.5261	1	1	16
ANGOLA	0.2181	1	1	16
MOZAMBIQUE	0.0132	1	1	16
ZAMBIA	0.7717	1	1	16
ZIMBABWE	0.6471	1	1	16

Individual intercept and trend

Null Hypothesis: Unit root (individual unit root process)
Series: ECI
Date: 08/11/21 Time: 03:23
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	11.3220	0.3330
ADF - Choi Z-stat	-0.68375	0.2471

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

Intermediate ADF test results ECI

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.6599	1	1	16
ANGOLA	0.4766	1	1	16
MOZAMBIQUE	0.0576	1	1	16
ZAMBIA	0.4673	1	1	16
ZIMBABWE	0.4109	1	1	16

None

Null Hypothesis: Unit root (individual unit root process)
Series: ECI
Date: 08/11/21 Time: 03:23
Sample: 2000 2017
Exogenous variables: None
User-specified lags: 1
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	7.46846	0.6806
ADF - Choi Z-stat	0.15121	0.5601

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

Intermediate ADF test results ECI

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.6316	1	1	16
ANGOLA	0.3764	1	1	16
MOZAMBIQUE	0.7378	1	1	16
ZAMBIA	0.1921	1	1	16
ZIMBABWE	0.7090	1	1	16

Economic Complexity Index (ECI) at 1st Difference

Individual Intercept

Null Hypothesis: Unit root (individual unit root process)
Series: D(ECI)
Date: 08/11/21 Time: 03:24
Sample: 2000 2017
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	29.2094	0.0012
ADF - Choi Z-stat	-3.41942	0.0003

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

Intermediate ADF test results D(ECI)

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.0583	1	1	15
ANGOLA	0.0958	1	1	15
MOZAMBIQUE	0.0930	1	1	15
ZAMBIA	0.0042	1	1	15
ZIMBABWE	0.2081	1	1	15

Individual Intercept and Trend

Null Hypothesis: Unit root (individual unit root process)
Series: D(ECI)
Date: 08/11/21 Time: 03:25
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	18.8347	0.0424
ADF - Choi Z-stat	-1.78123	0.0374

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

Intermediate ADF test results D(ECI)

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.2350	1	1	15
ANGOLA	0.2934	1	1	15
MOZAMBIQUE	0.4221	1	1	15
ZAMBIA	0.0055	1	1	15
ZIMBABWE	0.5092	1	1	15

None

Null Hypothesis: Unit root (individual unit root process)
Series: D(ECI)
Date: 08/11/21 Time: 03:26
Sample: 2000 2017
Exogenous variables: None
User-specified lags: 1
Total (balanced) observations: 75
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	50.9427	0.0000
ADF - Choi Z-stat	-5.54248	0.0000

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

Intermediate ADF test results D(ECI)

Cross Section	Prob.	Lag	Max Lag	Obs
SOUTH AFRICA	0.0063	1	1	15
ANGOLA	0.0086	1	1	15

MOZAMBIQUE	0.0069	1	1	15
ZAMBIA	0.0008	1	1	15
ZIMBABWE	0.0286	1	1	15

APPENDIX B4: PP-FISCHER unit root test

GDP

Individual Intercept

Null Hypothesis: Unit root (individual unit root process)
Series: GDP
Date: 10/09/20 Time: 13:14
Sample: 2000 2017
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 85
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	22.3138	0.0136
PP - Choi Z-stat	-2.34127	0.0096

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

Intermediate Phillips-Perron test results GDP

Cross Section	Prob.	Bandwidth	Obs
SOUTH AFRICA	0.2108	1.0	17
ANGOLA	0.2116	1.0	17
MOZAMBIQUE	0.0036	1.0	17
ZAMBIA	0.4780	2.0	17
ZIMBABWE	0.1884	1.0	17

Individual Intercept and Trend

Null Hypothesis: Unit root (individual unit root process)
Series: GDP
Date: 10/09/20 Time: 13:15
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 85
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	28.6801	0.0014
PP - Choi Z-stat	-2.74043	0.0031

** Probabilities for Fisher tests are computed using an

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

Intermediate Phillips-Perron test results GDP

Cross Section	Prob.	Bandwidth	Obs
SOUTH AFRICA	0.2295	3.0	17
ANGOLA	0.0975	0.0	17
MOZAMBIQUE	0.0002	2.0	17
ZAMBIA	0.5112	0.0	17
ZIMBABWE	0.2920	1.0	17

NONE

Null Hypothesis: Unit root (individual unit root process)
Series: GDP
Date: 10/09/20 Time: 13:16
Sample: 2000 2017
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 85
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	24.2625	0.0069
PP - Choi Z-stat	-2.83593	0.0023

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

Intermediate Phillips-Perron test results GDP

Cross Section	Prob.	Bandwidth	Obs
SOUTH AFRICA	0.0623	2.0	17
ANGOLA	0.0550	1.0	17
MOZAMBIQUE	0.1970	2.0	17
ZAMBIA	0.3695	2.0	17
ZIMBABWE	0.0216	1.0	17

GDP at 1st Difference
Individual Trend

Null Hypothesis: Unit root (individual unit root process)
Series: D(GDP)
Date: 10/09/20 Time: 13:17
Sample: 2000 2017
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**

PP - Fisher Chi-square	105.427	0.0000
PP - Choi Z-stat	-8.79578	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(GDP)

Cross Section	Prob.	Bandwidth	Obs
SOUTH AFRICA	0.0002	7.0	16
ANGOLA	0.0002	2.0	16
MOZAMBIQUE	0.0000	2.0	16
ZAMBIA	0.0002	1.0	16
ZIMBABWE	0.0011	4.0	16

Individual Intercept and Trends

Null Hypothesis: Unit root (individual unit root process)
Series: D(GDP)
Date: 10/09/20 Time: 13:18
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	86.3370	0.0000
PP - Choi Z-stat	-7.85763	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(GDP)

Cross Section	Prob.	Bandwidth	Obs
SOUTH AFRICA	0.0004	9.0	16
ANGOLA	0.0000	5.0	16
MOZAMBIQUE	0.0000	2.0	16
ZAMBIA	0.0001	4.0	16
ZIMBABWE	0.0117	3.0	16

NONE

Null Hypothesis: Unit root (individual unit root process)
Series: D(GDP)
Date: 10/09/20 Time: 13:19
Sample: 2000 2017
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel

Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	117.852	0.0000
PP - Choi Z-stat	-9.66004	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(GDP)

Cross Section	Prob.	Bandwidth	Obs
SOUTH AFRICA	0.0000	7.0	16
ANGOLA	0.0000	2.0	16
MOZAMBIQUE	0.0000	1.0	16
ZAMBIA	0.0000	1.0	16
ZIMBABWE	0.0000	4.0	16

Broad Money Growth (M2G) at Level

Individual Intercept

Null Hypothesis: Unit root (individual unit root process)
Series: M2G
Date: 08/10/21 Time: 18:19
Sample: 2000 2017
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 85
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	73.9624	0.0000
PP - Choi Z-stat	-6.27275	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 M2G

Cross Section	Prob.	Bandwidth	Obs
SOUTH AFRICA	0.2811	1.0	17
ANGOLA	0.0002	7.0	17
MOZAMBIQUE	0.0007	7.0	17
ZAMBIA	0.0000	2.0	17
ZIMBABWE	0.1083	1.0	17

Individual intercept and trend

Null Hypothesis: Unit root (individual unit root process)
Series: M2G
Date: 08/10/21 Time: 18:20
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 85
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	57.4169	0.0000
PP - Choi Z-stat	-5.42147	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 M2G

Cross Section	Prob.	Bandwidth	Obs
SOUTH AFRICA	0.1206	2.0	17
ANGOLA	0.0001	16.0	17
MOZAMBIQUE	0.0013	7.0	17
ZAMBIA	0.0001	12.0	17
ZIMBABWE	0.3512	2.0	17

None

Null Hypothesis: Unit root (individual unit root process)
Series: M2G
Date: 08/10/21 Time: 18:21
Sample: 2000 2017
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 85
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	51.1382	0.0000
PP - Choi Z-stat	-4.98106	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 M2G

Cross Section	Prob.	Bandwidth	Obs
SOUTH AFRICA	0.3793	5.0	17
ANGOLA	0.0000	3.0	17
MOZAMBIQUE	0.0634	5.0	17
ZAMBIA	0.0029	2.0	17
ZIMBABWE	0.0114	2.0	17

Broad Money Growth (M2G) at 1st difference

Individual Intercept

Null Hypothesis: Unit root (individual unit root process)
Series: D(M2G)
Date: 08/10/21 Time: 18:22
Sample: 2000 2017
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	443.908	0.0000
PP - Choi Z-stat	-16.8428	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(M2G)

Cross Section	Prob.	Bandwidth	Obs
SOUTH AFRICA	0.0003	6.0	16
ANGOLA	0.0001	4.0	16
MOZAMBIQUE	0.0000	13.0	16
ZAMBIA	0.0000	8.0	16
ZIMBABWE	0.0005	3.0	16

Individual Intercept and Trend

Null Hypothesis: Unit root (individual unit root process)
Series: D(M2G)
Date: 08/10/21 Time: 18:23
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear Trends
Newey-West automatic bandwidth selection and Bartlett kernel

Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	84.3210	0.0000
PP - Choi Z-stat	-7.82456	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(M2G)

Cross Section	Prob.	Bandwidth	Obs
SOUTH AFRICA	0.0030	6.0	16
ANGOLA	0.0002	4.0	16
MOZAMBIQUE	0.0001	12.0	16
ZAMBIA	0.0001	8.0	16
ZIMBABWE	0.0001	7.0	16

None

Null Hypothesis: Unit root (individual unit root process)
Series: D(M2G)
Date: 08/10/21 Time: 18:24
Sample: 2000 2017
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	102.976	0.0000
PP - Choi Z-stat	-8.90195	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(M2G)

Cross Section	Prob.	Bandwidth	Obs
SOUTH AFRICA	0.0001	5.0	16
ANGOLA	0.0000	3.0	16
MOZAMBIQUE	0.0000	15.0	16
ZAMBIA	0.0001	10.0	16
ZIMBABWE	0.0000	3.0	16

Domestic Credit to Banking Sector (DCBS) at Level

Infividual interecept

Null Hypothesis: Unit root (individual unit root process)
Series: DCBS
Date: 08/11/21 Time: 02:51
Sample: 2000 2017
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 85
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	9.28693	0.5051
PP - Choi Z-stat	-0.20767	0.4177

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

Intermediate Phillips-Perron test results DCBS

Cross Section	Prob.	Bandwidth	Obs
SOUTH AFRICA	0.1965	1.0	17
ANGOLA	0.5536	0.0	17
MOZAMBIQUE	0.7861	1.0	17
ZAMBIA	0.6611	3.0	17
ZIMBABWE	0.1702	2.0	17

individual intercept and trend

Null Hypothesis: Unit root (individual unit root process)
Series: DCBS
Date: 08/11/21 Time: 02:52
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 85
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	8.14513	0.6147
PP - Choi Z-stat	0.05559	0.5222

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

Intermediate Phillips-Perron test results DCBS

Cross Section	Prob.	Bandwidth	Obs
SOUTH AFRICA	0.4821	1.0	17
ANGOLA	0.9044	0.0	17
MOZAMBIQUE	0.4288	2.0	17
ZAMBIA	0.4502	5.0	17
ZIMBABWE	0.2024	2.0	17

none

Null Hypothesis: Unit root (individual unit root process)
Series: DCBS
Date: 08/11/21 Time: 02:53
Sample: 2000 2017
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 85
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	5.92751	0.8213
PP - Choi Z-stat	0.58837	0.7219

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

Intermediate Phillips-Perron test results DCBS

Cross Section	Prob.	Bandwidth	Obs
SOUTH AFRICA	0.5906	1.0	17
ANGOLA	0.6812	0.0	17
MOZAMBIQUE	0.7417	1.0	17
ZAMBIA	0.7633	4.0	17
ZIMBABWE	0.2267	7.0	17

Domestic Credit to Banking (DCBS) at 1st difference

Individual intercept

Null Hypothesis: Unit root (individual unit root process)
Series: D(DCBS)
Date: 08/11/21 Time: 02:53
Sample: 2000 2017
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	53.0348	0.0000
PP - Choi Z-stat	-5.21490	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(DCBS)

Cross Section	Prob.	Bandwidth	Obs
SOUTH AFRICA	0.0015	1.0	16
ANGOLA	0.0128	0.0	16
MOZAMBIQUE	0.4612	2.0	16
ZAMBIA	0.0063	8.0	16
ZIMBABWE	0.0001	15.0	16

Individual intercept and trend

Null Hypothesis: Unit root (individual unit root process)
Series: D(DCBS)
Date: 08/11/21 Time: 02:55
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	37.7344	0.0000
PP - Choi Z-stat	-3.02769	0.0012

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

Intermediate Phillips-Perron test results D(DCBS)

Cross Section	Prob.	Bandwidth	Obs
SOUTH AFRICA	0.0089	1.0	16
ANGOLA	0.0384	1.0	16
MOZAMBIQUE	0.9940	4.0	16
ZAMBIA	0.0234	9.0	16
ZIMBABWE	0.0008	15.0	16

None

Null Hypothesis: Unit root (individual unit root process)
Series: D(DCBS)
Date: 08/11/21 Time: 02:56
Sample: 2000 2017
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	76.8200	0.0000

PP - Choi Z-stat	-7.09646	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(DCBS)

Cross Section	Prob.	Bandwidth	Obs
SOUTH AFRICA	0.0001	1.0	16
ANGOLA	0.0009	1.0	16
MOZAMBIQUE	0.0876	2.0	16
ZAMBIA	0.0009	4.0	16
ZIMBABWE	0.0000	15.0	16

Domestic Credit to Private Sector (DCPS) at Level

Individual intercept

Null Hypothesis: Unit root (individual unit root process)
Series: DCPS
Date: 08/11/21 Time: 03:10
Sample: 2000 2017
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 85
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	8.23669	0.6057
PP - Choi Z-stat	-0.04173	0.4834

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

Intermediate Phillips-Perron test results DCPS

Cross Section	Prob.	Bandwidth	Obs
SOUTH AFRICA	0.3117	2.0	17
ANGOLA	0.5658	1.0	17
MOZAMBIQUE	0.7886	1.0	17
ZAMBIA	0.6251	2.0	17
ZIMBABWE	0.1872	2.0	17

Individual intercept and Trend

Null Hypothesis: Unit root (individual unit root process)
Series: DCPS
Date: 08/11/21 Time: 03:11
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear

Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 85
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	7.94124	0.6346
PP - Choi Z-stat	0.13091	0.5521

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

Intermediate Phillips-Perron test results DCPS

Cross Section	Prob.	Bandwidth	Obs
SOUTH AFRICA	0.3780	1.0	17
ANGOLA	0.8498	0.0	17
MOZAMBIQUE	0.4307	2.0	17
ZAMBIA	0.7393	3.0	17
ZIMBABWE	0.1844	1.0	17

None

Null Hypothesis: Unit root (individual unit root process)
Series: DCPS
Date: 08/11/21 Time: 03:11
Sample: 2000 2017
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 85
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	6.10002	0.8068
PP - Choi Z-stat	0.66696	0.7476

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

Intermediate Phillips-Perron test results DCPS

Cross Section	Prob.	Bandwidth	Obs
SOUTH AFRICA	0.8232	5.0	17
ANGOLA	0.6958	0.0	17
MOZAMBIQUE	0.7463	1.0	17
ZAMBIA	0.6222	2.0	17
ZIMBABWE	0.1781	6.0	17

Domestic Credit to Private Sector (DCPS) at 1st difference

Individual intercept

Null Hypothesis: Unit root (individual unit root process)
Series: D(DCPS)
Date: 08/11/21 Time: 03:12
Sample: 2000 2017
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	46.0022	0.0000
PP - Choi Z-stat	-4.39082	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(DCPS)

Cross Section	Prob.	Bandwidth	Obs
SOUTH AFRICA	0.0065	3.0	16
ANGOLA	0.0107	1.0	16
MOZAMBIQUE	0.4679	2.0	16
ZAMBIA	0.2214	7.0	16
ZIMBABWE	0.0000	15.0	16

Individual intercept and trend

Null Hypothesis: Unit root (individual unit root process)
Series: D(DCPS)
Date: 08/11/21 Time: 03:13
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	31.0587	0.0006
PP - Choi Z-stat	-1.94093	0.0261

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

Intermediate Phillips-Perron test results D(DCPS)

Cross Section	Prob.	Bandwidth	Obs

SOUTH AFRICA	0.0340	3.0	16
ANGOLA	0.0361	1.0	16
MOZAMBIQUE	0.9945	4.0	16
ZAMBIA	0.5858	9.0	16
ZIMBABWE	0.0003	15.0	16

None

Null Hypothesis: Unit root (individual unit root process)
Series: D(DCPS)
Date: 08/11/21 Time: 03:13
Sample: 2000 2017
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	68.1824	0.0000
PP - Choi Z-stat	-6.47273	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(DCPS)

Cross Section	Prob.	Bandwidth	Obs
SOUTH AFRICA	0.0003	3.0	16
ANGOLA	0.0008	0.0	16
MOZAMBIQUE	0.0900	2.0	16
ZAMBIA	0.0196	6.0	16
ZIMBABWE	0.0000	15.0	16

Economic Complexity Index (ECI) at Level

Individual Intercept

Null Hypothesis: Unit root (individual unit root process)
Series: ECI
Date: 08/11/21 Time: 03:26
Sample: 2000 2017
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 85
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	218.178	0.0000
PP - Choi Z-stat	-6.30228	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 ECI

Cross Section	Prob.	Bandwidth	Obs
SOUTH AFRICA	0.4045	1.0	17
ANGOLA	0.2674	1.0	17
MOZAMBIQUE	0.0000	16.0	17
ZAMBIA	0.7332	5.0	17
ZIMBABWE	0.6813	1.0	17

Individual Intercept and Trend

Null Hypothesis: Unit root (individual unit root process)
Series: ECI
Date: 08/11/21 Time: 03:27
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear
Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 85
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	24.1775	0.0071
PP - Choi Z-stat	-1.57413	0.0577

** 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	0.4334	1.0	17
ANGOLA	0.6530	0.0	17
MOZAMBIQUE	0.0001	10.0	17
ZAMBIA	0.2790	5.0	17
ZIMBABWE	0.7120	1.0	17

None

Null Hypothesis: Unit root (individual unit root process)
Series: ECI
Date: 08/11/21 Time: 03:28
Sample: 2000 2017
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel

Total (balanced) observations: 85
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	8.44838	0.5851
PP - Choi Z-stat	0.01990	0.5079

** 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	0.4675	0.0	17
ANGOLA	0.3722	1.0	17
MOZAMBIQUE	0.8027	2.0	17
ZAMBIA	0.1391	16.0	17
ZIMBABWE	0.7534	1.0	17

Economic Complexity Index (ECI) at 1st Difference

Individual Intercept

Null Hypothesis: Unit root (individual unit root process)
Series: D(ECI)
Date: 08/11/21 Time: 03:29
Sample: 2000 2017
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	64.6352	0.0000
PP - Choi Z-stat	-6.29202	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	0.0049	0.0	16
ANGOLA	0.0162	1.0	16
MOZAMBIQUE	0.0001	15.0	16
ZAMBIA	0.0000	15.0	16
ZIMBABWE	0.0697	0.0	16

Individual Intercept and Trend

Null Hypothesis: Unit root (individual unit root process)
Series: D(ECI)
Date: 08/11/21 Time: 03:29
Sample: 2000 2017
Exogenous variables: Individual effects, individual linear Trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	44.8057	0.0000
PP - Choi Z-stat	-4.71855	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	0.0245	0.0	16
ANGOLA	0.0661	1.0	16
MOZAMBIQUE	0.0028	15.0	16
ZAMBIA	0.0002	14.0	16
ZIMBABWE	0.2309	0.0	16

None

Null Hypothesis: Unit root (individual unit root process)
Series: D(ECI)
Date: 08/11/21 Time: 03:30
Sample: 2000 2017
Exogenous variables: None
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 80
Cross-sections included: 5

Method	Statistic	Prob.**
PP - Fisher Chi-square	81.8168	0.0000
PP - Choi Z-stat	-7.60973	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	0.0002	0.0	16
ANGOLA	0.0009	1.0	16

MOZAMBIQUE	0.0000	15.0	16
ZAMBIA	0.0002	9.0	16
ZIMBABWE	0.0067	0.0	16

APPENDIX C: PANEL COINTEGRATION TETS

APPENDIX C1: PEDRONI TEST RESULTS

Pedroni Residual Cointegration Test
Series: GDP FDI M2G DCBS DCPS ECI
Date: 10/02/20 Time: 22:32
Sample: 2000 2017
Included observations: 90
Cross-sections included: 5
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
Automatic lag length selection based on SIC with a max lag of 2
Newey-West automatic bandwidth selection and Bartlett kernel

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

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-1.926595	0.9730	-1.664464	0.9520
Panel rho-Statistic	0.796393	0.7871	0.905879	0.8175
Panel PP-Statistic	-2.679046	0.0037	-3.319575	0.0005
Panel ADF-Statistic	-1.913510	0.0278	-2.622012	0.0044

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

	Statistic	Prob.
Group rho-Statistic	1.879170	0.9699
Group PP-Statistic	-6.161526	0.0000
Group ADF-Statistic	-4.845109	0.0000

Cross section specific results

Phillips-Peron results (non-parametric)

Cross ID	AR(1)	Variance	HAC	Bandwidth	Obs
SOUTH AFRICA	-0.045	0.663949	0.377566	4.00	17
ANGOLA	-0.379	6.346210	2.101628	16.00	17
MOZAMBIQUE	-0.198	2.996180	1.329550	7.00	17
ZAMBIA	0.278	1.006328	1.006328	0.00	17
ZIMBABWE	0.074	29.01129	29.11601	1.00	17

Augmented Dickey-Fuller results (parametric)

Cross ID	AR(1)	Variance	Lag	Max lag	Obs
SOUTH AFRICA	-0.045	0.663949	0	2	17
ANGOLA	-1.373	4.399492	1	2	16
MOZAMBIQUE	-0.406	0.773487	1	2	16
ZAMBIA	0.278	1.006328	0	2	17
ZIMBABWE	0.074	29.01129	0	2	17

APPENDIX C2: KAO TEST RESULTS

Kao Residual Cointegration Test
Series: GDP FDI M2G DCBS DCPS ECI
Date: 10/02/20 Time: 22:37
Sample: 2000 2017
Included observations: 90
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
Automatic lag length selection based on SIC with a max lag of 3
Newey-West automatic bandwidth selection and Bartlett kernel

	t-Statistic	Prob.
ADF	-1.876078	0.0303
Residual variance	21.82852	
HAC variance	6.488656	

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RESID)
Method: Least Squares
Date: 10/02/20 Time: 22:37
Sample (adjusted): 2001 2017
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.629444	0.094992	-6.626280	0.0000

R-squared	0.342201	Mean dependent var	0.193569
Adjusted R-squared	0.342201	S.D. dependent var	4.812217
S.E. of regression	3.902940	Akaike info criterion	5.573032
Sum squared resid	1279.567	Schwarz criterion	5.601770
Log likelihood	-235.8539	Hannan-Quinn criter.	5.584591
Durbin-Watson stat	2.013979		

APPENDIX C3: JOHANSEN FISCHER TEST RESULTS

Johansen Fisher Panel Cointegration Test
Series: GDP FDI M2G DCBS DCPS ECI
Date: 10/02/20 Time: 22:40
Sample: 2000 2017
Included observations: 90
Trend assumption: Linear deterministic trend
Lags interval (in first differences): 1 1

Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)

Hypothesized	Fisher Stat.*		Fisher Stat.*	

No. of CE(s)	(from trace test)	Prob.	(from max-eigen test)	Prob.
None	6.931	0.7319	6.931	0.7319
At most 1	56.65	0.0000	75.07	0.0000
At most 2	92.10	0.0000	92.10	0.0000
At most 3	72.88	0.0000	58.17	0.0000
At most 4	39.51	0.0000	31.74	0.0004
At most 5	27.66	0.0020	27.66	0.0020

* Probabilities are computed using asymptotic Chi-square distribution.

Individual cross section results

Cross Section	Trace Test Statistics	Prob.**	Max-Eign Test Statistics	Prob.**
Hypothesis of no cointegration				
SOUTH AFRICA	NA	0.5000	NA	0.5000
ANGOLA	NA	0.5000	NA	0.5000
MOZAMBIQUE	NA	0.5000	NA	0.5000
ZAMBIA	NA	0.5000	NA	0.5000
ZIMBABWE	NA	0.5000	NA	0.5000
Hypothesis of at most 1 cointegration relationship				
SOUTH AFRICA	1144.1330	1.0000	556.6542	0.0001
ANGOLA	1068.5961	0.0001	543.4274	0.0001
MOZAMBIQUE	1010.9207	0.0001	478.1023	0.0001
ZAMBIA	NA	0.5000	NA	0.5000
ZIMBABWE	980.5545	0.0001	500.9896	0.0001
Hypothesis of at most 2 cointegration relationship				
SOUTH AFRICA	587.4788	0.0001	549.4225	0.0001
ANGOLA	525.1687	0.0001	490.9931	0.0001
MOZAMBIQUE	532.8184	0.0001	435.8401	0.0001
ZAMBIA	599.6557	0.0001	559.1207	0.0001
ZIMBABWE	479.5649	0.0001	451.6939	0.0001
Hypothesis of at most 3 cointegration relationship				
SOUTH AFRICA	38.0563	0.0045	21.3274	0.0469
ANGOLA	34.1756	0.0147	19.9959	0.0715
MOZAMBIQUE	96.9784	0.0000	61.9193	0.0000
ZAMBIA	40.5350	0.0020	26.9639	0.0067
ZIMBABWE	27.8710	0.0821	19.8860	0.0739
Hypothesis of at most 4 cointegration relationship				
SOUTH AFRICA	16.7289	0.0324	11.2243	0.1433
ANGOLA	14.1797	0.0781	13.6347	0.0627
MOZAMBIQUE	35.0590	0.0000	28.8346	0.0001
ZAMBIA	13.5711	0.0955	9.2914	0.2627
ZIMBABWE	7.9850	0.4670	6.5617	0.5422
Hypothesis of at most 5 cointegration relationship				
SOUTH AFRICA	5.5047	0.0190	5.5047	0.0190
ANGOLA	0.5450	0.4604	0.5450	0.4604
MOZAMBIQUE	6.2244	0.0126	6.2244	0.0126
ZAMBIA	4.2797	0.0386	4.2797	0.0386
ZIMBABWE	1.4233	0.2329	1.4233	0.2329

**MacKinnon-Haug-Michelis (1999) p-values

APPENDIX D: PARDL MODEL TEST RESULTS

Dependent Variable: D(GDP)
Method: ARDL
Date: 10/02/20 Time: 14:27
Sample: 2002 2017
Included observations: 80
Maximum dependent lags: 2 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): FDI M2G DCBS DCPS ECI
Fixed regressors: C
Number of models evalulated: 2
Selected Model: ARDL (2, 1, 1, 1, 1, 1)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
	Long Run Equation			
FDI	0.085587	0.017173	4.983961	0.0000
M2G	0.120428	0.024245	4.967057	0.0000
DCBS	0.860120	0.380933	2.257932	0.0288
DCPS	-1.050187	0.371038	-2.830403	0.0069
ECI	5.335799	2.182301	2.445033	0.0185
	Short Run Equation			
COINTEQ01	-0.554885	0.225828	-2.457110	0.0179
D(GDP(-1))	-0.219290	0.173333	-1.265137	0.2123
D(FDI)	0.281403	0.408103	0.689539	0.4940
D(M2G)	0.066274	0.080634	0.821914	0.4155
D(DCBS)	-2.750727	2.370635	-1.160334	0.2520
D(DCPS)	2.741378	2.346174	1.168446	0.2488
D(ECI)	6.542709	8.601521	0.760646	0.4508
C	0.096855	1.539412	0.062917	0.9501

Mean dependent var	-0.180780	S.D. dependent var	5.363093
S.E. of regression	3.152199	Akaike info criterion	3.904852
Sum squared resid	447.1360	Schwarz criterion	5.154756
Log likelihood	-130.7183	Hannan-Quinn criter.	4.408887

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

APPENDIX E: ENGLE-GRANGER CAUSALITY TEST RESULTS

Pairwise Granger Causality Tests
Date: 10/02/20 Time: 14:20
Sample: 2000 2017
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
FDI does not Granger Cause GDP	80	0.69689	0.5013
GDP does not Granger Cause FDI		0.69647	0.5015

M2G does not Granger Cause GDP	80	4.90145	0.0100
GDP does not Granger Cause M2G		18.3202	3.E-07
DCBS does not Granger Cause GDP	80	3.71174	0.0290
GDP does not Granger Cause DCBS		7.13920	0.0015
DCPS does not Granger Cause GDP	80	2.07577	0.1326
GDP does not Granger Cause DCPS		6.05872	0.0036
ECI does not Granger Cause GDP	80	0.04300	0.9579
GDP does not Granger Cause ECI		0.72612	0.4872
M2G does not Granger Cause FDI	80	1.06097	0.3513
FDI does not Granger Cause M2G		0.17746	0.8377
DCBS does not Granger Cause FDI	80	0.09631	0.9083
FDI does not Granger Cause DCBS		0.06922	0.9332
DCPS does not Granger Cause FDI	80	0.21371	0.8081
FDI does not Granger Cause DCPS		0.05387	0.9476
ECI does not Granger Cause FDI	80	3.36727	0.0398
FDI does not Granger Cause ECI		0.29290	0.7469
DCBS does not Granger Cause M2G	80	5.20605	0.0076
M2G does not Granger Cause DCBS		7.93443	0.0007
DCPS does not Granger Cause M2G	80	2.37915	0.0996
M2G does not Granger Cause DCPS		4.47616	0.0146
ECI does not Granger Cause M2G	80	0.65180	0.5240
M2G does not Granger Cause ECI		0.20218	0.8174
DCPS does not Granger Cause DCBS	80	6.71061	0.0021
DCBS does not Granger Cause DCPS		7.24336	0.0013
ECI does not Granger Cause DCBS	80	0.62664	0.5372
DCBS does not Granger Cause ECI		1.63487	0.2018
ECI does not Granger Cause DCPS	80	0.31423	0.7313
DCPS does not Granger Cause ECI		1.70295	0.1891