# Business Cycles, Fiscal Policy and Monetary Integration in Southern African Development Community

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THESIS

Submitted to the University of KwaZulu-Natal

in fulfillment of

the requirements for the degree of

Doctor of Philosophy

in

Economics

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# Declaration

I, Ntokozo Patrick Nzimande, declare that

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2. This thesis has not been submitted for any degree or examination at any other university.

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# Dedication

To my Dad and my late Mom

# Acknowledgements

This project would have not been a success were it not for the support and encouragement from various individuals. Although this was the hardest journey, the support I received made it seem easy and possible. Personally, I think writing acknowledgements is as onerous as writing the thesis. Having said that, those whom I forgot and could not mention by names just be aware that your support is well appreciated. You know who you are, and what you did. I would like to thank my supervisor, Prof. Harold Ngalawa, for patient guidance, encouragement and advice he has offered throughtout my time as his student. I have been extremely lucky to have a supervisor who cared so much about my work, and who responded to my quires so promptly. I would like to thank all members of the UKZN Macroeconomics Working Group (MWG) for their constructive criticism, especially in the early phases of this project. In particular, I would like to thank Dr. Chris Tipoy, Dr. Adebayo Kutu, Ms. Lenhle Dlamini, Dr. Joseph Akande, and Dr. Prince Sarpong. Moreover, I would like to thank all the members of staff at the University of KwaZulu-Natal. In particular, Prof. Mabutho Sibanda for his continuous support and encouragement, Prof. Urmilla Bob, Dr. Gerry Bokana, Prof Mustufa Özer, Mr Sakhile Mpungose, Dr. Phocenah Nyatanga, Dr. Sanele Gumede, Dr Evelyn Derera, and Tshepiso. Nobody has been more important to me in the pursuit of this project than my family members, and friends. I would like to thank my father and my late mother, whose love and guidance are with me in whatever I choose to pursue. In particular, I would like to express my sincere gratitude to Simiso Msomi, Noxolo Mkhwanazi, Onesimo Qhwesha, Thabani Irvin Mdlalose, Zibusiso Moyo, Nondumiso Masuku, and Siphiwe Zungu. Lots of people have contributed towards this project, and I thank you all. You know who you are and what you did. God bless you all.

Finally, I would like to thank the National Research Foundation (NRF), and University of Kwazulu-Natal Research office, not only for providing the funding which permitted me to undertake this research, but also for affording me the opportunity

to attend conferences and meet so many interesting people.

Philippians 4:13 *"I can do all things though Christ who strengthens me"*. God has been and continues to be my pillar of strength. For that I cannot thank him enough. All glory be to him [God], Amen.

# Abstract

This thesis investigated the selected macro-monetary topics in the Southern African Development Community (SADC). The thesis is presented in three distinct but related essays. The first essay (Chapter 2) examines the extent to which business cycles are synchronised in the SADC area using a dynamic factor model which separates idiosyncratic shocks from common shocks (regional common shocks). Countries are said to be synchonised if regional common shocks explain a large variance of within-country business cycles. Conversely, if a large variance of within-country business cycles is accounted for by idiosyncratic shocks then countries are said not to be synchronised. The study results have in-depth ramifications for the proposed SADC monetary union. If business cycles are synchronised, it implies that provided that other conditions for establishing a monetary union are satisfied, the use of a single monetary policy may be optimal. Put differently, if business cycles are driven by common shocks then the use of a mutual monetary policy is warranted. The results of the study show that the regional common factor is important for some countries, and not for others. More precisely, it was discovered that regional common shocks significantly explain most within-country business cycles in Botswana, South Africa, Malawi, Tanzania, Democratic Republic of Congo, Lesotho, and Swaziland, suggesting that a shared monetary policy could be considered among these countries. In addition, the study demonstrated that idiosyncratic shocks play little or no significant role in explaining within-country business cycles for most countries considered in the sample. Idiosyncratic factors are found to be significant only in Malawi, and Seychelles. The important finding emerging from the study results is that, based only on the business cycles synchronisation condition, a monetary union encompassing all SADC member countries would not be optimal.

The second essay (Chapter 3) examines the endogeneity hypothesis in the context of the SADC area. In particular, a *Generalised Method of Moments* is used to investigate the role of trade intensity, financial integration, macroeconomic policy

similarity, and exogenous factors on the extent to which SADC member states are synchronised. Panel data covering the period 2000 to 2016 is used to conduct the analysis. The study results show that trade integration positively affects business cycles synchronisation, suggesting that promoting/or stimulating intra-SADC trade could possibly result to intensified business cycles comovement in the bloc. In addition, the study results show that macroeconomic policies' similarity (that is both monetary and fiscal policies) exerts sanguine and statistically significant effect on business cycles synchronisation. It was found that oil price changes have a decouplinf effect on regional business cyles. This could be explained by the fact that, in the SADC region, some countries are net oil importers while other are net oil exporters. Thus, the effect of oil movements depends on whether a country is a net importer, or net exporter of oil.

While a monetary union entails benefits to member states, it comes at the 'expense' of the independence to alter monetary policy tools in order to deal with country-specific business cycles. Hence, for union members, fiscal policy becomes the only policy recourse available to deal with idiosyncratic macroeconomic disturbances/or to mitigate conflicts over a preferred monetary policy. Therefore, fiscal policy sustainability is crucial for the functioning of a monetary union. Unsustainable fiscal policies may neither be a mechanism, nor effective tool for dealing with country-specific disturbances, thus threatening the stability of a monetary union. Hence, the third essay (Chapter 4) of this thesis examines the sustainability of fiscal policies in the SADC region using Bohn's (1998) fiscal policy reactiom function. In particular, we employ dynamic panel models (that is, panel mean group, mean group, and dynamic fixed effects) to evaluate the response of government revenues to changes in public expenditures. Using data covering the period 1990-2016, the findings of the study reveal that public revenues positively react to changes in government expenditures. Thus, fiscal policies, in the SADC area, are found to be sustainable. However, the reaction coefficients are less than a unity, implying that

fiscal policies are 'weakly' sustainable. Therefore, we argue that SADC governments may face difficulties in marketing their debt in the future.

# Chapter 1

# Introduction

### 1.0.1 Background

Long before the formation of the Organization of African Unity (OAU) in May 1963, African leaders had acknowledged that cooperation, and integration in various areas, such as economic and social fields, were requisite to enhanced transformation and sustainable development on the continent. Since the early 1960s, OAU member countries were encouraged to merge their economies into sub-regional markets that would eventually translate into a single African market Kemegue and Seck (2014). In pursuit of this objective, a Lagos Plan of Action (LPA) and the Final Act of Lagos (FAL) were adopted in 1980. In 1994, the Abuja Treaty put the commitments of the LPA, and the FAL into action by establishing the African Economic Community (AEC), whose aim is to institute grounds for collective economic development among African countries through steady process by coordination and cooperation, synchronization and liberal integration of policies (and other undertakings) of the already existing regional economic communities (RECs). These RECs are the East African Community (EAC), Common Market for Eastern and Southern Africa (COMESA), Arab Maghreb Union (AMU), Economic Community of West African States (ECOWAS), Economic Community of Central African States (ECCAS), Intergovernmental Authority on Development (IGAD), Community of Sahel-Saharan States (CEN-SAD), and Southern African Development Community

(SADC). Interests to further integrate Africa, particularly SADC, were reinvigorated by the successful establishment of the European Monetary Union (EMU) in 1999, with the Euro replacing national currencies of the European Union (EU) member countries. A single market in SADC will not only afford the region a bargaining power, but it will also entail other benefits (See for example, Goodhart, 2007). For example, P. R. Krugman (1993) argues that economic integration encourages specialisation along the lines of comparative advantage. In a single market, the most efficient SADC producer will expand its production base, and supply nearly the whole market (that is, the whole region). Consequently, production costs will decline on the average, which will translate into lower consumer prices, consequently improving consumer welfare in the region – especially if trade creation outweighs trade diversion effects (Eichengreen, 1990). Furthermore, it is generally argued that the extent of intra-SADC trade is disappointingly low (Masson, 2008; Cobham & Robson, 1994; Yayo & Asefa, 2016; Gibb, 2016). This could be explained by the existence of 'too many currencies' in the region (See, Rose & Van Wincoop, 2001). Hence, the elimination of national currencies could potentially boost the scope of trade among member states in the region. In support of this thesis, Glick and Rose (2002) demonstrate that countries that leave a currency union tend to experience drastic declines in their bilateral trade. For example, trade fell by approximately 100% when a currency union between Djibouti and Gabon was disbanded in 1949 (Glick, 2017). In addition, R. Mundell (1961) asserts that the efficiency of money as a medium of exchange, and a unit of account is undermined by the existence of several sovereign national currencies, because it implies higher transaction costs (as a medium of exchange), and information costs (as a unit of account) (Tavlas, 2009b).

Whilst the debate of monetary unions has attracted considerable attention in Africa, SADC, which is the largest trading bloc, in terms of GDP per capita, on the continent, is often overlooked in many studies (See for example, Debrun, Masson, & Pattillo, 2005; Carmignani, 2009; Buigut & Valev, 2009). This thesis, therefore,

endeavors to explore the feasibility of establishing a monetary union in SADC. More precisely, the thesis will analyse two essential considerations for a monetary union, namely, business cycles synchronisation, and fiscal policies. To achieve this objective, the thesis is divided into three main objectives. First, the study will investigate the extent to which business cycles are synchronised in the SADC; second, we will identify and examine factors driving business cycles' co-movement in the region (the endogeneity hypothesis); and third, the thesis will evaluate the sustainability of fiscal policies in the SADC bloc.

### 1.0.2 The degree of business cycles' synchronisation in SADC

In Africa, there are concerns that a deeper economic integration may not yield the perceived benefits. In fact, it is argued that economic integration could result in macroeconomic disasters across the continent (Zerihun, Breitenbach, & Kemegue, 2014).This is because virtually all the existing economic communities are borne out of political agendas, and in most cases, are founded on colonial roots (Cobham & Robson, 1994), rather thhn economic merits (Tavlas, 2009a). Put differently, it is argued that these communities do not confine to the conditions set out in the theory of optimum currency areas(See for example, Buigut & Valev, 2009; Tavlas, 2009a; Cobham & Robson, 1994; Kabundi & Loots, 2007; Khamfula & Huizinga, 2004).

In so far as business cycles asymmetry or symmetry is concerned in SADC, empirical studies often document contradictory findings. The mixed evidence documented in these studies could be due to the use of different methodologies (See, Agbeyegbe, 2008; Zerihun et al., 2014; Zerihun & Breitenbach, 2016; Khamfula & Huizinga, 2004). In addition, the generally applied approaches suffer from several deficiencies. For example, basic correlation and Structural Vector Autoregressive (SVAR) models are unable to juxtapose common from idiosyncratic shocks. In Chapter 2 of this study, we employ a dynamic factor model to Forni, Hallin, Lippi, and Reichlin

(2005), a technique that is argued to be robust for business cycles' synchronisation (He & Liao, 2012). The model is able to isolate common from idiosyncratic shocks, thus, allowing us to make inferences about the practicality of a common monetary policy in SADC. If business cycles are significantly driven by a common or regional component then country-specific policies may be less useful, and consequently, regional policy coordinationation may be warranted (Kabundi & Loots, 2007). This approach has not been used in the SADC region to gauge the feasibility of a monetary union. An exception is an article by Kabundi and Loots (2007), which utilised this approach to explore business cycles co-movement between SADC member states and South Africa's business cycles. However, in their study they only consider 12 SADC member countries for the period of 1980-2002. In this study, we include all 15 SADC member states, and we use updated data to examine the extent to which business cycles are synchronised in the region.

Cognisant that the co-movement of business cycles is not static (i.e. it varies overtime), the use of updated data could yield different results. The proposed approach concurs with Allegret and Essaadi (2011). The authors use a time-varying coherence function, and find that business cycles' co-movement tends to improve with increased integration overtime. In line with this, Berdiev and Chang (2015) demonstrate that business cycles' co-movement varies overtime, thereby stressing the importance of using a time-varying framework when assessing business cycles synchronisation.

In line with existing studies (Asongu, Nwachukwu, & Tchamyou, 2017; Cobham & Robson, 1994), this chapter finds that business cycles' synchronisation in SADC is not sufficient to justify a monetary union in the region. Precisely, we find that regional common shocks are significant drivers of business cycles in some countries, and not in others. In particular, we demonstrate that regional common components are only significant drivers of business cycles in Botswana, South Africa, Lesotho,

Swaziland, Malawi, Tanzania, and Democratic Republic of Congo. Thus, we conclude that a monetary union subsuming all SADC member states would not be optimal and can results to macroeconomic instabilities across the region.

### 1.0.3 The endogeneity hypothesis: Factors influencing business cycles synchronisation in SADC

In the late 1990s, a new view which denounces business cycles' synchronisation as an *ex ante* condition for establishing a monetary union emerged (Frankel, Rose, et al., 1997; Abbott, Easaw, & Xing, 2008; Alesina & Barro, 2002; Arestis & Phelps, 2016). According to this view, business cycles' synchronisation is not irrevocably fixed, and is contingent on economic fundamentals, such as the degree to which countries trade with each other, and the extent to which countries are financially integrated, among others (Alesina, Barro, & Tenreyro, 2002; Frankel & Rose, 1998; Rose & Van Wincoop, 2001; Rose & Engel, 2002). If this hypothesis holds, then business cycles' synchronicity could be an *ex-post* phenomena.

This hypothesis is generally referred to as the endogeneity hypothesis. The ratoinale behind this proposition is that trade between countries, through demand linkages, facilitates the transmission process of a shock, hence synchronising business cycles (Rose & Engel, 2002; J. Ahmed, Chaudhry, & Straetmans, 2018).This owes to the notion that establishing a monetary or currency union tends to mitigate transaction costs and exchange rate risks, and consequently resulting intensified trade between member states (Rose & Engel, 2002), thereby enhancing business cycles' synchronisation (Rose & Van Wincoop, 2001).

This hypothesis has in-depth policy implications regarding the decision on whether to establish a monetary or not; and which countries are to join a monetary union. G. H. Lee and Azali (2010), contend that if indeed the endogeneity hypothesis is correct, then policy-makers need not to be concerned about the extent to which business

are synchronised. This is because, if business cycles are endogenous then synchronisation need not to be achieved prior to establishing a monetary union since it can be achieved after a union has been formed (Miles & Vijverberg, 2018). Parallel to this, (Vieira & Vieira, 2012) postulate that entry could be fast-tracked if the endogeneity hypothesis holds, with the expectation that convergence would be justified *ex-post*. This chapter attempts answer the question, *is the SADC monetary justifiable ex post rather than ex-ante?* We use *Generalised Method of Moments* (GMM) to investigate the role trade integration/or intensity, financial integration/or intensity, fiscal policy convergence, monetary policy similarity, and exogenous factors proxied by oil prices, on the business cycles' synchonisation in SADC. To the best of our knowledge, no study has attempted to examine the endogeneity hypothesis in the SADC region. Thus, this is one of the contributions of this thesis to the literature. The result of this study are expected to have far-reaching policy ramifications for the proposed SADC monetary union. Consistent with the endogeneity hypothesis of Frankel et al. (1997), chapter 3 of this study reveals that indeed the properties of a monetary union are not exogenous and irrevocably fixed. In particular, this study finds that trade integration, and macroeconomic policy similarity (that is, both fiscal and monetary policies) significantly bolster the extent to which business cycles are co-moving in the SADC region. Moreover, it is found that financial integration, as predicted by Obstfeld (1994), has an adverse effect on business cycles' synchronisation. The study further finds that global common shocks proxied by real oil prices have a decoupling effect on business cycles synchronicity in the SADC region.

### 1.0.4 Fiscal Policy Sustainability in SADC

In most cases, studies about the practicality of a monetary union are concerned more about monetary policy than about fiscal policy. Feasibility of SADC monetary union without fiscal policy sustainability considerations are incomplete. This is because countries in a monetary union would automatically relinquish their monetary policy control. Thus, the only policy re-course available to deal with idiosyncratic distur-

bances is fiscal policy. It is crucial, therefore, that fiscal policies are sustainable for prospective members of a monetary union. Schick (2005), contends that an unsustainable fiscal policy may neither be a mechanism nor effective for stabilising a macroeconomy. In Chapter 4 of this thesis, therefore, we assess fiscal policy sustainability in the SADC region. This is the first study of this kind in the region. Hence, this constitutes the contribution of this thesis.

We find that government revenues tend to increase following an increase in government expenditures. This, according to Bohn (1998), is sufficient to infer fiscal policy sustainability. Hence, we conclude that fiscal policies in SADC are sustainable. The reaction coefficient is less than a unity implying that fiscal policies are weakly sustainable (Quintos, 1995; Kalyoncu, 2005). However, we argue that a reaction coefficient that is less (greater) than a unity does not necessarily mean that policies are weakly (or strongly) sustainable. However, it reflects asset market conditions. Given that the probability of defaulting is higher in developing countries due to riskier economic environment agents would require a strong reaction (or significant increase) in government revenues following an increase in government expenditure. In all, fiscal policies are sustainabile in the SADC region.

# Chapter 2

# The degree of business cycles' synchronisation in SADC

### 2.0.1 Introduction

Formal arrangements to endorse economic cooperation in Southern Africa started in the 1960s with the Frontline States, namely, Angola, Botswana, Mozambique, Tanzania, Zambia and later Zimbabwe. The primary objective was to politically liberate Southern Africa by ending apartheid and white minority rule in South Africa and Southern Rhodesia (now known as Zimbabwe) (Rossouw, 2006). The initiative was later extended to support member states (Botswana, Zambia, Zimbabwe and Mozambique) that were targets of military incursions by the then apartheid South Africa.

One of the main problems facing the Front-line States was their economic dependence on South Africa. Against a background of numerous challenges, such as economic backwardness and poverty, these countries saw the promotion of economic and social development through economic cooperation and integration as the only logical option (Rossouw, 2006). This led to the formation of the Southern African Development Coordination Conference (SADCC) in April 1980, which was followed by a commitment to pursue economic freedom policies. In August 1992, SADCC

was renamed SADC (Southern African Development Community) and the Frontline States disbanded in 1994 following the end of apartheid in South Africa (Rossouw, 2006).

The idea of economic cooperation and integration in SADC is backed by (Debrun & Masson, 2013). They argue that integration would assist Southern African countries expand their market size, and thus take advantage of the resulting economies of scale. Guillaume and Stasavage (2000) also support the idea of monetary integration in Africa. They maintain that African countries are unable to credibly commit to financial stability in the conduct of monetary policy. Accordingly, they point out that a monetary union can provide an alternative means to conducting a sound monetary policy.

In light of these arguments, a number of initiatives have been put in place to advance the agenda of economic cooperation and integration in SADC (Rossouw, 2006; Zerihun & Breitenbach, 2016). SADC Treaties 21 and 22 lay out areas of cooperation, and emphasize the need for cooperation in all areas. The protocol on finance and investment was signed in 2006, in an attempt to financially integrate the region. In order to ensure free movement of people, a protocol on the facilitation of movement of persons was signed in 2005; and a protocol on trade was signed in 1996 and effected in 2001 to expand intra-regional trade. In line with these protocols, a SADC Free Trade Area (FTA) was established in 2008. The trading bloc is still working to establish a SADC Customs Union, which was initially set to be launched in 2010. Successful establishment of a customs union was set to be followed by the establishment of a SADC common market in 2015. A common market is the final phase towards the establishment of the SADC monetary union, which was initially planned to be functional by 2016.

While a lot of progress has been made towards the establishment of a monetary

union in SADC, the political (rather than economic) intentions that dominated the establishment of the union have not been followed by parallel empirical studies to investigate the suitability and merits of the envisaged monetary union. P. Krugman (2013) argues that the benefits of a monetary union come at a very high cost; and the theory of Optimal Currency Areas (OCA) remains the only device to weigh the balance between the potential costs and benefits of a monetary union. The major cost of a common monetary area is the loss of independent monetary policy to a supranational bank, which suggests that synchronisation of business cycles is necessary in order to establish a workable union (Soares et al., 2011).

Establishing a common monetary policy area with asynchronous business cycles could result in dysfunctional monetary policy, and eventually a collapse of a monetary union. With asynchronous business cycles, a single monetary policy will not be optimal for all member countries (Gogas, 2013; Soares et al., 2011). Issues associated with joining a union with asynchronous business cycles have been evident in the European Union (EU) (Zerihun et al., 2014). Therefore, for a workable monetary union in SADC, it is important to take lessons from the already existing unions to avoid repeating the same mistakes. The primary objective of this chapter, therefore, is to examine factors that mitigate the costs of adopting a common monetary policy by investigating the degree of business cycle synchronisation as a key prerequisite for adopting common monetary policy. This study investigates which members of the region have the characteristics to successfully adopt a common monetary policy without running the risk of destabilizing the union as it happened in the EU (H.-H. Lee, Huh, & Harris, 2003).

This study commences by evaluating pairwise correlation between the cyclical component of GDP in each of the SADC member countries and South Africa's cyclical component of GDP. The study reveals little, and in most cases insignificant correlations. Correlation anaylses have received large criticism in the literature.

Therefore, its analysis cannot be treated as a conclusive evidence for business cycles' synchronisation or lack thereof. In order to work around the issues associated with correlation analysis, the study employs a dynamic factor model. Previous studies, which employed a dynamic factor model, have predominantly focused on developed economies, and a combination of developing and developed economies (Alesina et al., 2002; Kabundi & Loots, 2007; Calderon, Chong, & Stein, 2007). Moreover, the only study conducted in the SADC region using the dynamic factor model was limited to 12 countries of the 15 SADC member states (Kabundi & Loots, 2007). This study, therefore, is somewhat an extension to the study conducted by Kabundi and Loots (2007). The study includes all SADC member countries and data is extended to cover the period of 1967-2015 whereas Kabundi and Loots (2007) cover until 2002. Furthermore, unlike Kabundi and Loots (2007) who only considered regional factors, we consider both regional factors and idiosyncratic factors. Studying idiosyncratic factors allows us to understand the impact of country-specific features in driving business cycles across the region, thus enabling us to come up with relevant policy recommendations.

Asongu et al. (2017) argue that studies often present conflicting results on the issue of establishing monetary unions in Africa. This, therefore, implies that the issue of the feasibility of monetary unions in Africa remains an unsettled matter. The failure to take into account regional factors, such as economic integration, political histories and institutional arrangements could be behind the conflicting results often found in African studies Asongu et al. (2017). By considering both the regional shocks and individual specific shocks, we are closing the gap or eliminating the failure to account for regional factors, thus resolving, to some extent, the existing conflict in the literature.

The findings of the study reveal that, given that other conditions of a monetary union are fulfilled, a monetary union which subsumes all SADC member states would

not be optimum. Put differently, it is shown that, for some countries, business cycles are driven by regional common shocks whilst in other countries they are explained by idiosyncratic factors. Therefore, a preferred conduct of monetary policy for the countries whose business cycles are driven by regional shocks may be different from those whose business cycles are driven by idiosyncratic shocks. The conflicting preferences about the conduct of monetary policy would threaten the stability of a monetary

### 2.0.2 SADC Macroeconomic Overview

SADC consists of fifteen sovereign member countries which are at different levels of development. South Africa is the most economically advanced country in the bloc. The levels of economic growth across SADC member states are highly heterogeneous, with other countries attaining high growth levels, and others achieving low levels of growth (See Figure 2.0.2). Notwithstanding, the imbalances and the relatively small individual market sizes, SADC's aggregate GDP is more than half of the Sub-Saharan Africa's (SSA) aggregate GDP, thereby making it the largest regional economic community (REC) in Africa in terms of GDP.

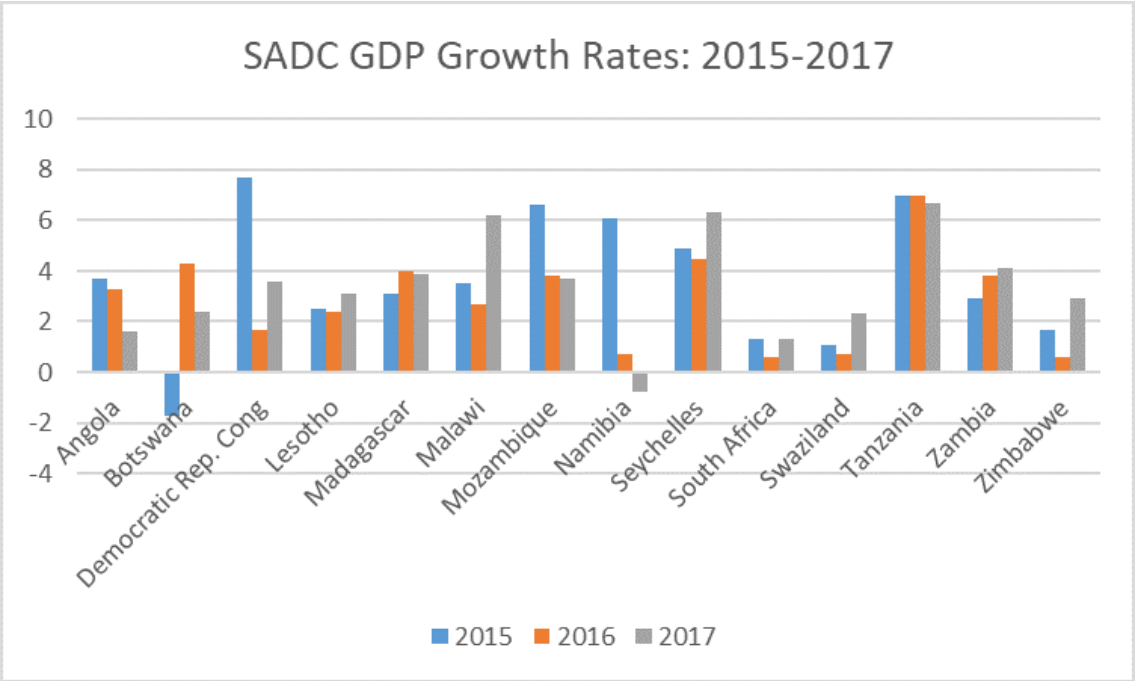



Figure 2.1: SADC GDP Growth Rates: 2015-2017

SADC income as measured by GDP per capita has remained low, and is declining. In the year 2002, SADC average GDP per capita stood at US$876, peaking between 2003 and 2011 to an average of US$2587 and declining in the subsequent periods 2012-2014 to US$2374. In the year 2014, Seychelles' GDP per capita was highest in the SADC region at US$16922, followed by Mauritius at US$10017, Botswana (US$7365), South Africa (US$6485), Angola (US$6060), Namibia (US$5309), and Swaziland (US$4112) in that order. Low-income countries in the region consist of Zimbabwe with an income per capita of US$1056, Madagascar (US$453), and Malawi (US$379), amongst others. If these countries were to close the gap and reduce poverty, formulation of appropriate policies to induce per capita growth is warranted. The primary contributors to the observed low levels of income per person include amongst others, distorted and underdeveloped production structures, meagre economic performance, macroeconomic management challenges, unfavorable international economic environment and lower representation to international market.

Given the heterogeneousness amongst SADC member countries, and the above-mentioned challenges, SADC made it her objective to ensure a balanced and equitable development amongst its member countries. Thus, it is believed that deeper integration would result to economic convergence as opposed to divergence of member states. This is supported by Hudson and Jones (2002) who demonstrates that economic integration in West Africa, ECOWAS to be precise, is associated with convergence in per capita income.

### 2.0.3 Literature Review

Prior to Mundell's (1961) seminal work, areas in which it is optimal to abandon flexible exchange rates in favor of fixed exchange rates (or single currency) were defined by the "existing national confines (McKinnon, 1963). Therefore, "existing national confine" constituted a country, each country had its own currency, and currency unions were very sporadic (Alesina & Barro, 2002). Defining countries as optimal currency areas, there was an exponential increase in the number of currencies used around the globe. Alesina and Barro (2002) argue that there were 76 countries in the world in 1947, and the number of countries today has more than doubled, reaching 195 in 2018, with few exceptions, each country has its own currency[1].

However, with the increasing number of currencies, and level of financial market integration, defining optimal currency areas with national confines has come under great scrutiny. As a result, some countries have stopped using their 'own currencies' and thus, deciding to share a single currency, while others have opted for dollarization and/ or currency boards. For example, in 1999 eleven European countries[2] adopted the "Euro", while countries in the CFA franc zone[3] fixed their curren-

[1] John Stuart Mill describes the use of multiple (different) currencies as "babaric"

[2] Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal and Spain.

[3] The CAF franc is the name of two currencies utilised in parts of West and Central African states. The West African states are: Benin, Burkina Faso, Guinea-Bissau, Ivory Coast, Mali, Niger, Senegal, Togo; and Central African states are: Cameroon, Central Africa Republic, Chad, Gabon, Republic of Congo, and Equatoral Guinea.

cies against the Euro (formerly to the French Franc). Given these developments, the question is how to determine the size of an optimal currency area, i.e. which countries are eligible to adopt and/ or join a common currency? Lerner (1947); McKinnon (1963); R. Mundell (1961) argue that economic fundamentals ought to be asked to determine the size of an optimal currency area. In line with the view that economic characteristics are in a better position to determine the optimal size of a monetary area, Christodoulakis, Dimelis, and Kollintzas (1995) postulate that the design of institutions and policies associated with a currency union is endogenous to the uniformity of some central economic traits for the economies in question[4].In line with this, Alesina and Grilli (1993) show that incentives to join a monetary union depend on a number of fact ors such as output and infla tion co-movement across the countries in question.

The theory of optimal currency areas[5] by R. A. Mundell (1961) prescribes optimal conditions for the adoption of a single currency, and consequently employment of common monetary policy (McKinnon, 1963). It has been argued that countries intending to share a common monetary policy should share some traits (Eickmeier & Breitung, 2006), which include an adequate degree of business cycle co-movement (R. A. Mundell, 1961; Fidrmuc & Korhonen, 2003). If business cycles are not matched, probably due to structural differences among countries, the use of a common monetary policy may be counterproductive (Correia, Gouveia, et al., 2013). This is because by being part of a monetary union , countries automatically surrender their monetary policy to a supranational bank (Buigut & Valev, 2009). Therefore, a common monetary policy designed to tackle union-wide disturbances in the presence of asymmetric and/ or asynchronous business cycles may not be optimal for all member count ries and conflicts on the preferred conduct of mon-

[4]The delicate question in this regard is whether or not countries are homogenous and have symmetric responses to shocks.

[5]The theory of optimum currency areas define a geographic domain under which abandonment of flexible in favor of fixed exchange rates would be beneficial (favorable)(see Lerner, 1947; Friedman, 1953, and Mundell, 1961 among others for further discussion.)

etary policy would arise (Seymen, 2012). For instance, countries that are on an expansionary phase of their business cycles would prefer a contractionary monetary policy in order to deal with the resulting inflation pressures, whereas countries experiencing recessions would prefer an expansionary monetary policy in order to fuel growth (Gogas, 2013). In line with this, Hallett and Piscitelli (2002) argue that if substantial differences among countries wanting to establish a monetary union exist, it is inevitable that common policies, and specifically common monetary policy, will have diverse effects in different economies. Accordingly, business cycles synchronicity is an inevitable requirement for monetary union. Similar sentiments are shared by Hallett and Piscitelli (1999).

Because perfect correlation of business cycles is hardly observed in the real-world Correia et al. (2013) and Eickmeier and Breitung (2006) argue that other adjustment mechanisms such as the use of fiscal policy, mobility of fact ors of production, and other nominal flexibilities could resolve the potential conflict on the preferred conduct of monetary policy. However, in the absence of these adjustment mechanisms, they argue that establishment of a monetary union would be impulsive (Chaplygin, Hallett, & Richter, 2006). Thence, business cycles' synchronisation becomes an essential precondition for the establishment of a monetary union and hence employment of common monetary policy (Correia et al., 2013).

There is a large strand of the literature examining the degree of business cycles' synchronisation (See for example, Altavilla, 2004; Bagliano & Morana, 2009; Correia et al., 2013). However, most of the a ttention has been placed on the United States, Europe, and East Asia (Moneta & Rüffer, 2009; G. H. Lee & Azali, 2010; Filipovski, Trpeski, & Bogoev, 2018). Empirical studies assessing business cycle correlation in developing countries are still scant (Calderon et al., 2007). He and Liao (2012) assess business cycles' synchronisation in Asia, and conclude that although global common factors have deepened overtime, business cycle co-movement has

not followed suit. However, regional factors have become significantly important in explaining business cycle co-movements in Asia. Their findings suggest that Asian economies (except for China, whose business cycles appear to be significantly driven by country-specific factors) can consider employing a region-wide monetary policy to tackle disturbances.

H.-H. Lee et al. (2003) support the aforementioned studies. They find that the regional common component plays a significant role in explaining business cycles for East Asian countries. Thus, they support the establishment of a monetary union, and argue that synchronisation will be further bolstered by trade integration. These findings are consistent with Bagliano and Morana (2009), who observed that in Europe, business cycles arc driven by both common global shocks, and idiosyncratic factors.

Giannone and Reichlin (2006) document the importance of regional (Euro area) common shocks in explaining individual country business cycles. In contrast to these studies, Seymen (2012) stresses on the importance of global shocks and country-specific shocks in explaining business cycles' co-movements as opposed to regional (Euro area) common shocks (Canova, Ciccarelli, & Ortega, 2007). Canova et al. (2007) find that business cycles in G-7 countries are largely driven by world cycles, while country-specific shocks play a very little role. In addition, they found no evidence of the importance of regional shocks. The importance of global shocks in explaining Emopean business cycles has far-reaching policy implications for the European Central Bank (ECB). With global shocks, the European Union policy makers ought to set their policies in tandem with major players in the world economy (Seymen, 2012). Overall, there seems to be consensus that business cycles' synchronisation in the Euro area has intensified, and global common shocks have played a major role in driving business cycles across Europe and Asia.

It is clear that more attention has been paid to developed and Asian countries; and African countries have been neglected in empirical analyses. Among the few studies that have been carried out on the SADC, the findings have been contradictory. Zerihun and Breitenbach (2016) investigate purchasing power parity in SADC, and find that it holds. Therefore, they conclude that SADC could consider adopting a common monetary policy. Tipoy (2015) and Debrun and Masson (2013) on the other hand, find that only some SADC member states are ready to adopt a monetary union. Precisely, Tipoy (2015) finds that conditional convergence was more pronounced among SACU member states. Tipoy (2015) argues that the lack of convergence in economic growth for these countries may hamper the optimality of a region-wide monetary policy. Buigut (2006) also find that not all SADC member countries should take part in the adoption of a common monetary policy in the region. They observe that business cycles in member states of the Common Monetary Area (CMA) am synchronised, and thus may consider adopting a common monetary policy. On the other hand, Agbeyegbe (2008), Vieira and Vieira (2013) and Asongu et al. (2017) argue that SADC member countries are too heterogeneous, and therefore adopting a common monetary policy would not be optimal for the trading bloc. Jefferis (2007) assesses the degree to which the fundamental monetary indicators are converging m the SADC region, and he finds that the converging group comprises of the CMA member countries, Botswana, Mozambique, Mauritius and Tanzania. Karras (2006) evaluates the costs and benefits of establishing a currency union in Africa. He finds that countries that are more likely to benefit more, also stand to lose more while countries that have little to gain, also have little to lose.

Kabundi and Loots (2007) employ a generalized dynamic factor model to assess the nature, and extent of business cycle synchronisation between SADC and South Africa. They demonstrate that there is significant business cycle synchronisation between South Africa and Botswana, Zimbabwe, Democratic Republic of Congo (DRC), Lesotho, Angola, Mozambique, Mauritius, and Namibia. They also

show that in SADC countries, business cycles are largely driven by idiosyncratic and global factors. The small impact of regional common factors on SADC business cycles implies that adoption of a regional common monetary policy would not be optimal. These findings are in line with Khamfula and Huizinga (2004) who argued that a monetary union that comprises of all SADC member countries would accrue large costs relative to its gains. Contrary to the aforementioned views, Rossouw (2006) argues that convergence should rather be a continuous objective rather than a precondition. This view supports the "cndogcncity" hypothesis of Frankel and Rose (1998), which suggests that a monetary union is a self-validating process. Thus, business cycle comovement is an *ex-post* rather than an ex ante phenomenon. Assessing the degree of business cycles' concordance in Central African Economic and Monetary Community (CAEMC) Carmignani (2009) reveals that the union is characterized by a low degree of business cycle synchronisation. However, overtime synchronisation has tended to increase. Thus, he provides evidence of the endogeneity of business cycles concordance.

Overall, the optimality of the proposed monetary union in SADC has received little attention, and the existing scant literature often present conflicting results about the size and the optimality of the envisaged SADC monetary union. Furthermore, the question of what drives business cycles, that is, whether they are driven by common shocks or idiosyncratic shocks, has not been properly attended to in the SADC region.

## 2.1 Data and Methodology

### 2.1.1 Data

Industrial Production (IP) and Gross Domestic Product (GDP) are two variables that are commonly used in the business cycles literature (Camacho, Perez-Quiros, & Saiz, 2006; Baxter & Kouparitsas, 2005; Clark & Van Wincoop, 2001). Often, quar-

terly or monthly frequency data is preferred to annual data to enable researchers capture high frequency oscillations, which is difficult with annual data. Unfortunately, high frequency data in SADC is rarely available. We, therefore, resort to annual data covering the period 1967-2015. The study period (1967-2015) is selected based on the availability of data, which were collected from the World Development Indicators (WDI).

### 2.1.2 Business Cycles Definition

In the literature, there are two alternative defmitions of business cycles namely, the classical business cycles due to Burns and Mitchell (1946), and the growth or deviation business cycles. The classical definition of business cycles states that business cycles are type of fluctuations found in the aggregate economic activity of nations that organize their work mainly in business enterprises. A cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals which emerge into the expansion phase of the next cycle. This sequence of changes is recurrent but not periodic. Durations of business cycles vary from more than one year to ten or twelve years; and they are not divisible into shorter cycles of similar characters with amplitudes approximating their own" (See, Burns and Mitchell, 1946, p.3).

Classical recessions are very rare. In the late 1960s scholars hcgan to think that business cycles were something of the past. Put differently, they believed that business cycles had vanished (Matthews, 1968). Mintz (1970) argues that business cycles did not demise in the 1960s, but prior to World War II. He argues that periods classified as recessions were not characterized by declines in overall output, which contradict the definition of Burns and Mitchell (1946). Rather they were periods of retardation in the growth rate of the economy. The reason for suspecting the end of business cycles is the mildness of [classical] business cycles recessions in many economies. According to De Haan, Inklaar, and Jong-A-Pin (2008), classical

recessions rarely happen because economies tend to grow overtime, thus rendering the classical definition of business cycles obsolete. Consequently, business cycle theorists came up with a new definition of business cycles, the deviation cycles. The deviation definition of business cycles' considers fluctuations of growth around their potential. In this sense, periods of low growth are considered as recessions, whereas periods of high growth are considered as expansions.

In line with recent studies, this study adopts the deviation cycle definition of business cycles (Carmignani, 2009). The choice of the deviation cycle definition owes to two considerations. Firstly, most economies are advancing, hence classical recessions are less frequent relative to recessions implied by deviation cycles (De Haan et al., 2008). Secondly, most econometric (i.e. parametric) approaches necessitate time series to be stationary which is often the case in growth cycles.

A study of business cycles does not end with the definition of business cycles. After defining business cycles, the central question is how to isolate a "deviation" or the cyclical component of the series from the permanent component of the series (Baxter & King, 1999)? To achieve this, several approaches have been used in the literature such as the first differenciation and the Hodrick-Prescott filter.

Prior to discussing a detrending technique employed in this study, it is essential to point out the main challenge facing researchers when choosing detrending tools. There are two sets of detrending techniques, namely, the statistically inclined approaches and the economic theory based approaches (Canova, 1994). The former set of approaches presume that the trend and the cyclical component are not observed, but employ heterogeneous suppositions to identify the trend and cyclical parts of the series; and in the latter, the trend is determined by the preferences of the researcher, economic theory and/or the question asked by the researcher (See, Canova, 1994). This issue is highly critical because empirical findings tend to be contingent on the

adopted approach and/ or the filtering technique (Canova, 1994).

However, in most recent business cycles literature, the commonly adopted approach is the statistical approach, precisely, the Hodrick-Prescott fillter (Ravn & Uhlig, 2002; Baxter & King, 1999). Below we concisely discuss the Hodrick-Prescott filter and its weaknesses.

A. C. Harvey and Jaeger (1993) argue tha.t structural time-series models are set up directly in terms of components that have explicit interpretation. In the context of this section, the appropriate model is as follows:

$$y_t = \varepsilon_t + \mu_t \; t = 1, 2..., T \tag{2.1}$$

where $y_t$ is the observed series, $\varepsilon_t$ and $\mu_t$ is the trend component and the cyclical component of the observed series, in that order. The Hodrick-Prescott filter assumes that the circular trend is difference stationary $I(1)$, whereas the cyclical component is stationary $I(0)$.

An estimate of the trend is obtained by minimising the following

$$\min_{[\varepsilon]_t^T} \sum_{t=1}^{T} (y_t - \varepsilon_t)^2 + \lambda \sum_{t=1}^{T} ((\varepsilon_{t+1} - \varepsilon_t)(\varepsilon_{t-1} - \varepsilon_t))^2 \tag{2.2}$$

where $\lambda$ is a smoothing parameter, which penalizes changes in the growth of the circular component. The larger the value of $\lambda$, the greater is the penalty imposed, and the smoother the resulting circular component. While the Hodrick-Prescott filter is the most popular filter in macroeconomics literature, it is associated with major concerns and has received great criticism (Ravn & Uhlig, 2002; Baxter & King, 1999; King & Rebelo, 1993). The main problem with the Hodrick-Prescott filter is on the selection of the appropriate smoothing parameter. While there seems to be consensus that for quarterly data, the smoothing parameter should be set to 1600, some data are hardly available at this frequency. The appropriate value of $\lambda$

for annual data, however, remains an unsettled matter. Backus and Kehoe (1992) set the smoothing parameter to 100, while Baxter and King (1999) suggest that it should be set to 10 for annual data. On the other hand, Ravn and Uhlig (2002) suggests that $\lambda$ should be set to 6.25 for annual data. The second problem with the Hodrick-Prescott filter was pointed out by A. C. Harvey and Jaeger (1993), Cogley and Nason (1995) and King and Rebelo (1993) amongst others. They argue that the Hodrick-Prescott (HP) filter is a two-sided symmetric moving average filter, and when applied to a trend stationary series the filter works like a high pass filter[6]. However, when applied to integrated series, the filter does not work like a high pass filter. In this case, the filter is comparable to a two-step linear filter, which differentiates the data to render them stationary, and thereafter smoothens the differentiated data with asymmetric moving averages (Cogley & Nason, 1995). The smoothing operation amplifies growth cycles at business cycle frequencies (Cogley & Nason, 1995), consequently, resulting to spurious cycles (Canova, 1994, 1998; Baxter & King, 1999; King & Rebelo, 1993; A. Harvey & Trimbur, 2008).

As a consequence, Baxter and King (1999) developed a band-pass filter which avoids limitations of the Hodrick-Prescott filter. Moreover, Baxter and King (1999) argue that filtering techniques, including the Hodrick-Prescott filter, tend to overlook the matter which Burns and Mitchell (1946) regarded as fundamental definition of a business cycle. According to Burns and Mitchell (1946) business cycles are cyclical components of no less than one and half years, and which typically last fewer than eight years. The Baxter-King filter applies these limits as a definition of business cycles. Baxter and King (1999) propose a bandpass filter of definite order $q$. The Baxter-King filter is defined as a finite-moving average:

$$y_t^p = \sum_{j=-q}^{Q} \alpha_j L^j y_y \tag{2.3}$$

where $\alpha_j$, $L$ denotes symmetric weights and a backshift operator ($L^n y_t = y_{t-n}$,

[6]For full details see Singleton (1988)

respectively. The symmetric weights are obtained as a solution to the subsequent minimization problem:

$$\min_{\alpha_j} Z = \int_{-\pi}^{\pi} (\beta(\omega) - \alpha(\omega))^2 d\omega \text{ subject to } \alpha(0) = 0 \tag{2.4}$$

where $\beta(\omega)$ is the best filter gain with cut-off frequencies $\omega_1$ and $\omega_2$. Similarly to Hodrick-Prescott filter, the cyclical component is obtained as $y_t^c = y_t - y_t^p$.

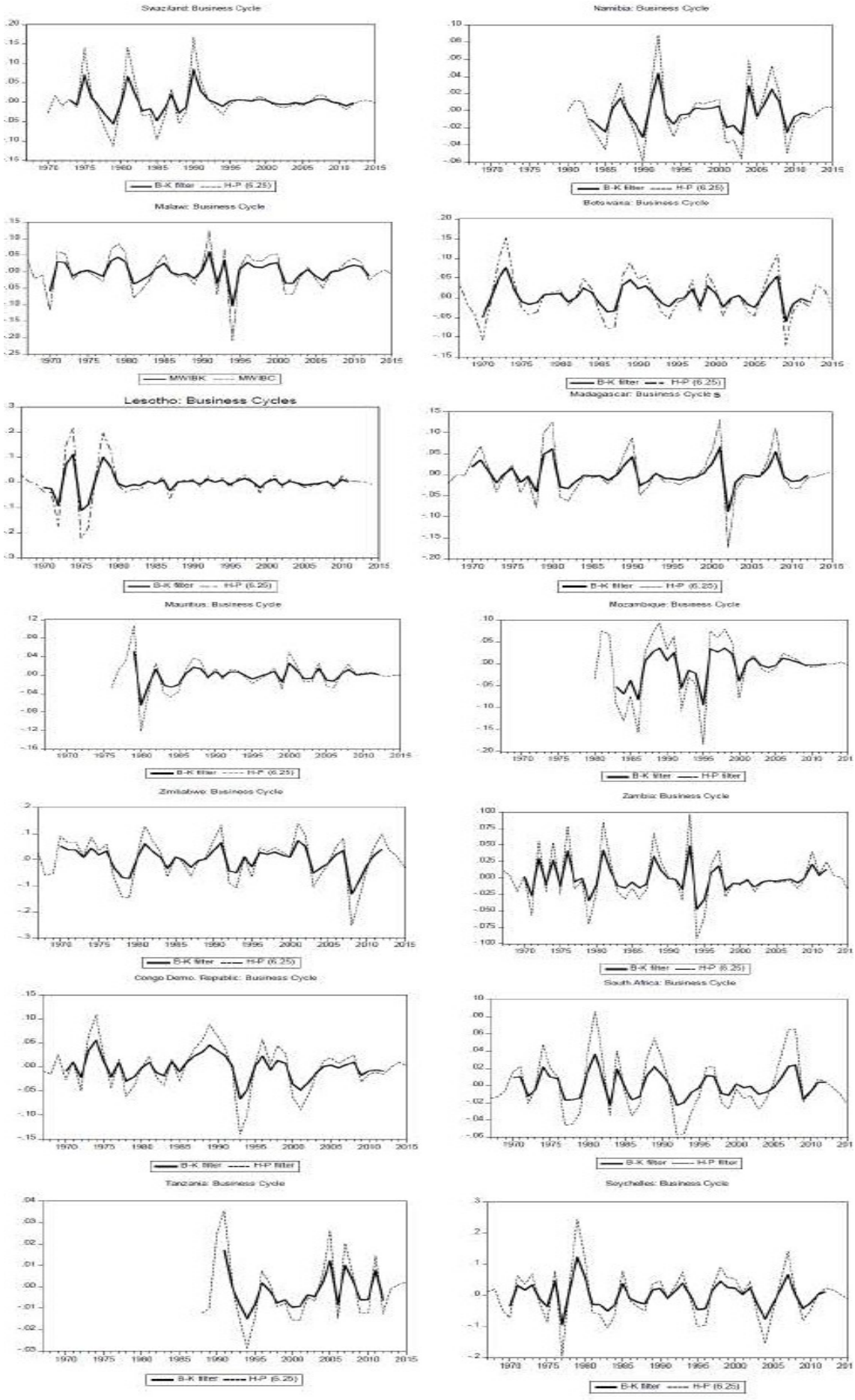



Figure 2.2: Business Cycles: Baxter and King v. Hodrick-Prescott Filter

In figure 2.1.2, we present business cycles obtained from the Baxter and King (1999) and the Hodrick and Prescott (1997) filtering techniques. In line with other previous studies, the figure reveals that there exist resemblances between the Hodrick-Prescott (H-P) filter and Baxter-King filter (Canova, 1994). However, when the Hodrick-Prescott filter is applied, turning points tend to be severe relative to Baxter-King filtered business cycles. Moreover, in contrast to H-P filtered cycles, B-K filtered cycles tend to be smooth (Buti, Franco, & Ongena, 1998; Baxter & King, 1999). Another point worth mentioning is that the order of turning points and periods suggest that business cycles are not synchronised.

As pointed out earlier, there are two mam issues associated with the application of the Hodrick-Prescott filter in business cycle analysis: poor approximation near the endpoints, and spurious or artificial" business cycles (Baxter & King, 1999; Buti et al., 1998; Cogley, 1990; Canova, 1994; A. C. Harvey & Jaeger, 1993). These limitations make the Baxter-King band pass filter to be more attractive than the Hodrick-Prescott filter (Christiano & Fitzgerald, 2003). Hence, this study uses the Baxter-King filtering approach.

### 2.1.3 Econometric Framework

The existence of common shocks, which drive business cycles for different economies intending to adopt a common monetary policy, is imperative. if common shocks exist and account for large variance of business cycles for individual economies, adopting a common policy should not be costly (Camacho et al., 2006). Although a consensus on the importance of business cycles synchronisation (measured by the existence of common shocks) has been reached, there has been no consensus on how to successfully measure business cycles co-movements. Consequently, a number of different approaches to evaluate business cycles' synchronicity have been employed. Baxter and Stockman (1989) and Backus and Kehoe (1992) apply basic correlation to analyse the degree of business cycles' synchronisation. Basic correlation has, however, received significant criticism by Moneta and Rüffer (2009), amongst others. They

argue that basic correlation fails to isolate idiosyncratic shocks from structural common shocks, and also fails to capture the tenacity of common shocks. In addition, H.-H. Lee et al. (2003) criticise correlation on the grounds that it measures bilateral co-movements between two countries, rather than region-wide business cycles co-movements. Therefore, the approach is silent about the effects of adopting a common monetary policy.

Other approaches such as structural vector autoregressive models (SVARs) have been utilized in the literature (Seymen, 2012). However, these models are not without imitations. One of the limitations is the inability to distinguish between idiosyncratic and structural common shocks (Forni, Giannone, Lippi, & Reichlin, 2009). ln addition, orthodox vector autoregressive models are incapable of incorporating a large information set, unlike dynamic factor models. The large information set complicates the identification of the model since the number of parameters to be estimated increases as well (Forni et al., 2009; Kutu, Akinola, & Nzimande, 2016).

Amongst others, it is for these reasons that this study employs a dynamic factor model, which owes its origins to the work of Geweke (1977). These models have been widely used to predict the behavior of macroeconomic variables (Stock & Watson, 2002; Forni et al., 2009, 2005). Our model assumes that an $N$ dimensional stationary processes $Y_t$ can be expressed as a sum of two independent components: the individual specific component, and the common component, which captures the part of the series that moves together with the rest of the region (Forni et al., 2009). The premise of the model is that time series (i.e. business cycles in our case) are driven by a small number ($q$) of common shocks, which in turn generates co-movements (H.-H. Lee et al., 2003). Quah and Sargent (1993) provide evidence that indeed a smaller number, which is two, of common shocks explain approximately 80% of the dynamics in microeconomic data.

Our model is therefore specified as follows:

$$Y_{it} = \Phi(L) f_t + \varepsilon_t \tag{2.5}$$

$$f_t = \chi(L) f_{t-1} + \zeta_t \tag{2.6}$$

where there are $N$ series such that $Y_t$ and $\varepsilon_t$ are $(N \times 1)$; there are $q$ dynamic factors, so $f_t$ and $zeta_t$ are $(q \times 1)$; $L$ is a lag operator; and the lag polynomial matrices $\Phi(L)$ and $\chi(L)$ are $(N \times q)$ and $(q \times q)$ accordingly. $\Phi(L) f_t$ is a common component of the series, and the $j^{th}$ lag polynomial $\Phi(L)$ are factor loadings for the $j^{th}$ series. The influence of the idiosyncratic component is embedded in the error term as in Stock and Watson (2011). In addition, we assume that $\varepsilon_t \sim \aleph(0, Q_t)$ where $Q_t$ is an $(N \times N)$ diagonal covariance matrix, and $\zeta_t \sim \aleph(0, \varpi)$ where $\varpi$ is a $(K \times K)$ covariance matrix. We assume that there is no correlation between the idiosyncratic shocks and the error term of the factors at all leads and lags, that is, $E\varepsilon_t \zeta_{t-k} = 0$ for all $k$. In classical ( or exact) dynamic factor models, country-specific components are assumed to be uncorrelated with each other, which limits their usefuh1ess (Stock & Watson, 2011). Forni and Lippi (2001) argue that while the assumption of orthogonality of idiosyncratic factors is essential for indentification purposes, it is a restrictive assumption. Indeed, in the context of this study, the assumption would not be appropriate, because SADC economies are open. As such, the business cycles of country $X$ may well be related to business cycles of country $Y$ in a way that is closely "cross-regressive", so that a country-specific shock originated in country $Y$ transmits, with a lag, to country $X$ (See, Forni and Lippi, 2001) Therefore, our approach permits country specific factors to be weakly and cross-sectionally correlated to some degree (Croux, Forni, & Reichlin, 2001; Forni & Lippi, 2001).

To estimate our model, we follow the work of Watson and Engle (1983) and Quah and Sargent (1993). We utilise the Kalman Filter to generate the Gaussian likelihood, estimate the parameters using the maximum likelihood, and thereafter

use Kalman Filter to get efficient estimates of the factors.

The first step to executing the approach is to cast the dynamic factor model into a linear state space model (Stock and Watson, 2010). Let $F_t = (f_t', f_{t-1}', ..., f_{t-p}')'$ represent $(r \times 1)$ vector, let $p$ be the extent of lag polynomial matrix $\Phi(L)$, and let $\Omega = (\Phi_0, \Phi_1, ..., \Phi_p)$, where $Phi_i$ is the $(N \times q)$ matrix of coefficients on the $i_th$ lag in $\Phi(L)$. Also, let $\Psi(L)$ be the matrix of $1's$ and $0's$, and the components of $\chi(L)$ such that the VAR in equation 2.6 is rewritten in terms $F_t$. Given this representation equations 2.5 and 2.6 can be rewritten as follows:

$$Y_{it} = \Omega F_t + \epsilon_t \tag{2.7}$$

$$\Psi(L)F_t = G\nu_t \tag{2.8}$$

where $G$ is a matrix of l's and 0's selected so that equation 2.6 and equation 2.8 are comparable. We complete our new representation by specifying the law of motion for $\epsilon_t$. Thus, $\epsilon_t$ is assumed to follow a univariate autoregressive process:

$$d_i(L)\epsilon_t = \eta_i t, \ i = 1, ..., N \tag{2.9}$$

Furthermore, it is assumed that $\eta_i t$ is identically, and independently distributed, (i.i.d.) $N(0, \sigma^2_{\eta_i})$, $\nu_t$ is i.i.d. $N(0, \sigma^2_{\nu_j})$ with $j = 1, ..., q$ and $\epsilon_t$ and $\nu_t$ are orthogonal.

Thus equations 2.7 to 2.9 constitute a comprehensive linear state space model. Given the parameters, we exploit the Kalman filter to generate the likelihood and estimate filtered values of $F_t$ and therefore of $f_t$.

## 2.2 Results and Discussion

For comparison purposes, this section assesses the correlation between business cycles in the SADC region, and further examines the correlation between the cyclical

components of aggregate demand. Whilst the findings obtained from this exercise do not allow us to draw conclusions, they serve as a benchmark against which we can compare our empirical findings. Moreover, they allow us to relate/or compare this work with other studies which relied on correlation analysis only.

### 2.2.1 Correlation of Cyclical Components of GDP

To investigate the extent to which business cycles arc synchronised in SADC, equation 2.10 is employed to compute the correlation coefficients between the cyclical component of real output in country $k$, and the cyclical component of the South African real GDP.

$$sync_{ksa} = corr(C_{sa}, C_k) \tag{2.10}$$

Ideally the correlation coefficient would be measured between country $k's$ cyclical component and the cyclical component of SADCs real GDP. However, aggregated SADC real GDP data is hardly available. Consequently, we use South Africa's real GDP as a proxy for the SADC GDP. The use of South Africa,s real GDP is motivated by the fact that South Africa contributes more than 60% towards SADCs total GDP. For example, in 2002, South Africa contributed 76% towards the SADC GDP (Kabundi & Loots, 2007). To disentangle between the cyclical component and permanent component of real GDP, we use a filter proposed by Baxter and King (1999). Generally, a higher correlation coefficient signifies a higher degree of business cycles' synchronisation (Buigut, 2006).

Business cycles' synchronisation of the Southern African Development Community (SADC) member states is compared to that of the member countries of the Common Monetary Area (CMA). The reason for comparing SADC business cycles synchronisation, against the business cycles' synchronisation of the member states of the CMA is simply because the CMA is the only bloc in Southern Africa which

closely resembles other fully-fledged monetary unions such as the Eurozone. The difference between the Eurozone and the CMA is that the Eurozone has a common central bank, whereas the CMA does not.

In addition to business cycle synchronisation using aggregate real GDP, we further investigate which aggregate demand component $i$ for each country $k$ is primarily responsible for the aggregate real GDP business cycle synchronisation. To this end, we construct the country's aggregate demand cyclical components, $c_k^i$ , and thereafter, compute the correlation between SADC real GDP cyclical component, and respective aggregate demand components.

The second and the third column of table 2.1 report results for business cycle synchronisation in the CMA and SADC. The second column of table 2.1, shows that correlation between South Africa's business cycles' and business cycles of other CMA member states is low and is statistically insignificant. We observe thath the correlation coefficients between South Africa's business cycles (a proxy for SADC) and Lesotho, Namibia and Swaziland, are 0.218, -0.074 and 0.147, respectively. The observed correlations in the CMA contradict our expectations, and what is observed in other parts of the world, particularly in Europe. Frankel and Rose (1998) suggest that countries with strong trade ties tend to be significantly correlated than countries which do not share strong trade ties.Hence, given that member states of the CMA share strong trade ties, it is expected that member states of the CMA would be strongly correlated with South Africa (Kabundi & Loots, 2007). Moreover, countries which are geographically proximate are expected to be strongly correlated with each other, therefore, the observed low and statistically insignificant correlation with South Africa is puzzling. Except for Botswana, Angola, Mozambique, and Democratic Republic of Congo, in the third column of table 2.1., we observe low and statistically insignificant correlations between South Africa's business cycles and the business cycles for the rest of SADC member states. Moreover, column three

of table 2.1 reveals that while Angola, Mozambique, Democratic Republic of Congo and Botswana have positive and statistically significant correlation coefficients, the correlation coefficients are below average, i.e. 0.5, except for Botswana whose correlation coefficient is 0.602. Overall, our findings agree with the existing studies that the business cycles' correlation is still limited, and in most cases, it is statistically insignificant (Zerihun et al., 2014; Zerihun & Breitenbach, 2016). The lack of business cycles' cohesion casts doubts on the feasibility of the proposed monetary union in the SADC region. This finding, the lack of business cycles synchronisation, could be consistent with the argument that political agendas, rather than economic merits arc the very important impetus for the envisaged SADC monetary union.

Table 2.1: Business Cycles Correlation

| | Business Cycles' Synchronisation | | Volatility of the Cyclical Component | |
|---|---|---|---|---|
| Countries | CMA | SADC | CMA | SADC |
| Botswana | | 0.602*** | | 0.026 |
| Lesotho | 0.218 | | 0.011 | 0.011 |
| Namibia | -0.074 | | 0.017 | 0.017 |
| Swaziland | 0.147 | | 0.215 | 0.215 |
| Angola | | 0.478** | | 0.058 |
| Congo Demo. | | 0.447** | | 0.058 |
| Malawi | | 0.068 | | 0.030 |
| Madagascar | | 0.341* | | 0.027 |
| Mauritius | | -0.014 | | 0.012 |
| Mozambique | | 0.358* | | 0.035 |
| Seychelles | | 0.225 | | 0.035 |
| Tanzania | | 0.37* | | 0.008 |
| Zambia | | 0.166 | | 0.018 |
| Zimbabwe | | 0.129 | | 0.044 |

Finally, columns four and five of table 2.1 report the volatility of the cyclical

component of real GDP in the CMA and SADC, respectively. The results reveal small differences in business cycles' volatility across all member states of the CMA and SADC region, except for Swaziland whose estimated output volatility is 0.215. Moreover, Swaziland's output volatility is about two and half times larger than the average volatility of the CMA, which is estimated at 0.081. In addition, Swaziland's output volatility is five times greater than the average volatility of the SADC region, which is estimated at 0.040. Overall, our findings suggest that business cycles in the SADC region are not highly volatile. This is in contrast with Gerlach (1988) who suggested that small countries tend to be characterized by high volatile business cycles. A possible explanation is that larger countries are more diversified, while small, more open countries arc more susceptible to global shocks (Darvas & Szapáry, 2008; Kose, 2002). The SADC region, however, is dominated by small, open economies.

#### 2.2.1.1 Correlation of Cyclical Components of GDP

In this section, we present the correlation between the cyclical component of South Africa's real GDP and the cyclical components of respective aggregate demand components for the CMA and SADC member states. As pointed out earlier, the purpose of this task is to investigate which components of aggregate demand are mainly responsible for business cycle synchronisation or lack, thereof. Disaggregating the aggregate demand component is essential because aggregate demand components differently contribute towards overall GDP. It is, therefore, possible that the impact of components with the least contribution toward GDP is outweighed by the effect of components that have a large share in overall GDP.

Table 2.2: Correlation: Private Consumption's Cyclical Component v. SA's GDP Cyclical Component

| Countries | CMA | SADC | Share in GDP(% GDP) |
|---|---|---|---|
| Botswana | | 0.296 | 40.37 |
| Lesotho | | | |
| Namibia | -0.238 | -0.238 | 62.23 |
| Swaziland | 0.215 | 0.215 | 77.09 |
| Angola | | 0.237 | 48.21 |
| Congo Dem. | | 0.034 | 81.53 |
| Malawi | | 0.061 | 81.60 |
| Madagascar | | -0.185 | 85.54 |
| Mauritius | | 0.389* | 66.59 |
| Mozambique | | 0.323 | 82.50 |
| Seychelles | | -0.353 | 60.39 |
| Tanzania | | 0.096 | 71.48 |
| Zambia | | | |
| Zimbabwe | | -0.364 | 80.17 |
| Minimum | 0.238 | -0.185 | 40.37 |
| Maximum | 0.215 | 0.389* | 85.54 |
| Average | -0.012 | -0.049 | 69.81 |

Table 2.2 presents the correlation between the cyclical component of household consumption and the cyclical component of South Africa's real GDP. Column two of table 2.2 reports correlation between the cyclical component of household consumption between South Africa and that of the CMA members, whereas, column two of table 2.2 reports correlation between the cyclical component of the household consumption for the rest of SADC member states and South Africa's business cycle. Furthermore, column three of table 2.2 reports a percentage share of household consumption in GDP for respective members of the SADC region. It is noteworthy

that private consumption contributes more than half to GDP in almost all Southern African countries, except for Botswana where private consumption contributed about 40% to GDP on average. Household consumption accounts for more than 60% of GDP in respective member states of the SADC. Column one of table 2.2 reveals low and statistically insignificant correlation between the cyclical component of consumption and South Africa's business cycle. More precisely, a negative, -0.238, correlation coefficient is estimated between South Africa's business cycle and the cyclical component of household consumption in Namibia.

For the rest of the SADC member states, column three of table 2.2 shows mostly low, and even negative and a statistically insignificant correlation between the cyclical component of household consumption and the cyclical component of South Africa's real GDP. For instance, the estimated correlation coefficients of 0.296, -0.185, -0.353 and 0.296, arc observed in Botswana, Madagascar, Seychelles and Tanzania, in that order. Overall, Table 2.2 shows that there exists no correlation between the household consumption cycles and the overall output cycles in SADC, except for Mauritius whose household consumption cycles appear to be sanguinely correlated with business cycles, and the correlation coefficient, 0.389, is statistically significant at 10%.

The significant positive correlation between household consumption cycles and GDP cycles has serious implications for economic theory. This finding is not in tandem with the permanent income hypothesis and is in line with the Keynesian thesis that consumption is proportionate to income (Zeldes, 1989). The permanent income hypothesis suggests that households smoothen their lifetime consumption, by saving when they have surpluses and borrowing or decummulating their assets when they have shortages; whereas; Keynesian consumers neither borrow nor save to smoothen their lifetime consumption. In the Keynesian hypothesis, consumers arc viewed as passive agents, such that changes in income are ' quickly and fully' prop-

agated to changes in consumption (Lusardi, 1996). Campbell and Mankiw (1990) also rejected the neoclassical life cycle, arguing that consumption does respond to transitory income changes, as in the case of Mauritius.

Moreover, we argue that the observed statistically insignificant correlation be tween GDP cycles and consumption cycles is consistent with the permanent income hypothesis (PIH). According to PIH, transitory income changes should not lead to large changes in the current consumption. This resonates with what we find in the case of SADC (Shea, 1995).

The observation that business cycles and household consumption are not correlated, and consumption accounts for a large share of GDP could possibly explain the observed marginal and insignificant correlation in business cycles across the region. From this, it is clear that assessment of correlation between GDP cycles and cycles of other components of GDP is warranted. It is possible that some components of GDP are strongly correlated with business cycles, however, they are ovenvhelmed by the effect of consumption. Thus, in the subsequent section, we assess the correlation amongst business cycles, and cyclical components of other elements of GDP.

In table 2.3, we show that general government consumption 111 Southern Africa contributes a small percentage to GDP relative to private consumption. On the average, government consumption accounted for almost 19% of GDP for the period under consideration. Madagascar had the smallest share (8%) of government consumption in GDP, while Seychelles had the largest share of government consumption (32,3%) in GDP. Again, we evaluate the correlation between the final government consmnption cycles and business cycles. On the average, synchronisation of public expenditure with business cycles in the CMA, and SADC as a whole is negative and statistically indistinguishable from zero. Surprisingly, we find that public expenditures in Swaziland and Malawi are negatively correlated with business cycles

and the correlation coefficients are statistically different from zero at 10% level of significance. Although, we cannot confirm without further scntinizing the observed relationship between business cycles and public expenditure in both Swaziland and Malawi, we argue that this could imply that fiscal policy in both Malawi and Swaziland are countercyclical as opposed to being procyclical. Thus, when the region as a whole experiences booms, government cuts back on its expenditure, and spends more during recessions which is in line with the proponents of the Keynesian or demand management policies.

Table 2.3: Correlation: Government Expenditure's Cyclical Component v. SA's GDP Cyclical Component

| Countries | CMA | SADC | Share in GDP(% GDP) |
|---|---|---|---|
| Botswana | | -0.19 | 22.97 |
| Lesotho | | | |
| Namibia | -0.027 | -0.027 | 23.72 |
| Swaziland | -0.370 | -0.370 | 16.94 |
| Angola | | 0.356 | 30.27 |
| Congo Dem. | | 0.641*** | 9.43 |
| Malawi | | -0.741 | 14.89 |
| Madagascar | | -0.190 | 8.84 |
| Mauritius | | 0.013 | 13.58 |
| Seychelles | | 0.042 | 32.30 |
| Tanzania | | -0.171 | 16.99 |
| Zambia | | | |
| Zimbabwe | | -0.658 | 17.64 |
| Minimum | -0.370 | -0.741 | 8.84 |
| Maximum | -0.027 | 641*** | 32.30 |
| Average | -0.012 | -.0128 | 18.75 |

In addition, table 2.3 shows a strong positive correlation between the Democratic Republic of Congo (DRC) public expenditure and business cycles. Contrary to what we argued about the case of Malawi and Swaziland, we argue that the observed sanguine relationship between DRC expenditure and business cycles could mean that DRC authorities engage in procyclical fiscal policy. That is, they spend more during expansions, and less during recessions. Ellery Jr, Gomes, and Sachsida (2002) observed a similar relationship in the case of Brazil, and they argue that the Brazilian government will consume whenever it has a chance, and will only reduce expenditure when compelled by a decline in total receipts, that is, during recessions. There are a plethora of reasons why countries, especially developing countries, tend to use procyclical policies. These include pressure from voters and other political parties, and borrowing constraints during hard times, amongst other reasons (Alesina, Campante, & Tabellini, 2008).

Table 2.4: Correlation: Gross Fixed Capital Formation's Cyclical Component v. SA's GDP Cyclical Component

| Countries | CMA | SADC | Share in GDP(% GDP) |
|---|---|---|---|
| Botswana | | 0.525*** | 49.92 |
| Lesotho | | | |
| Namibia | -0.092 | | 46.58 |
| Swaziland | -0.008 | | 65.00 |
| Angola | | | |
| Congo Dem. | | 0.388** | 21.84 |
| Malawi | | 0.173 | 24.52 |
| Madagascar | | 0.350* | 24.51 |
| Mauritius | | 0.218 | 55.61 |
| Mozambique | | 0.055 | 17.57 |
| Seychelles | | 0.392 | 42.80 |
| Tanzania | | 0.213 | 17.44 |
| Zambia | | -0.049 | 31.62 |
| Zimbabwe | | 0.092 | 29.11 |
| Minimum | -0.092 | -0.008 | 17.44 |
| Maximum | -0.008 | 0.525*** | 65.00 |
| Average | -0.050 | 0.019 | 35.19 |

In table 2.4 we show that gross fixed capital formation (GFCF) on contributes approximately 21% to GDP in Southern African countries. For the period under consideration, DRC is the country in which the GFCF's share in GDP is the lowest (12.09%) while Seychelles had the highest (30.33%). Assessing the correlation between private investment cycles and business cycles, we uncover low and insignificant correlation in most cases; with the exception of DRC, and Madagascar whose correlation between investment and business cycles is positive and statistically significant at 10% level. Although, DRC and Madagascar show positive correlation with GDP's

deviation from trend, the correlation coefficients arc below average. The observed positive correlation between private investment and business cycles accords with what one expects in theory (Ellery Jr, Gomes and Sachsida, 2002). In theory, one expects investment to go up in an expansionary phase of business cycle, and vice versa.

In table 2.5 we show synchronisation of exports and business cycles. Prior to correlation results, it is worthy to commence by looking at the average share of exports to GDP across the region. We document that on the average, exports account for 35% of GDP; and Swaziland is the country in which the share of exports to GDP is the highest (more than 60%) whereas, Tanzania is the country in which the share of exports to GDP is the lowest (17.44%). everall, the average correlation between export cycles and real GDP's cyclical component is 0,019 for Southern Africa as a whole. In the CMA, we observe a negative and statistically insignificant correlation and Botswana is the only country whose exports are positively correlated with South African business cycles in the SACU region. Lastly, for SADC as a whole, we show that correlation between exports and GDP's cyclical component is poor and insignificant, except for the case of Botswana, DRC and Madagascar.

Table 2.5: Correlation: Export's Cyclical Component v. SA's GDP Cyclical Component

| Countries | CMA | SADC | Share in GDP(% GDP) |
|---|---|---|---|
| Botswana | | 0.295*** | 28.82 |
| Lesotho | | | |
| Namibia | -0.080 | | 21.66 |
| Swaziland | -0.049 | | 18.30 |
| Angola | | 0.056 | 16.35 |
| Congo Dem. | | 0.488* | 12.09 |
| Malawi | | -0.169 | 14.96 |
| Madagascar | | 0.338* | 18.10 |
| Mauritius | | 0.096 | 24.08 |
| Mozambique | | 0.005 | 19.07 |
| Seychelles | | -0.054 | 30.33 |
| Tanzania | | -.0069 | 24.73 |
| Zambia | | 0.425 | 20.04 |
| Zimbabwe | | -0.664 | 14.03 |
| Minimum | -0.080 | -0.049 | 12.09 |
| Maximum | -0.049 | 0.488* | 30.33 |
| Average | -0.065 | -0.087 | 20.89 |

Regarding imports, we show that (sec Table 2.6) imports arc important to GDP more than exports. Imports contributed more than 45% on average for the period considered. As far as imports-business cycle synchronicity is concerned, we show that there is poor correlation, especially in the CMA. Turning to SADC as a whole, we find positive correlation in the case of Botswana, Democratic Republic of Congo and Mauritius.

Table 2.6: Correlation: Import's Cyclical Component v. SA's GDP Cyclical Component

| Countries | CMA | SADC | Share in GDP(% GDP) |
|---|---|---|---|
| Angola | | 0.351* | 52.31 |
| Lesotho | | | |
| Namibia | -0.033 | | 52.59 |
| Swaziland | -0.113 | | 52.59 |
| Congo Dem. | | 0.369** | 24.16 |
| Madagascar | | 0.153 | 29.80 |
| Seychelles | | -0.134 | 74.06 |
| Tanzania | | 0.310 | 30.01 |
| Zambia | | 0.038 | 35.22 |
| Zimbabwe | | 0.092 | 29.11 |
| Mauritius | | 0.452** | 62.25 |
| Malawi | | 0.088 | 36.08 |
| Mozambique | | -0.015 | 42.83 |
| Minimum | -0.113 | -0.113 | 24.16 |
| Maximum | -0.033 | 0.453** | 75.55 |
| Average | -0.073 | 0.018 | 45.85 |

The observed lmv degree of correlation between trade and South Africa could be possibly explained by several factors. Most of Southern African countries arc ,vell endowed with natural resources, such as Diamond, and Platinum, and therefore, intra-SADC intra-trade is scant *vis-a-vis* inter-trade, Europe being the favourite destination for Southern African exports.

It is difficult to conclude whether a monetary union would be possible in SADC only from correlation analysis. As pointed out earlier, correlation is associated with several limitations. For instance, correlation does not reflect the dynamics of co-

movements overtime (Kishor & Ssozi, 2011). Therefore, to overcome the limitations linked with correlation analysis, we estimate a dynamic factor model.

### 2.2.2 Empirical Findings

A dynamic factor model is used to assess the degree of business cycle synchronisation in SADC. Thus, this section presents and discusses the findings from the dynamic factor model. We commence by plotting the regional common component against business cycles for respective SADC member states. Using the eyeball inspection, Figure 2.2.2 demonstrates that while there is little cohesion between business cycles for most of SADC member countries and the regional common component, in other member states business cycles appear to be in harmony with the regional common component. For instance, in Malawi and Lesotho, business cycles appear to be moving in opposite directions with the regional common component in the 1970s up to the early 2000s. This is consistent with Blonigen, Piger, and Sly (2014) who argue that countries experienced strong co-movement around 2000s owing to global recession. Botswana's business cycles show strong co-movement with the regional common component, while in Mauritius, Zimbabwe, Tanzania, figure 2.2.2 shows that the relationship between the regional common component and business cycles is not clear-cut. In Mozambique and Seychelles, the figure shows that there is no consistency between business cycles and the regional common component.

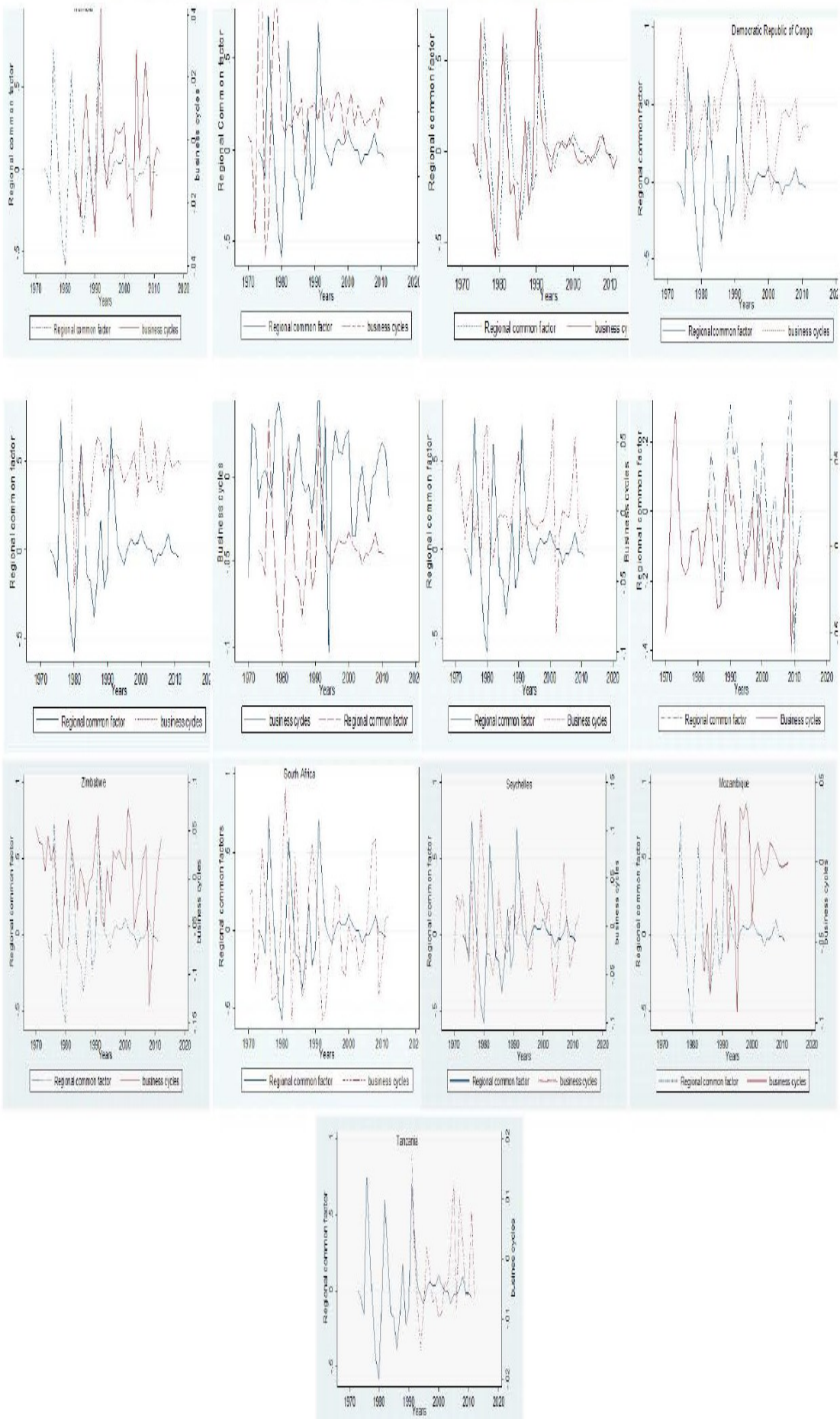



Figure 2.3: Regional Common Component and SADC Member States' Business Cycles

The observed comovemcnts or absence of comovements, is only based on visual inspection. As pointed out, the relationship between the regional common component and business cycles depicted on the diagram is not conclusive. Therefore, there is a need for a formal assessment of the relationships. Consequently, a dynamic factor model is estimated, and the findings are reported in Table 2.7.

Table 2.7: Dynamic Factor Estimates

| Country | Idiosyncratic Component | Regional Common Component |
|---|---|---|
| Botswana | -0.3324 | 0.0255*** |
| | (0.6435) | (0.0032) |
| Democratic Rep. Congo | 0.0920 | 0.0209*** |
| | (0.8650) | (0.0049) |
| Lesotho | 0.2344 | 0.0173* |
| | (0.1658) | (0.0098) |
| Madagascar | -0.0509 | -0.0012 |
| | (0.2133) | (0.0053) |
| Malawi | 0.3956* | 0.0112** |
| | (0.2069) | (0.0047) |
| Mauritius | 0.2228 | -0.0013 |
| | (0.1835) | (0.0020) |
| Mozambique | -0.0915 | 0.0080 |
| | (0.2135) | (0.0058) |
| Namibia | 0.1573 | 0.0032 |
| | (0.1808) | (0.0030) |
| Seychelles | 0.3086 | 0.0061 |
| | (0.1838) | (0.0056) |
| South Africa | -0.2361 | 0.0072*** |
| | (0.2068) | (0.0021) |
| Swaziland | 0.1411 | 0.0256** |
| | ((1.1794) | (0.0256) |
| Tanzania | -0.0710 | 0.0045*** |
| | (0.2367) | (0.0453) |

Table 2.7 show estimates from a dynamic factor model. More precisely, column one and two of Table 2.7 shows the influence of the idiosyncratic component and

regional common component, respectively, on individual SADC members' business cycles, accordingly. In contrast with the limited synchronisation of business cycles reported in table 2.7, the dynamic factor model reveals moderate evidence of business cycles comovement in SADC. We find that the regional common component exerts a positive and statistically significant impact on business cycles for 7 out of 14 SADC member states considered in this study. Column two of Table 2.7 further shows that in Madagascar, Mauritius, Mozambique, Seychelles, Namibia, Zimbabwe and Zambia, the influence of the regional common component is statistically insignificant.

While the regional common component has a positive influence on business cycles for Botswana, Democratic Republic of Congo, Lesotho, Malawi, South Africa, and Tanzania, the effect is very small. For example, Table 2.7 shows that a 1% change in regional common component results in a 2% change in business cycles for Botswana, and 0.45% variation in Tanzania's business cycles. In addition, a 1% change in the regional common component explains 2.09%, 1.7%, 0.72%, 1.1% and 2.5% variations in business cycles for Democratic Republic of Congo, Lesotho, South Africa, Malawi and Swaziland, respectively.The observed synchronicity between Botswana, Democratic Republic of Congo, Lesotho, Malawi, South Africa, and Tanzania may be explained by the notion of contagion effect. The knowledge of a crisis in another county raises the probability of a crisis in other countrics, consequently resulting in business cycles co-movements (See, Male, 2011).

In addition, Column one of table 2.7 shows the influence of the country-specific component on business cycles for respective SADC member states. The results suggest that the country-specific component does not significantly affect business cycles for SADC member states, except for Seychelles and Malawi. We find that a 1 % change in the country-specific component accounts for 30% changes in business cycles for Seychelles, whereas in Malawi, a percentage change in country-spccific

factors can explain approximately 40% variations in business cycles. Our findings are at odds with those of Gregory and Head (1999) who suggested that business cycles arc driven by country-specific factors.

Moreover, while our results concur with Kose, Prasad, and Terrones (2003a) that there is little cohesion between business cycles in Africa, they also contradict Kose, Prasad, and Terrones (2003b) and Male (2011) that business cycles are predominantly explained by country-specific shocks. Kabundi and Loots (2007) suspect that business cycles in the SADC region are explained by either the global or country specific factors or both. They argue this on the grounds that the regional common component seems to be failing to significantly explain variations in business cycles. In contrast with the suspicion of Kabundi and Loots (2007), our results suggest that country specific factors do not explain business cycles for most of SADC member countries. Moreover, we also suspect that indeed global factors could be dominant in explaining growth patterns in SADC. Our suspicion is in line with Michaelides, Papageorgiou, and Vouldis (2013). They find that global shocks a play a primary role in explaining countries' business cycles. Canova and Ciccarelli (2013) and Camacho et al. (2006) also support the importance of global shocks in explaining business cycles. They document that European business cycles arc largely driven by the world factors, rather than regional factors. Camacho, Perez-Quiros, and Saiz (2008) assert that over the past twenty-years, co-movement amongst European countries did not necessarily soar but rather globalisation has increased. Consequently, strengthening business cycle co-movement. Gregory, Head, and Raynauld (1997) argue that if business cycles are a global phenomenon, then country-specific policies may prove not to be useful. Therefore, if business cycles arc driven by global shocks, it implies that country-specific policies/or regional policies must be set such that they arc in line with those of important global actors such as the European Central Bank (ECB) and the Federal Reserve (Seymen, 2012).

The findings of the study arc somewhat similar of early European studies such as, Von Hagen and Neumann (1994) and Bayoumi and Eichengreen (1992). These studies found that in the European Community, there is a "core" and the "periphery" of countries (Ahlborn & Wortmann, 2018). Similarly in SADC, from our findings, it appears that there exists a 'core' and a periphery of countries. A 'core' consists of Democratic Republic of Congo, Malawi, Tanzania, and all members of the CMA except for Namibia; and is characterised by correlated business cycles. It is in this spirit that these studies had suggested a 'two-speed' approach to a European monetary Union. Hence, in this study, assuming that all other factors necessary for the establishment of a monetary union are fulfilled, we suggest a two-speed" approach to a SADC monetary union. A two-speed' approach which is sometimes referred to as the dual approach implies that the 'core' should speed up the process of integration while the peripheral works on harmonizing their policies and institutions with those of the core.

## 2.3 What Could Possibly Explain the Underlying Low Levels of Synchronisation in SADC?

Low levels of synchronisation in SADC have been attributed to overlapping memberships (Buigut, 2006; Tavlas, 2009a). There arc a number of regional groupings in Africa, and some cotmtries in the continent belong to more than one group with diverse objectives, consequently leading to asynchronous business cycles (Buigut, 2006). Southern Africa is considered as a region with many regional economic communities. Although SADC is the largest regional economic community in Southern Africa, there are other trading blocs in the region such as Southern African Customs Union (SACU), Common Market for Eastern and Southern Africa (COMESA) and the East African Community (EAC), among others.

All SACU[7] members are members of the SADC, and all SACU members, except for Botswana, arc also members of the Common Monetary Area (CMA); eight SADC member countries also belong to the Common Market for Eastern and Southern Africa[8] (COMESA) ; and Tanzania belongs to both SADC and East African Community (EAC) (See Figure 2.3).

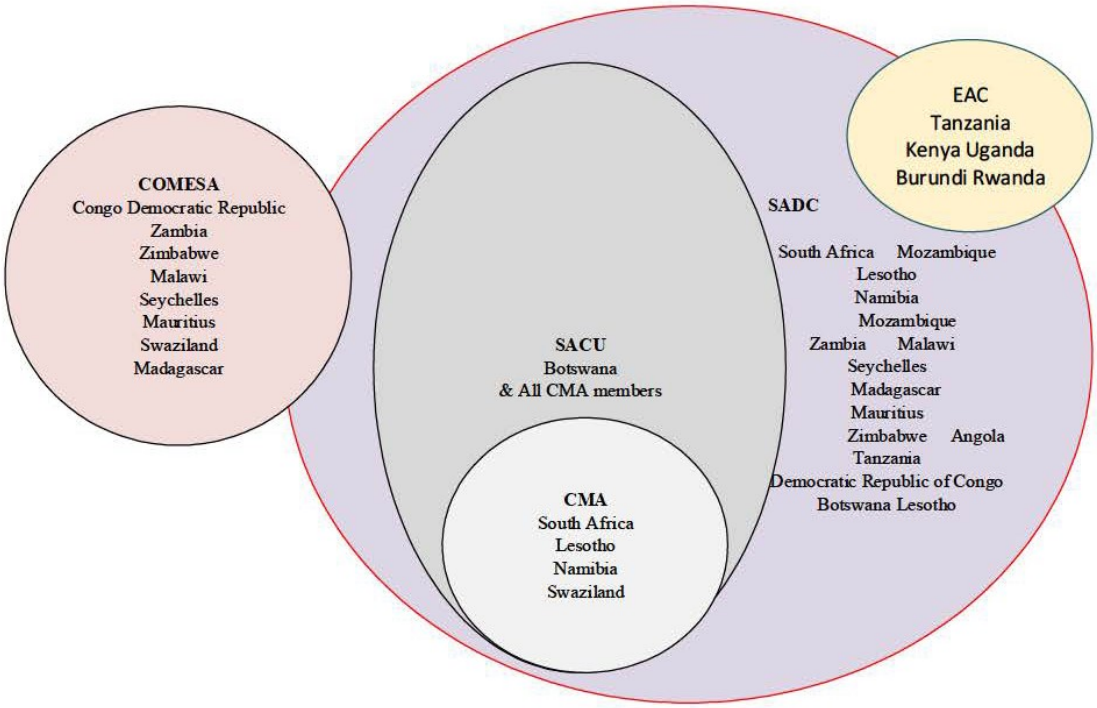



Figure 2.4: Membership Overlay

Harmonization of policies is often argued to be amongst the drivers of business cycle synchronisation. Given the overlapping membership, monetary policy harmonization would be hard to achieve in SADC. This is because although the regional economic communities have similar goals, their road maps to achieve them are heterogeneous. For instance, the process of establishing a customs union was set to be completed by 2008 in COMESA; whereas in SADC, it was set to be completed by 2010. This imposes a challenge to countries belonging to both SADC and COMESA.

[7]Botswana, Lesotho, Namibia, Swaziland and South Africa

[8]Democratic Republic of Congo, Madagascar, Malawi, Mauritius, Seychelles, Swaziland, Zambia and Zimbabwe

This is because a country cannot belong to more than one customs union, countries such as Seychelles and Swaziland will have to choose which customs union they want to belong to, which may be dependent on which customs union is achieved first (Meyn, 2004). This has serious ramifications as SADC endeavors to harmonize economic policies.

Southern African development community member states are characterized by heterogeneous economic structures, and in the literatme, it has been pointed out that coutries with different economic structures arc faced with asymmetric shocks thus diverging business cycles (Clark & Van Wincoop, 2001). We, therefore, suspect that the other potential culprit for the observed low levels of business cycle harmony could be the heterogeneity of economic structures (Claasen, Loots, Kabundi, & Viviers, 2017). For instance, Business cycles in Angola, and Democratic Republic of Congo arc highly contingent on the behavior of the oil market. An estimated 97% of Angolan exports come from oil exports, whereas Botswana heavily relies on diamonds, and the subdued demand for minerals has put significant strain on the Botswana economy. On the one hand, countries like Seychelles are heavily dependent on tourism, which makes their economies more vulnerable to global shocks, while South Africa, which is deemed as the most developed country in Africa, heavily relies on commodities such as gold, platinum and diamonds. Countries such as Malawi, whose economies largely depend on agricultural produce, continue to be more susceptible to adverse weather conditions, climatic shocks and declining demand for agricultural produce. With this, there is a strong reason to believe that these heterogeneities play a significant role in driving/or decoupling business cycles in the region.

Moreover, the asymmetric shocks in Africa have been a result of "political shocks". Most countries have been characterized by civil wars and political instabilities. Angola's civil war ended in 2002, while in countries like Mozambique

and Zimbabwe, political instabilities continue to have a detrimental impact on their economies. In South Africa, policy uncertainties continue to be a major challenge.

## 2.4 Summary and Conclusion

In this chapter we evaluated business cycle co-movements in the Southern African Development Community (SADC). To this end, we analyzed the correlation between individual member states' business cycles and South African business cycles which is used as a proxy for SADC business cycles. In addition, correlation between South Africa's business cycles and cyclical components of the respective aggregate demand components are evaluated in order to reveal which aggregate demand components arc responsible for synchronisation in the region. Finally, we employ the dynamic factor model to assess synchronisation of business cycles across the region. The dynamic factor model decomposes a series into two orthogonal components, that is, the regional common component and the idiosyncratic component. For the purpose of this study, if a large component of business cycles variation is explained by a regional common component *vis-a-vis* an idiosyncratic component, it 1s interpreted as evidence for synchronisation of business cycles.

In order to verify to what extent business cycles arc correlated 111 the SADC region, we computed correlation coefficients between business cycles of SADC mcm ber states using South African business cycles as a representative of the regional business cycles. This is justified by the fact that South Africa contributes over 61% towards SADC GDP. Our analysis revealed low and even negative correlation between business cycles in the SADC region. Breaking down GDP into its aggregate demand components in order to check which components of aggregate demand account for business cycle synchronisation in SADC reveals that imports and exports may be behind the observed business synchronisation in SADC, particularly, between Botswana and South Africa, and Democratic Republic of Congo and South Africa.

Having examined the correlation coefficients, we estimated a dynamic factor model. Contrary to existing literature which suggests that business cycles in developing countries arc mainly driven by country-specific shocks. Our results suggest that business cycles have a very small and statistically insignificant influence on business cycles, except for Seychelles and Malawi. In line with previous studies, the dynamic factor model further reveals that due to lack of business cycles cohesion, a region-wide monetary policy would not be optimal in the SADC region. Our findings reveal that the SADC regional common component has a limited effect on member states' business cycles. This is shown by the statistically insignificant regional common component across member states.

In line with existing studies (Kabundi & Loots, 2007; Zerihun et al., 2014), our analysis suggest that although a region-wide policy would not be optimal, some member states have the characteristics to proceed and establish a successful monetary union. We find Botswana, South Africa, Swaziland, Lesotho, Malawi, Mozambique, Tanzania, and Congo Democratic Republic to be potential candidates to adopt a common monetary policy. This is merely because their business cycles appear to be significantly driven by a regional common component.

Our findings concur with previous studies which suggested that business cycles are largely explained by the global shocks as opposed to the regional or country--specific shocks (See, Kose et al., 2003b).

The lack of synchronicity could, amongst other things, be attributed to multiple memberships. All member countries of the SADC region except for Mozambiquc, belong to more than one regional grouping. Moreover, the lack of synchronicity suggests that structural reforms and policy coordination are warranted. Overall, we suggest that a common monetary policy area consisting of Botswana, South

Africa, Tanzania, Malawi, Swaziland, Lesotho, Democratic Republic of Congo, and Mozambique could be considered as a fast-track project.

# Chapter 3

# The Endogeneity of Business Cycles' Synchronisation in SADC

## 3.1 Introduction

The establishment of a monetary union entails a loss of monetary policy control, to deal with economic disturbances at a country-level. Therefore, for countries whose business cycles arc significantly driven by idiosyncratic factors, using a common monetary policy or establishing a monetary union may be costly and not optimal for all member countries. Accordingly, to alleviate the costs associated with the loss of monetary policy independence, the theory of optimal currency areas (OCA), amongst other things, makes business cycles synchronicity a necessary requirement for establishing a monetary union. Consequently, in a monetary union environment, business cycles synchronisation has been extensively studied (See for example, Montoya & de Haan, 2008; Soares et al., 2011; Barrios & De Lucio, 2003). In addition, business cycle synchronicity has been applied as an instrument to gauge the suitability of a monetary union in the Euro Area, East Asia, East Africa and West Africa, and most importantly, in Southern Africa (see, Correia et al., 2013; Antonakakis, Gogas, Papadimitriou, & Sarantitis, 2016; Sethapramote, 2015; Kishor & Ssozi, 2011; Berdiev & Chang, 2015).

Relying on historical data, an enormous number of studies suggest that the adoption of a common monetary policy in the Southern African Development Community[1] (SADC) would be disastrous, and would lead to macroeconomic instabilities across the region (Kabundi & Loots, 2007; Khamfula & Huizinga, 2004; Zerihun et al., 2014). This view is because historical data uncover insufficient degrees of business cycles co-movements in SADC, and alternative adjustment mechanisms suggested by an OCA, such as labour mobility and nominal flexibilities, arc absent (Moneta & Rüffer, 2009).

Drawing from the famous Lucas critique, Frankel and Rose ( 1997) critique the vieťhat business cycles' synchronisation is a precondition for adopting a common monetary policy. They argue that historical data may be misleading, and business cycles synchronicity is not irrevocably fixed, and may not be exogenous (Frankel et al., 1997). If this thesis holds, business cycles synchronisation could be an ex post rather than an *ex-ante* phenomenon (Frankel & Rose, 1998). This notion owes to the view that introducing a single currency reduces transaction costs and exchange rate uncertainty (Rose & Van Wincoop, 2001), and therefore, stimulates trade, which in turn reinforce business cycles comovement (Correia et al., 2013). Consistent with this view, Rose and Engel (2002) demonstrate that countries sharing a single currency tend to trade more with each other, and are more synchronised *vis-a-vis* countries not sharing the same currency. Likewise, R. Barro and Tenreyro (2007) reveal that adopting a single currency tends to fuel trade. Moreover, Rose and Van Wincoop (2001) argue that, indeed, using a single currency tends to boost trade. Therefore, multiple national currencies appear to be a significant impediment to trade, and hence business cycles synchronicity.

[1]SADC consists of fifteen sovereign member countries, Angola, Botswana, Congo Democratic Republic, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Kingdom of Eswatini (formerly known as Swaziland), Tanzania, Zambia and Zimbabwe

As pointed out earlier, the literature on the degree of business cycles synchronisation in SADC often concludes that based on weaker business cycle alignment, a common monetary policy in SADC would not be optimal (see, Tipoy, 2015; Zerihun et al., 2014; Kabundi & Loots, 2007). However, these studies neither attempt to uncover factors, which could explain the underlying levels of synchronisation, nor suggest solutions to the observed low levels of synchronisation. This chapter, therefore, sets out to investigate factors influencing business cycles' co-movements in SADC.

Identification of factors explaining business cycles co-movement in SADC is essential for several reasons. Firstly, it equips policy makers with crucial knowledge to develop structural policies that will improve cffecicncy, and allow the application of a common monetary policy. Secondly, if business cycles arc driven by peripheral factors such as trade, internal policies intended to stabilise the economy would have a small impact on output growth, thus necessitating economic policy coordination. Therefore, deeper knowledge about factors through which business cycles arc transmitted is warranted, and will have far-reaching policy implications. Moreover, knowledge of the factors influencing business cycle co-movements would assist SADC monetary union aspirants in determining the best timing to adopt a single currency, and whether such a move would fast-track their convergence process (Vieira & Vieira, 2012).

This chapter tests the cndogcncity hypothesis in the Southern African Development Community. The results show that trade intensity positively and significantly influence the extent to which business cycles arc synchronised, suggesting that increased trade/or liberalisation of trade in SADC could potentially bring SADC member countries closer to being a monetary union. In addition, the study results show that macroeconomic policy similarity has a positive and statistically significant effect on business cycles' synchronisation in SADC. Furthermore, it is shown that

financial integration and oil prices (a proxy for external factors) has an adverse effect on business cycles' co-movement. Overall, the study findings lend support to the endogeneity hypothesis of Frankel et al. (1997); Frankel and Rose (1998).

The rest of the chapter is organized in four sections. The next section reviews the literature on factors explaining business cycle co-movements. Section 3 describes data and the empirical framework applied to conduct the analysis. Results and a discussion of the study findings are presented in Section 4. Section 5 concludes the chapter and identifies areas for further research.

## 3.2 Economic Development and Convergence in SADC

In what follows, we concisely review SADC performance against the backdrop of the set macroccononuc convergence criteria. In pursuit of a deeper regional integration, SADC encourage macroeconomic convergence among its member states. The goal of macroeconomic convergence is to stabilise the regional economy, and cushion it against excessive fluctiuations due to external shocks. Amongst others, it aims for a low and stable inflation (between 3 and 7%), sustainable economic growth (not below 7%), sustainable public debts (not exceeding 60% of GDP) and deficits (not greater than 3% of GDP). In order to enforce these convergence criteria, a Memorandum of Understanding was signed in 2002, and was subsequently annexed into the Protocal on Finance and Investment in 2006. In what follows, we consicely review the SADC performance against the backdrop of the set macroeconomic convergence criteria.

### 3.2.1 Economic Growth (7% Target)

Southern Africa's GDP growth in 2016 was estimated at 2.74 percent, with economic performance amongst countries differing (see Figure 3.2.1): South Africa grew by 0.6 percent, Tanzania by 7 percent, Mozambique by 4.2 percent, Mauritius by 4.2 percent, Madagascar by 4.17, and Botswana by 4.1 percent. The oil-dependent Angolan economy contracted by 0.7 percent in 2016, from 3 percent and 4.8 percent in 2015 and 2014, respectively.

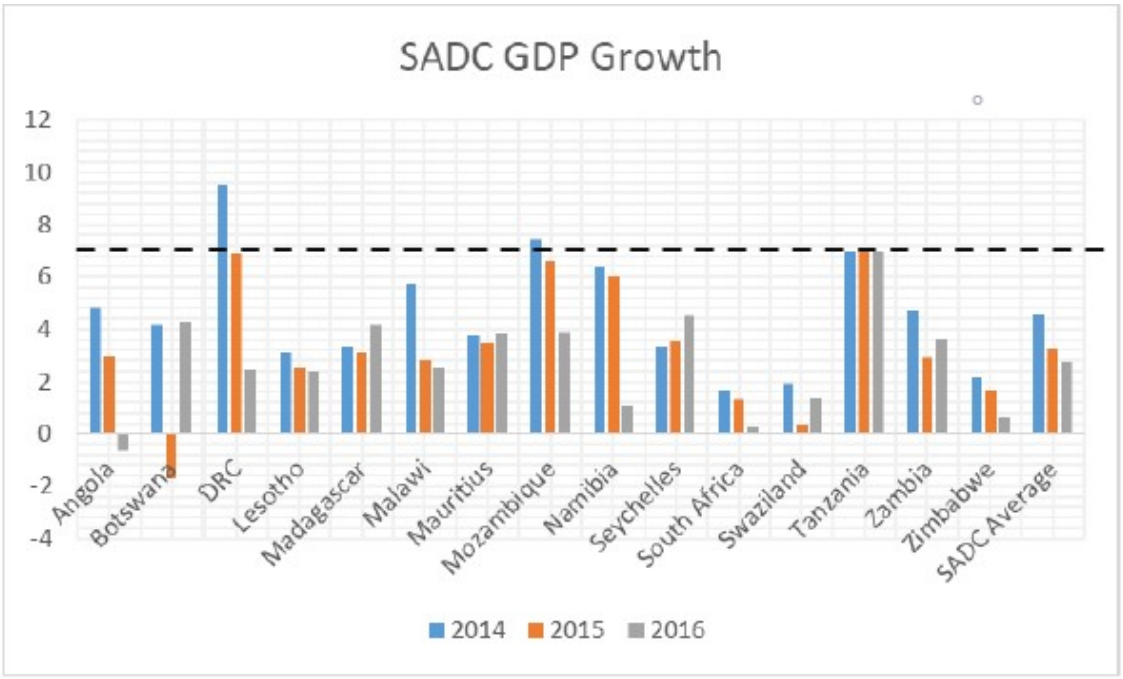



Figure 3.1: SADC Growth (Target 7% Growth)

Growth in DRC dropped to 2.4 percent in 2016 from 6.8 percent and 9.5 percent in 2015, and 2014, in that order; Lesotho's growth remained steady above 2 percent in 2016 and 2015 (more precisely, it was estimated at 2.51 percent in 2015 and 2.39 in 2016).

Overall, we show that while most countries have positive growth, all except for Tanzania are below the convergence target of 7 percent (Refer to Figure 3.2.1). As a consequence, the SADC average growth is still far short from the targeted level.

### 3.2.2 Inflation (between 3 to 7% by 2018)

Over the past three years, inflation generally continued to drop in Southern Africa, mirroring prudent monetary policies, declining oil prices, and other commodities, and good harvests, albeit some countries experienced a sharp increase due to excessive currency depreciation. Moreover, whilst declining oil prices had a positive effect in some countries, in Angola, which is oil dependent, declining oil prices resulted in a sharp rise in the inflation rate (see Figure 3.2.2). The average inflation for the SADC bloc was registered at 9 percent in 2016, up from 6 percent recorded in 2014. This rate remains high relative to the convergence criterion of 3 percent by 2018. On country-by-country basis, only Mauritius recorded an inflation rate that is within the 3 percent target, while Zimbabwe and Seychelles recorded a negative inflation rate in the period 2016. Assessing SADC inflation against the band of 3 to 7 percent, in figure 2 we show that the 2016 inflation performance did not meet the convergence target range. However, on a country-by-country basis, all countries with the exception of Angola, Malawi, Swaziland, Seychelles, Zimbabwe, and Zambia, had managed to remain within the current band (refer to Figure 3.2.2).

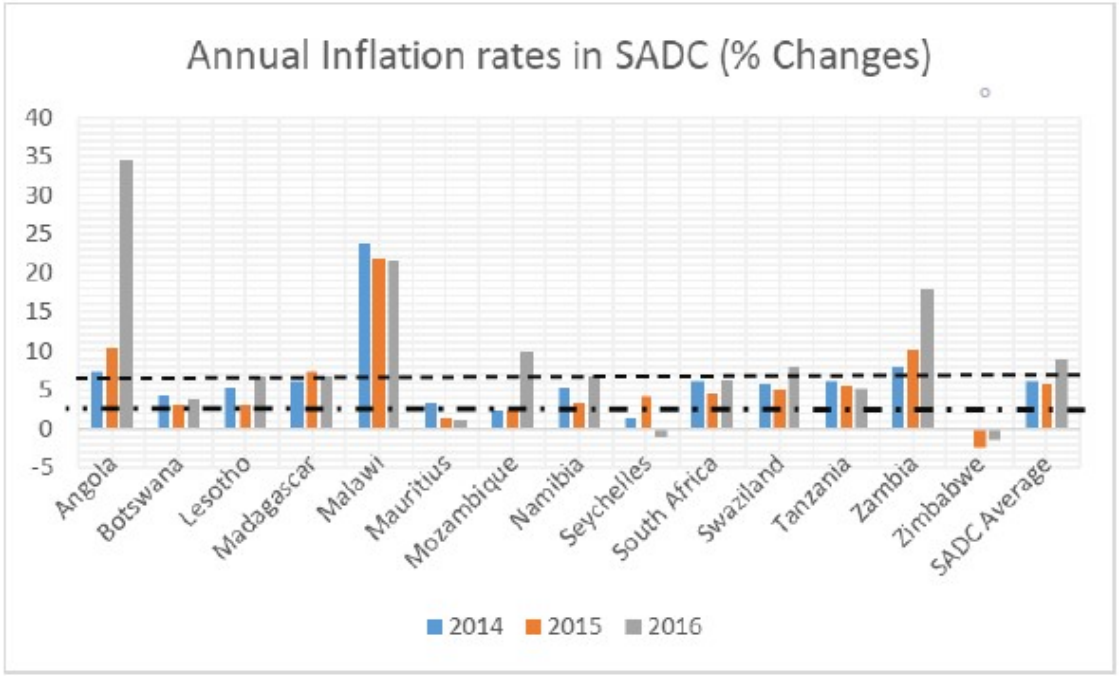



Figure 3.2: Inflation rates in SADC (3% to 7% )

This, failure to achieve a 3 percent inflation target and to remain within the 3%-7% hand suggests that inflation remains a challenge in the SADC region. The Committee of Central Bank Governors (CoCBG) in SADC attributes the observed high inflation in Malawi to the adoption of free floating exchange rate in May 2012 which led to large pass-through effects into local prices. Following the adoption of a free floating exchange rate in Malawi, the Malawian Kwacha depreciated by approximately 72 percent against the US dollar (USD) from 2012 to 2013. The depreciation of currencies could also be a culprit to the observed inflation challenges in other SADC member states. The CoCBG contends that nearly all SADC currencies depreciated by almost 5 percent against the USO, while the South African Rand (ZAR) depreciated by approximately 19 percent.

### 3.2.3 Budget Deficits (3% of GDP)

The sluggish economic growth, soaring government outlays, and slumping commodity prices (and hence lower export revenues) in the SADC region resulted in a significant widening of government deficits. In nearly all SADC member states, budget deficits are well above the targeted 3 percent (See Figure 3.2.3).

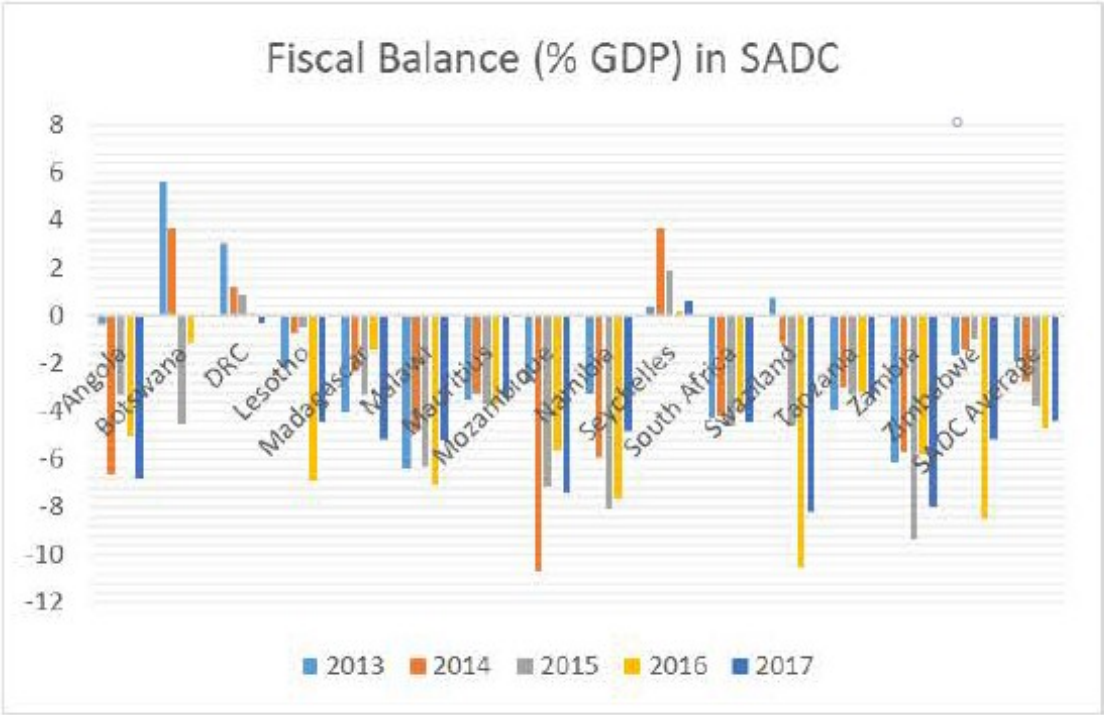



Figure 3.3: Fiscal Balance (% GDP) in SADC

In Angola, budget deficit rose to approximately 7 percent in 2017 relative to 5 percent in 2016. On the other hand, budget deficits in Tanzania and Zimbabwe exceeded 8 percent in 2017. The SADC average budget surplus reached 5 percent in 2017 compared to 3.8 percent in 2016 (see Figure 3.2.3). Overall, it appears that SADC is performing poorly in meeting the set 3% of GDP deficit. Put differently, SADC seems to be struggling to achieve the set target of 3 percent.

### 3.2.4 Public Debt (less than 60% of GDP)

According to the International Monetary Fund (IMF), public debt to GDP has significantly increased since 2013, and is now in excess of 50 percent of income in nearly half of the African countries. In addition, from 2013 to 2016, the number of low-income countries facing high risk of debt distress increased from 7 to 12; and all of the region's frontline markets/or nations with credit ratings have been downgraded to a junk status (that is, below investment grade) with the exception of Namibia. The increasing public debt could be attributed to broadening deficits,

currency depreciations, declining commodity prices, and sluggish economic growth (Auerbach, 2016).

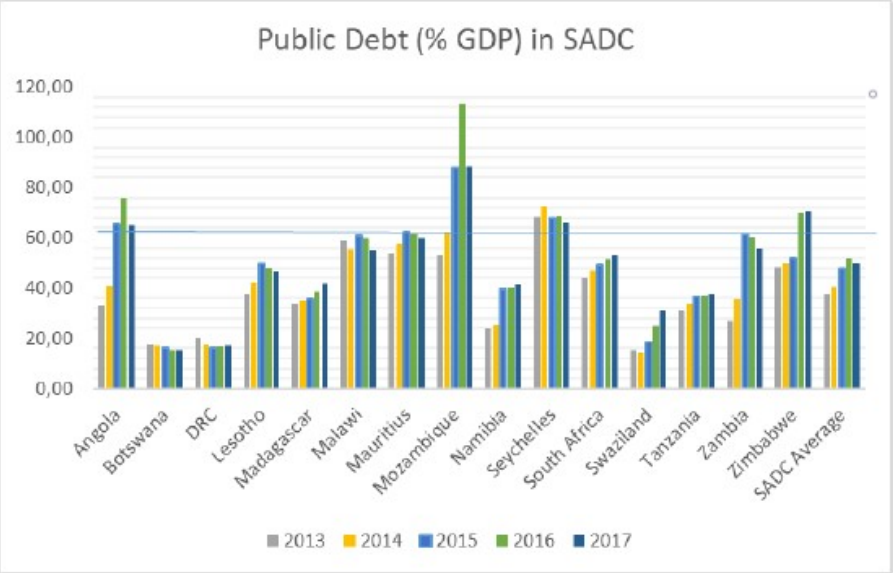



Figure 3.4: Public Debt (less than 60% of GDP)

The SADC average government debt remained well below 60 percent of GDP at 49.60 percent in 2017, down from 52.21 percent in 2016 (See Figure 3.2.4). A majority of the SADC member countries, particularly Botswana, Democratic Republic of Congo, Swaziland, Madagascar, and Tanzania, had public debt of less than 40 percent of GDP. Public debt surpassed the target level of 60 percent in some countries such as, Angola, Mozambique, Seychelles, and Zimbabwe. Oil revenues contribute significantly towards Angola's government revenue. Thus a decline in oil prices could be a culprit for the observed higher government debt. The substantial worsening of Mozambique's public debt from 53 percent in 2013 to 113 percent in 2016 is primarily due to the impact of critical depreciation of its currency on the external debt portion of its total debt.

## 3.3 Literature Review

Why are some countries' business cycles synchronised, and others are not? What could possibly explain the observed low levels of business cycles' synchronisation

in SADC? Answers to these questions will contribute towards the formulation of policies that may mitigate the adverse impact associated with the use of a single monetary policy in the SADC region. This section reviews the literature on the determinants of business cycles' co-movement.

Potential determinants of business cycles' synchronisation, such as trade, currency union membership and industrial similarity, amongst others, have been identified in the literature (Artis, 2003). Industrial similarity and currency union membership arc generally found to be weak estimators of synchronisation, and hence they arc excluded from our analysis (Cerqueira & Martins, 2009; Baxter & Kouparitsas, 2005; Clark & Van Wincoop, 2001; De Haan et al., 2008; Furceri & Karras, 2008). In addition, required data to compute industrial similarity is hardly available in SADC.

It is generally argued that trade plays an integral role in explaining business cycles synchronicity, specifically by increasing the speed of propagation of shocks across countries (R. Barro & Tenreyro, 2007; Choe, 2001; Frankel et al., 1997; Correia et al., 2013; Faia, 2007). However, both theoretical models and empirical evidence suggest an ambiguous link between trade and business cycle synchronicity (Abbott et al., 2008; Alesina & Barro, 2002; R. Barro & Tenreyro, 2007; Clark & Van Wincoop, 2001; Frankel & Rose, 1998).

There is a conviction that trade intensification could result to asynchronous business cycles. Orthodox models of trade demonstrate that intensification of trade would result in product specialisation as conntries attempt to exploit their comparative advantages (P. Krugman & Venables, 1996). Countries which specialize in certain products will be hit by sector-specific shocks, which in turn will translate into country-specific shocks, thus resulting in divergent business cycles. Consistent with this prediction, Crosby (2003) finds that trade has adverse effects on business cycle synchronicity in Asia-Pacific countries. In the case of ASEAN economies,

trade integration allows countries to exploit comparative advantages, consequently resulting to industry-specific shocks which in turn constitute country-specific shocks (since countries are specialised); thereby resulting in asynchronous business cycles.

On the one hand, Backus and Kehoe (1992) argue that trade results in strengthened business cycles co-movements. A shock hitting a particular economy will be transmitted through demand linkages to its trading partners (Kose & Yi, 2006). Accordingly, countries that trade more with each other tend to be more synchronised than countries that trade less with each other (Di Giovanni & Levchenko, 2010). In line with this view, Frankel and Rose (1997) find that trade has a sanguine impact on business cycle synchronisation. In addition, they conclude that prorpeties of the OCA are not exogenous, and a lack of business cycles synchronisation should not deter countries from establishing a monetary union. This is because establishing a monetary union would result in a reduction in transaction costs, thus stimulating trade, which in turn synchronises business cycles (Lin & Ye, 2010). Choe (2001) also demonstrates that trade interdependence has a sanguine impact on business cycles comovement. Palaşcă, Enea, Jaba, and Ţigănaş (2014) support the thesis that business cycles synchronisation is endogenous to trade. They find that indeed trade is a vehicle which transmits demand shocks, and thus synchronise business cycles. Rose and Engel (2002) demonstrate that countries in a currency union tend to trade more with each other than countries that are not in a currency union. Meissner et al. (2003) also find that countries that are in a monetary union trade with each other twice as much as they do with countries that are not in a union.Bergman and Jonung (2011), concur with this strand of the literature. They argue that increased trade feeds into intensified business cycles' synchronisation. In line with this strand of the literature, Hallett and Piscitelli (1999) demonstrate that the establishment of monetary union could enforce business cycles' comovemcnt, however, only if, adequate symmetry in the monetary transmission subsists.Ehrmann (2000) shows that in the European Union, monetary transmissions are not symmetrically, both in the

intensity and the timing, thus casting doubt on the ability of monetary union to bolster business cycles' synchronicity. Demertzis, Hallett, and Rummel (2000) attest that whilst asymmetries do exist in Europe, these have been managed through policies, and they could be eased through policies; and eventually, EMU may evolve to an optimal currency area. Similarly, Silvestre and Mendonça (2007) demonstrate that there exists a positive relationship between trade intensity, and business cycles' comovement. Thereby, surmise that the endogeneity hypothesis does hold. There is a large strand of the literature showing a positive relationship between trade and business cycles' co-movements (Clark & Van Wincoop, 2001; Fidrmuc, Ikeda, & Iwatsubo, 2012; Shin & Wang, 2003; Montinari & Stracca, 2016). In contrast to both views about the impact of trade on business cycles' synchronisation, Otto, Voss, and Willard (2001) question the importance of trade in explaining business cycle co-movements. They argue that Australia trades. more with .Japan than with the United States, yet, its business cycle is strongly correlated with that of the United States more than the .Japanese business cycle. This is consistent with Dellas (1986) wvho demonstrates that trade linkages play a negligible role in explaining business cycle co-movements. He further argues that business cycle interdependencies arc best explained by common shocks. Canova and Dellas (1993) failed to obtain a robust significance of bilateral imports on business cycles' synchronisation for 10 main industrial economics. Consistent with this strand of the literature, Doyle and Faust (2005) argue that while integration has intensified in the G-7, output co-movement has not followed suit. The findings of Doyle and Faust (2005) correspond with Alesina et al. (2002) who argue that currency unions do not necessarily intensify business cycles' co-movement. Consequently, it not clear whether the observed business cycles' co-movement in the Eurozone stems from the increased levels of economic integration (Schiavo, 2008). In line with this, Montinari and Stracca (2016) find no evidence that exchange rate regime influences business cycles synchronisation.

The other channel which is argued to have a positive impact on business cycles' co-movement is monetary policy similarity (see Frankel & Rose, 1998 for discussion). Although a plethora of studies have found monetary policy similarity to have a positive impact on business cycle synchronicity, its impact on business cycles remains an unsettled matter (Hsu, Wu, & Yau, 2011; Sethapramote, 2015). Otto et al. (2001) reveal that great volatility in the interest rate differential has a negative impact on business cycle synchronicity, whereas, Clark and Van Wincoop (2001) find that monetary policy similarity has no signicant impact on business cycle co-movement. Schiavo (2008) finds that monetary policy similarity has an indirect impact on business cycle comovement. Thus, the endogeneity of business cycle synchronisation does not suggest that by joining a monetary union, countries will automatically become more synchronised. Rather, the prospective increase in trade and financial linkages induced by using a common currency will have a positive influence on business cycle co-movement. On the constrary, Zervoyianni and Anastasiou (2009) reveal that monetary policy similarity (that is, the circulation of a single currency, the Euro) has a positive effect on business cycles correlation. Using M2 growth rates as a proxy for monetary policy similarity, Shin and Wang (2005), could no detect significant effect of monetary policy similarity on business cycles synchronicity. However, when they use correlation of short-term interest rates, they show that indeed monetary policy similarity tends to stimulate business cycles co-movement. Contrary to these studies, Bergman (2004) finds that monetary policy similarity negatively affects business cycles synchronicity, thereby casting doubts on the widely celebrated positive effect of a monetary union on business cycles. In line with this, Camacho et al. (2006) find no significant relationship between business cycles correlation and monetary policy similarity. This 1s inconsistent with De Haan et al. (2008). They find a positive link between cross-country business cycles' co-movement and monetary policy similarity.

Following the establishment of the European Union, the impact of financial integration received enormous interest from both scholars and policy makers around the

globe. There are, however, only a few studies in Southern Africa on financial integration. Financial integration is expected to promptly increase in Southern Africa due to the envisaged economic integration, and the proposed introduction of a Southern African single currency in 2018. Hence, understanding economic consequences of deeper financial integration is warranted.

Given the lack of an independent monetary policy response m a monetary union, asymmetric disturbances may induce welfare losses, and threaten the stability of the union, unless, risk sharing mechanisms arc in place. One of the mechanisms through which risks arc shared is financial integration.

Financial integration is central in the functioning of a monetary union because it allows agents to exploit ' risk sharing' mechanisms, thus resulting in synchronisation of business cycles (Cerqueira & Martins, 2009). For example, monetary policy in a monetary union may fail to deal with asymmetric disturbances. So, financial integration permits consumers to borrow from countries experiencing booms, and therefore synchronise business cycles (Schiavo, 2008). Kose, Otrok, and Whiteman (2008) argue that stronger financial linkages could reinforce business cycle synchronisation through demand linkages. Similar conclusions arc reached by Imbs (2006). Consistent with these studies, Jansen and Stokman (2004) demonstrate that financial integration results into stronger business cycle co-movement across countries. Moreover, Kose et al. (2008) show that financial linkages stimulate business cycle synchronisation.

Risk sharing theory suggests that financial integration encourages industrial specialisation, thus resulting in asymmetric shocks, which in turn leads to asynchronous business cycles. This has been demonstrated, amongst others, by Heathcote and Perri (2003), Kalemli-Ozcan, Sørensen, and Yosha (2003) and Obstfeld (1994). Furthermore, Backus et al. (1992) argue that the behaviour of financial flows is pro-

cyclical. For example, if there are two countries in the world, X and Y; and country X experiences a positive technological shock, agents will pull their capital from country Y to country X where the marginal product of capital and labour has increased. Therefore, the procyclical behaviour of financial flows will result in diverging business cycles. In line with these studies, Herrero and Ruiz (2008) show that intensified fmancial integration leads to asymmetric business cycles. Faia (2007) and Heathcote and Perri ( 2004) reach similar conclusions that financial integration leads to diverging business cycles.Montinari and Stracca (2016) find mixed evidence regarding the effect of financial integration. They find that financial links are either insignificant or have negative signs. Using a capital account restrictions often referred to as the *de jure* measure of financial integration, Kose et al. (2003) find that business cycles for countries with restricted capital flows tend to be less synchronised with world business cycles. This is because financial linkages are crucial, in terms of business cycles propagation, for countries that are open to capital flows (Kose ct al., 2003). However, the actual gross financial flows, that is, the de facto measure of financial integration, fails to reflect this. Consistent with this, lmbs (2006) shows that there exists a positive relationship between financial integration and business cycles. He argues that the observed relationship between business cycles and financial integration is puzzling. Generally, financial flows follow return differentials, which subsequently result to asynchronous business cycles.

Fiscal policy discipline or convergence is identied as another important channel through which business cycles are synchronised. However, a plethora of economists treat seal policy convergence with cynicism, because it has little or nothing to do with the traditional theory of optimal currency areas. In addition, there is no exist-ing theory linking fiscal policy convergence with business cycle co-movements (Darvas & Szapáry, 2008). Despite the lack of a theoretical connection between business cycle comovements and fiscal policy convergence, it is relatively easy to build an instinctive link between the two. Countries that are ill-disciplined in their

fiscal policy conduct, that is countries that run high budget deficits, generate individual fiscal policy shocks that lead to diverging business cycles. Thus, in envisaged and/or already established unions, fiscal policy should be countercyclical as opposed to procyclical (Gavin & Perotti, 1997; Brender & Drazen, 2005). Simply put, in the absence of idiosyncratic shocks, which would otherwise lead to divergent business cycles, the use of fiscal policy would be unnecessary and counterproductive. Zervoyianni and Anastasiou (2009) concur with this strand of the literature, they demonstrate that fiscal policy convergence, in the case of Europe, has strong positive effects on the correlation of shocks. Likewise, Bergman (2004) shows that fiscal policy convergence has sanguine impact on the business cycles synchronicity. On the contrary to this strand of the literature,Clark and van Wincoop (2001) and Shin and Wang (2005), fail to detect evidence linking fiscal policy synchronisation to intensified business cycles synchrony. This is in contrast to De Haan et al. (2008) and Camacho et al. (2006), they demonstrate that fiscal policy has positive effects on cross-country business cycles' comovement.

Consistent with the view that fiscal policy should be countercyclical, Fatas and Mihov (2003) argue that aggressive use of fiscal policy is associated with macroeconomic instabilities, and impedes economic growth. Similarly, Badinger (2009) shows that discretionary use of fiscal policy results in significant and ample output volatility. Rodden and Wibbels (2010) agree with the view that fiscal policy should rather be countercyclical. In addition, fiscal policy in a monetary union ought to be centralised; and centralised fiscal policy provides insurance (in terms of fiscal transfers) against adverse shocks hitting a particular economy in a union (See, Hemming & Spahn, 1997). Furthermore, Fatás and Mihov (2001) argue that fiscal policy restrictions would lower macroeconomic volatilities. However, fiscal policy restrictions are said to limit fiscal policy action when it is needed the most (i.e. in the presence of shocks that would otherwise lead to diverging business cycles). In addition, fiscal policy restrictions may exacerbate economic fluctuations since they disregard cycli-

cal conditions (Levinson, 1998). For example, in the case of Europe, it is argued that rules will worsen recessions, since countries will be tempted to apply procyclical fiscal policy when cyclical downturns increase deficits towards the Stability and Growth Pact (SGP) cap (Alt & Lowry, 1994; Lane, 2003).

In summary, whilst the determinants of business cycles synchronisation have been extensively examined, the findings documented often contradict each other (Lin and Ye, 2010). Moreover, these studies predominantly focus on developed and Asian countries, and hence, neglecting Africa, particularly, SADC.

## 3.4 Data and Methodology

### 3.4.1 Econometric Framework

Longitudinal data methods have become increasingly popular in recent years and are now the most used tools in contemporary econometrics, both in microeconomics and macroeconomics(Nickell, 1981; Hsiao, 2005; Okui, 2009). The increasing popularity of panel data techniques owes to many factors, predominantly because they allow practitioners to exploit two dimensions of the data: a cross-sectional dimension and a time series dimension (Hsiao, 2005; Hsiao & Zhang, 2015).

Consider the following basic linear dynamic model:

$$y_{it} = \alpha_1 y_{it-1} + X'_{it}\beta + \varepsilon_{it} \tag{3.1}$$

$$\varepsilon_{it} = \mu_i + \epsilon_{it} \tag{3.2}$$

where $i = 1, 2..., N$ is a vector of countries, $t = 1, 2, ..., T$ is a time index, $X'$ is a $(1xK)$ vector of regressors, $\beta$ is a (K x 1) vector of coefficients to be estimated, $\mu_i$ represents individual time-invariant effects capturing individual differences, and $epsilon_{it}$ denotes individual error terms. It is assumed that $\mu_i$ and $\epsilon_{it}$ are indepen-

dently and identically distributed terms with mean zero and constant variance ($\sigma^2$), that is, iid$(0, \sigma^2)$. Moreover, $\mu_i$ and $\epsilon_{it}$ are assumed to be exogenous to each other. Therefore:

$$E[\mu_i] = [\epsilon_{it}] = [\mu_i, \epsilon_{it}] = 0 \tag{3.3}$$

Following Ahn and Schmidt (1997), we impose an additional assumption about the initial conditions, that $E(y_{i1}, \epsilon_{it}) = 0$ for all $i = 1, 2...N; t = 2, ..., T$. Together these assumptions are adequate to indentify and estimate $\alpha$ for $T \geq 3$ (Blundell & Bond, 1998; Ahn & Schmidt, 1995).

The introduction of the lagged endogenous variable, $y_{it-1}$ introduces a dynamic panel bias because $\mu_1$ and $y_{it-l}$ are correlated. Since $y_{it}$ is a function of $\mu_i$, which is time-invariant, it must also be true that $yit - 1$ is a function of $\mu_i$. Therefore, one of the regressors is correlated with one component of the error term, thus giving rise to the problem of endogeneity.

Accordingly, application of the ordinary least square, (OLS) approach to equation 3.1 will yield inconsistent and upward biased estimates; and since $E[y_{it-1}, \epsilon_{it}] > 0$, then $\beta_1$ will be overestimated (Blundell & Bond, 1998, 2000). To tackle endogeneity bias, the literature suggests two remedies, which could be applied simultaneously or successively. First, one can eliminate time-invariant effects through data transformation such as first differencing (Nickell, 1981; Holtz-Eakin, Newey, & Rosen, 1988; Ahn & Schmidt, 1997). Han and Phillips (2013) commends the first differencing approach on the grounds that not only does it eliminate fixed cffects, but it also, in the presence of unit roots, transforms the data to stationary series. Second, the endogeneity problem can also be tackled by employing valid instruments of the lagged endogenous variable.

For illustration, we reduce equation 3.1 to include only one explanatory variable:

$$y_{it} = \alpha_i y_{it-1} + \epsilon_{it} \tag{3.4}$$

lagging equation 3.4 once, we obtain:

$$y_{it-1} = \alpha_i y_{it-12} + \epsilon_{it-1} \tag{3.5}$$

To remove the time-invariant component of the error term which is correlated with the explanatory variable, equation 3.5 is subtracted from equation 3.4 resulting to equation 3.6 (See, Hsiao and Zhang, 2015 ).

$$\triangle y_{it} = \alpha_i \triangle y_{it-1} + \triangle \varepsilon_i \tag{3.6}$$

where $\triangle = (1 - L)$ is a first difference operator. In other words, we obtain the transformation by multiplying equation 3.4 by $I_N \otimes D$, where $I_N$ is an identity matrix of dimension $N$, and $D$ is a $(T-1) \times T$ matrix:

$$\begin{pmatrix} -1 & 1 & 0 & \cdots & 0 & 0 \\ 0 & -1 & 1 & \cdots & 0 & 0 \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & 0 & 0 & -1 & 0 \end{pmatrix} \tag{3.7}$$

Although first differencing takes care of the individual time-invariant effect, it results to a loss of the degrees of freedom, since it drops $T$ initial observations, which could have severe ramifications for an unbalanced panel. Following the transformation, the first difference estimator is the OLS estimator of equation 3.6. That is:

$$\alpha = \left\{ \sum_{i=1}^{N} (DX_i)' DX_i \right\}^{-1} \sum_{i=1}^{N} (DX_i)' Dy_i \tag{3.8}$$

Owing to the assumption that $\epsilon \sim$ i.i.d $(0, \sigma^2)$, the first difference estimator is inconsistent since the transformation (i.e. first differencing) prompts a moving average of order one, that is, $MA(1)$ process for the $\triangle \epsilon_{it}$. This calls for a generalised least squares (GLS) approach ¡See,¿(M. Arellano, 2003). Moreover, as shown in Arellano

(2003) the optimal GLS estimator is the within-group estimator, which takes the following form:

$$\alpha_{WG} = \left\{ \sum_{i=1}^{N} X_i' D' (DD_i')^{-1} DX_i \right\}^{-1} \sum_{i=1}^{N} X_i' D' (DD_i')^{-1} Dy_i \tag{3.9}$$

In line with Arellano (2003), the $Q$ matrix is defined as the *"deviations-from-time means"* because it alters $y_{it}$ series into deviations from time averages $\bar{y}_i = Qy_i$, whose elements are $\bar{y}_{it} = y_{it} - \bar{y}_i$. The Q matrix is shown to be:

$$Q \equiv D'(DD')^{-1} D \tag{3.10}$$

Again, the within-group estimator successfully gets rid of the individual fixed effect. However, it fails to fix the dynamic panel bias. Therefore, it yields inconsistent estimates (Nickell, 1981).

Given the failure of pooled OLS, the first difference estimator and within-group estimator to resolve the issue of dynamic panel bias, an alternative tool to deal with the challenge is warranted.

Instrumental variable estimators are amongst alternative models used to deal with the issue of dynamic panel hias (T. W. Anderson & Hsiao, 1982). The instrumental variable approach is usually preferred over the maximum likelihood method of Hsiao (2003), on the grounds that maximum likelihood (ML) require, that assumptions about initial conditions be made, and that they must be correctly specified, otherwise the ML estimator would be inconsistent. Although the estimators of T. W. Anderson and Hsiao (1981) successfully identify the model, they arc not necessarily efficient because they do not exploit all instruments available (Okui, 2009).

The panel data Generalised Method of moments (GMM) circumvent most, if not all issues faced by other estimators. Through the exploitation of a set of meaningful

instruments, for each instrument, GMM permits the use of all available instruments (Holtz-Eakin et al., 1988; Arellano and Bond, 1991). Arellano and Bond (1991) suggest the use of all available lags for each period in time as instruments for the first-differenced lagged endogenous variable in equation (5). The Arellano and Bond (1991) estimator is known as the difference GMM estimator. The Arellano and Bond (1991) first difference estimator is given by:

$$\alpha_{GMMdiff} = \left( \left(\triangle y'_{-1} Z_d\right) W_N \left(Z'_d \triangle y_{-1}\right)^{-1} \left(\triangle y'_{-1} Z_d\right) W_N \left(Z'_d \triangle y\right) \right) \tag{3.11}$$

where $\triangle y_i = (\triangle y_{i3}, \triangle y_{i4}, ..., \triangle y_{iT}$, $\triangle y_{-1}$ is the vector that comprises the first lag of $\triangle y_i, Z' \triangle y = \sum_{i=1}^{N} Z_{di}, y_i, W_N$ is an optimal weighting matrix and $Z_d$ is an instrument matrix for the $i^{th}$ individual, which has $T-2$ rows with non-negative elements and $(T-2)(T-1)/2$ columns. The difference GMM estimator of Arellano and Bond (1991) is consistent for $T \to \infty$ and also for fixed $T$.

Although, the first difference GMM estimator performs better than other panel techniques (Blundell & Bond, 1998), it is not without hitches. More precisely, when the lags of the dependent variable are weakly correlated with the first difference of the dependent variable in the following period, first difference GMM (FDGMM) is argued to suffer from finite sample bias and it bas poor accuracy in simulation studies (Blundell and Bond, 1998).

The drawbacks of the Arellano and Bond (1991) estimator gave birth to the systems GMM (Blundell & Bond, 2000; Blundell, Bond, & Windmeijer, 2001; Blundell & Bond, 1998). The systems GMM formulates supplementary orthogonality conditions that make more valid instruments accessible and achieve efficiency gains. In addition to the use of lagged levels of $y_i t$ as instruments for the first differences equation, the systems GMM estimator (SGMM) uses the lagged first-difference $\triangle yit - 1$ of $y_{it}$ as instruments for equation 3.4 in levels. Therefore, the resulting SGMM

estimator is given by:

$$\alpha_{GMM} = (q'_{-1} Z_s W_N Z'_s q_{-1})^{-1} (q'_{-1} Z_s W_N Z_s q_i) \tag{3.12}$$

where $q_i = (\triangle y'_i, y'_i)$ and $Z_s$ is a full instrument matrix. The systems GMM is proven to be efficient relative to the first difference GMM estimator, especially when $\alpha \to 1$.

In light of the issues associated with dynamic panel data and other dynamic panel data estimators such as FD and the within-group estimator, this study employs systems GMM to estimate factors influencing business cycle comovements in SADC. A plethora of studies have used similar equations to estimate factors influencing business cycle synchronisation. Variables employed in this study, therefore, are adopted from some of these studies (See, Cerqueira and Martins, 2009; Clark and van Wincoop,2001; Darvas and Szapary, 2008; Lee and Azali, 2010). The empirical model, therefore, is given by:

$$Y_{ikt} = \phi_0 + \alpha Y_{ikt} + \theta TI_{ikt} + \varphi FI_{ikt} + \delta MPS_{ikt} + \omega FP_{ikt} + \rho OP_t + \varepsilon_{ikt} \tag{3.13}$$

where $Y_ikt$ measures business cycles' synchronisation between countries $i$ and $k$ at time $t = 1, 2..., T$, $TI_{ikt}, FI_{ikt}, MPS_{ikt}, FP_{ikt}$ and $OP_t$ represents trade integration/or intensity, financial integration, monetary policy similarity, fiscal policy convergence/or similarity, in that order, and lastly $\varepsilon_{ikt}$ denotes the error term.

### 3.4.2 Data Sources

We use panel data covering the period 1994-2014, which are collected from various sources. Nominal oil prices are collected from the International Monetary Fund's (IMF) World Economic Outlook (WEO), and converted into real oil prices using the world GDP deflator collected from the same source. Data on financial flows, inflation rates, and govermnent deficit/surplus were collected from the World Bank's

World Development Indicators, and data on bilateral trade were collected from the Centre d'Entudes Prospectives et d'Informations International (CEPII) database. While high frequency data would have been preferable, such data is hardly available in Southern Africa. Accordingly, we employ annual data. Thus, the scope of the data is dictated by its availability. Data were collected for all SADC member countries except for Namibia and Democratic Republic of Congo, where data were not available.

### 3.4.3 Definition of Variables

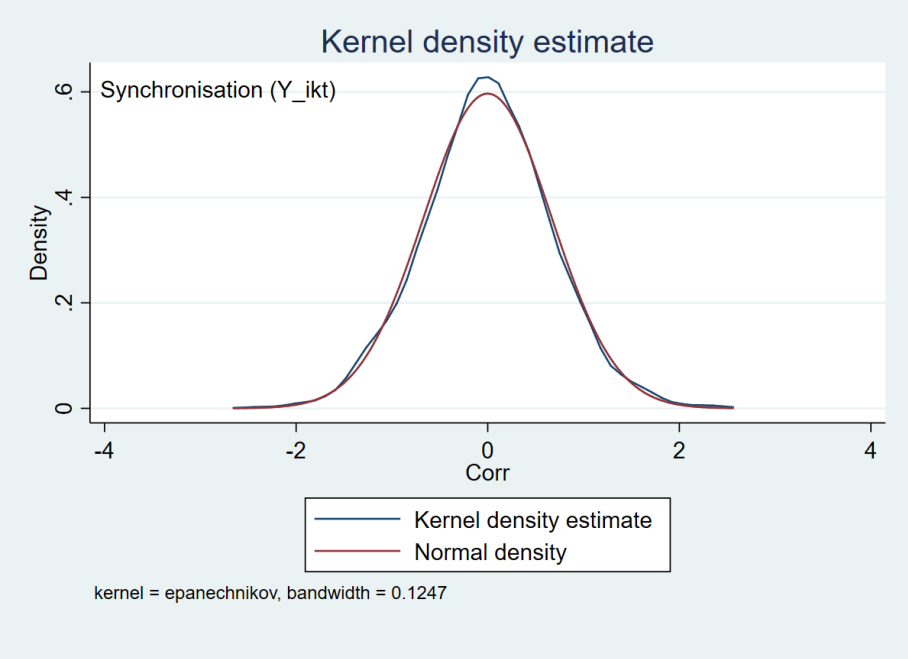
**Real Oil Prices**: In line with existing studies, we use real crude oil prices as a measure of global exogenous shocks (See, Kutu et al., 2016; Moneta & Rüffer, 2009).

**Business Cycles Synchronisation Index**: Business cycles synchronisation/ or co-movement is generally measured using correlation coefficients (See, Massmann & Mitchell, 2005), such that the higher the correlation coefficient the higher is the degree of business cycles co-movement (Croux et al., 2001). Correlation bctween variables, however, docs not imply co-movement or synchronisation (Sec, Croux ct al., 2001), and correlation based measures tend to reflect volatility of output growth, therefore, limiting their usefulness (Kalemli-Ozcan, Papaioannou, & Peydro, 2013). Hence, throughout this section, and in line with recent studies (Duval, Li, Saraf, & Seneviratne, 2016), we employ an alternative measure of business cycles synchronisation which can be calculated at any given period, rather than at a specific interval. Precisely, we follow Kalemli-Ozcan et al. ( 2013) by constructing a business cycles' synchronisation index. Assume $Y_{ikt}$ represents negative absolute differences of real GDP between countries $i$ and $k$ (See equation 3.14). The index measures the distance between business cycles. If they are closer to each other it implies a higher degree of synchronisation. Thence, the higher the values of $Y_{ikt}$ , the more synchronised are business cycles between a pair of countries. We, therefore, end up with a total of $N(N-1)/2$, bilateral correlations.

$$Y_{ikt} = -|lnGDP_{it} - lnGDP_{it-1} - (lnGDP_{kt} - lnGDP_{kt-1}) \tag{3.14}$$

Our preferred measure of business cycles synchronisation has several advantages over competing measurers. As pointed out earlier, we acknowledge that the degree of economic integration is changing overtime, and thus, our measure is constructed for each point in time, rather than for a given time interval. In addition, previous studies on the endogeneity of business cycles co-movement use the correlation coefficient of detrended series of GDP or Industrial Production to measure business cycles synchronisation.

Figure 3.5: Kernel density estimate of business cycles' synchronisation index




Because the correlation coefficient (Pearson) is confined between $-1 and 1$, the disturbance term in a regression model is more likely not to be normally distributed(De Haan et al., 2008). This results in unreliable inferences. Our approach do not suffer from this problem since it does not confine the correlation between $-1 and 1$, and thereby ensures that the error terms in a regression model are normally distributed (See, De Haan et al., 2008; David, 1949). De Haan et al. (2008) address this problem

by employing Fisher's z-transofrmation of correlation coefficients. This approach, however, does not render correlation coefficients normally distributed, but it brings them closer to being normally distributed (See, De Haan et al., 2008). In figure 3.5 we show that our approach is normally distributed, and thus somewhat addresses concerns flagged in previous studies.

**Fiscal Policy Convergence**: As pointed out in section 2, fiscal policy divergence and/or convergence may play a significant role in determining the extent to which business cycles are synchronised. It is often argued that divergent fiscal policies may decouple business cycles whereas, convergent business cycles will tend to strengthen business cycles' co-movement. With respect to monetary policy there seems to be a consensus that it should be taken away from the political arena, and assigned to an independent central bank. While the debate on fiscal policy has recently gained interest, there has been no consensus on the instruments or institutional amendments intended to improve policy results. Several measures have been proposed ranging from balanced budget to restraintson budget decits. With the latter, restrictions on budget decits, being the most popular procedure to guide the fiscal policy direction. For example, in the EMU, the Maastricht Treaty and the Stability Growth Path (SGP) stipulates acceptable levels of government budget deficits (3 percent) and tolerable levels of government debt (60 percent) as a ratio of GDP. In SADC, there is a Memorandum of Understanding (MoU) which resembles the Maastricht Treaty. Given that all SADC member countries should achieve budget deficit not more than 3 percent of GDP as an indication of fiscal policy prudence, this study takes advantage of this fact by constructing fiscal policy convergence or similarity as the absolute differences in government budget surplus/deficits as:

$$FC_{ikt} = |\frac{GDEF/SUR_{it}}{GDP_it} - \frac{GDEF/SUR_{kt}}{GDP_{kt}}| \tag{3.15}$$

where $GDEF/SUR$ represent general government deficit/surplus as a percentage of GDP. A similar procedure has been used by Darvas, Rose, and Szapáry (2005), to

measure fiscal policy convergence in Europe. A lower value of fiscal policy convergence index, $FC_{ikt}$ implies higher convergence between the countries in question.

**Monetary Policy Similarity**: To measure monetary policy similarity, ideally, one would opt to use nominal interest rates which is a direct monetary policy tool. However, sufficient interest rates data for a significant portion of SADC member states is not available. Consequently, inflation differentials are used to measure monetary policy similarity.

Virtually all central banks share an analogous mandate. They all aim to keep inflation as low as possible (Cukierman, 2009). Therefore, in the absence of a comprehensive measure for monetary policy similarity, inflation differentials can serve as a good indication of whether monetary policies are similar across countries, given that all central banks' monetary policies are aimed at keeping inflation low. Thus, for the purpose of this study, a monetary policy similarity index is constructed as absolute differences inflation rates between countries $i$ and $k$, as:

$$MPS_{ikt} = |\pi_{it} - \pi_{kt}| \tag{3.16}$$

where $\pi_{it}$ and $\pi_{kt}$ are inflation rates in countries $i$ and $k$, in that order, and M PSikt denotes monetary policy similarity. If $MPS_{ikt}$ is closer to zero, it signifies that monetary policies between countries $i$ and $k$ are comparable. The choice to employ inflation rates instead of interest rate is further justified both on theoretical and empirical grounds. On theoretical grounds, the 'Fisher effect', which implies a one-to-one relationship between inflation and nominal rate of interest (Koustas & Serletis, 1999), allows, in the absence of interest rate data, to use inflation. On empirical grounds, the existence of a plethora evidence supporting the Fisher effect further exonerates our index (Everaert, 2014; Panopoulou & Pantelidis, 2016), and inflation as a measure of monetary policy similarity has been used in several studies (Asongu, 2014).

**Financial Integration/Intensity**: A plethora of instruments have been used to measure the degree of integration (Kraay, Loayza, Serven, & Ventura, 2005; Lane & Milesi-Ferretti, 2001, 2007). There is, however, no consensus on the most appropriate measure (Chinn & Ito, 2008). In this chapter, we follow ? (?), by using capital flows-to-GDP to measure the extent of financial integration amongst countries $i$ and $k$. Essentially, we endeavor to measure the extent of capital movements between countries. Hence, the larger the value of $FI_{ikt}$, the higher the degree of financial integration between country $i$ and country $k$.

We refer to the measure of financial integration used in this chapter as the baseline financial integration. This measure captures the actual participation of a country in the capital market. The measure is constructed as:

$$FI_{ikt} = \left(\frac{CF_{it}}{GDP_{it}}\right) + \left(\frac{CF_{kt}}{GDP_{kt}}\right) \tag{3.17}$$

where $Fl_{ikt}$ represents financial integration between country $i$ and country $k$ at time $t = 1, 2..., T$ $CF_{it}$ and $CF_{kt}$ are sum of of financial flows ( inflows and outflows) in countries $i$ and $k$, respectively.

**Trade Integration/Itensity index**: The trade intensity/or integration index measures the extent to which countries transact with each other. The index is constructed as a total trade (i.e. sum of imports and exports) between country $i$ and country $k$. *Ceteris paribus*, if exports increase and imports decrease by the same magnitude then the index does not change, but if either imports or export/or both increase then the index would also rise by the same magnitude. Hence, a higher index implies a large degree of trade intensity. Following Otto et al. (2001) and De Haan et al. (2008), trade intensity is approximated as:

$$TI_{ikt} = \sum \frac{X_{ikt} + M_{ikt}}{Y_i t} + \sum \frac{X_{kit} + M_{kit}}{Y_{kt}} \tag{3.18}$$

where $X_{it}$ measures exports from country $i$ to country $k$, $M_{ikt}$ represents imports from $k$ to country $i$, and vice versa, and $Y_t$ denotes GDP. This bilateral trade intensity index (equation 3.18) is standard in the literature, and therefore, permits us to compare our findings with existing international studies (Imbs, 2004; Frankel et al., 1997).

## 3.5 Empirical Findings and Discussion

To estimate the influence of trade integration, financial integration, monetary policy similarity, fiscal policy similarity, and exogenous shocks, proxied by oil prices, on business cycles synchronisation, a generalized method of moments (discussed in the previous section) is employed. More precisely, we use GMM to estimate the relationship implied in equation 3.13.

As pointed out earlier, the effect of trade on business cycles comovemcnt is not unambiguous. It could either be negative or positive. If the "specialisation effect" of Krugman dominates, it is expected that the sign on the coefficient ($\theta$) measuring the effect of trade in equation 3.13 will be negative. However, if the "demand effect/or cndogencity effect" is dominant then, the sign will be positive (Lee and Azali, 2010). Hence, the object of interest is the significance and the sign of the coefficient. The systems GMM estimations of equation 3.13 are presented in Table 3.1.

Table 3.1: Generalised Method of Moments' Estimates

| Variables | Model 1 | Model 2 |
|---|---|---|
| $Y_{ikt-1}$ | 0.367*** | 0.341*** |
| | (0.013) | (0.027) |
| Trade Integration | 0.224** | 0.079*** |
| | (0.032) | (0.063) |
| Financial Integration | | -0.753*** |
| | | (0.098) |
| Monetary Policy similarity | | 0.055*** |
| | | (0.023) |
| Fiscal Policy convergence | | 0.455*** |
| | | (0.185) |
| Real oil prices | | -0.506*** |
| | | (0.212) |
| Arellano-Bond test for AR(1) | -4.98 | -4.24 |
| | [0.000] | [0.000] |
| Arellano-Bond test for AR(2) | 1.26 | 1.60 |
| | [0.206] | [0.109] |
| Hansen Test | 65.83 | 54.76 |
| | [1.000] | [1.000] |

***, ** represents 1% and 10%

levels of significance. In (•) are standard errors and in [•] are p-values

As a baseline, equation 3.13 is estimated, with only trade integration/intensity $TI_{ikt}$ and lagged business cycles synchronisation $Y_{ikt-1}$, as regressors. This is in line with the pioneering work of Frankel and Rose (1998). The resulting estimates are reported in Table 3.1, model 1.

As shown in model 1, Table 3.1, the coefficient ($\theta$) measuring the sensitivity of

business cycles synchronisation $Y_{ikt}$ to trade intensity is positive and statistically significant at 1 percent. This implies that there exists a positive relationship between trade intensity and busine,s cycles synchronisation in SADC. Therefore, an increase in trade integration may bolbier business cycles synchronisation in the region. The findings of the benchmark model lend support to the cndogeneity hypothesis of Frankel and Rose (1998).

However, results from the baseline model reported in Table 3.1 model 1, may be misleading. Duval et al. (2016) show that models with trade as the only regressor may yield inconsistent results. This is because the model may he incorrectly specified or some other important variables may have been omitted (Flandreau & Maurel, 2005). Consistent with this, Silvestre and Mendonça (2007) demonstrate that a model which subsumes only trade as an exogenous variable tend to have limited power in explaining variations in business cycles synchronisation. The benchmark model is, therefore, expanded (see Table 3.1) to include other potential determinants[2] of business cycles synchronisation.

Model 2 in Table 3.1 reports the findings from the extended model. Despite adding other variables namely, financial integration ($FI_{ikt}$), monetary policy similarity ($MPS_{ikt}$), fiscal policy convergence ($FP_{ikt}$) and real oil prices ($OP_t$), the coefficient ($\theta$) on trade integration remains positive and statistically significant. However, the magnitude of the influence of trade on business cycles synchronisation becomes smaller once other factors such as financial integration are taken into account (see Table 3.1). More precisely, we show that once other variables are accounted for, a 1 percent increase in trade intensity only improves business cycles synchronisation by 0.079 percent, and this coefficient is comparable to that of Kose and Yi (2006). Kose and Yi (2006) find that an increase in bilateral trade is associated with approximately 0.06 percent increase in output synchronisation. In line with Frankel and

[2]See Baxter and Kouparitsas (2005) for a list of robust determinants of business cycles' synchronisation

Rose (1998), Clark and van Wincoop (2001), Imbs (2006) and Cerqueira and Martins (2009) the study results show that countries that trade more with each other tend to have greater synchronisation of their business cycles. This implies that removal of trade restrictions will result to a higher degree of synchronisation since increased levels of trade will permit easy transmission of demand shocks across countries (Kose and Yi, 2006). In contrast to Kose et al. (2003) or Duval et al. (2016) who find that the positive link between trade and business cycle mmovements is limited to industrial countries, we demonstrate that the relationship holds even in developing countries (See, Calderon et al., 2007).

The study findings suggest that SADC must strive to strengthen trade ties amongst member countries. Indeed, initiatives to reinforce trade relations in SADC are in place. For example, a SADC free trade area (FTA) was established in 2008. However, countries such as the Democratic Republic of Congo and Seychelles are not part of the FTA. If countries that remain outside the free trade area could join, the scope of intra-SADC trade may be expanded thus reinforcing business cycle comovements. This is supported by Shin and Sohn (2006), who argue that liberalization of trade is often associated with increased trade integration among countries. As previously pointed out, implementation of the SADC trade protocol has been slow. For example, since 2004, Malawi fell behind with the process of phasing down the tariffs. However, in 2010, the country started a tariff restructuring exercise to bring into line its tariff schedule to both the COMESA and SADC tariff regimes. Ensuring that countries that are lagging behind with tariff phase-downs accelerate the proces.5 could possibly result to intensified business cycles cohesion in the SADC region. This is in line with Disdier, Fontagné, and Mimouni (2015) who showed that a reduction of tariffs tend to result to higher trade amongst countries. This concurs with Carrere (2006). He finds that regional trade agreements prompted a significant rise in trade among member states.

In addition, these results have far-reaching implications for the proposed SADC monetary union. As argued by Frankel and Rose (1997), if trade exerts a positive influence on business cycle comovements, then even a country that is not suitable *ex-ante* to join a monetary union, can be justified *ex-post* due to the resulting business cycle coherence. Overall, our estimates support the view that increased trade integration, in the context of SADC, is associated with intensified business cycles comovement and therefore, can reduce the costs of relinquishing national monetary policies.

As pointed out earlier, the effect of financial integration on the extent to which business cycles are synchronised is less clear-cut. Both theoretical and empirical results often conflict each other. Hence, the finding of this study could either be negative, or positive; depending on whether financial integration encourages economic agents to 'risk share' in which case the effect would be positive, and consequently the sign on the coefficient ($\varphi$) for financial integration ($FI_{ikt}$) would be positive (Kalemli-Ozcan et al., 2003), and negative if the 'specialisation effect' of Obstfeld (1994) is dominant (Schiavo, 2008).

Consistent with the view that financial integration and business cycles synchronisation are inversely related, the coefficient ($\varphi$) indicating the influence of financial integration on business cycles synchronisation is negative, and statistically significant at 1 percent level (See Table 3.1 Model 2). Thus, there exists a negative relationship between financial integration and business cycles synchronisation. These findings are inconsistent with lmbs (2004) and Kose et al. (2003) who find that financially integrated countries tend to be highly synchronised. The study findings suggest that a high degree of cross-country financial integration tends to weaken business cycles synchronisation. Moreover, the results are in contrast with Bekaert and Harvey (1995) who argued that the perpetual financial openness has significantly contributed towards more integrated economies. Our findings suggest that

the observed increase in the degree of economic integration is explained by other factors beyond financial integration.

The observed relationship between financial integration and business cycles synchronisation is in line with Obstfeld (1994). He postulates that a higher degree of financial integration results to high production and specialisation, and therefore induces industry-specific shocks, which then translate into country-specific shocks, and consequently, de-synchronization (Schiavo, 2008). Furthermore, the observed negative relationship could be explained by the idea that financial flows are tied to business cycles (Kaminsky, Reinhart, & Végh, 2004). Put differently, financial flows are procyclical in nature, such that agents tend to pull their investment from countries experiencing economic downturns to countries experiencing booms. Simply put, better performing countries attract more financial inflows, and therefore, resulting to decoupling business cycles (Backus et al., 1992).

It is often argued that business cycles comovement has increased overtime (Kalemli-Ozcan et al., 2013). A plethora.of mechanisms such as common external shock., proxied by oil prices for instance, have been argued to be behind the observed increase in business cycles comovement (Burstein, Kurz, & Tesar, 2008). If this thesis holds, the coefficient ($\rho$) measuring the sensitivity of business cycles comovement to oil prices ($OP_t$) ought to have a positive sign.

Contrary to our expectation, the coefficient ($\rho$) capturing the effect of oil prices to business cycles comovcmcnt is negative and statistically significant at 1 percent level (sec Table 3.1). This suggests that oil price changes result in asynchronous business cycles. This finding is inconsistent with Moneta and Ruffer (2009), who find that oil prices have a positive impact on business cycles comovement. We argue that the observed desynchronizing effect of oil prices may be attributed to the fact that some countries in the SADC region arc net oil exporters (i.e. Angola & Democratic Republic of Congo), and others arc net oil importers (that is, Botswana, Lesotho,

Madagascar. Malawi, Mauritius, Mozambiquc, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe). We, therefore, argue that real oil prices have different implications on business cycles across SADC member states, depending on whether a country is a net oil exporter/or importer. Indeed, studies examining the relationship between oil prices and economic activity suggest that the response differs depending on whether a cotmtry imports or exports oil (Lardic & Mignon, 2008; Nzimande & Msomi, 2016; Hamilton, 1983; Jiménez-Rodríguez & Sánchez, 2005).

while monetary policy and fiscal coordination arc argued to entail some benefits, such as credibility, their effect on business cycles coherence is, however tmclear, it is contingent of the type of distmbanccs that drive oscillations (Martincus & Molinari, 2007). Consequently, if fiscal/or monetary policies arc a source of business cycles themselves, then macroeconomic policy coordination ,vould result to business cycles synchronisation. In this case, the coefficients measuring the influence of macro- economic policy convergence/or similarity, that is, fiscal policy convergence ($\omega$) and monetary policy similarity ($\delta$), would have positive signs. Hovever, if macroeconomic policy discrepancies can be traced back to asymmetric disturbances, then policy convergence would lead to reduced business cycles synchronisation. The coefficients, therefore, would be negative.

The parameter ($\delta$) indicating the relationship between monetary policy similarity and business cycles synchronisation is positive and statistically significant at 1 percent level (see Table 3.1). This finding implies that monetary policy similarity exerts a positive influence on business cycles synchronisation. The results concur with the existing literature (see Frankel and Rose, 1998; etto et al., 2001, amongst others). These findings have far-reaching policy implications for the SADC region. They suggest that monetary policies should be coordinated in order to strengthen the extent of synchronisation of business cycles (Sethapramote, 2015). In line with

our findings, Flood and Rose (2010), show that countries that arc targeting inflation tend to be synchronised than countries that arc not targeting inflation. Additionally, monetary policy coordination will not only work to ensure strengthened business cycles comovcmcnt, but will also ensure that colmtrics without monetary policy credibility import credibility from countries with credible central banks (Tavlas, 1994).

Although there arc no established theoretical linkages between business cycle comovcmcnts and fiscal convergence, empirical studies have suggested a positive link between the two variables (Lukmanova & Tondl, 2017; Artis, Fidrmuc, & Scharler, 2008). Indeed, om results show that there is a positive association between fiscal policy convergence and business cycle synchronisation in SADC (Sec Table 3.1). More precisely, the coefficient ($\omega$) capt ming the sensitiveness of business cycles synchronisation to fiscal policy convergence is positive and statistically significant at 5 percent level (see Table 3.1 ). These findings are consistent with Darvas and Szapary (2008) and Artis et al. (2008). Countries in a monetary union are not only connected by a 'single currency', but trade relations as well. As such a fiscal stimuli (contraction) in one country may stimulate (dampen) exports in other countries, and thus business cycles comovement (Degiannakis, Duffy, Filis, & Livada, 2016). The findings of this study are inconsistent with Sethapramote (2015), who found no evidence supporting that fiscal policy similarity enhances business cycles synchronisation.

These results are in line with the view that in a monetary union, fiscal policy must be countercyclical, rather than 'procyclical' (Fatas and Mihov, 2003). In line with this, Carmignani and Laurenceson (2013) argue that coordination of fiscal policies could result in synchronized business cycles. Therefore, we suggest that fiscal policy restrictions be imposed across SADC member countries, and that fiscal policies be coordinated across the region. Lukmanova and Tondl (2017) hold a similar view in a study of the Eurozone. They suggest that a buoyant common economic control is crucial for the survival of the trading bloc. Overall, our findings show that the

SADC convergence criteria should give rise to further coupling effects because of convergent fiscal policies.

Subsequent to discussing the findings of the study and their implications, we employ the specification tests of by Arellano and Bond ( 1991) and advanced by Arellano and Bover (1995). The tests are used to validate the instruments in our GMM estimation. These test results are reported in the lower panel of Table 3.1. The Arellano-Bond test for serial correlation is used to test whether second-order serial correlation exists in the first differenced residuals. The null hypothesis tested is that there is no serial correlation. If the null hypothesis is rejected, it is concluded that there is second-order serial correlation and the GMM estimator is inconsistent. In addition to the Arellano-Bond test for AR(2), we use Hansen's J-test to examine the null hypothesis of validity of the instruments. Rejection of the null hypothesis indicates that the instruments are not valid. The study fails to reject both null hypothesis in both the Arellano-Bond test for AR(2), and the Hansen's J-test for the validity of instruments (See Table 3.1). This implies that there is no second-order serial correlation, and that our instruments are valid across different specifications.

## 3.6 Robustness Check

In this section, we use Three-Stage Least Squares (3SLS) to corroborate the findings of the GMM estimation (see Table 3.1). The 3SLS combines the features of simultaneous equations techniques, and control for possible endogeneity. It combines intuitions from Instrumental Variable (IV) and Generalized Least Squares (GLS) procedures, attaining consistency over instrumentation and efficiency from appropriate weighting in the variance-covariance matrix. The 3SLS subsumes the following steps: (i) estimate each equation exploiting Two-Stage Least Squares, and recover the covariance matrix of the equations errors, and thereafter, (ii) implement a type of GLS estimation on the stacked system, utilizing the covariance matrix from the initial step.

The trade equation is instrumented by gravity variables namely, common lan-

guage, distance, population, and GDP per capita. Furthermore, in order to ensure the correctness of the impact of financial integration we use the baseline measure of financial integration (Equation 3.17) which we will refer to as the *de facto*, hereafter, and the *de jure* measure of financial integration.

In contrast to the de facto financial integration index which measures the actual amount of cross-border movements, the de jure financial integration index is centered on the easiness of regulations and restraints, including capital mobility controls.

We estimate Three Stage Least Squares in order to corroborate the findings obtained from a single equation GMM. More precisely, we estimate Three-Stage Least Squares to assess the cndogeneity of business cycles' synchronisation. The estimates of the 3SLS are reported in Table 3.2.

Table 3.2: Three Stage Least Squares (3SLS) Estimates

| Column 1: 3SLS: De facto finance | | | Column 2: 3SLS De jure finance | | |
|---|---|---|---|---|---|
| Business Cycles' Synchronisation | | | | | |
| Variable | Coefficient | std errors | Variable | Coefficient | std errors |
| Trade integration | 0.482*** | 0.080 | Trade integration | 0.415*** | 0.067 |
| Financial integration | -0.292* | 0.167 | Financial integration | -0.997*** | 0.380 |
| Monetary policy sim. | 0.045 | 0.033 | Monetary policy sim. | 0.017 | 0.027 |
| Fiscal policy conv. | 0.401* | 0.216 | Fiscal policy conv. | 0.376* | 0.197 |
| Oil prices | -0.181*** | 0.225 | Oil prices | -0.300*** | 0.206 |
| Trade | | | | | |
| $Y_{ikt-1}$ | 0.065*** | 0.020 | $Y_{ikt-1}$ | 0.044** | 0.018 |
| Distance | -1.493*** | 0.237 | Distance | -1.702*** | 0.217 |
| Population | 0.537*** | 0.158 | Population | -0.176 | 0.128 |
| GDP per capita | -0.555*** | 0.112 | GDP per capita | -0.759*** | 0.996 |
| Common language | 1.515*** | 0.255 | Common language | 1.461*** | 0.235 |

In Table 3.2 columns 1 and 2 demonstrate whether, and how the factors pointed out earlier affect business cycles synchronisation. Column 1 and column 2 confirms

the large and statistically significant effect of trade intensity ($\theta$) in accounting for $Y_{ikt}$ in equation 3.13. In Table 3.2, columns 1 and 2, the coefficient measuring the effect of financial integration both the *de-facto* and the *de-jure* have negative signs and are statistically significant at 10 percent and 1 percent, respectively. This, therefore, confirms the findings from GMM estimates (Sec Table 3.1) that financial integration and business cycles synchronisation are adversely related. This is irrespective of whether a *de jure* or *de facto* measure of nancial integration is used (see Table 3.2). Moreover, it is shown that intensification of intra-SADC trade as measured by ($TI_{ikt}$) tends to bolster business cycles synchronisation. Overall, Table 3.2 shows that trade integration ($Tl_{ikt}$), fiscal policy convergence ($FP_{ikt}$), and monetary policy similarity ($MP_{ikt}$) all exert sanguine and statistically significant effect on the degree of business cycles synchronisation, which lends support to the endogeneity hypothesis.

Consistent with the existing literature all our gravity variables exert a significant effect on trade (Chaney, 2008) (see Table 3.2). We show that the distance between two countries has adverse influence on trade while population, GDP per capita, and the use of common language significantly improve trade amongst countries. More precisely, we show that pairs of countries with relatively higher GDP per capita tend to trade more with each other. In addition, countries with higher population also tend to trade more with each other. Furthermore, the use of common language is associated with the easiness of doing business between any two cmmtries involved. Hence, using a common language results to improved trading relations between countries. Most importantly, we show that business cycles synchronisation significantly stimulate trade amongst com1tries. Put differently, the higher the degree of business cycle comovement, the higher is the degree of trade integration amid countries. Table 3.2 shows that a 10% increase in the degree of business cycles comovement has a stimulating effect on trade integration ranging between 0.4% and 0.65%.

Overall, our findings suggest that business cycles synchronisation is indeed en-

dogenous, and not irrevocably fixed. it is found that trade indeed exerts a sanguine impact on the extent to which business cycles are synchronised(Rose & Engel, 2002; Rose & Van Wincoop, 2001). Furthermore, monetary and fiscal policy coordination (Carl, 2017), in line with existing studies (Abbott et al., 2008; Alesina et al., 2002; Artis & Hoffmann, 2008; Babetskii, 2005), are found to exert a positive and statistically significant influence on the extent to which economies are synchronised. This, therefore, implies that indeed business cycles synchronisation is an ex-post rather than an ex-ante phenomena (Frankel and Rose, 1998). In line with this, Massmann and Mitchell (2005) and Camacho et al. (2006) show that the establishment of EMU strengthened business cycles comovement in the Euro bloc. Our findings, and the evidence from the Eurowne (Furceri, 2009; Correia et al., 2013), therefore, bode well for the efficacious operation of a single monetary policy in SADC. In contrast to studies that have taken a myopic view that a monetary union in SADC would not be optimal and would be disastrous because business cycles are not synchronised (See, Kabundi & Loots, 2007; Zerihun et al., 2014), we argue that SADC can establish a monetary union even if business cycles are not synchronised; synchronisation will be justified *ex-post*. Consistent with our argument, Willett, Permpoon, and Wihlborg (2010) contend that if the endogeneity conjecture does hold, then the conventional *ex-ante* OCA criteria, ought to be applied less stringently. If a country comes close, but does not fully meet the criteria *ex-ante*, it should proceed and join the monetary union as the odds that it would fulfil the criteria *ex-post* are high.

## 3.7 Summary and Conclusion

The study investigates the factors influencing the degree of business cycles' synchronisation in the SADC region, using data for the period 1994-2014. More precisely, we investigate how trade integration, financial integration, monetary policy similarity, fiscal policy convergence, and global exogenous shocks proxied by oil prices, affect business cycles comovemcnt in SADC. In line with Frankel and Rose (1998) we confirm that business cycles comovement is endogenous, and thus the observed

lower level of synchronisation in SADC are not irrevocably fixed. In contrast to Krugman and Venables (1996), we discover that intensifying trade results is more in synchronous business cycles. In addition, all other variables, apart from oil prices and financial integration, have a positive impact on business cycle synchronisation. The adverse effect of financial integration on business cycles is in line with the predictions of ' risk sharing' theory. The risk sharing theory suggests that financial integration will induce industrial specialisation across the regions or cow1tries leading to asymmetric shocks, thus decoupling business cycles. Furthermore, the negative influence of financial integration on business cycle synchronisation could be explained by the procyclical behaviour of financial movements . With regards to oil prices, we argue that their decoupling effect can be explained by the fact that some com1trics in the region are net oil exporters while others are net oil importers. Furthermore, we show that fiscal policy convergence and monetary policy similarity have a positive impact on business cycle comovcmcnts. Thus, the SADC convergence criteria should give rise to increased synchronisation due to convergent fiscal policies and similar monetary policies . Overall, we conclude that indeed business cycle synchronisation is not irrevocably fixed, and is endogenous (Frankel & Rose, 1998). Thus, consistent with Flandreau and Maurel (2005) we recommend establishment of a SADC monetary union that is relatively independent of the attained degree of business cycle synchronicity. These findings corroborate several studies that have shown that a monetary union could be established even if countries' business cycles are not synchronised *ex-ante* because they can become more synchronised *ex-post* (Flandreau and Maurel, 2005; Furceri and Karras, 2008; Frankel and Rose, 1998; Lee and Azali, 2010).

# Chapter 4

# Fiscal Policy Sustainability in the SADC Area

## 4.1 Introduction

In the aftermath the 2008/09 financial crisis, most economies witnessed unprecedented levels of public debts and deficits. This was bemuse, during this period, economies experienced downturns, and governments across the globe resorted to expansionary fiscal policies in order to avert the recession (Polito & Wickens, 2012). This is, and continues to be more prominent in developing countries, where the capacity to raise more revenues is constrained by persistent low levels of economic growth (Schick, 2005; Auerbach, 2016). Commentators often argue that the explosion of public debt/or deficits in developing economies could partly be attributed to sharp dwindling commodity prices, and excessive currency depreciations.

Since the Southern African Development Communitis (SADC) Memorandum of Understanding (MoU), which outlines convergence criteria for its member states, came into effect in 2002, prudent management of public debt and deficits became of primary concern. The MoU stipulates a convergence criteria that defines of tolerable levels of public debts and deficits as being at 60 percent as share of GDP

and 3 percent as a share of GDP, in that order. These convergence criteria were aimed at paving a way for the envisioned SADC monetary union, which was initially proposed for implementation in 2016, to be followed by a single currency in 2018. Although determination to cut public debt in preparation for the SADC monetary union resulted to significant reductions in public deficits, and in better management of public indebtness, nearly, all SADC member states (since 2008) have witnessed significant increases in government debts, and deficits.

In 2015, for example, Angolan public debt was registered at 65.5 percent of GDP, a significant increase from 40.75 percent in 2014. Furthermore, public debt in the country was estimated at 71.8 percent in 2016 (11.8 percentage points higher than the 60 percent targeted debt). Observers of this trend argue that declines in oil prices, coupled by depreciation of the Angolan Kwanza played a significant role in accelerating public debt in the country. Approximately, 9.5 percent of the Angolan public debt is deno1ninated in foreign currency. Accordingly, a currency depreciation tends to inflate the value of the country's public debt.

In Malawi, debt-to-GDP was estimated at 55 percent in 2013, reaching 61 percent in 2015, and further increasing to 63 percent in 2017. South Africa's debt, on the other hand, was estimated at 31.5 percent in the 2009 /10 fiscal year, 5.5 percentage points higher than the previous year, 2008/2009. In the year, 2010/11, the country's debt was approximated to 35.1 percent, rising to 49.4 percent in 2015/2016. In the year 2016/2017, debt to GDP ratio in South Africa was estimated at 50.97 percent, and was forecasted to reach 52.9 percent in 2017/2018. This increase in public debt appears to be a region wide phenomenon.

Within a space of five years, Lesotho witnessed a 100 percent increase in public debt. More precisely, debt increased from Lesotho Maloti (LSL) 7 000 million in 2011/12 to LSL 14 158 million in the 2015/16 financial year. In the fiscal year

2011/12, Lesotho's public debt was estimated at 37.56 percent of GDP, rising to 5. 75 percent in 2014/15, and reaching to 53.87 percent in 2015/2016 fiscal year.

We are of the view that, owing to the escalating public debt/or deficits, fiscal policy may have been susceptible to become unsustainable. The persistently rising levels of public debt have serious consequences for the envisaged monetary union in SADC. As pointed out in the literature, countries taking part in a monetary union automatically forgo control over their monetary policy tools (Masson & Taylor, 1993). As a result, the only policy recourse accessible at a national level is fiscal policy. Therefore, it is imperative to ensure that fiscal policy is sustainable, so that it would be accessible when it is needed. Put differently, unsustainable fiscal policy may neither be a mechanism nor an effective tool for tackling macroeconomic disturbances (Greiner, Koeller, & Semmler, 2007), hence threatening the stability of a monetary union. In addition, Masson and Taylor (1993) argue that governments with unsustainable debt levels may find it challenging to borrow at reasonable costs/or servke their debt, which in turn may bumper their economic growth (Westerlnnd and Prohl, 2010). The difficulty to service debt will exert pressure on the central bank to monetise/or create money to finance the deficits, and subsequently, jeopardise the credibility of the central bank, hence, risking the stability of the union.

It is important to have a clear view of the severity of the problem in the SADC. This requires determining whether the current fiscal in the region is sustainable. Vve do this by investigating whether SADC countries have taken/or are taking corrective measures to control the(Lusinyan & Thornton, 2009) rising public debt. More precisely, we evaluate whether or not governments in SADC have stabilised policies by increasing revenues following the observed increases in debt. To the best of our knowledge this is the first study to examine sustainability of fiscal policies in SADC. This could partly be attributed to unavailability of the necessary data.

The few studies that exists, apply the traditional time-series tests to the relatively short-time series (See for example, Lusinyan & Thornton, 2009; Baharumshah, Jibrilla, Sirag, Ali, & Muhammad, 2016). We apply panel techniques in order to get around the issue of data limitations. Moreover, whilst there is no single fiscal policy in SADC, a panel sustainability analysis of government finances has to be viewed as significant in the context of SADC countries wanting to pursue a common and sound fiscal policy behaviour within the MoU framework. Potential cross-country interdependencies can be envisioned in the run-up to SADC monetary union. Claeys (2007) stresses the importance of dependencies acmss countries when evaluating sustainability of fiscal policies. He further argues that studying each national fiscal policy in the presence of such cross-country interdependencies turn out to be less insightful (Also see, Alagidede and Tweneboah, 2015). Hence, overall sustainability of fiscal policies is warranted, especially in a monetary union (Claeys, 2007). Therefore, in this study, we test the overall sustainability of fiscal policies in SADC.

## 4.2 Theoretical Framework

There exists a large strand of the literature addressing the question of srn,1:ainability, however, there is no unanimity on how to best measure fiscal position, or how to determine if it is sustainable without intervention (Polito and Wickens, 2012). However, it is customary in the literature to assess fiscal policy sustainability through the present value budget (or Borrowing) constraint (PVBC) (Afonso, 2005; Arghyrou & Luintel, 2007; Baharumshah, Soon, & Lau, 2017; Polito & Wickens, 2012). Hence, this st,udy also relies on the PVBC to appraise the sustainability of fiscal policy in the SADC bloc. To derive the PVBC, we present government budget constraint for country $i = 1, 2, ..., N$ at time $t = 1, 2, ..., T$.

$$E_{it} = (1 + r_{it})B_{it-1} = T_{it} + \triangle B_{it} \tag{4.1}$$

where $E_{it} = (G_{it} + H_{it})$ is a sum of goverment expenditures on public goods ($G_{it}$), and household transfers ($H_it$), $r_{it}$ represents nominal interest rate on bonds issued at time period $t-1$, $T_{it}$ denotes government reveues at time period $t$, and $B_{it}$ are government bonds issued at time period $t$.The left-hand side of equation 4.1 represent government expenditures in the current period, and the right-hand side of the same equation shows government revenues.

It is implicitly assumed that public expenditures are financed through tax revenues, and issuance of new government debt (R. J. Barro, 1979; Daniel & Shiamptanis, 2013). In addition, it is assumed that central banks are highly independent, and therefore, we rule out the possibility that government can use seignorage revenues to finance debts/or deficits (See also, Fincke & Greiner, 2011).

Generally, equation 4.1 is expressed as a ratio of GDP. Hence, in equation 4.2, the budget constraint in equation 4.1 is re-written as a ratio of GDP:

$$g_{it} = (1 + \theta)d_{it-1} = x_{it} + d_{it} \tag{4.2}$$

where $g_{it} = E_{it}/Y_{it}$ is government expenditure expressed as a ratio of GDP, $Y_{it}$, $x_{it} = T_{it}/Y_{it}$ are government revenues as a proportion of GDP, $d_it = B_{it}/Y_{it}$ denotes public debt as a share of GDP, and $\theta = \dfrac{(1 + r_{it})}{(1 + \rho)(1 + \pi_{it}) - 1}$ is an ouput-growth-adjusted real rate on government bonds.

Re-arraning equation 4.2, and recursively solving for posthumous periods, we obtain the present value budget constraint:

$$d_{it} = -\Xi_t \sum_{s=1}^{\infty} \frac{h_{it+s}}{\prod_{j=1}^{T}(1 + \theta_{it+j})} + \Xi_t \lim_{T\to\infty} \frac{d_{t+T}}{(1 + \theta_{it+j})} \tag{4.3}$$

where $\Xi_t$ denotes expectations conditional on the information available at time period $t$, $h_{it+s} = g_{it} - x_{it}$ repre..sents primary government deficit/surplus as a share of GDP. If and when the Present Value Budget Constraint (PVBC) is satisfied, it is

inferred that fiscal policy is sustainable. If the PVBC is fulfilled then fiscal policy is said to be Ricardian; meaning that an increase in government expenditure prompts an increase in taxes corresponding to the present value of debt (Seater, 1993). However, if PVBC is not satisfied the fiscal policy is said to be Non-Ricardian, in which case, the government has to alter either public expenditure or revenues.

If the discounted present value of du tends to zero in the limit, fiscal policy is said to be sustainable. Technically, this translates into a No-Ponzi scheme/or Transversality condition:

$$\Xi_t \lim_{T\to\infty} \frac{d_{t+T}}{(1+\theta_{it+j})} = 0 \tag{4.4}$$

which implies

$$d_{it} = -\Xi_t \sum_{s=1}^{\infty} \frac{h_{it+s}}{\prod_{j=1}^{T}(1+\theta_{it+j})} \tag{4.5}$$

As long as equations 4.4 and 4.5 are not desecrated, it implies that government cannot engage in 'rational Ponzi-Games' that is, government cannot perpetually roll over principal and interest repayments nor can they be financed by issuing new debt (Macdonald, 1992; Haug, 1991).

## 4.3 Literature Review

In the literature, there are two approaches which are generally applied to evaluate whether the PVBC is satisfied or not: stationarity tests, namely, unit root and cointegration techniques, and Bohn's structural test. In the former econometric approaches, equation 4.5 is generally the null hypothesis to be tested. The heuristic exercise was conducted by Hamilton (1986), in the United States covering the period of 1960-84. Contrast to other studies, they used real debt and real deficits (not as ratios of GDP). Moreover, they presume that real debt and real deficits are stationary, and that the interest rate is white noise. They derive the alternative hypothesis by assuming that:

$$\Xi_t \lim_{T\to\infty} \frac{d_{t+T}}{(1+\theta_{it+j})} = A > 0 \tag{4.6}$$

which implies that a certain amounts of government purchases need never be paid for with taxes. Thus, the null hypothesis is given by:

$$d_{it} = -\Xi \sum_{s=1}^{\infty} (1+\theta)^{-s} h_{it+s} + A_0(1+\theta)^{-t} \tag{4.7}$$

The hypothesis that PVBC holds is satisfied, if and only if, $A_0 = 0$ in equation 4. 7. They find that fiscal policy is fully compatible with the PVBC. Hence, fiscal policy in the U.S. for the period under consideration was Ricardian. Wilcox (1989) extends the work of Hamilton and Flavin (1986), by supposing non-stationary interest rate, and permitting for arbitrary violations of the budget constraint. In contrast to Hamilton and Flavin (1986), Wilcox (1989) found that fiscal policy was incompatible with intertemporal budget constraint in the United States. Haug (1991) finds that whilst primary surplus and the stock of government debt are non-stationary, residuals from cointegrating regression of the same variables are stationary. Therefore, he concludes that fiscal policy is harmonious with the intertemporal budget constraint (IBC) in the U.S. In agreement with Hamilton and Flavin (1986), Kremers (1989) finds that fiscal policy in the U.S. is consistent with the PVBC constraint; and is, therefore, entirely harmonious with the contention that investors rationally presume the budget to be balanced in present value terms. Unlike other studies (For example, Ehrhart & Llorca, 2008; Green, Holmes, & Kowalski, 2001), Gabriel and Sangduan (2010) use Horvath and Watson (1995) cointegration test, which they argue to be more efficient relative to conventional cointegration tests. They demonstrate the evidence for cointegration between government revenues and expenditures for all countries included in the sample, and conclude that Bahamas, Finland, France, South Africa1 Thailand, and the United States, are all compatible with govermnent intertemporal budget constraint. These findings are in harmony with those of S. Ahmed and Rogers (1995) , in which they examined sustainability

of fiscal policy for United Kingdom, and the U.S. Ahmed and Rogers (1995) found overwhelming evidence for debt sustainability in both countries.

Papadopoulos and Sidiropoulos (1999) evaluate the sustainability of fiscal policy for selected European countries[1]. They test for stationarity of public debt and deficits, and cointegration between the two variables. In so doing, they permit for structural breaks by using Gregory and Hansen (1996) and Zivot and Andrews (1992) tests. They find that fiscal policies in Greece, Portugal, and Spain arc on a sustainable path. However, they fail to find evidence favouring sustainability in Italy and Belgium. Evaluating cointegration between government expenditures for emerging emnomies, Kalyoncu (2005) finds that whilst South Korea, and Turkey satisfy govennnent intertcmporal budget constraint, albeit only the weak form, South Africa, Philippines, and Mexico pursue an unsustainable fiscal policy. This implies that in the long-run, these countries would require painful adjustments, either tax increases or expenditure cuts, in order to restore sustainability of their fiscal policies. In previous studies, Greece, Italy, Netherlands, and Ireland have been found not to satisfy the intertemporal budget constraint (See for example Makrydakis, Tzavalis, & Balfoussias, 1999; Corsetti & Roubini, 1991). Arghyrou and Luintel (2007) re-evaluate the sustainability of public debt for these economies. In contrast to previous studies, the study permits for both structural breaks and nonlinearities. Arghyrou amd Luintel (2007) find evidence of multiple structural shifts, and nonlinear adjustments. They also find fiscal policies to be sustainable for countries included in the sample. The study concludes that the failure to obtain evidence supporting debt sustainability could be attributed to the inability to take structural shifts and nonlinearities into account (Arghyrou and Luintel, 2007). Focussing on EMU member states[2] that either have violated the Maastricht treaty or have high debt as a share of GDP, Greiner et al. (2007) provide evidence that fiscal policies in these countries

[1]Belgium, Greece, Italy, Portugal and Spain

[2]Those countries are Italy, which had a high debt-to-GDP ratio, France, Portugal, and Germany which all violated the treaty

are sustainable despi te violation of the Maastricht treaty. This, therefore, implies that the ceiling imposed in the EMU/ or in the proposed SADC monetary union may not necessarily imply that debt will be sustainable/or unsustainable if not satisfied (Arghyrou and Luintel, 2007; Greiner et al., 2007). Thus, the sustainability of fiscal policy is an important heuristic task (Greiner ct al., 2007). In line with this, Afonso (2005) explores the sustainability of fiscal policy in Europe by evaluating cointegration between government revenues and expenditures. The author finds that whilst debt-to-GDP has stabilised, fiscal policies, with few exceptions, in the Euro area appear to be on an unsustainable path. Consequently, the governments in the EU are running a risk of becoming highly indebted, and as a result painful adjustments in the long-term may be inevitable (Afonso, 2005; Caporale, 1995). Similar results are documented by Afonso and Rault (2010). The authors evaluate the sustainability of public finances in the EU-15 using both cointegration and unit root tests. They find that while public finance sustainability appear to be problematic in some countries, fiscal policy was sustainable in the panel of EU-15. Claeys (2007) demonstrates that, overall, fiscal policies are sustainable in the EU, albeit national experiences vary significantly. Consistent with this, Westerlund and Prohl (2010) show that indeed the hypothesis of fiscal sustainability cannot be rejected for OECD countries.

Exploring sustainability of fiscal policies for Latin American countries, Alagidede and Tweneboah (2015), find that the intertemporal budget constraint is adhered to. Bravo and Silvestre (2002) evaluate cointegration between government revenues and expenditure for eleven European Union member countries for the period of 1960- 2000. They argue that if cointegration of public revenues and expenditures, as argued by Trehan and Walsh (1988), is a sufficient condition for sustainability of public debt, then their findings imply that debt, for the period under consideration, was only sustainable in five countries, namely Austria, France, Germany, Netherlands, and United Kingdom. Moreover, they demonstrate that Belgium, Denmark,

Ireland, Italy, and Finland were incompatible with the intertemporal budget constraint. Bajo-Rubio, Díaz-Roldán, and Esteve (2009) also find that whilst other EMU member states satisfy the intertemporal budget constraint, Finland does not. Thus, its fiscal policy is unsustainable. Fincke and Greiner (2010) examine the sustainability of public debts in developing countries, namely Botswana. Costa Rica, Panama, Mauritius, Rwanda, and Tunisia. The impetus for concentrating on developing countries is that whilst there exists an enormous amount of research concerning fiscal policy sustainability, the focus is usually limited to developed countries. Yet, developing countries have proved to be the most vulnerable to debt crises as evidenced in 1980s and 1990s. They find that fiscal policies, for the period under consideration, were sustainable for countries considered with the exception of Panama. This is despite the increasing levels of public debt to GDP.

Using conventional methods of evaluating sustainability, that is, unit roots/or cointegration tests, most studies fail to reject the null hypothesis of a unit root in government debt; implying that debt grows boundlessly. Bohn (1998) argues that failing to find evidence to reject the null hypothesis of a unit root does not necessarily imply that fiscal policies are unsustainable, or debt grows boundlessly. Moreover, requiring the debt-income ratio to be stationary for fiscal policy sustainability is an unnecessary condition (Bohn, 2007). He further argues that it is difficult to detect mean-reversion in debt-GDP ratio, because it is generally bounced by a number of shocks such as, fluctuations in output growth. Consequently, he suggests obtaining a direct signal for counteractive measures by evaluating the response of primary surplus to changes in debt. A sanguine response demonstrates that government is taking corrective actions by either reducing non-interest expenditure or increasing revenues (Mendoza & Ostry, 2008). This is all that is required to infer that fiscal policies arc sustainable (Bohn, 2007).

Using Bohn's approach and a large sample size, Mauro, Romeu, Binder, and

Zaman (2015), observe that when the sample is constrained to include only up to the pre-2008 crisis, most advanced economies adhered to intertemporal budget constraint. However, when data is extended beyond the 2008 financial crisis, most advanced economies disobeyed the intertemporal budget constraint. Fincke and Greiner (2012) evaluate the sustainability of public debt for a set of European countries. They find that primary surpluses positively react to changes in government debt for all countries included in the sample; implying that fiscal policies are on a sustainable path for the period under consideration. Furthermore, they examine if deficits inclusive of interest repayments are stationary. This is to corroborate the findings of the fiscal policy reaction function. They find that deficits inclusive of interest rates are stationary, thus fiscal policies are indeed sustainable. Mendoza and Ostry (2008) consider a sample of both industrial and emerging countries to evaluate the sustainability of fiscal policies using the model-based approach, that is, the Bohn reaction function. They find that primary balances react positively to changes in public debt. Accordingly, they conclude that fiscal policies are sustainable for both industrial and emerging countries.

Overall, although there exists a plethora of studies examining the sustainability of fiscal policies, the focus tends to be skewed towards developed countries (Afonso & Jalles, 2016; Arghyrou & Luintel, 2007; Auerbach, 2016; Feve, Henin, et al., 2000). Thus, developing countries which are argued to be more susceptible to debt crises (Fincke and Greiner, 2010) tend to be overlooked. The few studies which look into developing countries often present contradicting results(Ghatak & Sánchez-Fung, 2007; Fincke & Greiner, 2010), and concentrate in Asian, and Latin American economies, thereby, neglecting African economics (Alagidedc and Twencboah, 2015). The contradicting results in empirical studies could be ascribed to the use of different econometric techniques, and the assumptions made about the discounting factor (Caporale, 1995; Alagidede & Tweneboah, 2015). Moreover, the biasness towards developed could be attributed to difficulties in obtaining data, and reliability issues

where the data arc available (Lusinyan and Thornton, 2009). Lastly, most of the studies tend to concentrate on individual countries, and this is argued to be less insightful given the interdependencies across countries (Claeys, 2007), especially in regional economic communities (RECs); and fails to account for cross-country dependencies could yield misleading results (Banerjee, 1999).

## 4.4 Methodology and Data

### 4.4.1 Data

We evaluate the sustainability of fiscal policy in the panel of fifteen SADC countries over the period of 2000 to 2016. The data for all countries, except for South Africa arc taken from the World Development Indicators World Bank database, World Economic Outlook International Monetary Fund (IMF) database; and South Africa's data are collected from the South African Reserve Bank (SARB). The reason why South African data is collected from a different source (i.e. SARB) is because it incosistenly available from the World Development Indicators (i.e. it has several gaps). The sample consists of all SADC member states, that is, Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe. The series subsumes general goverment public debt, government expenditures, gross domestic product (GDP), and government revenues.

### 4.4.2 Univariate Analysis: Ng and Perron Unit Roots Test

Unit root testing has become a standard practice for macroeconomic analysis (Perron & Ng, 1996), and the generally used approach is the Augmented Dickey-Fuller (ADF) due to Dickey and Fuller (1979), advanced by Said and Dickey (1984); and the Phillips and Perron unit root test. Ng and Perron (2001) caution that inferences based on these traditional procedures could be misleading, and should therefore be treated with caution. This is due to two main misgivings raised in the literature.

First, these approaches generally have limited power in cases where the data generating process subsumes a moving average root near unity (DeJong, Nankervis, Savin, & Whiteman, 1992). Second, when the autoregressive polynomial of the first differenced series consists of a large negative root, the tests tend to suffer from size distortions (Schwert, 1987; Perron & Ng, 1996). Failing to take these concerns into account could result into incorrect rejection of the unit root hypothesis (Ng & Perron, 2001). Therefore, Ng and Perron (2001) develop new procedures which circumvent these issues.

The following data generating process is assumed:

$$y_t = d_t + \varepsilon_t \tag{4.8}$$

where $\epsilon_t = \alpha\epsilon_{t-1} + \varepsilon_t$, $E(\varepsilon_0^2) < \infty$, $\epsilon_t = \delta(L)e_t = \sum_{j=0}^{\infty} \delta_j e_{t-j}$ with $\sum_{j=0}^{\infty} j|\delta_j| < \infty$ and $e_t \sim \text{i.i.d}(0, \sigma_e^2)$. The non-normalised sprectral density at frequency zero of $\epsilon_t$ is given by $\sigma^2 = \sigma_e^2\delta(1)^2$. Moreover, $d_t =' z_t$ where $z_t$ is a set of deterministic elements. Ng and perron (2001) test the following null hypothesis:

$$H_0 : \alpha = 1$$

against the alternative hypothesis that:

$$H_1 : \alpha < 1$$

using three $M$[3] (that is, $MZ_\alpha, MZ_t$ and $MSB$) which are defined as follows:

$$MZ_\alpha = \left((T^{-1}y_T^2 - s_{AR}^2)2T^{-2}\sum_{t=1}^{T} y_{t-1}^2\right) \tag{4.9}$$

$$MSB = \left(T^{-2}\sum_{t=1}^{T} y_{t-1}^2/s_{AR}^2\right)^{1/2} \tag{4.10}$$

[3]See, Perron and Ng (2006) for properties of the tests.

$$MZ_t = MZ_\alpha \times MSB \tag{4.11}$$

where $s^2_{AR}$ is an estimate of the spectral density of $\epsilon_t$ at zero frequency which is given by:

$$s^2_{AR} = \frac{\hat{\alpha}^2_k}{\left(1 - \hat{\beta(1)}\right)^2} \tag{4.12}$$

where $\hat{\beta}(1)$ and $\hat{\alpha}^2_k$ are given by $\sum_{i=1}^{k} \hat{\beta}$ and $(T-K)^{-1}\sum_{t=k+1}^{T} \hat{e}_{ik}$, respectively. Perron and Ng (1996) suggest adapting local unity generalised least squares detrending process in order to improve the power of the $M$ tests. Furthermore, Ng and Perron (2001) consider two modified feasible point optimal tests given by:

$$p = 0 : MP^{GLS}_T = \left(\bar{c}^2 T^2 \sum_{t=1}^{T} \tilde{y}^2_{t-1} + (1 - \bar{c}T^{-1}\tilde{y}^2_t\right)/s^2_{AR} \tag{4.13}$$

$$p = 1 : MP^{GLS}_T = \left(\bar{c}^2 T^2 \sum_{t=1}^{T} \tilde{y}^2_{t-1} + (1 - \bar{c}T^{-1}\tilde{y}^2_t\right)/s^2_{AR} \tag{4.14}$$

In addition to these tests, Ng and Perron (2001) argue that the truncation lag selected by the Akaike criterion tends to be very small and they therefore, propose a modified Akaike Information Criterion (AIC) given by:

$$MAIC(k) = \left(ln\hat{\sigma}^2_k + \frac{2(\tau_T(k) + k}{T - k_{max}}\right) \tag{4.15}$$

with $\tau_T = \hat{\sigma}^2_k\Big)^{-1} \hat{\beta}_0 \sum_{t=k_{max}+1}^{T} \hat{\sigma}^2_k = (T - k_{max})^{-1} \sum_{t=k_{max}}^{T} \hat{e}^2_{tk}$.

### 4.4.3 Panel Data Analysis

#### 4.4.3.1 Cross-Country Interdependencies

Although panel data analysis offers numerous advantage over time-series, it is not without challenges which, if not taken into account, can significantly distort the results (Baltagi & Pesaran, 2007). For instance, countries have become more con-

nected than ever before, and thus neglecting those interdependencies could yield misleading/or incorrect inferences. As a consequence, scholars have migrated from the 'first generation unit root tests' which do not account for cross-sectional dependence (Im, Pesaran, & Shin, 2003; Levin, Lin, & Chu, 2002), to the 'second generation unit root tests' which acknowledge or rather allow for cross-sectional dependencies (Y. Chang, 2002; Pesaran, 2007; Choi, 2001; Bai & Ng, 2004; Moon & Perron, 2004).

Accordingly, in order to ensure that we employ correct instruments, and avoid issues related to cross-sectional interdependency, we commence by ascertaining the presence of cross-sectional dependence or absence thereof in the data. This exercise is in line with O'Connell (1998) who argues that using a panel unit root test which do not take into account the presence of cross-sectional dependence, even if it is present, will lead to false rejection of the null hypothesis that a series has a unit root.

We use several tests in order to check for cross-sectional dependence. The Breusch and Pagan (1980) test is centered on the squared average pairwise correlation of the residuals. The test uses the following LM statistic:

$$CD_{lm} = T \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho_{ij}} \tag{4.16}$$

where $\rho_{ij}$ denotes the sample estimate of the pairwise correlation of residuals. $\rho_{ij}$ is given by:

$$\rho_{ij} = \rho_{ji} = \frac{\sum_{t=1}^{T} e_{it} e_{jt}}{\left( \sum_{t=1}^{T} e_{it}^2 \right)^{1/2} \left( \sum_{t=1}^{T} e_{jt}^2 \right)^{1/2}} \tag{4.17}$$

The Breusch and Pagan Llvf test is only applicable when cross-section dimension ($N$) is smaller *vis-a-vis* the time-series dimension ($T$). Therefore, when $N > T$ the test suffers from size distortions. Consequently, Pesaran (2004) develops a new set

of tests wl1ich are based on the average of pairwise correlation coefficients of the residuals from individual ordinary least squares (OLS) regressions. The Pesaran (2004) tests are applicable to heterogeneous dynamics panels and are robust to structural breaks. The test developed by Pesaran is given by:

$$CD_{lms} = \sqrt{\frac{1}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \left( T\hat{\rho}_{ji}^{2} - 1 \right) \tag{4.18}$$

The LM statistic presented in equation 4.18 is a scaled version of equation 4.17. Pesaran (2004) argues that equation 4.18 can be utilised to assess cross-sectional dependence even if $N \to \infty$ and $T \to \infty$. However, the above test is likely to show significant size distortions for $N \to \infty$ and a small $T$. These shortcomings call for new tests. Hence Pesaran (2004) develops a test which is centered on the pairwise correlation coefficients as opposed to their squares as in the LM test:

$$CD = \sqrt{\frac{2T}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}_{ij} \tag{4.19}$$

Finally, we use a procedure developed by Pesaran, Ullah, and Yamagata (2008) which they argue to be consistent even in cases where the CD test is not. The adjusted LM statistics is given by:

$$CD_{adj} = \sqrt{\frac{2T}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \frac{(T-k)\hat{\rho}_{ij}^{2} - \mu_{Tij}}{\upsilon_{Tij}} \tag{4.20}$$

In Table 4.1 we present the findings from different tests of cross-sectional dependence. All tests indicate that the null hypothesis of no cross-sectional dependence is rejected, except for Pesaran CD test which fails to reject the null hypothesis of no cross-sectional dependence in government expenditure.

Table 4.1: Cross-Sectionally Dependence Tests Results

| | Government Expenditure | | Government Revenues | |
|---|---|---|---|---|
| Test | Statistic | P-value | Statistic | P-value |
| Breusch-Pagan LM | 300.188 | 0.000*** | 305.598*** | 0.000*** |
| Pesaran Scale LM | 20.383 | 0.000*** | 20.854 | 0.000*** |
| Bias-Corrected Scaled LM | 20.153 | 0.000*** | 20.624 | 0.000*** |
| Pesaran CD | 2.399 | 0.016** | 0.689 | 0.490 |

NB: ***,** denotes 1% & 5% levels of significance, accordingly.

As pointed out by Pesaran et al. (2008), that in some cases the CD test is inconsistent, we rely on the bias-corrected cross-sectional dependence test which rejects the null hypothesis of cross-sectional independence. Hence, our remits suggest that there is cross-sectional dependence among/in; and, therefore, using tests which do not account for cross-country interdependencies would be inappropriate. Accordingly, in the subsequent section, we provide a concise description of the second generation tests which would be employed in this study.

#### 4.4.3.2 Panel Unit Roots Test: Pesaran (2007)

The issue of unit roots in macroeconomics variables has long been studied. Accordingly, there exists a number of techniques through which the presence of a unit root (both in time-series and panel data) could be detected (Breitung, 2002; Choi, 2001; J. Lee & Strazicich, 2003; Maddala & Wu, 1999; Phillips & Perron, 1988). However, the caveat of most unit root techniques, particularly, panel unit root tests is that they presume that individual time-series are cross-sectional independent (Pesaran, 2007). Issues associated with the supposition that series are cross-sectional independent have already been pointed out in the preceding sections. As shown in Table 4.1, the application of first generation panel unit root tests would be inappropriate for this study. Therefore, in this study we use a panel unit root test

developed by Pesaran (2007) which takes cross-sectional dependence into account:

$$\triangle y_i t = \alpha_i + \phi y_{it-1} + \delta_i \epsilon_t + \varepsilon_{it} \; i = 1, .., N \; t = 1, ..., T \tag{4.21}$$

where $\epsilon_t$ and $\varepsilon_{it}$ are the unobserved common effects, and individual error term, accordingly. The null hypothesis to be tested is expressed as follows:

$H_0 : \phi_i = 0 \; \forall i$

against the possibly heterogeneous alternatives,

$H_1 : \phi_i < 0, \; i = 1, ..., N_1; \; \phi_i = i = N_1 + 1, \; N1 + 2, ..., N$

It is assumed that $\varepsilon_{it}$ are independently identically distributed across cross-sectional units and time, $N(0, \sigma^2)$. Moreover, it is assumed that $\epsilon_{it}$ is not serially correlated, and it has zero mean and constant variance, $\sigma_\epsilon^2$. Lastly, $\varepsilon_{it}, \epsilon_{it}$ and $\delta_i$ are assumed to be independently distributed for all cross-sectional units. Pesaran (2007), therefore, bases the test of a unit root hypothesis on the t-ratio of OLS estimate of $b_i(\hat{b}_i)$ in the following cross-sectionally augmented Dickey-Fuller (CADF) regression:

$$\triangle y_{it} = \alpha_i + b_i y_{it-1} + c_i \bar{y}_{t-1} + d_i \triangle \bar{y}_t + e_{it} \tag{4.22}$$

where $\bar{y}_t = N^{-1} y_{jt}$. The $t$-ratio is therefore given by:

$$t_i(N, T) = \frac{\triangle y_i' \bar{M}_w y_{i-1}}{\bar{\sigma^2}_i (y_{i-1}' \bar{M}_w y_{i-1})^{1/2}} \tag{4.23}$$

where $\triangle y_i = (\triangle y_{i1}, ..., \triangle y_{iT})', \; y_{i-1} = (y_{i0}, ..., y_{iT-1})', \; \bar{M}_w = I_T - \bar{W}(\bar{W}'\bar{W})^{-1}\bar{W}' \; \bar{W} = (\tau, \triangle \bar{y}, \bar{y}_{-1}), \; \tau(1, 1, ...1)', \; \triangle \bar{y} = (\triangle \bar{y}_1, ..., \triangle \bar{y}_T)', \; \bar{y}_{-1} = (\bar{y}_0, ..., \bar{y}_{T-1})', \; \sigma_i^2 = \dfrac{\triangle y_i' M_{iw} \triangle y_i}{T - 4}, \; M_{iw} = I_t - G_i(G_i' G_i)'$ and $G_i' = (y_{i-1}, \bar{W})$.

### 4.4.4 Panel Cointegration: Westrlund (2007) Procedure

There is a large strand of the literature scrutinizing the long-run linkages amongst economic variables. According to Westerlund (2007), such literature has taken two broad categories. The first category is based on the null hypothesis of cointegration

(See for example McCoskey & Kao, 1998). While the socond category is based on the null hypothesis of no cointegration (Kao, 1999; Pedroni, 1999). Most of these tests are based on Engle and Granger (1987) procedures. The challenge with Engle and Granger based procedures is that they often fail to find cointegration between economic variables, even if economic theorems strongly suggest the existence of long-run cointegration. Westerlund and Prohl (2010), Westerlund (2007) and Alagidede and Tweneboah (2015) contend that the reason for the failure of Engle-Granger based tests could be due to the imposition of a common factor limitation. Simply put, the Engle-Grange based tests impose that the long-run cointegrating vector for the variables in levels must be identical to the short-run adjustment process in the first differences.

Due to the limitations of cointegration tests based on the Engle-Granger procedure, Westerlund (2007) propose four tests which are based on structural as opposed to residual dynamics. These tests do not impose the common factor restriction (Alagidede & Tweneboah, 2015). Moreover, the cointegration tests proposed by Westerlund (2007) are general enough to accommodate individual peculiarities, for example, individual-specific short-run dynamics, trend, and heterogeneities in the slope parameters, as well as cross-sectional dependency.

The error correction based test of Westerlund (2007) assumes the following data generating process:

$$\triangle y_{it} = \beta_i' d_t + \alpha_i(y_{it-1} - \delta_i' x_{it-1}) + \sum_{j=1}^{p_i} \alpha_{ij} \triangle y_{it-1} + \sum_{j=-q_i}^{p_i} \upsilon_{ij} \triangle x_{it-j} + \varepsilon_{it} \qquad (4.24)$$

where $t = 1, ..., T$ and $i = 1, ..., N$ denotes the time-series and cross-sectional units, in that order. $d_t$ contains deterministic terms of which there are three possible cases: $d = 0,\ d = 1$ and $d = 1, t$. The first case refers to cases in which $\triangle y_{it}$ is generated with no deterministic terms, while in the second case $\triangle y_{it}$ is generated with only a

constant term, and in the third case, $\triangle y_{it}$ is generated with trend and the constant terms.

equation 4.24 can be rewritten as:

$$\triangle y_i t = \beta_i' d_t + \alpha_i \left( y_{it-1} - \Psi_i' x_{it-1} + \sum_{j=1}^{p_i} \alpha_{ij} \triangle y_{it-j} + \sum_{j=-q_i}^{p_i} \upsilon_{ij} \triangle x_{it-j} + \varepsilon_{it} \right) \quad (4.25)$$

where $\Psi_i' = -\alpha_i \delta_i'$. The parameter $\alpha_i$ determines the rate at which the system $y_{it-1} - \delta_i' x_{it-1}$ reverts back to equilibrium following a shock. For cointegration to exist the parameter $\alpha_i$ must be less than zero, suggeiting that following a shock the system returns back to equilibrimn. However, if $\alpha_i$ equals to zero, then there is no cointegration, and therefore, the system does not go back to equilibrimn following a shock.

The null hypothesis is therefore stated as:

$H_0 : \alpha_i = 0$

The alternative hypothesis is contingent on the assumption made about the homogeneity of $\alpha_i$. Westerlund (2007) proposed four tests of which two are panel mean tests and the other two are group mean tests. The group mean do not constrain $\alpha_i$ be identical accross the members of the panel, therefore, permitting the alternative hypothesis to differ accross panel members (that is, $H_1 : \alpha_i < 0$ for some members of the panel); while the panel mean test requires $\alpha_i$ to be homogenous accross the members of the panel. Accordingly the alternative hypothesis is $H_1 : \alpha_i < 0$ for all cross-sectional units.

### 4.4.5 Estimating Bohn's Reaction Function

Although the literature has not yet come up with a universally accepted measure/ or approach to assess fiscal sustainability, other approaches such as the Bohn (1998) have gained broader acceptance. The Bohn (1998) approach is based on time series regression of primary surplus and government debt. In this study, we employ the fiscal policy reaction approach of Bohn (1998) which has attracted a lot of attention.

The approach tests how government's primary surplus relative to GDP reacts to changes in public debt relative to GDP. If the reaction is sanguine and statistically significant then fiscal policy is said to be sustainable. This approach has a good economic intuition: if government runs into debt today, it has to run surpluses in forthcoming periods in order to meet today's obligations, and consequently remain sustainable (Fincke & Greiner, 2011). In order to obtain fiscal reaction functions we estimate equation 4.26 using various dynamic panel estimators:

$$x_{it} = \alpha_{it} + \delta_{it} g_{it} + \phi^T Z_{it} + \varepsilon_{it} \tag{4.26}$$

where $x_{it}$ represents government revenues relative to GDP, $\alpha_{it}$ are individual country intercepts, $g_{it}$ denotes goverment outlays as a share of GDP, $Z_{it}$ is a vector of additional variables which influence goverment revenues, and eu are individual error terms which are assumed to be i.i.d $N(0, \sigma^2)$.

Concerning variables included in $Z_{it}$ we follow a standard strategy in the literature (Sec, Bohn, 1998; Fincke and Greiner, 2011). The choice of these variables is stirred by Barro's tax smoothing hypothesis. The hypothesis contends that public deficits ought to be used only to keep tax rates constant over the state of nature, and overtime (Bohn, 1995). Consequently, normal expenditures should be financed by regular revenues, and deficits provide a windbreak against unanticipated government purchases. Therefore, we include a business cycle variable (or output gap), $Yvar_{it}$ which captures fluctuations in public revenues. This is computed by decomposing output into it circular and cyclical components, using the Hodrick-Prescott-Filter (H-P-Filter). If output is below its normal level, taxes will proportionately fall with the decline in output. On the one hand, if output rises above its normal level then revenues will proportionately increase with output. So, it is anticipated that the coefficient accounting for the effect of output deviations from trend will have a positive sign, that is, $\phi_{it} > 0$. In addition, deviations of government purchases from the trend will also affect revenues. Similar to business cycles, we utilize government

expenditure deviations from trend, $Gvar_{it}$ also computed using the H-P-Filter. In order to avoid potential endogeneity issues in our model, we use lagged government expenditure$g_{it-1}$ in our estimation. Therefore, equation 4.26 can be written as:

$$x_{it} = \alpha_{it} + \delta_{it} g_{it-1} + \phi^T Z_{it} + \varepsilon_{it} \tag{4.27}$$

In order to estimate the fiscal policy reaction function, we resort to Panel Mean Group, Mean Group, and the Dynamic Fixed Effect (discussed in lengthy below). These techniques would permit us to approximate the reaction coefficient, $\delta_{it}$ in equation 4.27, both in the short and the long-run.

The application of panel data has become standard practice in modern macroeconomics. As a consequence, a number of techniques have been developed to estimate, and deal with apparent issues in panel data (Pesaran & Smith, 1995). As argued by Pesaran and Smith (1995) there are four techniques of getting the average effect between endogenous variables and explanatory variables, especially when the sample size is sufficient to run individual regressions:

- Estimating different regressions for each member of the panel, and averaging the resulting coefficients. This is known as the mean group estimator.
- Merging data by constraining slopes to be identical across all members, while permitting for fixed effects or arbitrary intercepts, and estimating pooled regressions.
- Ireating panel data as a time-series data-by averaging data over members, and estimating aggregate time-series regression.
- Averaging data overtime, and estimating a cross-section regression on group means.

According to Pesaran and Smith (1995) all four procedures yield consistent and

unbiased estimates of coefficient means for static models, but the same is not true for dynamic models. Pesaran and Smith (1995) demonstrate that the group mean estimator is reliable for large $N$ and $T$, while the pooled and aggregate estimators are not reliable when used in a dynamic model, even when $N$ and $T$ are large, and the biases could be sizeable.

The most coimnonly used procedure is the Mean Group which is argued to yield consistent estimates of the average of the parameters (Pesaran and Smith, 1995). However, the Mean Group (MG) ignores the fact that some parameters may be identical across the panel. The other estimator which is commonly used Ls the pooled estimator of Arellano and Bond (1991), which allows for intercepts to be heterogeneous, while other parameters are constrained to be homogeneous (Pesaran & Smith, 1995; Pesaran, Shin, & Smith, 1999). However, in the literature it has been demonstrated that the supposition of common slopes is inappropriate (Phillips & Moon, 2000; Phillips & Sul, 2003; Im et al., 2003), hence, rendering the pooled estimator less useful.

Pesaran et al. (1999) developed a model referred to as the Pooled Mean Group (Asghar, Qureshi, & Nadeem, 2015), which is in-between the pooled estimator and the MG estimator. Their model permits for heterogeneity in the short-run parameters, intercepts, and error variances, but constrains the long-run coefficients to be identical.

This is consistent with economic theory, because in most cases long-run relationships are expected to be the same, owing to solvency conditions amongst other things (Pesaran et al., 1999). Their model assumes the following data generating process:

$$y_{it} = \sum_{j=1}^{p} \alpha_{ij} y_{it-j} + \sum_{j=0}^{q} \beta'_{ij} X_{it-j} + \epsilon_i + \varepsilon_{it} \tag{4.28}$$

where $i = 1, 2..., N$ and $t = 1, 2..., T$. $X_{it}$ is a $(Kx1)$ vector of endogenous variables, $\epsilon_i$ denotes fixed effects, while $\alpha_{it}$ are coefficients of the lagged endogenous variables, $\beta_{ij}$, and are $(K \times 1)$ coefficient vectors. It should be noted that other fixed regressors such as seasonal dummies could be included in 4.28, but for demonstration purposes,

such regressors are not included.

The advantage of the Panel Autoregressive Distributed Lags Model (P-ARDL) is that it does not necessarily require a balanced panel, although $T$ must be sufficient to estimate the model for each member country. If the variables under consideration are $I(1)$ and are cointegrated then the error term is $I(0)$. A crucial feature of cointegrated variables is their response to any deviation from long-run equilibria (Asghar et al., 2015). This characteristic supposes an error correction path of the variables. Therefore, equation 4.28 could be re-parameterized into an error correction model given by:

$$\triangle y_{it} = \theta_i y_{it-1} + \vartheta_i X_{it} + \sum_{j=1}^{p-1} \alpha_{ij}^* \triangle y_{it-j} + \sum_{j=0}^{q-1} \beta_{ij}^* \triangle X_{it-j} + \delta' D_t + e_{it} \tag{4.29}$$

$\theta = -\left(1 - \sum_{j=1}^{p} \alpha_{ij}\right),\ \vartheta = \sum_{j=0}^{q} \beta_{ij}, \alpha_{ij}^* = \sum_{m=j+1}^{p} \alpha_{im}$ and $\beta_{ij}^* = -\sum_{m=j+1}^{q} \beta_{im}$, with $j = 1, 2, ..., p-1,\ j = 1, 2, ..., q,\ i = 1, 2, ..., N$

Stacking series observation for each group, equation 4.29 can be expressed as:

$$\triangle y_{it} = \theta_i y_{it-1} + X_i \vartheta + \sum_{j=1}^{p-1} \alpha_{ij}^* \triangle y_{it-j} + \sum_{j=0}^{q-1} \beta_{ij}^* \triangle X_{it-j} + \epsilon_i l + \varepsilon_i \tag{4.30}$$

where $i = 1, 2, ..., N,\ y_i = (y_{i1}, ..., y_{iT})'$ is a $(T \times 1)$ vector of observations on the endogenous variables for the $i^{th}$ member country, $X_i = (X_{i1}, ..., X_{iT})'$ is a $(T \times k)$ matrix of observations on the exogenous variables which are time-variant and are different across member rountries, and $l = (1, ..., 1)'$ is a $(T \times 1)$ vector of $l$s,. $y_{i-j}$ and $X_{i-j}$ are $j$ period lagged values of $y_i$ and $X_i$, respectively, $\triangle X_i = X_i - X_{i-1},\ \triangle y_i = y_i - y_{i-j}$ and $\varepsilon_i = (\varepsilon_{i1}, ..., \varepsilon_{iT})'$.

The choice of P-ARDL is driven by a number of advantages relative to conventional cointegration testing procedures, such as the one of Engle and Granger (1987) and Johansen (1991). Firstly, the ARDL procedure does not require variables to be

integrated of the same order. It can take both $I(l)$ and $I(0)$ variables (Duasa, 2007; Kutu et al., 2016; Ozturk & Acaravci, 2010; Pesaran et al., 1999). Therefore, pre-testing to examine the order of integration is not obligatory. Secondly, the ARDL procedure remains robust even with small sample size (Acaravci and Ozturk, 2010; Kutu and Ngalawa, 2016; Duasa, 2007). In our case i.e. in the African context, where data availability is an issue, Panel ARDL is even more interesting.

### 4.4.6 Panel Granger Causality: Government Revenues and Expenditures

Lastly, this section evaluate the relationship between government revenues and expenditures. Understanding the nature of the relationship between these variables have both theoretical and policy significance. Moreover, understanding the direction of the relationship between government revenues and expenditures is highly important for governments wanting to curb or keep budget deficits in check. Hence, we investigate Granger causality between government revenues and expenditures using an approach developed by Dumitrescu and Hurlin (2012). The model offers advantage over other competing models in a sense that it allows for some degree of heterogeneity across countries, in terms of both the autoregressive parameter $\delta_i^{(k)}$ and the coefficients slope, $\beta_i^{(k)}$ (Nair-Reichert and Weinhold, 2001; Holtz-Eakin et al., 1988). Imposing the homogeneity of coefficients could result to misleading conclusions (Dumitrescu and Hurlin, 2012; Pesaran and Smith, 1995). While we allow for heterogeneity in the $AR$ parameter and slope coefficients, it is assumed that these are constant over time. The model is specified as follows:

$$y_{it} = \alpha_i + \sum_{k=1}^{k} \delta_i^{(k)} y_{it-k} + \sum_{k=1}^{k} \beta_i^{(k)} x_{it-k} + e_{it} \tag{4.31}$$

where $y$ and $x$ are stationary variables of interest observed for $N$ member states of the SADC region for $T$ periods while $K \in N.\beta = (\beta_i^{(k)}, ..., \beta_i^{(k)})'$. In contrast to Emirmahmutoglu and Kose (2011), this model supposes that the lag length is

identical across member countries of the panel. Moreover, the initial conditions $(y_{i-k}, ..., y_{i0})$ and $(x_{i-k}, ..., x_{i0})$ are known and observable. It is further presumed that for each member of the panel $i = 1, ..., N$ residual are i.i.d $N(0, \sigma^2_{e_i})$, and $E(e_{it}, e_{js}) = 0$, $\forall(t, s)$.

## 4.5 Results and Discussion

### 4.5.1 Testing the Transversality Condition: Augmented Dickey-Fuller Unit Roots Test

In the first step, stationarity properties of individual time series, public debt as a ratio of GDP, are examined. We employ the Augmented Dickey-Fuller (ADF) test. This exercise is conducted in order to compare/or streamline our findings with other btudies. The number of lags is chosen by Schwarz information criterion. The results are reported in Table 4.2. We employ the test for unit roots on public debt for individual countries.

This follows , who contend that difference stationarity of public debt is a sufficient condition for intertemporal budget constraint. If debt is difference stationary, it implies that equation 4.4 holds. Bergman (2001) argues that sustainability is satisfied as long as debt is integrated of any finite order. In addition, the author argues that this is a necessary and sufficient condition for sustainability.

Table 4.2: Augmented Dickey-Fuller Unit Roots Test: Public Debt

| Country | t-statistic | p-value |
|---|---|---|
| Angola | -6.903*** | 0.000 |
| DRC | -5.362*** | 0.003 |
| Lesotho | -9.444*** | 0.000 |
| Madagascar | -4.499*** | 0.008 |
| Malawi | -5.460*** | 0.004 |
| Mauritius | -4.719** | 0.011 |
| Mozambique | -4.685** | 0.012 |
| Namibia | -7.243*** | 0.000 |
| Seychelles | -4.953*** | 0.003 |
| Tanzania | -8.913*** | 0.000 |
| Zambia | -4.761*** | 0.009 |
| Zimbabwe | -4.383** | 0.031 |

***,**, denotes 1% & 5% significance levels, respectively.

Note: Botswana and Swaziland are omitted due to data limitations

The test results, in Table 4.2, depict that public debt is difference stationary for all countries included in the sample. The findings in Table 4.2 suggest that equation 4.4 does hold, and therefore, debt does not explode for countries included in the sample. Put differently, the findings reported in the Table 4.2 signify that governments do not resort to Ponzi-Schemes, that is, systematic financing of old growing public debt by issuing new debt (Flood and Garber, 1980). Unit root tests are generally known for their limited power in small samples, and on this ground, Caporale (1995) cautions that this test could be misleading. Therefore, its results should be treated cautiously. Hence, in the subsequent steps, we check alternative sustainability conditions; which require that government expenditure be cointegrated with government revenues.

### 4.5.2 Ng and Perron Unit Roots and Johansen Cointegration Test Results

In this section, we present the univariate unit root results. More precisely, the Ng and Perron (2001) unit root test is applied to assess the presence/or absence of unit roots in public expenditures and revenues for the period under consideration. The findings from this exercise are reported in Tables 4.3 and 4.4. The tests are applied on the log of government revenues and expenditures as a share of GDP in levels, and in first differences, with a constant, and constant and a trend in the unit root test equations.

Table 4.3: Ng and Perron (2001) Unit Roots Test Results: Government Revenues (share of GDP)

| | $MZ_\alpha$ | | $MZ_t$ | | MSB | | MPT | |
|---|---|---|---|---|---|---|---|---|
| | No Trend | Trend | No Trend | Trend | No Trend | Trend | No Trend | Trend |
| ANG | -6.238[0] | -7.649[0] | -1.324[0] | -1.730[0] | 0.212[0] | 0.226[0] | 5.125[0] | 13.324[0] |
| BWT | 1.355[0] | -12.051[3] | 1.308[4] | -2.444[3] | 0.965[4] | 0.202[3] | 69437[4] | 7.613[3] |
| DRC | -7.961[5] | -11.166[5] | -1.981[5] | -2.340[5] | 0.248[5] | 0.209[5] | 3.129[5] | 8.271[5] |
| LSO | -3.597[0] | -9.758[0] | -1.325[0] | -2.007[0] | 0.368[0] | 0.205[0] | 6.808[0] | 10.165[0] |
| MGD | -9.973[0] | -11.290[0] | -2.231[0] | -2.360[0] | 0.223[0] | 0.209[0] | 2.464[0] | 8.149[0] |
| MWI | -3.104[0] | -3.878[0] | -1.232[0] | -1.340[0] | 0.396[0] | 0.345[0] | 7.861[0] | 22.768[0] |
| MAU | -4.238[0] | -6.228[0] | -1.255[0] | -1.650[0] | 0.296[0] | 0.264[0] | 6.026[0] | 14.547[0] |
| MUS | -4.149[0] | 10.605[0] | -1.330[0] | -2.92[0] | 0.320[0] | 0.216[0] | 6.037[0] | 8.643[0] |
| NMB | -18.450[1] | -18.331[1] | -3.007[1] | -3.026[1] | 0.163[1] | 0.165[1] | 1.433[1] | 4.974[1] |
| SYC | -3.301[0] | 6.612[0] | -1.238[0] | -1.809[0] | 0.375[0] | 0.274[0] | 7.375[0] | 13.803[0] |
| ZAR | -2.688[0] | -24.793[1] | -0.841[0] | -3.508[1] | 0.313[0] | 0.141[1] | 8.024[0] | 3.749[1] |
| SWZ | -4.906[0] | -24.540[0] | -1.526[0] | -3.432[1] | 0.311[0] | 0.139[1] | 5.084[0] | 4.128[1] |
| TZA | -3.559[1] | -5.801[1] | -1.309[1] | -1.653[1] | 0.367[1] | 0.284[1] | 6.877[1] | 15.604[1] |
| ZMB | -12.506[0] | -12.508[0] | 2.490[0] | -2.495[0] | 0.199[0] | 1.999[0] | 1.998[0] | 7.311[0] |
| ZWE | -4.631[0] | -10.615[1] | -1.512[0] | -2.303[1] | 0.326[0] | 0.216[1] | 5.309[0] | 8.586[1] |
| | | | | Critical Values | | | | |
| 1% | -13.800 | -23.800 | -2.580 | -3.420 | 0.174 | 0.143 | 1.780 | 4.030 |
| 5% | 8.100 | 17.300 | -1.980 | -2.910 | 0.233 | 0.168 | 3.170 | 5.480 |
| 10% | -5.700 | -14.200 | -1.620 | -2.620 | 0.275 | 0.185 | 4.450 | 6.670 |

As shown in Tables 4.3 and 4.4, the modified versions of the Augmented Dickey-Fuller (ADF) and Phillips and Perron (PP) tests, that is, $MZ_\alpha$ and $MZ_t$ have test statistics which are larger than the critical values, regardless of whether the unit roots equation includes the trend component or not. Hence, the null hypothesis of a unit roots government revenues and expenditures for all SADC member states cannot be rejected.

Table 4.4: Ng and Perron (2001) Unit Roots Test Results: Government Revenue (share of GDP)

| | $MZ_\alpha$ | | $MZ_t$ | | MSB | | MPT | |
|---|---|---|---|---|---|---|---|---|
| | No Trend | Trend | No Trend | Trend | No Trend | Trend | No Trend | Trend |
| ANG | -6.238[0] | -7.649[0] | -1.324[0] | -1.730[0] | 0.212[0] | 0.226[0] | 5.125[0] | 12.324[0] |
| BWT | 1.355[4] | -12.051[3] | 1.308[4] | -2.444[3] | 0.965[4] | 0.202[3] | 69.437[4] | 7.613[3] |
| DRC | -7.961[5] | -11.166[5] | -1.981[5] | -2.340[5] | 0.248[5] | 0.209[5] | 3.129[5] | 8.271[5] |
| LSO | -3.597[0] | -9.758[0] | -1.325[0] | -2.007[0] | 0.368[0] | 0.205[0] | 6.808[0] | 10.165[0] |
| MDG | -9.973[0] | -11.290[0] | -2.231[0] | -2.360[0] | 0.223[0] | 0.209[0] | 2.464[0] | 8.149[0] |
| MWI | -3.104[0] | -3.878[0] | -1.232[0] | -1.340[0] | 0.396[0] | 0.345[0] | 7.861[0] | 22.768[0] |
| MAU | -4.238[0] | -6.228[0] | -1.255[0] | -1.650[0] | 0.296[0] | 0.264[0] | 6.026[0] | 14.547[0] |
| MUS | -4.149[0] | -10.605[0] | -1.330[0] | -2.92[0] | 0.320[0] | 0.216[0] | 6.037[0] | 8.643[0] |
| NMB | -18.450[1] | =18.331[1] | -3.007[1] | -3.026[1] | 0.163[1] | 0.165[1] | 1.433[1] | 4.978[1] |
| SYC | -3.301[0] | -6.602[0] | -1.238[0] | -1.809[0] | 0.375[0] | 0.274[0] | 7.375[0] | 13.803[0] |
| ZAR | -2.688[0] | -24.793[1] | 0.841[0] | -3.508[1] | 0.313[0] | 0.141[1] | 8.024[0] | 3.749[1] |
| SWZ | -4.906[0] | -24.540[1] | -1.526[0] | -3.432[1] | 0.311[0] | 0.139[1] | 5.084[0] | 4.128[1] |
| TZA | -3.559[1] | -5.801[0] | -1.309[1] | -1.653[0] | 0.367[1] | 0.248[0] | 6.877[1] | 15.604[0] |
| ZMB | -12.506[0] | -12.508[0] | -2.490[0] | -2.495[0] | 0.199[0] | 1.99[0] | 1.988[0] | 7.311[0] |
| ZWE | -4.631[0] | -10.615[1] | -1.512[0] | -2.303[1] | 0.326[0] | 0.216[1] | 5.309[0] | 8.586[1] |
| | | | | Critical Values | | | | |
| 1% | -13.800 | -23.800 | -2.580 | -3.420 | 0.174 | 0.143 | 1.780 | 4.030 |
| 5% | -8.100 | 17.300 | -1.980 | -2.910 | 0.233 | 0.168 | 3.170 | 5.480 |
| 10% | 5.700 | -14.200 | -1.620 | -2.620 | 0.275 | 0.185 | 4.450 | 6.670 |

The findings of the modified versions of the ADF and the PP are corroborated by the findings of the $MSP$ and $MPT$ tests, shown in Tables 4.3 and 4.4. Both the $MSB$ and $MPT$ tests have test statistics which are greater than critical values. Therefore, overall, the null hypothesis of a unit root in both government revenues and expenditures cannot be rejected. This implies that government revenues and expenditures grow boundlessly overtime, and arbitrary disturbances have enduring

effects on the variables (Alagidede & Tweneboah, 2015).

Table 4.5: Ng and Perron (2001) Unit Roots Test Results: Government Expenditures (share of GDP) First Differences

| | $MZ_\alpha$ | | $MZ_t$ | | MSB | | MPT | |
|---|---|---|---|---|---|---|---|---|
| | No Trend | Trend | No Trend | Trend | No Trend | Trend | No Trend | Trend |
| ANG | -7.189[0] | -6.76-[0] | -1.873[0] | -1.814[0] | 0.260[0] | 0.268[0] | 3.482[0] | 13.481[0] |
| BWT | -23.231[8] | -1.830[0] | -3.399[8] | -0.951[0] | 0.146[8] | 0.519[0] | 1.083[8] | 49.395[0] |
| DRC | -5.559[0] | -5.993[0] | -1.311[0] | -1.532[0] | 0.235[0] | 0.255[0] | 5.229[0] | 14.856[0] |
| LSO | -6.044[0] | -5.972[0] | -1.721[0] | -1.725[0] | 0.284[0] | 0.288[0] | 4.101[0] | 15.252[0] |
| MDG | -7.453[0] | -7.446[0] | -1.918[0] | -1.917[0] | 0.257[0] | 0.257[0] | 3.327[0] | 12.254[0] |
| MWI | -2.034[2] | -8.101[2] | -0.774[2] | -2.986[2] | 0.380[2] | 0.245[2] | 9.894[2] | 11.322[2] |
| MAU | -7.242[0] | -7.184[0] | -1.861[0] | -1.870[0] | 0.256[0] | 0.260[0] | 3.520[0] | 12.706[0] |
| NMB | -7.407[0] | -7.465[0] | -1.774[0] | -1.669[0] | 0.239[0] | 0.223[0] | 3.796[0] | 12.557[0] |
| SYC | -6.185[0] | -32.735[2] | -1.032[0] | -4.032[2] | 0.268[0] | 0.123[2] | 4.249[0] | 2.856[2] |
| ZAR | -18.870[1] | -19.710[1] | -3.060[1] | -3.122[1] | 0.162[1] | 0.158[1] | 1.335[1] | 4.716[1] |
| SWZ | -7.472[0] | -7.464[0] | -1.857[0] | -1.879[0] | 0.248[0] | 0.251[0] | 3.528[0] | 12.281[0] |
| TZA | -6.788[0] | -23.334[1] | -1.734[0] | -3.701[1] | 0.255[0] | 0.126[1] | 3.944[0] | 3.796[1] |
| ZMB | -1.748[1] | 2.357[1] | -0.875[1] | -0.371[1] | 0.362[1] | 0.371[1] | 9.994[1] | 29.909[1] |
| ZWE | -2.737[0] | -2.606[0] | -0.520[0] | -0.762[0] | -0.224[0] | 0.233[0] | 8.431[0] | 11.362[0] |
| | | | | Critical Values | | | | |
| 1% | -13.800 | -23.800 | -2.580 | -3.420 | 0.174 | 0.143 | 1.780 | 4.030 |
| 5% | -8.100 | 17.300 | -1.980 | -2.910 | 0.233 | 0.168 | 3.170 | 5.480 |
| 10% | 5.700 | -14.200 | -1.620 | -2.620 | 0.275 | 0.185 | 4.450 | 6.670 |

While government revenues and expenditures are shown to be non-stationary in levels (see Tables 4.3 and 4.4), it shown that their first differences are integrated of order zero, $I(0)$, that is, stationary (See Tables 4.6 and 4.5 ).

Table 4.6: Ng and Perron (2001) Unit Roots Test Results: Government Revenues (share of GDP): First Differences

| | $MZ_\alpha$ | | $MZ_t$ | | MSB | | MPT | |
|---|---|---|---|---|---|---|---|---|
| | No Trend | Trend | No Trend | Trend | No Trend | Trend | No Trend | Trend |
| ANG | -7.371[0] | -7.057[0] | -1.893[0] | -1.859[0] | 0.256[0] | 0.263[0] | 3.412[0] | 12.925[0] |
| BWT | -6.001[0] | -1.914[0] | -1.701[0] | -0.968[0] | 0.283[0] | 0.505[0] | 4.16[0] | 46.908[0] |
| DRC | -6.454[0] | -5.985[0] | -1.477[0] | -1.553[0] | -.228[0] | 0.359[0] | 4.691[0] | 14.908[0] |
| LSO | -7.262[0] | -6.850[0] | -1.734[0] | -1.753[0] | 0.238[0] | 0.256[0] | 3.920[0] | 13.331[0] |
| MDG | -5.928[1] | -5.907[1] | -1.704[1] | -1.705[1] | 0.287[0] | 0.288[1] | 4.181[1] | 15.398[1] |
| MWI | -2.034[2] | -8.101[2] | -0.774[2] | -2.986[2] | 0.380[2] | 0.245[2] | 9.894[2] | 11.322[2] |
| MAU | -6.569[0] | -6.834[0] | -1.676[0] | -1.782[0] | 0.255[0] | 0.260[0] | 4.139[0] | 13.350[0] |
| MUS | -6.820[0] | -6.859[0] | -1.676[0] | -1.712[0] | 0.245[0] | 0.249[0] | 0.245[0] | 13.329[0] |
| NMB | -6.917[0] | -7.017[0] | -1.689[0] | -1.651[0] | 0.244[0] | 0.235[0] | 4.070[0] | 13.120[0] |
| SYC | -1.748[3] | -0.913[3] | -0.815[3] | 0.570[3] | 0.466[3] | 0.624[3] | 12.236[3] | 74.984[3] |
| ZAR | -7.178[0] | -7.182[0] | -1.877[0] | -1.882[0] | 0.261[0] | 0.262[0] | 3.468[0] | 12.699[0] |
| SWZ | -7.498[0] | -7.420[0] | -1.892[0] | -1.902[0] | 0.252[0] | 0.256[0] | 14.290[0] | 12.311[0] |
| TZA | -7.469[0] | -6.866[0] | -1.835[0] | -1.641[0] | 0.245[0] | 0.239[0] | 3.601[0] | 13.341[0] |
| TZA | -7.469[0] | -6.866[0] | -1.835[0] | -1.641[0] | 0.245[0] | 0.239[0] | 3.601[0] | 13.341[0] |
| ZMB | -5.640 | -5.637[0] | -1.678[0] | -1.678[0] | 0.297[0] | 0.297[0] | 4.345[0] | 16.161[0] |
| ZWE | -5.767[0] | -1.506[0] | -1.520[0] | -1.762[0] | 0.274[0] | 0.267[0] | 4.251[0] | 13.441[0] |
| | | | | Critical Values | | | | |
| 1% | -13.800 | -23.800 | -2.580 | -3.420 | 0.174 | 0.143 | 1.780 | 4.030 |
| 5% | -8.100 | -17.300 | -1.980 | -2.910 | 0.233 | 0.168 | 3.170 | 5.480 |
| 10% | 5.700 | -14.200 | -1.620 | -2.620 | 0.275 | 0.185 | 4.450 | 6.670 |

Given that government revenues and public expenditures are integrated of order one, $I(1)$ (Refer to Tables 4.6 and 4.5 ), we proceed to evaluate the cointegration between government expenditures and government revenues. Cointegration is assessed using equation 4.5. Evidence of cointegration would imply that fiscal policies are sustainable. The use of cointegrating relationship implied in equation 4.5 to assess

countries' adherence to intertemporal budget constraint is not peculiar to this study, but has become a standard practice in the literature (Goyal, Khundrakpam, & Ray, 2004; Hakkio & Rush, 1991; Kia, 2008). Existence of cointegration between government revenues and government expenditures is generally treated as an indication that fiscal policies are sustainable (Kia, 2008).

The tests proposed by Johansen and Juselius (1990) and Johansen (1991), are employed to evaluate the presence of cointegration as implied by equation 4.3. The Johansen test for cointegration consists of two tests: the trace test ($\lambda_{trace}$) and the maximum eigenvalue ($\lambda_{max}$). The former tests the null hypothesis that there exists $r$ cointegrating vectors against the alternative hypothesis of $n$ cointegrating vectors, whereas the latter tests the null hypothesis of $r$ against the alternative hypothesis of $r+1$ cointegrating vectors (Christodoulakis et al., 1995). In Table 4.7, we report the findings from these tests.

Table 4.7: Johansen Cointegration Test Results

| Country | Hypothesis | Statistic | P-value | Cointegration |
|---|---|---|---|---|
| Angola | $r = 0$ | 33.004 | 0.005*** | Yes |
| Botswana | $r = 0$ | 22.187 | 0.004*** | Yes |
| Congo D. Rep. | $r = 0$ | 34.788 | 0.003*** | Yes |
| Lesotho | $r = 0$ | 18.480 | 0.312 | No |
| Madagascar | $r = 0$ | 17.231 | 0.397 | No |
| Malawi | $r = 0$ | 24.053 | 0.073* | Yes |
| Mauritius | $r = 0$ | 14.577 | 0.609 | No |
| Mozambique | $r = 0$ | 22.703 | 0.126 | No |
| Namibia | $r = 0$ | 24.703 | 0.069* | Yes |
| Seychelles | $r = 0$ | 23.465 | 0.096* | Yes |
| South Africa | $r = 0$ | 30.043 | 0.014** | Yes |
| Swaziland | $r = 0$ | 26.670 | 0.039** | Yes |
| Tanzania | $r = 0$ | 22.762 | 0.116 | No |
| Zambia | $r = 0$ | 20.735 | 0.190 | No |
| Zimbabwe | $r = 0$ | 39.170 | 0.000*** | Yes |

In the case of Lesotho, Madagascar, Mauritius, Mozambique, Tanzania, and Zambia, the null hypothesis of no cointegration cannot be rejected. Therefore, our findings suggest that revenues and expenditure do not share a permanent stochastic trend, thus casting doubts on the sustainability of budget deficits in these countries. Furthermore, we find evidence of cointegration between revenue and expenditure in the case of all other members of the SADC with the exception of the aforementioned countries. If cointegration between government revenues and expenditures is an adequate condition for sustainability of fiscal policies, then fiscal policies can be said to be sustainable in SADC with the exception of Lesotho, Madagascar, Mauritius, Mozambique, Tanzania, and Zambia.

As pointed out in Bohn (2007) results based on unit roots or cointegration analysis ought not be treated as a conclusive proof for the sustainability or unsustainability of fiscal policy. These results could be misleading on numerous grounds (Bohn, 1998, 2007). First, most cointegration techniques, including Johansen procedures, are based on the supposition of a strict-unit root (Jansson & Moreira, 2006; Cavanagh, Elliott, & Stock, 1995), which cannot be easily justified both on economic and theoretical grounds (Cavanagh et al., 1995). Conversely, modelling time series as integrated while it is not (near-integrated) could lead to erroneous conclusions regarding the cointegrating rank of the system (Elliott, 1998; Hjalmarsson & Österholm, 2010). Hjalmarsson and Österholm (2010) demonstrate that imposing strict unit roots (i.e. disregarding the near unit roots) could risk concluding a false relationship between unrelated variables. Therefore, they suggest that the findings of Johansen's procedures should be cautiously interpreted. In addition, several other studies have examined properties of the Johansen cointegration procedures. Virtually all studies tend to find that these procedures are more likely to yield false cointegration under various circumstances (See, Cheung & Lai, 1993; Gonzalo, 1994; Cavaliere, Rahbek, & Taylor, 2010). In line with this strand of the literature, Gabriel and Sangduan (2010) failed to find evidence of cointegration when Johansen procedures are used but they find evidence for cointegration when the Horvath and Watson (1995) cointegration test is used. Consequently, they conclude that conventional cointegration procedures tend to over-reject the null hypothesis of cointegration. Second, Bohn (2007) argue that unit roots/or cointegration are unnecessarily restrictive requirements for sustainability. Generally, for intertemporal government budget constraints to hold, public debt is necessitated to be difference stationary, and government revenues and expenditures to be cointegrated (See, Trehan & Walsh, 1988; Quintos, 1995).Bohn (2007) demonstrates that the intertemporal government budget is satisfied even if government revenues and expenditures are not cointegrated; and if public debt is stationary after any determinate number of differencing

exercises, then the budget constraint is fulfilled[4]. Lastly, time-series unit roots and cointegration tests are known for their limited power to reject the null hypothesis of a unit roots (Westerlund & Prohl, 2010). Consequently, time-series analysis may not be suitable for this study given data limitations. Hence, in the following section we employ panel data in order to verify the findings of the time-series data.

### 4.5.3 Panel Analysis

#### 4.5.3.1 Panel Unit Roots Test: Pesaran (2007)

In Table 4.8, we present Pesaran (2007) unit roots test statiịitics for government revenues and government expenditures in both levels and first differences. Consistent with the time-series results (see Tables 4.3 and 4.4), Table 4.8 suggests that non-stationarity cannot be rejected at all conventional levels of significance, for both government revenues and government expenditures. This is because the absolute value of the cross-sectionally augmented IPS (CIPS) test statistic is smaller than the critical value of -2.43.

Table 4.8: Pesaran 2007 Panel Unit Root Test

| | Levels | First Differences |
|---|---|---|
| Government Revenues | | |
| | CIPS | CIPS |
| t-statistic | -2.068 | -4.609*** |
| Government Expenditures | | |
| t-statistic | -1.833 | -4.617*** |
| *** represents 1% level of significance. | | |

However, when variables are differenced once, stationarity cannot be rejected at 1% level significance. Therefore, the Pesaran (2007) unit root test implies that both variables, in levels, are integrated of order one $I(l)$ whereas, the first differences are integrated of order zero $I(0)$.

[4]See Bohn (2007) for a detailed discussion on this subject

#### 4.5.3.2 Panel Cointegration Analysis: Westrlund (2007)

Having established the order of integration between government revenues and expenditures, we proceed to evaluating cointegration between these variables. In Table 4.9, the calculated values of the Westrlund panel cointegration statistics are reported alongside with bootstrapped $p$-vah1es (robust p-values) based on 400 imitations. The null hypothesis of no cointegration, with asymptotic p-values, is rejected for $G_t$ at 1 percent level of significance; and also for $P_t$ (that is, when $\rho_i$ is assumed to be homogenous) the null hypothesis of no cointegration is rejected at 1 percent level of significance.

Table 4.9: Westerlund (2007) Panel Cointegration Test

| Statistic | Value | Z-value | P-value | Robust P-value |
|---|---|---|---|---|
| $G_t$ | -5.358 | -14.591 | 0.000*** | 0.000*** |
| $G_\alpha$ | -20.887 | -13.012 | 0.000*** | 0.000*** |
| $P_t$ | -16.549 | -12.663 | 0.000*** | 0.000*** |
| $P_t$ | -19.267 | -21.825 | 0.000*** | 0.000*** |
| *** denotes 1% level of significance | | | | |

Similarly, with bootstrapped $P$-values the null hypothesis of no cointegration is always rejected, irrespective of whether $\rho_i$ is constrained to he homogeneous or not (See Table 4.9). Therefore, it is inferred that there is a long-run association between government revenues and expenditures. Put differently, while government revenues and expenditures can wander apart in the short-run, in the long-run they will always revert back to equilibrium. These results are in line with Lusinyan and Thornton (2009), that pointed out that fiscal policies are on a sustainable path in the case of South Africa.

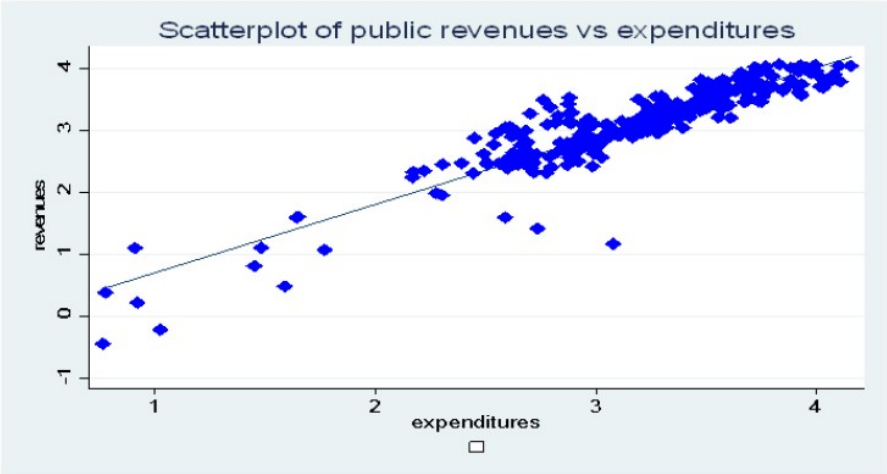
While panel cointegration test results suggest that fiscal policies are sustainable in the region, such results, as pointed in preceding sections cannot be relied upon. Therefore, in order to substantiate cointegration analysis, fiscal policy reaction func-

tions are therefore estimated in the following section.

### 4.5.4 Bohn's Fiscal Reaction Function: Dynamic Panel Analysis

In figure 4.1, we depict an unconditional scatterplot for government revenues and expenditures in SADC. The figure portrays a clear positive relationship between government revenues and expenditures in the region. The depicted relationship is not, however, a conclusive proof of the existence of a positive relationship between revenues and expenditures in SADC countries; but it does provide support for priori expectations.

Figure 4.1: Scatterplot for Public Revenues versus Government Expenditures in SADC




Relying on Bolm's reaction function approach, in this section we apply Panel Mean Group, Mean Group, and the Dynamic Fixed Effects outlined earlier, to formally evaluate fiscal policy sustainability in SADC. Our approaches allow us to evaluate both the short and long-nm behaviour of fiscal policy. Although fiscal policy sustainability is a long-nm phenomena, in this study, short-run analysis of fiscal policy sustainability is also included. The impetus to include short nm analysis is because of expectations. Economic agents use the short-run ( or current information) to form expectations about long-run behaviour of government. Hence, coefficients

obtained in the short-run could be a best approximation of the long-run coefficients. Consequently, estimations attained in the short-run could be used to infer agents' expectations regarding the future path of fiscal policy (Tiwari et al., 2012). Additionally, Payne, Mohammadi, and Cak (2008) argue that evaluating the short-run association between public outlays and revenues could shed some additional insight on the adjustment of budgetary process as well as the correction towards the long-run. Therefore, short-run and long-run estimates ought to corroborate each other.

In Table 4.10 column 1 estimates from a Panel Mean Group which imposes no restrictions on the short-run parameters, but constrains long-run parameters to be identical across groups are present,ed. In line with theoretical predictions, it is shown that the enor correction term (ECT) is negative and statistically significant at 1 percent level of significance. This implies the existence of a steady and converging association between public revenues aud expenditures. While our findings suggest the existence of a converging relationship between revenues and expenditures, the speed of convergence is low. The magnitude of the ECT suggests that only about 28 percent of disequilibrium are corrected in one year, thus, it takes approximately 4 years to fully restore equilibrium. When the Mean Group (MG) estimator, which unlike the PMG estimator imposes no restrictions on both the short and the long-run parameters is applied, the speed with which budgetary disequilibrium are corrected changes (becomes relatively faster). This agrees with Pesaran et al. (1999), who demonstrated that in the MG the adjustment process tends to be relatively quick compared to PMG. In contrast to PMG estimates, Table 4.10, demonstrates that, in the MG, approximately 33 percent of the discquilibrimn is corrected in a single year; therefore, it takes roughly 3 years for disequilibrium to be completely eliminated. The error correction term is statistically significant at 1 percent level. The significance of the error correction term not only shows the speed at which deviations to equilibrium are corrected, but corroborates the cointegration results as well. It suggests that indeed public revenues and expenditures are coin-

tegrated. Moreover, it demonstrates that this model, that is, the error correction model, is a good representation of the data.

Consistent with a priori theoretical expectations, the coefficient on output gap ($Yvar_{it}$) is positive and statistically significant at 5 percent level (see Table 4.10). This shows that government revenues are procyclical (Enomoto, Erickson, & Ghosh, 1992), such that when output is above its normal level, revenues relative to GDP are increasing, and revenues relative to GDP are decreasing when output is below it normal level. This finding is consistent irrespective of whether we impose constraints on the short-run parameters (PMG), or relax the assumption that short-run parameters are homogenous across panel members (MG). In addition, to PMG and MG estimators, a dynamic fixed effect (DFE) which restrains all slope coefficients (both short and long-run) and error variances to be identical is estimated. The findings of the DFE corroborate those obtained using PMG and MG. in Table 4.10, it is shown that there exists a positive and statistically significant relationship between public revenues and the output gap.

Theoretical predictions suggest that there is an adverse relationship between government revenues and unexpected changes in government expenditures (Barro, 1979). In line with this prediction, across all estimations in Table 4.10, the coefficient capturing unexpected changes in government expenditures, Gvarit has a negative sign, and is statistically significant at 1 percent level; implying that there exists a negative relationship between government revenues and unexpected public expenditures.

Table 4.10: Dynamic Panel Estimates

| Variables | PMG | MG | Hausman test | DFE |
|---|---|---|---|---|
| Error Correction Term | -0.276*** | -0.333*** | | -0.209*** |
| | (0.047) | (0.048) | | (0.043) |
| Long-Run Coefficients | | | | |
| Govt Expenditure | 0.815*** | 0.669*** | $H_0 : PMG$ | 0.776*** |
| Short-Run Coefficients | | | $H_1 : MG$ | |
| Gov Expenditure | 0.229** | 0.227** | $Chi - SquareStatistic$ | 0.476*** |
| | (0.103) | (0.193) | [0.433] | (0.065) |
| $Gvar_it$ | -0.639*** | -0.419*** | | -0.222*** |
| | (0.117) | (0.132) | | (0.096) |
| $Yvar_it$ | 0.634*** | 0.630** | | 0.308*** |
| | (0.402) | (0.445) | | (0.395) |
| No. of cross-sections | 12 | 12 | | 12 |
| Obs. | 312 | 312 | | 312 |

As pointed out earlier, short-run estimates, at least in theory, are a mirror image of what should be expected in the long-run. Hence, there should be some consistency between the short-run and long-run estimates. Theoretically, if the initial government debt is positive, $b_{it} > 0$, then government should, in the subsequent period, run a surplus so that it repays its debt. Conversely, it is expected that an increase in government outlays should be followed by an increase in revenues in order to ensure sustainability of fiscal policy. In Table 4.10, we demonstrate that government revenues react positively to changes in government expenditures in the short-run. The coefficient is statistically significant across all estimators. This is in line with the Ricardian equivalence of Barro (1979) which suggests that an increase in public expenditure financed through borrowing will prompt great future tax liabilities for

the public (Payne et al., 2008).

Consistent with the short-run estimates, Table 4.10 shows that there exibhits a positive and statistically significant relationship between government revenues and expenditures in the long-run. This implies that following an increase in public expenditures, governments tend to take corrective action by raising more revenues in the subsequent periods. According to Bohn (1998), finding a positive response of revenues to changes in public expenditures is sufficient to infer the sustainability of government debt. In line with this argument, we infer that SADC member states have been pursuing sustainable fiscal policies for the period under consideration. Although government revenues sanguinely react to government expenditure changes in the short-run, the short-run responses are smaller relative to the long-run estimates (See, Table 4.10). It is postulated that the reason why revenues positively react to changes in government expenditures in the short-run, however marginal, is to signal to economic agents that government is committed to maintaining a sustainable debt path. Moreover, government is not compelled to raise more revenues in the shortrun, since they can finance deficits by issuing new debt (Makrydakis et al., 1999). However, this behaviour cannot be continued in the long-run, because if it is continued, it raises suspicions about governments ability to service/ or manage its debt (Chen, 2014). Hence, long-run coefficients are relatively large.

In the literature, it is argued that when the response of government revenues to changes in public expenditures is less than unity, fiscal policy is 'weakly sustainable. This suggests that public expenditures tend to grow faster than revenues. According to this assertion, fiscal policies in the SADC region could be said to be weakly sustainable given that the long-run coefficient is positive, but less than unity (sec Table 4.10). It would be surprising to find anything beyond 'weak sustainability' i.e. strong sustainability. We argue this because taxes arc distortionary in nature. The distortionary nature of taxes implie,s an upper bound on the amount of taxes

that could be levied (Daniel and Shiamptanis, 2013; Barro, 1979). The upper limit on the value of taxes, therefore, implies an upper bound on the amount of revenues relative to GDP that could be raised, which may not necessarily be in harmony with expenditure growth (Daniel and Shiamptanis, 2013). In addition to the upper bound implied by the Laffer curve, the ability to raise more revenues through taxes is constrained by political will. Daniel and Shiamptanis (2013) contend that there is an upper bound on the country's willingness to tax itself. Consequently, an upper limit on the amount of revenues that could be generated. Hence, if indeed these limits hold then strong version of sustainability could be hardly observed in the real world. Hence, all that would be required to infer sustainability would be a positive response as suggested by Bohn (1998).

Mendoza and Ostry (2008) provide an internsting perspective concerning the interpretation of the coefficient linking government revenues and expenditures. They argue that a large value does not imply that fiscal policies are strongly sustainable or not. If $\delta_{it}$ is large, it implies that an increase in debt/or expenditures of a given magnitude requires a strong conditional response of primary surplus/ or revenues. Our estimated coefficient ranges between 0.667 and 0.8. This does not mean that fiscal policies are more sustainable in SADC, but rather this reflect financial market conditions facing these countries. The magnitude of the estimated coefficient reveals frictions in asset markets that arc more ubiquitous for developing economies, and the uncertain environment that they face. In line with this, C. Arellano (2008) and Aguiar and Gopinath (2006) show that the risk of default in emerging economies is relatively high, and these economies are persistently faced with a riskier economic environment (Aguiar and Gopinath, 2006); which is why a stronger conditional response is necessary for them (Mendoza and Ostry, 2008).

These results, however, should be treated cautiously on various grounds. Although we find that government revenues positively react to changes in government debt, it does not imply that government will maintain the same behaviour over an infinite horizon. In line with this argument, Claeys (2007) argues that after gaining

entry into EMU, most countries started accumulating excessive debts, and incurring large deficits (exceeding the targeted deficits). Thus, the observed discipline in SADC could be driven by the impetus to enter into the proposed monetary union, and may thereafter be discontinued.

### 4.5.5 Panel Granger Causality: Government Revenues-Expenditures Nexus

It is common in the fiscal policy sustainability literature to explore causality between government revenue and government expenditure (Li, 2001). Knowledge about the direction is not just an academic exercise, but has potent policy implications for addressing budget imbalance problems (Ram, 1988; T. Chang, Liu, & Caudill, 2002). The literature suggests three likely directions of causality between government revenue and expenditure. The spend-tax hypothesis suggests that increased government expenditure induces an increase in government revenues (T. Chang et al., 2002). Inferring that the causality runs from government expenditures to government revenues (W. Anderson, Wallace, & Warner, 1986). The tax-spend hypothesis supported by Friedman (1978) suggests that changes in government taxes bring changes in government expenditure. Therefore, decisions about expenditures are made after taxes have been decided; implying a unidirectional causality running from government revenues to govermnent expenditures (Buchanan, Wagner, et al., 1978). Overall, this proposition proclaims that government cannot deal with increasing government deficits by increasing taxes. This is argued in an article by Friedman (1978) in which he points out that an increase in taxes does not reduce deficits but results into increased expenditure. Lastly, the fiscal synchronisation hypothesis suggests that revenues and expenditures are adjusted simultaneously (Meltzer & Richard, 1981). Therefore, the direction of causality is bidirectional.

Hasan and Lincoln (1997) explore the direction of causality between government expenditure and government revenue in the United Kingdom. Their results lend

support to the fiscal synchronisation hypothesis. Similar evidence is documented by Kollias and Makrydakis (2000) in Greece and Ireland. In the case of Spain and Portugal, Kollias and Makrydakis (2000) document evidence supporting the tax-spend hypothesis, and spend-tax hypothesis, respectively.

Several studies have been carried out on this subject in Africa. For instance, Eita and Mbazima (2008) investigate causality between government expenditure and revenue in Namibia. They find evidence supporting the tax-spend hypothesis. Similar results are reported by Narayan and Narayan (2006) in Mauritius. Wolde-Rufael (2008) contradicts the findings of Narayan and Narayan (2006). They find evidence in support of the fiscal synchronisation hypothesis in Mauritius, Swaziland, and Zimbabwe, while in Botswana, Burundi, and Rwanda they find no evidence of causality. In Nigeria, Mali, Zambia, Ethiopia, Ghana and Kenya, they find evidence in support of the tax-spend hypothesis, and in Burkina Faso, they find evidence supporting the spend-tax hypothesis.Nyamongo, Sichei, and Schoeman (2007) find evidence of fiscal synchronisation hypothesis in South Africa. Baharumshah et al. (2016) find similar evidence in South Africa, and thus conclude expenditure decisions are not made in isolation to revenues. These findings are at odds with those of T. Chang et al. (2002) who found evidence in support of the spend-tax hypothesis in South Africa. AbuAl-Foul and Baghestani (2004) lend support to the tax-spend hypothesis in Egypt, while they find evidence of fiscal synchronisation in Jordan. Gounder, Narayan, and Prasad (2007) find evidence in support of the fiscal synchronisation hypothesis in Fiji. In line with this, (Cheng, 1999) find evidence of fiscal policy synchronicity in the case of Chile, Panama, Brazil and Peru, while in Colombia, Dominican Republic, Honduras, and Paraguay, he finds evidence lending support to the tax-spend hypothesis.

Equation 4.31 is applied to estimate Granger non-causality between government revenues and expenditures in SADC. The findings are reported in Table 4.11. As shown in Table 4.11, the null hypothesis that government revenues (expenditures)

do not Granger cause government expenditures ( revenues) is rejected at 1 percent level of significance. The findings of the study therefore, suggests that there exists a bidirectional causality between government revenues and public expenditures.

Table 4.11: Durmitrescu and Hurlin 2012: Panel Granger Causality Test Results

| | $GR \Rightarrow GE$ | $GE \Rightarrow GR$ |
|---|---|---|
| W-bar | 23.43 | 28.57 |
| Z-bar | 15.21 | 19.97 |
| | [0.000]*** | [0.000]*** |
| Z-bar-tilde | 2.07 | 2.97 |
| | [0.038]*** | [0.003]*** |

***, **, & * denotes 1%, 5% and 10% levels of significance, respectively. Reported in [.] are p-values.

This study therefore, lends support to the fiscal policy synchronisation hypothesis, which implies that decisions about government revenues and expenditures are jointly made Meltzer and Richard, 1981). The findings of this study have far-reaching policy implications. They indicate that governments cannot address the issue of perpetual debt/ or deficit by simply cutting back on government expenditures, or raising revenues without considering the interdependence between public revenues and expenditures, because if the interdependence is ignored, such policy action would yield an ambiguous effect on the fiscal position (Wolde-Rufael, 2008). These findings are appealing for the envisioned SADC monetary union. They imply that governments in member states do not make spending (revenue) decisions in isolation to revenue (spending) decisions. Therefore, in the long-run one would expect that debt (or deficits) will always be on a sustainable path. This is consistent with some studies conducted at a country-level which found evidence for fiscal synchronisation in some African countries (See, Baharumshah ct al., 2016; Wolde-Rufael, 2008).

## 4.6 Summary and Conclusion

Despite its significance, the sustainability of fiscal policy in SADC member countries is one of the least investigated issues. The fiscal framework imposing the sustainability and maintenance of government finance in SADC member states was implemented in the SADC Memorandum of Understanding which came into effect in 2001. The goal of this study was to investigate fiscal policy sustainability in a panel of SADC countries.

The study presents the first endeavour to address the fiscal policy sustainability hypothesis within a panel framework in the SADC countries using cointegration between public revenues and expenditures. The applied techniques have numerous advantages relative to univariate analysis used in the heuristic literature (Lusinyan and Thornton, 2009). First, they allow us to take into account the possible interdependencies among countries. Second, they permit us to eschew the power distortions of the traditional unit root and cointegration test resulting from the use of small sample size. Third, since public revenues and expenditures are cointegrated, we also apply dynamic panel estimators in order to assess both, the long- and short-run reactions of government revenues to changes in public expenditures.

Three main points emerge from the analysis undertaken. First, we employ the Augmented Dickey-Fuller test to assess time-series properties of public debt. Our analysis reveals that debt is difference stationary for all countries included in the sample. Walsh (1991) argue that stationarity of public debt is a sufficient condition for the sustainability of public debt. Therefore, we conclude that public debt in SADC are sustainable.

Secondly, using Westrlund (2007)'s cointegration test, we find evidence in favour of the sustainability hypothesis in the SADC area; and we demonstrate that public revenues and expenditures are cointegrated over the period under consideration.

Exploring country-by-country, we find that government revenues and expenditures are cointegrated for Angola, Botswana, Democratic Republic of Congo, Malawi, Namibia, Seychelles, South Africa, Swaziland, and Zimbabwe. These results are consistent with findings from other empirical studies. For the other countries included in the study, we fail to find evidence for cointegration. We argue that country-by-country analyses may be spurious because of their failure to take cross-country interdependencies into accowit. Therefore, they must be treated with caution.

Thirdly, using Bohn 's reaction function we find that government revenues positively, and significantly react to changes in public outlays. According to Bohn (1998) this is sufficient to infer sustainability of fiscal policies. Hence, we conclude that fiscal policies in the SADC region are on a sustainable path. These findings arc further corroborated by the error correction term which is negative and statistically significant, hence, implying that in the long-run revenues will always adjust to restore equilibrium/or sustainability. Additionally, we evaluated causality between revenues and public expenditures. Our findings reveal that there exists a bidirectional causality between public receipts and outlays. The in1plication is that governments do not make spending (revenue) decisions in isolation to revenues (spending) decisions. Thus, in the long-run, expenditures and revenues are expected to always comove.

In summary, our findings show that although country experiences differ, overall fiscal policies are on a sustainable path in the region. This is despite the surge in public debt in the region. In conclusion, in order to ensure fiscal sustainability over an infinite horizon, SADC member states should adhere to the public debts and deficits' limits outlined in the SADC Memorandum of Understanding. Moreover, given that between the bi-directional causality between government revenues and expenditures, any policy that aims to reduce deficits by either cutting expenditures/or increasing revenues without taking into account the interdependencies could yield ambigious outcome.

# Chapter 5

# Summary and Conclusions

This study is separated into three distinct but related topics in the macro-monetary economics of SADC. A high degree of business cycles comovement is generally viewed as a neccesary requirement for optimum use of a common monetary policy (Soares et al., 2011). The use of a single monetary policy cannot be optimal if business cycles are asymmetric among union member states (Soares et al., 2011). For example, while contractionary monetary policy helps curb inflationary pressures in booming countries, it exarccbatcs downturns/or hinders economic growth in countries with economic downturns (Eickmeier & Breitung, 2006). As such, knowledge about the extent to which business cycles are synchronised is nccccsary for countries seeking to launch a monetary union (Soares et al., 2011). Hence, the first part of the study (Chapter 2), assesses business cycles' synchronisation in the SADC region which envisages to establish a monetary union. Using annual data covering the period 1980-2014, we employ a Baxter and King (1999) filter to isolate the cyclical component of GDP (growth deviations) from the circular component. We thereafter employ a dynamic factor model a *la* Forni et al. (2005) to evaluate the share of variations in business cycles that is explained by common shocks relative to the share that is explained by country-specific shocks. If business cycles are driven by common shocks then policy coordination is warranted. However, if business cycles are driven by country-specific shocks, then the use of a common policy would be counterproductive.

Important findings emerged from our analysis. Our findings reveal that regional and country-specific shocks are important for some countries, but not for all. More precisely, we find that regional common shocks explain most within-country business cycles statistics in the case of Botswana, Democratic Republic, Lesotho, Malawi, South Africa, Swaziland, and Tanzania. The implication of this finding is that a shared monetary policy in these countries could be considered. Moreover, our analysis show that country-specific shocks play little or no significant role in explaining within-country business cycles in most countries included in the sample.In Malawi, it was discovered that both regional and country-specific shocks are important in explaining business cycles statistics whereas, in Seychelles, only idiosyncratic shocks are essential for explaining the within-country business cycles statistics. The important message from our findings is that, based only on the business cycles' synchronicity condition, a monetary union which subsumes all SADC member states would not be optimal, and would result into macroeconomic instabilities in the region.

In the second part of the study (Chapter 3), we used a generalised method of moments to investigate the endogeneity hypothesis in SADC. Using data covering the period of 1994-2014, we investigated the role of trade integration/or intensity, fi nancial integration, macroeconomic policy similarity (fiscal policy convergence and monetary policy similarity), and exogenous global factors (proxicd by real oil prices) on the extent to which business cycles arc synchronised across SADC member states. Important findings emerge from the study. We demonstrate that trade integration exerts positive and a statistically significant influence on business cycles' synchronisation, suggesting that intensifying trade integration in the SADC area could holster business cycles' comovement. we show that macroeconomic policy similarity tends to holster business cycles synchronisation. More precisely, our findings demonstrate that both monetary policy and fiscal policy similarity have positive and statistically

significant effects on the degree of business cycles synchronisation. The implication of these findings is that policy coordination ( or uniform macroeconomic policies) could intensify the business cycles synchronisation in the SADC area. Therefore, it is imperative that SADC member states should put more effort towards harmonising their macroeconomic policies. This could be done by ensuring that all member states adhere to the prescriptions of the Memorandum of Understanding.

Another important finding derives from the behavior of financial flows. The study reveals that financial integration has a dampening effect on business cycles synchronisation. The implication of this finding is that financial flows as predicted by theory, follow returns differential, consequently resulting to asynchronous business cycles. Moreover, the study unearthed that oil prices also have a decoupling effect. We argue that this is because SADC consists of both net oil importers, and exporters, hence oil price changes have different effects depending on whether a country is a net importer, or exporter of oil. It is shown in the literature that an oil price increase generally has a negative impact on oil importers, but a positive impact on exporters (See for example, Lardic & Mignon, 2008; Nzimande & Msomi, 2016).

To ensure that a single monetary policy is suitable for all member states, business cycles synchronisation is necessary. However, in the event of asymmetric business cycles ( due to country-specific disturbances/ or common shocks with asymmetric impact on individual countries) national fiscal policies play a significant role in stabilising the macroeconomy (Degiannakis et al., 2016). As such, it is paramount that national fiscal policies are sustainable. Unsustainable fiscal policies may neither be a mechanism nor an effective tool for tackling macroeconomic disturbances (Greiner et al., 2007), thereby threatening the stability of a monetary union. Against this background, the third part of the study (Chapter 4) investigated the sustainability of fiscal policies in the SADC region using Bohn's (1998) reaction function approach.

Dynamic panel techniques, that is, a pooled Mean Group, Mean Group, and a dynamic fixed effects, are used to estimate fiscal policy reaction functions (the response of government revenues following an increase in government expenditures). In line with the tax smoothing hypothesis, we include a variable which captures the effect of business cycles on fiscal policy, that is, output gap; and a variable capturing the effect of temporary deviations on government expenditures. We demonstrate that output gap has a positive effect on government revenues, signifying that government revenues are procyclical. When output is above its normal level, government revenues tend to increase, but decrease when output is below its normal level. Furthermore, we show that there exists an adverse relationship between temporary government deviations and its revenues, implying that unexpected changes in government expenditures negatively affect revenues.

Another important finding of the study is that there exist a positive and signicant relationship betweem government revenues and expenditures. According to Bohn (1998) a positive response is sufficient to infer that fiscal policy is sustainable. Hence, we infer that SADC fiscal policies are sustainable for the period under consideration. These findings are corroborated by the error correction tenn which is negative and statistically significant, impyling a steady and converging relationship between government revenues and expenditures. To verify these results, we estimate Granger causality between government revenues and expenditures. We find that there exists a bidirectional Granger causality between government revenues and expenditures. This implies that expenditure (revenue) decisions are not done in isolation to revenue ( expenditure) decisions. Therefore, revenues and expenditures cannot wander far apart, and thus fiscal policy will always be on a sustainable path.

In summary, we conclude that a monetary union comprising of selected members of the SADC bloc could be feasible, assuming that other requirements for a monetary union are satisfied. More precisely, we contend that a monetary union

consisting of Botswana, Lesotho, Democratic Republic of Congo, Republic of Tanzania, South Africa, and Swaziland can be optimally established. Our findings suggest that within-country business cycles statistics in these countries are significantly explained by common/or regional shocks. This implies that, for this group of countries, a common monetary policy could be used to deal with business cycles without destabilising the envisaged monetary union.

Although business cycles are not synchronised in SADC, the study further demonstrates that business cycles synchronisation is not irrevocably fixed, and is endogenous to other factors, such as trade, and macroeconomic policy similarity. This, as conteded by Frankel and Rose (1998), suggests that business cycles synchronisation could be justified *ex-post* rather than *ex-ante* of a monetary union. Thus business cycle synchronisation is not a necessary prerequisite for a monetary union. Consequently, provided that other preconditions of a monetary union are met, a monetary union (subsuming all SADC member states) could be established. Lastly, in the event of asymmetric disturbances, thereby, cushioning the union against potential conflicts over the preferred monetary policy conduct.

The findings of the study, especially in Chapter 3 and Chapter 4, have in-depth implications. Firstly, they signify that fiscal policy stance is an essential stabilisation tool in a currency union. For fiscal policy to play this role when needed, it is imperative that it is sustainable, therefore, fiscal policy restraints are necessary to ensure sustainability. However, the design of fiscal policy restraints ought not to hamper fiscal policy from playing this role when necessary, while preventing fiscal policy induced business cycles' decoupling.

Based on our analysis, we recommend that SADC authorities should take sound policy measures aimed at boosting intra-regional trade such as, ensuring that all member states fully liberalise intra-SADC trade, and also tightening the stringent

rules of origin; and strenghtening macroeconomic policy coordination in order to intensify economic convergence.

The study has several limitations. Firstly, the study as whole only concentrates on two aspects of a monetary union, that is fiscal and monetary policy, thereby neglecting other aspects such as political integration. Hence, the study is unable to onclude whether a monetary union would be feasible in SADC or not. This, study, however, provides a benchmark for future studies. Thus, we recommend that future studies should endeavor to ponder other aspects of a monetary union. Secondly, the second part of the study (Chapter 2) is likely to be improved upon by including a global common factor, thus allowing one to see if business cycles synchronisation is driven by regional or global common shocks. Thus, inclusion of a global common component may yield an important insight. Thirdly, the study was constrained by the availability of data, hence a number of important variables such as industry similarity were not included. Moreover, data limitation made it impossible to distinguish between intra- and inter-trade, thereby compelling us to rely on the total trade. Frankel and Rose (1998) postulate that it would be far useful to have a more disaggregated evidence on the composition of inter-industry and intra-industry parts. This view is supported by Fidrmuc (2004) among others. In his study, Fidrmuc (2004) demonstrate that inter-industry trade is not as important as intra-industry trade in explaining business cycles comovcment. However, in SADC, disaggregated data is not collated for the period under investigation. Thus, we used aggregated data as in Frankel and Rose (1998) and Tawadros (2008).

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