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MASTERS OF ARTS (ECONOMICS)

GROWTH CONVERGENCE IN SOUTHERN AFRICAN CUSTOMS UNION (SACU): A DYNAMIC PANEL APPROACH

By

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APPROVAL

This dissertation has been examined and approved by the department of economics in partial fulfilment of the requirements of the Masters of Arts Degree in Applied Economics.

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DECLARATION

This undersigned hereby declares that the study was undertaken from October 2016 to May 2017 at the University of Botswana. The dissertation has not been submitted for any degree or diploma to other universities or any tertiary institution. Content found on this dissertation are the works of my original work except where referenced.

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DEDICATION

This study is dedicated to our new born baby girl in our family Atsile Sophie Olorato Tshireletso. I believe and trust that she will find herself treasure in this and inspiration to prosper in her academic life. I also dedicate this study to my late grandmother, Tebatso Keatlaretse, I will forever be grateful for what you have done for me in my education journey.

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey Fuller
ASEAN	Association of Southeast Asian Nations
BNLS	Botswana, Namibia, Lesotho and Swaziland
COMESA	Common Market for East and Southern African
CET	Common External Tariff
FTA	Free Trade Area
GDP	Gross Domestic Product
GLS	Generalised Least Squares
GMM	Generalized Method of Moments
HCT	High Commission Territories
H-O	Heckscher-Ohlin
HIV	Human Immunodeficiency Virus
IID	Independent and Identically Distributed
IPS	Im, Pesaran and Shin
ISI	Import Substitution Industrialisation
LLC	Levin, Lin and Chu
OLS	Ordinary Least Square
PCSE	Prais-Winsten Regression; Correlated Panels Corrected Standard Errors

REC	Regional Economic Community
RSF	Revenue-Sharing Formula
SACU	Southern African Custom Union
SADC	Southern African Development Community
STATA	Data Analysis and Statistical Software
UNCTAD	United Nation Conference for Trade and Development
WDI	World Bank Development Indicators
3SLS	Three Stage Least Square

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ABSTRACT

This study examines the growth convergence within SACU economies using the unbalanced panel dataset for the period of 1992 to 2015. The study used a dynamic panel approach to check if less developed countries in SACU registered more growth than more developed countries in order to converge to a common steady state. In support to the main objective of the study we used the two GMM estimators (that is the one-step system GMM and one-step difference GMM models) to investigate growth convergence. Validity of these models is confirmed by the second order serial correlation test and Sargan test for overidentifying. The results shows that real GDP per capita as a measure of growth is significant in determining convergence for both the one-step system GMM and one step difference GMM estimators. This implies that within the region less developed countries attained growth in order to converge to their own steady state within the period of 1992 to 2015.The results has confirmed to conditional beta convergence and absolute beta convergence for SACU countries. The policy implication of this finding is that policy makers must cautiously implement economic development policies that aim to promote growth of GDP per capita and reduce on areas that discourage the growth of the country in order to converge.

Using the one-step system GMM model shows that the highest rate of convergence is about 9% within the SACU region while the highest rate of convergence is about 5% using one-step difference GMM model. This difference is supporting literature that suggests that the system GMM produces more efficient estimates. The results for the one-step system GMM shows more significant coefficients for variables than the difference GMM estimator for panel estimation. Foreign Direct Investment (FDI), trade openness, physical capital and tertiary

school enrollment positively and significantly affect economic growth and convergence as expected. Therefore this implies that for FDI, the more the country is attracting foreign investors, this augments the levels of domestically human capital. For trade openness (OPEN), the more the individual country is open to trade the higher the gain in productivity growth due to increase in flows of goods and services. Therefore these cases promote high economic growth in order for countries to converge.

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

The 1990s have seen a wave of the formations of regional economic integration by various countries. Thus, recent research effort has been directed to understanding the effects of regional integration agreements on regional economic growth. The underlying argument is that countries that are equal in all the dimensions of government policies and technology will experience economic convergence – where differences in real per capita incomes of the rich and poor members within a regional economic community (REC) narrow significantly over in the long run (Kabala and Mogotsi, 2012). Economic convergence is also expected to be observed between poor economies and developed economies globally.

There are two broad concepts of economic convergence in the classical literature which includes beta convergence and sigma convergence. The beta convergence occurs when a poor country grows faster than a rich country up until the two countries converge to similar levels of per capita income. Sigma convergence simply refers to the decline over time in the cross-sectional dispersion of per capita income (Barro, Hall and Sala-i-Martin, 1991). Additionally, beta convergence has two types of convergence: (i) conditional beta convergence, reflecting the tendency for differences in real per capita incomes across countries or RECs to narrow over time; and (ii) absolute beta convergence, where countries, independently of their initial conditions tend to have their per capita incomes converging to one another (Barro and Sala-i-Martin, 1992).

Of the two types of economic convergence, the study aims to focus on beta convergence (in the context of a regional economic community). There are two expectations from using this approach: (i) is that less developed countries in SACU will grow faster than more developed

countries until they converge to a common steady state level in terms of per capita output and (ii) less developed countries in SACU are expected to converge to their own steady state levels based on cross section differences in sources of growth (that is capital, technology and population growth).

Barro and Sala-i-Martin (1992) outlined that growth convergence can be explained by the use of per capita gross domestic product (GDP) or by the use of macroeconomic indicators. However, in this study the analysis of growth convergence will be in terms of per capita GDP. According to Kumo (2011) successful economic convergence should result in similar per capita incomes and growth patterns, empirical analysis of economic convergence should provide information on the effectiveness of a REC's integration promotion strategy.

At the general level, there are several reasons motivating interest in studying economic convergence. Among other reasons, empirical analysis of economic convergence should shed light on the validity of alternative economic growth theories. One such theory is the neoclassical growth model which states that each economy will converge to the steady state no matter the initial per capita income. Developing countries end up growing faster than developed countries because the diminishing returns to capital are lower in developed countries. This is reflected by the assumption that developing countries have capital-labour ratios that are less than the required long-run optimum. While the new growth theory (endogenous growth model) predicts that differences in the level of income for countries shows the possibility of no convergence.

Additionally, several studies investigating economic convergence have been undertaken for the Southern African Development Community (SADC). The rationale was to investigate the effectiveness of the integration promotion strategy in the SADC region. SADC's regional promotion strategy is encapsulated in the initiatives that were introduced in 2005. The first

major initiative entails introduction of Free Trade Area (FTA) by August 2008. The second step involves the Custom Union by 2010 and a common market by 2015 (Kumo, 2011).

Since Southern African Customs Union (SACU) is within the SADC region, the regional promotion strategies also affect the SACU member states. On the other hand, in order to promote regional integration which ultimately leads to convergence within the SACU region, different member states have to concentrate on obtaining stable macroeconomic management and policy principle. Harmonization of policies and openness of SACU can be a vehicle for promoting development and integration. According to Sefhemo (2007) there was convergence within SACU industries implying that less industrialized countries of SACU are growing faster than more industrialized countries. The prospects of enhancing the SACU region with different countries that differ in levels of development and income, give room to check if the states aspire to converge. Furthermore, even though the SACU region has failed to improve economic growth due to low accumulation of factors of production and ineffective technology mix there is room for deeper integration and development within the region.

The existence of convergence across economies has received a lot of attention from different macroeconomists because it helps assess the validity of modern theories of economic growth. This also helps by providing information on whether the distribution of world's income and output across countries is becoming increasingly equal over time (Barro and Sala-i-Martin, 1995). Moreover, components of the speed of convergence across countries are said to provide relevant information on key concepts of economic growth, that is, the share of capital in the production function (Barro and Sala-i-Martin, 1992).

It is noted that some studies (see Kumo, 2011; Selelo, 2004 and Sefhemo, 2007) were carried out in Southern Africa to investigate economic convergence. These studies used the Ordinary

Least Square (OLS) approaches, which by econometric view failed to take into consideration endogeneity, heterogeneity and omitted variables biases. The approach also failed to account for problems that are prevalent in empirical growth models. However, this brought an opportunity for a different econometric approach of which resolves such problems. As a result the study uses a dynamic panel model with one-step Generalized Method of Moment (GMM) estimators (system and difference GMM) which calls for the expectation that results can be different from other studies. The reason for using the one-step system GMM other than two-step system GMM is because the efficient two-step system GMM estimator has downward bias standard errors in small samples (Roodman, 2006).

1.2 Problem Statement

The economy of SACU slowed down in 2011 and 2012 with an average growth of 3.8 and 4.4 percent respectively. It further declined by 4.2 percent in 2013 (SACU, 2014). Taking into consideration of the individual growth rates in real terms, Botswana's economy grew by 5.9 % in 2013 from 4.3 % in 2012. Lesotho on the other hand grew by 6.5 % in 2012 and recorded 2.8 % in 2011. Namibia recorded an economic growth by 4.4 % a slowdown from 6.7% experienced in 2012, South Africa as the leading country in SACU realised the growth rate of 1.9% compared to 2.5 % in 2012. Lastly, Swaziland grew by 2.8% in 2013 from 2.7% recorded in 2012 (SACU, 2014).

The main challenge to member countries relates to dissimilar levels of economic and institutional development (political and social structures). In particular, there is high inequality between member states in respect of institutional setting, economic diversification, financial market development, infrastructure that could result in unequal benefits from integration (Kumo, 2011). With this challenges faced by SACU countries, it raises a question of, to what extent can less developed countries in SACU catch up with more developed countries?

Nevertheless, empirical macroeconomic evidence shows that a country's growth path is subject to influence by state intervention. In this context, the macroeconomic policies adopted by SACU member states will have impact on their growth paths. Hence, it should be useful to empirically investigate whether SACU's macroeconomic initiatives for economic convergence have been accompanied by appropriate economic policies (growth convergence) that foster regional integration. Moreover, limited literature is available for the long-run growth and macroeconomic convergence for the SACU region. For example, Sefhemo (2007) tested for convergence based on the industrial sectors in SACU. Therefore, the study aims to add to knowledge and contribute to filling the gap in the literature on economic convergence by investigating convergence in respect of growth for the whole economies, SACU member states not just industrial sectors as in Sefhemo (2007). Several studies (example Kumo, 2011; Selelo, 2004; Sefhemo, 2007) on Southern Africa used the static panel model approach which yields inconsistent estimation of parameters and serially correlated error. In order to deal with these problems the study adopted the dynamic panel modelling approach which uses the generalized method of moments (GMM) estimators (system and difference GMM). This problem associated with the static panel approach makes the use of dynamic model by the study more appealing.

Over the past years growth within the SACU region has been uneven, this might be due to more advanced countries such as South Africa, Namibia and Botswana experiencing sluggish growth in their economies. Therefore, poor countries such as Lesotho and Swaziland need to grow faster so that in the long run they can catch up with Botswana, Namibia and South Africa because economic convergence can be achieved with higher level of economic growth. It is important for poor countries to catch up because this will be supporting SACU's objective of promoting regional integration through the existence of convergence. With these

challenges the main question of the study to be addressed is, is there real per capita GDP convergence within SACU member states?

1.3 Objectives

The general objective of this study is to empirically investigate whether Lesotho and Swaziland (less developed countries) incurred economic growth in order to converge to Botswana, Namibia and South Africa (more developed countries) in SACU for the period 1992 to 2015. Specifically, the study aims to examine if less developed countries experienced faster growth than more developed countries, as predicted by the growth convergence literature. In order to attain this main objective specific objectives are as follows:

1. To investigate if absolute beta convergence in real per capita GDP has occurred in SACU region.
2. To investigate if conditional beta convergence in real per capita GDP has occurred in SACU.

3. To suggest recommendations on the way forward (based on the findings of the study).

1.4 Hypothesis of the study

To attain the study's objectives, the following hypothesis will be tested.

1. Countries with low real per capita GDP do not grow relatively faster than the countries with high real per capita GDP.
2. Less developed countries do not converge to their own steady state.

1.5 Research question

The main question of the study is whether there is real per capita GDP convergence within SACU member states.

Specific questions

1. What are the major macroeconomic variables affecting the growth convergence process?
2. How long would it take for SACU member states economies to converge?

1.6 Significance of study

Growth convergence is important as it remains to be the top of the regional integration arrangement. This implies that it is imperative to know if there is convergence in SACU and for how long does it take for poorer countries to catch up with richer countries in the form of growth rates in order to promote regional integration.

The study will establish if there is economic growth within SACU and how it significantly affected rate of growth convergence. The empirical results from the study are relevant to identify any obstacles to growth within the SACU region. This will potentially guide policies that may enhance future prospects of SACU economies. The study will further provide an opportunity for further research on areas of growth convergence for the success of regional cooperation. The relevance of the study is to discover if less developed countries can benefit through the convergence process compared to the more developed countries in the SACU region.

The use of dynamic estimation starts by transforming all regressors, usually by differencing, this is called difference GMM (Roodman, 2006). According to Arellano and Bond (1991); Blundell and Bond (1998) there are two types of GMM estimators namely system GMM and difference GMM. Under the system GMM estimators the study will use the one-step system GMM other than two-step system GMM because the efficient two-step system GMM estimator has downward bias standard errors in small sample (Roodman, 2006). The one-step difference GMM is also used mainly because the estimator takes into consideration the joint endogeneity of variables in the model. Furthermore, the difference GMM estimator deals

with endogeneity by transforming the data to remove fixed effects (Baum, 2006). However in situation whereby the regressors are non-stationary over time, their lagged levels are poor instruments for the first difference regression, this will require the use of the system GMM. Therefore, to address this issue, the system GMM estimator is used because it combines the regression equation both in levels and differences. The implication here is that the study seeks to contribute to empirical literature by using different estimators (GMM estimators) (that is one-step difference and one-step system GMM) as compared to one used before because of their above stated superior features.

Additionally, the study will shed more light on the importance of regional integration not only in Southern Africa but also in Africa as a whole. This will help different countries make informed decisions on joining different regional blocs. In a nutshell this will also equip the policymakers with useful information since policy decisions in one country are transformed to another country.

1.7 Organization of the Study

The rest of the current study is organized as follows; Chapter two outlines the brief overview of SACU region economy. Chapter three presents a theoretical and empirical literature from related studies. The fourth chapter outlines the methodology used in order to investigate economic convergence in SACU. Chapter five presents and discusses the empirical results and lastly, Chapter six which gives a summary, conclusion and policy recommendations of the study.

CHAPTER TWO: AN OVERVIEW OF SOUTHERN AFRICAN CUSTOMS UNION (SACU).

2.1 Introduction

Southern Africa in general is made up of overlapping regional integration arrangements which are Common Market for East and Southern African (COMESA), SADC and SACU. The current study focuses on the SACU region. This chapter gives an overview of the Southern African Customs Union (SACU)'s economic and social indicators. The chapter is organized as follows; section 2.2 is the economic history of SACU countries and section 2.3 which provides a brief discussion on economic growth in SACU countries.

2.2 Economic history of SACU member states

SACU being the oldest custom union in the world it dates back to 1889 Customs Union Convention between the British Colony of Cape of Good Hope and the Orange Free State Boer Republic. A new agreement was signed on 29 June 1910 (SACU, 2014). The 1910 Agreement which was in effect until 1969 created couple of policies which include, a Common External Tariff (CET) on all goods imported into the Union from the rest of the world. Secondly, free movement of SACU manufactured products within SACU region without any duties or quantitative restrictions. Lastly, a Revenue-Sharing Formula (RSF) for the distribution of customs and excise revenues collected by the union (SACU, 2014).

SACU is a five member state arrangement in which customs duties and other measures that restrict free trade are eliminated. The member states are Botswana, Namibia, Lesotho, Swaziland and South Africa, of which Namibia, Lesotho, Swaziland and South Africa are having a common currency (SACU, 2014). The headquarters of the union are located in Windhoek, Namibia.

As early as 1925, South Africa adopted import substitution industrialisation (ISI) policies, backed by the common external tariffs on non-SACU products. These measures guaranteed a regional market for South African manufacturers, while relegating the High Commission Territories (HCT) to producing primary commodities. Under apartheid, South Africa was the sole administrator of the common SACU revenue pool, setting SACU import duties and setting excise policy.

South Africa is characterized as the main dominant country in terms of economic growth and development. Other countries such as Botswana, Namibia, Lesotho and Swaziland (BNLS) are forced to heavily depend on her trade and investment. The other evident fact about South Africa within the region was that she accounted for about 91% of the region's total GDP (SACU, 2013). The SACU economies are mainly driven by export-led industries which include manufacturing and mining, particularly in commodities such as diamonds, gold, and platinum. In order to effectively perform its duties the region has the following objectives as contained in article 2 of the 2002 SACU agreement:

a. To facilitate the cross-border movement of goods between the territories of the member states;
b. To create effective, transparent and democratic institutions which will ensure equitable trade benefits to member states;
c. To promote conditions of fair competition in the common customs area;
d. To substantially increase investment opportunities in the common customs area;
e. To enhance the economic development, diversification, industrialization and competitiveness of member states;
f. To promote the integration of member states into the global economy through enhanced trade and investment;

g. To facilitate the equitable sharing of revenue arising from customs, excise and additional duties levied by member states; and
h. To facilitate the development of common policies and strategies (SACU, 2013).

The 2002 SACU agreement was transformed from an institution administered unilaterally by South Africa to an independent institution with all members being equal. In avoiding this unilateral decision which was favouring South Africa's development needs, the agreement was set in place for the decisions to serve as a need for democratic decision making, while addressing key developments for all member states. The South African board of tariff and trade was replaced by the SACU tariff board, where all members were fully represented. This was a move to ensure that all decisions are made on the basis of consensus with the interest of all member states considered (SACU, 2007).

The agreement further provides different policies which include; the industrial development policy, agricultural policy, competition policy and unfair trade practices. The member states were encouraged to cooperate by meeting a common ground with respect to all policies. According to SACU (2007) the article for unfair trade policies also did not refer to common policies. This was done by the council of the union, advising on development policies and instruments to address the issue of unfair practices between member states. Industrial policy has the objective of encouraging diversified growth through industrialisation. The policy was seen as a potential to promote productivity through the extra efforts made by the member states.

The difference between competition policy and unfair trade practices is narrow. The rules governing the member states called for more responsibility to them. As a result, this was a way to address the private behaviour for different markets that restricted importation and exportation of goods and services. In cases whereby a private action by SACU member state

restricts market access there was actionable act under competition policy but only when competition is lessened within the market. Additionally, competition is good for the market because it provides more competitive products with better prices to producers for their inputs. This can result in more competitive products being exported to access global market leading to economic growth.

2.3 Economic growth in SACU countries

The annual report for SACU (2013) states that economic growth levels have been uneven since the 2008 financial crises. These were because of the prolonged stagnation in the Euro Area and subdue growth in emerging economies which are SACU's largest trading partner. However the region's economic outlook is positive mainly due to infrastructural development and private sector development. The member states have shown a great improvement in terms of diversification of their economies and development of regional industrial value chains. The region's work programme remains the priority in pursuit of collective efforts to deepen regional integration.

According to SACU (2013) trade within the region grew by 8.3 percent in 2012 from the trade level of R103.3 billion registered in 2011. However, during the financial crisis of 2008 there was a downward trend within the SACU member states in their total GDP growth rates. The region has recorded 3.4% of GDP growth in 2011 and -1.7% in 2009.The growth rate is mainly affected by the financial crisis and poor performance on the mining and manufacturing sectors. Of which the SACU states depend mainly on the mining and manufacturing sectors.

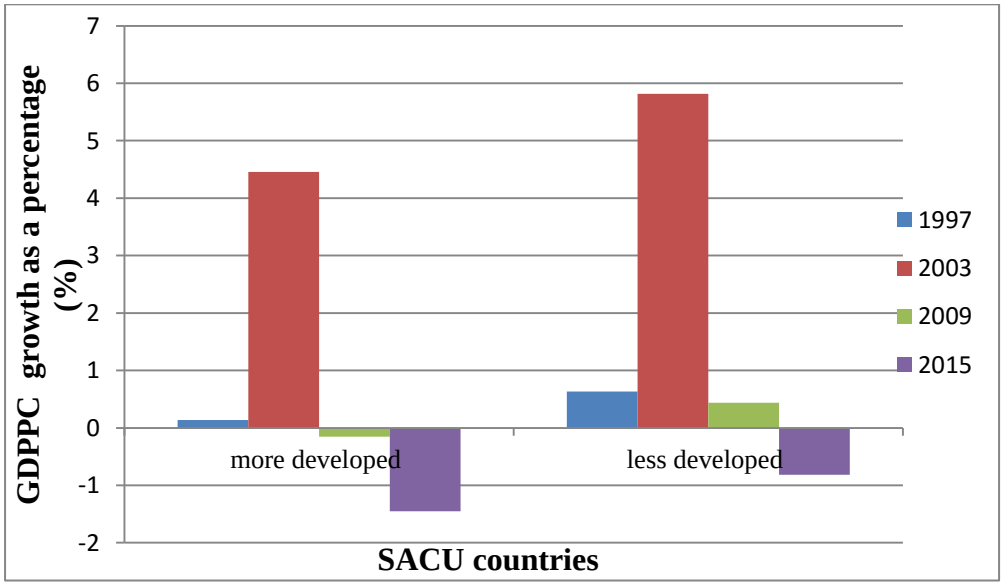
Table 2.1 Economic indicators for SACU

	BOTSWANA	LESOTHO	NAMIBIA	SOUTH AFRICA	SWAZILAND
Population	2262485	2135022	2458830	54490406	1286970
Per capita GDP(US$)	6360.6	940.6	4673.6	5773	3211.7
Growth rate (%)	-0.26	2.8	5.3	1.3	1.7

Source: United Nations National Accounts (2015)

As illustrated in Table 2.1, among the SACU countries, Botswana registered negative growth rate by 2015 this might be mainly due to poor performance of diamonds market, followed by South Africa with 1.3% and Namibia registering the largest growth of 5.3% in the union. This is because of the strong performance in the tourism and manufacturing sectors of Namibia. Lesotho is one the poorest countries in the union with the least per capita GDP of 940.6 US$. She mainly depends on remittances from migrants working in South Africa followed by Swaziland with 3211.7 US$ per capita GDP. Namibia's economy is quite impressing as shown by figures in the table and this is due to its good performing economic sectors including fishing and mining.

Figure 2.1: Trends in economic growth in SACU countries, 1992 to 2015



Source: Calculation by the author from World Development Indicators (2016)

As per the main objective of the study, the above figure 2.1 shows the trends in economic growth in SACU countries. The SACU countries are grouped into more developed (Botswana, Namibia and South Africa) and less developed countries (Lesotho and Swaziland). Therefore it is very important to briefly discuss trends in growth for the less developed and more developed in order to trace if less developed countries incurred economic growth in order to converge to more developed countries. Among the SACU region, more developed countries experienced a negative economic growth of -0.2 percent by 2009, it further declined to -1.5 percent in 2015. This is because of the financial crisis of 2008 and the decline in commodity price. Furthermore, the figure shows that the less developed countries experienced fluctuations in economic growth. This is shown by a significant growth rate of 0.6 percent in 1997 to 5.8 percent in 2003. It declined to 0.5 percent in 2009 and registered a negative growth of -0.8% in 2015. Therefore the less developed countries were following more developed countries and they ended up experiencing growth that is more than that of the more developed countries. In 2009, figure 2.1 shows that less developed countries experienced a positive growth while more developed countries registered a negative growth rate. It is an indication that more developed countries were highly affected by the financial crisis of 2008 as compared to less developed countries. This might be due to the fact that less developed countries are not much globally integrated like developed countries within the region.

In a conclusion given the analysis of SACU's economic performance, it is important to empirically investigate the convergence hypothesis in SACU. The investigation helps to assess whether SACU member's economic and social performance is converging towards a steady state. With SACU's slogan of *'implementing a common agenda towards regional integration.'* The main question that arises is, can SACU countries move together towards a common future in terms of economic and social development in order to satisfy their motto?

CHAPTER THREE: LITERATURE REVIEW

3.1 Introduction

This chapter presents the literature review on growth convergence. The chapter is divided into two sections, of which section 3.2 is the theoretical literature and section 3.3 is the empirical literature.

3.2 Theoretical literature

Convergence in general is a broad concept fully explained by economic growth theories and international trade theories. This phenomenon is trying to address questions that are related to economic growth, and how poorer countries catch up with richer countries. However, there are several reasons why literature on economic growth concentrates on economic convergence. These are considered in terms of several economic factors, which include, reduction of poverty, under the hypothesis that less productive countries will be in a position to catch up with more productive ones. Literature on economic convergence is also devoted to different state policies which encourage economic growth of less developed countries. In case these policies work it implies that countries will tend to be similar over a certain period of time. It is therefore vital to note that convergence in general does not obviously imply that the less developed countries will eventually overtake developed countries but this creates an opportunity for different countries to share long run growth and mainly for living standards to be equal across countries.

Economic Growth and Convergence

The literature on economic convergence is very broad as it can be explained by the economic growth theories and international trade theories. According to theoretical growth models and convergence hypothesis, there are usually two types of convergence tested in empirical research namely β convergence and σ convergence. β convergence is tested to prove whether less developed countries are growing faster than developed ones. While σ convergence

checks if dispersion in per capita income levels tends to decrease over time. Under β convergence there are two types of convergence which are absolute and conditional convergence.

The growth model for the absolute convergence can be written as follows:

$$G_{it} = \alpha + \beta Y_0 + \varepsilon_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.1)$$

Where:

G_{it} is the first difference of the logarithm of real GDP per-capita.

Y_0 is the logarithm of the initial level of real GDP per-capita.

Where:

i =1…N represent cross sections units (which are SACU countries)

t=1…T represent time periods.

For the conditional convergence the equation is estimated as follows:

$$G_{it} = \alpha + \beta Y_0 + \delta x_{it} + \varepsilon_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.2)$$

Where:

X_{it} is a vector containing explanatory variables which include; Foreign Direct Investment (FDI), Trade openness over GDP (OPEN), Gross fixed capital formation as share of GDP (GFCF), Human Capital (proxied by Secondary School Gross Enrolment (SSEC) and School enrollment, tertiary (SETER)), Terms of trade (TOT) and Inflation (INF). The convergence debate centres around two growth models which their views are discussed below.

The Endogenous Growth Theories

The new growth theories which differ from the neoclassical growth theories have displayed the content in which per capita income does not convergence on technology. With different

contributors of growth such as human capital, knowledge and innovation, the theory suggests that there will not be diminishing returns to capital. The economic convergence is not mainly brought by the exogenous technological progress which is also not the only source of economic growth (Barro and Sala-i-Martin, 1995). Conversely, sustainable growth can be achieved by accumulating different forms of capital. On different views of income growth by the endogenous theories, they believed that the commercial oriented research and development, innovative entrepreneurship can bring higher long run growth (Barro and Sala-i-Martin, 1995).

By contrast, neoclassical growth models predicted conditional convergence for countries with different characteristics. Countries differing in population rates, savings rates will converge to different steady states. This theory postulates that the conditional convergence hypothesis implies conditional steady state and negative relationship between real per capita income and growth rates. The source of convergence assumes the diminishing returns to capital and if the ratio of capital to effective labour declines relative to the steady-state ratio, then the marginal product of capital rises (Barro and Sala-i-Martin, 1992).

The root of these views is that, their treatment of technical change and returns to capital accumulation is different for each model. The endogenous models take technical change and returns to capital as endogenous while the neoclassical models take them as exogenous. Other views by different growth theories are presented as follows.

Trade, Growth and Convergence theories

The main question to be answered under this theory is that can international trade accelerate growth in poor countries and leading to faster convergence, or does it cause poor countries to grow at a slower rate than rich countries? The Heckscher-Ohlin trade theory postulates that

countries that differ only in their initial endowments of capital per labour may converge or diverge in income levels over time. This can happen depending on the elasticity of substitution between traded goods. Furthermore the theory suggests that the factor price equalization in a given period does not imply factor price equalization in future.

Dynamic Heckscher-Ohlin (HO) model

This trade model is assumed to be a combination of a static two- good, two-factor and a two sector growth model (2*2*2-model). HO model states that comparative advantage and trade are influenced by the differences between factor endowments among nations (implication is that comparative advantage occurs due to differences in technology). The model is based on four key relationships which includes; between factor prices and commodity prices, between goods prices and outputs, between good prices and factors returns and lastly between outputs and factor endowments. Country tends to produce and export commodity that uses intensively the factor in which it is relatively well endowed. Labour endowed countries tend to produce labour intensive goods while capital endowed countries tend to produce capital intensive goods.

In relation to convergence phenomenon, countries differing in their initial endowments of capital per labour may converge or diverge in income levels over time. This is said to be depending on the elasticity of substitution between tradeable goods. Therefore, there will be a chance of arbitrage, which in turn will lead to factor price equalisation theorem by Samuelson (1948). In a nutshell, the theorem infuses that because countries differ in factor endowments, there is a chance for trade due to arbitrage. Eventually this equates factor prices leading. However, if this is the case, growth among countries should be similar and therefore converge.

Concepts of Convergence

Convergence is a broad economic concept which was fully discussed by Barro and Salai-i-Martin (1992). The existence of economic convergence among different nations was seen to be a very important question by macroeconomists. Theoretically, the phenomenon was introduced by the neoclassical growth model. Convergence is said to be the tendency of economic to resemble each other time (Barro and Salai-i-Martin, 1992). It is sometimes called the catch up hypothesis. Economic convergence is made of two branches namely real convergence and nominal convergence. Real convergence is defined as a long term process of 'catch-up' by developing economies' output and income per capita to those of richer economies. The convergence of per capita income is mainly used as a proxy for real convergence. Nominal convergence is convergence of economic indicators such as fiscal deficit ratios and inflation rate. According to Barro (1991) nominal convergence is related to a process of nominal variables approaching equilibrium levels.

Additionally, as suggested by classical literature under real convergence there are two common types of convergence namely, beta convergence and sigma convergence. The beta convergence is said to be when the poor country grows faster than the rich country up until the two countries converge to similar level of per capita incomes. While sigma convergence refers to the decline over time in cross-sectional dispersion of per capita income (Barro *et. al*, 1991). The concept of beta and sigma convergence is somehow related. In case GDP levels of two countries become similar over a period time, this should be in situations whereby less developed economies grow faster than more developed countries. Furthermore, a condition of existence of sigma convergence is the existence of beta convergence. It follows that this in some instances, even though necessary, beta convergence is not a sufficient condition for sigma convergence.

Moreover, under the beta convergence there are two types of economic convergence which are: (i) conditional convergence, reflecting the tendency for differences in real per capita incomes across countries and (ii) absolute convergence, where countries, independently of their initial conditions tend to have their per capita incomes converging to one another (Barro and Sala-i-Martin, 1992). The neoclassical growth model says that absolute convergence relies on assumption that the only difference across economies was their initial amount of capital.

3.3 Empirical literature

Barro and Sala-i-Martin (1992) conducted a study in the United States using the neoclassical growth model framework to convergence across 48 states. The study used the data on personal income from 1840 and on gross state product from 1963. There was clear evidence of convergence in the sense that economies tend to grow faster in per capita terms when they are below the steady state position. As for the speed of the convergence it appeared to be roughly 2%.

Barro and Sala-i-Martin (1995) conducted a study on health expenditure in the European Union for the period of 1960 to 1995 using sigma convergence and rigorous parametric testing for beta convergence. Additionally, the study also discovered that dispersions in health expenditure were decreasing over time. The study confirmed the hypothesis that convergence of income improves economic integration.

According to a study by Badinger, Muller and Tondl (2002) in Germany during the period 1985 to 1999**,** regional convergence in the European Union was determined using a spatial dynamic panel analysis (GMM).The results from the study obtained using the system GMM estimator on the filtered variable showed a speed of convergence of 6.9 percent and a capital elasticity of 0.43.

Randa and Smith (2001) conducted a study on human capital convergence: international evidence from 100 different countries for the period of 1970 to 1996. The authors used the three-stage least square (3SLS) model to investigate the existence of human capital convergence. The study used education and life expectancy as explanatory variables and initial values of education and life expectancy as dependent variables. The results found that there is convergence of these variables. There is evidence that investment in health and openness of trade are important factors.

Selelo (2004) examined the regional economic convergence in SADC over the period of 1980 to 2001 using the parametic and non-parametic methods. Cross sectional data was used for analysis. The empirical results showed that there is absolute and conditional β-convergence with a speed of convergence of about 3%. Most countries were catching up with Seychelles being the leader of the region.

Rossouw (2006) undertook a study on South Africa's role in macroeconomic convergence in SADC. The results of the study shows that SADC countries have achieved the convergence goals and that considerable progress had already been made since 2004.The paper also outlined the challenge faced by South Africa, given its dominant economic role in SADC, is to ensure the necessary macroeconomic stability in the region to foster continued progress towards the achievement of the convergence goals.

Hammouda (2006) examined the macroeconomic convergence in various African RECs and its relationship to economic growth. The paper found that there is seemingly evidence of the tendency of macroeconomic convergence in various African RECs. However various African RECs displayed a stable macroeconomic environment for the recent years but there was very little growth associated with it. The paper attributed this little growth to many internal and external challenges being faced by the African continent.

A study in Malaysia by Ismail (2008) investigated convergence among Association of Southeast Asian Nations (ASEAN) using dynamic panel approach. The empirical evidence showed that the poor countries within the region do catch up with the richer ones. The ASEAN countries tend to converge to a steady state growth rate per capita GDP with a speed of convergence of between 1.6% - 16.6%.

Charles (2010) conducted a study on convergence of real per capita GDP within Common Market for Eastern and Southern (COMESA) countries using panel unit root evidence. The paper used the period from 1950 to 2003 and the outcome of the results found out there was no evidence supporting the convergence process for the income within the COMESA countries.

Kumo (2011) investigated convergence in macroeconomic policy and stability indicators in Southern Africa over the period 1992 to 2009 applying panel unit root test. The results of this study do not confirm the existence the convergence. Furthermore the study discovered that per capita GDP and income was negatively affecting the growth. In conclusion, the study outlined that most of the economies of SADC have shown a tendency of macroeconomic divergence in 2009 in monetary policy, fiscal policy, and foreign exchange reserve ratios.

Kabala and Mogotsi (2012) conducted the study of economic convergence in COMESA using the fixed effects panel data analysis. The outcome of results confirms the existence convergence among member states. The paper examined whether there was a tendency for real per capita income differences between richer and poorer countries in the region to narrow significantly and establish determinants of economic convergence over the period of 1996 to 2007. In the application of the economic criterion the paper outlined that the absolute convergence clubs into the COMESA and it also outlined that most of economies there are trapped into poverty.

Solarin and Sahu (2013) in Malaysia carried out a study to check the validity of convergence or divergence in CFA FRANC countries using time series analysis. The study used the total average, regional average (West African and Central African countries) and per capita income of France, as benchmarks. There was no conditional convergence towards any of the three benchmarks, even though Benin satisfies the catch-up hypothesis towards the total average, while Burkina Faso satisfies the catch-up hypothesis towards the West African.

Chapsa *et. al* (2015) examined income convergence within EU-15 over the period 1995-2013. The study used the dynamic panel approach with system GMM estimator. Furthermore, the study used economic factors such as physical and human capital, inflation, government consumption and openness. There was existence of conditional beta convergence. In addition the study used institutional variables, corruption and bureaucracy. The study found that corruption affects growth negatively; contrary bureaucracy has no significant effect on growth performance.

Tshekiso (2015) conducted a study on convergence of health expenditure and health outcomes in Southern Africa Development Community (SADC). The study used spatial dependence models and club convergence over a period of 1995 to 2012. The results show that SADC countries form two clubs in which 11 countries are converging towards 2 countries with the lowest health expenditure per capita are converging separately. In overall there was some convergence rate of 0.1% without the use spatial models. Furthermore the HIV prevalence was converging at 1.2 % in the spatial error model and by 1.1% in the spatial lag model.

CHAPTER FOUR: METHODOLOGY

4.1 Introduction

This chapter outlines the methodology of the study employed in investigating economic convergence in SACU. The outline is as follows, section 4.2 is the theoretical and empirical framework, section 4.3 is definitions of variables, measurement and expected sign, diagnostic tests for panel follows in section 4.4, section 4.5 is the estimation techniques and section 4.5 is the data sources and type.

4.2 The theoretical and empirical framework

The theoretical framework and empirical methodology used for the study is mainly adopting the one used in Chapsa, Tsanana and Katrakilidis (2015). This is because Chapsa *et al.* (2015)

estimate the dynamic model using the GMM estimator. A dynamic model used has overcome challenges faced by a static panel approach and was developed from the classical approach to convergence. Barro (1996) used the model to compare GDP per capita across countries. The model uses two concepts of convergence, namely β-convergence and σ-convergence. β-convergence is whereby poor economies tend to grow faster than rich ones while σ-convergence is when a group of countries are converging in the sense of σ if the dispersion of their GDP per capita levels tends to decrease over time (Barro, 1996). Additionally, theory postulates that it is possible for poor economies to grow faster than rich ones without observing the cross sectional dispersion falling over time. The key implication is that we can find β-convergence without finding σ-convergence.

These definitions of convergence were developed from the theory of Solow growth model (1956). The Solow growth model uses a cobb-douglas production function that assumes labour augmenting technological progress and constant returns to scale. Consequently, the growth equation is stated as:

$$Y = K^{\alpha}(AL)^{1-\alpha} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4.1)$$

Where:

Y = output

K = capital,

L = labour, and

α and 1-α denote output elasticities.

The assumption by Solow (1957) growth model postulates that technology is exogenous with diminishing marginal returns to capital. However, Romer (1986) argued that the diminishing marginal productivity of capital might not cause long run growth. Furthermore Romer (1990) stated that both physical and human capital are a function of new knowledge. Therefore he

argues that marginal productivity of knowledge can effectively overrides marginal productivity of physical capital only if there is increasing marginal product of both physical and human capital. However one can conclude that there is a possibility of economic growth in the long run as a result of increasing in marginal product of knowledge. Barro (1991) also suggested that the development of social infrastructure enhances more literacy and this can lead to an increase in economic growth.

On the basis of production function in equation (4.1), empirical studies testing absolute economic convergence estimate the following equation:

$$g_{i,t} = \alpha + \beta log y_{i,0} + \epsilon_{i,t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (4.2)$$

Where; α is the constant, β represent the estimated rate of convergence and $\epsilon_{i,t}$ is the error term. The dependent variable $g_{i,t}$ is the growth rate of per capita GDP of country i and independent variable $y_{i,0}$ represents the initial GDP per capita of the specific country. The above equation (4.2) implies that countries will converge towards a common steady state in terms of income.

On the other hand, empirical studies testing for the existence of conditional economic convergence estimate the following equation:

$$g_{i,t} = \alpha + \beta log y_{i,0} + \gamma X_{i,t} + \epsilon_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (4.3)$$

As discussed above; α is the constant, β stands for the estimated rate of convergence, $\epsilon_{i,t}$ is the error term. The dependent variable $g_{i,t}$ is the growth rate of per capita GDP of country i and independent variable $y_{i,0}$ represents the initial GDP per capita of the specific country. The term $X_{i,t}$ is the vector of independent variables which by economic theory includes;

Foreign Direct Investment (FDI), Trade openness over GDP (OPEN), Gross fixed capital formation as share of GDP (GFCF), Human Capital (proxied by Secondary School Gross

Enrolment (SSEC) and School enrollment, tertiary (SETER)), Terms of trade (TOT) and Inflation (INF). The above equation (4.3) implies that a country will converge to its own steady state based on cross section differences in different economic sources which include the population growth, technology, physical and human capital.

The general specification of the estimated model in reference to the objectives of the current study is given in two scenarios;

(i) For the absolute beta convergence the equation is as follows

$$GROWTH_{i,t} = f\left(lngdppc_{i,t-1}, GROWTH_{t-1}\right) \ldots\ldots\ldots\ldots\ldots\ldots\ldots (4.4)$$

Where: the dependent variable is the average growth rate and the explanatory variables are; the logarithm of lagged GDPPC and the lag of the growth rate.

$$GROWTH_{i,t} = \left(\frac{lngdppc_{i,2015} - lngdppc_{0i,1992}}{2015 - 1992}\right)$$

2015-1992 is the time period of the current study.

(ii) For the conditional beta convergence:

$$GROWTH_{i,t}$$

$$= \mathrm{f}\left(lngdppc_{i,t-1},\ lnFDI_{i,t}, lnOPEN_{i,t}, lnTOT_{i,t}, INF_{i,t}, lnGFCF_{i,t}, lnSETER_{i,t}, lnSSEC_{i,t}, GROWTH_{t-1}\right) \ldots\ldots (4.5)$$

Where; lnFDI is the logarithm of foreign direct investment, lnOPEN is the logarithm of trade openness, lnTOT is the logarithm of terms of trade, INF is inflation rate, lnGFCF is the logarithm of gross fixed capital formation, lnSSEC is the secondary school gross enrolment and lnSETER is the logarithm of tertiary school enrollment.

The choice of sources of economic growth was mainly selected in line with economic theory and also due to availability of data from potential sources. The expectation of the beta convergence is that the sign for the logarithm of the lagged per capita GDP variable should be negative implying that the less the initial value of real per capita GDP, the faster the growth and greatest possibility of less developed countries to catch up with developed ones in the region. The expectation on the catch up effect is that poorer countries are expected to

have higher economic growth, if the convergence coefficient is negative and significant. However the convergence coefficient (β) depends mainly on the productivity of capital and the willingness to save (Barro and Sala-i-Martin, 1992).

4.3 Definitions of variables, measurement and expected sign

The dependent variable

Real GDP per capita (GDPPC) growth rate– Real Per capita GDP is a measure of the total output of a country that takes gross domestic product (GDP) and divides it by the population in the country. The coefficient of the lagged gdppc is expected to be negative implying that poorer countries are eventually catching up with rich countries. The study follows literature by using growth rate of per capita GDP as a proxy for economic growth. The variable is measured using millions of US dollars. The variable was obtained from World Bank Development Indicators (WDI) statistical database.

The independent variables

Foreign Direct Investment (FDI) –It is mainly the capital investment that is owned and operated by a foreign entity (Black et al. 2012). The increase in investor's base can bring in more capital flows, therefore the expectation is that countries with higher FDI should have higher growth and converge. The data is in current millions of US dollars at constant prices for a given year. The World Bank Development Indicators (WDI) statistical database was used to extract the data.

Trade openness over GDP (OPEN) - Is mainly the total exports and imports of goods and services as a percentage of GDP. Literature has shown that trade openness has the potential to cause economic growth. Therefore the coefficient of the variable is expected to be significant and positive since economic theory suggests that the more the country has liberalized trade the higher the economic growth. The variable is expressed as a share of GDP

all in current US dollar for a given year. Data for this variable was obtained from the statistical database of the United Nation Conference for Trade and Development (UNCTAD).

Gross fixed capital formation as share of GDP (GFCF) - consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories (Black et al. 2012). It is a proxy for physical capital and it captures the role of capital investment in the growth process. The higher the accumulation of capital relative to labour creates economic growth therefore the expected sign is positive. The variable is measured as a share of GDP in US dollars. World Bank Development Indicators (WDI) statistical database was used as a source for this variable.

Secondary School Gross Enrollment (SSEC) - Is the ratio of total enrolment regardless of age, to population of the age group that officially corresponds to the level of secondary education (Black et al. 2012). This is a proxy for human capital; therefore the skilled labour may contribute to growth and convergence. The expectation here is that the SSEC should have a positive impact on growth.

School enrollment, tertiary (SETER) - Is the ratio of total enrollment regardless of age, to population of the age group that officially corresponds to the level of tertiary education. The expected sign is also positive. However the use of the two proxies is to ensure robustness. For all the human capital variables (SSEC and SETER) are used as education levels to show the different potential levels for skilled labour. The variables are measured as the gross secondary or tertiary enrolment for each country per year. For these two variables (SSEC and SETER) the data was from World Bank Development Indicators (WDI).

Terms of trade (TOT) - It is the ratio of the country's exports and imports. The study follows literature on growth which suggests that the impact of terms of trade on the growth rate depends on the trade pattern. The variable TOT is expected to have significant and positive impact on growth. It is measured by millions US dollar value as a share of GDP per year.

Terms of trade was also obtained from United Nation Conference for Trade and Development (UNCTAD) statistical database.

Inflation (INF) - Is measured by the consumer price index, it reflects the annual percentage change in consumer prices (Black et al. 2012). Rapid increase in prices will affect the inter economy because it impact the cost of living, the cost of doing business. As a result inflation is expected to have a negative impact to economic growth and convergence. Inflation was obtained from the World Bank Development Indicators (WDI) database.

A dynamic panel model is preferred to the static panel model because it includes the lagged dependent variable as an explanatory variable. Therefore this feature makes the assumption of strictly exogeneity not to hold under the dynamic model.

The study will employ a generalized method of moments (GMM) for dynamic panel since the method addresses the presence of unobserved country specific effect and common time effects as suggested by Allerano and Bond (1991). However another way of dealing with challenges encountered by previous studies (Kumo (2011), Charles and Hoarau (2012) Kabala and Mogotsi (2012)) is the use of instrumental variables with lags in order to take care of the endogeneity problem and checking cross sectional dependency. Most of economic issues are dynamic by nature therefore the use of dynamic panel model helps to understand adjustments of economic growth theories. The dynamic model is advantageous because it captures individual effects specification that may be used to summarize cross sectional heterogeneity which is not observable.

The measurement error and Endogeneity

The issue of measurement error occurs when the theory outlines that the inclusion of the variable in a model cannot be correctly measured (Gujarati and Porter, 2009). In econometric terms, it is very important to deal with measurement error. As a result, the difficulty in

measuring some important variables may force a researcher to measure using an incorrect variable. This might end up bringing some contradicting empirical results. Endogeneity occurs when the variable is correlated with the error term (that is when an explanatory variable is defies zero conditional mean assumption) (Arellano and Bond (1991). Literature has shown that measurement error and endogeneity has similar effects for panel regression model in general. The use of instrumental variables (IVs) is used as a remedy of endogeneity. However, the use of the GMM by the current study, while relaxing the assumption of exogeneity, just like the IVs method, it is expected to result in efficiency in the estimation

4.4 Diagnostic tests for panel model

Specification test

As far as empirical work is concerned, GMM estimators are said to be more efficient if the moment conditions are valid (Arellano and Bond, 1991). Under the specification tests we carry out the Sargan overidentifying test and AR(2) test of Arellano and Bond (1991) for second order test for serial correlation. The Sargan overidentifying test is done under the null hypothesis of overidentifying restrictions are satisfied or valid against the alternative hypothesis that overidentifying restrictions are unsatisfied or invalid. The test is about the validity of instrumental variables. Therefore due to believe on consistency of the GMM, it is very vital to carry out this test. The rejection of the null hypothesis does not support the model but failing to reject the null hypothesis supports the model. The model is supported when the probability value (p-value) of the J-statistic is insignificant.

Additionally, the consistency of the GMM also depends on second order serial correlation. Therefore, it requires that there should be no second order serial correlation in the first difference of the error term. The AR(2) test of Arellano and Bond (1991) is used because with any first differenced equation with original uncontrolled disturbance terms assumed not

to be serially correlated. Therefore, the first order serial correlation rejects the null hypothesis of no serial correlation. With this problem it makes the AR(2) more useful than the AR(1). The null hypothesis under this test is no autocorrelation against the alternative of autocorrelation. Therefore rejecting the null means that there is second order serial correlation and failing to reject the null means that there is second order serial correlation.

Testing for cross-sectional dependence

One of the most important steps before estimation of the model is also to test for cross-sectional dependence because ignoring cross-sectional correlation can lead to severely biased results. The study will use the Pesaran (2004) CD test to check if complex forms of spatial and temporal dependence may arise when the cross-sectional units have been randomly and independently sampled. The test employs the correlation-coefficients between the time-series for each panel member.

In the context of SACU as a region of interest, dataset is N=5 countries, this would be 5 x 4 the correlations between country i and all other countries, for i=1 to N-1. So it follows that the estimated correlation coefficient between country i and j is as ρ^{ij} , therefore the Pesaran CD statistic is computed as:

$$CD = \sqrt{\left[\frac{2}{N(N-1)}\right]} * \left[\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\sqrt{(T_{ij}\ \rho^{ij})}\right] \quad CD \sim N(0,1) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4.6)$$

Where:

T_{ij} is the number of observations for the correlation coefficient.

The equation 4.6 is mostly suitable for unbalanced panel data with the null hypothesis of cross-section independence, then the above statistic is distributed standard normal for T_{ij} >3 and N sufficiently large. The CD test is important because it is robust to non-stationarity, heterogeneity or structural breaks and was shown to be significant even in small samples.

Alternatively, Pesaran (2004) outlined that cross-section dependence is a panel test of error cross-section dependence used in different types of panel models. The proposed test is mainly concerned about the average of pairwise correlation coefficients of OLS residuals from each regression in panel rather than just a Breush-Pagan LM test.

The unit root tests and cointegration tests

Testing for unit root in panel has been made known by Levin, Lin and Chu (2002): Maddala and Wu (1999): Im, Pesaran and Shin (IPS) (2003): Choi (2001): Fisher (2002) and Hardi (2000). The study will use the Levin, Lin and Chu (LLC) test and the Augmented Dickey Fuller-Fisher (ADF-Fisher) test to determine the presence of unit root and order of integration for data series mainly because these two are allowed for unbalanced panel data. The other valid reason for using the two tests is that they allow for heterogeneous dynamics which are useful for panel applications. The LLC tests allow for fixed effects, individual deterministic trends and heterogeneous serially correlated errors.

The reason why we test for unit root is to determine the order of integration for variables. After identifying the order of integration, this is useful for testing for cointegration since cointegration test requires the use of variables of the same order (that is I(1)). Cointegration is the existence of a long-term or equilibrium relationship between two or more variables. The study will use the cointegration test of Kao residual test (1999) because the desired feature of the test is with respect to allowing for dynamic vector to be heterogeneous across SACU countries. In addition the test involves average test statistics for cointegration in the time series and across cross sections, therefore, it is done in pieces so that the limiting distributions are based on limits of piecewise numerator and denominator terms (Baltagi, 2013). We test variables for cointegration to check if there is cointegration in order to estimate the panel error correction model for difference GMM. If the variables are cointegrated this will require

to estimate panel error correction model for difference GMM but if there is no cointegration we just estimate the one-step difference GMM.

4.5 Estimation Techniques

The main reason why the study adopted the dynamic model over the static model is because of the assumption of uncorrelated errors being invalid and the chances of substantial amount of spatial dependence. Therefore in this context the static panel estimation will yield inefficient parameters, biased estimates and this makes the use of dynamic model more appealing. However the GMM estimation approach is used to deal with these issues. The dynamic panel model allows test on sample moments implied by the presence of individual effects by which the GMM is a robust estimator, unlike maximum likelihood estimation which does not require information of the exact distribution of the disturbances (Arellano and Bover, 1995).

Therefore most estimators in panel are special case of GMM (Wooldridge, 2009). The GMM also takes care of the problem of serial correlation and heteroscedasticity (Bond, Hoeffler and Temple, 2001). The estimator can be implemented when the number of time period (T) the greater than the cross sections (N) which is applicable to our sample of SACU. The GMM in general is capable of correcting unobserved country heterogeneity, omitted variable bias, measurement error and potential endogeneity problems arise in growth estimation (Arellano and Bond, 1991). The most two common estimators for the GMM are difference GMM due Arellano and Bond (1991) who built upon the works of Anderson and Hsiao (1982) and Holtz-Eakin, Newey, and Rosen (1988) and system GMM due Blundell and Bond (1998), extending the knowledge from Arellano and Bover (1995).

The difference GMM estimator goes by, firstly, taking the difference of the dynamic panel model in order to remove the individual specification unobserved effect. This is further discussed by Arellano and Bover (1995), who suggested that the average future value for

each variable is subtracted from the current one than the lagged one. This in short is describing the forward orthogonal deviations which are relevant and appropriate for unbalance panel.

For the system GMM estimator procedure, it manipulates the difference GMM, through the inclusion of an extra assumption which produces the additional set of moment condition to leverage. Furthermore this requires that lagged changes in the dependent variable are valid instruments for the level of the lagged dependent variable in the level equation (Arellano and Bover, 1995). In more specific terms this will be only true if and only if the deviations from the long run mean are correlated to the individual specific unobserved effect. As indicted earlier in chapter one (1) under the significance of the study, the study will use the one step system GMM over two-step GMM because the efficient two-step GMM estimator has downward bias standard errors in small sample (Roodman, 2006). For the one-step difference GMM is used because it takes into consideration the joint endogeneity of variables in the model and it deals with endogeneity by transforming the data to remove fixed effects (Baum, 2006).

Generalized Method of Moments (GMM) instruments

Instrument specification is very important in GMM estimation because it improves the efficiency of the estimator when correctly specified. The GMM estimator allows the correction of endogeneity bias (time varying component) through instrumenting the explanatory variables (Foreign Direct Investment, trade openness, gross fixed capital formation, secondary school gross enrolment, school enrollment, tertiary, terms of trade and inflation). With the use of the Stata 13 software it permits to correct any instrumental specification error by the ‘collapse’ command. This command is used to limit the instruments in case the researcher has over stated instrumental variables. Since the study uses the small sample (SACU region) large number of instruments may causes the Sargan test to be weak.

So the rule of thumb is to keep the number of instruments less than or equal to the number of groups. However the number of lags is very vital also under instrumental specification because with lags one can find a good instrument, but using deeper lags reduces sample size.

4.6 Data sources and type

The data used in the study for analysis is an annual data obtained from World Bank Development Indicators (WDI) and United Nation Conference for Trade and Development (UNCTAD) statistical database. The study adopts unbalanced panel data for five (5) SACU countries (Botswana, Lesotho, Namibia, South Africa and Swaziland). The study covers the period of 1992 to 2015 and the variables are expressed in United States dollars. The selection of variables was mainly due to availability of data.

CHAPTER FIVE: EMPIRICAL RESULTS

5.1 Introduction

This chapter presents the empirical results from all data techniques previously discussed in chapter four (4). Section 5.2 presents the panel unit root tests to establish stationarity and order of integration of all variables. This is followed by section 5.3 of panel cointegration tests to check the long run relationship between listed variables, results on cross sectional dependence and specification test on section 5.4 and finally section 5.5 is the results on the panel generalised method of moments GMM, one-step system GMM and one-step difference GMM equations.

5.2 Panel unit root tests

Before analysis of coefficients for our equations (panel GMM, one-step difference GMM and one-step system GMM), it is important to analyse the panel unit root test results. For panel modelling when testing for variables at level we include both cases of intercept and trend while at first difference we only provide intercept. This is because most macro and time series variables are generally exhibit some trends in levels and this is a standard practice in panel studies. As previously discussed in chapter four (section 4.4) we are testing for unit in order to determine the order of integration for variables so that we are able to check for cointegration. Since cointegration test require variables of the same order. This will help in avoiding the possibility of attaining spurious or nonsensical regression and choosing the wrong panel model.

Table 5.1 below indicates variable names, acronyms and unit of measurement.

Table 5.1 Variable Names, Acronyms and Unit of Measurements

Variable Name	Variable Acronym	Units of Measurements
Log of Nominal Gross Domestic Product Per Capita	LNGDPPC	Millions of US dollars.
Log of Foreign Direct Investment	LNFDI	Millions of US dollars.
Log of Trade Openness	LNOPEN	Millions US dollars.
Log of Terms of Trade,	LNTOT	Millions US dollars.
Inflation Rate	INF	Annual percentage (%) change in consumer prices.
Log of Gross Fixed Capital Formation	LNGFCF	A percentage (%) share of GDP in millions of US dollars.
Log of Secondary School Gross Enrolment	LNSSEC	Percentage (%) gross secondary enrolment for each country per year.
Log of Tertiary School Enrolment.	LNSETER	Percentage (%) gross tertiary enrolment for each country per year.

Panel unit root is tested using the stated hypothesis below,

H_0 = unit root present or non-stationary

H_1 = no unit root or stationary

Tables 5.2 and 5.3 indicate the summary of the results of LLC test for unit root and ADF-Fisher's Chi-squared test for all the variables.

Table 5.2 Levin, Lin and Chu (LLC) test

Variables	**Levels**		**First Difference**		
	Intercept	**Intercept and Trend**	**Intercept**	**Intercept and Trend**	**Order of Integration**
LNGDPPC	-0.66754	-1.52651	-8.60660*	-8.56709*	I(1)
LNFDI	-1.29036	-1.35719	-5.46030*	-5.50911*	I(1)
LNGFCF	-3.8775**	-4.85702*	…….	……	I(0)
INF	-5.27430*	-6.44419*	……..	……	I(0)
LNOPEN	-4.398705*	-5.23924*	……	…….	I(0)
LNSETER	-0.46153	-2.48501	-5.43355*	-5.30546*	I(1)
LNSESEC	-0.28969	-1.99110	-11.1516*	-10.21037*	I(1)
LNTOT	-4.73804*	-4.32812**	……...	……	I(0)
	Critical Values	**LLC with intercept**	**LLC with intercept and trend**		
	1%	**-4.10**	**-4.76**		
	5%	**-3.84**	**-4.26**		
	10%	**-3.08**	**-3.98**		

Note: *, ** and *** denotes that a variable is stationary at 1%, 5% and 10% level of significance, respectively.

Table 5.3 ADF-Fisher's Chi-squared test

Variables	Levels		First Difference		
	Intercept	**Intercept and Trend**	**Intercept**	**Intercept and Trend**	**Order of Integration**
LNGDPPC	-1.03899	-0.34049	-4.04935*	-4.00171*	I(1)
LNFDI	-2.20626	-2.43250	-6.79266*	-6.441205*	I(1)
LNGFCF	-5.9239*	-9.1977*	…….	……	I(0)
INF	-6.0861*	-6.0831*	…….	…….	I(0)
LNOPEN	-5.9304*	-6.3581*	…….	…….	I(0)
LNSETER	-1.77558	-0.39968	-2.49170**	-2.77980**	I(1)
LNSESEC	-0.97149	-1.43807	-7.1068*	-7.21578*	I(1)
LNTOT	-9.2000*	-9.5707*	……	……..	I(0)
	Critical Values	**ADF with intercept**	**ADF with intercept and trend**		
	1%	**-3.00**	**-3.44**		
	5%	**-2.30**	**-2.73**		
	10%	**-1.93**	**-2.35**		

Note: *, ** and *** denotes that a variable is stationary at 1%, 5% and 10% level of significance, respectively.

The results in table 5.2 and 5.3 are all done with the null hypothesis of non-stationarity which means that there is unit root. We can realise that the two tests are bringing in consistent results. Real GDP per capita (GDPPC), Foreign Direct Investment (FDI), Tertiary School enrollment (SETER) and secondary school enrollment (SESEC) are stationary in their first differenced form, this implies that they are integrated of order one (I(1)) while Trade openness (OPEN), Gross fixed capital formation as share of GDP (GFCF) Terms of trade (TOT) and Inflation (INF) are stationary in their levels (that is they are I(0)). The next step after testing unit root is to test for the existence of a long term or equilibrium relationship between two or more variables. This is tested using panel cointegration test of Kao residual test for cointegration. The main reason for this test is because it allow for heterogeneity.

5.3 Cointegration test results

Following the panel unit root test, which shows that Real GDP per capita (GDPPC) Foreign Direct Investment (FDI), Tertiary School enrollment (SETER) and School enrollment, tertiary (SETER) are non-stationary at levels (that is they are I(1)), we have used this I(1) variables to test for cointegration and table 5.4 below presents the result for the Kao(1999) cointegration tests using the below hypothesis,

H_0 = no cointegration equation

H_1 = cointegration equation exists

Table 5.4 Kao residual cointegration test

	t-Statistic	Prob.
ADF	-0.107762	0.4571
Residual variance	0.019810	
HAC variance	0.024737	

The Kao residual cointegration test result in table 5.4 shows an insignificant probability value of 0.4571 which means that we fail to reject the stated null hypothesis of no cointegration and conclude that there is no long run relationship among our I(1) variables. We then conclude that we are not going to estimate panel error correction model therefore we are going to estimate one-step difference GMM.

5.4 Pesaran (2004) CD test for cross-section dependence.

H_0 = cross-section independence

H_1= no cross section independence

Table 5.5 presents the results of the cross-sectional dependence among variables use in the current study. As stated in chapter 4, the study used the Pesaran (2004) CD test and the results are discussed after table 5.5.

Table 5.5 Results of Pesaran (2004) CD test.

CD-test	p-value	corr	abs(corr)
12.04	0.000	0.973	0.973

Note: Under the null hypothesis of cross-section independence CD ~ N (0,1)

The CD-test shows the significant probability value of 0.000, this means that we reject the null hypothesis of cross section independence and we conclude that there is cross section dependence among variables. However, it follows that the problem of cross section dependence on variables was corrected using the Prais-Winsten regression; correlated panels corrected standard errors (PCSEs).

5.5 Specification Test

As discussed under section 4.4 of chapter four (4), testing for specification and second order serial correlation is very important before the analysis of coefficients of the panel model. This is because the consistency of the GMM depends on the validity of the moments conditions. The current study used the Sargan overidentifying test with the null hypothesis of overidentifying assumption are valid. Therefore, rejecting the null hypothesis does not support the model while failing to reject the null hypothesis supports the model. Additionally, the consistency of the GMM also requires that there should be no second order serial correlation. The AR (2) test of Arellano and Bond (1991) tests for autocorrelation on our residuals with the null hypothesis of no autocorrelation. Failing to reject the null hypothesis supports the model.

5.7 Empirical findings

In support to the objective of the current study, table 5.6 presents the results of the absolute beta convergence using the system GMM estimator. Since we used one estimator for absolute beta convergence, only one model is presented in table 5.6.

Table 5.6 Absolute growth convergence in SACU (1992-2015): System GMM

Dependent Variable: growth rate $\left(\frac{lngdppc_{i,2015}-lngdppc_{0i,1992}}{2015-1992}\right)$	**Model 1**
Growth(-1)	0.0494* (0.0245)
$lngdppc_{i,t-1}$	-0.0371* (0.0123)
_cons	0.3370** (0.0561)
AR(2) (p-value)	0.603
Sargan test (p-value)	1.000

Note: *, ** and *** denotes that a coefficient is significant at 1%, 5% and 10% level of significance, respectively. Sargan test is asymptotically distributed as a X^2 and AR (2) test for second order serial correlation is asymptotically distributed as a N(0,1). Values in parenthesis are standard errors.

Table 5.6 shows the p-values for the Sargan test shows insignificant value at all significance levels (1%, 5% and 10%) this implies that we fail to reject the null hypothesis of overidentifying assumption are valid and we conclude that instruments are valid. On the other hand, we can also say that our models have no second order serial correlation due to the insignificant p-values for the AR (2). Therefore our model is correctly specified.

Furthermore, the result shows that there is absolute beta convergence within the SACU region. The existence of absolute beta convergence is shown by the negative sign of lagged GDP per capita in table 5.6. However, this implies that the less developed countries in SACU registered more growth rate as compared to more developed countries and converge to a

common steady state. Furthermore, the finding of the current study is also consistent with the neoclassical growth model, which states that countries will approach a common steady state in terms output, with poor countries growing faster than rich countries. Model 1 (see table 5.6) shows the rate of absolute beta convergence in SACU is about 4 percent per year.

In order to support the second objective of the study, the next step is to expand the scope of convergence by estimating the conditional beta convergence using the one-step system GMM and one-step difference GMM. Since we have seven explanatory variables (of which tertiary and secondary school enrollment measures human capital), the GMM procedure allows us to separately add each variable to the model to identify the impact of the each variable in convergence. Therefore, the results for each estimator (one-step system GMM and one-step difference GMM) will have 6 models.

Table 5.7 Conditional growth convergence in SACU (1992-2015): One-step system GMM

Dependent Variable: growth rate $\left(\frac{lngdppc_{i,2015}-lngdppc_{0i,1992}}{2015-1992}\right)$	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Growth(-1)	0.125*** (0.041)	0.310* (0.062)	0.129* (0.015)	0.224** (0.113)	0.027 (0.009)	0.024** (0.017)
$lngdppc_{i,t-1}$	-0.081* (0.085)	-0.051* (0.002)	-0.025* (0.367)	-0.032* (0.090)	-0.086* (0.041)	0.094** (0.008)
lnfdi	0.035** (0.011)	0.013* (0.712)	0.020** (0.002)	0.008* (0.056)	0.015*** (0.003)	0.064* (0.178)
lngfcf		0.090** (0.002)	0.091* (0.026)	0.070** (0.231)	0.096* (0.030)	0.113* (0.067)
lnopen			0.072** (0.413)	0.089* (0.066)	0.027** (0.001)	0.128* (0.971)
lntot				0.160 (-0.943)	-0.0021 (0.764)	0.138 (0.081)
lnssec					0.009* (0.312)	0.034 (0.461)
lnseter					0.024* (0.461)	0.031* (0.004)
inf						0.060** (0.023)
_cons	1.990* (0.115)	4.702** (-0.143)	1.85*** (0.069)	6.073** (0.221)	0.876 (-0.019)	2.001* (0.565)
AR(2) (p-value)	0.671	0.743	0.930	0.870	0.912	0.543
Sargan test (p-value)	1.000	1.000	1.000	1.000	0.988	1.00

Note: *, ** and *** denotes that a coefficient is significant at 1%, 5% and 10% level of significance, respectively. Sargan test is asymptotically distributed as a X^2 and AR (2) test for second order serial correlation is asymptotically distributed as a N(0,1). Values in parenthesis are standard errors.

Table 5.7 shows that the dependent variable is the annual growth rate, $lngdppc_{i,t-1}$ is the logarithm of lagged per capita GDP and growth (-1) is the lagged of the dependent variable. In reference to the theoretical literature, a negative and significant coefficient of the lagged per capita GDP shows the existence of conditional convergence. A dynamic panel model was estimated using the one-step system GMM and one-step difference GMM estimators, for which table 5.7 shows the results of the one step system GMM presented in 6 columns.

According to Roodman (2006) using the one-step system GMM over two-step GMM is because the efficient two-step GMM estimator has downward bias standard errors in small samples. From table 5.7 of one-step system GMM, only significant coefficients are discussed below. The p-values for the Sargan test, for all the 6 equations shows they are insignificant this implies that we fail to reject the null hypothesis of overidentifying assumption are valid and we conclude that instruments are valid. On the other hand, we can also see that for all the 6 equations the p-values for the AR (2) are insignificant. This implies that we fail to reject the null hypothesis of no autocorrelation and conclude that the equations have no second order serial correlation. With the use of Prais-Winsten correlated panels corrected standard errors (PCSEs) heteroscedasticity and cross section dependence were avoided. One-step system GMM shows no inclusion of the goodness of fit since it is irrelevant. This is suggested when analyzing growth factors the estimation technique matters most.

The coefficient of $lngdppc_{i,t-1}$ in all models (that is model 1 to 6) shows that there is evidence of conditional beta convergence. This implies that less developed countries are converging to their own steady states levels in SACU. The results are consistent with results obtained by Chapsa *et al.* (2015). In model 6 (where all variables are added to the model), most of the economic factors such as FDI, physical capital, terms of trade, tertiary school enrollment and terms of trade are positive and significant in affecting growth rate. The rate of convergence in model 6 is about 9%.

The coefficient of the lagged growth rate in model 6 is significant at 5% level of significance (see table 5.7). The implication here is that, changes in current growth is affected by its past value in determining conditional beta convergence. The below section analyses the coefficients of variables which are significantly affecting growth.

In model 1 to 6 (see table 5.7), **Foreign direct investment (FDI)** has a positive sign with the significant coefficient as expected, it implies that the more the country is attracting foreign

investors, this augments the levels of domestically human capital. Therefore these promote high economic growth in order for countries to converge to their own steady states. In model 6(see table 5.7), for every 1 percent change in FDI, growth rate will increase by 6 percent. This is in line with the objectives of SACU to achieve regional integration with sustainable growth.

Additionally, column 6 shows that **Trade openness (OPEN)** has a significant coefficient with and a positive sign as expected, except in model 4 (where it is insignificant). In model 6, holding other things constant, for every 1 percent increase in trade openness, growth rate will increase by 13 percent. This means that the more the individual country is open to trade the higher the gain in productivity growth due to increase in flows of goods and services. This is in line the neoclassical growth models that assert the gain of trade liberalized on economic growth through comparative advantage.

School enrollment, tertiary (SETER) (as a proxy for human capital) **in model 5 and 6** is also positive and significant as expected, therefore this implies that the more the country is investing into people's education especially tertiary education the high chances of increase in economic growth. This is in line with economic theory by Romer (1990), who suggests that the long run economic growth is attainable if the increasing marginal product of knowledge overrides the diminishing marginal product of physical capital. To be more specific the accumulation of human capital increases the technological process leading to increase in economic growth. For every 1 percent (%) increase in tertiary school enrollment, growth rate will increase by 2 % in model 5 and by 3 % in model 6. Therefore in order for less developed countries to attain growth for convergence in the long run they need to invest more in education facilities and to build up more tertiary institutions.

Gross fixed capital formation as share of GDP (GFCF) as a proxy for physical capital has a positive and significant coefficient as expected in model 2 to 6. It means that physical

capital has a positive impact on economic growth and convergence for SACU countries. This is supporting economic theory by Romer (1990). Holding other things constant, for every 1 percent (%) increase in physical capital there will be an increase in growth rate by 11 percent (%) (see table 5.7 model 6). It implies than increase in accumulation of physical capital levels by member states could have led to increase in economic growth over time. Furthermore the result is consistent with SACU's objective of promoting investment opportunities in the region though the accumulation of capital.

Table 5.8 Conditional growth convergence in SACU (1992-2015): One-step difference GMM

Dependent Variable: growth rate $\left(\frac{lngdppc_{i,2015}-lngdppc_{0i,1992}}{2015-1992}\right)$	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Growth(-1)	0.094** (-0.195)	0.031** (0.018)	0.024 (0.346)	0.037*** (0.002)	0.017*** (0.013)	0.014** (0.076)
$lngdppc_{i,t-1}$	-0.039* (0.075)	-0.048* (0.004)	0.027** (0.062)	-0.057* (0.001)	-0.050** (0.332)	-0.039* (-0.771)
lnfdi	-0.095* (0.004)	0.024* (0.055)	0.0583** (0.261)	0.388** (0.030)	0.216* (0.185)	0.092** (0.132)
lngfcf		0.6577 (0.702)	0.3851* (0.029)	0.0442 (0.003)	0.851* (0.848)	0.621* (0.393)
lnopen			0.7396 (0.329)	0.409** (0.031)	0.054* (0.008)	0.001* (0.032)
lntot				0.109 (0.581)	-0.985 (0.061)	0.023 (0.994)
lnssec					0.065 (0.133)	0.021 (0.219)
lnseter					0.251* (0.002)	0.318* (0.454)
inf						-0.057* (0.127)
_cons	7.431* (0.297)	-3.223 (0.502)	8.671** (0.997)	-6.719 (0.865)	6.002* (0.091)	-3.177 (0.011)
AR(2) (p-value)	0.711	0.991	-1.054	0.236	0.671	0.602
Sargan test (p-value)	1.000	0.630	1.000	1.000	1.000	1.000

Note: *, ** and *** denotes that a coefficient is significant at 1%, 5% and 10% level of significance, respectively. Sargan test is asymptotically distributed as a X^2 and AR (2) test for second order serial correlation is asymptotically distributed as a N (0,1). Values in parenthesis are standard errors.

Table 5.8 above shows the one-step difference GMM for the dynamic panel estimation results. The result from model 3 shows that the previous value of growth rate does not affect the current growth rate. The one step difference GMM also confirms the existence of conditional beta convergence as across all models the coefficient of $lngdppc_{i,t-1}$ is negative and significant. In reference to model 6, the differences in speed of convergence for the one-step system GMM and one-difference GMM is about 5%. This implies that the system GMM the speed of convergence is higher than that of the difference GMM, even the significance level for the system GMM is higher than that of the difference GMM.

Furthermore, model 6 (see table 5.8) shows that inflation is statistically significant and negatively affecting the growth convergence in SACU. The sign for inflation is correct and this is supported by macroeconomic theory that states an inverse relationship between inflation and growth. High inflation rate imposes negative externalities on the economy. Example of such externalities can be uncertainties about future profitability of investment project this can lead to lower levels of economic growth hence discouraging convergence. High inflation also reduces the achievement of rapid growth in SACU, therefore it is vital for SACU economies to maintain low inflation rates in order to converge to their own steady states.

The significant and positive coefficient for the physical and human capital suggest that SACU countries should concentrate more in investing in physical and human capital since both investment influences growth positively. In a nutshell it is empirically evident enough to conclude that one-step system GMM estimator is more efficient over the difference GMM. This is shown by more significant coefficients of variables (foreign direct investment, trade openness, tertiary school enrollment and physical capital) under one-step system GMM than few significant coefficients of variables (foreign direct investment, inflation and secondary

school enrollment) under the one-step difference GMM estimators for panel estimation. The use of the dynamic approach by the present study brought results that are consistent with the studies conducted by Chapsa *et al.* (2015): Badinger, Muller and Tondl (2002) and Ismail (2008).

The existence of both absolute and conditional beta convergence in SACU implies that less developed countries were growing faster than developed countries. In overall it follows that SACU economy achieved increase in economic growth during a period of 1992-2015.

CHAPTER SIX: CONCLUSIONS AND POLICY RECOMMENDATIONS

6.1 Introduction

This chapter summarizes and draws conclusions of the present study. The chapter is outlined as follows. Section 6.2 presents the summary and conclusion of the study, while policy recommendations are in section 6.3. Lastly section 6.4 presents the limitations and areas of further research.

6.2 Summary and conclusion

The main aim for the present study was to investigate growth convergence within the SACU states from 1992 to 2015. Using the dynamic panel approach the results obtained in the previous chapter (that is chapter 5) shows that real GDP per capita as a measure of growth is significant in determining convergence in both the one-step system GMM and one step difference GMM estimators. This implies that within the SACU region less developed countries attained faster growth to converge to their own steady state. The policy implication of this finding is that policy makers must cautiously implement economic development policies that aims to promote growth of GDP per capita and reduce on areas that discourage the growth of the country in order to reach converge.

The GMM estimators (one-step system GMM and one-step difference GMM) were employed to measure the speed of convergence for less developed countries within the SACU region. Some macroeconomic indicators such as trade openness, inflation, foreign direct investment and school enrollment, tertiary as a proxy for human capital were used to assess if the growth convergence exists within the SACU countries. The findings of this study support the convergence hypothesis and showed the conditional beta convergence within the SACU countries.

The results for the two estimators (one-step system GMM and one-step difference GMM) shows that foreign direct investment, trade openness, tertiary school enrollment and gross fixed capital formation are positively and significant in determining growth for less developed countries to convergence to their own steady state within the region. Both of these variables are supporting what was expected from economic theory. However, the highlight on the augment that one-step system GMM model has improved the results of the one-step difference GMM was seen by the one-step system GMM equation showing more significant variables and high convergence rate than the one-step GMM equation.

In a nutshell, findings for the study suggest that the SACU region seem to be surely moving towards a common future and this helps in providing more information about regional integration. The findings also help in informing other countries to make right decisions on joining the SACU region. Therefore, the SACU can be the bench mark for further improvement of regional integration within Southern Africa area and Africa as a whole.

6.3 Policy Recommendation

The first policy recommendation is that in order for SACU countries to achieve deeper regional integration in the future, policy makers need to pay attention to harmonizing of policies especially for those that are affecting growth. Variables such as trade openness, gross fixed capital formation and tertiary school enrolment (as a proxy for human capital) were positively affecting growth. Therefore, the less developed countries must work on investing more on human capital development as way to attain growth in order to converge in the long run. Besides the current lower GDP growth and increase in unemployment rate for SACU member states, different governments have to redirect the limited resources internally in order to reduce such burdens to improve sustainable growth.

Secondly, as per SACU's mission: to promote sustainable economic growth and development for employment creation. The SACU region need a strategy based on a rationalization of the number of trade agreements before deepening the trade and financial relations between the different economies. However, the ongoing free trade among SACU members might help in the achievement of better living standards in SACU countries. Therefore the region should continue with free trade among member states. The trade facilitation is largely used to improve the interface amongst member states and help on reducing transactional costs and complexity of international trade. Trade openness (OPEN) justifies the fact that there is a need to maintain policies that encourage and keep free trade within SACU member states in order to promote high rates of convergence.

The result from the one-step system GMM (see table 5.7 model 6) model shows that the rate of convergence is about 9% for the period 1992 to 2015. This rate indicates a plausible convergence process than previous convergence analysis for the Southern Africa as a whole. In order to improve convergence rate in the future SACU member states should increase levels of capital and tertiary school enrollment as per the study's findings.

6.4 Limitations and area of further research

The major limitation of the present study is unavailability of data for other variables, such as money supply, interest rates, savings and internet access and usage (as a proxy for technology) that could have been included in the model. These variables are expected to affect economic growth and convergence in SACU region. Moreover, the study has gone an extra mile towards making a contribution to existing literature by using the superior GMM estimator (that is one-step system GMM) of dynamic panel approach for SACU region and Southern Africa as a whole. It is evident enough to suggest that other studies can be conducted using other modern econometric approaches to increase the empirical evidence of growth convergence especially in Africa as a whole. The use of other convergence models

can be used to include structural breaks for the purpose of breaks in data for other countries. The other area of research that can be investigated is if there are convergence clubs within the SACU region.

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