College of Law and Management Studies

School of Accounting, Economics and Finance

Impacts of Military Expenditure and Institutional Quality on Inclusive Growth in BRICS Countries

By

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A thesis submitted in fulfilment of the requirements for the Degree of Doctor of Philosophy in Economics

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2019

DECLARATION

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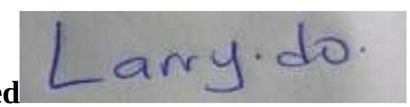
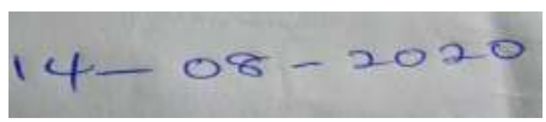
Signed 

Date 

DEDICATION

To my wife, Diekolola Adeola Ronke; children, Darasimi, Daniel, David, Dariola; father, Akinola Ebenezer, and mother, Agnes Abiola.

ACKNOWLEDGMENT

I would like to give glory to the Almighty God for giving me life, good health and the chance to reach this far. I sincerely thank my able supervisors, Dr. Omolade Adeleke (Main Supervisor), Dr. Sophia Mukorera and Professor. Phocenah Nyatanga (Co-supervisors), for their commitment, encouragement and guidance, mainly for their immense interest in this study. Without their invaluable supervision, all my efforts could have been in vain.

Special thanks goes to the former Vice-Chancellor, Professor Adebiyi Gregory Daramola and current Vice-Chancellor, Professor Joseph AdeolaFuwape, the Federal University of Technology, Akure, Ondo State, Nigeria for approving my NEEDS assessment research fund., I am also grateful to all academic and non-academic staff of the Department of Entrepreneurship and School of Management Technology (SMAT), Federal University of Technology, Akure, Ondo State and to my friends: Mrs.Duyilemi Josephine Fesola, Mr.FasanOlasehinde, Mr.Koladoye T.O., Irabor Henry, Martin Tino,Samuel OladunjoyeOdeyemi and School of Accounting, Economics and Finance (SAEF) Pietermaritzburg Postgraduate Cohort for their contribution.

In conclusion, special thanks to my father, Engineer Akinola Ebenezer Anifowose, mother, Mrs. Abiola Agnes Anifowose, father in law, Thompson Akinsulire mother in law, Mrs. Bentice Akinfolarin, and the entire family who allowed me to travel all the way from Nigeria to South Africa and supported me throughout my studies.

List of papers and presentation

Published/Accepted Papers

Anifowose Oladotun Larry (2019). Military expenditure and Institutional quality on BRICS inclusive growth based on World Bank Income classification, *ACTA Universities Danubius Economica*, Vol.15 Issue 3, page 20-39(Online ISSN: 2067-340X, Print ISSN 2065-017).

Anifowose Oladotun Larry, Omolade Adeleke& Sophia Mukorera (2019).Determinant for BRICS Military expenditure, *ACTA Universities Danubius Economica*, Vol.15 Issue 4, page 165- 190(Online ISSN: 2067-340X, Print ISSN 2065-017).

Anifowose Oladotun Larry & Phocenah Nyatanga (2019).Military Expenditure, Institutional and Inclusive Growth in South Africa, *ACTA Universities Danubius Economica*, Vol.15 Issue 5/, page 142-153 (Online ISSN: 2067-340X, Print ISSN 2065-017).

Referred conference presentation

Anifowose Oladotun Larry "The inclusive growth Index - A new measurement of the BRICS economic growth" paper presented at 23rd Annual Conference of the African Studies and Research Forum (ASRF) at Carolina Central University in Durham, North Carolina (U.S.A) March 28-30, 2019. (Skype Presentation).

Anifowose Oladotun Larry "The inclusive growth Index - A new measurement of the BRICS economic growth" paper presented at 4th interdisciplinary Research and Innovation Conference of Durban University of Technology held at Hilton Walnut Road, Durban, South Africa between 17 and 20 September 2019. (Oral Presentation).

ABSTRACT

This study investigated the relationship between military expenditure, institutional quality and inclusive growth in BRICS countries from 1970 to 2017. The increase in military expenditure by BRICS and the worsening inclusive growth indices such as unemployment, inequality, poverty, among others, necessitated the assessment of the relationship between military expenditure, institutional quality and inclusive growth in the BRICS countries. The study was carried out under three modular themes, which also form the objectives of the study, namely; the determinants of military expenditure, computation of inclusive growth index for the BRICS and the effects of military expenditure and institutional quality on the inclusive growth index of the BRICS countries. Panel data analysis was applied for the first objective, the Z-score technique was used for the second objective, which involved the computation of inclusive growth index for BRICS. The third objective was analysed using the Auto-Regressive Distributed Lags ARDL for BRICS countries by using times series data. The results obtained on the first objective revealed that BRICS military expenditure was significantly and majorly determined by Gross Domestic Product (GDP), trade balance, security web and inflation rate for the period under analysis. The results on Objective 2 revealed that the average inclusive growth index for Russia was the highest among the five BRICS countries, followed by China and Brazil. However, South Africa and India fell below the average inclusive growth index computed for BRICS. The results on Objective 3 showed that the impacts of military expenditure and institutional quality on inclusive growth varied among the BRICS countries. From the literature, the most effective way of assessment is to focus on the impact of the interactive form of military expenditure and institutional quality. Findings revealed that the interactive form of military expenditure and institutional quality (MCP) only have significant impact on inclusive growth of Russia because the coefficient is positive and significant. The coefficient is negative and significant for China and South Africa while the same coefficient is not significant at all in Brazil and India. This implies that Russia is the only country in the BRICS where the interaction of military expenditure and institutional quality supports inclusive growth. Notwithstanding, other control variables such as

education and population have statistically significant effects on inclusive growth in Brazil, China and South Africa. Results on India emerged as a complete outlier among the five as none of the variables, including the control variables was found to have a statistically significant relationship with inclusive growth. Again, the efforts in this study included a comparison of the inclusive growth results with those of economic growth and per capita income which have been used by previous studies to investigate the effect of military expenditure on the BRICS economy. The results showed that findings under the Inclusive Growth Model were the same for that of economic growth and per capita income for Russia, China and South Africa. However, there are some differences firstly; the negative effect of the interaction of military expenditure and institutional quality in Brazil which is significant on inclusive growth is not significant on economic growth and per capita income. This shows that the adverse effect of this variable was more felt on inclusive growth than economic growth in Brazil. Again, military expenditure and institutional quality showed a positive significant impact on India's economic growth and per capita income, but the effect on inclusive growth was not significant. Finally, levels of investment in all the countries have shown significant positive impacts on economic growth and per capita income, but the current levels of investments in the BRICS fail to drive inclusive growth significantly except in Russia. These results further confirmed that assessment of the impacts of military expenditure and institutional quality using economic growth and not inclusive growth might be misleading. Based on the findings from this study, the following recommendations are made: First, there is the need for improvement of synergy between military expenditures and institutional quality before the challenge of inclusive growth in the BRICS can be tackled effectively. Second, prioritising inclusive growth more than economic growth is more germane to the assessment of the effectiveness of military expenditure.

LIST OF ABBREVIATIONS

ABBREVIATION	MEANINGS
ADF	Augmented Dickey-Fuller
ARDL	Autoregressive Distributed Lag
BRICS	Brazil, Russia, India, China, South Africa
COR.	Corruption
EDU.	Education
EXCH.	Exchange Rate
EXT	External Threats
GDP	Gross Domestic Product
IGI	Inclusive Growth Index
INF.	Inflation rate
INQ	Institutional Quality
INT.	Internal Threats
INV.	Investment
MCP	The interactive variable of military expenditure and corruption
ME	Military Expenditure
OLS	Ordinary Least Square
PP	Phillips Perron Test
POP.	Population
SECWEB	Security Web
SIPRI	Stockholm International Peace Research
TB	Trade Balance

WDI	World Bank Development Indicator Online database

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CHAPTER 1

GENERAL INTRODUCTION

1.1 Background to the study

The effectiveness of military expenditure in stimulating economic growth has been a subject of debate among economic development researchers. For instance, BRICS (Brazil, Russia, India, China and South Africa) countries have assigned an enormous budget for the purchase of arms, ammunition and developing military related industries. According to the WorldBank (2009) and Jaarboek (2018), the amount assigned to military sector investment in BRICS countries has witnessed a significant increase when compared to other regional blocs and groupings. The rationale for investing in the military is that it will improve security and guarantee peace that will create an investment-friendly enabling environment that will, in turn, engender sustainable economic growth. These hypotheses have been supported by various theories of economic development and empirical studies.

According to the findings of Keynes(2016), Yildirim and Öcal, (2016) and Zhang et al., (2017a), among others, military expenditure might not promote economic growth as expected because an increase in military expenditures will only attract more external aggression that will hinder the growth process. Contrary to these authors' findings on military expenditure and growth, for instance, Acemoglu and Robinson(2013) believed that military expenditure will influence growth positively if the funds are effectively and efficiently managed. This assertion brought to the fore the relevance of the quality of institutions in the administration of military expenditure. This forms the crux for this study which is to investigate the validity for BRICS countries since it is apparent that regardless of the increasing military expenditure, BRICS countries are still ranked high among countries in the world with the prevalence of income inequalities.

On the other hand, many countries globally have witnessed outstanding growth rates over the years, yet they are confronted with severe problems of poverty, unemployment, and inequality, among others. BRICS countries are not exempted from this trend. For example BRICS countries have witnessed an average GDP growth rate of around 5 per cent spanning over two decades, yet they are still confronted with a rise in the unemployment rate, income disparity and poverty levels.

According to WIDER, (2013), in a report titled, "Growth is not working", they maintained that, basing the assessment of policies or government interventions on economic growth effect has been condemned because most of the impressive economic growth witnessed by some countries across the globe failed to have a trickling down effect in a way that it can lead to inclusive growth. For instance, within the last half decade, India has witnessed the most outstanding growth rates among the BRICS, yet as of 2017, it had the largest number of poor people in the world (WorldBank, 2009).

Several government institutions across the globe are, however, adjudged to be weak and infested with corruption which has hampered the growth process of various countries. BRICS is not an exemption in this ugly trend, as shown by the worsening corruption index of the BRICS countries in recent times (TMG, 2017). However, the interaction of military expenditure and institutional quality might provide a better platform for the assessment of the effect of military expenditure on growth. In addition, countries across the globe appear not to be cognizant of these as military expenditure data show that military spending has been on the rise globally including the BRICS, but little attention is paid to its effect on economic growth. This is why an assessment of the relationship between military expenditure and economic growth will remain a crucial research topic in years to come.

In conclusion, based on the preceding paragraphs, what is clear is that there are grey areas on the linkages between military expenditure, institutional quality and inclusive growth in the BRICS countries. For instance, what is the influence of military expenditure on BRICS inclusive growth? Does the quality of the institutions in BRICS countries affect inclusive growth? Will the interaction between the two have more effects on inclusive growth than their individual effect? Finally, is the inclusive growth a better way of assessing the effects of military expenditure? All these burning questions, among others, are important to this study.

1.2 Statement of the problem

The issue of the relationship between military expenditure and economic growth was popularised by the work of Benoit (1973), Benoit(1978) who emphasised the expected link between the two to be a symbiotic one. According to the study, it is expected that a safe country, guaranteed by sophisticated military apparatus, is important for peaceful co-existence that will create an enabling environment for economic activities to thrive, and in the long-run promote economic growth. On the other hand, the study further identified a thriving economy as a prerequisite for an efficient and effective military formation. However, going by the contradictory school of thought on the military expenditure impact on growth as shown under the background to the study, it appears that this symbiotic relationship is not evident in the BRICS where the unemployment and poverty rates have continued to grow unabatedly. Hence, this calls to question the assertions from the study as to whether the peaceful environment that the increased military expenditure is supposed to create has engendered the required peace that will improve inclusive growth in the BRICS countries. Literature has shown that BRICS countries have made a series of efforts to ensure that unemployment, inequality and poverty, which are symptoms of poor inclusive growth, are reduced through the creation of an enabling environment and promotion of ease of doing business in their regions (UNEP, 2017). An important aspect of the MDG which the BRICS also keyed into is the improvement in the ease of doing business among countries. This aspect of the MDG primarily rests on guaranteeing the security of investments in both property and humans. Consequently, as part of the commitments of the BRICS countries to this course, military expenditure has increased tremendously in recent years in their bid to fortify their security architectures in order to ensure peaceful environments that will drive growth.

However, these efforts appear not to be yielding the expected results as income inequality stood at 56.88 % in Brazil, 40.20 % in Russia, 33.63 % in India, 40 % in China and 61.71% in South Africa as reported in the statistics provided in the World Bank Development Online Database (2019). One of the reasons suggested in literature that might be responsible for this is the quality of the institutions in the BRICS countries. According to Asongu (2016), Méon and Sekkat(2005), institutional quality, which is required to manage and administer the funds meant for the military, is crucial for the assessment of the effects of military expenditure on inclusive growth.

The role of institutional quality has become an important question in research because it is believed that it is one of the factors causing international differences in inclusive growth. Gramlich (1994) and Bellos (2017) affirmed that in the mid-1990s, institutional quality had become a major component in the policy advice of international financial institutions (IFIs), wrapped into so-called good governance conditionality. Therefore, to actualise inclusive growth, an institutional role in managing the increasing public expenditure on the military is important. Wagner (1883), North (1990), North, (2006) and Acemoglu et al.(2005) assert that the pace of economic growth and development across countries can be attributed fundamentally to institutional quality as natural resource-endowed countries with better institutional quality are not affected by a resource curse. From all these submissions, it is clear that the role of institutional quality in achieving inclusive growth, and more importantly, in ensuring efficient utilisation of the rising military expenditure, so that it can drive inclusive growth, cannot be overemphasised.

The institutional quality in the BRICS countries has remained questionable over time. For instance, the corruption index in the BRICS countries has been on the rise recently, and this speaks volumes about the quality of the institutions in these countries. According to Transparency International (2009), mismanagement and misplacement of priorities, as far as military expenditure is concerned, exist in BRICS countries. But if this has been responsible for the seemingly unimpressive relationship between military expenditure and inclusive growth in BRICS, it remains a pertinent question to be answered. Another reason why the efforts of the BRICS countries in achieving inclusive growth seems not to be working is attributed to the fact that economic growth has been given more priority over inclusive growth in the past (Collier 2008). This is why most of the studies on military expenditure have investigated its impact on economic growth and not inclusive growth (McKay and Sumner, 2008). Economic growth is necessary but not sufficient to ensure better living standards for all citizens (Collier, 2008). The challenge is that the current growth in Brazil, Russia, India, China and South Africa (BRICS) countries is neither sustainable nor inclusive (Mckay and Sumner, 2008). However, inclusive growth has been identified as the type of growth that can engender reductions in poverty rate, inequality and unemployment, which are perennial problems of the BRICS countries. Therefore, it is obvious that an assessment of the impact of military expenditure on inclusive growth rather than economic growth would have been a better way of assessing the effectiveness of military expenditure. Hence computation of inclusive growth index for the BRICS, which is not in existence before, will provide an avenue to achieve this.

In conclusion, Alexander (2015) asserts that military expenditure alone can still be short of what can engender inclusive growth; hence, the incessant advocacy for an increase in military expenditure. However, the ability to reduce or increase military expenditure primarily rests on its determinants, which vary from region to region and economic bloc to economic bloc. Therefore, could the identification of these factors in BRICS countries affect military expenditure and enhance its effect on inclusive growth? This, and other questions raised previously, will be answered empirically in this study.

1.3 Research questions

The questions raised during the discussions on the statement of the problem, which the study will attempt to provide answers to are as follows:

1. What factors drive BRICS countries military expenditure?
2. What is the inclusive growth index for BRICS countries for the period of 1970 to 2017?
3. What is the role of military expenditure and institutional quality in achieving inclusive growth in BRICS countries?

1.4. Objectives of the study

The following are the objectives the research intends to achieve. These objectives are interdependent and are as follows:

1. to identify the factors that drive BRICS countries military expenditure;
2. to compute a better measurement of the inclusive growth index in BRICS countries; and
3. to explore the impact of military expenditure and institutional quality on inclusive growth in BRICS countries.

1.5 Justification for the study

Given the advocacy for an increase in military expenditure as explained under the statement of the problem, it is important to examine those shift factors that can either be responsible for the rise or fall in the military expenditure since they vary from country to country and economic bloc to economic bloc (Alexander, 2015). These research questions seek to unravel the factors that determine military expenditure in BRICS countries from 1970 to 2017.According to the existing literature on both developing and developed countries, the following noticeable factors have been identified are political, economic and security-related driven factors. More explicitly, these factors include economic factors (such as Gross Domestic Product (GDP) growth rate, population growth rate and arms trade; external and internal security threats and the political structure (such as democratic or authoritarian regime). Many studies in the past have focused mostly on macroeconomic and demographic features only while neglecting the security features. This study includes security indicators such as security web, external and internal security threats as part of the causative factors of military expenditure.

The need for the reduction in the emphasis on economic growth as a basis for assessing government policies and interventions is also very important. This is due to the fact that many countries that have achieved promising economic growth in recent times are still grappling with problems of poverty, unemployment and inequality necessitate shifting of attention to inclusive growth (WIDER, 2013). Inclusive growth precludes minimum levels of poverty, unemployment and inequality; therefore, it serves as a better assessment of the effectiveness of both military expenditure and institutional quality in the BRICS countries. Therefore, computation of inclusive growth index provides a platform that incorporates the socio-economic variables omitted in economic growth rate and in human development index computation. Notwithstanding, getting an appropriate inclusive growth index has witnessed some research activities over the years. Anand et al. (2013) and Anand and Sen (1994) used three indicators to compute inclusive growth for the International Monetary Fund for accessing the development of countries. Again, OECD (2013) in their own empirical work included some indicators that are different from Anand et al., (2013), Anand and Sen, (1994), yet, only three indicators were also used. More so, it has been emphasised that poverty rates, investment and employment to population are also important indicators of inclusive growth, but they are not included in the previous studies (Anand and Sen, (1994). Consequently, this study will develop an inclusive growth index, which is a composition of five economic indicators and five social indicators for BRICS countries from 1970 to 2017. This will give a broader perspective of computing inclusive growth index unlike the narrow approach embraced by previous studies.

In conclusion, there has been persistent rise in military expenditure in the BRICS countries, yet poverty, unemployment and inequality persist. These call to question the role of military expenditure in promoting inclusive growth in the BRICS since poverty, unemployment and inequality are all inclusive growth indicators. The scenario has also called to question the relevance of institutional quality in the BRICS since the institutions are required to manage the funds released for military purposes. From literature, military expenditure could have both positive and negative impacts on inclusive growth in developing countries. These impacts could be direct and indirect, depending on the prevailing institutional environment. For instance, military expenditure might drive BRICS countries' inclusive growth if there is a strong institutional quality that encourages channelling of military expenditure into productive military industries, which in return, generates income through the sales of arms. Military expenditure might also retard inclusive growth due to weak institutions, which encourage rent-seeking and corrupt activities. Consequently, assessing the effect of the interactions of military expenditure and institutional quality on inclusive growth in the BRICS is germane to this study.

1.6 Scope of the study

The research explores the impact of military expenditure, institutional quality on the inclusive growth of BRICS countries from 1970 to 2017. The starting year 1970 was selected based on data availability for key variables used in the study while 2018, 2019 and 2020 were excluded based on unavailability of data for key variables of the study as at the time of writing this thesis. Also, BRICS countries were selected for this study because of their peculiar nature as one of the economic blocs where the relationship among military expenditure, intuitional quality and inclusive growth requires investigation especially due to the fact that military expenditure has been on the rise in the BRICS and yet unemployment rate, poverty rate and income inequalities have all been rising unabatedly in these countries as well.

1.7 Significance of the study

The findings of this study will provide some significant contributions to the fields of knowledge in development economics, political science and peace and conflict studies. These contributions include the followings

1. The computation of BRICS inclusive growth Index (IGI) will be the first of its kind in development economics for BRICS countries. This is because global attention of development economics researchers has shifted to the concept of inclusive growth since economic growth is not working.
2. For the BRICS countries to unravel the pull and push factors of military expenditure which is very important for controlling the expenditure on the military, assessment of the determinants of military expenditure becomes expedient to the study.
3. For the BRICS countries to be able to assess the progress made so far on their quest for inclusive growth the computation of the inclusive growth index is done in the study and it will give a clearer picture of where the BRICS countries stand currently on the scale of the inclusive growth index.

4. For assessment of the BRICS by international communities and BRICS themselves on the level of synergy currently existing between their institutional quality and military expenditures, it is necessary to assess the interactive impacts of military expenditure and institutional quality. However, it has been emphasized that military expenditure can better lead to inclusive growth with good institutional quality.

1.8 List of key terminologies used in this thesis

This section presents the key terminologies used during the course of writing this thesis.

1. **Military expenditure** –is the total monies a central government spent on its military sector which covers its personnel salaries, funds for the purchase of arms, building of military infrastructures such as barracks and offices and related industries. For this study, military expenditure as a percentage share of Gross Domestic Product (GDP) is used for measuring military expenditure for all the BRICS countries.
2. **Institutional Quality**- is a measure which indicates the quality of governance and institutions in a country. For this study, institutional quality is measured using corruption to determine the quality of governance and institutions in each of the BRICS countries. For example, high corruption denotes weak governance and institution while low corruption denotes strong governance and institution.
3. **Inclusive growth**– Refers to economic growth that creates opportunity for all segments of the population and distributes the dividends of increased prosperity, both in monetary and non – monetary terms, fairly across society. For this study to measure inclusive growth in BRICS countries, an index will be computed for each of the BRICS countries.
4. **BRICS countries-**BRICS is the acronym coined for an association of five major emerging national economies: Brazil, Russia, India, China and South Africa. Originally the first four were grouped as BRIC (or the BRICs”), before the induction of South Africa in 2010.

1.9 Structure of the Thesis

The structure of the thesis is outlined as follows: Chapter 1 presents the background of the study, problem statement, research objectives and questions, justification of study and structure of the thesis. Chapter 2 provides detailed background information on BRICS military expenditure, institutional quality and inclusive growth trends from 1970 to 2017. Chapter 3 critically reviews the theoretical and relevant empirical literature relating to the determinants of military expenditure. Chapter 4 presents the datasets and methodologies used in investigating the determinant of military expenditure in BRICS countries; computation of an inclusive growth index for BRICS countries and investigating the effect of military expenditure, institutional quality and inclusive growth in BRICS countries. Chapter 5 presents the regression estimation output and analysis of all the three objectives outlined in this study. Chapter 6 discusses the research findings in detail and possible economic implications to BRICS countries. Chapter 7 summarises the thesis, offers possible recommendations, and areas of future research.

1.9 Limitation of the study

Like any other research, this study has some limitations. Firstly, the study only covers the periods of 1970 to 2017 and for BRICS countries only at the time of writing this thesis. In conclusion, this restriction will not in any way diminish the content and purpose of the study.

CHAPTER 2

2.0. MILITARY EXPENDITURE, INSTITUTIONAL QUALITY AND INCLUSIVE GROWTH IN BRICS COUNTRIES

This chapter commences with the socio-economic view of BRICS countries, section two presents BRICS countries military expenditure, section three presents institutional quality of the BRICS countries', section four presents economic development in BRICS countries while section five presents poverty and other socioeconomic problems within the BRICS countries.

2.1 Socio-economic View of BRICS countries

In 2001, Jim O'Neill of Goldman Sachs created the term BRIC, and later South Africa was included in 2010. The term BRICS denotes Brazil, Russia, India, China and South Africa. According to (JAARBOEK, 2018, SIPRI, 2019), BRICS countries account for about 26.11 per cent of total world military expenditure and have a total military expenditure of US$ 391391 million in constant 2017 price, which is among the top five in the world and represents over 3.6 billion people, or about 41% of the world population. The BRICS economies combined nominal GDP of US$ 16.6 trillion, equivalent to approximately 22% of the gross world product, and have a combined GDP (PPP) of around US $ 37 trillion and an estimated US $ 4 trillion in combined foreign reserves.

By virtue of their large sizes and markets, the creation of this body was considered important for the economic development of the world. Although the five-member states are members of different colonies, they have strong historical and cultural relationships. Furthermore, they are geographically distant, but strategically located and are either the largest or second-largest sub-regional economic powerhouses of their respective geographical locations as presented in Figure 2.1 below.

Figure 2.3: Map of BRICS countries

Source: World Bank 2018

According to (JAARBOEK, 2018, WorldBank, 2009), income classification reveals that BRICS countries are a combination of high and middle income per capita, and carry the burden of large military expenditure. These countries have different levels of economic growth and resources. Table 2.2 gives a snapshot of the selected basic macroeconomic characteristics of these countries. Furthermore, the BRICS countries represent 27 per cent of the world's land area, which covers a surface area of about 39,000,000 square kilometres. The population is 41 per cent of the world's total population. The climatic and geographical conditions of these countries range from equatorial rain forests to hot desert belt (Jones, 2002).

2.1.1 Economic Potential of BRICS Countries

The well-known, static and dynamic effects of economic integration can be influenced for better or worse by economic peculiarities of geopolitical or geo-cultural environments. In this view, this section focuses on the economic potential of BRICS in the long-run.

According to Akpan et al. (2014), the following are the economic potential of BRICS countries.

First, is the trade creation potential. BRICS offers a substantial potential for trade creation. The wide range of human, mineral, financial and entrepreneurial resources existing in the region has not been fully utilised. With a large market of over 3.1 billion inhabitants and a population growth rate of about 2.5%, a wide market would be assured for any well-designated and managed industry. For example, empirical studies of bilateral industrial integration between China and Russia reveal that their welfare gains were 33 and 22% of gross output, respectively. There are indications that a large scale integration such as BRICS can even increase such gains for all member countries.

In addition, the economic potential of BRICS includes the potential for dynamic gains in terms of large scale economies and the opportunity for long term planning for growth. In terms of large scale economies, the choice of optimal locations for integration projects, based on economic and technical considerations and accessibility to inputs in the regional market would ensure a substantial fall in per-unit cost of outputs. For coordinated industrial development, BRICS would allow ordering priorities for the terms of the projects to be exploited. Such coordinated development could avoid uneconomic duplication and wastage.

Furthermore, taking a collective approach is also a potential economic benefit to BRICS in the long-run, which is derived from the old principle of “united we stand, divided we fall”. This is a collective way of fighting development problems. According to (Akpan et al.,(2014), having collective bargaining within the context of the BRICS would, therefore:

(1) improve export market prospects for member countries’ primary products;
(2) strengthen the negotiations position for technology transfer from multinational companies and developed countries;
(3) attract meaningful aid and technical assistance programs from multilateral agencies; and
(4) enable member countries to fight region-wide economic problems such as smuggling and dumping, with coordinated efforts.

The BRICS countries depend largely on mineral and agricultural production, which makes them susceptible to commodity and natural shocks such as droughts and international glut. Furthermore, agriculture, mineral resources such as diamonds, gold, iron ore, and bauxite can be found in countries like South Africa, India, while large deposits of petroleum and bauxite can be found in Russia. The industrial manufacturing and processing are being promoted in all BRICS member countries at different levels. However, the export of primary agricultural produce for foreign exchange is still the leading sector of the domestic economies (see Table 2.1).

Table 2.1: BRICS countries

No.	Countries	Main Exports
1	Brazil	Iron ore, crude oil, soybeans, sugar and poultry
2	Russia	Oil and petroleum, gas, coal, timber, machinery and equipment
3	India	Minerals, machinery, organic chemicals precious metals
4	China	Cotton, tea, rice, soybeans, crude oil and iron ore
5	South Africa	Platinum, coal, cars, gold and iron ore

Source: Food Agricultural Organisation (F.A.O.), United Nations International Trade Statistics online database (2018)

Table 2.2: BRICS selected economic indicator

Country	Population (millions) 2016	GDP Growth (annual %) (2009-2017) Average	Military Expenditure (% of GDP) (2009-2017) Average	Military Expenditure (% of central government expenditure) 2009-2017	Military Expenditure (at Current USD (2009-2017) Average	Arms Export US Dollars (2009-2017) US $	Inflation, consumer prices (annual %) 2009-2017	Arms Import US Dollars (2009-2017) US $
Brazil	207	1.20	1.41	3.70	30470586503	59666666.67	6.19	219777777,8
Russia	144	0.74	4.20	-	70778630551	6625888889	8.09	89777777,78
India	132	7.40	2.57	9.40	50204195950	28125000	7.98	3423444444
China	137	8.11	1.91	6.71	1,72858E+11	1521555556	2.24	1224666667
South Africa	56	1.61	1.11	3.48	3906171615	105333333.3	5,59	89500000
Total	**676**							

Source: World Bank (2019) *World Development Indicators* Online database in annual figures and in percentages

2.1.2 Socio-Economic Problems of BRICS Countries

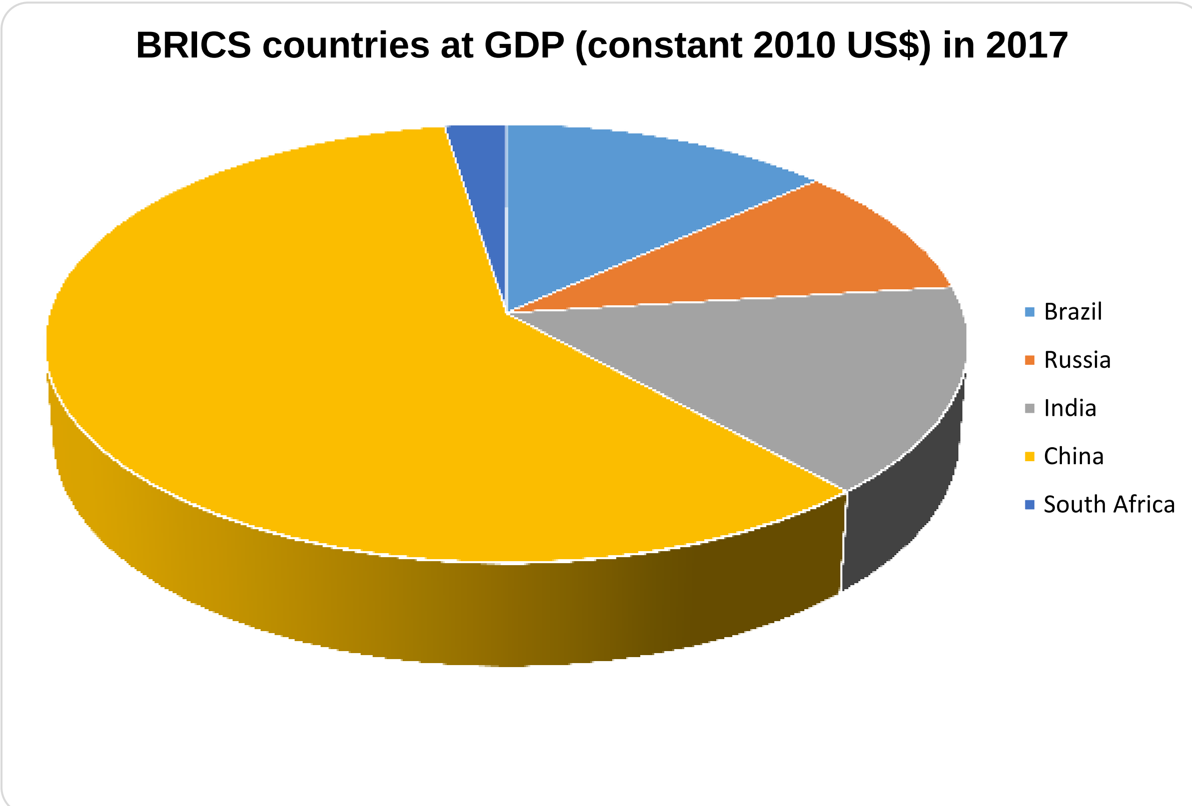
Despite the great potentials that BRICS has, the problems facing it are enormous and similar. A clear identification of these problems is the first step in any search for effective solutions. Some of the major economic problems facing BRICS include huge internal and external security challenges. For instance, the combined military expenditure of the BRICS member states is currently put at 391 trillion in current US dollars, with China the second-highest military spender country in the world. Military expenditure is expected to swallow, on average, about 15% of the central government expenditure of BRICS countries. This also means that three times more resources will be allocated to military expenditure than to education and health[1].

In addition, there are other serious structural problems with multiple dimensions. These include problems of low capita income, low or negative rates of savings, investment and GDP growth, high population growth rate, chronic balance of payment deficit, high rates of inflation and unemployment. Another noticeable problem is planning conflicts. Each member undertakes economic planning in terms of its national goals without reference to the BRICS goals. This is likely to make the selection of integration projects with trade opportunities difficult. Furthermore, members of BRICS are plagued with massive corruption. Political instabilities in countries like South Africa and Russia are substantially attributed to corruption. These corrupt activities tend to undermine the internal and external balance of members' economies. In South Africa, widespread smuggling and unfriendly government policies (land ownership) have led to heavy losses of jobs in industries like textiles and cigarettes. The foreign exchange drains experienced in recent years are partially attributed to black-marketers in foreign exchange.

In conclusion, the population growth is about 2.5 per cent, with a higher proportion under the age of 15. The literacy rate is very low among the population, and the infant mortality rate ranges from 64 to 163 per thousand live births. Figure 2.2 below shows the share of each BRICS country in terms of Gross Domestic Product, with China contributing about 59% of the GDP to the BRICS community.

[1]BRICS Annual Bulletin (2010).

Figure 2.4: GDP share of each BRICS country in 2017



Source: World Bank (2018) *World Development Indicators* Online database

2.1.3 Strengths and Weaknesses of BRICS

There are no specially defined strengths and weaknesses of BRICS as a group. However, the strengths and weaknesses of each member state may be used to define them for the group. In this regard, the following strengths and weaknesses are the suggestions by the author based on the observation he has made on the subject. These reports are BRICS joint statistical publications of 2013, 2014 and 2015, BRICS report 2012, the Gauteng BRICS Report of 2013 and the Global Competitiveness Report of 2012, 2013 and 2014.

Table 2.3: strengths and weaknesses of BRICS

Country	Strength	Weakness
Brazil	Politically stable Model Democracy Relatively low unemployment rate	Lacking economic infrastructure Poor investment in roads, rail ports and energy
Russia	Permanent member of UNSC Nuclear power Strong military Relatively stable political environment but sometimes faced with pockets of sanctions as well as heavily linked with international war either as an arms sponsor or financier. Relatively good foreign investment	Becoming an authoritarian state Suspended from the G8 and facing sanctions Stagnant economic growth
India	Strong information and technology and service sector Has coal, manganese and natural gas Huge human capital base Model democracy Politically stable Moderate foreign investment Large market base	Large public debts Poor infrastructure High unemployment rate
China	Permanent member of UNSC Largest economy in BRICS BRICS Bank headquarters in Shanghai Very strong manufacturing Strong foreign financial investment Most industrialized economy	Non-democratic state (one party state) Increasing income inequality causing social tensions Currency undervaluation Environmental insecurity
South Africa	Best constitution in the world Unstable political environment. For instance, the rate of xenophobic attacks on Nigerians and other nationals and land without compensation with white communities. Democratic state	High level of unemployment Most unequal society in the world Labour unrest threating the country's backbone of the economy (the mines) Poor education system Smallest economy in BRICS

	Fair electoral system Member of the G20, UNSC and BRICS Regional leader in Sub-Sahara Africa	

Source: Compilation by Author based on Gauteng BRICS Report 2013, BRICS Joint Statistical Publications, 2013-2014, Global Competitive Index 2012/1

2.2 Military Expenditure in BRICS Countries Over the Period

Institute (2018), SIPRI (2019) affirm that BRICS countries account for about 26.11 per cent of total world military expenditure as well as control 32% of the world's Gross Domestic Product GDP and have experienced a high level of both internal and external security challenges. The intra-conflict rivalry among BRICS countries also makes this empirical investigation an interesting one to explore. For example, conflicts between India and China have been confirmed and as the two countries are perceived as the world's fast-growing powerhouse countries; their relationship synergy plays a significant influence in the political domain. Finally, on a general note, the world's military expenditure has declined due to the peace dividend. However, BRICS countries still assign a high percentage of their central government budgetary allocation to the military sector and industries despite witnessing harsh socio-economic inclusive growth challenges. For instance, BRICS countries are experiencing downturned GDP growth rates coupled with high unemployment rates, crime rates, high poverty rates, high-income disparity, climate change and a host of other challenges.

Military expenditure in BRICS countries plays a pivotal role in government expenditure which often gulps a huge percentage in budgetary allocation compared to other critical sectors, for example, the health and education sectors. It is oftentimes among the first four major sectors in budgetary allocation decisions. Many development economists have argued that increased military expenditure crowds out both public and private investment, and consequently hampers growth. However, this assertion is not valid for all countries as confirmed by some scholars Benoit (1973), Yildirim and Öcal (2016), Zhang et al. (2017a) . For example, Benoit (1973) confirmed that military expenditure stimulates economic prosperity in emerging countries. On the other hand, some scholars have disagreed with Benoit (1973) school of thought. Some of the prominent antagonist scholars are Dash et al.,(2016), Künü et al. (2016),Malizard (2016).

On a general note, the world's military expenditure has decreased after the Cold war because of the peace dividend. However, in recent times, military expenditure has increased as the BRICS countries still allocate a huge amount from their budgetary allocation to the military sector as shown below.

Table 2.4: BRICS' military expenditure and its central government expenditure 2013

Countries	Military expenditure of GDP 2013	Military expenditure of Central Government Expenditure 2013
Brazil	1.3	4
Russia	3.9	15
India	2.5	14
China	1.8	15
South Africa	1.1	3.2

Source: World Bank (2017) *World Development Indicators* Online database

A reduction of investment and expenditure in education, health and other critical sectors, BRICS countries' inclusive growth (especially those with double-digit military expenditure percentage of its Central Government Expenditure) might be jeopardised by high military expenditure. As a result, the impact of military expenditure on inclusive growth in BRICS countries needs to be explored and analysed carefully.

2.2.3 BRICS Military Expenditure Ranking and Pattern

BRICS countries are one of the largest and most powerful economic blocs with over 500 billion people and has one of the largest combined military force in the world. The BRICS countries have a combined military expenditure of USD 348942 SIPRI (2017) in constant 2016 prices. The BRICS bloc is ranked the largest in terms of PPP dollar.

Table 2.5: BRICS Military expenditure ranking and pattern

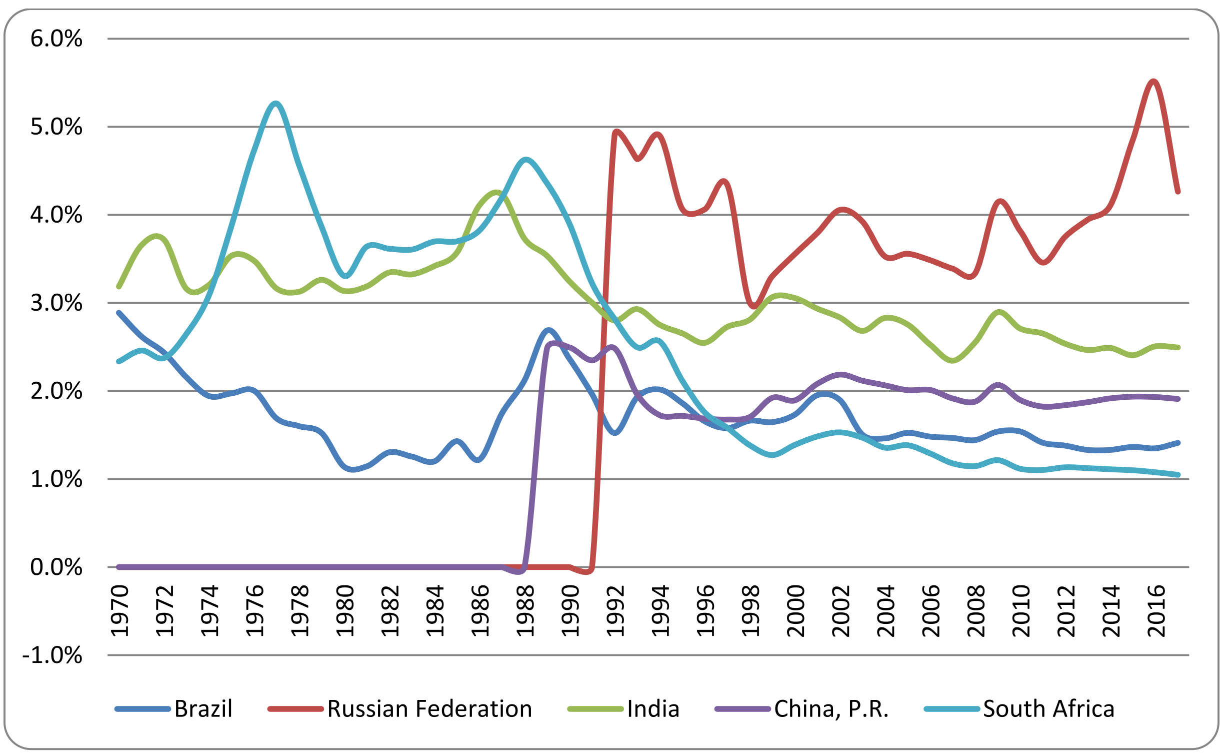
2017 / Countries	World country ranking by military expenditure	Military expenditure by constant million USD
Brazil	11th	25751.34
Russia	4th	55327.10

India	5th	59757.10
China	2nd	228173.00
South Africa	43rd	3110.20
Total		348942.40

Source: Stockholm International Peace Research Institute. (2017), SIPRI Report Shifting Trend in Global Military Expenditures. Available from: http://www.dw.de/sipri-reports. [Last accessed on 2017 Oct 03].

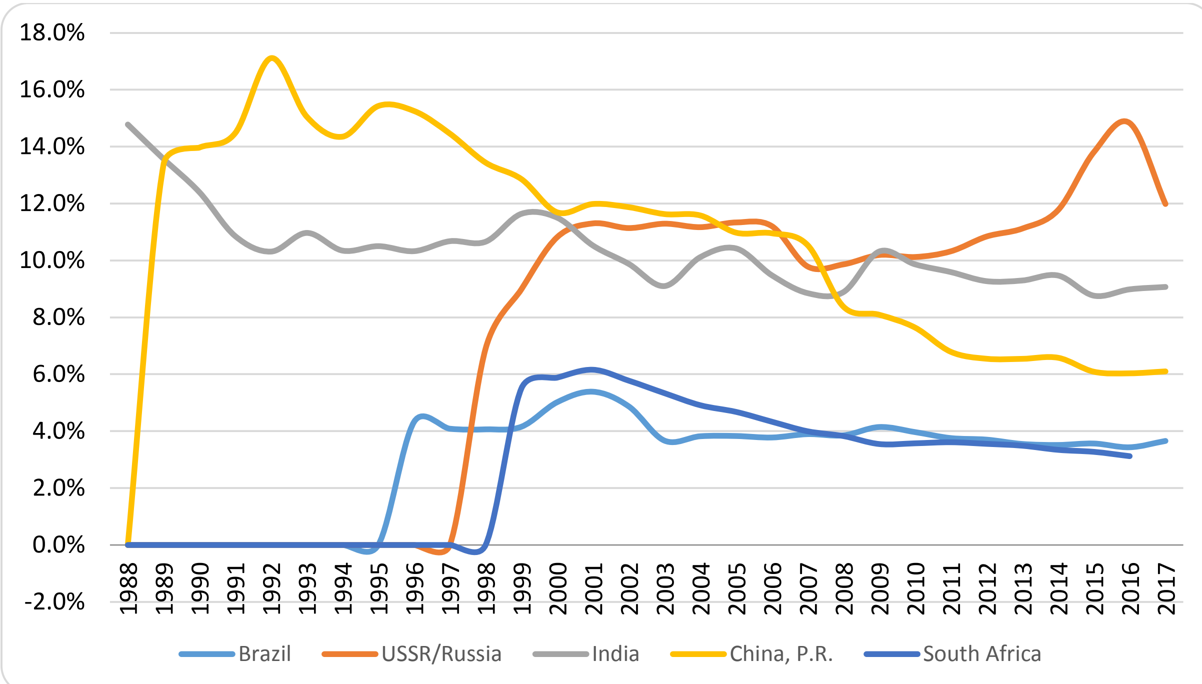
BRICS countries have demonstrated a sustained increase in military expenditure and contributed to growth in World military expenditure in recent years. BRICS countries' real military expenditure has been rising from 1946 to 2017. The BRICS combined military expenditure has risen from 1.0% in 1984 to 1.8 in 2017, which outweighs the NATO benchmark requirement for development.

Figure 2.3 -BRICS Military expenditure (% of GDP) 1970- 2017



Source: Stockholm International Peace Research Institute. (2017), SIPRI Report Shifting Trend in Global Military Expenditures. Available from: http://www.dw.de/sipri-reports. [Last accessed on 2017 Oct 03].

Figure 2.4 - BRICS countries' military expenditure (military expenditure as a percentage of GDP)



Source: Stockholm International Peace Research Institute. (2017), SIPRI Report Shifting Trend in Global Military Expenditures. Available from: http://www.dw.de/sipri-reports. [Last accessed on 2017 Oct 03].

Figure 2.4, above depicts the trends of BRICS countries' military expenditure (military expenditure as a percentage of GDP). The range of BRICS military expenditure is 0.0% to 6.0%.

2.2.3 Chronology Of Wars Involving BRICS Countries From 1971 To Present

This section presents both wars/conflicts as the main determinants for military expenditure in BRICS countries. Table 2.6 below provides a chronological start and finish dates, names of conflicts and BRICS countries involved consequently stimulating increased military expenditure from 1970 to 2017.

Table 2.6: Chronology of wars involving BRICS countries from 1971 to present

Years		Name of conflicts	Victorious side	Defeated side
Start	**Finish**			
1971	1971	Indo-Pakistan wars and Conflicts	India and Bangladesh	Pakistan
1974	1974	Battle of the Parcel Islands	China	South Vietnam
1975	2002	Angolan Civil Wars	Russia and others	South Africa and others
1975	**On-going***	Cabinda war	Russia	FLEC
1977	1978	Ethio - Egyptian war	Russia	Somalia
1979	1990	Sino-Vietnamese war	China	Vietnam
1979	1989	Soviet- Afghan war	Tehran Eight	Russia
1983	2009	Sri-Lankan Civil war	India (1987-1990)	Tamil Tigers
1984	1987	Siachen Conflict	India	Pakistan
1989	**On-going ***	Insurgency in Jammu and Kashmir(part of the Kashmir conflict)	India	Harket-ul-Jihad Isau and others
1991	2002	Sierra-Leone Civil war	South Africa mercenaries and Nigeria ECONOMG and others	Revolutionary United Front and others
1991	1993	Georgian civil	Georgian and Russia	Zviadist
1992	1992	East Progorodry conflicts	Russian army and others	Ingush militia
1992	1992	War of Transnistria	Russia 14^{th}Army and others	Moldova and others
1992	1993	War in Abkhazia (1992-1993)	Russia and others	Afghanistan
1993	**On-going ***	Ethnic conflict in Nagaland	India and others	Rebel forces
1993	1993	1993 Russian constitutional crisis	President of Russia and others	Supreme Soviet of Russia and others
1984	**On-going***	Armenia-Azerbaijan border conflict	Russia supports	Azerbaijan supported by

			Armenia	Turkey
1984	1996	First Chechen	The Chechen Republic of Ichkeria and others	Russia
1996	2006	Nepalese civil war	China support Communist Party of Nepal	India support the Kingdom of Nepal
1996	2001	Civil in Afghanistan	India supports the USA and others	Al-Qaeda and others
1999	1999	Kargi War (part of Indo Pakistan war)	India	Pakistan
1999	1999	War of Dagestan	Russia	IIPB and Shura of Dagestan
1999	2009	Second Chechen War	Russia and Republic of Chechnya	Republic of Ichker and others
1996	**On-going***	South Africa farm attacks	South Africans	Foreign nationals and South Africans
2002	2007	First Ivorian civil war	Russia support	France / UN
2002	On-going	Taliban Insurgency	India Coalition forces and others	Taliban
2007	2015	War in Ingushetia	Russia and others	Caucasus Emirate and others
2008	2008	Russo-Georgia	Russia and others	Georgia
2009	**On-going***	Insurgency in the North Caucaus	Russia	Caucasus Emirate
2011	**On-going***	Syrian civil war	Russia supports Syria	The USA supported the Free Syrian Army
2012	2013	M23 rebellion	South Africa and others	March 23 movement

Sources: (Posen, 1986), Correlate of Wars (2017)

2.2.4 Arms Production and BRICS countries

This section presents the arm production capacity of BRICS countries from 1970 to 2010.

2.2.4.1 Arms Production

A new and interesting development in the defense-related activities of BRICS countries is the growing importance attached to domestic arms production. (Wulf and Ball (1983) list about fifteen countries with a reasonable volume of armament manufactures within the economy, while another seventeen produce some (albeit minor) armament. For countries like India, Israel and Brazil, the fabrication of armaments is a major component of the industrialisation programmes, and the latter two have also entered significantly into export markets. Even though the total volume of such production is still a tiny percentage of world output, it is rising and has important implications for the domestic economy of these countries. A careful analysis of the different facets of this phenomenon is, therefore, necessary. Table 2.7 below gives information on the volume of arms output for specific regions.

Table 2.7: Armament production export (in US $ billion 2010 prices)

	1970	1980	1990	2000	2010
East Asia and the Pacific			1255000000		
South Asia			85000000	24000000	
Sub-Sahara Africa	3000000				
Brazil		156000000	96000000		151000000
Russia				4503000000	6091000000
India			3000000	21000000	5000000
China	893000000	949000000	941000000	302000000	1479000000
South Africa	3000000	39000000		20000000	235000000

Source: Stockholm International Peace Research Institute (SIPRI) (2018)

This section presents an in-depth study of arms production in BRICS countries. First, the section discusses the motives for initiating domestic manufacture of arms. Thereafter, the section analyses the links between weapons production and the industrialisation strategy followed by the relevant countries. The section specifically distinguishes between countries following inward-looking import substitution policies and those in outward-looking import substitution policies and those involved in outward-looking export promotion strategies. Within this framework, it will be seen that there is a close connection between developmental policy and armament manufacture. This leads to a discussion of the linkages between the industrial base of the economy and defence production sectors. In particular, those industries that constitute the

Potential Capacity for Defence (PCD) (Kennedy, 1974), and have close inter-industrial linkages with arms need to be analysed with care. These are the industries that are potentially capable of contributing to and benefitting from arms manufacturing. As we shall observe, both backward and forward linkages can be established. The PCD group of industries forms the basic industrial framework, which constitutes the necessary conditions for the establishment and expansion of domestic arms production. On the other hand, inter-industrial demand and technological spin-offs from the defence industries may help in boosting the output of the PCP group. This is one of the major reasons given in support of defence production within the economy, and if the spin-off effects are significant, it could be a major positive point in favour of the domestic manufacture of weapons.

The final section will concentrate on the resource and allocation costs of military industrialisation. In particular, the initial foreign exchange requirements for such activities can be quite substantial. In fact, imports may even continue, long after what is warranted by import-substituting strategies, due to the technological characteristics of modern weapons systems and rapid obsolescence. Some overall conclusions will then be drawn on the causes, rationale, impact, benefit and cost of arms production in the NICs.

2.2.4.2. Reasons For Establishing Arms Production

Many motives lie behind the decision taken by various countries to establish the domestic production of arms. The first and most often cited reason is political. As Pierre (2014) notes, almost all of the countries that have embarked upon creating an arms-manufacturing industry have done this for political and security reasons. They wish to become independent by becoming self-sufficient. Clearly, by its nature, arms production is expected to be motivated by political, security and military factors.

Threat perceptions are important in perpetuating arms race in emerging countries (Deger and Sen, 1990). These threats - occasionally real, more often potential - can also induce a country with access to relevant technology to produce arms within the economy. Independence from major suppliers and superpowers, who may have an undue influence on the receipt country during a time of tension and hostilities, is a powerful inducement for the domestic manufacture of at least basic weapons. The Indian ordinance factory system which was languishing in the late

1950s was dramatically revitalised during the Sino-Indian war, and from the mid-1960s became highly organised in the manufacture of relatively sophisticated weapons.

Coupled with perceived threats, it has been claimed that some countries have established arms production as a result of their implicit desire for regional dominance (Wulf and Ball, 1983). Examples are India in southern Asia, Brazil in Latin America, and South Africa in sub-Saharan Africa. Since the major suppliers have been known to cut off resupply during a war (witness the embargoes imposed on Greece-Turkey, India-Pakistan, Iran-Iraq), a country going for regional arms superiority will find it more useful to have domestic sources of supply at hand. In a different form, this motive may resurface in the form of "prestige" attached to arms manufacture at home and the concomitant power that a dictatorial military government may have.

Finally, certain countries, such as South Africa, find themselves ostracised by sizeable sections of the international community. These countries have often invested large sums of resources for the local manufacture of weapons than relying on undependable imports.

Thus, politico-security considerations play an important role in determining whether nations attempt the domestic production of weapons, if technologically feasible. The fifteen largest arms producers among emerging countries - Israel, India, Brazil, South Africa, Turkey, Indonesia, to mention a few - can be slotted into one of the groups mentioned above. However, these political motives can be overemphasised, and there is always the danger that other causes, which may play a very big role in arms production, may be overlooked.

Important economic considerations are often cited as providing the major motivation behind armament production. These can be grouped under three categories. First, there may be technological spin-offs from defence industrialisation. These include research and development, increased productivity of the labour force, skill formation through learning by doing and familiarisation with advanced technology. Second, emerging countries often suffer from excess capacity, thus military industries may have backward linkages and create effective demand for inputs produced by horizontally integrated civilian industrial systems. Third, as the international trade in arms increases and weapons tend to be sold rather than given as grants or aid, the foreign exchange costs are becoming prohibitive. Import-substituting domestic weapons manufacture may reduce import and gain foreign exchange. The next stage of arms exports has also become relevant for countries like Brazil, Israel and South Korea. Thus, foreign exchange earned directly through export or indirectly through import saved, can be a major economic motive for local production.

Even though a few emerging countries produce arms, the technology is usually imported and the supplier states (DCs) are also involved in the production process (Carranza, 1983). The role of such suppliers in technology transfer and helping to set up plants is rather important and often controversial. (Wulf and Ball (1983) believe that developed countries, for political reasons, will continue to export arms production technology and thus help developing nations to set-up their own weapons manufacturers.

This is partly due to geopolitical interest and the desire to feed the recent military-industrial aspirations of clients or friendly regimes. However, the recipients have their own political power. Since the market is essentially oligopolistic, recipients have a choice of countries from which they can buy the technology inputs for home production of arms. Thus, they can bargain intensively, and the seller may finally have to agree to their demands in order not to lose substantial economic benefits, trading profits or political control. Thus in principle, given resource constraints, it is easy for emerging countries to set up their own factories producing weapons. However, Pierre (2014) takes the opposite view.

Given the prevalence of armed conflict in emerging countries, the attempt of superpowers to curb the problem of moral hazard, it is possible that suppliers will be careful not to allow indiscriminate use of defence technology by client countries. It is believed that co-production and foreign licensing agreements by defence firms in the larger exporting countries (e.g. the U.S, the U.K, France, Germany) will be very carefully scrutinised and often stopped by the exporter government: 'the major suppliers have begun to examine requests more critically and are becoming less supportive of the ambitions of emerging nations to develop their own weapon capabilities" (Pierre, 2014).

Essentially, the debate is inconclusive because case studies can be used to substantiate either viewpoint. Overall, we tend to agree that the major constraints on expanding arms production lie on the demand side rather than on the supply side (from DCs). The US embargoes on military export to India (after the Indo-Pakistan wars) have not prevented India from building up a substantial armaments industry with the help of Russia. Therefore, the major issues in arms production for emerging countries are the opportunity costs of resources involved, the various types of spin-offs that may occur, and finally the potential capacity of the civilian industrial sector to sustain a military-industrial complex. These are the central problems; the behaviour of supplier countries in providing technology, know-how and licensing arrangements.

2.3. Institutional quality of BRICS countries

"If we do not kill corruption, corruption will kill us "
(Anonymously, 2017)

"You thief cent you are in prison;
You thief 10 million this patriotism.
You are given chieftaincy and national honour
You steal even bigger; this is referred to as rumour
(Wole Soyinka, 1985 literature Nobel Prize winner, Unlimited Liability Company, 1983)

Over the past 40 years, corruption has become the prism through which BRICS countries are seen the world over. The most recent report (2017) on how the Corruption Perception Index (CPI) published by Transparency International (TI) ranks BRICS countries is presented below. The ranking score criteria are as follows: 100-50 is referred to as less corrupt countries while 49-0 is referred to as more corrupt countries.

Table 2.8: Corruption Perception Index (CPI) and the World Bank Income classification 2017

S/N	Countries	CPI 2017 Ranking score	2017 World Bank income Classification
1	Brazil	40	Upper Middle income
2	Russia	29	Upper Middle income
3	India	40	Lower Middle income
4	China	40	Upper Middle income
5	South Africa	45	Upper Middle income

Source: Corruption Perception Index (CPI) ranking 2017, World Bank 2017

Therefore, based on the above CPI 2017 rankings score, all BRICS countries are regarded as corrupt countries. However, according to World Bank countries classification as presented above, four out of BRICS club countries are ranked Upper Middle income countries except for India...

2.3.1 Types Of Corruption In BRICS Countries

In the development literature, corruption is typically defined roughly as the abuse of public office or entrusted power for private gain (Bank, 1997, Transparency International, 2009). Public office is abused for private gain when an official accepts, solicits, or extorts a bribe, or when private agents actively offer bribes to circumvent public policies and processes for competitive advantage and profit. Public office can be abused for personal benefit, even if no bribery occurs, through patronage and nepotism, the theft of state assets, or the diversion of state revenues (Bank, 1997). Corruption includes bribery, extortion, influence peddling, nepotism, fraud, the use of "speed money" and embezzlement.

It should be noted that corruption is not limited to the official domain, and there is no suggestion in this paper that official corruption is the only important aspect. The private sector is as prone as the public sector to abuse of power or position for private gain. It is also almost implicated in government corruption as a motivator of corrupt behaviour and a repository for its proceeds. The focus of this paper on official corruption is due merely to the need to keep the scope discussion manageable. Several approaches to classifying corruption have been proposed (Kpundeh and Hors, 1998, Karklins, 2016, Vargas-Hernández, 2013). The easiest approach analytically may be to distinguish between petty, grand and political corruption, depending on the amounts of money lost and the sector where it occurs.

Petty corruption is a corrupt tendency often perpetuated by low ranking public officials to lower the standard and regulation for a "fee". It often involves a small amount of money. These activities are common in inspection and licensing duties, issuance of driver licenses and other documents. It is often small in magnitude, but often present in the form of a threat or delay in processing someone's files.

Grand corruption, as the name implies, involves a colossal misappropriation of public funds by top public and political officials (Rose-Ackerman and Palifka, 2016). The top public and political officials include presidents, deputy presidents, directors of ministries, governors, parliamentarians, to mention a few. These activities are executed through inflating prices of goods and the costs of projects as well as receiving large kickbacks, just to mention a few. An extreme grand corruption is termed “state capture”. This exists when a top government official connives with a private entity (it could be local or foreign) to convert the state into a personal “cash cow”. For instance, the alleged state capture between former South African President Jacob Zuma and the Gupta family involvement in state capture activities.

Political corruption involves the gross abuse of the nation’s apparatus. It is done through legislative and judicial arms of government, involvement in electoral frauds such as vote-buying and related electoral manipulations, illegal conversion/ transfer of government properties for personal use, just to mention a few.

The major types of corruption in the BRICS are highlighted in Table 2.9 below.

Table 2.9: Types of corruption in BRICS countries

Type	**Main Actors**	**Mode**
Petty Corruption	Low and mid-level public official	Small scale embezzlement and misappropriation; bribes to bend rules or ignore misdemeanors; using licensing and inspection powers for extortion; minor favoritisms
Grand corruption	High-level public officials; political; representatives of donor and recipient countries; bureaucratic elites; businessmen and middlemen	Large-scale embezzlement and misappropriation via public procurement; payment for non-existent goods or services; kickbacks; “ghost workers” on government payroll; economic privileges given to special interest
Political corruption	Top-level executive; legislative and judicial officials; bureaucratic elites; politicians; big business	Abuse of legislative powers; corruption of the judicial process; abuse of auditing, investigatory, and oversight powers; undermining electoral processes through vote-buying and bribery of accountable officials; large-scale assignment of public property to privileged interests; large contributions from public coffers to the private cause; large political donations and bribes

Source: Author’s compilation

Another survey by TI shows a perception of widespread corruption among the country's major institutions of policy, restraint and service delivery (International, 2009). Respondents were asked questions: "Percentage of respondents who felt the following institutions in BRICS countries were corrupt or extremely corrupt".

Table 2.10 Percentage of respondents who felt the following institutions in BRICS countries were corrupt or extremely corrupt

Institutional	Brazil %	Russia %	India %	China %	South Africa%
Political parties	84	77	86	N/A	77
Police	70	89	75	N/A	83
Legislature	72	83	65	N/A	70
Public officials and civil servants	46	92	65	N/A	74
Judiciary	50	84	45	N/A	50
Education systems	33	72	61	N/A	32
Military	30	70	20	N/A	11
Medical and health service	55	75	56	N/A	55
Business	35	57	50	N/A	54
Media	30	59	41	N/A	40
NGOs	35	45	30	N/A	43
Religious organization	31	40	44	N/A	24

Source: Transparency International Global Corruption Barometer 2013https://www.transparency.org/gcb2013/country?country=south_afric

2.4. Economic Development in BRICS Countries

The concept of inclusive growth is a subject matter without a universally acceptable definition. It has varying meanings for different scholars across the world. For this thesis, the researcher will be developing an inclusive growth index to capture the uniqueness of BRICS countries. The BRICS countries are a potential world economic powerhouse characterized by countries with high GDP growth rates with high unemployment and inflation rate.

The concept of inclusive growth in literature has not enjoyed a universal definition. While some scholars' definitions of inclusive growth are interchanged with poor growth, others incorporate non-income dimensions (non-income factors affecting the poverty elasticity of growth). For instance, Ranier and Ramos (2013) conceptualise inclusive growth as an improvement in the living standards of large groups of people regardless of tribe, race and religion as well as opening up more opportunities for all.

In this line of argument, Rauniyar and Kanbur (2010) asserted that inclusive growth must be characterised by a reduction in income disparity and the provision of more income for lower-income earners. It is about inclusive development: it is growth that opens up income growth, reduces discrepancies and involves 'disadvantaged reducing improvement in non-dimensions of wellbeing' (Klasen 2010). Anders and Sperling (2013) describe inclusive growth as growth that accommodates more people in terms of wealth creation and sharing; thus, everyone benefits from overall economic prosperity.

Elena and Susana (2010) define inclusive growth as a broad-based growth that leads to poverty reduction and creates opportunities for people to participate in the process as well as beneficial to the people in the long run. They also highlighted that a sustained growth rate of 5-7 per cent is required for all sectors in the economy as well as absorb a large proportion of the country's labour force. This definition is consistent with McKinley (2010) and Paramasivan, Mani and Utpal (2014), who pointed out that inclusive growth is about achieving income growth while reducing inequality, improving social opportunities, ensuring equality of access (to services and markets) and protecting the vulnerable.

One common objective recognised by the various definitions of Inclusive Growth (I.G.) is the goal of sustainable growth that covers a large percentage of the entire country labour force. Its characteristics are:

- It emphasizes a sustained economic growth of about 5% to ensure a reduction in poverty;
- I.G. adopts a futuristic dimension and the pace of growth that affects a large percentage of the country's workforce.

Inclusive growth centres on addressing the following questions: What is happening to un/employment, education, provision of health services, provision of shelter, food, clothing and water, poverty reduction and widening inequality? If the answers to these questions are negative, then there is no development no matter the rate of growth of the economy's GDP.

Inclusive growth refers to economic growth that trickles down and across all sectors in an economy, contributed to and benefitted by a cross-section of people in the economy, including the poor (Alao and Olufemi). It focuses on ways to raise the pace of growth by utilising more fully parts of the labour force trapped in low productivity or completely excluded from the growth process. It is a catalyst for poverty reduction in emerging countries. Inclusive growth is becoming a development agenda nationally and internationally and there are several reasons why inclusiveness is so important.

Furthermore, these countries are developing or new industrialised countries located in diverse geographical but in strategic locations in the world endowed with a large and young labour force. Having this in mind, the researcher thought it wise to develop an inclusive growth index that incorporates this uniqueness that was omitted by the United Nations Development Program (UNDP), Human Development Index and World Economic Forum (WEF), and Inclusive Development Index (IDI) (Desli et al.) (See below for details)[2].

The conceptual analysis of inclusive growth suggested by Ianchovichina and Lundstrom-Gable (2012) is the same as that in Dutz (2007). Both claimed that their notion of inclusive growth was broader than pro-poor growth, which they conceived as poverty-reducing growth. Their argument was that pro-poor growth was interested only in the welfare of the poor while inclusive growth was concerned with opportunities for a broader group of the disadvantaged: the labour force, the poor and the middle class.

[2] See http://reports.weforum.org/the-inclusive-development-index-2017/technical-notes-and-sources/

According to Klasen (2010), inclusive growth is growth that encompasses a wide spectrum of individuals via active and labour rewarding jobs, which contribute to growth. A labour rewarding job is dire to inclusive growth; it unlocks both social and economic opportunities for all. It centres on equal opportunity for all. It encompasses both the microeconomics and macroeconomics factors (Papanek, 2002). Inclusive growth centres on the rate of growth and how it trickles down to the common man on the street. It is also futuristic in that it focuses on labour rewarding jobs. Although income redistribution schemes can temporally dispense benefits to all, they are not sufficient to actualise growth. The term inclusive is rather termed that way when it creates economic opportunities for all in the economy. Apart from resolving the income disparity issues, growth is also term inclusive when poverty levels are reduced from high to low levels. In conclusion, growth is term inclusive; it accommodates all people irrespective of tribe, culture and religion in the production process.

(Suryanarayana, 2008) affirms that growth is not inclusive if there exists exclusion of people based on tribes, religion and ethnicity as this propels income disparity across the world. The author also affirms that the richest 10% of people control 85% of assets, while the poor 50% own 1%. In order to resolve this malady, there is a need for the combined effort of labour, education and training to actualise optimum inclusiveness.

Ramos et al. (2013) describes inclusive growth as an encompassing process that involves joint participation effort in wealth creation and wealth sharing. The author further emphasises the need to improve the living conditions of the poor and unlock new opportunities for the poor.

In the same vein, Lledó and Garcia-Verdu (2011) defined inclusive growth as that which is sustainable for longer periods (say 5-10 years) spread across all the economic sectors and provides labour rewarding job for the majority of the labour forces (say 80 % of the natural total labour force). They opined that the key attribute of inclusive growth is that it must be sustainable for long periods capable of promoting structural changes as regards output and export diversification.

The Commission (2010) defined inclusive growth as the "process and outcome where all groups of people have participated in the organisation of growth and have benefited equitably from it". It characterises growth as inclusive when it occurs in sectors such as agriculture where the poor work, in places where the poor live and employs factors of production that the poor possess - unskilled labour. However, Caldor's (1966) theory of economic growth suggests that the sustainability of economic growth is anchored on high rates of manufacturing growth, vis-à-vis the overall growth of GDP and those of other sectors. Corroborating Caldor's assertion, Islam noted that high manufacturing growth rates are necessary at the initial stage of development to create conditions that are conducive for the transfer of surplus labour from sectors with low labour productivity to those with higher productivity. Even so, the success of the transfer process largely depends on higher growth rates of labour-intensive manufacturing sub-sectors, particularly at the initial stage of development to create conditions that are conducive for the transfer of surplus labour from sectors with low labour productivity to those with higher production. Even so, the success of the transfer process largely depends on higher growth rates of labour-intensive manufacturing sub-sectors, particularly at the initial development stages.

In development economics, growth is termed total economic activity (ies) characterised by full employment. It is often estimated using inflation-adjusted figures. Growth is said to exist, if there is a rise in the production of goods and services in a country, usually for a long period. It is calculated as the per cent rise of real Gross Domestic Product GDP. Growth is said to exist if the following are addressed:

- Is the unemployment rate decreasing?
- Is the poverty rate reducing?
- Is inequality decreasing?

In conclusion, the growing desire to study inclusive economic growth is a strong indication that high growth is inadequate for addressing the ills of poverty, unemployment and inequalities. Also, there is no single unanimously agreed measurement of inclusive growth, For instance, (Ali and Son (2007) developed the principle of social welfare function to measure inclusive growth. They affirmed that economic growth is inclusive if the social opportunity function is enhanced. Social opportunity connotes accessibility to healthcare services and education, which translate to income distribution to denote whether there is a pro-poor social improvement, or not. By implication, if income is distributed fairly that the poor have access to healthcare services and education, then growth is inclusive.

Klasen (2010) developed a wider measure of inclusive growth by adopting income and non-indicators of wellbeing such as access to education and health, nutrition and social integration. It was theorised that a decline in inequality in the non-income dimension of wellbeing is an indicator of inclusion. The flaw of this measurement is the unavailability of data for the computation of non-income indicators, especially emerging countries. In conclusion, there is no universally-accepted definition and measurement of inclusive growth in an economy.

Many proposals earlier presented to develop an index reflecting either human development or the level of well-being did not include a measure of income per capita; poverty, inequalities. For example, Drewnowski and Scott (1968) developed the level of Living Index and the variables employed include nutrition, housing, education and others. Similarly, Morris (1978) developed the Physical Quality of Life Index employing infant mortality and longevity. In this context of BRICS countries, data variables are ranked maximum core indicators and observe the level where we stand in terms of economic development. Publishing (2013) developed an inclusive growth measurement using eleven monetary and non-monetary parameters that are deemed important for human well-being. Some of the variables include health, institutional and environmental quality.

Other indices often used by scholars include Osberg and Sharpe (2002) Index of Economic Well-being, Lawn (2003) Index of Sustainable Economic Welfare and Ullah and Kiani (2017) Socio-economic index. These indexes provide the literature and methodological platform of new index development.

Samans et al. (2015), a group of researchers at the World Economic Forum (WEF) developed an Inclusive Development Index for the annual assessment of 103 countries' economic performance that measures how countries perform on eleven dimensions of economic progress in addition to GDP. It has three pillars; growth and development, inclusion and, intergenerational equity - sustainable stewardship of natural and financial resources. The flaw of this index is the averaging technique and unavailability of data for the computation of the index. Secondly, there is a difference between inclusive growth and inclusive development which is similar to economic growth and economic development. Other social-economic indices are tabulated in Table 2.11 below.

Table 2.11: Previous Composite Development Indices

S/N	Authors	Index
1	Bennett 1951	Consumption Level Index
2	Beckerman and Bacon 1966	Real Index of Consumption (RIC)
3	Drewnowski and Scott 1966	Level of Living Index (LLI)
4	United Nations Research Institute for Social Development 1984	Socioeconomic Development Index (SID)
5	McGranahan et al 1972	General Index of Development
6	(Morris, 1978)	Physical Quality of Life Index
7	Camp and Speidel 1987	Human Suffering Index (HIS)
8	UNDP 1990	Human Development Index (HDI)
9	UNDP 1995	Gender-related Development Index(GDI) and the Gender Empowerment Measure (GEM)
10	Diener 1995	Combined Quality of Life Indices (CQCL)
11	(Noorbakhsh, 1998)	Modified Human Development Index (MHDI)
12	UNDP1997	Human Poverty Index (HPI)
13	Cherchye and Kuosmanen 2004	Constructs a meta index of SD (MISD)
14	Chatterjee 2005	Measurement of Human Development with an alternative approach
15	Bory's 2005	Sustainable Development Indicators (SDI)
16	Marchante and Ortega 2006	Augmented Version of Human Development Indicator
17	Burd-Sharps, Lewis and Martins 2008	American Human Development Index (AHDI)
18	Engineer, King and Roy 2008	Calculate the modified indices for country members of Organisation for Economic Co-operation and Development (Publishing)
19	Eurostat 2009	Sustainable Development in the European Union (SDIEU)
20	New Economic Foundation 2009 (Marks, 2010)	Happy Planet Index (HPI)
21	UNDP 2010	The Inequalities-adjusted HDI
22	Niels 2010	Calibrated Human Development Index

23	Veljko et al 2011	Economic Footprint (EF)
24	Tolga, Bulent and Hakan 2011	Suggest the use of employment or unemployment dimensions in the HDI

Source: Author's compilation

These indices constitute part of the theoretical literature and foundational methodology of the new index developer. Therefore, key economic growth indicators are used for developing BRICS inclusive growth index.

In conclusion, the researcher identified one of the flaws in the recent WEF IDI Index as regards their choice for averaging all their variables to arrive at their index, as all countries are at a different stage of development and confronted with diverse socio-economic challenges. Having pointed out some of these flaws, the researcher, therefore, embarked on developing an inclusive growth index for the BRICS countries based on two pillars - social and economic indicators identified in the inclusive growth index literature.

2.5 Poverty And Other Socioeconomic Problems Within The BRICS Countries' Inclusive Growth

Like most of the emerging countries, BRICS countries have seen significant, but not sufficiently pro-poor economic growth. High poverty rates, unemployment and income disparity, all encapsulated into Misery index and economic performance index in BRICS countries remain high. In spite of average GDP growth rates of around 5percent between 1999 and 2010, 48 per cent of the population in BRICS countries lived on less than 1.25 international dollars per day in 2010. For instance, in South Africa, where growth rates have been high even by African standards, leading South Africa to graduate into middle income status, one in two rural habitants is still poor (WorldBank, 2009).

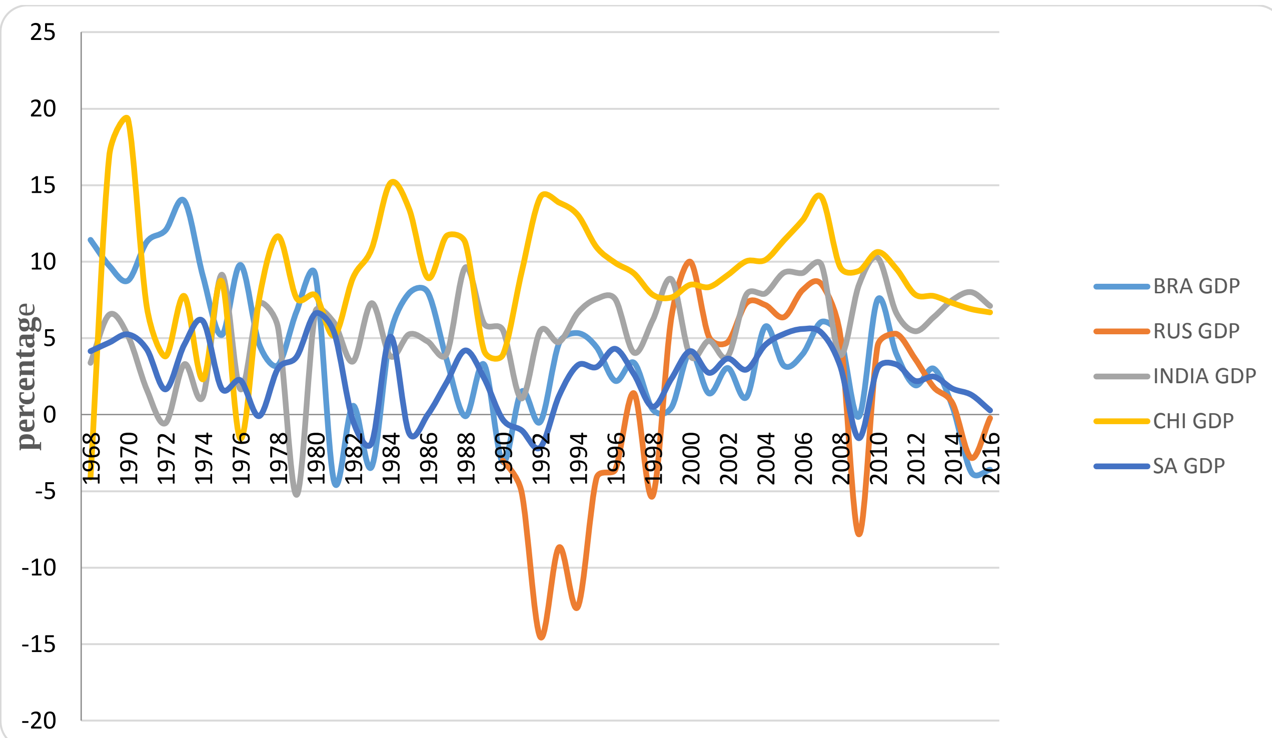
Economic growth creates jobs, and jobs create economic growth. Higher demand for goods and services increases opportunities for self-employed workers and boosts demand for wage labour. Higher productivity of firms and workers is reflected in higher economic growth. Whether economic growth can reduce poverty depends on many factors, but the extent to which economic growth reflects positive job-related changes is the most important link. Jobs are the most important transmission mechanism from growth to household welfare, largely because poor people have few assets other than their labour on which to rely in making a living, and jobs account for the largest source of household income (WorldBank, 2009). Improving labour intensive earnings - whether in the form of higher productivity and output on the farm, higher productivity and output on the farm, higher profits in a household enterprise, or access to a job with a higher wage – is, therefore. central to improving the welfare of poor people.

Focusing only on growth strategies may not be sufficient to lower poverty. Growth is not sufficient to lower poverty. Growth does not automatically trickle down to poor households. For example, a resource-rich country like South Africa may see high growth due to natural resources, but little effect on aggregate employment numbers if export revenues are not used to diversify these economies and create jobs outside the narrow domain of extraction. Similarly, higher labour demand in the formal wage sector is not likely to make a large dent in poverty over the short run, because these sectors' absorptive capacity is limited and poor people may not have the necessary skills or live in urban areas, where formal wage jobs are likely to emerge. Over the medium term, South Africa faces important challenges in fostering the conditions for creating better jobs, strengthening human capital, and reducing population growth.

For instance, South Africa has developed into Africa's largest economy (using US dollars as a benchmark), with a relatively diversified output. In 2014, a statistical reassessment of national accounts data showed the overall size of South Africa's national product to be over 70 per cent larger, which catapulted South Africa into the upper middle-income country status and made it the largest economy in Africa. Traditionally, important sectors like agriculture, oil and gas, and trade account for just over half of South Africa's output while "modern" sectors in industries and services such as telecommunication, real estate, manufacturing, construction, and entertainment together with public administration, are now shown to account for an insignificantly greater share of output than previous estimates had shown.

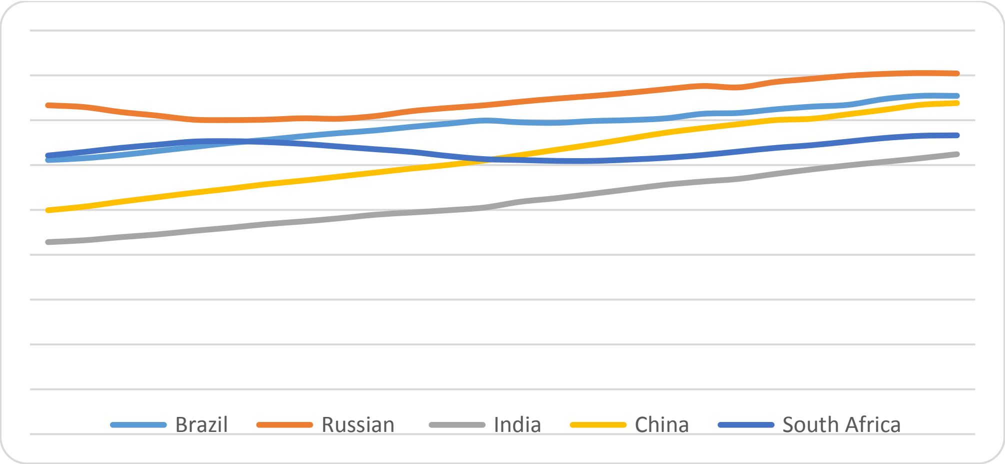
In spite of this remarkable economic achievement, BRICS countries are bedevilled by the problems of inclusive growth as data show that 70 per cent of the BRICS population is still living below the poverty line despite policies of past governments to improve their welfare. Still, unemployment, income disparity and poverty levels in BRICS countries remain high as shown in Figures 1 and 2. In spite of an average GDP, growth rate of around 5 per cent over two decades, 48 per cent of the population in BRICS lived on less than 1.25 international dollars per day in 2010. This is also true for South Africa, where growth rates have been high even by African standards, leading South Africa to graduate into middle-income status, but where one in two rural habitants is still poor. This depicts that regardless of the notable growth witnessed and UNDP HDI report over the years, problems appear to be lingering.

Figure 2.8: BRICS GDP annual growth rate



Source: World Bank (2018) *World Development Indicators* Online database

Figure 2.9: BRICS Human Development Index for years



Source: UNDP Human Development Index (HDI) online database (2018)

Table 2.12: BRICS countries average unemployment rate, poverty rate and income Disparity for years 1970 to 2018

Country	Unemployment rate	Poverty rate	Income inequality
Brazil	15.71	-	56.88
Russia	17.21	1.60	40.20
India	8.71	6.2	33.63
China	-	-	40
South Africa	53.3	35.6	61.71

Source: World Bank (2019) *World Development Indicators* Online database

While the poverty rate has not been increasing, the number of BRICS (especially South Africa) living in poverty has grown because the population continues to expand rapidly. The number of poor people in BRICS (especially South Africa) increased by one million between 2010 and 2013, to 34 million. This national average masks a striking rural/urban divide: 54 per cent of the rural population was poor in 2013, compared to 12 per cent of people in urban areas.

There is also a regional pattern. Poverty is substantially higher within the locals (Black South Africans).

Why has economic growth not brought down poverty levels more significantly? First, welfare effects from economic growth are diluted by high population growth. For instance, South Africa's population growth has remained high at around 2.8 per cent since 2000, depressing growth in per capita GDP as expanding output must be shared among more and more people. While the global population has seen a reduction in young dependents and a swelling in the working-age population in the past 20 years, BRICS countries' population pyramid remains dominated by children and youth. Children aged fewer than 5 make up 44 per cent of the population except for Russia. BRICS countries fertility rate of 6 births per woman remains higher than that of sub-Sahara. The result is that adult workers in BRICS still need to provide for a high share of dependents, especially children.

High fertility rates in the past manifest themselves as a surge in the number of young people entering the working-age population now, and most of them are not finding jobs in high-growth sectors. Between 2000 and 2010, BRICS working-age population grew by over 600000 young people (ages 15 to 24) each year. As demonstrated by many Asian countries, such a bulge in the working-age population can become a "demographic dividend" with economic benefits arising from an increase in working-age adults relative to young dependents. For this demographic dividend to take shape as a strong force for development in BRICS countries, two conditions must come down so that the dependency ratio decreases and working adults have fewer children to maintain - in other words, the population pyramid needs to become less "broad-based" (WorldBank, 2009). Second, the growing ranks of working-age adults must find more productive jobs, translating into higher GDP growth. Most jobs and workers in BRICS countries (especially South Africa) remain in sectors with low levels of labour productivity.

High average growth in the BRICS countries masks large variations across space and income groups, with increasing inequality between rural and urban areas. An increase in spatial differences is likely to have undone the effect of growth on overall poverty reduction. Slow progress on reducing poverty in rural areas is linked to the slow structural transformation in the agricultural sector because that is where most people work. Agricultural growth (averaging just over 2 per cent since 2010) has barely kept up with population growth (at just under 2 per cent in rural areas). Stagnating production and productivity in the farm sector, where half of the population works, is a key reason for continued high poverty levels.

Conversely, sectors that have seen economic growth are not likely to generate enough jobs. For instance, the small scale trade sector is limited in terms of income opportunities. High growth sectors such as telecommunications are not particularly labour-intensive and are too small to absorb much demand for non-farm employment, even with high growth rates.

Access to a job is not a guaranteed escape from poverty, as economic growth does not translate into labour earnings for low-income groups. Poor people were as likely as other groups to be employed in 2012 and less likely than the non-poor to be unemployed. Accelerating poverty reduction in BRICS (especially South Africa) will require more than job creation; the existing jobs that BRICS nationals do will need to be translated into more productive work. Human capital is at low levels. BRICS countries have made some, albeit slow progress towards improving socioeconomic outcomes.

Nonetheless, BRICS countries will fall well short of meeting many of its Millennium Development Goals (MDGs), including for health, education and skills, and remains significantly behind other similar African countries. Infant mortality rate (per 1000 live birth) and Under 5 mortality rate (per 1,000 live births) are lower in South Africa than on average in Africa, for instance.

Differences in well-being across regions resonate in socio-economic indicators. Consistent with consumption patterns, disaggregated data reveal sharp differences in socioeconomic indicators across BRICS countries. Population growth is significantly higher in South Africa, India and China.

In conclusion, the potential economic benefit includes a reduction in development inequalities. The BRICS countries have varying degrees of development inequalities. This is reflected in their 2017 GDP per capita income, which ranges from US$1942 for India to about US$10743 for Russia. A differential in resource base implies that income gaps within the group and the individual countries would grow wider with time. However, with the provision of BRICS funds for cooperation, compensation and development are meant to ensure that distributional problems are resolved.

CHAPTER 3

3.0 THEORETICAL AND EMPIRICAL LITERATURE REVIEW

3.1 Introduction

This chapter reviews the relevant empirical and theoretical literature for the three objectives of this study. This literature commence with theoretical and empirical literature reviews on determinants of Military expenditure; theoretical and empirical literature reviews on inclusive growth; theoretical and empirical literature reviews on impacts of military expenditure, institutional quality and inclusive growth within and outside BRICS countries. The chapter goes further to present the literature on the military expenditure, institutional quality to achieving inclusive growth.

3.2 Theoretical Models On Determinants For Military Expenditure

The determinants of military expenditure can be divided into three models- Organizational politics models; Arms–race models and neoclassical models.

3.2.1 Organizational Politics Model

Isard et al (1988) developed an organizational politics model. The crux of the model centres on the intersectional relationship and struggle existing among bureaucratic, arm industry and political office holders for power who optimize their individual goal. Thus, this struggle determines the percentage of budgetary allocation to the military sector and arms industries.

3.2.1.1 Lucier model

One of the simplest military economics organizational models is Lucier (1979). The military Lucier model , forecast budgetary allocation to military sector on the premise of no change / minor adjustment of previous military expenditure allocation and represented mathematically as

$$M_t = q\ M_{t-1} \quad \text{..} 3.1$$

Where M_t - Military expenditure at time T

q - Policy making units

The model focused on the movement of " q ". A change in "q" is possible if the following events occur:

a) A global and regional change of arms procurement, policies and standard or restriction on certain ammunition will definitely cause a significant change in military expenditure composition. Thus, the effect of such global and regional change takes effect from the following year and not with immediate effect;
b) A change in global and regional security environment such as Security web, threat level and Doom clock to mention a few, will greatly affect budgetary allocation to the military sector and related industries.

In summary, budgetary allocation to military sector and industries are premised on previous level of military expenditure and the degree of changes of parameter “q” in the model.

Similarly, Majeski (1983) developed a military organizational model by examining the factors that determine the U.S military expenditure budgetary allocation. The mathematical modelling identified four distinct policy making units responsible for the U.S military expenditure budgetary allocation levels

1. U.S. military force and other paramilitary agencies, present the U.S. security request. They are denoted as M_1
2. The Presidency denoted as M_2, might be interested if the year is an election year
3. The congress, which debates on military expenditure appropriation and examine the cost and benefit implications is denoted by M_3
4. The department of defense, which utilizes the funds and may further request if need arises denoted by M_4
5. The level /budgetary allocation assigned to military sector and allied industries depends on the outcome of these four policy-making groups.

3.2.1.2 Rattinger model

Rattinger (1975) military organizational politics model postulate that military expenditure is determined by bureaucratic structure and the prevailing international and regional tension/ threats.

3.2.1.3 Ostrom and Marra model

Ostrom & Marra (1986) model using U.S. military expenditure as a case-study, found out that U.S. military expenditure is driven by its arch-enemy Soviet Union’s

(Russia) military expenditure and the U.S. public opinion often expressed via public opinion votes.

3.2.2 Arms Race models

As the name implies, the model is most suitable for countries in conflict. Arms race model depicts that the level of a rival country's military expenditure is the major factor that determines another military expenditure. The military expenditure decision is based on action-reaction process.

3.2.3 Neoclassical model

The military neoclassical model is chiefly centred on (Smith, (1995) and Smith (1980) work. It encompasses how political and economic factors influence military expenditure component. The neoclassical model assumes optimization of welfare. The military neoclassical model can be written as:

$$W_1 = W(S, C, N, Zw) \qquad \text{……………………………………………3.2}$$

W-Welfare of the country; S- Security of lives and property from attacks; C-Consumption and Zw - Other factors.

Since, S cannot be measured but can be measured by using a proxy of military expenditure and other countries (this can be allies and rivals) denoted as $M_1, M_2, \dots, M_n$. Thus, this can be substituted and incorporated equation 1

$$W_1 = W \qquad \text{…………………………………………………………3.3}$$

N.B. Allies military expenditure raises the country security whereas rivals military expenditure poses a threat.

Mathematically, military budget constraint can be written as

$$Y = P_C C + P_m M \qquad \text{………………………………………………3.4}$$

Y-nominal aggregate income; P_m-Prices of military expenditure; P_c-Prices of consumption and M-real military expenditure

$$M_1 = M\left({}^{P_m}/_{P_c}, Y, N, M_1, \dots, M_n, Z_w, Z_s\right) \qquad \text{……………….3.5}$$

Welfare function is given as $W = \propto \log(C) + (1 - \propto)\log(S)$

The above is premised on the country as a rival neighbouring country M_1 and absence of allies. The security function is assumed as

$$S = M - M^* = M - (\beta_0 + \beta_1 M_1) \quad \text{......................................} 3.6$$

Where

M^* - Military expenditure a country to resist its rival neighbour attack

β_0-Fixed element not linked to rival military expenditure, it is negative if neighbouring security is natural and negative if vice versa.

β_1-Relative effectiveness of military

The Lagrange function of above budget constraint

$$L = \propto \log(C) + (1-\propto)\log(M - M^*) + \lambda(y - P_C C - P_m M) \quad \text{.................................} 3.7$$

The First Order Condition (FOCs) is

$$\frac{\partial L}{\partial c} = \frac{\partial L}{\partial c} - \lambda P_C = 0 \; i.e. \; C = \frac{\alpha}{\lambda P_C} \quad \text{.....................} 3.8$$

$$\frac{\partial L}{\partial c} = \frac{1-\alpha}{M-M^*} - \lambda P_m = 0 \; i.e. \; M = \frac{1-\alpha}{\lambda P_m} + M^* \quad \text{..............} 3.9$$

$$\frac{\partial L}{\partial c} = Y - P_c C - P_M M = 0 \quad \text{..} 3.10$$

This gives

$$\frac{\partial L}{\partial c} = \frac{\partial L}{\partial c} = \frac{1-\alpha}{M-M^*} - \lambda P_m = 0 \; i.e. \; M = \frac{1-\alpha}{\lambda P_m} + M^* \quad \text{...} 3.11$$

$$y - P_C \frac{\alpha}{\lambda P_c} - P_m \left(\frac{1-\alpha}{\lambda P_m} + M^*\right) = 0 \quad \text{..............................} 3.12$$

The Lagrange multiplier can be eliminated by

$$\frac{1}{\lambda} = Y - P_m M^* \quad \text{..} 3.13$$

The two linear equations = M= $\frac{1-\alpha}{\lambda P_m} + \alpha(\beta_0 + \beta_1 M_1)$ 3.14

$$C = \frac{\alpha}{P_C} + (Y - P_M\,(\beta_0 + \beta_1 M_1) \quad \text{................................} 3.15$$

Some of Smith's, (1995) landmark achievements include but not limited to, one , the model distinguish between military force stock and military expenditure levels effects. Two, the impact of political regimes and how it affects military expenditure budgetary decisions. Therefore, employing neoclassical models for examining the determinant for military expenditure is ideal. The neoclassical model has ability to accommodate diverse components spanning economic variables such as income, prices and population to mention a few as well as socio-political variables such as strategic factors and military expenditure. The neoclassical model has been suggested to be more comprehensive, well detailed and presents reasonable economic outcome on determinants for military expenditure in an economy. It is also said to provide a clearer and satisfactory results as confirmed and presented in the empirical literature review section.

3.3. Empirical Literature On Determinants For Military Expenditure Across The Globe

The determinant for military expenditure in countries ranges from economic factors, socio-political factors to security to mention a few. This section presents the prominent determinants for military expenditure following the above categories.

3.3.1. Security Threats

Provision of security for lives and properties of their citizens has been affirmed to be one of the cardinal functions of the central government military and paramilitary agencies. The scope of the military and paramilitary agencies includes, but not limited to, intervening in communal clashes, inter-state boundaries disputes, national and international conflicts; Civil wars, and also participating in both regional and international peace-keeping missions and ad-hoc joint task forces operations.

One of the key determinants for military expenditure identified by security /defence experts such as Dunne & Perlo-Freeman,(2003) is external wars threat. Dunne & Perlo-Freeman, (2003) averred that external wars is one of the major determinants, if not the major driver, for the rise of military expenditure in developing economies. They further explained that the rise in military expenditure is triggered and evident during wartime or crisis period via the procurement of arms/ammunition and rise in voluntary enrolment / conscription of young youths during such periods.

Hewitt (1991, 1992 and 1993) employing public-choice framework analysed the association between military expenditure and threats for 125 Less Developed Countries (LDCs) over the period 1972-1990. The empirical result indicates that an international war positively does matter in increased military expenditure levels.

Batchelor et al (2000), using South Africa as a case study, explored the determinants for military expenditure. They incorporated Angolan war (1977-1993) in their estimation. The empirical result indicates a significant and positive effect of war on South Africa's increased military expenditure for the period considered.

Dunne & Perlo-Freeman (2003) presented a comparative analysis of a cold war (1981-1989) and post-cold war period (1990-1997) for developing economies. The result confirmed a positive impact from external wars on military expenditure. Tambudzai (2011) examined Zimbabwe's military expenditure determinants from 1998-2008. The external wars variable clearly indicates a positive impact on Zimbabwe's military expenditure on a long run basis.

Ball (1983) asserted that internal threats (civil wars) is more severe and detrimental than external threats for developing economies. Dunne & Mohammed (1995) also examined 13 sub-Saharan countries determinants for military expenditure for the period 1967-1985. The empirical result shows a significant and positive impact of civil war on military expenditure. (Collier & Hoeffler, 2002) carried out a comparative econometric analysis between civil war (internal threats) and international wars (external threats) on military expenditure. The result indicates that civil war (internal threats) is significant and has positive impact on military expenditure than international threats (external threats).

Collier (2003) asserts that developing economies allocate 2.8 per cent of its GDP to military expenditure during peacetime whereas during wartime their assign about 5 per cent of national Gross Domestic Product to military expenditure and allied industries.

Aziz et al (2017) investigated the milex-growth nexus of seventy countries taking cognizance the presence of internal and external threats from 1990 to 2013 using Generalized Moments Methods (GMM) as well as fixed / random models. Their result suggests a negative relationship between military expenditure and growth for all the models.

3.3.2. Security Web

The concept of security web was a product of Rosh (1988). The concept refers to a nation's X security web as all other countries capable of influencing country X's security both at national and regional levels. (Rosh (1988) further explained that country X's threat levels can be ascertained by average military expenditure of Gross Domestic Product of countries in the security web. (Rosh (1988) affirmed that security web plays significant role and positively stimulate the increased military expenditure of 63 LDCs over the period 1969-1978. Dunne & Perlo-Freeman (2003)and Dunne et al (2008) further explore the security web dynamics, by categorizing the countries in the security web into three distinct groups of Allies, neutral and rivalry/ enemies. Their empirical result was mixed for all the three distinct groups. However, Sun & Yu (1999) depicts that China's military expenditure was significantly and positively influenced by Japanese military expenditure for the period of 1965-1993. Likewise, Tambudzai (2011) affirmed that Zimbabwe's military expenditure was significantly and positively influenced by growth in South Africa's military arsenal for the period of 1980-2003.

3.3.3 Economic Factors

Barro and Sala-i-martin (1992) asserted that determinants of military expenditure are not affected by threat only but by a host of economic, political and environmental factors. This section focuses on empirically identified economic determinants of military expenditure.

Looney (1989) highlights that at aggregate level, economic variables such as income inequality disparity level, growth rate of GDP, budget size and Milex Industrial Complex (MIC) matter in determining a nation's military expenditure.

On a general note, GDP has been singled out as an important economic determinant of military expenditure. Other empirical studies have also used per capita and GNP to examine income on military expenditure

Other identified internal economic determinants include the presence of arms industries, Central Government Expenditure (CGE) and non-military government expenditure. For instance, Hewitt and Van Rijckeghem (1995)in their work on military expenditure-growth nexus suggest that GDP level clearly depicts real impacts of military expenditure. The empirical result indicates the existence of convex relationship. Tambudzai (2011) examined 12 Southern African countries' determinant for military expenditure for the period 1997-2004. The empirical result indicates the significance of GDP per capita on military expenditure determinant's estimation.

Conversely, in individual country studies, Gross national income variables have been suggested to have positive effect as a determinant of military expenditure. For instance,Sun & Yu (1999) examine the determinant of military expenditure for China. The result reveals that military expenditure is significantly and positively related to its Gross National Product. In examining an African context, Batchelor et al (2000) find that South Africa's military expenditure is related to its income level .

Central Government expenditure is the reported final budget details stated in the accounts. (Dommen & Maizels' (1988) in their work on military burden on developing economies use central government's GDP as one of the determinants of military expenditure. The empirical result shows that central government expenditure is significant and positive. Likewise, (Dommen & Maizels, 1988) result was corroborated by that of Hewitt (1991). (Hewitt (1991) further reiterated that central government expenditure is significant and positive in determining military expenditure.

(Yildirim et al, 2005)

Yildirim et al (2005) investigated government consumption effect on military expenditure for 92 countries from 1987 to 1997.The result revealed that central government expenditure is significant and positive on military expenditure. In summary, above empirical results affirmed that central government expenditure is significant and positive with military expenditure.

(Deger and Sen (1990) included arms production as a variable to examine military expenditure on the Indian economy for the period 1960-1985. However, the result showed that arms production is insignificant in the estimation.

Maizels & Nissanke (1986)in their empirical work on foreign exchange growth identified foreign exchange and major aid as stimulatants for military expenditure. In addition, foreign arms production does have positive impacts on military expenditure demand. Arms producing countries can influence non-arms producing nation to buy military weapons exceeding their request.

Rosh (1988) also opined that economies infused with international economic politics do have the privilege to access funds to procure arms. He also asserted that trade is a key and does have a significant and positive effect on military expenditure for emerging economies.

Dunne and Perlo-Freeman (2003) and Dunne et al (2008) included trade variables in their demand for military expenditure estimation. The empirical result shows that trade does matter with a significant and positive impact on military expenditure whereas (Dunne and Mohammed (1995) in their work indicate that trade is not significant in Sub-Saharan Africa This may be due to low intra sub-Saharan trade activities.

3.3.4 Political factors

In determining the factors that influence military expenditure, it has been suggested by Hou (2010) that, the political institution regimes does affect a nation's quest for military effort. For instance, Dommen & Maizels (1988)have affirmed that democratic regimes tend to spend less whereas authoritarian regimes tend to invest more in military sector and allied industries to be in full control of the nation. However, the above assertion cannot be generalized for all nations.

Other notable empirical works that have investigated political regimes in the Milex demand debates are as follows: Dommen and Maizels (1988) Milex demand work use political regimes (from military to democratic) for 72 countries for the period of 1978-1980. Their result revealed that two fifth of military regimes make use of military force against the public.

On the other hand , (Dunne et al (2008), Dunne & Perlo-Freeman (2003)incorporated democracy index from POLITY 1998 in estimating determinant of developing economies covering 1981 to1997. Their result indicates that democracy does have significant and negative impact on military expenditure on developing economies.Hou (2010) identified the relevance of political regimes investigating India's demand for military expenditure. Sun & Yu (1999) examined the change of China's leadership from war oriented to economic development after1979. Their result indicates an inverse change on Chinese military expenditure level from 1965 to 1993.

Batchelor et al (2000) in their empirical work on South Africa military demand incorporated a political dummy to capture a change of leadership administration. The empirical result indicates an inverse relationship with military expenditure.

(Yu, 2002) use US-China conflict and major political shock as an independent variable for determinant for Taiwan's military expenditure for 1966 to 1992. The empirical result indicates a significant and positive impact as a determinant for military expenditure.

3.3.5 Other factors

Dunne and Perlo-Freeman (2003) identified population as a significant determinant of military expenditure based on "Public good "theory. They opined that a large population does make military expenditure more effective. Also, Hewitt and Van Rijckeghemm (1995)found that population is significant and positive for developing economies. However, Dunne et al (2008) found that there exists an inverse relationship between population and military expenditure for countries with large population whereas countries with small population invest more on military technologies. They suggest that a country with large population tends to focus more on consumption demand than security matters.

Other notable variables identified by empirical studies on determinant for military expenditure includes external threats. Dunne and Mohammed (1995) explored military participation-military expenditure nexus for 13 sub-Saharan economies. They use proportion of armed forces. The empirical result shows that proportion of armed forces significantly and positively affects military expenditure level. Yildirim et al (2005) used ratio of armed forces per 1000 population to estimate determinant of military expenditure for 92 countries for 1987 to 1997. Their panel analysis result indicates that higher ratio of armed forces per 1000 population is linked to an increased military expenditure levels.

Dommen & Maizels (1988) and Dunne & Perlo-Freeman (2003) identified geographical factor as a possible contagion effect especially in Middle East countries embodied in conflicts. Their empirical analyses attest to the presence of regional factor as a significant and positive determinant of military expenditure for all Middle East countries.

3.4 Theoretical Framework on Inclusive Growth

The concept of inclusive growth is a subject matter without a universally acceptable definition. Therefore, the concept has varying meanings for different scholars across the world. For this dissertation, the researcher will be developing an inclusive growth index that seems to capture the uniqueness of the research countries (BRICS countries). The BRICS countries are a potential world economic powerhouse characterized with countries with high GDP growth rates with high unemployment and inflation rate.

The concept of inclusive growth in literature has not enjoyed a universal definition. While some scholars definitions of inclusive growth are interchanged with poor growth, other incorporate non-income dimensions (non-income factors affecting the poverty elasticity of growth). For instance, Ranier and Ramos (2013) conceptualize inclusive growth as an improvement in the living standards of large groups of people regardless of tribe, race and religion as well as opening up more opportunities for all.

In the line of argument, Rauniyar and Kanbur (2010) observed that ‘’inclusive growth must be characterized by reduction in income disparity and provision of more income for lower income earners. It is about inclusive development; it is growth that opens up income growth, reduces discrepancies and involves ‘disadvantaged reducing improvement in non-dimensions of wellbeing’ (Klasen 2010). Anders and Sperling (2013) describe inclusive growth as growth that accommodates more people in terms of wealth creation and sharing, thus everyone benefits from overall economic prosperity.

Elena and Susana(2010) see inclusive growth as a broad-based growth that leads to poverty reduction and create an opportunity for people to participate in the process as well as beneficial to the people in the long run. They also opined that sustained growth rate of 5-7 per cent is required for all sectors in the economy as well as absorb large proportion of the country’s labour force. This definition is consistent with McKinley(2010) and Paramasivan,Mani and Utpal (2014),who pointed out that inclusive growth is about achieving income growth while reducing inequality, improving social opportunities, ensuring equality of access(to services and markets) and protecting the vulnerable.

One common objective recognized by the various definitions of Inclusive Growth (I.G.) is the goal of sustainable growth that covers a large percentage of the entire country's labour force. Its characteristics are:

- It emphasizes sustained economic growth of about 5% to ensure reduction in poverty;
- I.G. adopts a futuristic dimension and the pace of growth that affect large percentage of the country's workforce.

Inclusive growth centres on addressing the following questions: What is happening to un/employment, education, provision of health services, provision of shelter, food, clothing and water, poverty reduction and widening inequality? If the answers to these questions are negative then there is no development no matter the rate of growth of the economy's GDP.

Inclusive growth refers to economic growth that trickles down and across all sectors in an economy, contributes to and benefitted by a cross section of people in the economy, including the poor(Alao & Olufemi). It focuses on ways to raise the pace of growth by utilizing more fully parts of the labour force trapped in low productivity or completely excluded from growth process. It provides background and a catalyst for poverty reduction in emerging countries. Inclusive growth is becoming a development agenda nationally and internationally and has several reasons why inclusiveness is so important.

Furthermore, these countries are developing or new industrialized countries located in diverse geographical but in strategic locations in the World endowed with large and young labour force. Having this in mind, the researcher thought it wise to develop an inclusive growth index that incorporates this uniqueness that was omitted by United Nation Development Program (UNDP) Human Development Index and World Economic Forum (WEF) Inclusive Development Index (Desli et al) (See below for details).

The conceptual analysis of inclusive growth suggested by Ianchovichina & Lundstrom-Gable (2012) is the same as that in Dutz (2007).Both claimed that their notion of inclusive growth was broader than pro-poor growth, which they conceived as Poverty-reducing growth. Their augment was that pro-poor growth was interested only in the welfare of the poor while the inclusive growth was concerned with opportunities for a broader group of the disadvantaged: the labour force, the poor and the middle class.

According to Klasen (2010) inclusive growth is growth that encompasses a wide spectrum of individuals via active and labour rewarding jobs which contribute to the growth .A labour rewarding job is dire to inclusive growth, it opens up both social and economic opportunities for all. It centres on equal opportunity for all. This encompasses both the microeconomic and macroeconomic factors (Papanek, 2002).Inclusive growth centres on the rate of growth and how it trickles down to the common man on the street. It is also futuristic in nature that focuses on labour rewarding jobs. Though income redistribution schemes can temporarily dispense benefits to all it is not sufficient to actualize growth inclusiveness, rather, it is term inclusive when it creates create economic opportunities for all in the economy. Apart from resolving the income disparity issues, growth is also term-inclusive when poverty levels are reduced from high to low levels. In conclusion, growth is term-inclusive it accommodates all people in irrespective of tribe, culture and religion in the production process.

Suryanarayana (2008) affirms that growth is not inclusive if there exists exclusion of people based on tribes, religion and ethnicity as this propels the income disparity across the world. The author also affirms that the richest 10% people control 85% of assets, while the poor 50% own 1%. In order to resolve this malady, there is the need for combined effort of labour, education and training to actualize optimum inclusiveness.

Ramos et al (2013) describe inclusive growth as an encompassing process that involves joint participation effort in wealth creation and wealth sharing. The authors further emphasized the need to improve the living condition of the poor and open up new opportunities to the poor.

In the same vein Lledó & Garcia-Verdu (2011) defined inclusive growth as that which is sustainable for longer period of years(say 5-10 years) spread across all the economic sectors and provide labour-rewarding job for majority of the labour forces(say 80 % of natural total labour force). They opined that a key attribute of inclusive growth must be that it must be sustainable for long periods capable of promoting structural changes as regards output and export diversification.

The Commission (2010) defined inclusive growth as the “ process and outcome where all groups of people have participated in the organization of growth and have benefited equitably from it’.

It characteristics growth as inclusive when it occurs in sectors such as agriculture where the poor work, in places where the poor live and employs factors of production that the poor possess-unskilled labour. However, Kaldor's view of economic growth suggests that the sustainability of economic growth is anchored on high rates of manufacturing growth, vis-à-vis the overall growth of GDP and those of other sectors (Kaldor, 1966). Corroborating Kaldor's assertion, Islam (2010) noted that high manufacturing growth rates are necessary at the initial stage of development to create conditions that are conducive for the transfer of surplus labour from sector with low labour productivity to those with higher productivity. Even so, the success of the transfer process largely depends on higher growth rates of labour-intensive manufacturing sub-sectors, particularly at the initial stage of development to create conditions that are conducive for the transfer of surplus labour from sectors with low labour productivity to those with higher production. Even so, the success of the transfer process largely depends on higher growth rates of labour intensive manufacturing sub-sectors, particularly at the initial development stages.

In development economics, growth is term total economic activity (ies) characterized by full employment. It is often estimated using inflation-adjusted. Growth is said to exist, if there is a rise in the production of goods and services in a country usually for a long period. It is calculated as a per cent rise of real Gross Domestic Product GDP. Growth is said to exist if the following are addressed:

- Is unemployment reducing?
- Is poverty rate reducing?
- Is inequality reducing?

In conclusion, the growing desire to study inclusive economic growth is a strong indication that high growths are in themselves inadequate for addressing the ills of poverty, unemployment and inequalities.

Also, there is no single unanimously agreed measurement of inclusive growth,For instance, (Ali & Son (2007) developed the principle of social welfare function to measure inclusive growth. They affirmed that economic growth is inclusive if the social opportunity function is enhanced. Social opportunity connotes accessibility to healthcare services and education, which translate to income distribution to denote whether there is a pro- poor social improvement, or not. By implication, if income is distributed fairly that the poor has access to healthcare services and education then growth is inclusive.

Klasen (2010) developed a wider measure of inclusive growth by adopting income and non-indicators of wellbeing such as access to education and health, nutrition and social integration. It was theorized that a decline inequality in the non-income dimension of wellbeing is an indicator of inclusion. The flaw of this measurement is the unavailability of data for the computation of non-income indicators especially emerging countries. In conclusion, there is no universally acceptable definition and measurement of inclusive growth in an economy.

Many proposals earlier presented to develop an index reflected either human development or the level of well-being. Some of the proposals did not include a measure of income per capita; poverty, inequalities. For example, Drewnowski & Scott (1968) developed the level of Living Index and the variables employed include nutrition, housing, education and others.

Similarly,Morris (1978) developed Physical Quality of Life Index employing infant mortality and longevity. In the context of BRICS countries, data variables are rank maximum core indicators and observe the level where we stand in terms of economic development.

OECD Publishing (2013) developed an Inclusive growth measurement using eleven monetary and non-monetary parameters which are deemed important for human well-being. Some of the variables include health, institutions and environmental quality.

Other Indexes often used by scholars include (Osberg & Sharpe, 2002) Index of Economic Well-being; (Lawn, 2003)Index of sustainable economic welfare and (Ullah & Kiani, 2017) socio-economic index. These indexes provide the literature and methodological platform of new index development.

Samans et al (2015) a group of researchers at World Economic Forum (WEF) developed an Inclusive Development Index for annual assessment of 103 countries' economic performance that measures how countries perform on eleven dimensions of economic progress in addition to GDP. It has three pillars; growth and development; inclusion and; intergenerational equity – sustainable stewardship of natural and financial resources. The flaw of this index is the averaging technique and unavailability of data for the computation of the index. Secondly, there is a difference between inclusive growth and inclusive development which is similar to economic growth and economic development. Other social economic indexes are presented as follows

Table 3.1: Previous Composite Development Indices

S/N	**Authors**	**Index**
1	Bennett 1951	Consumption level Index
2	Beckerman and Bacon 1966	Real Index of Consumption (RIC)
3	Drewnowski and Scott 1966	Level of Living Index (LLI)
4	United Nations Research Institute for Social Development 1984	Socioeconomic Development Index (SID)
5	McGranahan et al 1972	General Index of Development
6	(Morris, 1978)	Physical Quality of Life Index
7	Camp and Speidel 1987	Human Suffering Index (HIS)
8	UNDP 1990	Human Development Index (HDI)
9	UNDP 1995	Gender related Development Index(GDI) and the Gender Empowerment Measure (GEM)
10	Diener 1995	Combined Quality of Life Indices (CQCL)
11	(Noorbakhsh, 1998)	Modified Human Development Index (MHDI)
12	UNDP1997	Human Poverty Index (HPI)
13	Cherchye and Kuosmanen 2004	Constructs a meta index of SD (MISD)
14	Chatterjee 2005	Measurement of Human Development with alternative approach
15	Bory's 2005	Sustainable Development Indicators (SDI)
16	Marchante and Ortega 2006	Augmented Version of Human Development Indicator
17	Burd-Sharps, Lewis and Martins 2008	American Human Development Index (AHDI)
18	Engineer, King and Roy 2008	Calculate the modified indices for country members of Organization for Economic Co-operation and Development (Publishing)

19	Eurostat 2009	Sustainable Development in the European Union (SDIEU)
20	New Economic Foundation 2009(Marks, 2010)	Happy Planet Index (HPI)
21	UNDP 2010	The Inequalities-adjusted HDI
22	Niels 2010	Calibrated Human Development Index
23	Veljko et al 2011	Economic Footprint (EF)
24	Tolga,Bulent and Hakan 2011	Suggest the use of employment or unemployment dimensions in the HDI

Source: *Authors Computation*

These indexes constitute part of theoretical literature and foundational methodology of new index developer. Therefore, key economic growth indicators are used for developing BRICS inclusive growth index.

In conclusion, the researcher identified one of the flaws in the recent WEF IDI Index as regards their choice for averaging all their variables to arrive at their index, as all countries are on different stages of development and confronted with diverse socio-economic challenges. Having pointed out some of these flaws, the researcher, therefore, embark on developing an Inclusive growth index for the BRICS countries based on two pillars- social and economic indicators identified in Inclusive growth index literature.

3.4.1. Inclusive Growth-Economic Growth Nexus Theories

This section reviews theoretical literature on the economic growth theories-inclusive growth nexus.

3.4.1.1 Inclusive growth theories

Inclusive growth can be defined as the growth of the economy as measured by the increase in the GDP in real term over time that leads to a reduction in unemployment, poverty rate and income disparity. An increase in the IG means that growth is leading to better welfare in living standard, access to quality education and opening up more employment opportunities that reflect the true impact of high growth on the common man in the street. Such increases are due to an increase in productivity or increases in the factors of production that contribute by the large labour force, and that is evenly shared among all.

The foundational theories of inclusive growth dates back to classic economic thoughts of Adam Smith (1776), Malthus (1798), David Ricardo (1817) and many others. They provide the basic ingredients that reflect in the modern theories of economic growth.

3.4.1.1.1 Classical school of thought

The prominent scholars in the classical school of thought are Ramsey (1928), Young (1928), Schumpeter (1934) and Knight (1944), among others. Their thoughts were not limited to the impact of a diminishing rate of return, population growth rate, physical and human capital (BARRO and SALA-I-MARTIN, 1992). The classical theory propounds that a rise in economic growth developed out of the philosophical question of progress, a basic tenet of enlightenment that applied quality to ideas, innovations, social norms and more generally the material bases of the society. Sequel to this, the classical thinkers sought a general account of the forces and mechanism that influences economic growth. They believed in productive investment and capital accumulation as the principal impetus to achieve economic growth. They recognised the impact of technological changes on growing the division of labour and introducing changes in production methods.

3.4.1.1.2 Neoclassical school of thought

According to the neoclassical school of thought, the notion of sustainable growth chiefly centres on the rate of population growth and technological advancement (Solow, 1956). They also opined that both human and capital might be influenced by the nature of government expenditure/ tax, thus affecting the equilibrium factor but not the growth rate.

On the flip side, Barro (1990) and King and Rebelo (1990) believe that tax and productive government expenditure can stimulate sustainable growth in the endogenous model. The implications of endogenous growth models for fiscal policy have been particularly examined by Barro (1990), Jones et al. (1993) and Mendoza et al. (1997).

In view of the shortcoming of the neoclassical growth theory which stipulated that the long-run growth rate is determined by the rate of technological progress (a factor outside the model). Romer (1986) sought to analyse the long-run determinants of the rate of growth by factors within the model, hence the name ‘endogenous growth’. The endogenous growth theory holds that investment in human, capital; innovation and knowledge is significant for attaining growth. The theory emphasised that positive externalities like capital inflows and spill-over effects of a knowledge-based economy to a deficient one and appropriate policy measures like subsidies on research and development can culminate in the long-run growth of the economy.

Bleaney et al. (2001) empirically examined (Barro (1990) proposition in OECD countries for the period of 1984-1995. Their result affirms that government expenditure and tax do have both temporary and permanent impact of growth.

Therefore, to achieve inclusive growth implies attacking income disparity, education, health, poverty and welfare, which require breaking down the barriers to inclusive growth. Everyone should be able to actualise their dreams and derive from the inclusive growth proceeds.

3.4.1.1.3 Endogenous growth theory

Endogenous growth models such as Barro (1990) and King and Rebelo (1990) predict that distortionary taxation and productive expenditures will affect the long-run growth rate. The implications of endogenous growth models for military expenditure have been examined by Benoit (1973), Barro (1990), d'Agostino et al. (2012) and Compton and Paterson (2016).

In view of the shortcomings of the neoclassical growth theory which stipulated that the long-run growth rate is determined by the rate of technological progress (a factor outside the model), Romer (1986) and Lucas Jr (1988) analysed the long-run determinant of the rate of growth by factors within the model, hence the name "endogenous growth". The endogenous growth theory holds that the investment in human capital, innovation and knowledge are significant incentives for attaining growth. The theory emphasised that positive externalities like capital inflows and spill over effects of a knowledge-based economy to a deficient one and appropriate policy measures like subsidies on research and development can culminate in the long-run growth rate of the economy.

Unlike the neoclassical growth model (exogenous growth model), where fiscal effects alter the level of the long-run output path, the endogenous growth model permits government expenditure to alter the slope of the long run-run output path, as illustrated by the example in Barro (1990). Here, Aizenman and Glick (2006) presentation was adopted for Barro and Sala-i-martin (1992) model of endogenous growth. This adaption is also used in Kolawole (2016) to examine public spending and inclusive growth in Nigeria. According to Compton and Paterson (2016), the endogenous growth model Barro (1990) predicts that military expenditure and institutional quality will have both negative or zero effects on growth. They test this prediction using panels of period-averaged data for over 100 countries during 1988- 2010, isolating long run and short-run effects and country-specific dynamics. Their result suggests a negative or zero impact of military expenditure on growth, and this migrated by the presence of good economic and political institutions.

Barro (1990) model of endogenous growth implies that economic growth will initially rise with the increase in taxes directed toward “productive” expenditure (e.g. provision of security for lives and property against internal and external threats), but will subsequently decline. The endogenous growth model of Barro and Sala-i-martin (1992) with the public good, argue that public expenditure makes private production more profitable. An endogenous model of economic growth theory appears to be the most suitable for the study. The model suggests that endogenous factors such as government policies, political stability, market distortions, human capital, etc. can significantly affect economic growth. It is a widely used growth model to provide a systemic investigation of the military expenditure-economic growth nexus. For example, d’Agostino et al. (2017) and Compton and Paterson (2016) used it to assess the role of military expenditure and growth.

3.5 Military Expenditure-Growth Theories

The literature on theoretical models and existing empirical models can be grouped into seven (7) groups: Benoit type regression, supply side (Feder-type) models, Demand side models, Deger type (a combination of Demand and Supply side), the Barro models, the Solow models and Causality analysis.

3.5.1 Benoit type regression (Benoit’s (1978) work

In 1978, Benoit investigated the military expenditure –growth nexus for 44 developing countries. The result concluded that countries with high military budgetary allocation experienced speedy and sustained economic growth than countries with low military budgetary allocation to the military. In conclusion, the author postulated that emerging and developing countries must be devoting a huge chunk of their budgetary allocation to the military.

The equation used is

$$CG^1 = \propto_I + \beta_1 Me + \beta_2 IR + \beta_3 BA + \varepsilon \quad \ldots\ldots\ldots\ldots\ldots\ldots.3.16$$

Where CG^I is the civilian growth, Me is the Military expenditure, IR is the investment ratio, BA is the bilateral aid and ε is the error term for the duration of 1950 to 1965. The study examined further the causation direction between military expenditure and growth. The result affirmed strongly that there exists weak causation from economic growth to military expenditure. It, however, affirmed that a strong causation from military expenditure to economic growth exists. Therefore, military expenditure is a strong catalyst for economic growth and not vice versa.

Benoit (1973) examined the cost and benefits of military expenditure on economic growth. The author confirms that there is a strong spill over impact on civilian sectors via technology transfer and enhanced human capacity. Thus, a high military expenditure also ensures optimum utilisation of resources, and the benefits can offset the adverse growth effects.

Conversely, Benoit's (1978) work was characterised by some weaknesses. For instance, Frederiksen and Looney (1983) examined Benoit's (1978) work using the same sample, same period and the same estimation technique. They mentioned that Benoit's (1978) sample was unsuitable and that military expenditure accounts for a reasonable portion of un-allocable explanatory power. They advised that the countries, be divided into two: Poor countries (resource-constrained) and rich countries (abundant resources). Their result affirmed that military expenditure contributes positively and influences on rich resource-endowed economic growth and vice versa in the resource-constrained countries. Therefore, military expenditure retards economic growth in resource-poor countries.

In conclusion, Biswas and Ram (1986) expanded Benoit's (1978) work by adding more developing countries and grouped into different income groups of low-income and middle-income countries for the periods 1960-1984 and 1984-1977. They found that military expenditure on growth was not statistically insignificant for low-income countries for periods examined.

3.5.2. Demand-side models (Military Keynesianism)

Theoretical Models

The demand side models are based on Keynesian theory which identifies military expenditure as an independent component of the national accounting equation as shown below:

$$Y = Q - W = C + I + M + (X - M) \text{ ....3.17}$$

Y = Actual output, Q= potential output, W= difference between the actual and potential output, C= aggregate consumption, I= investment, M=military expenditure and (X-M) balance of trade. A share of potential output can be rearranged as:

$$i = 1 - w - c - m - (X - M) \text{ ....3.18}$$

The share of consumption can further be broken as

$$c = \alpha_0 - \alpha_1 u - \alpha_2 g \text{ ....3.19}$$

u = unemployment rate, g= growth rate of actual output. A rise in u and g can adversely affect the consumption pattern of potential output.

$$i = (1 - \propto_0) + \propto_0 U + \propto_2 g - m - (w + b) \text{ ....3.20}$$

$(w + b)$ – Balance local demand and potential supply are related to unemployment. $(w + b) = \beta_u$

$$i = (1 - \propto_0) + (1 - \propto_0)U + \propto_2 g - m \text{ ....3.21}$$

Equation 5 can investigate the possibility of the crowding out effect of military expenditure on investment and economic growth.

3.5.3. Supply-side models (Feder-Ram models)

Theoretical Models

The Supply-side models are based on Feder's (1984) on the effects of export on economic growth. Biwas and Ram model used Feder's (1984) model to examine the military expenditure – growth nexus. They assumed the existence of two sectors (military and civilian) sectors and focused chiefly on externality/spill over effects of the military sector (including military industries) and factor productivity between the two sectors.

The model denotes the two sectors as military (M) and civilian (C) taking cognisance of the output of labour and capital. That is,

$$M = (L_c , L_m), C = \left(L_c , k_{m,} M\right) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..3.22$$

Taking into account factor endowment constraint

$$L = L_m + L_c , K = K_m + K_c \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.23$$

The addition of M and C gives output (Y)

$$Y = M + C \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.24$$

Therefore, we can derive the marginal productivity (propensity) for both sectors as

$$\frac{M_k}{C_k} = \frac{M_l}{C_l} = 1 + \delta \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.25$$

The model postulates that military output impacts total output via two channels.

1. $C_m\left(\frac{\partial c}{\partial m}\right)$ = externality effect of military output on the civilian output.
2. δ = relative factor productivity difference between the two sectors. If $\delta > 0$ productivity in the military sector (military industries) is greater than the civilian sector (public and private industries), then more resources will be devoted to the military sector (military industries), therefore aggregate output increase.

Equation (1) and (3)

$$\dot{y} = \alpha\frac{1}{y} + \beta\, \dot{L} + \left(\frac{1}{y} + C_m\right)\dot{m}\frac{m}{y} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.26$$

$$\beta = C_L\,\frac{1}{y} + \beta\, \dot{L} + \left(\frac{1}{y} + C_m\right)\dot{m}\frac{m}{y} \ldots\ldots\ldots\ldots\ldots\ldots\ldots.3.27$$

The dot overts the variable connote rate of growth and L connotes aggregate investment.

Let us assume externality parameter as $C_L\left(\frac{m}{c}\right)$ and represent with θ, we can rewrite the equation as

$$C = M^{\theta} H\,(K_c , L_c) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.3.28$$

The equation ( ) be rewritten as

$$\dot{y} = \alpha\frac{1}{y} + \beta\, \dot{L} + \left(\frac{\delta}{y} - \theta\right)\dot{m}\frac{m}{y} + \theta\dot{L} \ldots\ldots\ldots\ldots\ldots...3.29$$

Which differentiates externality effect from factor productivity effect?

The setback of the model is as follows:

- Only applicable for two-sector, (Ram, 1995) as multi-sectorial modeling will pose serious problems.
- It ignores the demand side.
- It poses interpretation challenges (Dunne and Perlo-Freeman, 2003).

Setbacks of the Feder-model

Dunne and Perlo-Freeman (2003) outline some of the setbacks of Feder models as follows:

1. The regression treats labour and capital asymmetrically of parameters.
2. The problem of Multicollinearity especially in estimating externality and factor productivity effects.
3. The model is static and without lagged dependent variables.

In conclusion, Dunne and Perlo-Freeman (2003) strongly advised that based on Feder-Ram's weak theoretical and structurally faulty econometric underpins; Feder-Ram model must not be employed.

3.5.4. Demand and supply-side models (Deger type models)

Theoretical models

In order to ascertain the direct impact via externality / spill over effects of military expenditure and Keynesian stimulation and adverse impact of military expenditure via reduction in savings and crowding out investments, the Demand and Supply side was incorporated into a single model called the Demand and Supply model also called Deger Types Simultaneous Equation Model (DTSEM). The model was developed by Deger (1986). The regression equation is given as

$$g = a_0 + a_1 S + a_2 M + a_3 B + a_4 Z_1 \quad \text{..........................3.30}$$

$$s = b_0 + b_1 M + b_2 g + b_3 B + b_4 Z_2 \quad \text{.........................3.31}$$

$$B = c_0 + c_1 m + c_2 g + c_3 Z_3 \quad \text{...3.32}$$

$$m = d_0 + d_1 Z_4 \quad \text{..3.33}$$

a_1, b_1, c_1, d_1 – set of parameters, g- growth rate of GDP, S-saving ratio, M- military expenditure; B-trade balance of GDP; Z_i set of controlled variables were selected via data specification.

The DTSEM provides the net effects for both the positive effects and negative effects of military expenditure on an economy utilising the 3SLS technique. The regression is provided as follows:

$$\frac{\partial_g}{\partial_m} = \frac{a_2 + a_1(b_1 + b_3 C_1) + a_3 C_1}{1 - C_{a_1} b_2 + a_1 b_3 c_2 + a_2 C_2} \quad \ldots\ldots 3.34$$

DTSEM has some strengths and weaknesses. Some of the strengths of DTSEM include the following it overcomes the problems of endogeneity, causality and simultaneous problem. However, some of the setbacks of Deger model: Relied on Ad-hoc theoretical specification (that is, not based on strong theoretical underpins); it ignores the human capital component of growth.

3.5.5. The Aizenman and Glick model

Aizenman and Glick (2006) developed a theoretical framework to analyse military expenditure-growth nexus based on (Barro and Sala-i-martin (1992) work. They opined that military expenditure asserts a negative or insignificant effect on growth because of its non-linearity and omitted variable biases.

Aizenman and Glick (2006) postulated that threat is a key factor to determine if military expenditure will assert a positive impact on growth

$$\uparrow threat + \uparrow military\ expenditure = \uparrow economic\ growth\ (growth\ occur\ via\ provision\ of\ security)$$

$$\downarrow\ threat + \uparrow military\ expenditure\ =\ \downarrow\ economic\ growth\ (via\ \ corruption\ and\ rent\ seeking)$$

This can be written mathematically as follows:

$$\frac{\partial\ growth}{\partial\ m} = \alpha_1 + \ a_1 threats\ ; a_1 < 0, a_2 > 0 \quad \ldots\ldots 3.35$$

$$\frac{\partial\ growth}{\partial\ threat} = \ b_1 + \ b_2 m\ ; b_1 < 0, b_2 > 0 \quad \ldots\ldots 3.36$$

G= growth rate of real GDP per capita; m= military expenditure; threat-level of country’s effective military threat.

This suggests a basic growth equation written as:

$$growth\ =\ a_1 +\ a_2 m\,(threat) + b_1\ threat\ + b\,X_i\ ; a_1 < 0, b_1 < 0;\ a_2 > 0 \quad \ldots\ldots 3.37$$

Where X- set of control variables e.g. Income (GDP), Investment share and population growth rates and other socio-economic variables.

Aizenman and Glick (2006) postulate that the direct impact of military expenditure and external threats on growth are assumed to be an inverse relationship while the collaborative impact is positive. The Barro style model of military expenditure-growth relationship indicates that military expenditure influenced by external threat stimulates output by increasing security, whereas military expenditure influenced by rent-seeking and corruption will retard growth by disrupting productive economic activities.

3.5.6. The Augmented Solow Model

(Mankiw et al., 1992) augmented the Solow (1956) (Solow, 1956) neoclassical model by incorporating human capital component. The regression can be written as:

$$y(t) = Pc\,(t)^{\alpha} H\,(t)^{\beta}[A\,(t)\,L\,(t)]^{1-\alpha-\beta} \qquad \text{.................3.38}$$

$$0 < \alpha + \beta < 1 \qquad \text{..3.39}$$

α *and* β- Elasticities of income with respect to capital and Labour, Y- output, Pc - Physical capital, L- labour

$A(t)L\,(t)$-effective units of labour that grow at n + g

$$Y = \frac{y}{AL}\,, K = \frac{y}{AL}\,, and\ h = \frac{H}{AL} - quanitites\ of\ effective\ labour \qquad \text{..............3.40}$$

S_k *and* S_h denote the fraction of income spent on physical capital and human capital. The transition equation is written as:

$$k(\dot{t}) = S_k\,y(t) - (n + g + \delta\,)k(t) \qquad \text{..........................3.41}$$

$$h(\dot{t}) = S_h\,y(t) - (n + g + \delta\,)\,h(t) \qquad \text{.......................3.42}$$

The production function and the transition equations are based on the standard neoclassical assumptions. When the economy is at a steady-state, $\dot{k} = h \dot{=} 0$ and when the stationary of k * and h* is obtained as:

$$K^* = \left(\frac{S_k^{1-\beta} S_k^{1-\beta}}{n+g+\delta}\right)^{1/(1-\alpha-\beta)} \qquad \text{..3.43}$$

$$h^* = \left(\frac{S_k^{\alpha} S_k^{1-\alpha}}{n+g+\delta}\right)^{1/(1-\alpha-\beta)} \qquad \text{..3.44}$$

The Solow model provides the speed of convergence around the steady-state:

$$\frac{\partial \ln(y(t))}{\partial t} = \lambda[\ln(y^* - Ln(y(t)] \qquad \text{...................................3.45}$$

Where

$$\lambda = (n + g + \delta)(1 - \alpha - \beta) \qquad \text{..................................3.46}$$

When the variables of K * and h* are incorporated in the steady-state transition equations and production function to derive the long-run steady-state per capita income as:

$$\ln\big(y(t)\big) - Ln\big(y(0)\big) = \left(1 - e^{-\lambda t}\right)\frac{\alpha}{1-\alpha-\beta}\ln(S_k) + \left(1 - e^{-\lambda t}\right)\frac{\beta}{1-\alpha-\beta}\ln(S_h) - \big(1 - e^{-\lambda t}\big)\frac{\alpha+\beta}{1-\alpha-\beta}\ln(n+g+\delta) + \left(1 - e^{-\lambda t}\right)\frac{\alpha+\beta}{1-\alpha-\beta}\ln\big(y(0)\big)$$

…………………………………………………………………………………………………….3.47

The augmented Solow model depicts that income growth is a function of the initial level of income and determinants of the ultimate steady-state.

As regards military expenditure –growth nexus, augmented Solow model with a military variable is chiefly cantered on (Knight et al., 1996) works which is written as:

$$Y = a_0 + a_1 lny_0 + a_2 \ln K + a_3 \ln h + a_4 \ln(\mathrm{n+g+\delta}) + a_5 \ln m$$ ………3.33

Y - Income per income growth rate; y_0- initial income per capita levels; K-investment; h-human capital, $\mathrm{n+g+\delta}$ - effective labour growth plus depreciation and m- military expenditure.

3.5.7 Theoretical model for growth, military expenditure and institutional quality

Aizenman and Glick (2006) developed a theoretical framework to analyse the interaction among military expenditure, growth and institutional quality (corruption) by improving on Barro and Sala-i-martin (1992) work. They assumed that there was zero population growth. Output per worker is affected positively by infrastructure supplied by the public sector, and negatively by the magnitude of the external threats. The reduced form of output is:

$$y = A(k)^{1-\alpha}(g)^{\alpha} f$$ …………………………………………….3.34

Where A denotes an exogenous productivity factor, k is the capital/labour ratio, g is the ratio of government (non-military) expenditure on infrastructure relative to labour, and 1-f measures the output cost of the threat external unfriendly neighbours. Thus, it assumes that this cost depends negatively on domestic military expenditure and positively on an index of the magnitude of the threat; this can be presented in the following functional form:

$f(g_{m,}Z) = \frac{g_m}{g_m+Z};\ f_{gm} > 0, f_z < 0, f(0,z) = 0, f(\infty, z) = 1{,}0 < f < 1$ ………………….3.35

Where g_m - military expenditure (locally) and z is the external threat level.

N.B. This specification indicates that z is measured in units comparable to military expenditure (locally) so that g_m and z may be aggregated.

Corruption may be incorporated into the model as an activity that taxes fiscal expenditure on military and non-military government expenditure at a rate of t_c. Therefore, output with corruption is:

$$y = A(k)^{1-\alpha}(g[1-t_c])^{\alpha}\frac{g_m[1-t_c]}{g_m[1-t_c]+z}$$ ……………………..3.36

The ratio of military to non-military infrastructure expenditure by $\emptyset$,

$$g_m = \emptyset g$$ ………………………………………………………3.37

Therefore, the total fiscal outlay on both military and non-military expenditure is $(1+\emptyset)g$. The rest of the model specification is identical to that of (Barro, 1990). It is assumed that capital does not depreciate. The fiscal outlay is financed by a proportional tax t:

$$(1+\emptyset)g = t_y$$ …………………………………………………………3.38

The representative agent's preference is:

$$U = \int_0^{\infty}\frac{c^{1-\sigma}-1}{1-\sigma}\,exp\,(-pt)dt$$ ……………………………………3.39

In line with (Barro, 1990), it presents the output growth as follows:

$$\gamma = \frac{\dot{Y}}{Y} = \frac{1}{\sigma}\left[(1-t)\frac{\partial y}{\partial k} - p\right]$$ ……………………………………………3.40

The optimal pattern of taxes and expenditure is represented by $\check{t}\phi$ that determines the military sector size and maximises the growth rate presented by

$$\check{t} = \alpha(1+\check{\phi})$$ ………………………………………………………3.41

$$(\check{\phi})^2\alpha[\alpha(1-t_c)]^{\frac{1}{1-\alpha}}[1-\alpha\check{\phi}]^{\frac{1}{1-\alpha}} = \frac{z}{k}$$ …………………………………3.42

$$\breve{t} = \alpha(g + g_m\breve{\phi})/_y$$

Equation equates the tax , and thereby also the government's expenditure share to the output elasticity with respect to the marginal product of non-expenditure, α magnified at the rate $\breve{\phi}$ (the ratio of military to non-military government expenditure). In a situation of no military expenditure, equation (a) reduces to $\breve{t}$ = α, lead to standard production efficiency situation.

Equation b denotes that the military expenditure ratio Φ has a positive link with an external threat (normalised by the domestic stock of capital). The military expenditure ratio Φ positively links the corruption level and negatively with the productivity level.

$(\breve{\phi}) = (\breve{\phi}, t_c, A); \breve{\phi}_z > 0; \breve{\phi}_{t_c} > 0, \breve{\phi}_A < 0;\ \phi(0, t_c, \bar{A}) = 0$ ………………….3.43

Correspondingly, from equation (a) it follows:

$\breve{t} = \breve{t}(\breve{z}, t_c, A);\ \breve{t}_z > 0;\ \breve{t}_{te} > 0, \breve{\phi}_A < 0$………………………………..3.44

The figure presents the military expenditure-threat level nexus implied by (8b) and (9). In the absence of threats, z=0, also $\breve{\phi}$=0, the optimal amount of military expenditure is zero. For positive threat levels, z>o, however, $\breve{\phi}$>0, that is the optimal level of military expenditure is positive. As the threat level increases, the optimal amount of military expenditure rises monotonically.

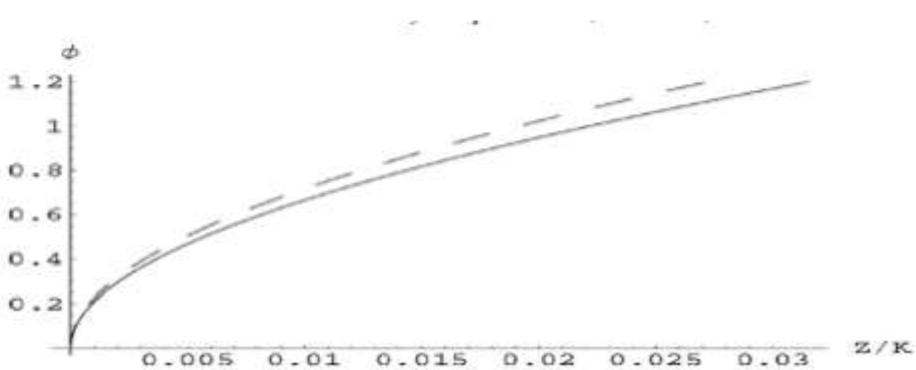


Figure 3.1: Optimal military expenditure and external threat level

Note ϕ *is the optimal ratio of military to non-military expenditure; Z / K connotes the external threat level (normalised by the capital stock). The plots are calibrated by assuming A=1.*

Figure 3.1 depicts the impact of parametrically increasing the corruption rate, t_c. The solid line denotes the benchmark relation between ϕ and z (for t_c=0.1); the dashed line represents the impact of rising the corruption rate for (t_c=0.2). Obviously, rising corruption connotes a higher optimal of military expenditure for any given threat level.

An important feature of equilibrium government expenditure is described as the optimal share of military expenditure equal directly to the output cost of external threat,1-f.

$\widetilde{\phi} = \frac{1-f}{\alpha}$ ……………………………………………………..3.45

In the situation of no threats, the optimal level of military expenditure is zero, the output cost of threats is zero (f=1), and output is a standard CRS function of k and g. Similarly, the optimum tax rate $(\widetilde{\tau})$ equals the output proportion of government services (α), and is independent of scale impact as indicated in 8a and 10. The presence of threats and hostile actions, however, shows positive military expenditure and output costs (f <1) and adds a non-linear multiplicative term (f) to output.

This, in turn, adds a scale consideration to the design of optimal tax and expenditure rates, summarised as:

$\alpha\widetilde{\phi} = \quad 1 - f = \frac{z}{\widetilde{g_m}(1-t_c)+z}$ ………………………………………3.46

Where $\widetilde{g_m} = \frac{\widetilde{\phi}\widetilde{\tau}\,\widetilde{y}}{1+\phi}$. The optimal ratio of military to non- military government expenditure(ϕ) times the output share of non-military expenditure α equals the output cost of external threats (1-f), which invariably equal the magnitude of the external threats(z) relative the aggregate effective expenditure by the domestic country and its unfriendly neighbours $\widetilde{g_m}(1 - t_c) + Z$, where "effective denotes net of corruption tax. Consequently, an exogenous rise in the external threat level, z, rises the optimal expenditure and tax rates, $\breve{\phi}$ and $\breve{\tau}$.

Therefore, unfriendly external threats affect growth negatively due to two factors: the direct negative effects on growth linked to the reduction of marginal product of capital, linked to the negative effect with a higher tax rate as a result of lower productivity. Therefore, a rise in corruption t_c and reduced domestic productivity (A) raises military expenditure and, therefore, result in retarded growth. This is presented in the following reduced form for optimal output growth:

$\breve{y} = \breve{y}(z, t_c, A); \breve{y}_z < 0, \breve{y}_A > 0$ ……………………………………….3.47

To determine that:

$\frac{\partial \breve{y}}{\partial \phi} =< 0 \; and \; \frac{\partial^2 \breve{y}}{\partial \phi \partial z} => 0$ ……………………………………………3.48

Therefore, confirming the nonlinear theoretical relationship between growth and military expenditure.

Figure 2 presented the optimal growth levels and military expenditure, while holding constant the levels of external threats and corruption. Higher military expenditure retards growth, all being equal. A rise in threat level moves the entire locus upwards.

In conclusion, the theoretical models imply that the relationship between military expenditure and growth depend on corruption and rent-seeking behaviour thus, acting as tax fiscal expenditures, corruption increases the desired level of military expenditure. They opined that military expenditure asserts negative or insignificant effect on growth because of its non-linearity and omitted variable biases.

Aizenman and Glick (2006) postulated that threat is a key factor to determine whether or not military expenditure will assert a positive impact on growth

$\uparrow threat + \uparrow military\, exp. = \uparrow economic\ growth\ (growth\ occur\ via\ provision\ of\ security)$

$\downarrow\ threat + \uparrow\ military\, exp. = \downarrow\ economic\ growth\ (via\ corruption\ and\ rent\ seeking)$

This can be written mathematically as follows:

$\frac{\partial\, growth}{\partial\, m} = \propto_1 + \; a_1 threats\,; a_1 < 0, a_2 > 0\, \emptyset$ …………………………3.49

$\frac{\partial\, growth}{\partial\, threat} = \; b_1 + \; b_2 m\,; b_1 < 0, b_2 > 0$ ………………………………….3.50

G= growth rate of real GDP per capita; m= military expenditure; threat- level of country's effective military threat.

This suggests a basic growth equation written as:

$IGI = a_1 + a_2 m(corruption) + b_1\, corruption + b\, X_i\,; a_1 < 0, b_1 < 0;\; a_2 >$ ……..3.51

Where X- set of control variables e.g. Income (GDP), investment share and population growth rates and other socio-economic variables.

(Aizenman and Glick, 2006) postulate that the direct impact of military expenditure and external threats on growth are assumed to be an inverse relationship while collaborative impact is positive. The Barro style model of military expenditure-growth relationship indicates that military expenditure influenced by external threat stimulate output by increasing security whereas, military expenditure influenced by rent-seeking and corruption will retard growth disrupting productive economic activities.

3.5.1. Theoretical and Empirical literature on Institutional quality

The two prominent scholars of institutional quality are Acemoglu and Robinson (2013) and often regarded as the fathers of institutional theory. Acemoglu and Robinson (2013) published a book titled "*Why nations fail.*". The book was majorly influenced by North's (1990) argument that a good institution is a precondition for sustainable and inclusive growth. North's (1990) viewpoint was often supported by citing historical facts covering Egypt, China, Britain and Latin America. Acemoglu and Robinson (2013) theorized that it was essential for a country to develop a certain set of institutions which are capable of stimulating incentives for economic activities. Also, they pointed out that economic institutional quality alone was not sufficient; rather a combined effort of both economic institutional quality and political institutional quality can bring about development. Citing that few countries with good economic and political institutions often experience rapid and sustainable development than other countries with only either economic or political-institutional quality alone.

Acemoglu and Robinson (2013) criticized some existing institutional assumptions for developments. For instance, the geography led growth assumption which emphasized that countries in tropical region are often confronted with diseases, this therefore led to less agricultural production output. Acemoglu and Robinson (2013) gave an example of North and South Korea in the same location but at variance in terms of economic development. As regards diseases, they attribute this to a deficit in the health care sector. Also, they refute the role the cultural factor as an impediment towards development. Rather, deficiency in the political and economic structure that is unable to stimulate incentives for economic growth was responsible and not culture.

In conclusion, the last theory they dismissed was ignorance in policy selection. They argued that oftentimes nations have been advised by both international and renowned academics, but were rejected by the political and economic institutions they operate within.

Good institutional and sound policies create an enabling environment, thus capable of promoting business growth and economic development via optimum utilization of resources. More often, the conceptualization of institutional quality allows the view that institutions are all rules or forms of conduct, which are intentionally devised to reduce the uncertainty that results from imperfect information, control the environment and social interaction, as well as lower transaction cost (Ménard and Shirley,2005). Also, Ostrom (2015) defined institutional quality as the sets of working rules that are used to determine who is eligible to make decisions in some arena, what actions are allowed or constrained, what aggregation rules will be used, what procedures must be followed, what information must or must not be provided and what pay-offs will be assigned to individuals dependent on their actions.

Using the **degree of embeddedness**, Williamson (2000) classified an institution into four levels. Level 1 consists mostly of informal institutions such as religion, traditions, norms and customs. Level 2 includes the formal institutional environment, defined as the formal rules of social interaction, such as the polity, property rights, bureaucracy and judiciary. Level 3 incorporates the institution of governance. This relates the structure of governance with transactions, especially those relating to contracts with their transaction costs. Lastly, institutional quality in Level 4 involves the rules that govern employment and resource allocation.

On the other hand, Beck et al. (2002) classified institutional quality based on the **unit of analysis**. Such a unit could be legal, political, economic and social (Joskow, 2008). While the political institution takes care of the political process and party politics, an economic institution is concerned with production, distribution and consumption activities in the society. Social institutional concepts such as norms, beliefs, trust and civic cooperation, coincide largely with informal institutions on the basis of formality classification. Political and economic institutional factors are important determinants of differences in growth across economies.

On the measure of institutional quality, several efforts have resulted in the coining of the term **"institutional quality"**. It is the level attained relative to a standard set, as suitable to represent the quality of an institutional environment, by an individual, a body of professionals, organisation, or institution. Generally, institutional quality is measured using a scale of example, 1 to 6 (Country Policy and Institutional Assessment, 2015) or 1 to 100 (O'Driscoll et al., 2001). Unlike the Fraser House where a higher score or number implies lower quality, most sources of institutional measure use a higher score for higher quality and a lower score for lower quality. In this light, some institutional measures and proxies are tabulated below.

Table 3.2: Measure of institutional quality

Institutional group	***Measure***	***Source***
Legal Institution:		
Index of Economic Freedom	Property rights	The Heritage Foundation
Freedom of the Press	Legal environment	Freedom House
Freedom in the World (EFW)	Civil Liberties	Freedom House
Economic Freedom to World (EFW) Index	Impartial courts	Fraser Institute
EFW Index	Protection of property rights	Fraser Institute
Law and order		ICRG
Religion in politics		ICRG
Rule of Law		WB WGI
Political Institution		
Freedom of the press	Political Environment	Freedom House
Freedom in the World Institutionalised	Political Rights	Freedom House
Democracy	Institutional Autocracy Polity	IV
Checks and balances		WB
Democratic accountability		ICRG
Corruption		ICRG
Bureaucratic quality		ICRG

Internal Conflict		ICRG
Military in politics		ICRG
Control of corruption		WB WGI
Corruption perception index		Transparency International
Political terror scale		Political terror scale
Economic Institution		
Index of Economic Freedom	Financial Freedom	The Heritage Foundation and WSJ
Index of Economic Freedom	Business freedom	The Heritage Foundation and WSJ
Regulatory Quality		WB and WSJ
Freedom of the Press	Economic Environment	Freedom House
EFW Index	Freedom to own foreign currency bank accounts	Fraser Institute
EFW Index	Regulation of credit, labour and Business: Credit market regulations	Fraser Institute
EFW Index	Regulation of credit, labour and Business: Labour market regulations	Fraser Institute
EFW Index	Regulation of credit, labour and Business: Business regulations	Fraser Institute
EFW Index	Foreign ownership / Investment restrictions	Fraser Institute
EFW Index	Capital controls	Fraser Institute

Source: Adapted from Kuncic (2013)

Nevertheless, irrespective of measures and sources, institutional quality should reflect growth. As noted by North (2006), Institutional quality spurs economic growth when the environment encourages voluntary transactions in productive activities. Public spending represents one of the important policy instruments for governments. It denotes the expenses which the government incurs in the performance of its operations. While acknowledging the fact that economic growth's impact on the poor is complex and contentious in developing countries, Mckay and Sumner (2008) stressed the likelihood of growth being unequal. Thus, in order to benefit the poor, the researchers suggested a redistributive and transformative public spending that can break the intergenerational transmission of poverty, increase the rate at which jobs are created from growth, and support a broad-based sectorial growth. Consequently, public spending is expected to engender large positive effects on economic growth.

3.5.1.1. Inclusive and extractive institutional

Though inclusive and extractive institutions are obtained from theory, they form the theoretical framework; Acemoglu and Robinson (2013) ascribe inclusiveness and exclusiveness to the specific set of institutions. As regards economic institutional quality, they argue that countries differ in economic growth as a result of their different institutions, the rules affecting how the economy works, and the incentives that drive people (Acemoglu and Robinson, 2013).

In summary, inclusive economic institutions are made up by their inherent incentive structure such as equality before the law and public services that present equal chances, which are vital features of inclusive economic institutions. Acemoglu and Robinson, (2013) observed that extractive economic institutions are the direct opposite of inclusive economic institutions characterized by poor public services, to mention a few. Also, under extractive economic institutions, there is the possibility of state capture where national resources are shared among a certain class of individuals.

Political institutions control how power is shared within a society. Inclusive political institutions cut across and encompass diverse groups of people. To sustain an inclusive economic institution, there is a need for a certain degree of centralization. On the other hand, an extractive political institution is characterized by the control of the national resources by the elite alone. A unique relationship exists among the types of institutions. For instance, inclusive political institutions support inclusive economic institutions, just like extractive political institutions that support extractive economic institutions.

In conclusion, institutional quality concept will be the foundational institutional quality theoretical framework of this thesis. The political institution will be proxied by corruption because corruption is the direct outcome of either a good or bad institution. For this study, **corruption will be the proxy for measuring institutional quality in BRICS countries**.

3.5.1.2 Theories on corruption proxy for institutional quality- The "grease the wheels" hypothesis of corruption (also called the "greasers" school of thought)

The "grease the wheels" hypothesis of corruption states that graft may act as a trouble saving device, thereby raising efficiency. Furthermore, the "greasers" school of thought of corruption posits that corruption may enhance growth, investment and development in the short run depending on the low quality of governance and bureaucratic rules and regulations. They also argue that it could also motivate public officials in a situation where the wage is grossly insufficient (Leff, 1964, Leys, 1965, Aidt, 2003, Cuervo-Cazurra, 2006, Wang and You, 2012).

Some of the common consensus among prominent scholars of the "grease the wheels" hypothesis of corruption is that corruption may enhance economic growth through various channels especially in the presence of ill-functioning of bureaucracy.

One of the channels of ill-functioning of bureaucracy is slowness. Lui (1985), Aidt (2003), Cuervo-Cazurra (2006) applying a formal economic model to estimate the impact of corruption on growth assert that corruption could efficiently reduce the time spent in queues but speed up the transaction process. The rationale behind this is that bribes could serve as a motivation to bureaucrats to fast track the process in a sluggish administration. Also, Huntington (1968) affirms that corruption could lessen the tedious bureaucratic regulations and enhance growth. The author further cited the United States of America railroad utility and Industrial Corporation in the 1870s and 1880s where the high-level prevalence of corruption also witnessed rapid growth during the same period.

Secondly, (Hewitt and Van Rijckeghem (1995) and Méon and Weill (2010) argue that another channel through which corruption can drive growth in the presence of ill-functioning bureaucracy is focus on the quality of civil/public servant. Also, Leys, (1965), Bayley (1966), Van Rijckeghem and Weder (2001) and Muttreja et al. (2012) posit that if wages in government institutions are low or insufficient, corruption (bribes) could serve as perks/motivation to civil servants. As a result, this attracts highly skilled manpower from poorly remunerated private organisations to government owned corporations.

Thirdly, corruption could serve as a means of decision rule by public officials (Beck and Maher, 1986, Lien, 1986). For instance, in competition auction or bidding for government contracts or projects, the authors assert that only firms that pay the highest amount of bribes in such bidding process will win such contracts. Therefore, corruption can be said to be a benchmark for granting government procurement contracts.

Also, Leff, (1964) and Bayley (1966) affirm that corruption could serve as a hedge against unfavourable government policies especially if institutions are biased against entrepreneurship due, for example, to an ideological bias.

Furthermore, Leff (1964) asserts that corruption could enhance the quality of investment provided if it is in form of tax avoidance and such investment is channelled in high yielding project with Return On Investment (ROI).

Akai et al. (2005) assert that, in the short run, corruption may "counteract government failure and promote economic growth and exogenously determine suboptimal bureaucratic rules and regulations.

Recently, Wang and You (2012) confirmed that corruption may promote the most efficient form to bypass strict and rigid laws and regulations in China. Also, Dreher and Gassebner (2013), who use an extreme bounds analysis in a panel of 43 countries from 2003 to 2005 share the same view. The result indicates that when government regulations are excessive, corruption might be beneficial.

In summary, the aforementioned propositions confirm that corruption may positively drive inclusive growth because it greases the adverse defective bureaucracy and bad policies.

3.5.1.3 Theories on corruption proxy for institutional quality-The “sand the wheels” hypothesis of corruption (also called the “Sanders” school of thought)

The “Sanders” school of thought of corruption affirms that corruption is inimical to economic growth, investment and development (Mauro, 1995, Tanzi, 1998, Al-Sadig, 2009, Méon and Weill, 2010, Ibrahim et al., 2015). The “sand the wheels” hypothesis of corruption is of the view that corruption is detrimental to economic growth through several distorting channels.

Kurer (1993) argued that corrupt officials have an incentive to create other distortions in the economy to cover up their ill-gotten wealth. Also, that a “civil servant can limit new or other civil servants access to key or “juicy” positions to preserve the rent from corruption.

Rose-Ackerman (1997) counter the assumption that graft can promote the choice of the right decision as subjective. The authors argue that a firm willing to pay the highest bribe tends to compromise in the quality of goods and services to be produced or to be rendered.

In conclusion, the aforementioned argument affirms that corruption may negatively retard inclusive growth because of the “sand effect “on investment and good policies.

3.6. Empirical studies on military expenditure and economic growth

The objective of this section is to analyze empirical literature related to the military expenditure–growth nexus.

3.6.1. Empirical studies outside BRICS countries

Benoit (1973) investigated the military-growth nexus for 44 developing countries by correlation analysis. The result suggests that military expenditure does have a positive effect on growth. Later on, Babin and Society (1989) examined the impact of military expenditure on growth in 88 developing countries. They found out that military expenditure plays an important role in economic growth.

Also, Atesoglu (2009) explored the military growth relationship using the United States as a case study. Their result indicates a positive spill over from military expenditure to the civilian sector.

Using a group of developing countries Stewart and Change (1991) examined military expenditure-growth relationship using the Keynesian demand function. Their result indicates that the non-military sector has a stronger positive effect on growth than military expenditure growth positive impact.

Also, incorporating technology Mueller et al. (1993) employed the Feder model to analyse military expenditure impact on the United States' economic growth. Their result reveals a positive impact from military expenditure to growth.

Sezgin and Economics (2001) explore the military expenditure-growth linkage in Turkey and Greece utilizing regression analysis. Their findings suggest that military expenditure has a positive impact on growth.

Wijeweera et al. (2009) investigate the effect of military expenditure on Sri Lanka economic growth based on the Keynesian theoretical model incorporating real interest and non-military expenditure components. Their finding suggests a positive impact on growth.

Aye et al. (2014) revisited the military expenditure-growth relationship for the United States of America employing Factor Augmented Vector Autoregressive (FVAR) model. Their outcome indicates a positive effect of military expenditure on aggregate output.

Feridun et al. (2011) also examined the military expenditure-growth dynamics in North Cyprus. He found that military expenditure has a significant positive impact on economic growth.

In multi-country studies, Bose et al. (2003) examined military expenditure -growth nexus for thirty developing countries. Their result indicates a significant positive impact of military expenditure on growth. Similarly, Yildirim et al. (2005) looked at the military expenditure-growth relationship of OECD countries. They discovered that military expenditure spurs aggregate output. Narayan et al. (2007) using Fiji Islands as a case study, examined military expenditure-growth by incorporating export in the cob-Douglas function. Their finding reveals the positive effect of military expenditure on growth. Also, Ando (2009) explored 109 countries' military expenditure-growth linkage. He found that there exists a positive effect on growth from the military expenditure.

However, Huang and Mintz (1991) using the United States of America as a case study, investigated the military expenditure-growth relationship. Their finding suggests an adverse relationship between military expenditure and growth. Ward and Davis (1992) revisited the military expenditure -growth nexus using the three-sector model. Their result reveals a negative impact of military expenditure via productive declining. Also, Atesoglu (2002) investigated the military expenditure-growth in the United States of America employing Romer and Taylors model. Their result shows an inverse relationship between military expenditure and the United States of America's economic growth.

Klein* (2004) using Peru as a case study, explored the impact of military expenditure on growth. His result shows a negative impact on growth. In the same vein, Karagol* et al. (2004) revisit the military expenditure-growth nexus in Turkey. His result suggests a long-run association between military expenditure and growth but affirms a negative military expenditure effect on growth.

Kentor and Kick (2008) investigated military expenditure-growth debate for both developed and developing countries. They expanded this debate by introducing military expenditure variable as a proxy for capital intensiveness. Their result indicates that an increase in military expenditure per soldier leads to a significant reduction in gross domestic product per capita, especially in developed countries. Also, Smith et al. (2008) revisit the United States of America's military expenditure-growth debate by employing Atesoglu (2002) model. Their outcome indicates a negative military expenditure effect on growth.

Applying the Keynesian hypothesis, Shahbaz and Shabbir (2012) revisit the military expenditure-growth nexus using Pakistan as a case study. Their finding suggests that an increase in military expenditure slows down the economic growth rate.

Wijeweera and Webb (2011) use a panel cointegration approach to examine the relationship between military spending and economic growth in the five South Asian countries (namely, India, Pakistan, Nepal, Sri Lanka and Bangladesh) over the period of 1988-2007. They found that a 1% increase in military spending increases real GDP by only 0.04% and hence they concluded that the substantial amount of public expenditure that is currently used for military purposes in these countries has a negligible impact upon economic growth.

Faini et al. (1984) further examined the impact of military expenditure on investment and growth of 69 countries from 1950 to 1972, employing the fixed effect model. Their result revealed that military expenditure has an adverse impact on economic growth and investment. Thus, military expenditure crowds out investment and retards economic growth for the countries understudied.

Deger (1986) examined military expenditure and investment relationship, where military expenditure was the independent variable and investment equations as the dependable variable. The result revealed that the military expenditure coefficients on investment equations are negative and statistically significant. Thus, military expenditure partly crowds out investment in emerging countries.

Knight et al. (1996) investigated the military expenditure–investment nexus for 79 countries including control variables such as human capital proxy, war proxy and trade. Their result revealed an inverse relationship between military expenditure and investment, therefore, confirming the crowd-out effect.

Feder (1983) re-examined the three sectors model on two groups of countries (8 Asians and 16 Latin America). The pooled time series, cross-sectional techniques were employed. Their result affirmed that military expenditure and other expenditures have a direct positive impact on economic growth in Asian countries whereas military expenditure and non-military expenditure have a negative impact on the growth of Latin American countries.

Yildirim et al. (2005) explore the military expenditure-growth relationship for Middle Eastern countries and Turkey by employing the two-sector model, they confirmed the military expenditure stimulate economic growth for the period 1989-1999, and that military expenditure (industries) were more productive than the civilian sector.

Sezgin (2001) explored the impact of military expenditure, military size on economic growth using Turkey as a case study covering 1950-1993 by utilising the two-sector Feder model. They, however, expanded the two-sector model by incorporating human capital. Their result confirmed that both military size and size of military budgetary allocation matter and positively impact on growth; however, the externality effect from the military sector was negative.

Reitschuler and Loening (2005) employed the two-sector Feder model to empirically analyse the impact of military expenditure on the economic growth of Guatemala for the period 1951-2001. The empirical analyses indicate that a military expenditure threshold of around 0.33% of GDP is preferred and has a positive impact on growth whereas above the threshold of 0.33% military expenditure will have an adverse effect on growth. As regards the externality effect, they assert that the military sector has less productivity and externality effects on the civilian sector.
Galvin (2003) investigated the military expenditure and economic growth relationship by employing a panel data analysis framework based on 2 SLS and 3SLS estimation techniques. The result shows that military expenditure has a negative effect on the 64 countries' economic growth and affirmed that military expenditure’s adverse impact is greater in middle-income countries and less in low-income countries.

The demand and supply model was modelled by Deger (1986) to examine the military expenditure on LDC economic growth using 3SLS and 4SLS for the period of 1965-1973. The result indicates that military expenditure retards investment, whereas military expenditure has a positive impact on economic growth. Thus, military expenditure has a net negative impact on economic growth.

Deger (1986) re-examined military expenditure –growth nexus by incorporating a balance of trade and utilising the 4 SLS estimation technique. The empirical analyses reveal that military expenditure has an inverse relationship with the balance of trade.
Sezgin (2001) selected a Eurasian economy (Turkey) to examine the military expenditure –growth relationship for the period 1956-1984 by employing 2 SLS and 3 SLS methodologies. The result shows that military expenditure has a positive effect on economic growth whereas there exists no significant adverse effect on saving and investment for the period examined.

Ramos et al. (2013) investigated military expenditure –growth nexus on Mexico for a period of 1984-2000 by utilising the Demand and Supply model and adopting the 3 SLS estimation technique. The result indicates that military expenditure stimulates Mexican economic growth. However, it crowds out savings and investment.

Klein* (2004)explores military expenditure on Peru's economic growth by employing Deger-type 3 equation. Their outcome indicates the existence of crowd out effect by military expenditure on savings and economic growth.

Aizenman and Glick (2006) use Barro style growth model to explore the impact of military expenditure on economic growth, taking cognizance of the threat of 90 countries spanning 1989-1999. The empirical result revealed that military expenditure and antagonistic threat have a negative effect on growth, whereas, military expenditure in the midst of threats stimulates growth. This innovative specification indicates that output is influenced by security or military expenditure depending on the presence of a hostile threat.

Yakovlev (2007) use the Barro growth model for 28 countries over the period of 1965-2000 to examine the impact of military expenditure, arms trade on economic growth. Employing the random and fixed effects and GMM techniques, the cross-sectional results revealed that high military expenditure coupled with net arms exports separately retard growth whereas, net arms exporting countries coupled with high military expenditure do not retard economic growth.

Chowdhury (1991) examined the military-growth nexus of 55 LDCs using the Granger causality approach covering the period 1961-1987. The empirical analyses indicate a causal relationship from military expenditure to growth for 15 countries, causal relationship from growth to military expenditure for seven countries, bi-directional relationship for three countries and no causality for 30 countries. This affirms that military expenditure growth causality is mixed and therefore, cannot be generalised for all countries.

Kusi (1994) investigated the causality dynamics between military expenditure and growth for 77 LDCs by utilising Granger causality for over the period 1971-1989. The result affirms that in seven countries military expenditure Granger cause growth, seven countries’ economic growth Granger cause military expenditure, one country has bi-directional causality and 62 countries show no causality exists.

Kollias* et al. (2004) examined military expenditure-growth nexus and found that there exists bi-directional causality between military spending and economic growth in the case of Cyprus for the period 1964 to 1999.

Karagianni and Pempetzoglu (2009) investigated the military expenditure on economic growth using the Granger causality technique. They discovered that there exists a linear and non-causality between military expenditure and economic growth in Turkey for the period 1949 to 2004.

Farzanegan (2014) explored the military expenditure-growth nexus in the case of Iran. The scholar employed Granger causality techniques for the period 1959 to 2007. It was found that the Granger causality result depicts that there is a unidirectional link from military expenditure to growth.

Selvanathan and Selvanathan (2014) analysed the military expenditure-growth connection using Sri-Lanka as a case study covering the period 1975 to 2013. They confirmed that military expenditure causes economic growth. However, there was no causal impact from growth to military expenditure despite Sri-Lankan civil wars.

Furthermore, Gokmenoglu et al. (2015) investigated the military expenditure-growth link using Turkey as a case study by employing Johansen co-integration and Granger causality tests for the period 1988 to 2013. They affirmed that military expenditure and growth are linked while the Granger causality confirms that there is a unidirectional link between growth and military expenditure.

Zhao et al. (2015) examined the military-growth nexus in China for the period 1952 to 2012. They used an impulse response function based on the vector error correction model and Granger causality technique. Their result revealed that there are two long-run relationships and that there exists a negative and unidirectional Granger on growth.

Anwar (2017) using Pakistan as a case study for the period 1988 to 2011 investigated the military expenditure-growth nexus by employing Toda Yamamoto-Modified Standard Granger causality. The causality result depicts that there is a unidirectional causality from growth to military expenditure.

Kovačević and Smiljanić (2017) analysed a potential causality between military expenditure and Croatia's gross domestic product (GDP), as well as between DEFEXP and the number of Croatian Armed Forces personnel (AFP). The research is based on the use of the Granger causality test followed by procedures proposed by Toda and Yammamoto (1995) and the impulse response function with data from 1995 to 2014. Their empirical results affirmed that there was neither a short-run nor a long-run link between growth and military expenditure. The results obtained show one-way causality from DEFEXP to AFP, with AFP responding to shock from DEFEXP after three years.

Alazim (2017) analysed the military-growth debate by using Algeria as a case study, by employing a Granger-causality method for a time series data for growth and military expenditure for the period 1995 to 2014. The result denoted that there exists a unidirectional direction from government spending to military expenditure and per capita income.

Kalyoncu and Yucel (2006) examined the military-growth link for Turkey and Greece for the period 1956 to 2003 by employing the Engle-Granger cointegration method and Granger causality technique. The study revealed that military expenditure and growth are co-integrated for both countries and there exists the presence of a unidirectional link running from growth to military expenditure for Turkey only.

Pan et al. (2015) using ten Middle East countries reinvestigated the military-growth nexus using the panel causality technique. They found the presence of a unidirectional link from military expenditure to growth for Turkey: one-way link from growth to military expenditure for Kuwait, Egypt, Syria and Lebanon while no causality for Oman, Saudi Arabia and Jordan and a bi-directional link for Israel. In summary, there is no consensus on the causal military-growth nexus in these nations.

Al-Hamdi and Alawin (2016) examined the military-growth connection in Israel and its four Arab neighbours spanning the period 1988 to 2010. They used the Granger-causality technique and concluded that military expenditure tends not to be active during the war / crisis period; however, it is impacted positively by the income levels.

Topcu and Aras (2017) investigated the military-growth connections using the Central and Eastern European countries by applying panel cointegration and causality techniques spanning the period 1993 to 2013. Their result indicates that military expenditure and growth are at variance in the long run and the causality direction is from growth to military expenditure.

Aydemir et al. (2017) investigated the effects of military expenditure on economic growth. Based on military Keynesianism theory, the findings revealed that military spending has positive effects on the economic growth (reduction in unemployment) in some G20 states while it also has negative effects in some and has neutral effects in others. In addition, it is further indicated that the positive effects are experienced in relatively advanced countries, the negative effects emerge in relatively less developed countries, and the countries with abundant natural resources experience neutral effects.

3.6.2. Empirical Studies Within BRICS Countries

Stålenheim et al. (2008) stated that Brazil is now the 11th world's biggest military spender. Hunter (1997) postulates that the democratic system of government assigns less budgetary allocation for military expenditure unlike the military or authoritarian system of government. Zaverucha and da Cunha Rezende (2009) further re-examine Hunter (1997) postulation and affirm whether it was true or not. However, Zaverucha and da Cunha Rezende (2009) finding revealed that the democratic system of government assigns more funds for the military as a result of high internal political instability from the opposition groups.

According to Stålenheim et al. (2008) Brazil is now the 4th world's biggest military spender. In 2007, Russia's military expenditure rose by 13 percent higher than its economic growth rate of 11 per cent annual average over the past 10 years. For instance, since 2003, Russia’s military outlay has risen by 41 per cent while in 1998 by 160 per cent despite a year of Russia’s financial crisis.

According to Stålenheim et al. (2008), India occupies the 5th position and represents about 80 per cent of South Asia total with an increase of three per cent in real terms in 2007. The average growth rate over 1998-2007 was 6 per cent. Ward et al. (1991) explored the military expenditure-growth nexus in India employing three-sector model taking note of the externality and productivity effects. Their findings show that military expenditure has a significant positive impact on growth.

According to Stålenheim et al. (2008) and Furuoka et al. (2016), China's military expenditure has risen *pari-passu* with its economic growth, now making China the 2nd world's military spender. China's military rose by 12 per cent in 2007. Between 2003-2007, China recorded the highest rise of 59 per cent. China has raised its budgetary allocation for military over the past decade, in some years even more than its economic growth rate during 1998-2006. The major composition of the increased China military expenditure since 1997 has been (1) increased in military personnel emolument (2) transformation of Chinese to a high technology-driven one (3) mailings the military strength for potential war over Taiwan.

Chang et al. (2001) employed cointegration analysis and a Vector Regressive Model (VAR) to explore the military expenditure-growth in China from 1952 to 1995. Their result indicates that Granger causality runs from economic growth to military expenditure for mainland China.

Chang et al. (2014) re-examined the effect of military expenditure on growth in China for the period 1988 to 2010. Their result found that Granger causality runs from economic growth to military expenditure for China.

Dimitraki et al. (2015) re-examined the military expenditure-growth link in China from 1952 to 2010 based on Barro style growth model. Their finding shows that China's Gross Domestic Product (GDP) determines the rise in military expenditure and not vice versa.

Zhao et al. (2015) examined the military–growth nexus in China for the period 1952 to 2012. They used an impulse response function based on the vector error correction model and Granger causality technique. Their result revealed that there are two long-run relationships and that there exists a negative and unidirectional Granger on growth.

Also, Furuoka et al. (2016) explored the impact of military expenditure on the growth in China. They confirmed that the increase in military expenditure is mainly driven by Chinese economic development expansion for the period 1989 to 2011.

However, Meng et al. (2015b) finding indicates that an increase in Chinese military expenditure has contributed to the expansion of income disparity in China from 1989 to 2012 using the Granger approach.

Dunne and Vougas (1999) investigated the impact of military expenditure-growth nexus in South Africa for the period 1964 to 1996 employing standard Granger causality test within the VAR framework. They found a significant adverse impact of military expenditure on growth for the period considered.

Birdi and Dunne (2002) examined the military expenditure-growth relationship utilising Feder-Ram. The result suggests that military expenditure adversely retards growth in the short run.

Aye et al. (2014) explored the military expenditure- growth relationship using bootstrap rolling window estimation and revealed that military expenditure had a positive effect during the apartheid period but not later.

Zhong et al. (2016) using BRICS countries (Brazil, Russia, India, China and South Africa) and the USA as a case study re-examined the military-growth nexus spanning from 1988 to 2012. They employed the Granger causality technique. Their result revealed that military expenditure impacts positively on growth in the United States, growth influences military expenditure in Brazil and India, while a feedback hypothesis was valid between military expenditure and growth for Russia. In conclusion, there exists no causality presence for China and South Africa.

Zhang et al. (2017a) examined whether military expenditure stimulates social welfare in BRICS and G7 countries employing panel cointegration and impulse response for two distinct periods 1998-2011 and 1993- 2007. Their result revealed that military expenditure stimulates social welfare expenditure in G7 countries while military expenditure has an adverse impact on social welfare on BRICS countries.

Ward and Davis (1992) examined the impact of military expenditure on growth in India by employing the three-sector Feder model for the period 1950-1987. Their result revealed no externality effect from military expenditure to the civilian sector and that military size affects economic growth positively whereas non-military public sector has an adverse effect.

Also, Batchelor et al. (2000) investigated the effects of military expenditure on the manufacturing sector and economic growth of South Africa by employing the two-sector Feder type model for 1964-1995. Their findings revealed that military expenditure has an adverse impact on manufacturing output and no significant impact on aggregate growth in South Africa.

Dunne et al. (2000) explored the military expenditure impact on economic growth in South Africa for the period 1961-1997 by utilising the Deger type four-equation model. Their result concluded that military expenditure overall effect was negative.

Zhong et al. (2016) using BRICS countries (Brazil, Russia, India, China and South Africa) and the USA as a case study, re-examined the military-growth nexus spanning 1988 to 2012. They employed the Granger causality technique. Their result revealed that military expenditure impacts positively on growth in the United States, growth influences military expenditure in Brazil and India, while a feedback hypothesis was valid between military expenditure and growth for Russia. In conclusion, there is no causality presence for China and South Africa.

Table 3.3: Tabular summary of key literature

Author (s)	**Method / Techniques**	**Countries**	**Variables (proxy(ies) IQ**	**Results**
Benoit (1973)	OLS technique	44 developing countries	Growth, Military expenditure, investment and bilateral aid	Strong positive causation from military expenditure to growth
(Frederiksen an d Looney, 1983)	OLS technique	44 developing countries BUT subdivide the countries into resource-constrained (regarded as poor countries) and Resource abundance (regarded as rich countries)	Growth, Military expenditure, investment and bilateral aid	Military expenditure stimulates growth in rich resource countries while military expenditure retards growth in resource-constrained countries (poor countries).

Biwas and Ram, 1986	OLS technique	More than 44 developing countries	Growth, military expenditure, investment and bilateral aid	Military expenditure not statistically significant on growth for low – income countries.
Aizenman and Glick (2006)	OLS technique	Over 90 countries	Growth rates, military expenditure, threat, investment, education and population	High Military expenditure and high threats lead to growth while high military expenditure and low threats retard growth
Deger, S. & Sen., S. 1990	Deger Types Simultaneous Equation Model (DTSEM) Regression analysis and causality	50 countries	GDP growth rates, saving ratio, military expenditure, trade balance	Military expenditure does have a positive spin over effect and significant. If feedback is considered military expenditure has a negative feedback on saving rate.
Zhang, Liu, &Wang (2016)	Panel integration and impulse response function	(BRICS and G7)	Military spending, education, health, income, social welfare index and social welfare expenditure	Military spending enhances social welfare expenditure in developed countries but negative and short in BRICS.
Menla Ali & Dimitraki (2014)	Markov-Switching model	(China)	Real GDP, population, non-defense, government investment and human capital	Military spending changes affect economic growth negatively during a slower-higher variance state.
Meng et al (2013)	Engle and Granger two-step co-integration	(China)	Defence expenditure(DE), population,	Military expenditure and income inequality

	and Granger causality test		GINI coefficient	are co integrated. Causality from military expenditure changes to those of income inequality is found.
Acemoglu H.S. (2013)	Military spending model	(China)	Military expenditure and Gross domestic product	Positive relationship between defence spending and economic growth
Yiwen & Zhonghou (2014)	Military Keynesian model	(China)	Real GDP, Military spending and aggregate non-defence spending and interest rate	A rise of defence spending should grow the Chinese economy.
(Compton and P aterson, 2016)	Aizenman and Glick augmented Barro model	Over 100 countries	Military expenditure, populations, investment, institutional quality and growth	Military expenditure has a negative or zero impact on growth.

Source: Author's compilation

3.7 Empirical literature on institutional quality and economic growth

The objective of this section is to analyse empirical literature related to the institutional quality–growth nexus.

3.7.1. Studies outside BRICS countries

A considerable amount of country and cross-country studies has been done on the relationship between economic growth and institutional quality. Among the prominent ones is that of Acemoglu et al. (2005) which emphasised the fundamental importance of institutional quality in causing growth and differences in the levels of development across countries.

Also, while examining discussions on institutional quality and economic development, Chang (2011) suggested that more attentive institutional economists were needed to focus on the real-world institutional research, rather than retelling fairy-tales. According to the author, it is because of reality and not fiction, that policy-relevant theories of institutional quality could be developed.

Valeriani and Peluso (2011) explore the effect of institutional quality on economic growth over sixty years among countries at different stages of development, using the pooled regression fixed effects model to test three institutional indicators which included civil liberties, number of veto players and quality of government. The result revealed that institutional quality impacted positively on economic growth. However, further finding from the study showed that the size of the institutional impact on growth varies between developed and developing countries considered. Thus, in conclusion, the study claimed that institutions mattered for growth.

Also, Berggren et al. (2013) investigated the impact of institutions on economic growth in the EU-27, seven other similar European countries and Israel over the period 1984 to 2009. The result of the panel data analysis submitted that then the quality of policy, which included the stability of government, favourable socio-economic condition, strong investment environment and democratic accountability, was growth-enhancing.

Bhupatiraju and Verspagen (2013) explained differences in the levels of development across countries using a multi-faceted database to measure institutional quality. Findings showed that institutional quality ranked above other factors when GDP per capita regressed. However, when factors such as investment and growth were included as an independent variable, institutional factors were negatively associated with development variables.

3.7.2. Studies Within BRICS Countries

Goel and Korhonen 2011) examined the role of institutional quality as a determinant of economic growth in BRIC (excluding South Africa) for the period 2000-2007 based on a simple two-factor production function. Their result revealed that efficiency aspects of corruption (as a proxy for institutional quality) subdue the adverse impact, thereby stimulating growth rates.

Mbulawa and Finance (2015) explored the impact of institutional quality on the Southern Africa Development Community SADC by employing the Generalised Method of Moment GMM spanning from 1996 to 2010. Government effectiveness, regulatory quality, rules and law and corruption were institutional variables used in the study. Their results indicate that institutional quality is a key determinant for economic growth to take place in the region.

Asongu (2016) investigated whether institutional quality matters in economic growth determinant in BRICS and MINTS for the period 2001 to 2011 by selecting 10 institutional quality proxies using panel regression and principal component analysis. The outcome indicates that institutional qualities have positive but varying levels of significance for each of the BRICS countries.

Sabbagh (2017) also re-examined the impact of institutional quality as a catalyst for the real economic growth rate for BRICS countries by employing dynamic panel data. Proxies for institutional quality were democracy index, law enforcement index and economic freedom for the period of 2000-2012. Their result shows that all three institutional quality proxies have a strong impact on BRICS countries' economic growth.

3.7.2. Tabular summary of literature

Table 3.3 below presents a summary of the literature on institutional quality and economics.

Table 3.4: Summary of institutional quality (IQ) and economic growth

Author (s)	**Method / Techniques**	**Countries & Year**	**Variables (proxy(ies) IQ**	**Results**
Hadhek Z. (2012)	Dynamic panel data	11 countries in the MENA region (2000-2009)	Governance Indicators	Corruption and political stability negative with GDP
Jumal B. & Djekonde N.(2012)	Generalised Method of Moment (GMM)	All 27 African countries south of the Sahara (2002-2009)	Governance indicator index	Political stability and absence of violence appears insignificant
Jose A. &Gracimartin C.(2013)	Panel data analysis	East Asian countries (1998-2006)	Governance indicator index	Positive on GDP per capita
Cristina J & Levievge G.(2013)	Panel Smooth Transition Regression (PSTR)	94 developing countries (1984-2009)	Governance indicator index	Positive on FDI growth
Chaib & Siham (2013)	Panel data analysis	3 selected Maghreb countries	Governance indicator index	Only Regulatory quality and

			and economic freedom index	government effectiveness have a positive effect on annual GDP growth.
Godwin & Akpan (2012)	Pooled OLS Regression	21 sub-Saharan African (1998-2007)	Rule of law, regulatory quality, absence of political violence and instability	Positive
Bichaka N.(2010)	Quantile regression analysis	28 sub-Saharan Africa (1990-1984)	IQ	Positive
Richard & Marcus (2009)	Panel least square method	OECD (2004-2007)	Economic freedom and governance- including business freedom, monetary freedom, trade freedom, property right, political instability and control of corruption	Positive between IQ and economic growth
Vidmantas Jankauskas (2009)	Panel data analysis	41 good institutional environment (1996-2006)	Worldwide indicators and Heritage index of economic freedom	Positive
Kim long C. (2005)	White heteroscedasticity-consistent matrix	50 countries (1981-2000)	Heritage foundation index of economic freedom	Positive with economic growth
Polteroich, Popov& Ladimir (2007)	Panel Least Square model	180 countries	Rule of freedom and government	IQ positive on economic growth
Marijana B. (2005)	GLS (weighted Least square method)	14 EU and 11transition countries (1995-2002)	Rule of law	IQ is positive impact more on transition countries than

				developed countries.
Niyongabo G.(2004)	2 SLS	102 countries (1984-2000)	Voice and account, regulatory and government effectiveness	IQ is positive economic growth.

Source: Author's compilation

3.8. Empirical studies on military expenditure, institutional quality and growth

The objective of this section is to analyse empirical literature related to military expenditure, institutional quality and growth.

3.8.1 Empirical Studies Outside BRICS Countries

d'Agostino et al. (2012) further examined military expenditure-growth in the presence of corruption using an African sample from 2003 to 2007. They found that corruption does influence the impact of military expenditure on growth. In a related paper, (d'Agostino et al. (2017) re-examined the military expenditure-–growth using the 1996-2007 period by employing a system GMM estimation. The paper confirms that military expenditure and corruption retard economic growth.

Recently, Compton and Paterson (2016) considered how institutional quality can impact military expenditure-growth nexus. The research was based on 100 countries of annual data from 1988 to 2010 by employing Panel Ordinary Least Square (OLS) and system-generalised methods of moments (GMM). The researchers found out that military expenditure on growth is negative or zero at best and this impact is lessened in the presence of good economic and political institutions.

Table 3.5: Tabular summary of the literature

Author (s)	**Method / Techniques**	**Countries & Year**	**Variables (proxy(ies) IQ**	**Results**
d'Agostino et al., 2012	Dynamic panel data approach (System GMM estimation)	53 African Countries (2003-2007)	Military expenditure, corruption, GDP growth rates and investment	High levels of military expenditure and corruption have a negative impact on growth.
(Compton and Paterson, 2016)	Aizenman and Glick augmented Barro model	Over 100 countries (1988-2010)	Military expenditure, populations, investment,	Military expenditure has a negative or zero impact on growth

			Institutional quality and growth	

Source: Author's compilation

3.9. Gaps in the Literature

To the best knowledge of the researcher, the gaps that exist are as follows:

1. There are limited studies that have examined the causes of rising military expenditure but not in the context of BRICS countries as well as what nature of BRICS military expenditure that is, the pull and push factors responsible;
2. There exist no inclusive growth index for BRICS countries from 1970 to 2017;
3. No studies were found exploring the combined impact of military expenditure and institutional quality on BRICS countries inclusive growth from 1984 to 2017 except for Compton and Paterson (2016) which focused on 88 countries from 1988 to 2016 without taking cognizance of each country's prevailing growth inclusiveness level as well as not taking the political administration in place of the countries examined; and
4. Previous empirical studies were discovered using inappropriate econometric modeling technique as well as using an inappropriate proxy (Bates and Unions) for inclusive growth.

In conclusion, these gaps will make the current thesis worthwhile as well as it would help put in perspective the extent to which military expenditure and institutional quality can influence inclusive growth using BRICS countries as a case study.

CHAPTER 4

DATA AND METHODOLOGY

4.1. Introduction

This chapter discusses the methodology of the study. The study data source was discussed. Variables used in the analysis were presented together with their respective definitions. The study expected priori of the each variables are stated. The Chapter concludes with definition of key variables in the study and chapter summary.

The chapter starts off with a discussion of the research design in section 4.2 which is split into 3 sub-sections in line with the three objectives of the study. Section 4.2.1 present the objective one –investigating factors that drive BRICS countries military expenditure, Section 4.2.2 present the objective two – measurement of the inclusive growth Index in BRICS countries, Section 4.2.3- the impacts of military expenditure and institutional quality in achieving inclusive growth and the chapter concludes with the summary of the Chapter.

1.2. Research Design

This study adopts a quantitative design approach using both time-series and panel data to analysis the relationship between military expenditure, institutions and inclusive growth in BRICS countries. It used secondary data sourced from International Country Risk Guide (1984-2017), *World Development Indicators* Online database *2018*, World Bank and Polity IV for the period 1970 to 2017.The study EVIEWS and STATA software to estimate the econometric models. The next sections discuss the theoretical frameworks, analytical models and data, used to answer the three research questions of this study.

1.3 Research method for objective one

This section contains the theoretical framework, model specification, definition of variables, data sources and the method of analysis for the objective one of the study.

4.3.1. Theoretical framework for objective one

The first objective of the study was to estimate the determinants of military expenditure of military expenditure in BRICS. .

Recent studies on the determinant of military expenditure have adopted the standard neoclassical framework as a theoretical basis Tambudzai (2011). Although other studies have employed diverse and less formal approaches Dommen and Maizels(1988), they are all based on historical and institutional data in their analysis. Adopting this approach has been affirmed the best approach as it allows for easy model specification, developing a testable hypothesis Dunne and Mohammed (1995).

Military expenditure is classified as a public good, though its determinant is driven by diverse factors such as economic, political, threats and social variables. One of the key variables includes the threats levels (that is either within (internal threat) or outside (external). The unique feature that differentiates public good expenditure from military expenditure is the security function that enters the national welfare function. It encompasses how political and economic factors are influencing military expenditure components.

The neoclassical model assumes the optimisation of welfare. The military neoclassical model can be written as:

$$W_1 = W(S, C, N, Zw) \ldots\ldots\ldots\ldots\ldots 4.0$$

Where

W-Welfare of the country;

S- Security of lives and property from attacks;

C-Consumption and

Zw - Other factors.

The welfare function is optimised subject to the budget constraint and a security function. The budget function is given by,

$$Y = P_C C + P_m M \ \ldots\ldots\ldots\ldots\ldots 4.1$$

Where

Y is nominal aggregate income

Pm is Prices of real military spending M

Pc is the price of Consumption

According to Smith (1980), Smith (1995) assert that a nation security (S) is determined by a country's military expenditure, that of immediate neighbouring countries or those that fall within a nation security web (this can be allies and rivals) denoted as $M_1, M_2, \dots, M_n$ and other strategic variables T, which affect the security situation.

$$S = S(M, M_1 \dots M_n, T) \text{……………….4.2}$$

For allies military expenditure raises the country's security whereas rivals military expenditure poses a threat. The maximisation problem is then solved to find a derived demand for the level of military spending.

$$M_1 = M\left({}^{P_m}/_{P_c}, Y, N, M_1, \dots, M_n, Z, T\right) \text{……………….4.3}$$

Where

M- Level of military spending

Pm –Price of real military expenditure

Pc-Price of Consumption

Y- Real GDP

T-Other variables (e.g. the politics of the ruling party and strategic

$$M_1 = M\left({}^{P_m}/_{P_c}, Y, N, M_1, \dots, M_n, Z, T\right) \text{……………4.4}$$

For estimation purposes, equation 4.3 is often written as shares of output or income Y instead of levels. The demand equation had to be modified to suit the country's characteristics and data availability. Dunne and Mohammed (1995) and Dunne and Perlo Freeman (2003a) argue that when studying developing countries it is important to take the nature of the country into account. The dependent variable military expenditure will be measured by the military expenditure (percentage of GDP). The income constraint(Y) will be measured by GDP growth rates. As GDP rises, a country has more resources for production and greater means and need for protection. To capture the economic integration on military expenditure, the author use the trade balance.

BRICS countries Trade Balance (TB) is defined as the difference between exports and imports (X-M). This sign of openness of the economy and the growth of foreign currency. Its impact of military expenditure is ambiguous, but for BRICS the author expects a positive sign for India since it imports the greater part of its weaponry while vice versa for Russia, China, Brazil and South Africa.

The security web (SW) is measured by the average military expenditure of countries able to affect the security of BRICS countries. Other variables included are internal threats such as civil conflict (war or political unrest) and External threats such as external war, international war, World War II. A positive sign is expected.

4.3.2 Model specification for objective one

Taking into account the most important country conditions (geo-strategic and economic) such as Internal and External threats, GDP, and Population the model used to investigate the factors that drive BRICS countries military expenditure is defined by equation 4.5 below.

$$Me = f(Y, Pop, SW, TB, I.T., ET, DI, Exch, inf.)\text{……………..4.5}$$

Where

Me is military expenditure as percentage of GDP

Y is Gross Domestic Product

Pop is Population

SW is the security web which is the military expenditure by other countries

TB is the Trade balance

I.T. is Internal Threats

E.T. is External Threats

D.I. is Democratic Index

Exch. is the Exchange Rate

Inf. is the Inflation rate

4.3.3 Definition of variables for objective one

All the variables stated in Equation 4.5 are defined and described in Table 4.1 below. The sources of data are also stated.

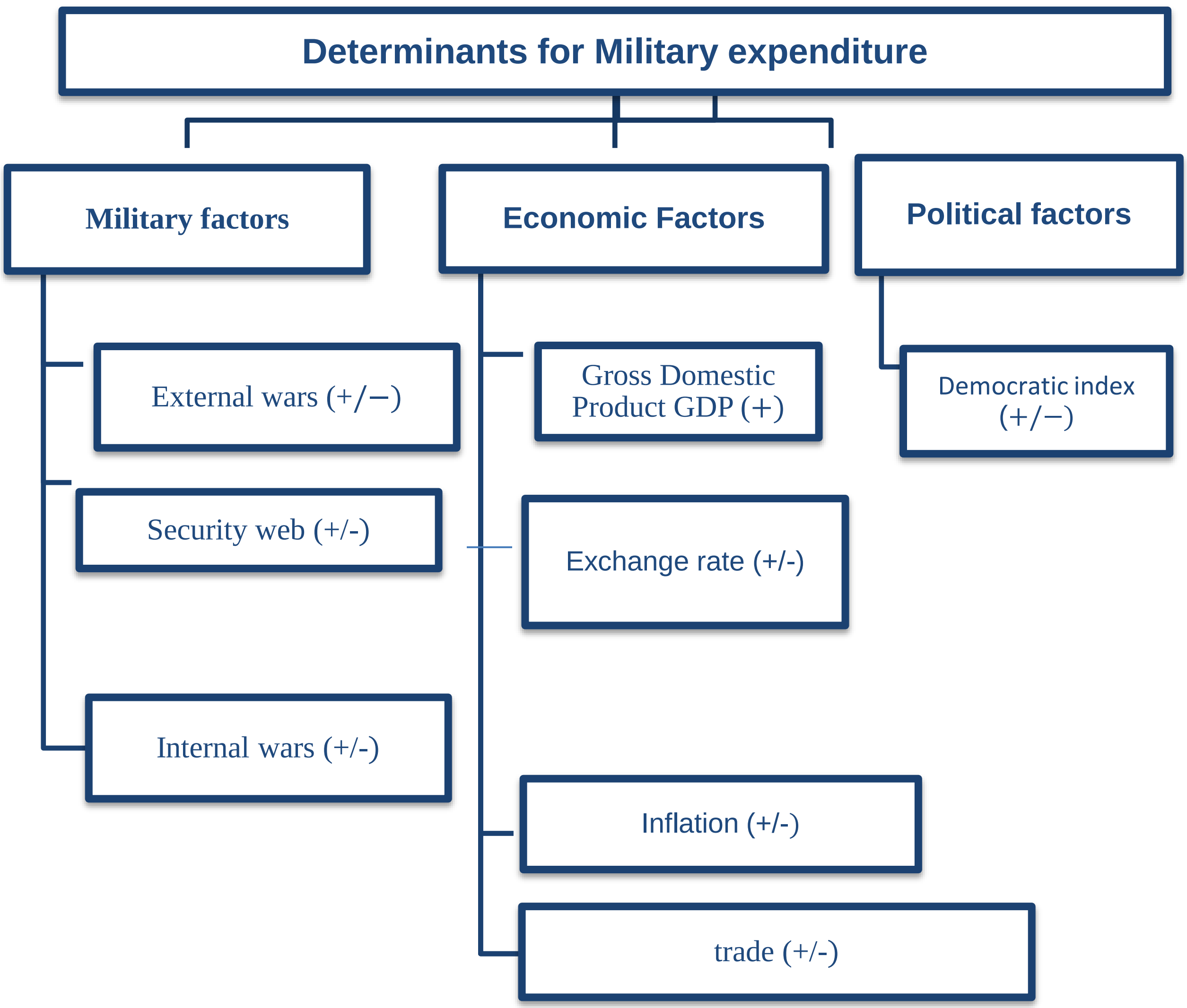
Table 4.1: Definition of variables for objective one

S/N	Proxy	Definition of variables
Military factors	a. External threats	The external conflict measure is an assessment both of the risk to the incumbent government from foreign action, ranging from non-violent external pressure (diplomatic pressures, withholding of aid, trade restrictions, territorial disputes, sanctions, etc.) to violent external pressure (cross-border conflicts to all-out war). External conflicts can adversely affect foreign business in many ways, ranging from restrictions on operations to trade and investment sanctions, to distortions in the allocation of economic resources, to violent change in the structure of society. The risk rating assigned is the sum of three subcomponents, each with a maximum score of four points and a minimum score of 0 points. A score of 4 points equates to Very Low Risk and a score of 0 points to Very High Risk. The subcomponents* are: • War • Cross-Border Conflict • Foreign Pressures

	b. Internal threats	This is an assessment of political violence in the country and its actual or potential impact on governance. The highest rating is given to those countries where there is no armed or civil opposition to the government and the government does not indulge in arbitrary violence, direct or indirect, against its own people. The lowest rating is given to a country embroiled in an on-going civil war. The risk rating assigned is the sum of three subcomponents, each with a maximum score of four points and a minimum score of 0 points. A score of 4 points equates to Very Low Risk and a score of 0 points to Very High Risk. The subcomponents* are: • Civil War/Coup Threat • Terrorism/Political Violence • Civil Disorder
	c. Security web	The Security web is measured by the averages of military expenditure (% of Gross Domestic Product) of countries able to affect the security of BRICS countries. A rise in Security web for country X could be positive or negative depending if these countries are friendly or hostile to country X. For instance, South Africa security web will includes countries such as Zimbabwe, Angola, Zambia, Mozambique, Botswana and Malawi.
Economic Factors	a. Gross Domestic Product	Gross Domestic Product is the total economic activities within a country.

	b. Trade Balance	Trade balance is defined as the difference between exports and imports(X-M) percentage of Gross Domestic Product (GDP) that is, (X-M); it could be positive or negative. This is a sign of openness of the economy and the growth of foreign currency. Its impacts on military expenditure is ambiguous, but for BRICS countries we expect a positive sign since it exports the greater part of arms production.
	c. Exchange rate	Exchange rate is the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator.
	d. Inflation	Inflation is the general increase in price levels of goods and services. The estimated annual inflation rate (the unweighted average of the Consumer Price Index) is calculated as a percentage change.
Political Factors	a. Democratic Index	Democratic index is the measurement of state of democracy in 167 sovereign states and 64 are UN member states
Other	a. Population growth rate	Annual population growth for year t is the exponential rate of growth of midyear population from year t-1 expressed as a percentage. Population is based on the defacto definition of population , which counts all residence regardless of legal status or citizenship

Source: Author’s compilation


Determinants for Military expenditure
Military factors
Economic Factors
Political factors
External wars (+/−)
Security web (+/-)
Internal wars (+/-)
Gross Domestic Product GDP (+)
Exchange rate (+/-)
Inflation (+/-)
trade (+/-)
Democratic index (+/−)

4.3.4. Apriori expectation for objective one

Table 4.2 present the expected direction of result from the variables to be employed in the analysis of determinants of BRICS military expenditure for the period covered for this study.

Table 4.2: Apriori expectation for objective one

S/N	**Variable**	**Expected Signs**
	a. External threats	+ / -
	b. Internal threats	+ / -
	c. Security web (denoted the percentage of military expenditure to GDP by neighbouring countries for each BRICS countries)	+ / -
2	**Economic factors**	
	a. Gross Domestic Product	+ / -
	b. Inflation	+ / -
	c. Trade Balance	+ / -
	d. Exchange rate	+ / -
3	**Political factor**	
	a. Democratic index	+/ -

Source: Author's compilation

4.3.5. Sources of data for objective one

All the variables stated in Equation 4.5 are defined and described in Table 4.3 below. The sources of data are also stated.

Table 4.3: sources of data for objective one

S/N	Proxy	Data measurement	Sources
Military expenditure by other countries **Threats**	a. External threats b. Internal threats	Annually	International Country Risk Guide 1984-2017
	c. Security web	Annually	World Bank Indicator online database
Economic	a. Gross Domestic Product (GDP)	Annually	World Bank Indicator online database
	b. Trade Balance		
	c. Exchange rate		
	d. Inflation		
Political	a. Democratic Index	Annually	Polity IV

Source: Author's compilation

4.3.6. Estimating techniques for objective one

Equation 4.5 was estimated in a Panel data regression analysis.Gujarati (2009)lists the following arguments as advantages of panel data analysis:

1. Panel Data give "more informative data, more variability, less collinearity and greater degrees of freedom and more efficiency".

2. Panel data are more appropriate for investigating the dynamics of change.
3. Panel data can better detect and measure effects that cannot be observed in pure time series or pure cross-section data.
4. Panel data allow us to study behavioural models that are more complicated.
5. Panel data minimize bias.

Yaffee (2003) discusses a number of panel data analytical models, particularly constant-coefficient, fixed effects and random effect models. In the midst of these types of models are dynamic panel, robust and covariance structure models.

1. **The panel least squares regression estimation**

Also known as the constant coefficient model, pooled regression models use constant coefficient (both intercepts and slopes) and is relevant when there is neither significant country nor significant temporal effects. We pool all the data and run an OLS regression model.

$$y_{it} = \beta_1 + \sum_{k=2}^{k} \beta_k x_{it} + \varepsilon_{it} \quad \text{.............................4.6}$$

For N cross-section units- i= 1, 2,

Periods T=1, 2, T

K is the number of the explanatory variables- k = 2,

β_k are the slope coefficients and are assumed to be constant over countries and time.

$\varepsilon_{it}$is the random error term for the i^{th} country and t^{th} year.

Y is a dependent variable and X an independent variable;

$x_{kit}$is an observation on the k^{th} explanatory variable for the i^{th} country and the t^{th} time period.

This model has the drawback that it assumes that all parameters are the same for each country, thus ignoring country-specific factors.

In addition, the cross-section variation will drown the time-series effects.

2. **Fixed effect models**

Fixed effect model allows the intercept to change across groups (countries in our class) but the model will have constant coefficients (slopes). There will be no importance sequential impact, but important countries' differences. The intercepts are cross-section specific and differ from Country to country, but they may not differ over time.

$$y_{it} = \beta_{1i} + \sum_{k=2}^{k} \beta_k x_{it} + \varepsilon_{it} \quad \text{...4.7}$$

Where, β_{1i} represents the country-specific effects. The intercepts are assumed different for individual countries but constant over time. This type of fixed effects model is called the Least Squares Dummy Variable model.

There are four other types of fixed effects models. One type of fixed effects model could have constant slopes, but intercepts that vary according to time. A third type could have a coefficient that is constant, but the intercept varies over the country and time. A fourth kind has differential intercepts and slopes varying according to the country. The last type is a fixed-effect model in which both the intercepts and the slopes might over time cross the countries.

3. **The random effect models**

It is a regression model with a random constant term. The constant in this model is not fixed, but is an independent random variable. The model can be presented as follows,

$$y_{it} = \beta_{1i} + \sum_{k=2}^{k} \beta_k x_{kit} + \varepsilon_{it} \quad \text{... 4.8}$$

Where β_{1i} is an independent random variable with mean, β_{1i} and σ_{μ}^{2}.........4.9

While $\beta_{1i} = \beta_1 + \mu_i$

Equation (3) becomes

$$y_{it} = \bar{\beta}_1 + \sum_{k=2}^{k} \beta_k x_{kit} + \mu_i + \varepsilon_{it} \quad \text{.....................................4.10}$$

In order to permit analysis to be carried out at aggregate military expenditure, the above regression model was estimated as a panel data model- random effects and fixed-effect models. (Gujarati, 2009) provides an extensive list of advantages of panel data:

1. The problem of heterogeneity in panel data units is solved by estimation techniques that allow for individual-specific variables.
2. Data gives “more informative data, more variability, less collinearity and greater degrees of freedom and more efficiency”.
3. Panel data are more appropriate for investigating the dynamics of change.
4. Panel data can better detect and measure effects that cannot be observed in pure time series or pure cross-section data.
5. Panel data allow us to study behavioral models that are more complicated.
6. Panel data minimizes bias caused by aggregation of micro-units’ data.

4. **General diagnostic tests**

To ensure that the estimation model was appropriate so as to ensure consistency of the coefficient estimate diagnostic test were undertaken.

a) **Jarque Bera test:** The test is a goodness of fit measure of departure from normality based on the sample kurtosis and skew. In other words, Jarque Bera test determines whether the data, skew and kurtosis are matching a normal distribution. The study employed Jarque-Berra static for normality tests to test for serial autocorrelation.
b) **Breuch-Godfrey langrage multiplier test:** is used to assess the validity of some of the modeling assumptions inherent in applying regression-like models to observed data. To use to test for the presence of serial correlation. If found, to be the presence of serial correlation would mean that a spurious conclusion would be drawn from other tests.
c) **Cross-Sectional Dependence Test:** is used to assess if the n individuals in a sample are no longer independently drawn observations but affect each other's outcome. For example, this is can result from the fact that we look at a set of neighbouring countries, which are usually highly interconnected.
d) **Langrage multiplier (LM) test:** To ascertain the assumptions on the residual of the ordinary least squares, a langrage multiplier test for autoregressive conditional heteroskedasticity (ARCH) was performed.

4.4 Research method for objective two

The objective two of the study is focused on computing inclusive growth index for the BRICS therefore, this section of the study highlights the methods and step by step approach to developing this index for the BRICS

4.4.1 Theoretical framework of objective two

The theoretical framework for calculation of a measurement of inclusive growth is embedded in diverse models and methodologies for estimation of composite index of development indicators.

The Inclusive Growth Index (IGI) is a summary measure of social and economic indicators that measures the average achievements of social economic indicators. The evaluation focuses upon five principal economic indicators and five principal of social indicators.

These approaches among others are the Factor Analysis (FA), Grade Point Average (GPA) and the Z-sum score technique, which are among the famous approach to measuring each indicator's performance.

The Z-sum score is a standardised score, which has a different mean and different variance for each indicator. According to Kothari, (2004) and Ullah and Kiani (2017) the normalised Z value is calculated as follows:

$$Z = \frac{X - \mu}{\sigma} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4.11$$

Z - Standard variate or number of standard deviations from *X* to the mean of the Distribution

X - Value that will be wants to normalize

μ - mean of the distribution.

σ - Standard deviation (S.D) of the distribution

The mark of standardize values must be changed for indicators that are inversely related to development , so that negative values become positive and positive values becomes negative .This is accomplished by multiplying the Standardized value by negative one (-1). For example, countries with a low inflation are better than those with a high inflation rate, because inflation indicators are inversely related to development .If cash income and the rate of inflation increase at the same rate income will remain constant and will not indicate an improvement in standard of living of the individual. Whereas if the cash income increases at a rate lower than the rate of inflation, real per income decline alongside the standard of living. Hereinafter, for this study the following indicators are considered to relate inversely with Inclusive growth. For example,

1. The Number of Homicides
2. GINI index

After finding the Z-sum score, we will evaluate the average of the area under the curves already normalised. These values are considered as inclusive growth index by the following:

IGI= average of Z score is divided by number of observation

$$Inclusive\ Growth\ Index\ (IGI) = \frac{\varepsilon x}{n}$$

0<IGI<1

The values of the IGI index vary between 0 and 1. The Decision rule is that, if Values close to 0 indicates a very low level of inclusive economic growth. On the other hand, values close to 1 indicates a very high level of inclusive economic growth. Each indicator has assigned equivalent weight age in the index.

4.4.2 Step and step description of the procedure of the index computation

The Inclusive growth index was calculated using the following steps

Step 1 - Determine (goalposts) values

Step 2 - Calculate the standardised values (X, mean, standard dev.) for each indicator in BRICS.

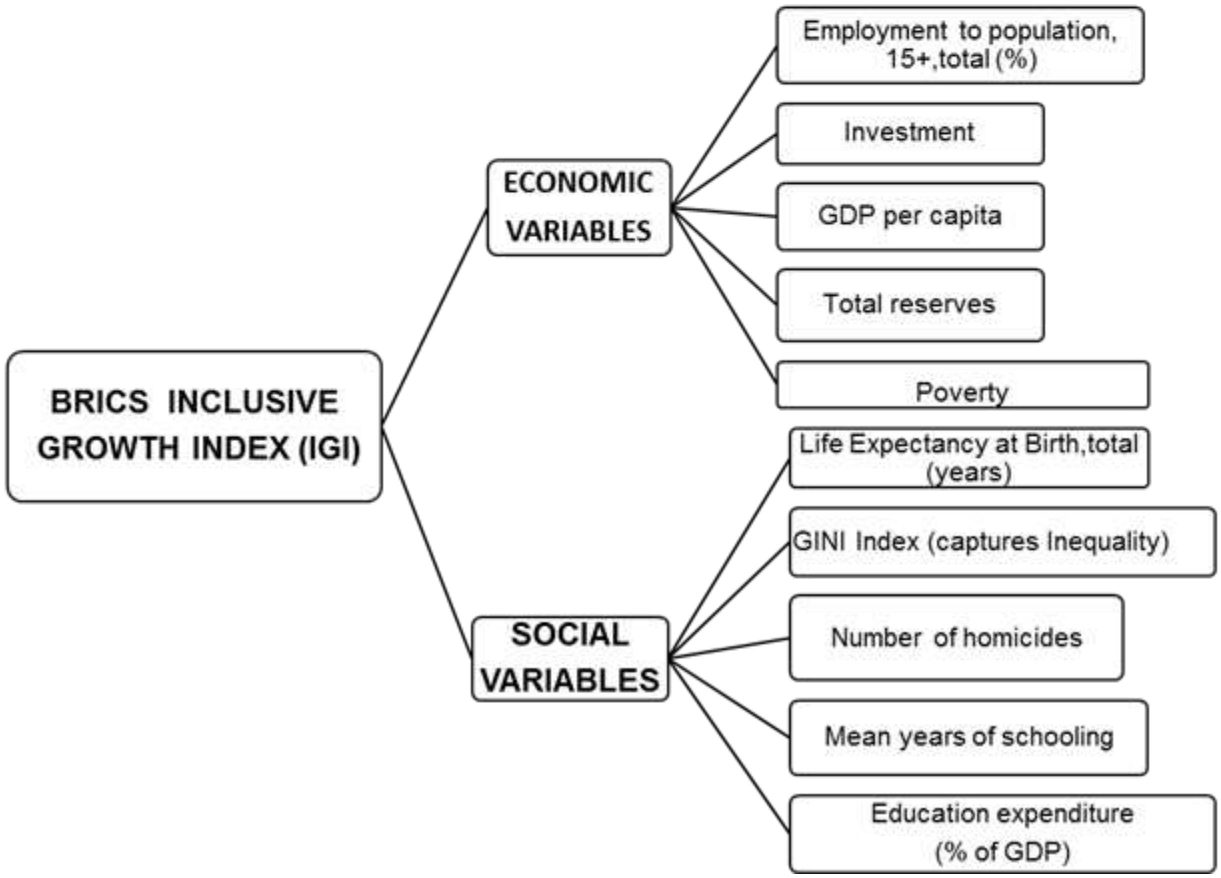
Step 3 - Find the area under the standard normal curve (using Z table)

The standard normal distribution is a normal distribution with a mean of 0 and standard deviation 1. Fifty per cent of the total area under the curve is to the left of 0 and 50% of the total area under the curve is to the right of 0. The total area under a standard normal curve is exactly 1.0.

Step 4 - Calculate the average of the values area under the standard curve for the indicators in each index.

Step 5 - Aggregate the sub-indices to produce the Inclusive growth index.

Decision rule: Values close to 0 indicates that BRICS countries have a very low level of inclusive growth. On the other hand, values close to 1 indicate that the BRICS countries have a very high level of inclusive growth.



4.4.3 Definition of variables for objective two

A single economic, social or environment development indicator was not affirmed as sufficient to explain the term “Inclusive growth” WIDER (2013). Thus, necessitating the need to develop a composite index. Table 4.4 presents the socio-economic variables used to construct the Inclusive Growth Index for the period 1970 to 2017. Variables under the computation of the inclusive growth are mainly those social and economic indicators that are prominent in the BRICS. They are presented in Table 4.4.

Table 4.4: Definition of IGI index variables for objective two

S/N	Inclusive Growth Index Variables	Definition
1	GDP per capita, PPP, (Constant 2010 international $)	GDP per capita based on purchasing power parity (PPP). PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the U.S. dollar has in the

		United States. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2011 international dollars.
2	Employment to population, 15+, total (%)	Employment to population ratio is the proportion of a country's population that is employed. Employment is defined as persons of working age who, during a short reference period, were engaged in any activity to produce goods or provide services for pay or profit, whether at work during the reference period (i.e. who worked in a job for at least one hour) or not at work due to temporary absence from a job, or to working-time arrangements. Ages 15 and older are generally considered the working-age population.
3	GINI Index (captures Inequality)	Gini index measures the extent to which the distribution of income (or, in some cases, consumption expenditure) among individuals or households within an economy deviates from a perfectly equal distribution. A Lorenz curve plots the cumulative percentages of total income received against the cumulative number of recipients, starting with the poorest individual or household. The Gini index measures the area between the Lorenz curve and a hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line. Thus a Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality.
4	Poverty	Poverty gap at $1.90 a day (2011 PPP) is the mean shortfall in income or consumption from the poverty line $1.90 a day (counting the nonpoor as having zero shortfall), expressed as a percentage of the poverty line. This measure reflects the depth of poverty as well

		as its incidence. As a result of revisions in PPP exchange rates, poverty rates for individual countries cannot be compared with poverty rates reported in earlier editions.
5	Total reserves (includes gold, current US$)	Total reserves comprise holdings of monetary gold, special drawing rights, reserves of IMF members held by the IMF, and holdings of foreign exchange under the control of monetary authorities. The gold component of these reserves is valued at year-end (December 31) London prices. Data are in current U.S. dollars.
6	Life Expectancy at Birth, total (years)	Life expectancy at birth indicates the number of years a new-born infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.
7	Education expenditure (% of GDP)	General government expenditure on education (current, capital, and transfers) is expressed as a percentage of GDP. It includes expenditure funded by transfers from international sources to government. General government usually refers to local, regional and central governments.
8	Mean years of schooling	Average number of completed years of education of a country's population aged 25 years and older, excluding years spent repeating individual grades in formal education.
9	Number of homicides	Intentional homicides are estimates of unlawful homicides purposely inflicted as a result of domestic disputes, interpersonal violence, and violent conflicts over land resources, intergang violence over turf or control, and predatory violence and killing by armed groups. Intentional homicide does not include all intentional killing; the difference is usually in the organization of the killing. Individuals or small groups usually commit homicide, whereas killing in armed conflict is usually committed by fairly cohesive groups

		of up to several hundred members and is thus usually excluded.
10	Investment (proxy by Gross fixed formation)	Gross fixed capital formation is essentially net investment. It is a component of the expenditure method of calculating GDP. To be precise formation measure the net increase in fixed capital. Gross fixed capital formation includes spending on land improvements (fences, ditches, drains and so on); plants, machinery, and equipment purchases; the construction of roads, railways, private residential dwellings, and commercial and industrial buildings. Disposal of fixed assets is taken away from the total.

Source: Author's compilation

4.4.4 Sources of data for objective two

Table 4.5 presents the sources of data socio-economic variables used to construct the Inclusive Growth Index for the period 1970 to 2017. Variables under the computation of the inclusive growth are mainly those social and economic indicators that are prominent in the BRICS. They are presented in Table 4.5.

Table 4.5: Sources of data for objective two

S/N	Inclusive Growth Index Variables	Data measurement	Sources
1	GDP per capita, PPP, (Constant 2010 international $)	Annual	World Bank
2	Employment to population, 15+, total (%)	Annual	World Bank
3	GINI Index (captures Inequality)	Annual	World Bank
4	Poverty	Annual	World Bank
5	Health expenditure(% of GDP)	Annual	World Bank
6	Life Expectancy at Birth, total (years)	Annual	World Bank
7	Education expenditure (% of GDP)	Annual	World Bank
8	Mean years of schooling	Annual	UNDP
9	Number of homicides	Annual	UNODC
10	Investment	Annual	World Bank

Source: Author's compilation

4.5 Research method for objective three

The third objective of the study analyses the impacts of military expenditure, institutional quality on inclusive growth in the BRICS. This section contains the theoretical framework, model specification, definition of variables, data sources and the estimating techniques for the objective.

4.5.1 Theoretical Framework for objective three

Aizenman and Glick (2006) developed a theoretical framework to analyse the interaction military expenditure, growth and institution quality (corruption) by improving on Barro and Sala-i-martin (1992) work. The assumptions of the relationship are that:

(1) There is zero population growth.

(2) Output per worker is affected positively by infrastructure supplied by the public sector, and negatively by the magnitude of the external threats.

The reduced form of output is then given as:

$$y = A(k)^{1-\alpha}(g)^{\alpha}f \quad \text{...4.13}$$

Where

Y is output (Inclusive growth Index)

A denotes an exogenous productivity factor

k-is the capital/labour ratio

g - is the ratio of government (non-military) expenditure on infrastructure relative to labour

1-f- measures the output cost of the threat external unfriendly neighbours. Thus it assumes that this cost depends negatively on domestic military expenditure and positively on an index of the magnitude of the threat; this can be presented in the following functional form

$$f(g_{m,}Z) = \frac{g_m}{g_m+Z};\ f_{gm} > 0, f_z < 0, f(0,z) = 0, f(\infty,z) = 1, 0 < f < 1 \quad \text{.........4.14}$$

Where g_m- military expenditure (locally) and z is the external threats level. N.B. this specification indicates that z is measured in units comparable to military expenditure (locally) so that g_m and z may be aggregated.

The model abstracts from a number of possible considerations. First. It is assumed that the economy is always in a long-run full employment steady state. Hence, there is no need to address transitional dynamics, according to which, fiscal spending on military expenditure may reduce excess capacity and unemployment during the transition to the steady state. Second, since the model consists of a single sector, it was abstracted from possible technological spillovers from military goods output to the production of goods in a distinct civilian sector.

Corruption (a proxy for Institutional quality) may be incorporated into the model as an activity that taxes fiscal expenditure on military and non-military government expenditure at a rate of t_c. Therefore, output with corruption is as follows:

$$y = A(k)^{1-\alpha}(g[1-t_c])^{\alpha}\frac{g_m[1-t_c]}{g_m[1-t_c]+z} \quad \text{..........4.15}$$

The ratio of military to non-military infrastructure expenditure by $\emptyset$,

$$g_m = \emptyset g \quad \text{....................4.16}$$

Therefore, the total fiscal outlay on both military and non-military expenditure is $(1+\emptyset)g$. The rest of the model specification is identical to that of (Barro, 1990). It is assumed that capital does not depreciate. The fiscal outlay is financed by a proportional tax t:

$$(1+\emptyset)g = t_y \quad \text{..................................4.17}$$

The representative agent's preference is as follows:

$$U = \int_0^{\infty}\frac{c^{1-\sigma}-1}{1-\sigma}\,exp\,(-pt)dt \quad \text{...........4.18}$$

In line with (Barro, 1990), it presents the output growth as follows:

$$\gamma = \frac{\dot{Y}}{Y} = \frac{1}{\sigma}\left[(1-t)\frac{\partial y}{\partial k} - p\right] \quad \text{...........4.19}$$

The optimal pattern of taxes and expenditure represented by $\breve{t}\phi$ that determines the military sector size and maximises the growth rate is presented by

$$\breve{t} = \alpha\left(1+\breve{\phi}\right) \quad \text{...............4.20}$$

$$(\breve{\phi})^2\alpha[\alpha(1-t_c)]^{\frac{1}{1-\alpha}}[1-\alpha\breve{\phi}]^{\frac{1}{1-\alpha}} = \frac{z}{k} \quad \text{.........4.21}$$

Equation a equates the tax $\breve{t} = \alpha(g + g_m \breve{\phi}) / y$, and thereby also the government's expenditure share to the output elasticity with respect to the marginal product of non-expenditure, α magnified at the rate $\breve{\phi}$ (the ratio of military to non-military government expenditure). In a situation of no military expenditure, equation (a) reduces to $\breve{t} = \alpha$, lead to standard production efficiency situation.

Equation b denote that military expenditure ratio ϕ has a positive link with the external threat (normalised by the domestic stock of capital), positively on the corruption level and negatively on the productivity level.

$(\breve{\phi}) = (\breve{\phi}, t_c, A); \breve{\phi}_z > 0; \breve{\phi}_{t_c} > 0, \breve{\phi}_A < 0; \phi(0, t_c, A) = 0$ ……………………………….4.22

Correspondingly, from equation (a) it follows that

$\breve{t} = \breve{t}(\breve{z}, t_c, A); \ \breve{t}_z > 0; \ \breve{t}_{te} > 0, \breve{\phi}_A < 0$ ………..4.23

The figure presents the military expenditure-threat level nexus implied by (8b) and (9). In the absence of threats, z=0, also $\breve{\phi}$=0, the optimal amount of military expenditure is zero. For positive threat levels, z>o, however, $\breve{\phi}$>0, that is the optimal level of military expenditure is positive. As the threat level increases, the optimal amount of military expenditure rises monotonically.

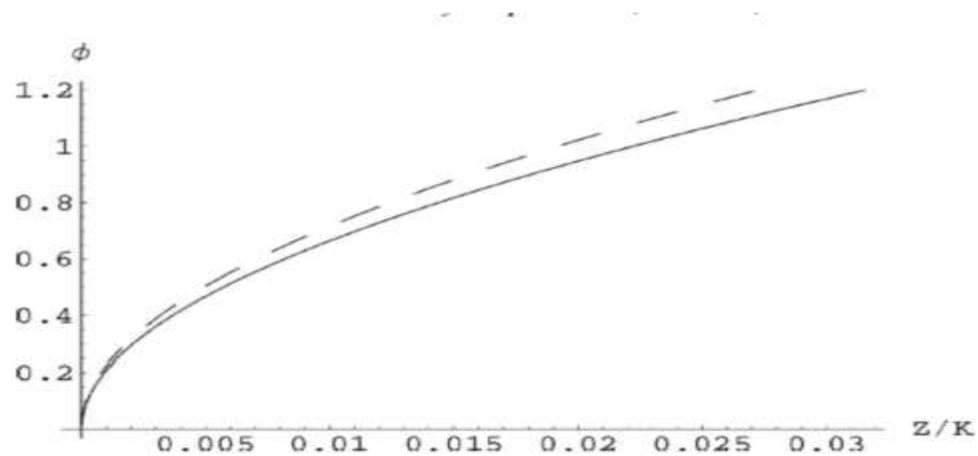


Figure 4.1: Optimal military expenditure and external threat level

Note ϕ is the optimal ratio of military and to non-military expenditure; Z / K connotes the external threat level (normalised by the capital stock). The plots are calibrated by assuming A=1,

Figure 4.2 depicts the impact of parametrically increasing the corruption rate, t_c. The solid line denotes the benchmark relation between ϕ and z (for t_c=0.1); the dashed line represents the impact of rising the corruption rate for (t_c=0.2). Obviously, rising corruption connotes a higher optimal of military expenditure for any given threat level.

An important feature of equilibrium government expenditure is described as the optimal share of military expenditure equal directly to the output cost of external threat,1-f

$\tilde{\phi} = \frac{1-f}{\alpha}$ ………………………………..4.24

In the situation of no threats, the optimal level of military expenditure is zero, the output cost of threats is zero (f=1), and output is a standard CRS function of k and g. Similarly, the optimum tax rate $(\tilde{\tau})$ equals the output proportion of government services (α), and is independent of scale impact as indicated in 8a and 10. The presence of threats and hostile actions, however, shows positive military expenditure and output costs (f <1) and adds a non-linear multiplicative term (f) to output.

This, in turn, adds a scale consideration to the design of optimal t x and expenditure rates, summarised as follows:

$$\alpha\tilde{\phi} = 1 - f = \frac{z}{\tilde{g}_m(1-t_c)+Z} \quad \ldots\ldots\ldots\ldots\ldots 4.25$$

Where $\tilde{g}_m = \frac{\check{\phi}\check{\tau}\check{y}}{1+\phi}$. The optimal ratio of military to non-military government expenditure(ϕ) times the output share of non-military expenditure α equals the output cost of external threats (1-f), which invariably equal the magnitude of the external threats(z) relative the aggregate effective expenditure by the domestic country and its unfriendly neighbours $\tilde{g}_m(1-t_c)+Z$, where "effective denotes net of corruption tax. Consequently, an exogenous rise in the external threat level, z, rises the optimal expenditure and tax rates, $\check{\phi}$ and $\check{\tau}$.

Therefore, unfriendly external threats affect growth negatively due to two factors: the direct negative on growth linked to the reduction of marginal product of capital, linked to the negative effect with a higher tax rate as a result of lower productivity. Therefore, a rise in corruption t_c and reduce domestic productivity (A) rise military expenditure and therefore retard growth. This is presented in the following reduced form for optimal output growth:

$$\check{y} = \check{y}(z, t_c, A); \check{y}_z < 0, \check{y}_A > 0 \quad \ldots\ldots\ldots\ldots\ldots 4.26$$

To determine that

$$\frac{\partial \check{y}}{\partial \check{\phi}} =< 0 \; and \; \frac{\partial^2 \check{y}}{\partial \check{\phi} \partial z} => 0 \quad \ldots\ldots\ldots\ldots\ldots 4.27$$

Therefore confirming the nonlinear theoretical relationship between growth and military expenditure.

Figure 2 presented the optimal growth levels and military expenditure while holding constant the levels of external threats and corruption. Higher military expenditure retards growth, all being equal. A rise in threat level moves the entire locus upwards.

In conclusion, the theoretical models imply that the relationship between military expenditure and growth depends on corruption and rent-seeking behaviour thus; acting as fiscal tax expenditures, corruption increases the desired level of military expenditure. They opined that military expenditure asserts a negative or insignificant effect on growth because of its non-linearity and omitted variable biases.

4.5.2 Model specification for objective three

The current study centres on works by Aizenman and Glick (2006), Compton and Paterson, (2016) as the foundational theoretical framework pillars that suit the nomenclature of this research. This study however uses an inclusive growth index (IGI) as the dependent variable and corruption as a proxy for institutional quality. The model for estimation is then expressed as:

$$Y_{it} = \alpha + \beta_1 M_{it} + \beta_2 I_{it} + \beta_3 M_{it} * I_{it} + \gamma' X_{it} + \eta_i + \varepsilon_{it} \quad \text{...........................4.30}$$

Where

IGI is the Inclusive growth Index

M - is the military expenditure (percentage of Gross Domestic Product)

I - is the institutional quality (proxy by Corruption)

$M \,.\, I_{it}$- is the interaction of military expenditure with institution (which shows the degree of effect as well as level of significance one variable on the other),

X_{it}– Is the set of control variables – education, population and Investment variables. ϵ_{it} is the error term for the period 1970 to 2017.

The decision rule for $M \,.\, I_{it}$ which is interactive variable in this thesis is as follows-

- If the interactive form result is **positive** and **significant**. Then, it stimulates inclusive growth.
- If the interactive form result is **negative** and **significant**. Then, it retards inclusive growth.
- If the interactive form result is **positive** and **not significant**. Then, it is regarded as "Jobless growth or Non inclusive growth".
- If the interactive form result is **negative** and **not significant**. Then, it is regarded as no growth.

See, Aizenman and Glick (2006) and Compton and Paterson (2016), where the interactive form have been used.

However, this study differs from Compton and Paterson (2016) as the author first computes an inclusive growth index (IGI) as the dependent variable; the institutional quality is proxied by corruption since corruption is often a symptom of bad institution; the duration covered in this study (that is, 1970 to 2017) exceed the time frame covered by Compton and Paterson (2016) as well as a comparison of the inclusive growth index with other development indicators (that is GDP annual growth and Per capita income) will be examined in the context of BRICS countries. The model specification for this study is as follows:

$$IGI_{it} = \alpha + \beta_1 M_{it} + \beta_2 I_{it} + \beta_3 M_{it} * I_{it} + \gamma' X_{it} + \eta_i + \varepsilon_{it} \qquad \text{……………4.31}$$

In conclusion, the theoretical model implies that the impact of military expenditure on growth is a non-linear function of the level of the institutional quality environment (that is, corruption and rent-seeking behaviour). Thus, acting as tax fiscal expenditures, corruption increases the desired level of military expenditure. Military expenditure in the presence of corruption reduces growth.

4.5.3 Definition of variables for objective three

Table 4.6 present the description of variables to be employed in the analysis of impacts of military expenditure and institutional quality on inclusive growth in BRICS countries on country specific.

Table 4.6: Definition of variables for objective three

S/N	**Variables**	**Proxy**	Definition of variables
1	Inclusive Growth Index (IGI)	Inclusive growth	Inclusive growth refers to economic growth that creates opportunity for all segments of the population and distributes the dividends of increased prosperity , both in monetary and non-monetary terms, fairly across society (OECD,2013)
2	Military Expenditure (ME)	Military expenditure (% of GDP)	Military expenditures data from SIPRI are derived from the NATO definition, which includes all current and capital expenditures on the armed forces, including peacekeeping forces; defense ministries and other government agencies engaged in defense projects; paramilitary forces, if these are judged to be trained and equipped for military

			operations; and military space activities. Such expenditures include military and civil personnel, including retirement pensions of military personnel and social services for personnel; operation and maintenance; procurement; military research and development; and military aid (in the military expenditures of the donor country). Excluded are civil defense and current expenditures for previous military activities, such as for veterans' benefits, demobilization, conversion, and destruction of weapons.
3	Corruption (proxy of Institutional quality (IQ)	Corruption	This is an assessment of corruption within the political system. Such corruption is a threat to foreign investment for several reasons: it distorts the economic and financial environment; it reduces the efficiency of government and business by enabling people to assume positions of power through patronage rather than ability; and, last but not least, introduces an inherent instability into the political process. The most common form of corruption met directly by business is financial corruption in the form of demands for special payments and bribes connected with import and export licenses, exchange controls, tax assessments, police protection, or loans. Such corruption can make it difficult to conduct business effectively, and in some cases may force the withdrawal or withholding of an investment. Although our measure takes such corruption into account, it is more concerned with actual or potential corruption in the form of excessive patronage, nepotism, job reservations, ‘favor-for favors’, secret party funding,

			and suspiciously close ties between politics and business. In our view these insidious sorts of corruption are potentially of much greater risk to foreign business in that they can lead to popular discontent, unrealistic and inefficient controls on the state economy, and encourage the development of the black market. The greatest risk in such corruption is that at some time it will become so overweening, or some major scandal will be suddenly revealed, as to provoke a popular backlash, resulting in a fall or overthrow of the government, a major reorganizing or restructuring of the country's political institutions, or, at worst, a breakdown in law and order, rendering the country ungovernable.
4	Military expenditure * Institutional Quality (MCP)	Interactive form of military expenditure and institutional quality	This is the interaction of military expenditure and corruption a proxy for institutional quality.
5	Population (POP)	BRICS Population	Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. The values shown are midyear estimates.
6	Education (EDU)	Education expenditure (% of GDP)	General government expenditure on education (current, capital, and transfers) is expressed as a percentage of GDP. It includes expenditure funded by transfers from international sources to government. General government usually refers to local, regional and central governments.
7	Investment (INV)	Gross fixed capital formation (% of GDP)	Gross fixed capital formation is essentially net investment. It is a component of the expenditure method of calculating GDP. To be precise formation measure the net increase in

			fixed capital. Gross fixed capital formation includes spending on land improvements (fences, ditches, drains and so on); plants, machinery, and equipment purchases; the construction of roads, railways, private residential dwellings, and commercial and industrial buildings. Disposal of fixed assets is taken away from the total.

Source: Author's compilation

4.5.4 Apriori expectation for objective three

Table 4.7 present the possible expected result from the variables to be employed in the analysis of impacts of military expenditure and institutional quality on inclusive growth in BRICS countries.

Table 4.7 Apriori expectation for objective three

S/N	Variables	Expected Signs
1	Military Expenditure (ME)	+/-
2	Corruption (proxy for Institutional quality (IQ)	+/-
3	Interactive variable of military expenditure and Corruption (proxy for Institutional quality (MCP)	+/-
4	Population (POP)- to reflect the negative growth impact of overpopulation pressures on the capita-to labour ratio	-
5	Education (EDU) -as a proxy human capital development	+
6	Investment (INV)- as a proxy for physical capital	+

Source: Author's compilation

4.5.5 Sources of data for objective three

Table 4.8 presents the sources of data to be employed in the objective three, that is, analysis of impacts of military expenditure and institutional quality on inclusive growth in BRICS countries.

Table 4.8: Sources of data for objective three

S/N	Variables	Proxy	Data measurement	Sources
1	Inclusive Growth Index (IGI)	Inclusive growth	Quarterly	Author computation

2	Military Expenditure (ME)	Military expenditure (% of GDP)	Quarterly	World Bank Indicator online database
3	Corruption (proxy of Institutional quality (IQ)	Corruption	Quarterly	International Country Risk Guide 1984-2017
4	Military expenditure * Institutional Quality (MCP)	Interactive form of military expenditure and institutional quality	Quarterly	World Bank Indicator online database and International Country Risk Guide1984-2017
5	Population (POP)	BRICS Population	Quarterly	World Bank Indicator online database
6	Education (EDU)	Education expenditure (% of GDP)	Quarterly	
7	Investment (INV)	Investment (% of GDP)	Quarterly	

Source: Author's compilation

4.5.6 Estimating technique for objective three

The choice of this estimation procedure is primarily informed by the fact that it passes the fitness-for-the-purpose-test. For instance, one option available to perform the co-integration test is the Engle-Granger approach, but its weakness lies in the fact that it is only able to use two variables. A multivariate analysis, such as that considered in this study, leads to the use of the Johansen and Joselius co-integration analysis (Johansen and Juselius, 1990) or ARDL model. These two models provide the statistical equivalence of the economic theoretical notion of a stable long-run equilibrium, but the choice will depend on the characteristics of the data. The guide that is followed in this study is that if all variables are stationary, I(0), an ordinary least square (OLS) model is appropriate and for all variables integrated of the same order, say I(1), Johansen's method is very suitable. But when we have fractionally integrated variables, variables at different levels of integration (but not at I (2) level) or cointegration amongst I (1) variables, then ARDL is the best model.

This study did not use the Johansen procedure (an option) as all the variables used in this study are not completely I (1), that is, integration of order one. This assumption is a pre-condition for the validity of the Johansen procedure. Alternatively, the ARDL model is appropriate to run the short-run and long-run relationships (Shin *et al.*, 2014). The choice of ARDL is further informed by the advantages it portends. Firstly, it is not as restrictive in terms of the meeting of integration of the same order (as in Johansen); it is not sensitive to the size of the data as small sample sizes can also be efficiently accommodated subject to non-compromise to the optimal lag-length selection affecting estimation efficiency owing to the consumption of the degree of freedom; and it also produces unbiased estimates even in the presence of endogenous covariates (Harris and Sollis, 2003).

The study uses ARDL since not all the variables are I (1) and there is no I (2) among them and guide that is followed to test for the cointegration is bound test. Under the Bound testing, a set of critical values are based on the assumption that variables are I(0) while the other set is based on the assumption that variables are I(1) in the model. The selection criterion is then that H0 is rejected if the F-statistic is greater than the upper boundary. But we shall fail to reject Ho if the F-statistic is lower than the lower boundary. The cointegration test is deemed inconclusive when the F-statistic value falls within the two boundaries. (Gujarati, 2009) provides an extensive list of advantages of panel data:

1. The problem of heterogeneity in panel data units is solved by estimation techniques that allow for individual-specific variables.
2. Data gives “more informative data, more variability, less collinearity and greater degrees of freedom and more efficiency”.
3. Panel data are more appropriate for investigating the dynamics of change.
4. Panel data can better detect and measure effects that cannot be observed in pure time series or pure cross-section data.
5. Panel data allow us to study behavioural models that are more complicated.
6. Panel data minimize bias caused by aggregation of micro-units’ data.

General diagnostic tests

To ensure that the estimation model was appropriate so as to ensure consistency of the coefficient estimate diagnostic test were undertaken.

- **Jarque Bera test:** The test is a goodness of fit measure of departure from normality based on the sample kurtosis and skew. In other words, Jarque Bera test determines whether the data, skew and kurtosis are matching a normal distribution. The study employed Jarque-Berra static for normality tests to test for serial autocorrelation.

- **Breuch-Godfrey langrage multiplier test:** is used to assess the validity of some of the modeling assumptions inherent in applying regression-like models to observed data. To use to test for the presence of serial correlation. If found, to be the presence of serial correlation would mean that a spurious conclusion would be drawn from other tests.
- **Cross-Sectional Dependence Test:** is used to assess if the n individuals in a sample are no longer independently drawn observations but affect each other's outcome. For example, this is can result from the fact that we look at a set of neighbouring countries, which are usually highly interconnected.
- **Langrage multiplier (LM) test:** To ascertain the assumptions on the residual of the ordinary least squares, a langrage multiplier test for autoregressive conditional heteroskedasticity (ARCH) was performed.
- **Structural Break test-**is used to determine when and whether there is a significant change in the time series data. For this study, Bai-Perron multiple breakpoint test will be used to ascertain the exact breakpoint in the time-series data.

4.6 Conclusion of the chapter

This chapter reviewed some of the existing theories, empirical literature and estimating techniques that were used to investigate the linkage between military expenditure, institutional quality and inclusive growth. The issue of inclusive growth is of great importance to any nation-state because growth leads to better welfare in living standard, access to quality education and opening up more employment opportunities that reflect the true impact of high growth on the common man in the street. The provision of security, as well as the presence of strong institutional quality, will lead to the provision of a secure environment. Therefore, investment in the military sector coupled with good institutional quality will stimulate inclusive growth.

In conclusion, from the evidence of the reviewed of the theoretical and estimation technique, the researcher concludes that the impact of military expenditure and institutional quality is different for different nations and literature shows that there is need for a more comprehensive study on the subject matter using BRICS as a case study. This will enable the study to determine whether the hypothesis is valid for BRICS or not.

CHAPTER 5

EMPIRICAL FINDINGS

This chapter presents the results of the analysis and interprets the findings of the study. The analyses are done according to the objectives with the application of relevant techniques as discussed under the methodology. The results of various diagnostic tests are also presented and interpreted in this section

In conclusion, this chapter is subdivided into four main sections- Section 5.1. - present the introduction for analysis of the three objectives of the study Section 5.2 presents empirical finding for objective 1- Determinant for BRICS military expenditure 1970 -2017, section 5.2- computation of BRICS inclusive growth index 1970-2017 and the chapter concludes by presenting the result of objective 3-impact of military expenditure and institutional quality on inclusive growth for BRICS countries 1970 to 2017.

5.1 Introduction

The empirical findings of this chapter are aimed at answering the three main objectives of this study. They are – objective 1- determinant for BRICS military expenditure 1970-2017; objective 2- computation of BRICS inclusive growth index 1970-2017 and objective 3- impact of military expenditure and institutional quality on inclusive growth for BRICS countries 1970-2017.

5.2 Objective 1- Determinant for BRICS military expenditure 1970-2017

To estimate the determinants of military spending in BRICS, the study begins with the descriptive analysis. The results of the descriptive statistics are reported in Table 5.1.

5.2.1. Descriptive statistics for the determinant of military expenditure in BRICS

Table 5.1 presents the summary statistics of the variables engaged in this study. The mean distribution of all the variables was presented in the third column of the table. Mean is unarguably one important tool for measuring central tendencies. The six columns present the maximum, while the fifth column shows the minimum value for all the variables. Row four presents the standard deviation result. The ME which is the dependent variable has a maximum of only 5.503756, and the minimum is as low as 0.00000 with a mean of 2.111923 which is closer to the minimum than the maximum. This result strongly lays credence to the extant a priori expectations that military expenditure (ME) is relatively low in BRICS countries.

Moreover, the results for all the independent variables, namely, Int, ext., Secweb, GDP, TB, demo index, Exch and infl. follow similar maximum and minimum trends with the military expenditure (ME). For instance, Secweb shows 9.361947 for the maximum, whereas the minimum is as low as 0.0000 and its mean value of 2.768716 which is closer to the minimum than the maximum. We can, therefore, infer that Secweb has been very erratic and unprecedented, looking at the gap between the minimum and the maximum.

We recall from the background and computation of the incidence of inclusive growth and the trend of military expenditure in Figure 2.3 that there is persistent rise in the incidence of military expenditure in BRICS countries despite the increase and growth in the gross domestic Product (GDP). Our result validated this claim as both the values of Military expenditure and SECWEB are positively related and are increasing. Nevertheless, the information shown in the summary statistics can be subjected to further empirical investigation.

Table 5.1: Summary of descriptive statistics for the determinant of military expenditure in BRICS countries

Variable	OBEs	Mean	Std. Dev.	Min	Max
ME	240	2.111923	1.348055	0	5.503756
INT.	240	5.672019	4.255748	0	11.91667
EXT.	240	6.521458	4.726551	0	12
SECWEB	240	2.768716	1.452574	0	9.361947
GDP	221	7.987818	1.250257	5.430738	9.385589
TB	240	8.74e+07	2.15e+09	-5.31e+09	8.56e+09
Demo Index	240	1.491667	10.67276	-88	9
Exch.	240	8.616337	13.17995	0	58.59785
Inf.	183	2.359151	1.418705	-1.05611	7.988791

Source: Author's computation

Table 5.2 shows the covariance structure of the adopted variables. The variables show different associations with one another. Nevertheless, we show particular interest in the association between dependent variable ME and other independent variables in the table, since this is our main interest in this section of the study. Military expenditure (ME) is weakly and positively correlates with Secweb, TB, demo index, exch. and Inf. with the value rates of 0.1812, 0.2709, 0.0370, 0.2283 and 0.0998, respectively, but negatively correlates with Int., Ext., and GDP. These results show a weak correlation existing between the endogenous and the exogenous variables. The implication is that there is no problem of multicollinearity in the model.

Table 5.2: Covariance matrix for the determinant of military expenditure in BRICS

	Me	**Int.**	**Ext.**	**Secweb**	**GDP**	**TB**	**Demo Index**	**Exch**	**Inf.**
Me	1.0000								
int.	-0.4740	1.0000							
ext.	-0.4273	0.9293	1.0000						
Secweb	0.1812	-0.2647	-0.2598	1.0000					
GDP	-0.1749	0.2978	0.3349	-0.0980	1.0000				
TB	0.2709	0.2137	0.1372	-0.0290	0.5324	1.0000			
Demo Index	0.0370	-0.1006	-0.0535	-0.2354	-0.0421	-0.0603	1.0000		
Exch	0.2283	0.0803	0.0847	-0.2737	-0.3978	0.0200	0.1646	1.0000	
Inf.	0.0998	-0.0284	0.0901	0.0501	0.2098	0.1673	0.0634	-0.1614	1.0000

Source: Author’s computation

5.2.2 Panel Unit root test for the determinant of BRICS countries military expenditure

Various studies such as Kutu and Ngalawa, 2016; Omolade and Ngalawa, 2014 among others have advised researchers to always use more than one methods of panel unit root test in order to be sure of the order of integration of the variables to be included in a particular model... For this study, both the IPS, LLC and ADF methods of Panel unit root tests are adopted for consistency. Their results are presented in Table 5.3.

Table 5.3: Panel unit root tests for determinant for BRICS countries military expenditure

	Levin et al. (2002)				**Im et al. (2003)**			
	Level		First Diff		Level		First Diff	
Variables	**Stat.**	**P-val**	**Stat.**	**P-val**	**Stat.**	**P-val.**	**Stat**	**P-val**
ME	-1.20247	0.1146	-10.3185	0.0000	-1.10034	0.1356	-10.4873	0.0000
INT	-1.02950	0.1516	-15.9196	0.0000	0.17815	0.5707	13.4058	0.0000
EXT.	-1.20438	0.1143	-16.0053	0.0000	0.11704	0.5466	-13.6685	0.0000
SECWEB	-1.39839	0.0810	-12.0931	0.0000	-1.67129	0.0473	-13.3773	0.0000
GDP	13.3771	1.0000	-1.57036	0.582	9.31774	1.0000	-3.81231	0.0001
TB	-2.67451	0.0037	-	-	-3.33891	0.0004	-	-
DEMOINDEX	-1.876221	0.0303	-	-	-2.2048	0.0137	-	-
Exch	0.24073	0.5951	-12.9703	0.0000	0.15184	0.5603	-9.17874	0.0000
INF	-6.6041	0.0000	-	-	-5.80599	0.0000	-	-

	ADF Fisher Chi Square				
	Level		First Diff		
Variables	**Stat.**	**P-val.**	**Stat**	**P-val**	**Status**
ME	14.1463	0.1664	108.814	0.0000	**I(1)**
INT	6.14092	0.8033	143.486	0.0000	**I(1)**
EXT	6.31176	0.7884	145.900	0.0000	**I(1)**
SECWEB	17.5762	0.0625	141.552	0.0000	**I(1)**
GDP	4.01389	0.9467	57.9757	0.0000	**I(1)**
TB	33.3252	0.0002	-	-	**I(0)**
DEMOINDEX	22.5096	0.0041	-	-	**I(0)**
EXCh.	6.68203	0.7551	6.68203	0.7551	**I(1)**
INF	55.4634	0.0000	-	-	**I(0)**

Source: Author's computation

It is evident from Table 5.3 that all the variables are either stationary at levels or after the first difference. The implication of this is that they are suitable for all the analysis adopted in the study. The methods of the panel unit root test give the same levels of integration for each variable. This speaks volume of the consistency level of the panel unit root results. Furthermore, the results indicate that apart from the trade balance, inflation, Demo index and Inflation that are stationary at levels, all other variables in the table are stationary after the first difference that is the integration of order one I (1).

5.2.3 Panel Least Squares regression analysis for the determinant of military expenditure BRICS countries

The essence of Panel Least Squares regression analysis is to verify if there will be need to use panel data analysis for the estimation of the equation or not. Panel data application might not be necessary if there is no problem of cross-sectional dependence. In other words, if the estimated pool regression model does not have a specific effect, then pool regression will suffice for the analysis but if otherwise then, panel data analysis is more suitable to be used for the estimation. One of the shortcomings of the pool regression is the problems of heterogeneity, which is not present in the panel data.

Table 5.4: Panel Least Squares regression results for determinant for BRICS countries military expenditure

Dependent Variable: Military expenditure(% of GDP)				
Method: Panel Least Squares				
Sample: 1970-2017				
Periods included: 48				
Cross-sections included: 5				
Total panel (unbalanced) observations: 239				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
SECWEB	0.434569	0.036863	11.78863	0.0000
TB	5.13E-11	3.97E-11	1.292722	0.1974
DEMOINDEX	0.014325	0.007229	1.981492	0.0487
EXCH	0.049175	0.006123	8.031229	0.0000
EXT.	0.079268	0.057617	1.375775	0.1702
GDP	0.000101	2.41E-05	4.209215	0.0000
INF.	0.000241	0.000253	0.950460	0.3429
INT.	-0.103914	0.059950	-1.733331	0.0844
R-squared	0.373526	Mean dependent var		2.110150
Adjusted R-squared	0.354542	S.D. dependent var		1.350604
S.E. of regression	1.085081	Akaike info criterion		3.034086
Sum squared resid	271.9794	Schwarz criterion		3.150453
Log likelihood	-354.5732	Hannan-Quinn criter.		3.080978
Durbin-Watson stat	0.348895			

Source*:* Author's computation

Considering the individual variable in the context of BRICS countries, security web denoted by Secweb with coefficient value of 0.434569 indicates a positive and significant determinant of BRICS countries military expenditure. The implication is that a unit rise of security web denoted by Secweb will lead to about 0.434569 increases in determinant of BRICS military expenditure.

Secondly, Trade Balance denoted by TB with coefficient value of 5.13E-11 indicates a positive but not significant determining of BRICS countries military expenditure. The implication is that a unit rise of trade balance denoted by TB will lead to about 0.434569 increase in determinant of BRICS military expenditure but not significant.

Another variable employed in the model is Democratic Index denoted by Demo-Index with coefficient value of 0.014325 and it is statistically significant at 5% level. Democratic Index exhibits a positive and significant in determining BRICS military expenditure. The implication is that a unit rise of Democratic Index will lead to about 0.014325 increases in determining BRICS countries military expenditure.

In addition, Exchange rate denoted by Exch-Rate with coefficient is 0.049175 and it is statistically significant at 5% level. The implication is that a unit rise of exchange rate will lead to about 0.0049175 increases in determining BRICS countries military expenditure. The result is an indication that exchange rate exhibits a positive but significant long run relationship in determining BRICS countries military expenditure, since most of the BRICS countries are either in the world's top arms manufacturing or arms exporting countries in their continents and earn foreign revenue from their sales of such arms and security gadgets .

Another variable used is the model is external threats denoted by ext. threat with a coefficient value of 0.079268. The result shows that the external threat exhibits a positive and significant long –run relationship in determining BRICS countries military expenditure. The implication is that a unit rise of external threat denoted by ext. threat will lead to about 0.079268 increases in determining BRICS countries military expenditure.

Furthermore, Gross Domestic Product denoted by GDP with a coefficient value of 0.000101 and it is significant at 5%. The implication is that a unit rise of Gross Domestic Product denoted by GDP will lead to about 0.000101 increases in determining BRICS countries military expenditure. This result shows that the Gross Domestic Product exhibits a positive and significant long –run relationship in determining BRICS countries military expenditure.

Also, Inflation denoted by Infl. with a coefficient value of 0.000241 but not significant at 5%. The implication is that a unit rise of Inflation denoted by Infl. will lead to about 0.000241 increases in determining BRICS countries military expenditure. This result shows that the inflation exhibits a positive and not significant long –run relationship in determining BRICS countries military expenditure.

More so, Internal threat denoted by INT. with a coefficient value of -0.103914 but significant at 10 %. The implication is that a unit rise of Inflation denoted by internal threat will lead to about 0.103914 decreases in determining BRICS countries military expenditure. This result shows that the internal threats exhibits a negative and is not significant impact in determining BRICS countries military expenditure.

In Summary, the results in Table 5.4 are an indication that many of the variables have a significant impact on ME as a percentage of GDP. This is shown from the probabilities of the t statistics of each of the independent variables in the estimated model, which are significant at 5% level. Adoption of the Gross Domestic Product particularly showed a significant impact on Military expenditure. Notwithstanding, this approach of pool regression might not be sufficient to explain the relationship between the independent variables and the dependent variable because the results are prone to specific effects/heterogeneity influence which might undermine the reliability of the parameter estimates in the estimated model. Consequently, cross-sectional dependence test is conducted to ascertain if there is the presence of specific effect in the result. The result of the cross-sectional dependence test is presented in Table 5.5

Table 5.5: Cross-sectional dependence test (Pool-ability test) for determinant for BRICS countries military expenditure

Residual Cross-Section Dependence Test			
Null hypothesis: No cross-section dependence (correlation) in residuals			
Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	72.92935	10	0.0000
Pesaran scaled LM	12.95340		0.0000
Pesaran CD	-0.831331		0.4058

Source: Author's computation

The results from Table 5.5 show that the null hypothesis is rejected and the alternative hypothesis that there is cross-sectional dependence in the estimated panel model is accepted. This result implies that it is not appropriate to pool the data. Therefore, the pool regression results are not reliable for forecasting and empirical inferences. Consequently, the panel model approach is used to reduce the problem of cross-sectional dependence. The results of panel estimation are presented as follows:

5.2.4 Panel data estimation for the determinant of military expenditure in BRICS countries

Following the results of the panel Least squares regression, it is obvious that there will be a need for panel data estimation in order to reduce the implications of the problem of cross-sectional dependence. Both fixed and random effects are used in this study to be able to ascertain the level of consistency in the panel results as well as investigating the approach that is more suitable for the nature of our data. The results of the fixed and random effects are presented in Tables 5.6 and 5.7, respectively.

Table 5.6: Fixed effects panel results for the determinant of military expenditure in BRICS

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Internal	-.0845414	.0555871	-1.52	0.130
External	.0626497	.0499752	1.25	0.211
Security web	.3381968	.0463219	7.30	0.000
GDP	.000222	.0000332	6.68	0.000
TB	2.12e-10	5.07e-11	4.19	0.000
Demo Index	-.0034721	.0066425	-0.52	0.602
Exchrate	.0022599	.0070385	0.32	0.748
Inflation	.0004513	.0002169	2.08	0.039
Cons	.1566255	.2011105	0.78	0.437

sigma_u | 1.3324109
sigma_e | .89206655
rho | .69048958 (fraction of variance due to u_i)

F test that all u_i=0: F(4, 226) = 27.00 Prob > F = 0.0000

Source: Author’s computation

Table 5.7: Random effects panel results for the determinant of military expenditure in BRICS

Variable	Coefficient	Std. Error	t-Statistic (Z)	Prob. P>|z|
Internal	-.1307021	.0605125	-2.16	0.031
External	.0973939	.0576178	1.69	0.091
Security web	.3584819	.0491526	7.29	0.000
GDP	.000075	.0000265	2.83	0.005
TB	7.39e-11	4.05e-11	1.82	0.068
Demo Index	.0172946	.0072763	2.38	0.017
Exchrate	.0433276	.0065718	6.59	0.000
Inflation	.0002008	.0002517	0.80	0.425
Cons	.4678524	.2022761	2.31	0.021
sigma_u | 0 sigma_e | .89206655 rho | 0 (fraction of variance due to u_i)				

Source: Author's computation

From Tables 5.6 and 5.7, it is clear that there are similarities in the results of the fixed and random effects. Firstly, all the variables that are significant under the fixed effects are also significant under the random effects. That is security web and GDP are all significant in both estimated models. Notwithstanding, the coefficients are different slightly. The overwhelming similarity in the two results is evidence of consistency in the results. Notwithstanding, the HAUSMAN test is conducted to know which of the two estimated panel models is more suitable for this study. The results of the HAUSMAN test are presented in Table 5.8.

5.2.5 HAUSMAN test for the determinant of military expenditure in BRICS

As earlier said, the results of the HAUSMAN test are to determine which of the fixed or random effect model is more suitable for the analysis. The result of the HAUSMAN test is presented in Table 5.8.

Table 5.8: HAUSMAN test for the determinant of military expenditure in BRICS

Test Summary		Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random				
Cross-section random effects test comparisons:				
Variable	Fixed	Random	Var(Diff.)	Prob.
	(b) (B)	(b-B) Difference	sqrt(diag(V_b-V_B))	
Internal	-.0845414	-.1307021	.0461607	.0287306
External	.0626497	.0973939	-.0347442	.0175242
Sec web	.3381968	.3584819	-.0202851	.0264584
GDP	.000222	.000075	.0001471	.0000301
TB	2.12e-10	7.39e-11	1.38e-10	4.57e-11
Demo Index	-.0034721	.0172946	-.0207667	.0033361
Exch.	.0022599	.0433276	-.0410677	.0053624
Infl.	.0004513	.0002008	.0002505	.0000703
b = consistent under Ho and Ha; obtained from xtreg B = inconsistent under Ha, efficient under Ho; obtained from xtreg Test: Ho: difference in coefficients not systematic chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 74.37 Prob>chi2 = 0.0000 (V_b-V_B is not positive definite)				

Source*:* Author's computation

The Hausman test revealed that the chi-square probability is significant at 5% level. This is an indication that the null hypothesis is rejected and the alternative hypothesis is accepted. The implication of the results is that the fixed effect is more preferable for this study hence we go ahead to interpret the results of the fixed effects.

In conclusion, from the fixed effects results four variables have significant impacts on Military expenditure namely security web, GDP, inflation, and Trade Balance. The Security Web represents the variables that captured the possibility of arms race for each BRICS neighbour. The coefficient is significant and positive. The implication of this is that there is a positive significant relationship between the activities of BRICS countries regarding arms purchase and that of their neighbouring countries.

Again, economic growth is the most significant determinant for military expenditure. The coefficient of economic growth, which is proxy by GDP, is positive and significant. This indicates that BRICS countries economic growth is majorly responsible for the drive to invest military expenditure. The implication is that the BRICS countries economic prosperity dictates the levels of their investment in the military.

The third variable with a significant effect on ME is the trade balance. From the results of the fixed effect, the coefficient of the variable is positive and significant. It shows that there exists a favourable trade transaction among the BRICS countries. This might be due to the fact that they all have active defence industries. The more positive trade balance, the more effective government policies are implemented in the countries.

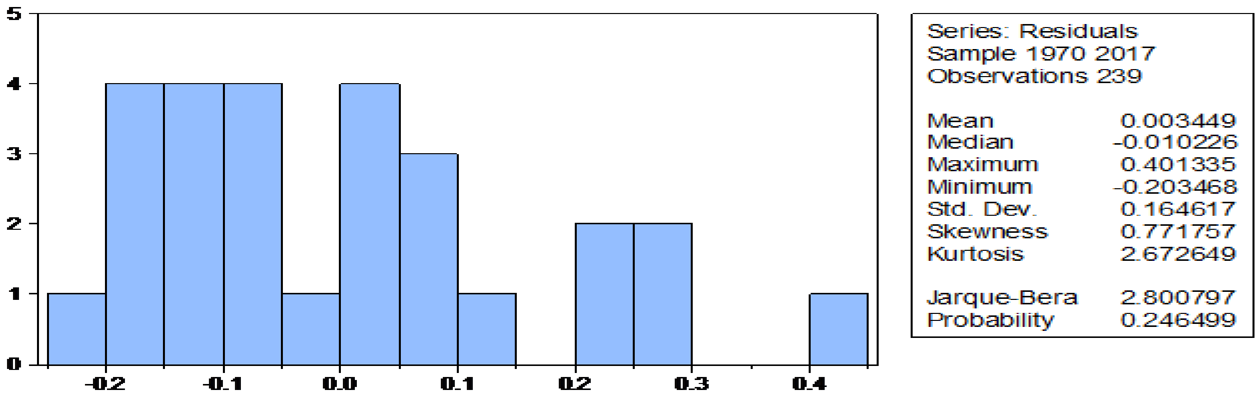
The fourth variable with the least significant effect on the determinant of BRICS military expenditure is inflation. This indicates that rising BRICS military expenditure is inflation driven, especially if military expenditure finance is through debt; this might be inflationary.

Finally, the overall results from the fixed effect reveal that four out of the eight variables considered in this study are significant. The significant variables are TB, security web and GDP. They are all significant at 1% and 5%, respectively. While the GDP effect on military expenditure under fixed effect is positive and significant, it is worthy of note that all variables under fixed effect have a positive effect on military expenditure. While GDP, security web, Trade balance are the major determinants of military expenditure under fixed effect, inflation is the least determinant.

5.2.6 Post estimation tests for the determinant of military expenditure in BRICS

Some diagnostic tests are necessary for the panel data analysis. These tests are required to verify the validity of the parameter estimates. To ascertain the appropriateness of panel linear regression, the study conducted the normality test on the residual and the results are presented in Figure 5.1.

Figure 5.1: Normality test for the determinants of military expenditure in the BRICS



Source: Author's computation

The result of the normality test shows that the probability value of the Jarque-Bera statistics of 0.246499 is greater than 5%, indicating that the residuals from the estimates are normally distributed. Again, the estimated panel result is re-verified for cross-sectional dependence the result is shown in Table 5.10.

Table 5.9: Pesaran's test of cross-sectional independence

Test Statistics	Probability
-1.582	1.8862

Source*:* Author's Computation

The results from the table confirm the nonexistence of cross-sectional dependence because the probability of the Pesaran statistics is not significant. Therefore, we accept the Null hypothesis of no cross-sectional dependence unlike what we saw in the pool regression analysis.

5.3 Objective 2- Computation of BRICS inclusive growth index 1970-2017

Figure 5.2 presents the graphical representation of the BRICS inclusive index from 1970 to 2017 while in Appendix page 253 to 255 present BRICS inclusive growth index from 1970 to 2017 for each individual BRICS countries.

Decision rule - Value for IGI close to zero shows low inclusive growth (0.00-0.59), while, a value close to one denotes the high inclusive growth (0.60-1.00) for the study period.

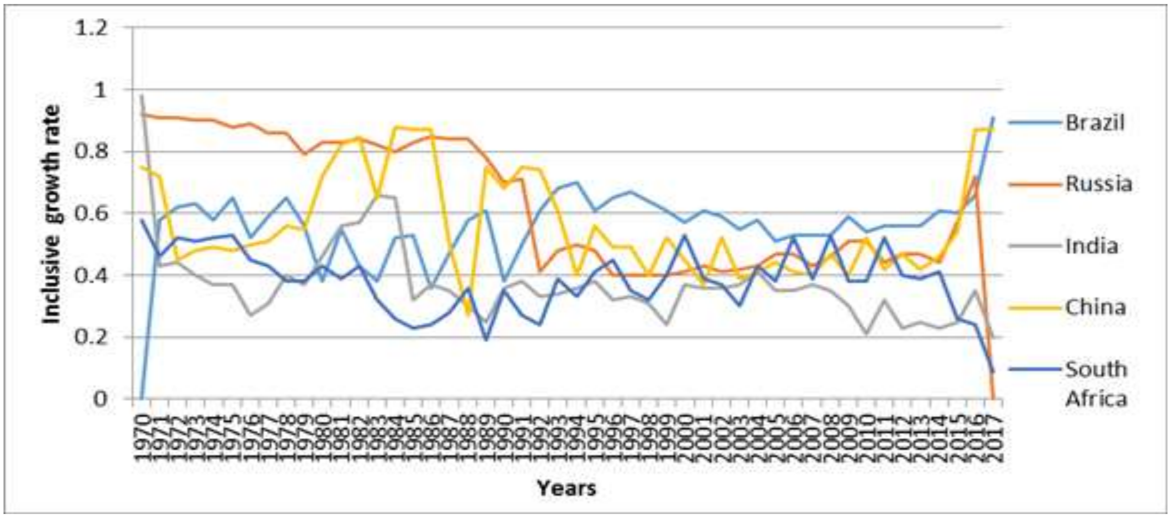


Figure 5.2: Graphical representation of BRICS IGI index from 1970 to 2018

Source: Author's computation

The graph above presents the trend line analysis of BRICS countries inclusive growth from 1970 to 2017. Value for IGI close to zero show low inclusive growth (0.00-0.49), while, a value close to one denotes the high inclusive growth (0.50-1.00) for the study period. The trend indicates that inclusive growth in the BRICS shows a downward trend, although, it has not been stable during the period under review. Notwithstanding, the most visual movement noticed from the graph for the five countries is that of a falling trend.

5.3.7 Comparison of average inclusive growth index during the period under review across member countries

The average IGI for individual member countries is presented under this section. The value for IGI close to zero show low inclusive growth (that is between 0.00 to 0.49), while, a value close to one denotes the high inclusive growth (that is between 0.50 to 1.00) for the study period. For example, averaging BRICS countries inclusive growth rates for the periods of 1970 to 2017 as presented in Table 5.10

Table 5.10: BRICS Inclusive growth average for the periods of 1970 to 2017

S/N	Countries	Inclusive growth rate average for the periods of 1970 to 2017	Discussion on inclusive growth index numbers
1	**Brazil**	0.56	This means that Brazil has a relatively high inclusive growth trajectory for the periods of 1970 to 2017. This means that growth experienced in Brazil is trickling down to the poor and it is inclusive in nature.
2	**Russia**	0.63	This means that Russia has a much higher inclusive growth trajectory for the periods of 1970 to 2017. This means that growth experienced in Russia is trickling down to the poor and it is inclusive in nature.
3	**India**	0.37	This means that India has a low inclusive growth trajectory for the periods of 1970 to 2017. This means that growth experienced in India is not trickling down to the poor and it is not inclusive in nature.
4	**China**	0.57	This means that China has a relatively high inclusive growth trajectory for the periods of 1970 to 2017. This means that growth experienced in China is trickling down to the poor, and it is inclusive in nature.
5	**South Africa**	0.38	This means that South Africa has a low inclusive growth trajectory for the periods of 1970 to 2017. This means that growth experienced in South Africa is not trickling down to the poor and it is not inclusive in nature.

Source: Author’s computation

Brazil with 0.56 which is slightly above 0.50 denoted that Brazil has a relatively high inclusive growth trajectory for the periods of 1970 to 2017. This means that growth experienced in Brazil is trickling down to the poor and it is inclusive in nature.

Secondly, Russia with 0.63 which is much more than 0.50 mean denotes that Russia has a much higher inclusive growth trajectory for the periods of 1970 to 2017. This means that growth experienced in Russia is trickling down to the poor and it is inclusive in nature.

Thirdly, India with 0.37 represents that India has a low inclusive growth trajectory for the periods of 1970 to 2017. This means that growth experienced in India is not trickling down to the poor and it is not inclusive in nature. Thus affirms the World Bank ranking of India as the capital of the poorest people on earth as at the time of writing this thesis.

In addition, China (the second economic world power) denotes that China has a relatively high inclusive growth trajectory for the periods of 1970 to 2017. This means that growth experienced in China is trickling down to the poor, and it is inclusive in nature.

Lastly, South Africa (the smallest economy among the BRICS countries) with 0.38 denotes that South Africa has a low inclusive growth trajectory for the periods of 1970 to 2017. This means that growth experienced in South Africa is not trickling down to the poor and it is not inclusive in nature.

In summary, the index indicates the true growth inclusiveness in the BRICS countries for the period covered. The tables show that Russia has the highest average inclusive growth index during the periods under review. This is followed by China and Brazil. However, South Africa and India are the countries with the lowest inclusive growth index. The index revealed the outcome of various government poverty interventions, and levels of inequality and unemployment rate, unlike other developmental indicators that have failed to capture all these dynamics.

5.4 Objective 3 - Impact of military expenditure and institutional quality on inclusive growth for Individual BRICS countries 1970-2017

Based the heterogeneous results obtained from the Inclusive growth index measurement of BRICS countries under Table 5.3 in objective 2. Therefore, objective 3 estimation is done on individual countries bases by using time series data from each of the five countries. The analysis of the impact of military expenditure and institutional quality on inclusive growth for individual BRICS countries starts with the descriptive analysis. This will enable comparative analysis among the countries. Therefore, this section presents the time-series analysis of the individual country. In other words, Brazil, Russia, India, China and South Africa individual analysis of the effect of military expenditure and institutional quality on inclusive growth is carried out by exploring the time series properties of the data first.

5.4.1 Analysis of impact of military expenditure, institutional quality and inclusive growth in Brazil

This section presents the time series data analysis of the impact of military expenditure and institutional quality on Inclusive growth for Brazil.

5.4.1.1 Descriptive statistics result for Objective 3- Military expenditure, institutional quality and inclusive growth in Brazil

Table 5.11 presents the summary statistics of the variables engaged in this study. The mean distribution of all the variables was presented in the second row of the table. Mean is unarguably one important tool for measuring central tendencies. The third row presents the maximum, while the fourth row shows the minimum value for all the variables. Row five presents the standard deviation result. The IGI which is the dependent variable has a maximum of only 0.910000, and the minimum is as low as 0.36000 with a mean of 0.576654 which is closer to the minimum than the maximum. This result strongly lays credence to the extant a priori expectations that inclusive growth (IGI) is relatively low in Brazil. The implication here is that, during the period under review, Inclusive growth in Brazil has never gone below 36 per cent.

Moreover, the results for all the independent variables, namely, Investment (In), log of population, the interactive variable of military expenditure and corruption (MCP), Military expenditure (me), Corruption (cor) and Education (edu) follow similar maximum and minimum trends with the inclusive growth (IGI). For instance, MCP shows 10.7450 for the maximum, whereas the minimum is as low as 2.6969 and its mean value of 5.0816 which is closer to the minimum than the maximum. We can, therefore, infer that the interactive variable of military expenditure and corruption (MCP) has been very erratic and unprecedented, looking at the gap between the minimum and the maximum.

We recall from the background and computation of the incidence of inclusive growth and the trend of military expenditure in Figure 2.3 and Table 2.12 that there is persistent rise in the incidence of inclusive growth in Brazil despite the increase and growth in the military expenditure. Our result validated this claim as both the values of Inclusive growth and military expenditure are positively related and are increasing. Nevertheless, the information shown in the summary statistics can be subjected to further empirical investigation.

Table 5.11: Summary of descriptive statistics military expenditure, institutional quality and inclusive growth 1984-2017 for Brazil

	IGI	INV	LNPOP	MCP	ME	COR	EDU
Mean	0.576654	2.240048	18.96875	5.081614	1.645771	3.022713	2.485229
Median	0.572500	2.264751	18.98892	4.881555	1.539016	3.000000	2.378330
Maximum	0.910000	5.034129	19.15922	10.74500	2.686250	4.000000	5.948480
Minimum	0.360000	0.128665	18.70436	2.696998	1.199541	1.833333	0.000000
Observations	133	133	133	133	133	133	133

Source: Author's Computation

Table 5.12 shows the covariance structure of the adopted variables. The variables show different associations with one another. Nevertheless, we show particular interest in the association between dependent variable IGI and other independent variables in the table, since this is our main interest in this section of the study. IGI weakly and positively correlates with INV and LNPOP with the value rates of 0.321032 and 0.354209, respectively, but negatively correlates with the interactive variable of military expenditure and corruption (MCP), Military expenditure (ME), Corruption (COR) and Education (EDU). These results show a weak correlation existing between the endogenous and the exogenous variables. The implication is that there is no problem of multicollinearity in the model.

Table 5.12: Covariance Matrix for military expenditure, institutional quality and inclusive growth for Brazil

	IGI	INV	LNPOP	MCP	ME	COR	EDU
IGI	1.000000						
INV	0.321032	1.000000					
LNPOP	0.354209	0.784617	1.000000				
MCP	-0.187743	-0.641635	-0.741853	1.000000			
ME	-0.005136	-0.424080	-0.482648	0.868346	1.000000		
COR	-0.313031	-0.686036	-0.840603	0.857315	0.502901	1.000000	
EDU	-0.067761	0.612212	0.670091	-0.562395	-0.355526	-0.608105	1.000000

Source: Author's Computation

5.4.1. 2 Unit root test for military expenditure, institutional quality and inclusive growth for Brazil

The study made use of more than one methods of unit root test in order to be sure of the order of integration of the variables to be included in a particular model. For this study, both the ADF and PP methods of unit root tests are adopted for consistency. Their results are presented in Table 5.13.

Table 5.13: Unit root test for military expenditure, institutional quality and inclusive growth for Brazil

	Augmented Dickey Fuller (ADF)				**Phillips-Perron (PP)**				**Status**
	Level		First Diff		Level		First Diff		
Variables	**Statistics**	**P-value**	**Stat.**	**P-value**	**Statistics**	**P-value**	**Statistics**	**P-value**	
IGI	0.5532	0.8344	1.5003	0.0246	0.8052	0.8850	3.4864	0.0098	I(1)
INV	0.6085	0.4520	3.4574	0.0007	0.2877	0.5805	3.7375	0.0002	I(1)
LNPOP	0.5611	0.4723	1.8889	0.0565	12.8686	1.0000	8.2373	0.0000	I(1)
MCP	0.8576	0.3426	3.1447	0.0019	0.6275	0.4438	3.7452	0.0002	I(1)
ME	0.5803	0.4642	3.1039	0.0021	0.2746	0.5854	4.0834	0.0001	I(1)
COR	1.2402	0.1966	3.2149	0.0015	0.8118	0.3626	3.9289	0.0001	I(1)
EDU	1.2553	0.1981	2.6090	0.0093	1.7545	0.4016	3.8644	0.0002	I(1)

Source: Author’s computation

It is evident from Table 5.13 that all the variables are either stationary at levels or after the first difference. The implication of this is that they are suitable for all the analysis adopted in the study. The methods of the unit root test give the same levels of integration for each variable. This speaks volume of the consistency level of the unit root results. Furthermore, the results indicate that all variables in the table are stationary after the first difference that is the integration of order one I (1).

5.4.1.3 Test for Structural Breaks

Bai and Perron (2003) argue that time series data often possess sudden changes either in the mean or in the other parameters that bring about the series. The structural break test enables us to identify the particular time the changes occur, if any. If this is not identified and corrected, it could lead to a misleading result. Therefore, we need to correct for a structural break in the series if the break is significant.

Table 5.14: Structural Breaks Result

Null Hypothesis: No breaks at specified breakpoints			
F-statistic	110.6488	Prob. F(2,132)	0.0000
Log likelihood ratio	133.8932	Prob. Chi-Square(2)	0.0000
Wald Statistic	221.2976	Prob. Chi-Square(2)	0.0000

Source: Author's Computation

From Table 5.14, we can identify three (3) breaking points in the chosen variables and the years where those breaks occurred. Therefore we proceed to test if the breaking points are significant by adding dummy variables to the model and regressing the model.

5.4.1.4 The ARDL lag Determination

Table 5.15: The ARDL lag Determination

VAR Lag Order Selection Criteria						
Endogenous variables: IGI INV LNPOP MCP ME EDU						
Exogenous variables: C						
Included observations: 128						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-357.9879	NA	1.19e-05	5.687311	5.820999	5.741629
1	508.2990	1637.824	2.76e-11	-7.285922	-6.350099	-6.905692
2	518.9373	19.11564	4.12e-11	-6.889645	-5.151689	-6.183504
3	541.6430	38.67079	5.12e-11	-6.681923	-4.141833	-5.649871
4	920.9163	610.3929	2.44e-13	-12.04557	-8.703344	-10.68760
5	1140.824	333.2972	1.42e-14*	-14.91912*	-10.77476*	-13.23525*
6	1149.557	12.41779	2.27e-14	-14.49308	-9.546590	-12.48330
7	1165.565	21.26064	3.29e-14	-14.18071	-8.432082	-11.84501
8	1214.571	60.49148*	2.92e-14	-14.38392	-7.833163	-11.72231
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Source: Author's Computation

Table 5.15 above shows the ARDL optimal lag result. The optimal lag length was obtained for the regression estimates of the variables under study. This was done using the Akaike Information Criterion (AIC), Hannan-Quinn information criterion(HQIC), sequential modified LR test statistics (LR), Schwarz Bayesian Criterion (SBC) and final prediction error (FPE) which are mostly used in ARDL estimation (see Dritsakis, 2011). Relying on the merit that different variables can be assigned different lags as they enter the ARDL model that (as indicated in Table 5.9 above). This study tested for various lag lengths selection criteria, and we chose five lag lengths since four out of the five criteria were chosen by FPE, AIC, SC and HQ at 5% level each. Hence, this forms the optimal lag length, which is used for the regression.

5.4.1.5 ARDL Bound test result for Objective 3- Military expenditure, institutional quality and inclusive growth 1984-2017in Brazil

The ARDL Bound testing provides the log-likelihood ratio statistics for determining the number (r) of the long-run relationship between IG, Me, Corr., Edu. Pop and M*Corr. The calculated value of the F statistics must be greater than 95% critical value at both lower and upper bounds for the null of r= 0, which indicates no long-run relationship to be rejected. This means that the alternative hypothesis of long-run relationship is accepted. Now that we have established that, IG, Me, Corr., Edu. Pop and M*Corr. are non-stationary at the level we can test for the presence of integration.

Table 5.16: ARDL Bounds test for military expenditure, institutional quality and inclusive growth for Brazil

ARDL Bounds Test		
Included observations: 131		
Test Statistic	Value	K
F-statistic	3.694138	6
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.12	3.23
5%	2.45	3.61
2.5%	2.75	3.99
1%s	3.15	4.43

Source: Author's Computation

The ARDL bound test results are reported above. Results indicate that there is a long-run relationship between military expenditure, institutional quality and inclusive growth in Brazil.

The ARDL bound test results for Brazil (3.694138 is greater than 2.45 and 3.61 at 5%) and statistically significant at α= 1% and 5%, respectively. This shows that there is a long-run relationship among military expenditure, institutional quality and inclusive growth.

5.4.1.6 ARDL co integrating and long-run result for military expenditure, institutional quality and inclusive growth 1984-2017 in Brazil

After the confirmation of a cointegration among variables, the next step is to estimate the short-run and long-run form of the coefficients. The results are presented in Table 5.16

Table 5.17: ARDL co integrating and long run test result for military expenditure, institutional quality and inclusive growth for Brazil

ARDL Co integrating And Long Run Form				
Dependent Variable: IGI				
Selected Model: ARDL(1, 5, 0, 1, 1, 0, 1, 1)				
Co integrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ME)	0.166123	0.032502	5.111117	0.0000
D(ME(-1))	-0.000000	0.035851	-0.000000	1.0000
D(ME(-2))	0.000000	0.035851	0.000000	1.0000
D(ME(-3))	0.189104	0.036576	5.170109	0.0000
D(ME(-4))	-0.172915	0.028887	-5.986009	0.0000
D(MCP)	-0.003221	0.004457	-0.722754	0.4713
D(LNPOP)	1.010240	0.509522	1.982719	0.0498
D(INV)	-0.013601	0.008067	-1.685884	0.0946
D(EDU)	-0.004756	0.001910	-2.490275	0.0142
D(COR)	0.113191	0.031949	3.542905	0.0006
D(COR(-1))	-0.000000	0.039266	-0.000000	1.0000
D(COR(-2))	0.000000	0.039266	0.000000	1.0000
D(COR(-3))	-0.232517	0.040936	-5.680033	0.0000
D(IGI)	0.150198	0.090309	1.663154	0.0989
D(DM1)	-0.347533	0.071821	-4.838898	0.0000
D(DM2)	-0.660614	0.072006	-9.174477	0.0000
D(DM3)	-0.347533	0.071821	-4.838898	0.0000
CointEq(-1)	-0.117214	0.047458	-2.469821	0.0150
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.

ME	0.190274	0.208727	0.911596	0.3639
MCP	-0.027483	0.038615	-0.711704	0.4781
LNPOP	1.065010	0.660307	1.612903	0.0096
INV	0.013906	0.032429	-0.428804	0.6689
EDU	-0.040579	0.019199	-2.113571	0.0368
COR	0.419042	0.426866	0.981672	0.0083
IGI	3.956620	3.024825	1.308049	0.1934
DM1	-0.009414	0.745715	-0.012623	0.9899
DM2	0.204407	0.698012	0.292842	0.7702
DM3	-0.035748	0.130967	-0.272951	0.7854
C	-19.655779	12.387212	-1.586780	0.1154

Note- DM1, DM2 and DM3 represent the dummy for the three structural breaks points identified within the time series data.

Source: Author's Computation

Considering the individual variable in the context of Brazil, military expenditure indicates a significant positive long-run relationship on inclusive growth. The long-run coefficient of military expenditure is 0.190274 is positive and significant. The implication is that a unit rise of military expenditure will lead to about 0.190274 increases in inclusive growth.

The long-run relationship and impact of corruption (proxy for institutional quality) exhibits a positive long-run relationship with inclusive growth. The long-run coefficient of institutional quality (proxy by corruption) is +0.419042 and it is statistically at 5% level. The implication of this is that there is the presence of positive additive of institutional quality (proxy by corruption) (i.e. greasing the wheels for growth) as it reduces government red tape/ bureaucracies, thereby promoting inclusive growth. The implication is that a unit rise of corruption will lead to about 0.269733 increases in Brazil inclusive growth.

Another variable employed in the model is education. Education exhibits a positive long-run relationship with inclusive growth, which is a proxy for human development. The long-run coefficient of education is 0.040579 and it is statistically significant at 5% level. The implication is that a unit rise of education will lead to about 0.040579 increases in inclusive growth.

The investment long-run coefficient is 0.013906. The result is an indication that investment exhibits a positive but non-significant long run relationship with inclusive growth. The implication of this is that there is a need for more investment to stimulate inclusive growth. The implication is that a unit rise of investment will lead to about 0.013906 increases in inclusive growth.

Another variable used is the interactive form of military expenditure- institutional quality, denoted by MCP with coefficient is -0.027483. The implication is that a unit rise of interactive form of military expenditure- institutional quality (proxy by corruption) will lead to about 0.027483 decreases in inclusive growth. This shows that interactive form of military expenditure and institutional quality does not stimulate inclusive growth.

Population long-run coefficient is -1.065010. The result is an indication that the population exhibits a negative long-run relationship with inclusive growth and it is statistically significant at 5%. The implication of this is that the rise in population can significantly affect inclusive growth negatively. The implication is that a unit rise of population will lead to about 0.202997 decreases in inclusive growth.

Under the short-run aspect of the cointegration regression, the result shows that the lagged values of corruption (proxy for institutional quality), education, investment, military expenditure, and military expenditure -institutional quality denoted by MCP all have short-run significant impact on inclusive growth in Brazil. However, the error correction term is correctly signed and significant which indicates a good adjustment to equilibrium.

5.4.1.7 Post estimation test: Military expenditure, institutional quality and inclusive growth 1984-2017 Brazil

Table 5.18 presents the post estimation diagnostic tests, which include heteroskedasticity and serial correlations. The rationale of the post estimation tests is to ascertain the robustness of the ARDL results.

Table 5.18: Heteroscedasticity Test: Breusch-Pagan-Godfrey Test for Brazil

Null Hypothesis: No Heteroscedasticity			
F-statistic	0.367258	Prob. F(16,15)	0.9724
Obs*R-squared	9.007232	Prob. Chi-Square(16)	0.9131
Scaled explained SS	1.647357	Prob. Chi-Square(16)	1.0000

Source: Author’s Computation

The null hypothesis is that there is no heteroscedasticity. Using the F statistics, it is discovered that the probability of F shows that the null hypothesis is to be accepted. Therefore, we conclude that the model is not having the problem of heteroscedasticity, which may affect the validity of the result.

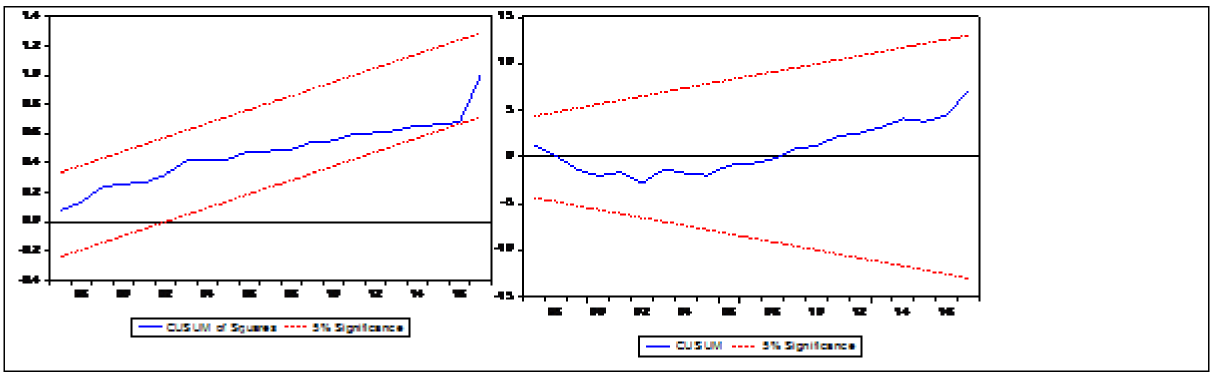
Table 5.19: Breusch-Godfrey serial correlation LM test for Brazil

Null Hypothesis: No Serial-Correlation				
F-statistic	1.336783	Prob. F(2,13)	0.2965	
Obs*R-squared	5.458497	Prob. Chi-Square(2)	0.0653	

Source: Author's Computation

The null hypothesis for Brazil indicates that there is no serial correlation. Since the F-statistical probability is greater than 5%, it is the null hypothesis is to be accepted while we reject the alternative hypothesis that there is no serial correlation. Consequently, the estimates from our model are valid and can be used for forecasting.

Figure 5.3 Stability test for Brazil



Source: Author's Computation

In conclusion, the stability test indicates that the model is reliable (that is, the model falls within the red lines) and does not suffer from any structural break. This is an indication that the estimated exhibit the stability required for a model that will be useful for forecasting.

5.4.2 Analysis of impact of military expenditure, institutional quality and inclusive growth 1984-2017in Russia

The second country under consideration in the BRICS is Russia. The analysis is explained as follows.

5.4.2.1 Descriptive statistics result for Objective 3- Military expenditure, institutional quality and inclusive growth 1984-2017in Russia

Table 5.20 below presents the summary statistics of the variables engaged in this study. The mean distribution of all the variables was presented in the second row of the table. Mean is unarguably one important tool for measuring central tendencies. The third row presents the maximum, while the fourth row shows the minimum value for all the variables. Row five presents the standard deviation result. The IGI which is the dependent variable has a maximum of only 0.850000, and the minimum is as low as 0.00000 with a mean of 0.528722 which is relatively closer to the maximum than the minimum. This result strongly lays credence to the extant a priori expectations that inclusive growth (IGI) is relatively high in Russia. The implication here is that, during the period under review, Inclusive growth in Russia relatively high.

Moreover, the results for all the independent variables, namely, Inv, log of pop, mcp, me, cor and edu follow similar maximum and minimum trends with the inclusive growth (IGI) except for Lpop and Me.. For instance, MCP shows 181399 for the maximum, whereas the minimum is as low as 0.0000 and its mean value of 5.9279 which is closer to the minimum than the maximum. We can, therefore, infer that MCP has been very erratic and unprecedented, looking at the gap between the minimum and the maximum.

We recall from the background and computation of the incidence of inclusive growth and the trend of military expenditure in Figure 2.3 and Table 2.12 that there is persistent rise in the incidence of inclusive growth in Russia despite the increase and growth in the military expenditure. Our result validated this claim as both the values of Inclusive growth and military expenditure are positively related and are increasing. Nevertheless, the information shown in the summary statistics can be subjected to further empirical investigation.

Table 5.20: Summary of descriptive statistics military expenditure, institutional quality and inclusive growth 1984-2017in Russia

	IGI	INV	LNPOP	MCP	ME	COR	EDU
Mean	0.528722	1.410135	18.79536	5.927907	3.177122	1.491228	0.981682
Median	0.470000	1.064660	18.79151	6.469227	3.676790	1.541667	0.000000
Maximum	0.850000	4.502704	18.81737	18.13993	5.503756	3.916667	4.101750
Minimum	0.000000	0.000000	18.77655	0.000000	0.000000	0.000000	0.000000
Observations	133	133	133	133	133	133	133

Source: Author's Computation

Table 5.21 shows the covariance matrix structure of the adopted variables. The variables show different associations with one another. Nevertheless, we show particular interest in the association between dependent variable IGI and other independent variables in the table, since this is our main interest in this section of the study. IGI weakly and positively correlates with LNPOP with the value rates of 0.061120, respectively, but negatively correlates with INV., MCP, ME, COR and EDU. These results show a weak correlation existing between the endogenous and the exogenous variables. The implication is that there is no problem of multicollinearity in the model.

Table 5.21: Covariance matrix for military expenditure, institutional quality and inclusive growth 1984-2017in Russia

	IGI	INV	LNPOP	MCP	ME	COR	EDU
IGI	1.000000						
INV	-0.501608	1.000000					
LNPOP	0.061120	-0.718095	1.000000				
MCP	-0.606986	0.230366	0.146906	1.000000			
ME	-0.763090	0.402040	-0.038557	0.762015	1.000000		
COR	-0.696253	0.355910	0.085860	0.974468	0.756198	1.000000	
EDU	-0.358124	0.457586	-0.373936	-0.014894	0.223231	0.058479	1.000000

Source: Author's Computation

5.4.2.2 Unit root test for military expenditure, institutional quality and inclusive growth for Russia

Various studies such as Kutu and Ngalawa, 2016; Omolade and Ngalawa, 2014 among others have advised researchers to always use more than one methods of time-series unit root test in order to be sure of the order of integration of the variables to be included in a particular model. For this study, both the ADF and PP methods of time series unit root tests are adopted for consistency. Their results are presented in Table 5.22.

Table 5.22: Unit root test for military expenditure, institutional quality and inclusive growth for Russia

	Augmented Dickey Fuller (ADF)				Phillips-Perron (PP)				Status
	Level		First Diff		Level		First Diff		
Variables	**Statistics**	**P-value**	**Stat.**	**P-value**	**Statistics**	**P-value**	**Statistics**	**P-value**	
IGI	1.7914	0.0697	2.7225	0.0068	1.4687	0.1322	2.6120	0.0092	I(1)
INV	0.6336	0.4410	2.8738	0.0043	0.6520	0.4331	3.7999	0.0002	I(1)
LNPOP	0.6351	0.4404	2.1068	0.0342	0.3935	0.7960	2.1855	0.0283	I(1)
MCP	1.2094	0.2067	2.8887	0.0041	1.0801	0.2525	3.8589	0.0002	I(1)
ME	0.8089	0.3638	3.1930	0.0016	0.4175	0.5311	3.6895	0.0003	I(1)
COR	1.0597	0.2601	3.5447	0.0005	0.8100	0.3633	3.8942	0.0001	I(1)
EDU	1.6999	0.0844	2.2863	0.0221	1.4916	0.1267	4.8077	0.0010	I(1)

Source: Author's computation

It is evident from Table 5.21 that all the variables are either stationary at levels or after the first difference. The implication of this is that they are suitable for all the analysis adopted in the study. The methods of the unit root test give the same levels of integration for each variable. This speaks volume of the consistency level of the unit root results. Furthermore, the results indicate all other variables in the table are stationary after the first difference that is the integration of order one I (1).

5.4.2.3 Test for Structural Breaks

Bai and Perron (2003) argue that time series data often possess sudden changes either in the mean or in the other parameters that bring about the series. The structural break test enables us to identify the particular time the changes occur, if any. If this is not identified and corrected, it could lead to a misleading result. Therefore, we need to correct for a structural break in the series if the break is significant.

Table 5.23: Test for structural breaks for military expenditure, institutional quality and inclusive growth 1984-2017in Russia

Chow Breakpoint Test: 1999Q1 2005Q1 2011Q1	
Null Hypothesis: No breaks at specified breakpoints	
Varying regressors: All equation variables	
Equation Sample: 1984Q1 2017Q4	

F-statistic	39.44823		Prob. F(9,124)	0.0000
Log likelihood ratio	183.8027		Prob. Chi-Square(9)	0.0000
Wald Statistic	355.0341		Prob. Chi-Square(9)	0.0000

Source: Author's Computation

From Table 5.23, we can identify three (3) breaking points in the chosen variables and the years where those breaks occurred. Therefore we proceed to test if the breaking points are significant by adding dummy variables to the model and regressing the model.

5.4.2.4 The ARDL lag Determinant

Table 5.24: The ARDL lag Determinant for military expenditure, institutional quality and inclusive growth 1984-2017in Russia

VAR Lag Order Selection Criteria						
Endogenous variables: IGI INV LNPOP MCP ME EDU COR						
Exogenous variables: C						
Sample: 1984Q1 2017Q4						
Included observations: 128						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-436.1795	NA	2.40e-06	6.924680	7.080650	6.988051
1	439.1586	1641.259	5.93e-12	-5.986853	-4.739090*	-5.479880
2	453.1580	24.71774	1.03e-11	-5.439969	-3.100413	-4.489395
3	481.1258	46.32157	1.46e-11	-5.111340	-1.679991	-3.717165
4	604.3637	190.6337	4.71e-12	-6.271308	-1.748166	-4.433532
5	906.0239	433.6366	9.59e-14*	-10.21912*	-4.604189	-7.937747*
6	921.7713	20.91447	1.75e-13	-9.699552	-2.992824	-6.974574
7	949.8227	34.18762	2.73e-13	-9.372229	-1.573709	-6.203651
8	1025.619	84.08645*	2.11e-13	-9.790921	-0.900607	-6.178741
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Source: Author's Computation

Table 5.24 above shows the ARDL optimal lag result. The optimal lag length was obtained for the regression estimates of the variables under study. This was done using the Akaike Information Criterion (AIC), Hannan-Quinn information criterion(HQIC), sequential modified

LR test statistics (LR), Schwarz Bayesian Criterion (SBC) and final prediction error (FPE) which are mostly used in ARDL estimation (see Dritsakis, 2011). Relying on the merit that different variables can be assigned different lags as they enter the ARDL model that (as indicated in Table 5.9 above). This study tested for various lag lengths selection criteria, and we chose five lag lengths since three out of the five criteria were chosen by FPE, AIC and HQ at 5% level each. Hence, this forms the optimal lag length, which is used for the regression.

5.4.2.5 ARDL Bound test for military expenditure, institutional quality and inclusive growth 1984-2017 in Russia

The ARDL Bound testing provides the likelihood ratio statistics for determining the number (r) of a long-run relationship between IG, Me, Corr., Edu. Pop and M*Corr. Since the calculated value of the F statistics is greater than 95% critical value at both upper and lower bounds, the null of r= 0, which indicates no long-run relationship, is rejected against the alternative hypothesis.

Table 5.25: ARDL Bounds tests for military expenditure, institutional quality and inclusive growth 1984-2017in Russia

ARDL Bounds Test		
Sample: 1984Q3 2017Q1		
Included observations: 131		
Test Statistic	Value	K
F-statistic	3.69109	6
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.12	3.23
5%	2.45	3.61
2.5%	2.75	3.99
1%	3.15	4.43

Source: Author's Computation

5.4.2.6 ARDL Co integrating and long-run for military expenditure, institutional quality and inclusive growth 1984-2017in Russia

After the cointegration result, the next line of action will be the ARDL cointegration of the long and short-run effect.

Table 5.26: ARDL Co integrating and long-run form for military expenditure, institutional quality and inclusive growth 1984-2017in Russia

ARDL Co integrating And Long Run Form				
Dependent Variable: IGI				
Selected Model: ARDL(5, 5, 5, 5, 4, 0, 5)				
Sample: 1984Q1 2017Q4				
Included observations: 131				
Co integrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(IGI(-1))	0.373180	0.119693	3.117818	0.0024
D(IGI(-2))	0.373180	0.119693	3.117818	0.0024
D(IGI(-3))	0.373180	0.119693	3.117818	0.0024
D(IGI(-4))	-0.280231	0.204974	-1.367155	0.1748
D(INV)	0.034985	0.012404	2.820486	0.0058
D(INV(-1))	-0.000000	0.016192	-0.000000	1.0000
D(INV(-2))	-0.000000	0.016192	-0.000000	1.0000
D(INV(-3))	0.077331	0.016760	4.614020	0.0000
D(INV(-4))	-0.061977	0.012978	-4.775669	0.0000
D(LNPOP)	51.919968	11.341330	4.577944	0.0000
D(LNPOP(-1))	-0.000001	3.161646	-0.000000	1.0000
D(LNPOP(-2))	-0.000000	3.161646	-0.000000	1.0000
D(LNPOP(-3))	54.222369	10.795661	5.022607	0.0000
D(LNPOP(-4))	-49.983913	10.888990	-4.590317	0.0000
D(MCP)	0.015089	0.011131	1.355612	0.1784
D(MCP(-1))	-0.000000	0.013446	-0.000000	1.0000
D(MCP(-2))	-0.000000	0.013446	-0.000000	1.0000
D(MCP(-3))	-0.065386	0.014305	-4.570892	0.0000
D(MCP(-4))	0.043752	0.010786	4.056340	0.0001
D(ME)	0.009286	0.010435	0.889838	0.3758
D(ME(-1))	0.000000	0.012892	0.000000	1.0000
D(ME(-2))	0.000000	0.012892	0.000000	1.0000
D(ME(-3))	0.033499	0.013047	2.567591	0.0118
D(EDU)	-0.004032	0.004233	-0.952500	0.3433
D(COR)	-0.072505	0.052201	-1.388968	0.1681
D(COR(-1))	0.000000	0.064543	0.000000	1.0000
D(COR(-2))	0.000000	0.064543	0.000000	1.0000
D(COR(-3))	0.310759	0.066639	4.663350	0.0000
D(COR(-4))	-0.198464	0.048472	-4.094399	0.0001
D(DM1)	-0.025305	0.020074	-1.260617	0.2099
D(DM3)	-0.001348	0.021881	-0.061620	0.9510
D(DM2)	-0.006156	0.021657	-0.284242	0.7767
CointEq(-1)	-0.562617	0.147892	-3.804232	0.0003

Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
INV	0.013326	0.016310	-0.817070	0.4159
LNPOP	1.484741	1.370484	-1.083370	0.2814
MCP	0.046611	0.016168	2.882923	0.0049
ME	0.075768	0.014771	-5.129629	0.0000
EDU	-0.007166	0.007635	-0.938499	0.06040
COR	-0.183616	0.067333	-2.726995	0.0076
DM3	-0.028388	0.442514	-0.064152	0.9490
DM2	-0.129605	0.407196	-0.318287	0.7508
DM1	-0.532788	0.826167	-0.644892	0.5202
C	28.693929	25.788013	1.112685	0.2687

Note- DM1, DM2 and DM3 represent the dummy for the three structural breaks points identified within the time series data.

Source: Author's Computation

Considering the individual variable in the context of Russia, military expenditure with a coefficient positive coefficient of 0.075768 with 5% statically significance. The long-run coefficient of military expenditure is 0.075768. The implication is that a unit rise of military expenditure will lead to about 0.076798 increases in inclusive growth. This indicates that military expenditure have a positive and significant impact on inclusive growth.

Corruption which is a proxy for institutional quality with the coefficient -0.183616 and it is statistically significant at 5% level. The implication is that a unit rise of corruption will lead to about 0.183616 decreases in inclusive growth. The result is an indication that institutional quality (proxy by corruption) exhibits a negative long-run relationship with inclusive growth.

Another variable employed in the model is education. Education denoted with EDU with coefficient of education is 0.007166. The implication is that a unit rise of education will lead to about 0.018604 rises in inclusive growth. Though, the coefficient is positive but only significant at 10%. The implication of this is that there is a need for a more inclusive education system that stimulates inclusive growth.

The investment long-run coefficient is 0.013326. The result is an indication that investment exhibits a direct long-run relationship with inclusive growth. It is significant hence; investment in Russia supports inclusive growth significantly. The implication is that a unit rise of investment will lead to about 0.013326 rises in inclusive growth.

Another variable employed the military expenditure-institutional quality interactive form denoted by MCP with coefficient value of 0.046611 and it is statistical significant at 5%. Therefore, the implication is that a unit rise of corruption will lead to about 0.046611 rises in inclusive growth. The implication of this is that military expenditure joint relationship with institutional quality stimulates Russia's inclusive growth.

The population long-run coefficient is 1.484741. The result is an indication that the population exhibits a positive but not significant long-run relationship with inclusive growth in Russia. The implication is that a unit rise of population will lead to about 1.484741 rises in inclusive growth.

Under the short-run aspect of the cointegration regression, the short-run dynamics produces an error correction term that is negative and significant, which is a good adjustment process to inclusive growth equilibrium in Russia.

5.4.2.7 Post estimation tests for military expenditure, institutional quality and inclusive growth 1984-2017in Russia

Below are the post estimation diagnostic tests ranging from heteroscedasticity and serial correlations. The rationale of the post estimation tests is to ascertain the robustness of the ARDL results for Russia.

Table 5.27: Heteroscedasticity test: Breusch-Pagan-Godfrey test for Russia

Null Hypothesis: No Heteroscedasticity			
F-statistic	3.358836	Prob. F(18,13)	0.0654
Obs*R-squared	26.33698	Prob. Chi-Square(18)	0.0923
Scaled explained SS	4.662358	Prob. Chi-Square(18)	0.9993

Source: Author's Computation

The null hypothesis is that there is no heteroscedasticity. Using the F statistics, it is discovered that the probability of F shows that the null hypothesis is to be rejected. Therefore, it was concluded that the model is not having the problem of heteroscedasticity, which may affect the validity of the result.

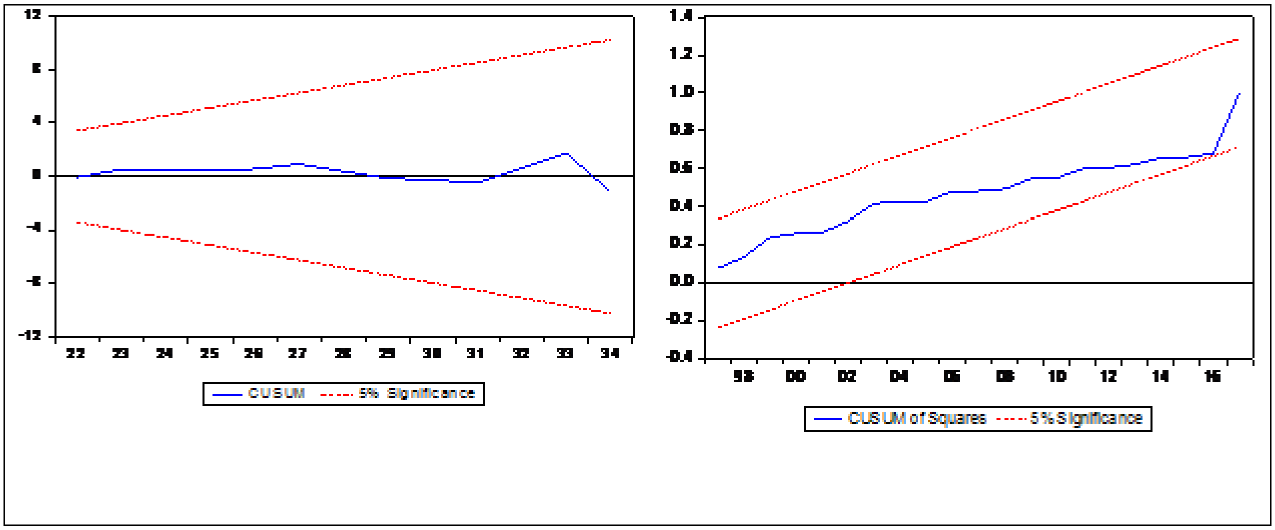
Table 5.28: Breusch-Godfrey serial correlation LM test for Russia

Null Hypothesis: No Serial Correlation LM Test:			
F-statistic	1.504894	Prob. F(2,11)	0.2644
Obs*R-squared	6.874708	Prob. Chi-Square(2)	0.0321

Source: Author's Computation

The null hypothesis for Russia indicates that there is no serial correlation. The F-statistic and the probability show that the null hypothesis is to be accepted while we reject the alternative hypothesis that there is a serial correlation. Consequently, the estimates from our model are valid and can be used for forecasting.

Figure 5.4: Stability test for Russia



Source: Author's Computation

In conclusion, the stability test indicates that the model is reliable (that is, the model does fall within the red lines) and does not suffer from any structural break. This is an indication that the estimated exhibit the stability required for a model that will be useful for forecasting.

5.4.3. Analysis of impact of military expenditure, institutional quality and inclusive growth 1984-2017in India

This section presents the time series data analysis of the impact of military expenditure and institutional quality on inclusive growth for India.

5.4.3.1 Descriptive statistics result for Objective 3- Military expenditure, institutional quality and inclusive growth 1984-2017in India

Table 5.29 presents the summary statistics of the variables engaged in this study. The mean distribution of all the variables was presented in the second row of the table. Mean is unarguably one important tool for measuring central tendencies. The third row presents the maximum, while the fourth row shows the minimum value for all the variables. Row five presents the standard deviation result. The IGI which is the dependent variable has a maximum of only 0650000, and the minimum is as low as 0.20000 with a mean of 0.327851 which is closer to the minimum than the maximum. This result strongly lays credence to the extant a priori expectations that inclusive growth (IGI) is on the average for the countries is relatively low during the period in Brazil. The implication here is that, during the period under review, Inclusive growth in Brazil has never gone below 20 per cent.

Moreover, the results for all the independent variables, namely, Inv, log of pop, mcp, me, cor and edu follow similar maximum and minimum trends with the inclusive growth (IGI) except for military expenditure. For instance, MCP shows 12.6939 for the maximum, whereas the minimum is as low as 0.0000 and its mean value of 7.3108 which is closer to the maximum than the minimum. We can, therefore, infer that MCP has been very erratic and unprecedented, looking at the gap between the minimum and the maximum.

We recall from the background and computation of the incidence of inclusive growth and the trend of military expenditure in Figure 2.3 and Table 2.12 that there is persistent rise in the incidence of inclusive growth in India despite the increase and growth in the military expenditure. Our result validated this claim as both the values of Inclusive growth and military expenditure are positively related and are increasing. Nevertheless, the information shown in the summary statistics can be subjected to further empirical investigation.

Table 5.29: Summary of descriptive statistics military expenditure, institutional quality and inclusive growth 1984-2017in India

	IGI	INV	LNPOP	MCP	ME	COR	EDU
Mean	0.327857	0.997913	20.76715	7.310887	2.827267	2.558271	1.433145
Median	0.337500	0.775558	20.78363	6.665849	2.754964	2.500000	0.000000
Maximum	0.650000	3.656951	21.01532	12.69395	4.231318	3.000000	4.475090
Minimum	0.200000	0.009191	20.45440	0.000000	0.000000	1.500000	0.000000
Observations	133	133	133	133	133	133	133

Source: Author’s Computation

Table 5.30 shows the correlation structure of the adopted variables. The variables show different associations with one another. Nevertheless, we show particular interest in the association between dependent variable IGI and other independent variables in the table, since this is our main interest in this section of the study. IGI weakly and positively correlates with MCP and ME with the value rates of 0.249932 and 0.375010 , respectively, but negatively correlates with INV., LNPOP, ME, COR and EDU. These results show a weak correlation existing between the endogenous and the exogenous variables. The implication is that there is no problem of multicollinearity in the model.

Table 5.30: Covariance Matrix

	IGI	INV	LNPOP	MCP	ME	COR	EDU
IGI	1.000000						
INV	-0.317876	1.000000					
LNPOP	-0.487934	0.839588	1.000000				
MCP	0.249932	-0.481180	-0.723062	1.000000			
ME	0.375010	-0.525300	-0.762580	0.865781	1.000000		
COR	-0.011816	-0.227330	-0.374679	0.755142	0.329932	1.000000	
EDU	-0.253453	0.243565	0.438801	-0.162477	-0.167215	-0.079843	1.000000

Source: Author's Computation

5.4.3.2 Unit root test for military expenditure, institutional quality and inclusive growth for India

Various studies such as Kutu and Ngalawa, 2016; Omolade and Ngalawa, 2014 among others have advised researchers to always use more than one methods of time-series unit root test in order to be sure of the order of integration of the variables to be included in a particular model... For this study, both the ADF and PP methods of unit root tests are adopted for consistency. Their results are presented in Table 5.31

Table 5.31: Unit root test for military expenditure, institutional quality and inclusive growth for India

	Augmented Dickey Fuller (ADF)				**Phillips-Perron (PP)**				**Status**
	Level		First Diff		Level		First Diff		
Variables	**Statistics**	**P-value**	**Stat.**	**P-value**	**Statistics**	**P-value**	**Statistics**	**P-value**	
IGI	0.7562	0.3869	3.1506	0.0018	2.1281	0.0325	2.0673	0.0276	I(1)
INV	0.9148	0.3183	3.2867	0.0012	0.4843	0.5044	3.4849	0.0006	I(1)
LNPOP	2.2622	1.0000	1.1544	0.0254	17.9116	1.0000	8.3912	0.0000	I(1)
MCP	1.6310	0.0969	2.0673	0.0376	1.4224	0.1438	2.2072	0.0268	I(1)
ME	1.2896	0.1812	0.8364	0.3518	1.3160	0.1733	1.0293	0.2719	

COR	0.7402	0.3941	3.8091	0.0002	0.6474	0.4351	3.9676	0.0001	I(1)
EDU	2.7491	0.0062	2.2072	0.0268	1.8196	0.0656	4.1555	0.0000	I(1)

Source: Author's computation

It is evident from Table 5.30 that all the variables are either stationary at levels or after the first difference. The implication of this is that they are suitable for all the analysis adopted in the study. The methods of the unit root test give the same levels of integration for each variable. This speaks volume of the consistency level of the panel unit root results. Furthermore, the results indicate that all variables in the table are stationary after the first difference that is the integration of order one I (1).

5.4.3.3 Test for Structural Breaks

Bai and Perron (2003) argue that time series data often possess sudden changes either in the mean or in the other parameters that bring about the series. The structural break test enables us to identify the particular time the changes occur, if any. If this is not identified and corrected, it could lead to a misleading result. Therefore, we need to correct for a structural break in the series if the break is significant.

Table 5.32: Structural Breaks Result

Chow Breakpoint Test: 1991Q1 1999Q3 2012Q1				
Null Hypothesis: No breaks at specified breakpoints				
Varying regressors: All equation variables				
Equation Sample: 1984Q1 2017Q4				
F-statistic	6.188124		Prob. F(6,128)	0.0000
Log likelihood ratio	34.63854		Prob. Chi-Square(6)	0.0000
Wald Statistic	37.12875		Prob. Chi-Square(6)	0.0000

Source- Author's Computation

From Table 5.32, we can identify three (3) breaking points in the chosen variables and the years where those breaks occurred. Therefore we proceed to test if the breaking points are significant by adding dummy variables to the model and regressing the model.

5.4.3.4 The ARDL lag Determinants

Table 5.33: Lag Order Selection Result

VAR Lag Order Selection Criteria						
Endogenous variables: IGI MCP POP ME INV EDU COR						
Exogenous variables: C						
Sample: 1984Q1 2017Q4						
Included observations: 128						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2792.276	NA	2.33e+10	43.73869	43.89466	43.80206
1	-1781.575	1895.064	6961.263	28.71211	29.95988	29.21909
2	-1770.603	19.37254	12692.08	29.30630	31.64586	30.25687
3	-1747.299	38.59736	19279.22	29.70780	33.13915	31.10197
4	-1360.907	597.6998	102.1987	24.43605	28.95919	26.27383
5	-1057.344	436.3729	2.018589	20.45849	26.07343*	22.73987*
6	-1041.490	21.05549	3.673806	20.97641	27.68313	23.70138
7	-1011.155	36.97128	5.527162	21.26804	29.06656	24.43662
8	-869.8954	156.7094*	1.538346*	19.82649*	28.71680	23.43867
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Source- Author's Computation

Table 5.33, above shows the ARDL optimal lag result. The optimal lag length was obtained for the regression estimates of the variables under study. This was done using the Akaike Information Criterion (AIC), Hannan-Quinn information criterion(HQIC), sequential modified LR test statistics (LR), Schwarz Bayesian Criterion (SBC) and final prediction error (FPE) which are mostly used in ARDL estimation (see Dritsakis, 2011). Relying on the merit that different variables can be assigned different lags as they enter the ARDL model that (as indicated in Table 5.9 above). This study tested for various lag lengths selection criteria, and we chose eight lag lengths since three out of the five criteria were chosen by LR,FPE and AIC at 5% level each. Hence, this forms the optimal lag length, which is used for the regression.

5.4.3.5 ARDL Bound test for military expenditure, institutional quality and inclusive growth 1984-2017in India

The ARDL Bound testing provides the log-likelihood ratio statistics for determining the number (r) of the long-run relationship between IG, Me, Corr., Edu. Pop and M*Corr. Once the F statistics is greater than the critical values at both the upper and the lower bounds, the conclusion would be to accept the alternative hypothesis and reject the null hypothesis which means that there is a long-run relationship between the dependent and independent variables which is the case under the India estimated model. The result is shown in Table 5.31.

Table 5.34: ARDL Bound test result for military expenditure, institutional quality and inclusive growth 1984-2017in India

ARDL Bounds Test				
Sample: 1984Q3 2017Q1				
Included observations: 131				
Null Hypothesis: No long-run relationships exist				
Test Statistic	Value	K		
F-statistic	7.839137	6		
Critical Value Bounds				
Significance	I0 Bound	I1 Bound		
10%	2.12	3.23		
5%	2.45	3.61		
2.5%	2.75	3.99		
1%	3.15	4.43		

Source: Author's Computation

The ARDL bound test results are reported for India shows F statistics of 7.839137 while the critical values at both lower and upper bounds are 2.45 and 3.61, respectively. This shows that there exists a long-run relationship among the variables.

5.4.3.6 ARDL Co integrating and long-run form for military expenditure, institutional quality and inclusive growth 1984-2017in India

After the confirmation of cointegration among variables, the next line of action is to estimate the short-run and long-run form of the coefficients. The results are presented in Table 5.32.

Table 5.35: ARDL Co integrating and long-run form result for military expenditure, institutional quality and inclusive growth 1984-2017in India

ARDL Co integrating And Long Run Form				
Dependent Variable: IGI				
Selected Model: ARDL(5, 1, 0, 1, 0, 0, 1)				
Sample: 1984Q1 2017Q4				
Included observations: 131				
Co integrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(IGI(-1))	0.036259	0.057597	0.629516	0.5302
D(IGI(-2))	0.036259	0.057597	0.629516	0.5302
D(IGI(-3))	0.036259	0.057597	0.629516	0.5302
D(IGI(-4))	-0.188358	0.061914	-3.042252	0.0029
D(INV)	0.029243	0.009906	2.952070	0.0038
D(LNPOP)	-0.015581	0.043720	-0.356381	0.7222
D(MCP)	-0.000743	0.019287	-0.038509	0.9693
D(ME)	0.037472	0.047722	0.785211	0.4339
D(EDU)	-0.000346	0.001492	-0.232081	0.8169
D(COR)	-0.027625	0.056534	-0.488640	0.6260
D(DM5)	-0.235407	0.057293	-4.108809	0.0001
D(DM4)	-0.172970	0.050908	-3.397678	0.0009
D(DM2)	-0.048646	0.036220	-1.343059	0.1820
D(DM1)	-0.068156	0.025935	-2.627990	0.0098
D(DM3)	-0.128165	0.044444	-2.883756	0.0047
CointEq(-1)	-0.167315	0.056114	-2.981671	0.0035
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
INV	0.011186	0.032673	-0.342366	0.7327
LNPOP	0.093123	0.249701	-0.372939	0.7099
MCP	-0.078073	0.108468	-0.719780	0.4731
ME	0.223959	0.296122	0.756307	0.4510
EDU	-0.002070	0.008993	-0.230191	0.8183
COR	0.162477	0.309549	0.524885	0.6007
DM5	-0.075672	0.036911	-2.050098	0.0427
DM4	-0.020533	0.036073	-0.569207	0.5704
DM2	0.002129	0.038083	0.055901	0.9555
DM1	0.022602	0.041461	0.545138	0.5868
DM3	0.055039	0.041830	1.315765	0.1910
C	1.790409	5.415044	0.330636	0.7415

Note- DM1, DM2, DM3 and DM3 represent the dummy for the three structural breaks points identified within the time series data.

Source: Author's Computation

Considering the individual variable in the context of India, military expenditure denoted with ME and coefficient value 0.223959, though not statistical significant either 5% or 10%. The implication is that a unit rise of military expenditure will lead to about 0.223959 increases in inclusive growth.

Corruption, a proxy for institutional quality with coefficient of 0.162477. The implication is that a unit rise of corruption will lead to about 0.162477 decreases in inclusive growth. The result is an indication that institutional quality exhibits a negative long-run relationship India inclusive growth.

Another variable employed in the model is education. Education with -0.002070 though not statistical significant. The implication is that a unit rise of education will lead to about -0.002070 decrease in inclusive growth.

The investment long-run coefficient is 0.011186. The implication is that a unit rise of investment will lead to about 0.011186 rises in inclusive growth. The result is an indication that investment exhibits a direct relationship with inclusive growth though insignificant.

Another variable employed is the military expenditure-institutional quality interactive form denoted by MCP. Therefore, the implication is that a unit rise of interactive form of military expenditure and institutional quality will lead to about 0.078073 decreases inclusive growth process in India though insignificant.

The population long-run coefficient is 0.093123. The implication is that a unit rise of population will lead to about 0.093123 rises in inclusive growth. The result is an indication that the population exhibits a positive but not significant long-run relationship with inclusive growth in India.

Under the short-run aspect of the cointegration regression, the short-run dynamics produces an error correction term that is negative and significant, which is a good adjustment process to inclusive growth equilibrium in India.

However, the result of India is a clear departure from what we have seen in other BRICS countries. Firstly, the key variables, namely; military expenditure institutional quality and the interactive for military expenditure and institutional quality failed to have significant impacts on inclusive growth. This underscores the irrelevance of military expenditure in the inclusive growth process in India.

In conclusion, other control variables that are shift factors on inclusive growth which are included in the model such as investment, population and education did not have a significant impact on inclusive growth in India. Notwithstanding, in the short run model, investment, and education show a significant impact on inclusive growth, but this impact was not sustained to the long-run period. More importantly, the short-run model shows an error correction term of -0.167315 which is also significant. The implication is that the adjustment process to equilibrium inclusive growth is in order.

5.4.3.7 Post estimation for military expenditure, institutional quality and inclusive growth 1984-2017in India

Below are the post estimation diagnostic tests ranging from heteroscedasticity to serial correlations? The rationale of the post estimation tests is to ascertain the robustness of the estimations on India.

Table 5.36: Heteroscedasticity test: Breusch-Pagan-Godfrey test for INDIA

Null Hypothesis: No Heteroscedasticity			
F-statistic	0.473234	Prob. F(13,18)	0.9130
Obs*R-squared	8.151080	Prob. Chi-Square(13)	0.8336
Scaled explained SS	2.989523	Prob. Chi-Square(13)	0.9980

Source: Author's Computation

The null hypothesis is that there is heteroscedasticity. Using the F statistics, it is discovered that the probability of F shows that the null hypothesis is to be accepted. Therefore, it was concluded that the model is not having the problem of heteroscedasticity, which may affect the validity of the result.

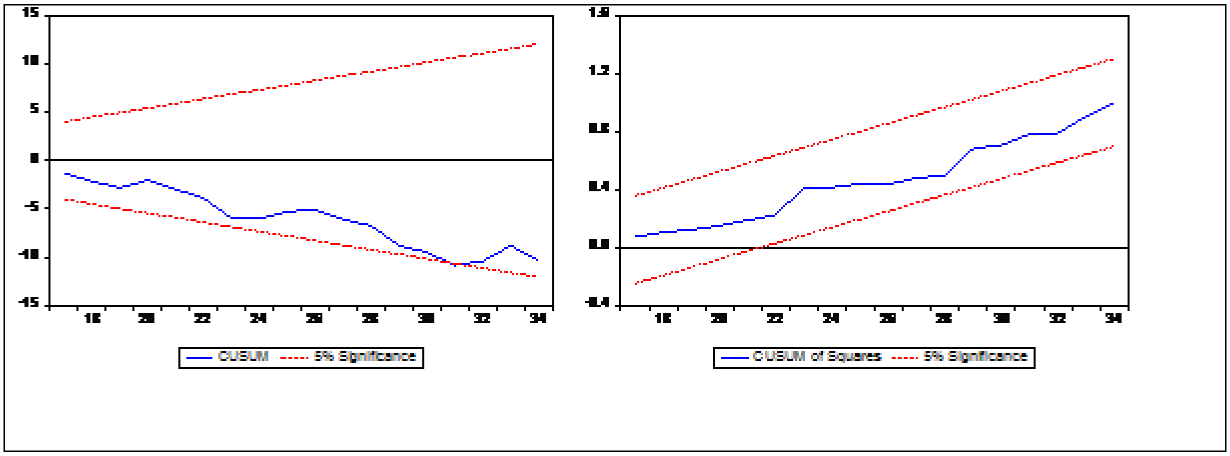
Table 5.37: Breusch-Godfrey Serial Correlation LM Test for India

Null Hypothesis: No serial correlation			
F-statistic	6.661372	Prob. F(2,16)	0.0579
Obs*R-squared	14.53915	Prob. Chi-Square(2)	0.0007

Source: Author's Computation

The null hypothesis for India indicates that there is no serial correlation. Considering the F-statistic and the probability, the null hypothesis is to be accepted while we reject the alternative hypothesis that there is a serial correlation. Consequently, the estimates from our model are valid and can be used for forecasting.

Figure 5.5: Stability test for India



Source: Author’s Computation

In conclusion, the stability test indicates that the model is reliable (that is, the model does fall within the red lines) and does not suffer from any structural break. This is an indication that the estimated model for India exhibits the stability required for a model that will be useful for forecasting.

5.4.4 Analysis of the impact of military expenditure, institutional quality and inclusive growth 1984-2017in China

This section presents the time series data analysis of the impact of military expenditure and institutional quality on inclusive growth for China.

5.4.4.1 Analysis of the impact of military expenditure, institutional quality and inclusive growth 1984-2017 in China

Table 5.38 presents the summary statistics of the variables engaged in this study. The mean distribution of all the variables was presented in the second row of the table. Mean is unarguably one important tool for measuring central tendencies. The third row presents the maximum, while the fourth row shows the minimum value for all the variables. Row five presents the standard deviation result. The IGI which is the dependent variable has a maximum of only 0.880000, and the minimum is as low as 0.270000 with a mean of 0.540263 which is closer to the minimum than the maximum. This result strongly lays credence to the extant a priori expectations that inclusive growth (IGI) is on the average for the countries is relatively low during the period in China. The implication here is that, during the period under review, Inclusive growth in China has never gone below 27 per cent.

Moreover, the results for all the independent variables, namely, Inv, log of pop, mcp, me, cor and edu follow similar maximum and minimum trends with the inclusive growth (IGI) except for military expenditure. For instance, MCP shows 9.973033 for the maximum, whereas the minimum is as low as 0.0000 and its mean value of 4.6655 which is closer to the minimum than the maximum. We can, therefore, infer that MCP has been very erratic and unprecedented, looking at the gap between the minimum and the maximum.

We recall from the background and computation of the incidence of inclusive growth and the trend of military expenditure in Figure 2.3 and Table 2.12 that there is persistent rise in the incidence of inclusive growth in India despite the increase and growth in the military expenditure. Our result validated this claim as both the values of Inclusive growth issues and military expenditure is positively related and is increasing. Nevertheless, the information shown in the summary statistics can be subjected to further empirical investigation.

Table 5.38: Summary of the descriptive statistics military expenditure, institutional quality and inclusive growth 1984-2017in China

	IGI	INV	LNPOP	MCP	ME	COR	EDU
Mean	0.540263	3.042429	20.93908	4.665568	1.846692	2.619048	0.650017
Median	0.480000	3.484582	20.96011	3.925372	1.925132	2.000000	0.000000
Maximum	0.880000	6.186882	21.04997	9.973033	2.493258	4.500000	2.061550
Minimum	0.270000	0.483946	20.75943	0.000000	0.000000	1.000000	0.000000
Observations	133	133	133	133	133	133	133

Source: Author's Computation

Table 5.39 shows the correlation structure of the adopted variables. The variables show different associations with one another. Nevertheless, we show particular interest in the association between dependent variable IGI and other independent variables in the table, since this is our main interest in this section of the study. IGI weakly and positively correlates with COR and EDU with the value rates of 0.493284 and 0.270635, respectively, but negatively correlates with INV., LNPOP and ME. These results show a weak correlation existing between the endogenous and the exogenous variables. The implication is that there is no problem of multicollinearity in the model.

Table 5.39: Covariance matrix for military expenditure, institutional quality and inclusive growth 1984-2017in China

	IGI	INV	LNPOP	MCP	ME	COR	EDU
IGI	1.000000						
INV	-0.605898	1.000000					
LNPOP	-0.460669	0.437513	1.000000				
MCP	-0.023652	-0.069113	-0.231062	1.000000			
ME	-0.476540	0.187840	0.466943	0.590510	1.000000		
COR	0.493284	-0.285034	-0.745218	0.588506	-0.295456	1.000000	
EDU	0.270635	-0.027551	-0.717743	0.048351	-0.516468	0.580178	1.000000

Source: Author's Computation

5.4.4.2 Unit root test for military expenditure, institutional quality and inclusive growth for China

Various studies such as Kutu and Ngalawa, 2016; Omolade and Ngalawa, 2014 among others have advised researchers to always use more than one methods of times series unit root test in order to be sure of the order of integration of the variables to be included in a particular model.. For this study, both the ADF and PP methods of unit root tests are adopted for consistency. Their results are presented in Table 5.40.

Table 5.40: Unit root test for military expenditure, institutional quality and inclusive growth for China

	Augmented Dickey Fuller (ADF)				**Phillips-Perron (PP)**				**Status**
	Level		First Diff		Level		First Diff		
Variables	**Statistics**	**P-value**	**Stat.**	**P-value**	**Statistics**	**P-value**	**Statistics**	**P-value**	
IGI	0.0891	0.7092	3.2134	0.0015	0.6498	0.4340	3.8022	0.0002	I(1)
INV	1.0473	0.2650	3.7831	0.0002	0.6707	0.4248	4.011	0.0001	I(1)
LNPOP	1.6624	0.9763	2.9405	0.0035	8.3194	1.0000	2.0742	0.0370	I(1)
MCP	1.1325	0.2333	3.9495	0.0001	0.6657	0.4270	3.7546	0.0002	I(1)
ME	0.3924	0.5408	4.2661	0.0000	0.0402	0.6939	3.8917	0.0001	I(1)
COR	0.9116	0.3196	3.4895	0.0006	1.2868	0.1821	3.7259	0.0003	I(1)
EDU	2.3733	0.0176	-	-	2.0930	0.0354	-	-	I(0)

Source: Author's computation

It is evident from Table 5.40 that all the variables are either stationary at levels or after the first difference. The implication of this is that they are suitable for all the analysis adopted in the study. The methods of the time-series unit root test give the same levels of integration for each variable. This speaks volume of the consistency level of the time series unit root results. Furthermore, the results indicate that all variables in the table are stationary after the first difference that is the integration of order one I (1) except for EDU which denote education.

5.4.4.3 Test for Structural Breaks

Bai and Perron (2003) argue that time series data often possess sudden changes either in the mean or in the other parameters that bring about the series. The structural break test enables us to identify the particular time the changes occur, if any. If this is not identified and corrected, it could lead to a misleading result. Therefore, we need to correct for a structural break in the series if the break is significant.

Table 5.41: Structural Breaks Result

Chow Breakpoint Test: 2005Q1 1999Q2 2005Q3 2016Q4				
Null Hypothesis: No breaks at specified breakpoints				
Varying regressors: All equation variables				
Equation Sample: 1984Q1 2017Q4				
F-statistic	3.120839		Prob. F(1,134)	0.0796
Log likelihood ratio	3.131097		Prob. Chi-Square(1)	0.0768
Wald Statistic	3.120839		Prob. Chi-Square(1)	0.0773

Source: Author's Computation

From Table 5.41, we can identify four (4) breaking points in the chosen variables and the years where those breaks occurred. Therefore we proceed to test if the breaking points are significant by adding dummy variables to the model and regressing he model.

5.4.4.4 The ARDL Lag Determination

Table 5.42: Lag Order Selection Result

VAR Lag Order Selection Criteria						
Endogenous variables: IGI LNPOP INV MCP ME EDU COR						
Exogenous variables: C						
Sample: 1984Q1 2017Q4						
Included observations: 128						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-269.7754	NA	1.78e-07	4.324615	4.480586	4.387987
1	711.7352	1840.332	8.38e-14	-10.24586	-8.998100	-9.738890
2	727.6989	28.18588	1.41e-13	-9.729670	-7.390114	-8.779097
3	759.5471	52.74851	1.88e-13	-9.461673	-6.030324	-8.067498
4	1070.958	481.7136	3.21e-15	-13.56184	-9.038700	-11.72407
5	1364.223	421.5686	7.46e-17	-17.37848	-11.76355*	-15.09711
6	1387.694	31.17256	1.21e-16	-16.97960	-10.27287	-14.25462
7	1432.759	54.92230	1.44e-16	-16.91810	-9.119582	-13.74952
8	1596.774	181.9542*	2.81e-17*	-18.71521*	-9.824899	-15.10303*
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Table 5.42 above shows the ARDL optimal lag result. The optimal lag length was obtained for the regression estimates of the variables under study. This was done using the Akaike Information Criterion (AIC), Hannan-Quinn information criterion(HQIC), sequential modified LR test statistics (LR), Schwarz Bayesian Criterion (SBC) and final prediction error (FPE) which are mostly used in ARDL estimation (see Dritsakis, 2011). Relying on the merit that different variables can be assigned different lags as they enter the ARDL model that (as indicated above). This study tested for various lag lengths selection criteria, and we chose eight lag lengths since all four out of the five criteria were chosen by LR, FPE, AIC and HQ at 5% level each. Hence, this forms the optimal lag length, which is used for the regression.

5.4.4.5 ARDL Bound test analysis of the impact of military expenditure, institutional quality and inclusive growth 1984-2017 in China

The ARDL Bound testing provides the log-likelihood ratio statistics for determining the number (r) of long-run relationship between IG, Me, Corr., Edu. Pop and M*Corr. In the result of China, the F the statistics is greater than 95% critical value at both upper and lower bounds, therefore, the null of r= 0, which indicates no long-run relationship, is rejected against the alternative hypothesis.

Table 5.43: ARDL bounds tests results for military expenditure, institutional quality and inclusive growth 1984-2017in China

ARDL Bounds Test				
Sample: 1984Q3 2017Q1				
Included observations: 131				
Null Hypothesis: No long-run relationships exist				
Test Statistic	Value	k		
F-statistic	6.118468	6		
Critical Value Bounds				
Significance	I0 Bound	I1 Bound		
10%	2.12	3.23		
5%	2.45	3.61		
2.5%	2.75	3.99		
1%	3.15	4.43		

Source: Author's Computation

Specifically, the ARDL bound test results for China show F statistics of 6.118468, which is greater than 3.61 upper bound at 5%. This shows that there is a long-run relationship among military expenditure, institutional quality and inclusive growth as well as other control variables.

5.4.4.6 ARDL Co integrating and long-run form for the impact of military expenditure, institutional quality and inclusive growth 1984-2017in China

After the confirmation of cointegration among variables, the next line of action is to estimate the short-run and long-run form of the coefficients. The results are presented in Table 5.44.

Table 5.44: ARDL Co integrating and long-run form result for military expenditure, institutional quality and inclusive growth 1984-2017in China

ARDL Co integrating And Long Run Form				
Dependent Variable: IGI				
Selected Model: ARDL(5, 5, 5, 5, 1, 1, 5)				
Sample: 1984Q1 2017Q4				
Included observations: 131				
Co integrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(IGI(-1))	0.086279	0.071172	1.212256	0.2284
D(IGI(-2))	0.086279	0.071172	1.212256	0.2284
D(IGI(-3))	0.086279	0.071172	1.212256	0.2284
D(IGI(-4))	-0.293967	0.072405	-4.060053	0.0001
D(INV)	-0.025529	0.010943	-2.332806	0.0217
D(INV(-1))	-0.000000	0.014136	-0.000000	1.0000
D(INV(-2))	0.000000	0.014136	0.000000	1.0000
D(INV(-3))	0.067580	0.014517	4.655144	0.0000
D(INV(-4))	-0.055895	0.011348	-4.925641	0.0000
D(LNPOP)	151.117585	35.111552	4.303928	0.0000
D(LNPOP(-1))	0.000001	1.276404	0.000001	1.0000
D(LNPOP(-2))	-0.000001	1.276404	-0.000001	1.0000
D(LNPOP(-3))	141.493250	33.672288	4.202068	0.0001
D(LNPOP(-4))	-115.339613	35.410948	-3.257174	0.0016
D(MCP)	-0.195453	0.043190	-4.525457	0.0000
D(MCP(-1))	-0.000000	0.009109	-0.000000	1.0000
D(MCP(-2))	0.000000	0.009109	0.000000	1.0000
D(MCP(-3))	0.058007	0.009952	5.828564	0.0000
D(MCP(-4))	-0.055996	0.008131	-6.886591	0.0000
D(ME)	0.432158	0.121325	3.561976	0.0006
D(EDU)	-0.050600	0.014739	-3.433139	0.0009

D(COR)	0.405908	0.079956	5.076633	0.0000
D(COR(-1))	0.000000	0.028288	0.000000	1.0000
D(COR(-2))	-0.000000	0.028288	-0.000000	1.0000
D(COR(-3))	-0.189906	0.031029	-6.120317	0.0000
D(COR(-4))	0.178090	0.025309	7.036665	0.0000
D(DM1)	0.487734	0.062681	7.781165	0.0000
D(DM2)	0.279396	0.087823	3.181352	0.0019
D(DM3)	0.395354	0.107101	3.691419	0.0003
D(DM4)	0.428172	0.123022	3.480443	0.0007
CointEq(-1)	-0.220903	0.072651	-3.040611	0.0030
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
INV	-0.044914	0.021671	-2.072562	0.0409
LNPOP	5.442216	1.931829	2.817131	0.0059
MCP	-0.226026	0.070205	-3.219494	0.0017
ME	0.556727	0.240942	2.310628	0.0230
EDU	-0.026490	0.046787	-0.566176	0.5726
COR	0.443946	0.143390	3.096083	0.0026
DM1	0.447522	0.460345	0.972145	0.3329
DM2	0.338531	0.528361	0.640718	0.5229
DM3	0.227042	0.472913	0.480093	0.6320
DM4	0.291612	0.504754	0.577731	0.5645
C	-115.467539	40.793644	-2.830528	0.0056

Note- DM1, DM2, DM3, DM3 and DM4 represent the dummy for the four structural breaks points identified within the time series data.

Source: Author's Computation

Considering the individual variable in the context of China, military expenditure denoted by ME The result revealed that military expenditure with positive coefficient value of 0.556727 and it is statistical significant at 5%. The implication is that a unit rise of military expenditure will lead to about 0.556727 rises in China's inclusive growth; hence, this is an indication that military expenditure exhibits a direct and significant long-run relationship on inclusive growth.

Corruption is the proxy of institutional quality in the model. From the analysis, it show that the coefficient of corruption as 0.443946 and it is statistically significant at 5% level The implication is that a unit rise of corruption will lead to about 0.443946 rise in inclusive growth. The implication of this is that there is the presence of positive additive of institutional quality (proxy by corruption) (i.e. greasing the wheels for growth) which reduces government red tape/ bureaucracies, thereby promoting inclusive growth.

Military expenditure and institutional quality is the interactive form in the model denoted by MCP. From the analysis the MCP coefficient show a -0.226026 and it is statistical significant at 5%. The implication is that a unit rise of interactive form of military expenditure and institutional quality will lead to about 0.226026 decreases in inclusive growth. This implies that the interactive variable of military expenditure and institutional quality in the model retards inclusive growth in China.

From the result it shows that Education denoted with EDU with coefficient 0.026490 is positive and not significant, also in the inclusive growth model of China. It serves as a proxy for human capital in the model and according to the result, the long-run coefficient of education is 0.026490. The implication is that a unit rise of education will lead to about 0.026490 rises in inclusive growth.

From the result it indicate that investment coefficient value of 0.044914 and it is statistical significant at 5%. The implication is that a unit rise of investment will lead to about 0.044914 rises in inclusive growth. The implication of this is that investment has significantly influenced inclusive growth in China.

Population with long-run coefficient is 5.442216 and it is statistical significant at 5%. The implication is that a unit rise of population will lead to about 5.442216 rises in inclusive growth. The result is an indication that population exhibits a positive and significant long-run relationship with inclusive growth in China. The implication of this is that the upsurge in the Chinese population is an incentive to inclusive growth in the country.

Under the short-run aspect of the cointegration regression, the result shows that the lagged values of institutional quality (proxy by corruption), education, investment, military expenditure, military institutional quality (proxy by corruption) all have a short-run significant impact on inclusive growth in China. Again, the error correction term is -0.220903 and it is statistically significant thus showing a good adjustment process to inclusive growth in China.

5.4.4.7 Post Estimation Test for Impact of Military expenditure, Institutional quality and Inclusive growth 1984-2017in China

The results below present the post estimation diagnostic tests ranging from heteroscedasticity and serial correlations. The rationale of the post estimation tests is to ascertain the robustness of the results of the previous estimations.

Table 5.45 Heteroscedasticity test: Breusch-Pagan-Godfrey test for China

Null Hypothesis: No Heteroscedasticity			
F-statistic	0.552917	Prob. F(12,19)	0.8525
Obs*R-squared	8.282429	Prob. Chi-Square(12)	0.7627
Scaled explained SS	3.270186	Prob. Chi-Square(12)	0.9933

Source: Author's Computation

The null hypothesis is that there is no heteroscedasticity. Using the F statistics, it is discovered that the probability of F shows that the null hypothesis is to be accepted. Therefore, the Chinese model is not having the problem of heteroscedasticity which may affect the validity of the result.

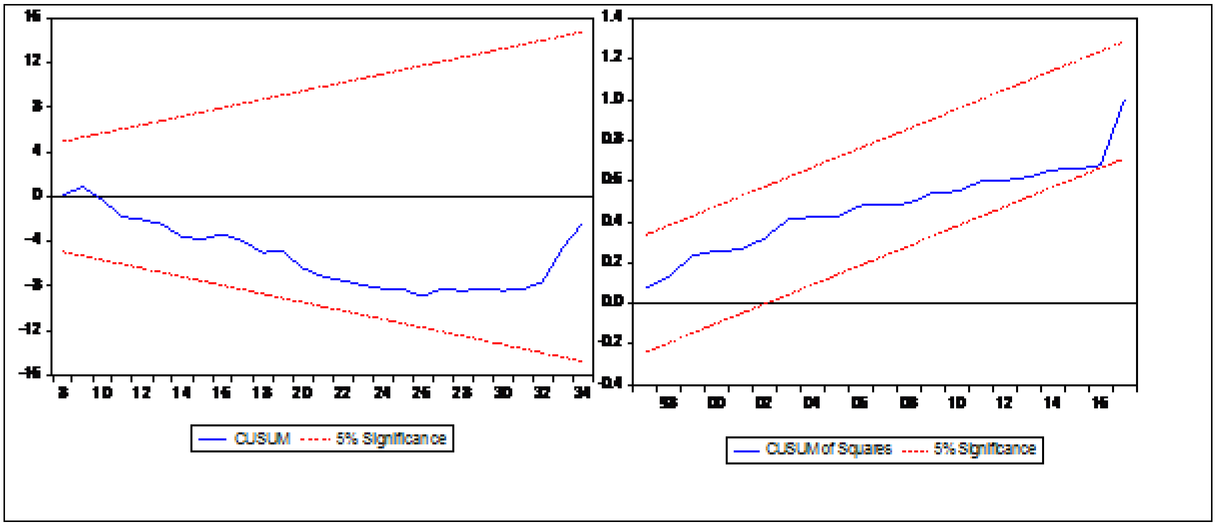
Table 5.46: Breusch-Godfrey serial correlation LM test for China

No Hypothesis: No Serial Correlation			
F-statistic	0.270933	Prob. F(2,15)	0.7663
Obs*R-squared	1.115678	Prob. Chi-Square(2)	0.5724

Source: –Author's Computation

The null hypothesis for China indicates that there is no serial correlation. Since the F-statistic is not significant, it is obvious that the null hypothesis is accepted while we reject the alternative hypothesis that there is a serial correlation. Consequently, the estimates from our model are valid and can be used for forecasting.

Figure 5.6: Stability test for China



Source: Author's Computation

In conclusion, the stability test indicates that the model is reliable (that is, the model does fall within the red lines) and does not suffer from any structural break. This is an indication that the estimated model for China exhibits the stability required for a model that will be useful for forecasting.

5.4.5 Analysis of the impact of military expenditure, institutional quality and inclusive growth 1984-2017in South Africa

This section presents the time series results on the analysis of the impact of military expenditure and institutional quality on inclusive growth in South Africa.

5.4.5.1 Descriptive statistics result for the impact of military expenditure, institutional quality and inclusive growth 1984-2017in South Africa

Table 5.47 presents the summary statistics of the variables engaged in this study. The mean distribution of all the variables was presented in the second row of the table. Mean is unarguably one important tool for measuring central tendencies. The third row presents the maximum, while the fourth row shows the minimum value for all the variables. Row five presents the standard deviation result. The IGI which is the dependent variable has a maximum of only 0.530000, and the minimum is as low as 0.090000 with a mean of 0.357083 which is closer to the minimum than the maximum. This result strongly lays credence to the extant a priori expectations that inclusive growth (IGI) is on the average for the countries is relatively low during the period in South

Africa. The implication here is that, during the period under review, Inclusive growth in China has never gone below 9 per cent.

Moreover, the results for all the independent variables, namely, Inv, log of pop, MCP, me, cor and edu follow similar maximum and minimum trends with the inclusive growth (IGI). For instance, MCP shows 27.74255 for the maximum, whereas the minimum is as low as 0.0000 and its mean value of 7.358225 which is closer to the minimum than the maximum. We can, therefore, infer that MCP has been very erratic and unprecedented, looking at the gap between the minimum and the maximum.

We recall from the background and computation of the incidence of inclusive growth and the trend of military expenditure in Figure 2.3 and Table 2.12 that there is persistent rise in the incidence of inclusive growth in South Africa despite the increase and growth in the military expenditure. Our result validated this claim as both the values of Inclusive growth and military expenditure are positively related and are increasing. Nevertheless, the information shown in the summary statistics can be subjected to further empirical investigation.

Table 5.47: Summary of descriptive statistics for military expenditure, institutional quality and inclusive growth 1984-2017in South Africa

	IGI	INV	LNPOP	MCP	ME	COR	EDU
Mean	0.357083	1.007243	17.62070	7.358225	1.741681	3.669823	4.127302
Median	0.373750	0.744786	17.64714	4.159098	1.383167	2.973958	5.035659
Maximum	0.530000	5.978862	17.85359	27.74255	4.623759	6.000000	6.371640
Minimum	0.090000	-0.654029	17.31621	0.000000	0.000000	2.000000	0.000000
Observations	132	132	132	132	132	132	132

Source: Author's Computation

Table 5.48 shows the correlation structure of the adopted variables. The variables show different associations with one another. Nevertheless, we show particular interest in the association between dependent variable IGI and other independent variables in the table, since this is our main interest in this section of the study. IGI weakly and positively correlates with INV, LNPOP and EDU with the value rates of 0.512561, 0.384919 and 0.524413, respectively, but negatively correlates with MCP, ME and COR. These results show a weak correlation existing between the endogenous and the exogenous variables. The implication is that there is no problem of multicollinearity in the model.

Table 5.48: Covariance matrix for military expenditure, institutional quality and inclusive growth 1984-2017in South Africa

	IGI	INV	LNPOP	MCP	ME	COR	EDU
IGI	1.000000						
INV	0.512561	1.000000					
LNPOP	0.384919	0.525872	1.000000				
MCP	-0.474217	-0.532869	-0.915638	1.000000			
ME	-0.376637	-0.484340	-0.914332	0.974136	1.000000		
COR	-0.438434	-0.555637	-0.912755	0.859316	0.793938	1.000000	
EDU	0.524413	0.281283	0.343184	-0.412702	-0.292744	-0.461120	1.000000

Source: Author's Computation

One of the major reasons for conducting a Covariance matrix is to ascertain the presence of multicollinearity or otherwise among the independent variables. The result on South Africa Covariance matrix has therefore shown that three are negative and three are positive, it shows all independent variables can be included in the same model without the fear of multicollinearity.

5.4.5.2 Unit root test for military expenditure, institutional quality and inclusive growth for South Africa

Various studies such as Kutu and Ngalawa, 2016; Omolade and Ngalawa, 2014 among others have advised researchers to always use more than one methods of time series unit root test in order to be sure of the order of integration of the variables to be included in a particular model... For this study, both the ADF and PP methods of time series unit root tests are adopted for consistency. Their results are presented in Table 5.49.

Table 5.49: Unit root test for military expenditure, institutional quality and inclusive growth for South Africa

	Augmented Dickey Fuller (ADF)				**Phillips-Perron (PP)**				**Status**
	Level		First Diff		Level		First Diff		
Variables	**Statistics**	**P-value**	**Stat.**	**P-value**	**Statistics**	**P-value**	**Statistics**	**P-value**	
IGI	0.7389	0.3945	2.5814	0.0101	0.7286	0.3993	4.1703	0.0000	I(1)
INV	0.4751	0.5079	3.0426	0.0026	2.2094	0.0267	1.7082	0.0029	I(1)
LNPOP	0.7017	0.8657	1.6646	0.0906	13.2446	1.0000	1.8965	0.0555	I(1)
MCP	4.3377	0.0000	-	-	4.3268	0.0000			I(0)

ME	3.0257	0.0027	.-	-	3.3341	0.0010			I(0)
COR	1.7082	0.0829	3.4013	0.0008	2.2802	0.0223	2.0246	0.0022	I(1)
EDU	1.1041	0.2435	2.9745	0.0032	1.0848	0.2507	3.7597	0.0002	I(0)

Source: Author's computation

It is evident from Table 5.49 that all the variables are either stationary at levels or after the first difference. The implication of this is that they are suitable for all the analysis adopted in the study. The methods of the panel unit root test give the same levels of integration for each variable. This speaks volume of the consistency level of the panel unit root results. Furthermore, the results indicate that apart from the military expenditure (ME), the interactive form of military expenditure and corruption(which is proxy for institutional quality) that are stationary at levels, all other variables in the table are stationary after the first difference that is the integration of order one I (1).

5.4.5.3 Test for Structural Breaks

Bai and Perron (2003) argue that time series data often possess sudden changes either in the mean or in the other parameters that bring about the series. The structural break test enables us to identify the particular time the changes occur, if any. If this is not identified and corrected, it could lead to a misleading result. Therefore, we need to correct for a structural break in the series if the break is significant.

Table 5.50: Structural Breaks Result

Chow Breakpoint Test: 1989Q1 1994Q1 1999Q1 2005Q1 2011Q1				
Null Hypothesis: No breaks at specified breakpoints				
Varying regressors: All equation variables				
Equation Sample: 1984Q1 2017Q4				
F-statistic	7.449654		Prob. F(10,124)	0.0000
Log likelihood ratio	63.98665		Prob. Chi-Square(10)	0.0000
Wald Statistic	74.49654		Prob. Chi-Square(10)	0.0000

Source: Author's Computation

From Table 5.50, we can identify five (5) breaking points in the chosen variables and the years where those breaks occurred. Therefore we proceed to test if the breaking points are significant by adding dummy variables to the model and regressing in the model.

5.4.5.4 The ARDL lag Determinants

Table 5.51: Lag Order Selection Result

VAR Lag Order Selection Criteria						
Endogenous variables: IGI POP ME MCP INV COR EDU						
Exogenous variables: C						
Sample: 1984Q1 2017Q4						
Included observations: 128						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2830.749	NA	4.26e+10	44.33983	44.49580	44.40321
1	-1791.591	1948.422	8140.549	28.86861	30.11637	29.37558
2	-1773.222	32.43260	13222.23	29.34722	31.68678	30.29779
3	-1736.882	60.18893	16383.17	29.54503	32.97637	30.93920
4	-1466.510	418.2317	532.1660	26.08609	30.60923	27.92386
5	-1198.342	385.4913	18.27430*	22.66159*	28.27652*	24.94297*
6	-1182.549	20.97454	33.29069	23.18046	29.88718	25.90543
7	-1154.098	34.67488	51.58160	23.50153	31.30005	26.67011
8	-1077.725	84.72680*	39.56869	23.07382	31.96413	26.68600
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Source: Author’s Computation

Table 5.51 above shows the ARDL optimal lag result. The optimal lag length was obtained for the regression estimates of the variables under study. This was done using the Akaike Information Criterion (AIC), Hannan-Quinn information criterion(HQIC), sequential modified LR test statistics (LR), Schwarz Bayesian Criterion (SBC) and final prediction error (FPE) which are mostly used in ARDL estimation (see Dritsakis, 2011). Relying on the merit that different variables can be assigned different lags as they enter the ARDL model that (as indicated in Table 5.9 above). This study tested for various lag lengths selection criteria, and we chose five lag lengths since four out of the five criteria were chosen by FPE, AIC, SC and HQ at 5% level each. Hence, this forms the optimal lag length, which is used for the regression.

5.4.5.4 ARDL Bounds test for impact of military expenditure, institutional quality and inclusive growth 1984-2017in South Africa

After the confirmation of time series properties of the variables, the next is the cointegration test before the estimation of the ARDL regression for both long and short-run periods. The result of the ARDL bound test for cointegration is presented in Table 5.52.

Table 5.52: ARDL bounds test results for military expenditure, institutional quality and inclusive growth 1984-2017in South Africa

ARDL Bounds Test				
Sample: 1984Q3 2017Q1				
Included observations: 131				
Null Hypothesis: No long-run relationships exist				
Test Statistic	Value	k		
F-statistic	5.963981	6		
Critical Value Bounds				
Significance	I0 Bound	I1 Bound		
10%	2.12	3.23		
5%	2.45	3.61		
2.5%	2.75	3.99		
1%	3.15	4.43		

Source: Author's Computation

The ARDL bound test results indicate that there is a long-run relationship between military expenditure, institutional quality and inclusive growth in South Africa since the calculated value of the F statistics is greater than 5% critical values at both lower and upper bounds. This shows that there is co-movement among military expenditure, institutional quality and inclusive growth.

5.4.5.5 ARDL Co integrating and long-run form for the impact of military expenditure, institutional quality and inclusive growth 1984-2017in South Africa

After the confirmation of cointegration among variables, the next line of action is to estimate the short-run and long-run form of the coefficients. The results are presented in Table 5.53.

Table 5.53: ARDL Co integrating and long-run form result for military expenditure, institutional quality and inclusive growth 1984-2017in South Africa

ARDL Co integrating And Long Run Form				
Dependent Variable: IGI				
Selected Model: ARDL(5, 0, 0, 0, 0, 5, 1)				
Sample: 1984Q1 2017Q4				
Included observations: 131				
Co integrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(IGI(-1))	0.052673	0.089206	0.590466	0.5561
D(IGI(-2))	0.052673	0.089206	0.590466	0.5561
D(IGI(-3))	0.052673	0.089206	0.590466	0.5561
D(IGI(-4))	-0.528956	0.085373	-6.195822	0.0000
D(INV)	-0.000580	0.003814	-0.152091	0.8794
D(LNPOP)	0.111570	0.116968	0.953851	0.3422
D(MCP)	-0.015626	0.005826	-2.681943	0.0084
D(ME)	0.087747	0.036155	2.426989	0.0168
D(EDU)	0.014417	0.003025	4.766461	0.0000
D(EDU(-1))	0.000000	0.003259	0.000000	1.0000
D(EDU(-2))	-0.000000	0.003259	-0.000000	1.0000
D(EDU(-3))	-0.007774	0.003876	-2.005789	0.0473
D(EDU(-4))	0.008425	0.003070	2.744161	0.0071
D(COR)	0.074138	0.025810	2.872519	0.0049

D(DM1)	-0.127682	0.042624	-2.995553	0.0034
D(DM2)	-0.110190	0.062646	-1.758939	0.0816
D(DM3)	-0.051776	0.074290	-0.696947	0.4874
D(DM4)	-0.030734	0.088141	-0.348691	0.7280
D(DM5)	-0.075115	0.101554	-0.739652	0.4612
CointEq(-1)	-0.150152	0.082564	-1.818606	0.0116
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
INV	-0.003863	0.026497	-0.145785	0.8844
LNPOP	0.743047	0.717124	1.036148	0.3023
MCP	-0.104067	0.049354	-2.108611	0.0372
ME	0.584392	0.285228	2.048860	0.0428
EDU	-0.011508	0.021213	-0.542515	0.5885
COR	0.151391	0.086745	1.745255	0.0837
DM1	0.007596	0.088441	0.085889	0.9317
DM2	0.049426	0.096129	0.514169	0.6082
DM3	0.031379	0.105171	0.298360	0.7660
DM4	0.120996	0.089729	1.348459	0.1805
DM5	-0.133898	0.135446	-0.988564	0.3252
C	-13.466066	12.969321	-1.038302	0.3013

Note- DM1, DM2, DM3, DM3, DM4 and DM5 represent the dummy for the five structural breaks points identified within the time series data.

Source: Author’s Computation

Considering the individual variable in the context of South Africa, the result revealed that military expenditure(ME) has a positive coefficient of 0.584392 and it is statistical significant at 5% . The implication is that a unit rise of military expenditure will lead to about 0.584392 rises in inclusive growth. The implication of this is that military expenditure will positively and significantly stimulate inclusive growth in South Africa.

The result from the analysis revealed that Corruption (COR) the proxy for institutional quality within the model has a positive coefficient of 0.151391 and it is statistical significant at 10%. The implication is that a unit increase of corruption will lead to about 0.151391 increases in inclusive growth. This indicates there is a presence of positive additive impact of corruption (i.e. greasing the wheels for growth) therefore promoting inclusive growth.

Another variable employed in the model is education. The result indicate that education (EDU) has a positive coefficient of 0.011508 but insignificant. The implication is that a unit increase of education will lead to about 0.011508 increases in inclusive growth**.** The implication of this is that South African education system stimulates inclusive growth.

The investment (INV) long-run positive coefficient is 0.003863 but it is insignificant. The implication is that a unit increase of investment will lead to about 0.003863 increases in inclusive growth. The result is an indication that investment exhibits a direct but not significant long-run relationship with inclusive growth. The implication of this is that there is a need for more investment to ensure inclusive growth.

However, the interactive form of military expenditure and institutional quality (MCP) have negative coefficient of 0.104067 and it is statistical significant at 5%. The implication is that a unit rise of the interactive form of military expenditure and institutional quality lead to about 0.104067 decreases inclusive growth. The implication of this is that the interactive form of military expenditure and institutional quality retards inclusive growth.

The population long-run negative coefficient is 0.504764 but it is insignificant. The implication is that a unit rise of the population leads to about 0.504764 decrease inclusive growth. The implication of this is that South Africa population growth rate undermines the actualisation of inclusive growth.

Under the short-run aspect of the cointegration regression, the result shows that the lagged values of institutional quality (proxy by corruption), education, investment, military expenditure, military institutional quality (proxy by corruption) all have short-run significant impact on inclusive growth in South Africa. The error correction term, as usual, is rightly signed and significant.

5.4.5.6 Post estimation test for that impact of military expenditure, institutional quality and inclusive growth 1984-2017in South Africa

The post estimation diagnostic tests ranging from heteroscedasticity and serial correlations for South Africa are presented in Tables 5.54 and 5.55. The rationale of the post estimation tests is to ascertain the robustness of the estimated ARDL regression results.

Table 5.54: Heteroscedasticity Test: Breusch-Pagan-Godfrey Test for South Africa

Null Hypothesis: No Heteroscedasticity			
F-statistic	0.546328	Prob. F(15,16)	0.8755
Obs*R-squared	10.83854	Prob. Chi-Square(15)	0.7640
Scaled explained SS	1.903403	Prob. Chi-Square(15)	1.0000

Source: – Author's Computation

The null hypothesis is that there is no heteroscedasticity. Using the F statistics, it is discovered that the probability of F shows that the null hypothesis is to be accepted. Therefore, it is concluded that the model is not having the problem of heteroscedasticity, which may affect the validity of the result.

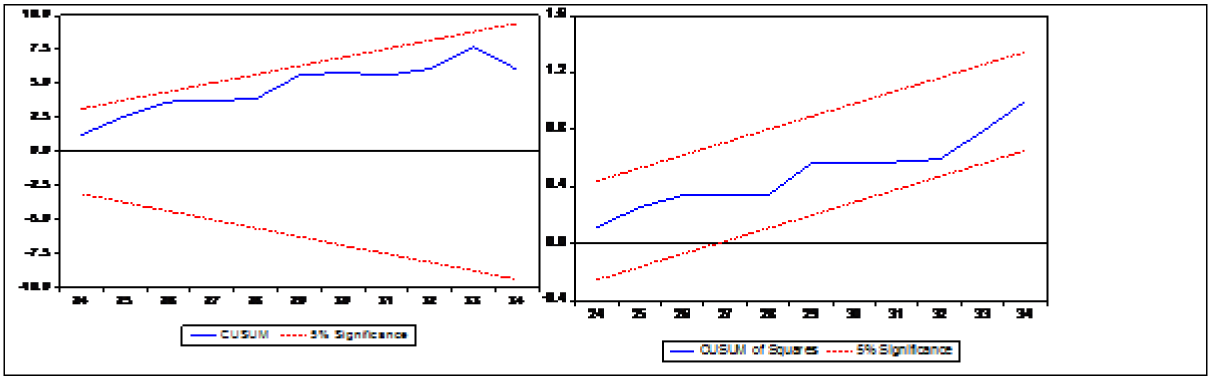
Table 5.55: Breusch-Godfrey serial correlation LM test for South Africa

Null Hypothesis: No Serial Correlation			
F-statistic	2.497440	Prob. F(2,14)	0.1182
Obs*R-squared	8.414697	Prob. Chi-Square(2)	0.0149

Source: Author's Computation

The null hypothesis for the serial correlation test in South Africa indicates that there is no serial correlation. Since the F-statistic and the probability values are 2.497440 and 0.1182, respectively. The null hypothesis is to be accepted while we reject the alternative hypothesis that there is a serial correlation.

Figure 5.7: Stability test for South Africa



Source: Author's Computation

In conclusion, the stability test indicates that the model is reliable (that is, the model falls within the red lines) and does not suffer from any structural break. This is an indication that the estimated results exhibit the stability required for a model that will be useful for forecasting.

5.4.6 Comparison of the results on inclusive growth model with other conventional development indicator models

In order to test the uniqueness, consistency or otherwise of the inclusive growth index that is computed in this study, the results of the impacts of military expenditure and institutional quality on inclusive growth are compared with other conventional development indicators such as GDP growth rate (Economic growth) and per capita income that have been used in previous studies such Destek (2016), Zhong et al. (2016), Chang et al. (2015), Hatemi-J et al. (2017), Hatemi-J et al. (2015), Dash et al. (2016). In these studies, the per capita income and GDP growth rate (Economic growth) were used as development indicators and the dependent variable on which the effect of military expenditure was investigated.

Again, this effort became imperative because to the best of the knowledge of the author, this study is the first attempt to compute an inclusive growth index for the economic bloc hence the need to test its efficiency, uniqueness and the novelty in general. It will let us know if it produces outliers as a result of significant differences that are not theoretically and empirically justifiable. The analysis is done using individual country base analysis.

Table 5.56: Results on inclusive growth, Economic growth and per capital income models

Country		Model I	Model II	Model III
BRAZIL	**LONG RUN**	**Inclusive growth as dependent variable**	**GDP annual % as dependent variable**	**Per Capita Income % as dependent variable**
		Coefficient	Coefficient	Coefficient
	ME	0.1903*** (0.9116)	3.919048** (1.859501)	3.831907** (1.755082)
	COR	0.4190*** (0.9817)	2.701590 (3.121041)	2.642287 (3.073351)
	MCP	-0.027483*** (-0.7117)	-2.313193 (1.798294)	-2.265329 (1.770904)
	EDU	0.040579*** (-2.1136)	0.68618 (0.144785)	0.681247*** (0.142632)
	INV	0.013906 (-0.4288)	0.439786** (0.085249)	0.432712** (0.079494)
	POP	-1.065010*** (1.612903)	5.653634** (2.188610)	4.569425** (2.155026)
	CointEq(-1) ECT	-0.1172** (2.4698)	-2.010631** (0.414221)	-2.014027** (0.415035)
RUSSIA	**LONG-RUN**			
	ME	0.075768*** (-5.1296)	1.833696*** (0.373000)	1.557639*** (0.386908)

	COR	-0.183616*** (-2.7270)	4.734802** (2.196525)	4.706125** (2.167861)
	MCP	0.046611** (2.8829)	2.407256*** (0.523994)	2.368111*** (0.541664)
	EDU	0.007166 (-0.9385)	1.743321*** (0.441280)	1.728837*** (0.458239)
	INV	0.013326** (-0.8171)	0.819451** (0.015339)	0.812926** (0.029111)
	POP	-1.484741 (-1.0834)	1.591407 (2.316045)	0.382257 (2.402430)
	CointEq(-1) ECT	-0.5626*** (-3.8042)	-2.161112** (0.272238)	-2.193846** (0.283959)
INDIA	**LONG-RUN**			
	ME	0.223959 (0.7563)	22.198858** (9.154600)	21.959629** (8.921385)
	COR	-0.162477 (0.5249)	-24.198858 (13.054565)	-23.803245 (12.823083)
	MCP	0.078073 (-0.1778)	7.969644 (4.457542)	7.837201 (4.378322)
	EDU	-0.002070 (-0.2302)	0.613279** (0.268873)	0.602996** (0.264320)
	INV	-0.011186 (-0.3424)	2.6854472** (0.115955)	2.644325** (0.100498)
	POP	0.093123 (-0.3729)	5.342951 (2.920733)	4.216146 (2.871146)

	CointEq(-1) ECT	-0.167315*** (-2.981671)	-1.243786** (0.289324)	-1.242356** (0.288856)
CHINA	**LONG-RUN**			
	ME	0.5567*** (2.3106)	12.747205** (5.775693)	12.596196** (5.735140)
	COR	0.4440*** (3.0960)	15.462032*** (4.442594)	15.295601*** (4.408808)
	MCP	-0.2260*** (-3.2195)	-6.591925*** (2.080239)	-6.521597*** (2.06535)
	EDU	-0.0264 (0.5661	6.442079*** (2.059029)	6.392787*** (2.042192)
	INV	-0.044914 (-2.0725)	1.501020*** (0.089399)	1.491976*** (0.086590)
	POP	-5.442216*** (2.8171)	-0.989676 (3.251947)	-2.028573 (12.843628)
	CointEq(-1) ECT	-1.453658** (0.402880)	-0.724131** (0.176870)	-0.723104** (0.176884)
South Africa	**LONG-RUN**			
	ME	0.584392*** (2.0489)	3.238539*** (0.964274)	3.198722*** (0.949724)
	COR	0.151391*** (1.7453)	1.673626*** (0.495893)	1.642390*** (0.488388)

	MCP	-0.104067*** (-2.1086)	-0.599474*** (0.197147)	-0.591037*** (0.194180)
	EDU	0.011508** (-0.5425)	0.877852*** (0.181566)	0.863060*** (0.178828)
	INV	0.03863 (-0.1458)	1.006121*** (0.087987)	0.994755*** (0.083720)
	POP	-0.743047*** (1.0361)	-5.931991*** (1.190381)	-6.837041*** (1.172335)
	CointEq(-1) ECT	-0.1501* (-1.8186)	-1.275532** 0.189187	-1.277448** (0.189705)

Notes: Dependent variables: Inclusive growth (model I); GDP annual % (model II) and Per Capita % (model III); robust standard errors are indicated in parenthesis ***, **,* indicates significance at 1, 5 % and 10 % levels.

Source: Author's Computation

(1) Brazil interpretation

As discussed before, the result of the inclusive growth model as discussed shows that the coefficient of military expenditure, institutional quality and inclusive growth is positive. However, the interactive relationship between military expenditure and institutional quality, education, investment and population were negative and significant. But the coefficient of investment was not significant. For Model II which is the economic growth model, the results also show that military expenditure exhibits a positive and significant relationship with the economic growth of Brazil. The same result goes for institution quality and economic growth but the interaction of military expenditure and institutional quality failed to produce a significant impact on the economic growth of Brazil. The result of the per capita income model for Brazil shows a similar result with the economic growth model. The interaction of military expenditure and institutional quality also failed to have a significant impact on per capita income. Although it is also negative signs like inclusive growth and economic growth model, the inclusive growth model short-run result shows that the coefficient of the error correction term (ECT) was significant at 5% and had a negative sign, as expected. The ECT estimated of -1.49 implied that the speed of adjustment to equilibrium after a shock was high. As such, disequilibrium from shock in the previous year converged quickly back to long-run equilibrium in the current year with an adjustment speed of 149 %, appropriately. The economic growth model short-run result shows that the coefficient of the error correction term (ECT) was significant at 5% and had a negative sign, as expected. The ECT estimated of -2.01 implied that the speed of adjustment to equilibrium after a shock was high such that a disequilibrium from shock in the previous year converged quickly back to long-run equilibrium in the current year with an adjustment speed of 201 %, appropriately. Similarly, the short-run result for per capita income model shows that the coefficient of the error correction term (ECT) was significant at 5% and had a negative sign, as expected. The ECT estimated of -2.01 implied that the speed of adjustment to equilibrium after a shock was high. As such, disequilibrium from shock in the previous year converged quickly back to long-run equilibrium in the current year with an adjustment speed of 201 %, appropriately.

(2) Russia interpretation

The results on Russia for all the three models, namely, inclusive growth, economic growth and per capita income models, are overwhelmingly the same. They show that there is consistency in the results obtained for the inclusive growth and the remaining two. The result of Russia is different from that of Brazil in that the interaction of military expenditure and institutional quality produced a significant positive impact on all the three growth indicators used, unlike the negative relationship that was seen in Brazil estimated models. This is an indication that the institutional quality in Russia supports military expenditure to have a significant positive impact on their economic development. In the same vein, the short-run result for an inclusive growth model shows that the coefficient of the error correction term (ECT) was significant at 5% and had a negative sign, as expected. The ECT estimated of -2.40 implied that the speed of adjustment to equilibrium after a shock was high. Thus, disequilibrium from shock in the previous year converged quickly back to long-run equilibrium in the current year with an adjustment speed of 240 %, appropriately. While, the short-run result for economic growth model for Russia shows that the coefficient of the error correction term (ECT) was significant at 5% and had a negative sign, as expected. The ECT estimated of -2.18 implied that the speed of adjustment to equilibrium after a shock was high. As such, disequilibrium from shock in the previous year converged quickly back to long-run equilibrium in the current year with an adjustment speed of 218%, appropriately. Lastly, the per capita income model short-run result shows that the coefficient of the error correction term (ECT) was significant at 5% and had a negative sign, as expected. The ECT estimated of -2.19 implied that the speed of adjustment to equilibrium after a shock was high. Thus, disequilibrium from shock in the previous year converged quickly back to long-run equilibrium in the current year with an adjustment speed of 219 %, appropriately.

(3) India interpretation

The results on India for the three models present a clear difference from what we noticed under Russia and Brazil. Notwithstanding, economic growth and per capita income models show a similar result in that military expenditure shows a significant positive relationship with economic growth and per capita income respectively in India. However, the inclusive growth model shows a different situation where military expenditure fails to have a significant positive impact on inclusive growth. All other variables such as military expenditure interaction with institutional quality as well as institutional quality fail to have a significant impact on inclusive growth, economic growth and per capita income in the results of India. The inclusive growth model short-run result shows that the coefficient of the error correction term (ECT) was significant at 5% and had a negative sign, as expected. The ECT estimated of -0.90 implied that the speed of adjustment to equilibrium after a shock was high. As such, disequilibrium from shock in the previous year converged quickly back to long-run equilibrium in the current year with an adjustment speed of 90 %, appropriately. Again, the economic growth model short-run result shows that the coefficient of the error correction term (ECT) was -1.24 significant at 5% and had a negative sign, as expected. The ECT estimated of -1.24 implied that the speed of adjustment to equilibrium after a shock was high. Thus, disequilibrium from shock in the previous year converged quickly back to long-run equilibrium in the current year with an adjustment speed of 124 %, appropriately. Finally, the per capita income model short-run result for India shows that the coefficient of the error correction term (ECT) was -1.24 significant at 5% and had a negative sign, as expected. The ECT estimated of -1.24 implied that the speed of adjustment to equilibrium after a shock was high. Thus, disequilibrium from shock in the previous year converged quickly back to long-run equilibrium in the current year with an adjustment speed of 124 %, appropriately.

(4) China interpretation

The results from China on the three models almost give the same result. The following three variables which are the core independent variables of interest, namely, military expenditure, institutional quality and military expenditure interaction with institutional quality were all significant in all three models. It is almost a similar result to what was obtained under Brazil models. Military expenditure and institutional quality both show a significant positive relationship with inclusive growth, economic growth and per capita income but the interaction of military expenditure and institution quality failed to produce a positive and significant impact on inclusive growth, economic growth and per capita income. The inclusive growth short-run result in China shows that the coefficient of the error correction term (ECT) was significant at 5% and had a negative sign, as expected. The ECT estimated of -1.45 implied that the speed of adjustment to equilibrium after a shock was high. As such, disequilibrium from shock in the previous year converged quickly back to long-run equilibrium in the current year with an adjustment speed of 145 %, appropriately. Similarly, the economic growth model short-run result shows that the coefficient of the error correction term (ECT) was significant at 5% and had a negative sign, as expected. The ECT estimated of -0.7241 implied that the speed of adjustment to equilibrium after a shock was high. Thus, disequilibrium from shock in the previous year converged quickly back to long-run equilibrium in the current year with an adjustment speed of 72 %, appropriately. Also, per capita income model short-run results for China show that the coefficient of the error correction term (ECT) was significant at 5% and had a negative sign, as expected. The ECT estimated of -0.7231 implied that the speed of adjustment to equilibrium after a shock was high. As such, disequilibrium from shock in the previous year converged quickly back to long-run equilibrium in the current year with an adjustment speed of 72 %, appropriately.

(5) South Africa interpretation

The results from South Africa's three models are also similar. The summary of the result is the same as what we obtained under Brazil and China. The results on an inclusive growth model, economic growth model and per capita income model generally show that the same variables are significant across the three models. Like what was obtained in Brazil and China, the interaction of military expenditure and institution quality also failed to have a positive significant impact. Notwithstanding military expenditure and institutional quality individually show a significant positive relationship with inclusive growth, economic growth and per capita income in South Africa. The inclusive growth model short-run result shows that the coefficient of the error correction term (ECT) was significant at 5% and had a negative sign, as expected. The ECT estimated of -2.47 implied that the speed of adjustment to equilibrium after a shock was high. As such, disequilibrium from shock in the previous year converged quickly back to long-run equilibrium in the current year with an adjustment speed of 247 %, appropriately. Again, the economic growth model short-run result shows that the coefficient of the error correction term (ECT) was significant at 5% and had a negative sign, as expected. The ECT estimated of -1.27 implied that the speed of adjustment to equilibrium after a shock was high. Thus, disequilibrium from shock in the previous year converged quickly back to long-run equilibrium in the current year with an adjustment speed of 127 %, appropriately. Finally, the short-run result for per capita income shows that the coefficient of the error correction term (ECT) was significant at 5% and had a negative sign, as expected. The ECT estimated of -1.27 implied that the speed of adjustment to equilibrium after a shock was high. Thus, disequilibrium from shock in the previous year converged quickly back to long-run equilibrium in the current year with an adjustment speed of 127 %, appropriately.

In conclusion, the effort to compare the results obtained on the inclusive growth model with other models used by previous authors appears to have yielded the desired results. Firstly, it has shown some degrees of consistencies with other growth indicator models in many areas. Secondly, it has shown some differences with justifiable reasons.

In terms of consistency, the results obtained for Russia, China and South Africa are similar across the three models. In other words, all the variables that were significant under the inclusive model are also the same as that of economic growth model and per capita income model for these three countries.

However, some significant differences are also evident in the results. For instance, under Brazil, the interaction of military expenditure and institutional quality which shows the negative sign for all the three models is only significant in the inclusive growth model but not significant under the economic growth and per capita income models. This is an indication that the debilitating effect of military expenditure interaction of institutional quality appears not to be significant when economic growth and per capita income are used. But with the usage of inclusive growth, it becomes clearer that the negative impact of this variable is significant. Other outstanding differences are also noticed under India. All the variables that are significant under the economic growth and per capita income models are not significant under the inclusive growth model. Most important of these variables is military expenditure which is shown to be significant in both economic growth and per capita income model but not significant under the inclusive growth model. This is an indication that the belief that military expenditure has a significant positive impact on the growth of India might be erroneous when inclusive growth is used to proxy growth.

Table 5.57: Post estimation test results for all the three estimated models on individual countries

Country	**Diagnostics**	**Model1**	**Model 2**	**Model 3**
BRAZIL	**Cointegration test**			
	F statistics	6.052933	3.846919	3.84883
	Lower at 5%	3.23	3.23	3.23
	Upper at 5%	3.99	3.99	3.61
	Serial correlation test			
	F statistics	2.907085	6.5511506	6.503902
	Probability	0.0905	0.0100	0.0101
	Heteroscedasticity test			
	F statistics	0.577655	0.846575	0.847183
	Probability	0.8565	0.6242	0.6237
	Normality Test			

	JARQUE BERA	0.914470	0.860135	0.849125
	Probability	0.633032	0.650465	0.654056
RUSSIA				
	Cointegration test			
	F statistics	7.363916	6.868184	6.817248
	Lower at 5%	3.23	3.23	3.23
	Upper at 5%	3.99	3.99	3.99
	Serial correlation test			
	F statistics	4.703732	2.242888	3.072865
	Probability	0.0334	0.1487	0.0836
	Heteroscedasticity test			
	F statistics	4.642078	1.482117	1.253703
	Probability	0.0036	0.2312	0.3382
	Normality Test			
	JARQUE BERA	0.995457	2.180203	1.935405
	Probability	0.607910	0.336182	0.379955
INDIA				
	Cointegration test			
	F statistics	4.119241	3.924320	3.928960
	Lower at 5%	3.23	3.23	3.23

	Upper at 5%	3.99	3.99	3.99
	Serial correlation test			
	F statistics	0.183257	12.17440	12.11840
	Probability	0.8341	0.0010	0.0011
	Heteroscedasticity test			
	F statistics	0.522786	1.245096	1.243982
	Probability	0.8654	0.3380	0.3386
	Normality Test			
	JARQUE BERA	0.631021	0.771847	0.777519
	Probability	0.729416	0.679823	0.677897
CHINA				
	Cointegration test			
	F statistics	2.287263	6.339673	6.294887
	Lower at 5%	3.23	3.23	3.23
	Upper at 5%	3.99	3.99	3.99
	Serial correlation test			
	F statistics	0.228031	2.139876	2.180429
	Probability	0.7998	0.1546	0.1498
	Heteroscedasticity test			
	F statistics	0.563749	2.641532	2.668204
	Probability	0.8714	0.0314	0.0301

	Normality Test			
	JARQUE BERA	4.849865	0.839394	0.839623
	Probability	0.088484	0.657246	0.657171
SOUTH AFRICA				
	Cointegration test			
	F statistics	5.678228	5.967575	5.949699
	Lower at 5%	3.23	3.23	3.23
	Upper at 5%	3.99	3.99	3.99
	Serial correlation test			
	F statistics	3.152914	2.526772	2.582216
	Probability	0.0917	0.1113	0.1067
	Heteroscedasticity test			
	F statistics	0.796417	0.843145	0.840386
	Probability	0.6836	0.6166	0.6189
	Normality Test			
	JARQUE BERA	1.038820	19.24733	19.74499
	Probability	0.594871	0.000066	0.000052

Source: Author's Computation

Generally, four-post estimation tests are carried out for each of the three models estimated for the five countries. The heteroscedasticity, serial correlation, normality and stability tests. All their results are presented in Table 5.40. The results show that they are largely in order and confirmed the validity of the estimates in all the three models for all the five countries. For instance, the null hypothesis that there is no heteroscedasticity is accepted for all the three models across the five countries because the probability of the Breusch-Pagan-Godfrey F statistics is not significant.

Similarly, the null hypothesis of no serial correlation is also accepted because the Breusch-Godfrey F statistics probability is not statistically significant across the five countries for all the three models. In the same vein, the normality test for all the five countries and for the three models is also good. The Jarque-Bera Statistics probability is also not significant at 5% in all the models thus, confirming that the residuals of all the models conform to normal distribution.

In conclusion, all the models also passed the stability tests as depicted by the figures in the appendix where the cumulative sum of recursive (CUSUM) and CUSUM of squares (CUSUMSQ) graphical illustrations show that the plots of the residual do not cross the 5% critical lines of parameter stability. This, in essence, means the stability of the long- run parameters of the military expenditure, institutional quality, and inclusive growth over the period 1984 to 2017 for all the three models and across the five countries.

CHAPTER 6

DISCUSSIONS OF RESEARCH FINDINGS

1.1.Introduction

The focus of this study has been to examine the relationship between military expenditure, institutional quality, and inclusive growth in BRICS countries 1970 to 2017. Three sub-objectives are identified and have been empirically analysed in the previous chapter. The objectives are to investigate determinants of BRICS military expenditure from 1970 to 2017; computation of BRICS inclusive growth index; and assessment of the combined impact of military expenditure and institutional quality on Inclusive growth in BRICS countries. These three areas are interrelated with the core-stylised information on BRICS military setting and their developmental challenges: the high growth, poor people dilemma; the core determinant of military expenditure as a public good, establishment of whether the impact of military expenditure on BRICS inclusive growth depends on the institution quality or not are all interwoven. Therefore, the analysis encompasses these three inter-related topics, although separated for clarity.

The results and interpretation presented in the previous chapter follow the following arrangement. The first objective, which deals with the determinant for BRICS military expenditure, is investigated by adopting the neoclassical demand model and panel data estimation techniques. The second objective has to do with developing a BRICS inclusive growth index from 1970 to 2017. The inclusive growth index is a composition of 10 socio-economic development indicators which Z-score technique harmonized them to generate the inclusive growth index. The third objective analysed the impact of BRICS countries' military expenditure and institutional quality on its inclusive growth using the (Aizenman and Glick, 2006) model. The data period was reduced to 1984 to 2017[3]. Discussions on each of the results presented for each of the objectives are as follows.

[3]The ICRG database only started from 1984, so this inform the reduction from 1970 to 1984 for a more equitable and reliable inferences to be made.

1.2. Discussions of result for Objective 1: Determinant for BRICS military expenditure 1970 to 2017

This section discusses the empirical result of the determinant for the military expenditure of BRICS countries from 1970 to 2017 employing the panel data analysis approach. Based on the detailed theoretical and empirical literature on determinant for military expenditure, the neoclassical model was considered the best to analyse determinant of BRICS countries military expenditure. BRICS countries' political economy and security factors were incorporated for model specification. The fixed effects results revealed that four variables have significant impacts on military expenditure namely security web, GDP, inflation, and Trade Balance (TB). The Security Web represents the variables that captured the possibility of the arms race for each BRICS neighbour. The coefficient is significant and positive. The implication of this is that there is a positive significant security web among BRICS and their neighbouring countries. In literature security web explains the tendency of a country's military expenditure being influenced by her neighbour's expenditures on the military. This is much more evident when there is hostility between two neighbouring countries or when a country is involved in regional or continental peacekeeping missions or international war (for instance, the South African Army joined UN peacekeeping missions in the Democratic Republic of the Congo, Sudan and South Sudan). South Africa is considered as the 11th biggest troop contributor to UN peacekeeping in Africa and the 17th biggest in the World (SIPRI, 2019, WorldBank, 2018).

It thus implies that has the hostile neighbour is increasing her armouries, the country also will be poised to increase her expenditures on the military so as to match-up with her neighbours level of ammunition in case of a future attack. This finding is supported by the findings of (Rosh, 1988, Sun and Yu, 1999, Dunne and Perlo-Freeman, 2003, Tambudzai, 2011) on the security web.

Again, economic growth is the most significant determinant for military expenditure. The coefficient of economic growth, which is proxied by the GDP growth rate, is positive and significant. This indicates that BRICS countries' economic growth is majorly responsible for the drive to invest in the military. The implication is that the levels of economic growth in the BRICS countries are important factors that influence their expenditure in the military. These findings support the Keynesian school of thought on the importance of military expenditure as part of total government expenditure. The findings of (Tambudzai, 2011) are also in line with the results obtained in this study. It shows that our results on the relationship between military expenditure and economic growth enjoyed both theoretical and empirical support.

The third variable with a significant effect on military expenditure is the trade balance. Since most of the BRICS countries buy their ammunition from developed countries, there exists a strong relationship between their trade balance and military expenditure. This implies that a favourable balance of trade encourages military expenditure in the BRICS. Some studies have also obtained a similar result (Yakovlev, 2007, Tambudzai, 2011).

The fourth variable with significant effect as a determinant of BRICS military expenditure is inflation. The results confirm a positive and significant relationship between the two, which is an indication that when domestic inflation is rising, there will be a significant increase in military expenditure. Inflation reflects the general price level therefore whenever there is a persistent rise in the general price level there will be a significant increase in the expenditure on the military. The reason for this might not be unconnected with the fact that the value of the currency falls during rising inflation rate hence there will be the need to raise general expenditure in order to purchase what could have been purchased with the lower amount before. (Kaufman, 1972, Capra, 1981, Günana, 2004) in their studies also obtained a positive and significant relationship between military expenditure and inflation.

However, the following variables failed to have individual significant impact on military expenditure; democracy index, exchange rate, external and internal threats. Notwithstanding, the test of the overall significance of the factors influencing military expenditure shows that the model is statistically significant which is an indication that all the variables used as factors influencing military expenditure in the BRICS are all desirable variables in the model and will jointly affect military expenditure significantly. On this note, as obtained in this study these variables are genuinely determinants of military expenditure in the BRICS.

1.3.Discussions of result for Objective 2: Computation of BRICS inclusive growth from 1970 to 2017

This section presents the discussion on the computation of BRICS Inclusive Growth Index (IGI) from 1970 to 2017. The computation of inclusive growth for the BRICS appears to have revealed some important lines of discussions concerning the inclusive growth of all the member countries. It would be recalled that at the introductory aspect of this study and under the literature review as well, an effort was made to explain the importance of inclusive growth, especially over economic growth indicators. Consequently, the results from the computation of inclusive growth for the BRICS have shown that some of the countries with promising economic growth might not have the kind of growth that trickles down to the poor (George, 2011).

For instance, out of all the five countries, it was shown from the result that inclusive growth of Russia, China and Brazil are the highest on the average in that order while South Africa and India have the lowest inclusive growth. Russia has the most promising inclusive growth among the five countries and the implication is that the economic growth of Russia has much more effects on the poor than it does in the remaining four countries. The result has further supported the opinions of development organisations such as UNDP, UNEP, and UNESCO who have identified Russia and China as a leading countries among the BRICS in terms of development plans (WorldBank, 2009). The paces of technology and drive to reduce poverty in these two countries have been well commended by these organisations and their development trajectory have been identified as very promising. These conclusions were reached by the organisation after consideration of some key indicators such as the human development index, technology advancement, poverty, and health indicators, among others in the BRICS. Brazil also has an average inclusive growth that is relatively high after these two countries notwithstanding some developmental issues facing the country recently, it still remains one of the BRICS countries with promising inclusive growth.

On the other hand, South Africa and India's inclusive growth index are not promising with India (that is, 0.37 and 0.38 which are below the average of 0.50 respectively) emerging as the worst out of the five countries. It will be noted that until 2018 November, India was categorised as the country with the highest number of impoverished people in the world (WorldBank, 2009). The endemic effect of poverty in India has been reflected by the inclusive growth index computed in this study. Again, this result is a confirmation of the findings of various international development organisations that have condemned the increasing rate of poverty and the poor human development index that is prominent in India as a member of the BRICS. All these might not be shown by economic growth which has been used as a parameter for assessing economic development by some authors. For instance, in 2015 India's economic growth was one of the highest among the BRICS with about 7.5% GD growth rate compared to China then which was 7%. However, findings from this study have shown that relying on those growth indicators might be misleading but instead, inclusive growth index performs better as a development indicator more than GDP growth rate.

The recent downward trend in the economy of South Africa in recent times, especially within the last one decade, has reflected in the inclusive growth index. The study has revealed that South Africa's inclusive growth is not a promising one. Although the average GDP growth rate within the last decade, especially in the last three years, has not shown a good outlook, the inclusive growth index has shown a more damning result about the level of development in Africa's most developed economy. The concern raised by the Africa Development Bank, World Bank, among others, in 2018 about the rising inequality, unemployment and poverty generally in South Africa has been justified by the findings on inclusive growth index computed for South Africa in this study.

Generally, it has been shown by this study that reliance on economic growth and the growth indicators to measure economic development might be misleading. Some development literature has used per capita income to proxy economic development because of its direct nexus with the standard of living; however, this study has shown that inclusive growth is much deeper than the per capita income which might not reflect the level of inclusiveness in the growth of the countries.

1.4. Discussion of Objective 3 - Analysis of the impact of military expenditure and institutional quality on inclusive growth for individual BRICS countries

The author deemed it wise to toe the line of carrying data analysis for objective three research finding to focus on individual BRICS countries due to the heterogeneous results earlier showed in objective two computations of BRICS inclusive growth index for BRICS countries. Therefore, to capture these peculiarities the author deemed it reasonable to toe the line of carrying out country-based analysis for further clarifications on the relationship between military expenditure, institutional quality, and inclusive growth. Discussions on the results from this are summarised in Table 6.1.

Table 6.1: Discussion Table for Objective three- Individual BRICS analysis

Countries	Significant variables and sign	Insignificant variables and sign	Short remark
Brazil	The institutional quality (proxy by corruption) exhibits a positive long-run relationship with inclusive growth. Other variables with significant impact on inclusive growth are education and population.	Investment is positive but not significant in the long-run on inclusive growth Military expenditure indicates a insignificant positive long-run relationship on inclusive growth. The interactive form of military expenditure and institutional quality form exhibits an adverse but not long-run relationship with inclusive growth.	The result indicates that despite the positive relationship between military expenditure and inclusive growth, when the military expenditure interacts with the institutional quality, it reflects a negative impact on inclusive growth but not significantly.
Russia	Military expenditure result shows a positive and significant relationship with inclusive growth. Institutional quality (proxy by corruption) is	The population is negative and also not significant. Investment is positive but insignificant. Population is positive but	Military expenditure with institutional quality will jointly improve inclusive growth.

	negative. The interactive form of military expenditure and institutional quality produce a positive relationship with inclusive growth. Education is negative also.	insignificant.	
India	All the variables failed to have a significant impact on inclusive growth in India.	All the variables, including military expenditure, institutional quality, the interactive form of military expenditure and institutional quality failed to have a significant impact on inclusive growth. Again, other control variables also do not have a significant impact on inclusive growth in India	Military expenditure with institutional quality will jointly improve inclusive growth.
China	Military expenditure exhibits a positive long-run relationship with inclusive growth along with institutional quality. However, military expenditure- and institutional quality interactive form shows a coefficient that is negative and significant. Population is negative and significant as well.	Investment is positive but not significant. Also, education is positive and not significant.	The result shows that the interaction of military expenditure and institutional quality growth does not influence inclusive growth significantly.

South Africa	The military expenditure result, inclusive growth both have a positive and direct relationship with inclusive growth while the interactive form of the two has a significant negative impact on inclusive growth.	Other variables, such as investment, education and population also have insignificant impact.	The result is almost similar to what was obtained in China. Again, the interactive form of military expenditure and institutional quality failed to produce a significant positive impact on inclusive growth.

In summary, China and South Africa support the assertion of adverse inclusive growth effect of military expenditure and institutional quality interactive form. In the two countries, military expenditure and institution quality exhibit positive and significant relationship with inclusive growth but the interaction of the two produced a significant negative impact on inclusive growth index of the two countries. This result is similar to the findings supported by (Compton and Paterson, 2016). Therefore, it shows that in China and South Africa the quality of their institution and the management of the expenditure on the military have not significantly and positively promoted inclusive growth.

On the other hand, Russia's interactive form of military expenditures and institutional quality is unique and a classic example of where military expenditure and institutional quality drives strong and significant inclusive growth. The result of Russia is a clear departure from the previous results as it indicates that apart from the fact that military expenditure and institutional quality individually have significant positive impacts on their inclusive growth, the interaction of the two also produces a significant and positive inclusive growth. The result implies that military expenditure drives inclusive growth in Russia due to good institutional quality. This finding has also shown some levels of consistency in our results because under Objective 2 of this study Russia has the highest average inclusive growth index among the BRICS member countries. This underscores the importance of government in terms of management of military expenditure in this country. It can, therefore, be inferred from the findings that there appears to be less corruption in the management of military expenditure in Russia hence allowing it to have a trickling down positive effect on the society (George, 2011). This is what interaction of the two is meant to achieve and portray. It points to the fact that a weak institutional quality where corruption is endemic will weaken the positive impact of military expenditure on inclusive growth. The result further affirms the findings of the UNO (2010) that Russia is fast becoming the world superpower in terms of military armoury and that this has promoted the economic power of the country. The position of the UNO was premised on the fact that most of the expenditures of Russia on the military are basically on the production of ammunitions because they manufacture almost 80% of their military weapons (UNO, 2010). This implied that apart from the promotion of internal security which guarantees investment, the production and manufacturing of the weapons locally would have assisted in generating more employment opportunities and hence reduces inequality and poverty which is core to inclusive growth.

The results of Brazil and India in this study are the direct opposite of Russia. Virtually all the indicators are not significant in the inclusive growth model of India. Firstly, the military expenditure failed to have a significant impact on inclusive growth, institution quality also does not have a significant impact on inclusive growth and most importantly, the combination of both which depicts the interaction between military expenditure and institutional quality also failed to have a significant impact on inclusive growth. The implication of this result is that the rising trend of military expenditure in India has not impacted significantly on their inclusive growth. This is worsened by the lack of quality in a government institution. Worse still, the management of military expenditure by the institution in India, which is shown via the interactions of both also failed to have a significant impact on inclusive growth of India. This result shows a high degree of consistency in the findings of this study as it was shown earlier under the computation of the inclusive growth index that India as a country has the least average inclusive growth index among the BRICS. However, this result has also been supported by (Yildirim and Öcal, 2016, Zhang et al., 2017b). Currently, India is estimated to have one-third of the world's poor. In 2012, 37 per cent of India's 1.21 billion people fell below the international poverty line, which is $1.25 a day (Indian Planning Commission, 2013). It would also be noted that during these periods, military expenditure has always been on the rise but this study has shown that the effect on inclusive growth is not significant. Notwithstanding, this result is contrary to the findings of

(Dunne, 2012, Zhang et al., 2016) who concluded that military expenditure has a positive and significant impact on the economic growth of India. The reason for the difference in the findings is not unconnected to the fact that the study used GDP growth rate while the inclusive growth index computed for India in this study was used in the analysis. Consequently, the developmental impact of military expenditure and institution quality in India leaves much to desire and this has culminated in the economic struggle of the second-most populous country in the World.

Furthermore, the study compared the results of the inclusive growth model with other models that have been used by previous authors to investigate the effect of military expenditure and institutional quality. It was discovered from the existing literature on military expenditures that GDP growth rate and per capita income are other development indicators used by previous authors to measure the effectiveness of military expenditure consequently, in order to draw the line between the usage of these indicators and inclusive growth computed in this study, effort was also made to compare the results obtained under the inclusive growth model with these two models. The summary of the results is presented in Table 6.2.

Table 6.2: Discussion on the comparison of results on inclusive growth, economic growth and per capita income models

Country	**Model I**	**Model II**	**Model III**	**Remarks**
Brazil	**Inclusive growth as dependent variable**	**GDP annual % as dependent variable**	**Per Capita Income % as dependent variable**	
	Military expenditure is insignificant and positive on the inclusive growth index.	Military expenditure is positive and insignificant on GDP annual.	Military expenditure is positive and insignificant on per capita income.	In the model, I, II and III military expenditure alone it is positive but not significant.
	Institutional quality is significant and positive on the	Institutional quality is positive and insignificant on GDP annual.	Institutional quality is positive and insignificant on per capita	In the model, I, II and III institutional quality alone it is positive but not significant.

	inclusive growth index.		income.	
	The interactive form of Military expenditure and institutional quality is significant and negative on the inclusive growth index.	The interactive form of military expenditure and institutional quality is insignificant and negative on the annual GDP.	The interactive form of military expenditure and institutional quality is insignificant and negative on per capita income.	The interactive form of military expenditure and institutional quality in models I, II and III, it was negative but not significant. Hence, retarded inclusive growth within the Brazil countries for the period study.
	Education is significant and negative on the inclusive growth index.	Education is insignificant and positive on the annual GDP.	Education is significant and positive on per capita income.	Education, in model I, is negative and significant in model one; however, in model II, it was positive but not significant. In model III, it was positive and significant.
	Investment is insignificant and positive on the inclusive growth index.	Investment is negative and insignificant on the annual GDP.	Investment is negative and insignificant on per capita income.	Investment, in model I, is positive but not significant. However, in models II and III, it was negative and significant.
	Population is significant and positive on the inclusive growth index.	Population is significant and positive on the annual GDP.	Population is significant and positive on per capita income.	Population was found to be negative at 1% in model I while in models II and III, it was negative and significant at 5%.
	The speed of adjustment is significant and negative on the inclusive growth index.	The speed of adjustment is significant and negative on the annual GDP.	The speed of adjustment is significant and negative on per capita income.	The Speed of adjustment (ECT) for all models (1, II and III) are negative and significant. The speed of adjustment is faster and evident in model III than other models.
	Military	Military	Military	In model I, military

Russia	expenditure is significant and positive on the inclusive growth index.	expenditure is significant and positive on the annual GDP.	expenditure is significant and positive on per capita income.	expenditure alone is significant and negative, whereas, in models II and III, it is positive and significant.
	Institutional quality is significant and negative on the inclusive growth index.	Institutional quality is significant and positive on the annual GDP.	Institutional quality is significant and positive on per capita income.	In model I, Institutional quality alone is significant and positive, but in model II, it is positive but not significant. In model III, it is positive and significant.
	The interactive form of military expenditure and institutional quality is significant and positive on the inclusive growth index.	The interactive form of military expenditure and institutional quality is significant and negative on the annual GDP.	The interactive form of military expenditure and institutional quality is significant and negative on per capita income.	The interactive form of military expenditure and institutional quality in model one is significant and positive. In models II and III, it was negative and significant. Therefore, the result here is mixed and inconclusive depending on the dependent variable used in the estimation.
	Education is significant and negative on the inclusive growth index.	Education is significant and positive on the annual GDP.	Education is significant and positive on per capita income.	Education, in model one, is negative but not significant in model I, however, in models II and III, it was positive and significant.
	Investment is significant and positive on the inclusive growth index.	Investment is significant and positive on the annual GDP.	Investment is significant and positive on per capita income.	Investment, in model I, is negative but not significant. However, in models II and III, it was positive and significant.
	Population is insignificant and positive on the inclusive growth index.	Population is insignificant and positive on the annual GDP.	Population is insignificant and positive on per capita income.	Population was found to be positive but not significant in models I and III while in model II, it was positive and significant.
	The speed of adjustment is	The speed of adjustment is	The speed of adjustment is	The Speed of adjustment (ECT) for all models (1, II

	significant and negative on inclusive growth index	significant and negative on GDP annual	significant and negative on per capita income	and III) are negative and significant and positive. However, the speed of adjustment is more evident faster in model I than the other models.
India				
	Military expenditure is insignificant and positive on the inclusive growth index.	Military expenditure is significant and positive on the annual GDP.	Military expenditure is significant and positive on per capita income.	In model I, military expenditure alone is positive but significant.
	Institutional quality is insignificant and negative on the inclusive growth index.	Institutional quality is insignificant and negative on GDP annual.	Institutional quality is insignificant and negative on per capita income.	In the models I and II, institutional quality alone is negative but not significant, but in model III, it is negative but significant.
	The interactive form of military expenditure and institutional quality is insignificant and positive on the inclusive growth index.	The interactive form of military expenditure and institutional quality is insignificant and positive on the annual GDP.	The interactive form of military expenditure and institutional quality is insignificant and positive on per capita income.	The interactive form of military expenditure and institutional quality in model one is not significant and positive. In models II and III, it was positive and significant. Therefore, the result here is mixed and inconclusive depending on the dependent variable used in the estimation.
	Education is insignificant and negative on the inclusive growth index.	Education is significant and positive on the annual GDP.	Education is significant and positive on per capita income.	Education, in model I, is negative but not significant in model I; however, in models II and III, it was positive and significant.
	Investment is	Investment is	Investment is	Investment, in model I is

	insignificant and negative on the inclusive growth index.	significant and positive on the annual GDP.	significant and positive on per capita income.	negative but not significant. However, in models II and III, it was positive and significant.
	Population is insignificant and positive on the inclusive growth index.	Population is insignificant and positive on the annual GDP.	Population is insignificant and positive on per capita income.	Population was found to be positive but not significant in models I, II and III.
	The speed of adjustment is negative and significant.	The speed of adjustment is negative and significant.	The speed of adjustment is negative and significant	The Speed of adjustment (ECT) for all models (1, II and III) are negative and significant. However, the speed of adjustment is more evident faster in model II than the other models.
China				
	Military expenditure is significant and positive on inclusive growth index.	Military expenditure is significant and positive on the annual GDP.	Military expenditure is significant and positive on per capita income.	In model I, military expenditure alone is significant and positive.
	Institutional quality is significant and positive on the inclusive growth index.	Institutional quality is significant and positive on the annual GDP.	Institutional quality is significant and positive on per capita income.	In models I and II, institutional quality alone is positive and significant, but in model III, it is not significant.
	The interactive form of military expenditure and institutional quality is significant and negative on the inclusive growth index.	The interactive form of military expenditure and institutional quality is significant and negative on the annual GDP.	The interactive form of military expenditure and institutional quality is significant and negative on per capita income.	The interactive form of military expenditure and institutional quality in models I, II and III is significant and negative. Therefore, the result here is negative and significant in all the models in all the estimation.

	Education is insignificant and positive on the inclusive growth index.	Education is significant and negative on the annual GDP.	Education is significant and negative on per capita income.	Education, in model I is negative but not significant in model I, however, in models II and III, it was negative and significant.
	Investment is insignificant and positive on the inclusive growth index.	Investment is significant and positive on the annual GDP.	Investment is significant and positive on per capita income.	Investment, in model I is negative but not significant. However, in models II and III, it was positive and significant
	Population is significant and negative on the inclusive growth index.	Population is insignificant and negative on the annual GDP.	Population is insignificant and negative on per capita income.	Population was found to be positive and significant in model I; In model II, it is negative but not significant while model III, it is negative and significant.
	The speed of adjustment is significant and negative on the inclusive growth index.	The speed of adjustment is significant and negative on the annual GDP.	The speed of adjustment is significant and negative on per capita.	The Speed of adjustment (ECT) for all models (1, II and III) are negative and significant and positive. However, the speed of adjustment is more evidently faster in model I than the other models.
South Africa				
	Military expenditure is significant and positive on the inclusive growth index.	Military expenditure is significant and positive on the annual GDP.	Military expenditure is significant and positive on per capita income.	In model I, military expenditure alone is significant and positive.
	Institutional quality is insignificant and negative on the inclusive growth index.	Institutional quality is significant and positive on the annual GDP.	Institutional quality is significant and positive on per capita income	In model I, institutional quality alone is negative but not significant; model II, it is positive and significant; model III, it is positive and significant.

	The interactive form of military expenditure and institutional quality is significant and negative on the inclusive growth index.	The interactive form of military expenditure and institutional quality is significant and negative on the annual GDP.	The interactive form of military expenditure and institutional quality is significant and negative on per capita income.	The interactive form of military expenditure and institutional quality in model I, II and III, it was negative and significant. Therefore, the result here is conclusive
	Education is significant and negative on the inclusive growth index.	Education is significant and positive on the annual GDP.	Education is significant and positive on per capita income.	Education, in model I is negative and significance in model I, however, in model II and III, it was positive and significant.
	Investment is insignificant and negative on inclusive growth index	Investment is significant and negative on GDP annual	Investment is significant and negative on per capita income	Investment, in model I, II and III is negative and significant.
	Population is significant and positive on the inclusive growth index.	Population is significant and negative on the annual GDP.	Population is significant and negative on per capita income.	Population was found to be positive and significant in models I, II and III.
	The speed of adjustment is significant and negative on the inclusive growth index.	The speed of adjustment is significant and negative on annual GDP.	The speed of adjustment is significant and negative on per capita income.	The Speed of adjustment (ECT) for all models (1, II and III) are negative and significant. However, the speed of adjustment is more evidently faster in model I than the other models.

The summary of discussions as shown in Table 6.2 shows some degree consistencies of the results obtained under the inclusive growth model with the results of both economic growth and per capita income models. One of the major reasons behind this comparison is to either validate or invalidate the conclusions of some previous studies on military expenditure and growth relationships. However, the results from an inclusive growth model are not completely different from those of economic growth and per capita income models due to the following similarities. Generally, the results obtained on Russia, China and South Africa is very similar across the three growth indicators. In other words, the same conclusions that were reached about the relationship between inclusive growth, military expenditure, institutional quality and other independent variables are similar to the conclusions obtained from when both economic growth and per capita income are used as dependent variables. This revelation is a pointer to that fact that the inclusive growth index computed in this study has not completely produced results that are outliers. Hence, some levels of consistency with the findings using other existing growth indicators are also obtained. This effort is worth it in order to verify the reliability of the results on the inclusive growth index since this is the first effort to compute it for the BRICS countries to the best of the author's knowledge.

Notwithstanding, some clear differences are also obtained when the findings on an inclusive growth model are compared with that of economic growth and per capita income models. From the interpretation of the result presented in Chapter 5, it appears there are justifiable reasons why this is so.

Firstly, the interaction of military expenditure and institutional quality that showed a significant negative impact under the inclusive growth model was not significant under both economic growth and per capita income models. The results imply that the adverse impact of the interactions of military expenditure and institutional quality is significant on inclusive growth whereas if the findings were to be based on economic growth and per capita income results the conclusion would have been that the adverse impact is not significant. This might allow erroneous conclusion that this variable is not important in determining growth in Brazil. However, the results from the inclusive growth index have revealed that treating the interplay between military expenditure and institutional quality with "kid gloves" might be a mistake because the negative effect on inclusive growth is severe.

Secondly, another area of difference is that of India. Military expenditures and institutional quality showed a significant impact on both economic growth and per capita income models but failed to show a significant impact under the inclusive growth model. The implication of this difference is that had it been inclusive growth index is not computed for India, there would have been erroneous conclusions based on economic growth and per capita income that military expenditure and institution quality have a positive and significant impact on economic development in India. The conclusions would have been in a direct opposite with the realities which is evident in the country and that has been attested to by various development agencies. The alarming rate of poverty, unemployment and inequalities, among others, are ravaging the Indian economy; all this might not be taking into account when GDP growth rate and per capita income are used as development indicators. Furthermore, the result implies that military expenditure has been rising consistently with the country's economic growth but this has not reflected on inclusive growth.

Again, another implication of this result is that institutional quality in India which shows a significant impact on their economic growth failed to reflect on their inclusive growth. Many studies such as (Shleifer and Vishny, 1993, Jain, 2001, Méon and Sekkat, 2005) in the past have also attributed the alarming rate of poverty, inequality and high unemployment rate to lack of good institutions but with economic growth and per capita income, the result has gone contrary to this reality and showed a positive and significant relationship between institution quality and economic growth. This shows that the larger population of the poor in the country have not been positively influenced by the institutional quality in India.

Finally, the computation of inclusive growth index for the BRICS appears to have been justified based on the various differences as well as similarities that exist between its model and the usual GDP growth rate and per capita income models that have been used by many of the past literature.

CHAPTER 7

SUMMARY, CONCLUSIONS AND RECOMMENDATION

This chapter presents the summary, conclusion and proffers some recommendations based on the findings of the thesis. This section also highlights some recommendations for BRICS countries on how to sustain inclusive growth.

7.1 Summary

This thesis consists of seven chapters. Chapter 1 presents the introduction and detailed the main research problem and objectives of the study. Chapter 2 covers an overview of military expenditure, institutional quality and inclusive growth of BRICS from 1970 to 2017. To complement the trend analysis, a survey on the economic potentials, strengths and weakness of each of BRICS, the trends of military expenditure; state of institutional quality and level of growth inclusiveness were reviewed. This revealed some socio-economic challenges faced by BRICS countries and also provides a good background for subsequent empirical investigation. Chapter 2 presents the relevant theory and empirical literature on the determinant for military expenditure; computation of an index; the impact of military expenditure and institutional quality on growth in BRICS and outside BRICS countries. The fourth chapter focuses on data and methodology employed for the study as well as the definition and description of key variables in the study.

In Chapter 5, the empirical results are presented and interpreted. The first objective is to investigate the main drivers of military expenditure in BRICS countries from 1970 to 2017 and to explore fully the determinants of BRICS military expenditure; the study used an ICRG index (which has been adjudged better measure the measurement of threats) to capture external and internal threats. This is done by employing a cross-sectional estimation technique. The econometric tests utilised enabled us to identify the main determinant military expenditure in the BRICS.

The second objective is based on the computation of the inclusive growth index for BRICS countries from 1970 to 2017. Z-sum technique was employed for the computation of the inclusive growth index. Values close to zero were termed as having low growth inclusive (0.00-0.50) while any country with an inclusive growth index rate of (0.51 to 1.00) was termed to having a high inclusive growth.

The third objective examines the combined effect of military expenditure and institutional quality on inclusive growth in BRICS countries. The analysis was done using panel data analysis as well as time series analysis of individual BRICS member countries. Also, the results were compared with other situations where other development indicators, such as GDP growth rate and per capita income were used as dependent variables instead of inclusive growth. This was done to verify the robustness of the inclusive growth computed in this study for the first time for the BRICS.

Chapter 6 includes the discussions of the empirical findings, drawing inferences and comparison with previous empirical studies' results. The last chapter which is Chapter 7 which gives a summary of the thesis, conclusion and recommendations.

Considering the fact that the empirical findings from all the objectives of the study are interwoven, all the empirical findings are summarised as follows;

The first objective of the thesis focuses on the use of econometric methods to ascertain the major determinants of military expenditure in BRICS countries from 1970 to 2017. The analysis involved the cross-country investigation of the determinant military expenditure in BRICS countries using panel data analysis. The results from the fixed effect revealed that four out of the eight variables considered in this study are significant. The significant variables are trade balance, security web, GDP and inflation. They are all significant at both 1% and 5%, respectively. These findings, therefore, show that the major drivers of military expenditures in the BRICS are trade balance, security web, economic growth and inflation rate.

Findings on the second objective which is based on the computation of BRICS Inclusive Growth Index (IGI) from 1970 to 2017 remain one of the most important contributions of this study. The computation included both the economic and social indicators in the BRICS economies. Findings revealed that Russia has the highest inclusive growth index on the average during the period under study. This is followed by China, Brazil, South Africa and India in that order. It was also discovered from the result that the dominant trend in the computed inclusive growth index for the BRICS during the period under review is downward in nature. This shows that the inclusive growth index for the entire BRICS has been on a downward movement within the period investigated in the study.

The third objective focuses on the impact of military expenditure and institutional quality on inclusive growth for BRICS countries. The analysis made use of two approaches, namely, panel data and time series techniques. The reason behind this is to verify the consistency of the individual countries results with the panel results. This will go a long way to identify the most dominant country among the five and it can be a useful policy reference on BRICS. Findings from the panel data analysis results show that military expenditure and institutional quality (proxy with corruption index) are positive and significant. The implication of this is that there is the presence of positive additive of corruption (i.e. greasing the wheels for growth) reduces government red tape[4]/ bureaucracies, thereby promoting inclusive growth. The result also shows that there exists a positive and significant relationship between military expenditure and inclusive growth. Again, the interactive form of military expenditure and institutional quality which is also used as a variable in the model exhibits an adverse significant long-run relationship with inclusive growth.

Based on the post estimation results of the panel estimation of the impact of military expenditure, institutional quality on inclusive growth for BRICS countries which includes cross-sectional dependence test and normality test, it was found necessary to conduct a time series analysis of the impact of military expenditure and institutional quality on inclusive growth for each of the five-member countries. The results are also summarised as follows;

In Brazil, military expenditure indicates a significant positive long-run relationship with inclusive growth. The implication of the findings is that military expenditure rises and falls with inclusive growth. The long-run relationship result of institutional quality shows that it exhibits a positive long-run relationship with inclusive growth, which is a proxy for institutional quality.

[4]Red tape is an idiom that refers to excessive regulation or rigid conformity to formal rules that is considered redundant or bureaucratic and hinders or prevents action or decision-making. It is usually applied to governments, corporations and other large organisations.

The implication of this is that there is the presence of positive additive of corruption (i.e. greasing the wheels for growth) reduces government red tape[5]/ bureaucracies, thereby promoting inclusive growth. However, the interactive form of military expenditure and institutional quality shows a significant negative impact on inclusive growth. It shows that the institutional management of military expenditure in Brazil might not promote growth.

Findings on Russia indicated that military expenditure influences inclusive growth positively while institutional quality proxy with corruption discourages inclusive growth. However, the interaction of military expenditure and inclusive growth produce a positive and significant impact on inclusive growth in Russia, unlike what we saw under Brazil. Education in Russia is revealed as a driver of inclusive growth. Investment and population growth show a positive and negative impact, respectively on inclusive growth but they are not significant.

The result on India is a clear departure from what we have seen under the two previous BRICS countries that is Brazil and Russia. Findings on India show that none of all the variables has a significant impact on inclusive growth in the country. Notwithstanding investment and education have short-run impact but the effect is not sustained to the long run. Again, the overall evaluation of the inclusive growth model estimated for India indicates that all the variables will jointly affect inclusive growth but not individually as noticed in the previous two countries. Therefore, military expenditure, institutional quality and the interactive form of the two failed to exert a significant effect on inclusive growth in India during the period under study.

Findings on China were almost similar to what was obtained for Brazil as the results also showed that military expenditure and institutional quality individually exhibit a positive relationship with inclusive growth but the interaction of the two shows a significant negative impact on inclusive growth. This implies that the management of military expenditure by the Chinese institutions has not produced a significant positive result on inclusive growth in the country. Also, the result in China shows that the upsurge in population is an important deterrent to inclusive growth. In

[5] Red tape is an idiom that refers to excessive regulation or rigid conformity to formal rules that is considered redundant or bureaucratic and hinders or prevents action or decision-making. It is usually applied to governments, corporations and other large organisations.

addition, education in the country although have a positive impact on inclusive growth but the impact is not significant.

South Africa findings practically almost replicated what was obtained for Brazil and China. Apart from the fact that both military expenditure and institutional quality have a significant positive relationship with inclusive growth individually, their interactive form that is the interactive variables between military expenditure and the institutional quality shows a negative and significant impact on inclusive growth in South Africa. However, population growth was shown as a disincentive to inclusive growth in South Africa because the result shows that population in South Africa has a significant negative relationship with inclusive growth. On the contrary, education shows a positive and significant impact on inclusive growth in South Africa.

In order to check the robustness of the results on inclusive growth, the consistency or otherwise of these results is compared with the results from other development indicators such as economic growth and per capita model which has been used in some studies in the past of the results inclusive growth index with other existing development indicators like GDP per capita and per capita income. This will enable the author to identify if the results we have obtained under the inclusive growth are outliers of produce different results that are justifiable or it produces direct similar results to these other two most commonly used development indicators.

In Brazil, there are some differences in the results obtained under the inclusive growth index when compared to economic growth and per capita income models. For instance, employing inclusive growth index as the dependent, military expenditure alone is significant and positive, institutional quality alone is significant and positive while the interactive form of military expenditure and institutional quality is significant and negative. Employing GDP growth annual as a dependent variable, military expenditure alone is significant and positive while institutional quality alone is significant and positive. The interactive form of military expenditure and institutional quality is insignificant and negative. This study produced the same result as under the economic growth model. Other control variables such as investment show a significant impact on both economic growth and per capita income but not significant under an inclusive growth model. The summary of the comparison here shows that the interactive form of military expenditure and institutional quality have a significant negative impact on inclusive growth but under economic growth and per capita income this impact is not significant.

For Russia, all the three models produced almost similar results all through especially for the three variables of interest. For instance, military expenditure, institutional quality and the interactive form of military expenditure and institutional quality all show the same relationships with inclusive growth, economic growth and per capita income.

In India, there are some differences in the result obtained under the inclusive growth index and the ones gotten for economic growth and per capita income. Firstly, military expenditure showed a significant and positive impact on both economic growth and per capita income but not significant on inclusive growth. Again, institutional quality yielded the same result in that it was significant in both economic growth and per capita income models but not on inclusive growth.

Findings on China show some slight differences among the three models. But these differences were not on the core variables of interest. This implies that military expenditure, institutional quality and the interaction of the two show similar results across the three models Notwithstanding, considering the other control variables, investment showed significant impacts on both economic growth and per capita income but not significant on inclusive growth. Again, the negative impact of population is not significant on economic growth and per capita income but it is significant on inclusive growth.

South Africa findings on the three models have overwhelming similarities. All the core variables, namely; military expenditure, institutional quality and their interactive form produce the same signs and significance across the three models. The same thing with control variables except for investment that shows significant impacts on economic growth and per capita income but not on inclusive growth index.

7.2. Conclusion

Following the findings from this study there are some conclusions that are pertinent to the relationship between military expenditure, institutional quality and inclusive growth in the BRICS during the period under review.

Firstly, the study revealed that security web, GDP, inflation, and Trade Balance (TB) are the most important factors that determine military expenditure in the BRICS. From these findings, it can be concluded that the level of their economic growth in terms of national income is an important factor that affects their expenditures on the military. In addition, the activities of the neighbouring countries in terms of arms purchase and the level of relationship between the two countries goes a long way to determine the expenditures on the military in the BRICS. This is described by the security web which further shows that the BRICS countries prioritise the level of ammunitions acquired by their neighbouring countries in their decisions to increase or decrease military expenses. Inflation rate which influences the general price levels of military ammunition is revealed from the findings of this study as an important factor influencing military spending and finally trade balance in other words decisions on military expenditure in the BRICS is also guided by whether the terms of trade is favourable or not. This is much more important in BRICS members like Russia and China who manufacture some of their military apparatus themselves.

The second objective of this study is the computation of inclusive growth index for the BRICS. Findings from the analysis also lead to some conclusions about the BRICS inclusive growth pursuit.

Firstly, at the beginning of the study, it was reviewed from the literature that the major problem faced by the BRICS is the fact that some of their growth processes still lack sustainability and this has prevented the recent accelerated growth witnessed by some of the members' countries from trickling down to the poor society. This led to the computation of inclusive growth index for the BRICS. This thesis has shown that the five-member countries have different inclusive growth trajectories during the period under review. Notwithstanding, the common trend noticed when the inclusive growth index was computed for the BRICS is that of a downward movement during the period under study. This shows that despite the fact that recent data on BRICS shows that economic growth in the economic bloc is rising especially in India; the inclusive growth index computed for the bloc shows a downward trend. This brings this conclusion that the nature of economic growth currently witnessed in the BRICS is not having a trickling down effect to the poor society in the countries.

Secondly, conclusions on the comparison of the average inclusive growth of each member countries show that Russia has the highest inclusive growth index during the period. This is followed by China, Brazil, South Africa and India in that order. Therefore, Russia has been shown by this study as the country among the BRICS with the most promising inclusive growth index. China and Brazil are so close with their inclusive growth indices slightly above the average. But both South Africa and India have weak inclusive growth indexes that fall below average with India emerging as the weakest of all the five-member countries of the BRICS. The implication of this is that Russia has the most promising inclusive growth among the five countries and the implication is that the economic growth of Russia has much more effects on the poor than it does in the remaining four countries. The result has further supported the opinions of development organisations such as UNDP, UNEP, and UNESCO who have identified Russia and China as a leading country among the BRICS in terms of development plans (WorldBank, 2009). The pace of technology and drive to reduce poverty in these two countries has been well commended by these organisations and their development trajectories have been identified as very promising. These conclusions were reached by the organisation after consideration of some key indicators such as human development index, technology advancement, poverty, and health indicators, among others, in the BRICS. Brazil also has an average inclusive growth that is relatively high after these two countries notwithstanding some developmental issues facing the country recently.

The third objective which investigates the impact of military expenditure and institutional quality on inclusive growth also revealed some important conclusions which are discussed as follows.

Firstly, the study discovered that the panel result on BRICS investigating the impacts on military expenditure and institutional quality on inclusive growth index failed to pass some post estimation test that will enable us generalise our findings for the whole countries hence the study decided to leverage on individual country-based analysis to ascertain the relationships between military expenditure, institutional quality and inclusive growth. This leads to the conclusion that the study on inclusive growth for BRICS can better be studied on individual country basis as the results from this study as shown that generalisation via panel results for all the countries might be misleading. Notwithstanding the BRICS member countries share a lot of similarities but evidence from this study has shown that they have different inclusive growth trajectories hence any study that included inclusive growth can best be studied on individual country bases after which comparative analysis can now be done to extract policy implications of the results.

Secondly, conclusions from the findings on individual countries show that Brazil, South Africa and China have a lot of similarities in their results. In these three countries, military expenditure and institutional quality have a positive and significant impact on inclusive growth index. This means that military expenditure and institutional quality supports inclusive growth in these three countries. But the interactive form of both military expenditure and the institutional quality shows a negative and significant impact on inclusive growth. This result seems ambiguous but literature has emphasised that the joint relationship between the two matter most in the inclusive growth process. According to the literature, military expenditure will rise significantly whenever some countries achieve accelerated growth rate because they have much more to spend on the military but the administration and management of the spending on the military are reflected by the interactive form of both. On theoretical grounds, the theoretical models embraced for the study implies that the relationship between military expenditure and growth depends on corruption and rent-seeking behaviour and that the joint effect of both of them is much more important for sustainable growth which inclusive growth is all about. Therefore, the conclusions on these countries are that the interaction of the two fails to support the inclusive growth process in Brazil, China and South Africa. However, considering other variables included in the model as drivers of inclusive growth, education remains an important factor driving inclusive growth but the levels of investment during the period under study failed to drive inclusive growth significantly in the three countries. However, population has a significant negative impact on inclusive growth in China but not in South Africa and Brazil. This further shows that the hypothesis that the rising population discourages inclusive growth is much more pronounced and confirmed in China which is the most populous country in the world than South Africa and Brazil.

Thirdly, Russia exhibits different results from the remaining four BRICS members in terms of the relationship between military expenditure, institutional quality and inclusive growth. Conclusions on Russia indicate that the country apart from having results that show that military expenditure and institutional quality influence inclusive growth significantly, the country result further shows that the interaction between military expenditure and institutional quality show a significant positive impact on inclusive growth unlike what we saw in Brazil, China and South Africa. This is an indication that the joint relationship between the two which failed to drive inclusive growth in those three countries actually drives inclusive growth in Russia. This conclusion is consistent with what was obtained under objective two of the study where the computation of the inclusive growth shows that Russia has the highest average inclusive growth index among the BRICS. The implication of this finding is that military expenditure appears to be better managed by institutional in Russia and it is less influenced adversely by corruption. This might be the reason why this variable shows a significant positive impact on inclusive growth in Russia and not on Brazil, China and South Africa. Concerning other control variables, both education and investment show a significant impact on inclusive growth in Russia, unlike the previous three countries where investment failed to drive inclusive growth. The implication of this conclusion is that the levels of investment during the period under consideration support the inclusive growth process in Russia that is, the level of investment trickles down to the poor.

However, the results on India lead to conclusions that are a clear departure from what we saw in the other four BRICS countries. The result from India shows that none of all the core variables have a significant impact on inclusive growth. This shows that military expenditure and institutional quality do not have a significant impact on inclusive growth. In addition, the interactive form of the two which actually measure how institutional manages the expenses on the military also failed to show a significant impact on inclusive growth in India. Consequently, it is concluded from this study that military expenditure during the period under review in India has not been significantly supporting their inclusive growth. Again, the result is consistent with what we obtained under objective two of the study where the average inclusive growth index for India is the least among the five countries in the BRICS. Also, other control variables used in the model failed to produce any significant impact on inclusive growth in the country. That is education, an investment which was found to be significant inclusive growth drivers in the other four countries are not significant inclusive growth drivers in India.

The last batch of conclusions on objective three is on the comparison of the results on inclusive growth with the results of other conventional development indicators which were used in most of the previous studies.

Firstly, conclusions form the results show that usage of inclusive growth index to measure the impact of military expenditure and institutional quality on the BRICS economy is well justified because it produces some significant differences from the results obtained for economic growth and per capita income as development indicators in BRICS. Notwithstanding some similarities were also ascertained which confirms some consistencies with the results on both economic growth and per capita income. It was also discovered that the areas of differences in the results are not outliers but they are differences that are reasonable, justifiable and empirically supported.

Firstly, the areas of similarities are noticed under Russia, South Africa and China. In these three countries, the results obtained when inclusive growth index is used as a dependent variable is similar to what is obtained when economic growth and per capita income are used as dependent variables. The implication is that conclusions on inclusive growth index in terms of its relationship with military expenditure, institutional quality and other control variables are the same with conclusions on the relationships between these variables and GDP growth rate (economic growth) and per capita income for these three countries. This conclusion speaks volumes of the consistency in the results for inclusive growth index since this study is the first effort to compute an inclusive growth index for the BRICS; therefore, this consistency serves as a good robustness test outcome for the inclusive growth index.

Secondly, as emphasised that there are some differences in the results where inclusive growth index is used as a dependent variable and the ones where economic growth and per capita income are used as dependent variables. Under Brazil's results it was discovered that the interaction of military expenditure which shows a negative significant impact on inclusive growth index do not show a significant impact on economic growth and per capita income although the coefficient is still negative in both models. The implication of the differences is that the negative influence of misappropriation of military expenditure by the institutional of Brazil has a more severe negative impact on inclusive growth index than economic growth and per capita income. These efforts might have prevented wrong conclusions that would have emanated that the negative impact of corruption in military expenditure is not significant in Brazil economy. However, the conclusions have shown that if inclusive growth is used the adverse effect of corruption in the spending of the military would be more significant in Brazil economy.

Thirdly, the three core independent variables which are the focus of this study namely military expenditure, institutional quality and the interactive form of the two which failed to have a significant impact on inclusive growth but they exert a significant impact on economic growth and per capita income in India. The implication is that the conclusions that would have been made if economic growth or per capita income is used to represent Indian economy would have been that military expenditure and institutional quality have a significant positive impact Indian economy. However, with the usage of inclusive growth index, this conclusion is different as it is evident from the analysis that this variable failed to drive inclusive growth significantly in India during the period under review. Empirical justification for this is seen in the rising poverty and unemployment rates in India and yet the country recorded the highest economic growth rate among the BRICS recently.

Finally, conclusions from this study have shown that all the shift factors such as investment, population and education are largely more significant under the economic growth and per capita income results. But under the inclusive growth models, they are not significant in all the countries. In fact, in most of the countries, the conclusion is that their levels of investment during the period under review failed to drive inclusive growth except in Russia. On the contrary for investment is shown as an important driver of economic growth and per capita income in all the five countries of the BRICS.

7.4 Contribution to literature and body of knowledge

Firstly, many studies on the determinants of military expenditure have focused mostly on individual countries. This thesis has not only contributed to economics literature, but it has also contributed to the body of knowledge in the field of political science, defense economics and peace studies where usually qualitative analysis is used to examine topics like this. In addition, some important variables that have been identified in the literature as important factors influencing military expenditure which have been used studies outside BRICS are tested in BRICS by this study. Examples of these variables are external threats and internal threats, Democracy index and security web.

Secondly, the computation of BRICS Inclusive Growth Index (IGI) is unprecedented to the best of the knowledge of the author. Globally, attention to development economics researchers has shifted to the concept of inclusive growth since economic growth is not working. The inability of the economic growth witnessed by many developing countries in the world to trickle down to the downtrodden and the poor in general has generated a lot of developmental debates on whether economic growth is the way to go(Ullah and Kiani, 2017). Consequently, the emphasis has been placed more on inclusive growth rather than economic growth. This study has contributed to literature and a more important body of knowledge with the successful attempt to compute inclusive growth index for the BRICS. The BRICS Inclusive Growth Index (IGI) computed in this study is unique as it includes both economic and social variables. Z-sum score technique is employed to find the index. Value for IGI close to zero shows low growth, while, a value close to one denotes the high inclusive growth. For instance, out of all the five countries, it was shown form the result that inclusive growth of Russia, China and Brazil are the highest on the average in that order while South Africa and India have the lowest inclusive growth. The robustness of the inclusive growth was also tested and the results also followed the positions of international development organisations such as World Bank, UNESCO, and UNDP among others that pronounced Russia and China as the two countries with the most promising inclusive growth trajectories among the BRICS.

Thirdly, on the investigation of the effect of military expenditure and institutional quality on inclusive growth in the BRICS, this study took a step further from where previous empirical literature stopped on BRICS by incorporating additional variables called the interactive form of the two which has been used in studies outside BRICS. The significance of the variable is its ability to present a joint effect of the two on inclusive growth. This effort has yielded promising outcomes because the variables produced a result that is more consistent with realities in the individual countries of the BRICS.

In addition, for the first time to the best of the knowledge of the author three separate development indicators are used to measure the effects of military expenditure and institutional quality on the BRICS economy. In order to test the robustness of the results on the inclusive growth index, both economic growth and per capita income are used in this study to separately investigate the effect of military expenditure and institutional quality. This effort yielded the desired result as it shows that there are both areas of similarities that show consistency and some areas of dichotomy which are empirically and theoretically justifiable.

7.3 Recommendations

Based on the findings from this study, the following recommendations are made

I. **Improvement of synergy between military expenditures and institutional**: There is overwhelming evidence from the findings of this study that there exists a poor synergy between military expenditure and institutional in the BRICS. The results from the analysis show that the existence of corruption (a proxy for institutional quality) in the management of military expenditure portends more damming consequences on the inclusive growth of the BRICS economy. Consequently, the level of corruption, especially in the administration of military expenditure in the BRICS, should be reduced drastically as it is affecting their inclusive growth trajectory.

II. **Prioritizing inclusive growth more than economic growth**: results from the study have also shown that it might be misleading if the effectiveness of military expenditure on BRICS economy is assessed using economic growth only. Consequently, it is recommended that the BRICS economy should improve on its drive towards the achievement of inclusive growth.

III. **General improvement in the inclusive growth of the BRICS:** Again, findings from the study show that the highest level of inclusive growth recorded by the BRICS is in Russia. However, India and South Africa showed a gloomy inclusive growth trajectory. This study, therefore, advocates for more efforts in achieving inclusive growth in these two countries. This is imperative since they are lagging behind in inclusive growth pursuit by the BRICS as revealed by this study.

IV. **Pursuit of investment that drives inclusive growth**: Generally across all the results obtained for this study it was discovered that levels of investment currently witnessed in the BRICS have not supported inclusive growth drive immensely. The only exception is Russia where investment shows a significant impact on inclusive growth. Consequently, it is recommended that investment that is inclusive growth driven or oriented should be prioritized by the BRICS.

V. **Increase in investment in the education sector**: All through the study, results have shown that education is important for inclusive growth. On this note, this study advocate for more investments in the education sectors of the BRICS in order to promote the drives toward the achievement of inclusive growth.

7.4 Areas for Further research

There are quite a number of possible research avenues that could be explored

I. Another avenue would be to consider other alternative methodical approaches.

II. Considering alternative measures of institutional would permit for further testing of the robustness of the results, while country case studies would allow for more discussion of how particular types of the institution might affect the amount and type of military expenditure and how it translates to inclusive growth.

III. Consider a more advanced / developed economic union/ blocs such as NATO, the European Union and Nordic countries can provide more useful and more interesting results.

IV. An item of military expenditure and external debt analysis can be examined.

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EDITORIAL

CERTIFICATE

Author: Oladotun Larry Anifowose

Document title: Military Expenditure, Institutional Quality and Inclusive Growth in BRICS Countries 1970-2017

Date issued: 07/02/2020

SUPREME EDITOR

This document certifies that the above manuscript was proofread and edited by Dr Gift Mheta (PhD, Linguistics).

The document was edited for proper English language, grammar, punctuation, spelling and overall style. The editor endeavoured to ensure that the author's intended meaning was not altered during the review. All amendments were tracked with the Microsoft Word "Track Changes" feature. Therefore, the authors had the option to reject or accept each change individually.

Kind regards

Dr Gift Mheta (Cell: 073 954 8913)

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Appendix 1

Objective one: Determinant of BRICS military expenditure 1970 to 2017

Determinant of BRICS military expen

Appendix 2

Objective 2: Computation of the Inclusive growth index for BRICS countries.

(A) **BRICS inclusive growth index from 1970 to 2017 using Z sum technique**

Year	**Brazil IGI**	**Year**	**Brazil IGI**	**Year**	**Brazil IGI**	**Year**	**Brazil IGI**
1970	0	**1982**	0.43	**1994**	0.7	**2006**	0.53
1971	0.58	**1983**	0.38	**1995**	0.61	**2007**	0.53
1972	0.62	**1984**	0.52	**1996**	0.65	**2008**	0.53
1973	0.63	**1985**	0.53	**1997**	0.67	**2009**	0.59
1974	0.58	**1986**	0.36	**1998**	0.64	**2010**	0.54
1975	0.65	**1987**	0.47	**1999**	0.61	**2011**	0.56
1976	0.52	**1988**	0.58	**2000**	0.57	**2012**	0.56
1977	0.59	**1989**	0.61	**2001**	0.61	**2013**	0.56
1978	0.65	**1990**	0.38	**2002**	0.59	**2014**	0.61
1979	0.56	**1991**	0.5	**2003**	0.55	**2015**	0.6
1980	0.38	**1992**	0.61	**2004**	0.58	**2016**	0.66
1981	0.55	**1993**	0.68	**2005**	0.51	**2017**	0.91

Source: Author's Computation

Year	Russia IGI	Year	Russia IGI	Year	Russia IGI	Year	Russia IGI
1970	0.92	**1982**	0.84	**1994**	0.5	**2006**	0.47
1971	0.91	**1983**	0.82	**1995**	0.48	**2007**	0.43
1972	0.91	**1984**	0.8	**1996**	0.4	**2008**	0.46
1973	0.9	**1985**	0.83	**1997**	0.4	**2009**	0.51
1974	0.9	**1986**	0.85	**1998**	0.4	**2010**	0.51
1975	0.88	**1987**	0.84	**1999**	0.4	**2011**	0.44
1976	0.89	**1988**	0.84	**2000**	0.41	**2012**	0.47
1977	0.86	**1989**	0.78	**2001**	0.43	**2013**	0.47
1978	0.86	**1990**	0.7	**2002**	0.41	**2014**	0.44
1979	0.79	**1991**	0.71	**2003**	0.42	**2015**	0.57
1980	0.83	**1992**	0.41	**2004**	0.43	**2016**	0.72
1981	0.83	**1993**	0.48	**2005**	0.47	**2017**	0

Source*:* Author’s Computation

Year	India IGI	Year	India IGI	Year	India IGI	Year	India IGI
1970	0.98	**1982**	0.57	**1994**	0.36	**2006**	0.35
1971	0.43	**1983**	0.66	**1995**	0.38	**2007**	0.37
1972	0.44	**1984**	0.65	**1996**	0.32	**2008**	0.35
1973	0.4	**1985**	0.32	**1997**	0.33	**2009**	0.3
1974	0.37	**1986**	0.37	**1998**	0.31	**2010**	0.21
1975	0.37	**1987**	0.35	**1999**	0.24	**2011**	0.32
1976	0.27	**1988**	0.3	**2000**	0.37	**2012**	0.23
1977	0.31	**1989**	0.25	**2001**	0.36	**2013**	0.25
1978	0.4	**1990**	0.36	**2002**	0.36	**2014**	0.23
1979	0.37	**1991**	0.38	**2003**	0.37	**2015**	0.25
1980	0.46	**1992**	0.33	**2004**	0.41	**2016**	0.35
1981	0.56	**1993**	0.34	**2005**	0.35	**2017**	0.2

Source*:* Author's Computation

Year	China IGI	Year	China IGI	Year	China IGI	Year	China IGI
1970	0.75	**1982**	0.85	**1994**	0.4	**2006**	0.41
1971	0.72	**1983**	0.65	**1995**	0.56	**2007**	0.4
1972	0.45	**1984**	0.88	**1996**	0.49	**2008**	0.47
1973	0.48	**1985**	0.87	**1997**	0.49	**2009**	0.4
1974	0.49	**1986**	0.87	**1998**	0.4	**2010**	0.52
1975	0.48	**1987**	0.51	**1999**	0.52	**2011**	0.42
1976	0.5	**1988**	0.27	**2000**	0.45	**2012**	0.47
1977	0.51	**1989**	0.75	**2001**	0.37	**2013**	0.42

1978	0.56	**1990**	0.68	**2002**	0.52	**2014**	0.46
1979	0.55	**1991**	0.75	**2003**	0.39	**2015**	0.54
1980	0.72	**1992**	0.74	**2004**	0.41	**2016**	0.87
1981	0.82	**1993**	0.61	**2005**	0.44	**2017**	0.87

Source*:* Author's Computation

Year	South Africa IGI	Year	South Africa IGI	Year	South Africa IGI	Year	South Africa IGI
1970	0.58	**1982**	0.43	**1994**	0.33	**2006**	0.52
1971	0.46	**1983**	0.32	**1995**	0.41	**2007**	0.39
1972	0.52	**1984**	0.26	**1996**	0.45	**2008**	0.53
1973	0.51	**1985**	0.23	**1997**	0.35	**2009**	0.38
1974	0.52	**1986**	0.24	**1998**	0.32	**2010**	0.38
1975	0.53	**1987**	0.28	**1999**	0.4	**2011**	0.52
1976	0.45	**1988**	0.36	**2000**	0.53	**2012**	0.4
1977	0.43	**1989**	0.19	**2001**	0.39	**2013**	0.39
1978	0.38	**1990**	0.35	**2002**	0.37	**2014**	0.41
1979	0.38	**1991**	0.27	**2003**	0.3	**2015**	0.26
1980	0.43	**1992**	0.24	**2004**	0.43	**2016**	0.24
1981	0.39	**1993**	0.39	**2005**	0.38	**2017**	0.09

Source: Author's Computation

Appendix 3

Objective three: Military expenditure, institutional quality and Inclusive growth in individual BRICS countries 1970 to 2017

- **Individual country result**
  - **Brazil**

Descriptive stats

	IGI	INV	LNPOP	MCP	ME	COR	EDU
Mean	0.576654	2.240048	18.96875	5.081614	1.645771	3.022713	2.485229
Median	0.572500	2.264751	18.98892	4.881555	1.539016	3.000000	2.378330
Maximum	0.910000	5.034129	19.15922	10.74500	2.686250	4.000000	5.948480
Minimum	0.360000	0.128665	18.70436	2.696998	1.199541	1.833333	0.000000
Std. Dev.	0.080125	1.543958	0.132939	1.921231	0.309960	0.701069	2.376973
Skewness	0.441087	0.060498	-0.341293	1.012505	1.255151	0.061355	0.126492
Kurtosis	5.734770	1.572569	1.894862	3.585622	4.322237	1.806923	1.297908
Jarque-Bera	45.75863	11.37260	9.350195	24.62506	44.61001	7.971640	16.40952
Probability	0.000000	0.003392	0.009325	0.000004	0.000000	0.018577	0.000273
Sum	76.69500	297.9263	2522.844	675.8546	218.8875	402.0208	330.5355
Sum Sq. Dev.	0.847449	314.6625	2.332807	487.2289	12.68189	64.87770	745.8000
Observations	133	133	133	133	133	133	133

Results of correlation matrix

	IGI	INV	LNPOP	MCP	ME	COR	EDU
IGI	1.000000	0.321032	0.354209	-0.187743	-0.005136	-0.313031	-0.067761
INV	0.321032	1.000000	0.784617	-0.641635	-0.424080	-0.686036	0.612212
LNPOP	0.354209	0.784617	1.000000	-0.741853	-0.482648	-0.840603	0.670091
MCP	-0.187743	-0.641635	-0.741853	1.000000	0.868346	0.857315	-0.562395
ME	-0.005136	-0.424080	-0.482648	0.868346	1.000000	0.502901	-0.355526
COR	-0.313031	-0.686036	-0.840603	0.857315	0.502901	1.000000	-0.608105
EDU	-0.067761	0.612212	0.670091	-0.562395	-0.355526	-0.608105	1.000000

Chow Break point test/ Test for structural Breaks

Null Hypothesis: No breaks at specified breakpoints
Varying regressors: All equation variables
Equation Sample: 1984Q1 1989Q3 2017Q4

F-statistic	110.6488	Prob. F(2,132)	0.0000
Log likelihood ratio	133.8932	Prob. Chi-Square(2)	0.0000
Wald Statistic	221.2976	Prob. Chi-Square(2)	0.0000

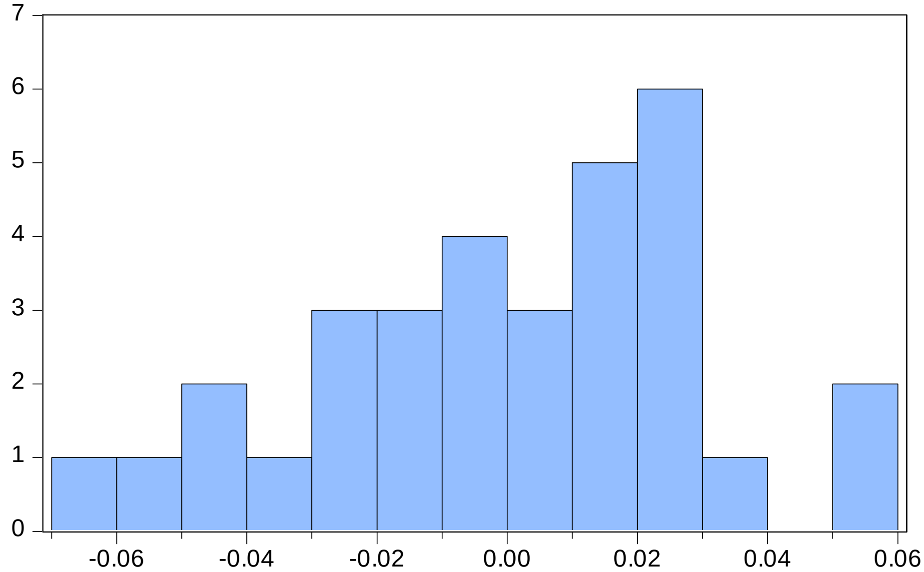
From the f-test, we reject the null hypothesis and accept the alternative hypothesis. There appears to be breaks in Brazil in the years highlighted and they are significant

The ARDL lag Determination

VAR Lag Order Selection Criteria						
Endogenous variables: IGI INV LNPOP MCP ME EDU						
Exogenous variables: C						
Date: 04/05/20 Time: 14:10						
Sample: 1984Q1 2017Q4						
Included observations: 128						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-357.9879	NA	1.19e-05	5.687311	5.820999	5.741629
1	508.2990	1637.824	2.76e-11	-7.285922	-6.350099	-6.905692
2	518.9373	19.11564	4.12e-11	-6.889645	-5.151689	-6.183504
3	541.6430	38.67079	5.12e-11	-6.681923	-4.141833	-5.649871
4	920.9163	610.3929	2.44e-13	-12.04557	-8.703344	-10.68760
5	1140.824	333.2972	1.42e-14*	-14.91912*	-10.77476*	-13.23525*
6	1149.557	12.41779	2.27e-14	-14.49308	-9.546590	-12.48330
7	1165.565	21.26064	3.29e-14	-14.18071	-8.432082	-11.84501
8	1214.571	60.49148*	2.92e-14	-14.38392	-7.833163	-11.72231
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

ARDL Cointegrating And Long Run Form SR AND LR

ARDL Cointegrating And Long Run Form				
Dependent Variable: IGI				
Selected Model: ARDL(1, 5, 0, 1, 1, 0, 1, 1)				
Date: 04/05/20 Time: 14:15				
Sample: 1984Q1 2017Q4				
Included observations: 131				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ME)	0.166123	0.032502	5.111117	0.0000
D(ME(-1))	-0.000000	0.035851	-0.000000	1.0000
D(ME(-2))	0.000000	0.035851	0.000000	1.0000
D(ME(-3))	0.189104	0.036576	5.170109	0.0000
D(ME(-4))	-0.172915	0.028887	-5.986009	0.0000
D(MCP)	-0.003221	0.004457	-0.722754	0.4713
D(LNPOP)	1.010240	0.509522	1.982719	0.0498
D(INV)	-0.013601	0.008067	-1.685884	0.0946
D(EDU)	-0.004756	0.001910	-2.490275	0.0142
D(COR)	0.113191	0.031949	3.542905	0.0006
D(COR(-1))	-0.000000	0.039266	-0.000000	1.0000
D(COR(-2))	0.000000	0.039266	0.000000	1.0000
D(COR(-3))	-0.232517	0.040936	-5.680033	0.0000
D(IGI)	0.150198	0.090309	1.663154	0.0989
D(DM1)	-0.347533	0.071821	-4.838898	0.0000
D(DM2)	-0.660614	0.072006	-9.174477	0.0000
D(DM3)	-0.347533	0.071821	-4.838898	0.0000
CointEq(-1)	-0.117214	0.047458	-2.469821	0.0150
Cointeq = IGI - (0.1903*ME -0.0275*MCP + 1.0650*LNPOP -0.0139*INV				
-0.0406*EDU + 0.0140*DM5 -0.0357*DM4 -19.6558)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ME	0.190274	0.208727	0.911596	0.3639
MCP	-0.027483	0.038615	-0.711704	0.4781
LNPOP	1.065010	0.660307	1.612903	0.1096
INV	-0.013906	0.032429	-0.428804	0.6689
EDU	-0.040579	0.019199	-2.113571	0.0368
COR	0.419042	0.426866	0.981672	0.3283
IGI	3.956620	3.024825	1.308049	0.1934
DM1	-0.009414	0.745715	-0.012623	0.9899
DM2	0.204407	0.698012	0.292842	0.7702
DM3	-0.035748	0.130967	-0.272951	0.7854
C	-19.655779	12.387212	-1.586780	0.1154



Series: Residuals
Sample 3 34
Observations 32

Mean	5.38e-16
Median	0.003088
Maximum	0.054570
Minimum	-0.067060
Std. Dev.	0.029824
Skewness	-0.355630
Kurtosis	2.575782
Jarque-Bera	0.914470
Probability	0.633032

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.907085	Prob. F(2,13)	0.0905
Obs*R-squared	9.889005	Prob. Chi-Square(2)	0.0071

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.577655	Prob. F(16,15)	0.8565
Obs*R-squared	12.20005	Prob. Chi-Square(16)	0.7301
Scaled explained SS	2.112079	Prob. Chi-Square(16)	1.0000

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 06/05/19 Time: 12:09

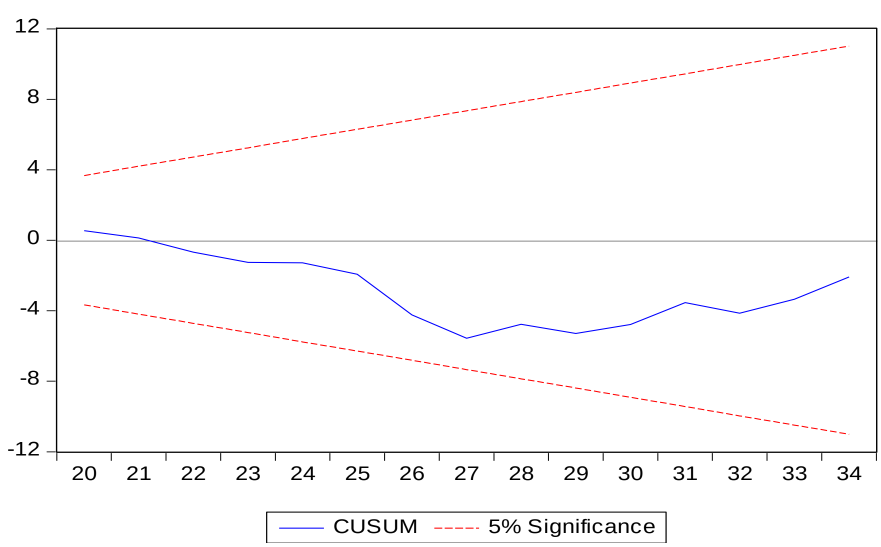
Sample: 3 34

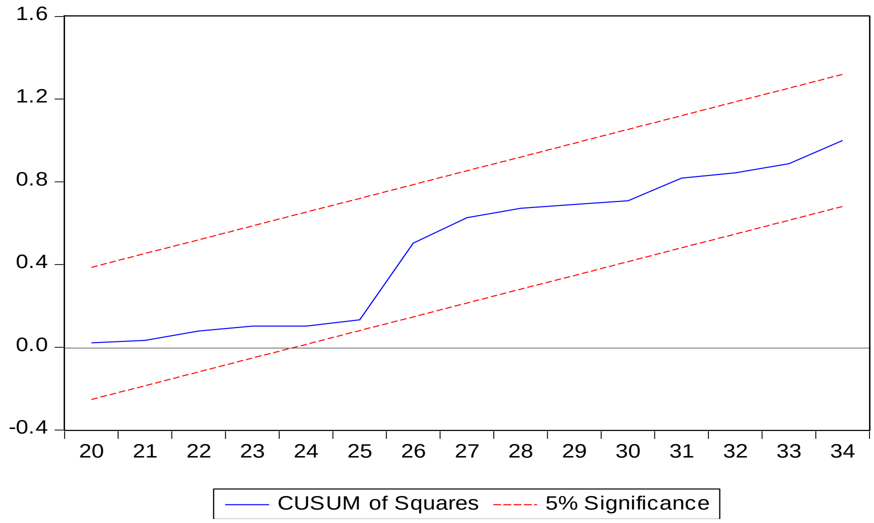
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	0.004525	0.008546	0.529488	0.6042
GROWTH(-1)	0.002939	0.005244	0.560486	0.5834
GROWTH(-2)	-0.001485	0.004621	-0.321358	0.7524
INV	0.000419	0.000412	1.015769	0.3258
MCP	0.001047	0.001902	0.550791	0.5899
MCP(-1)	-7.53E-05	0.000370	-0.203725	0.8413
MCP(-2)	0.000269	0.000364	0.739299	0.4711
ME	-0.004544	0.007907	-0.574679	0.5740
ME(-1)	0.000979	0.002216	0.441725	0.6650
ME(-2)	-0.001384	0.001750	-0.791176	0.4412
POP	0.007804	0.060169	0.129693	0.8985
POP(-1)	-0.008745	0.119683	-0.073067	0.9427
POP(-2)	0.001558	0.062844	0.024790	0.9805
COR	-0.001425	0.003165	-0.450217	0.6590
EDU	0.000232	0.000135	1.726387	0.1048
EDU(-1)	-8.90E-05	0.000161	-0.551810	0.5892
EDU(-2)	-0.000120	0.000166	-0.725360	0.4794

R-squared	0.381252	Mean dependent var	0.000862
Adjusted R-squared	-0.278747	S.D. dependent var	0.001099
S.E. of regression	0.001243	Akaike info criterion	-10.23815
Sum squared resid	2.32E-05	Schwarz criterion	-9.459478
Log likelihood	180.8104	Hannan-Quinn criter.	-9.980042
F-statistic	0.577655	Durbin-Watson stat	2.869114
Prob(F-statistic)	0.856462		





b. Brazil GDP annual

ARDL Bounds Test

Date: 06/05/19 Time: 14:33

Sample: 1986 2017

Included observations: 32

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	3.846919	6

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.12	3.23
5%	2.45	3.61
2.5%	2.75	3.99
1%	3.15	4.43

Test Equation:

Dependent Variable: D(GDP_ANNUAL)

Method: Least Squares

Date: 06/05/19   Time: 14:33

Sample: 1986 2017

Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP_ANNUAL(-1))	0.356256	0.241533	1.474977	0.1596
D(MCP)	3.988336	5.496945	0.725555	0.4786
D(MCP(-1))	0.630954	0.460388	1.370484	0.1895
D(ME)	-19.67963	22.57260	-0.871837	0.3962
D(POP)	257.4628	148.1240	1.738158	0.1014
D(POP(-1))	-247.8078	128.3610	-1.930553	0.0715
D(COR)	-7.795414	9.557716	-0.815615	0.4267
D(EDU)	0.870636	0.327048	2.662101	0.0170
C	-17.02060	21.07612	-0.807577	0.4312
INV(-1)	-0.347686	0.789087	-0.440618	0.6654
MCP(-1)	-3.985500	4.284476	-0.930219	0.3661
ME(-1)	6.363113	17.34894	0.366773	0.7186
POP(-1)	10.77002	7.412278	1.452997	0.1656
COR(-1)	4.722173	7.613263	0.620256	0.5438
EDU(-1)	1.186264	0.468613	2.531439	0.0222
GDP_ANNUAL(-1)	-1.827045	0.406039	-4.499683	0.0004

R-squared	0.734315	Mean dependent var	-0.217806
Adjusted R-squared	0.485236	S.D. dependent var	3.406448
S.E. of regression	2.444027	Akaike info criterion	4.932024
Sum squared resid	95.57229	Schwarz criterion	5.664892
Log likelihood	-62.91239	Hannan-Quinn criter.	5.174949
F-statistic	2.948115	Durbin-Watson stat	2.581034
Prob(F-statistic)	0.019568		

ARDL Cointegrating And Long Run Form

Dependent Variable: GDP_ANNUAL

Selected Model: ARDL(2, 0, 2, 1, 2, 1, 1)

Date: 06/05/19 Time: 14:33

Sample: 1984 2017

Included observations: 32

Cointegrating Form

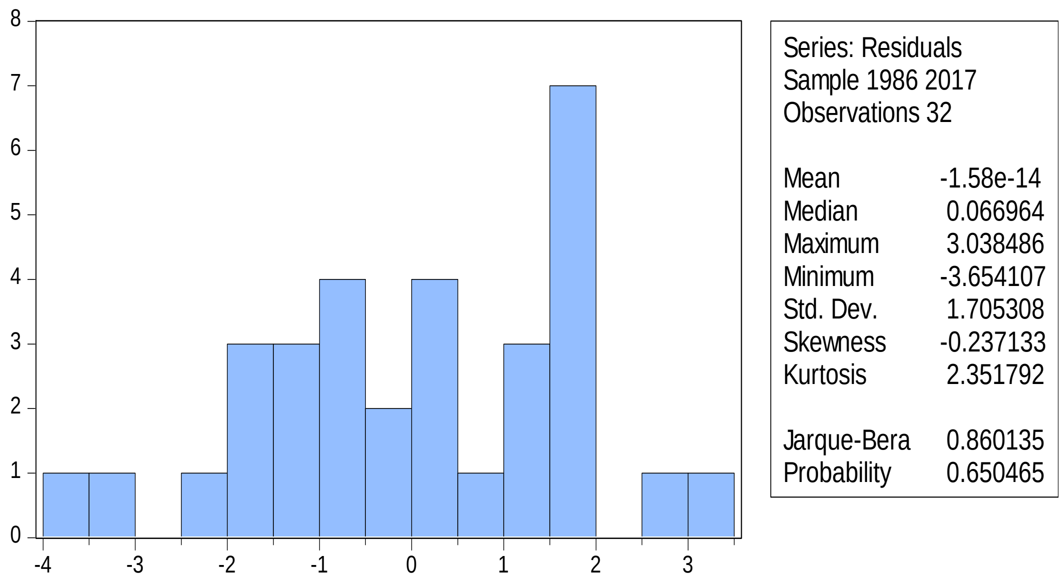
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP_ANNUAL(-1))	0.432578	0.246313	1.756211	0.0982
D(INV)	-0.884247	0.818146	-1.080793	0.2958
D(MCP)	4.032027	4.487563	0.898489	0.3822
D(MCP(-1))	0.920353	0.526001	1.749719	0.0993
D(ME)	-19.530754	17.867877	-1.093065	0.2906
D(POP)	226.219923	120.665019	1.874776	0.0792
D(POP(-1))	-203.063223	116.688142	-1.740222	0.1010
D(COR)	-8.051508	7.718853	-1.043096	0.3124
D(EDU)	0.976612	0.305720	3.194470	0.0056
CointEq(-1)	-2.010631	0.414221	-4.854007	0.0002

Cointeq = GDP_ANNUAL - (-0.4398*INV -2.3132*MCP + 3.9190*ME + 5.6536*POP + 2.7016*COR + 0.6868*EDU -8.5415)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INV	0.439786	0.385249	-1.141563	0.2704
MCP	-2.313193	1.798294	-1.286327	0.2166
ME	3.919048	6.859501	0.571331	0.5757

POP	5.653634	2.188610	2.583207	0.0200
COR	2.701590	3.121041	0.865605	0.3995
EDU	0.686818	0.144785	4.743725	0.0002
C	-8.541479	8.959505	-0.953343	0.3546



Breusch-Godfrey Serial Correlation LM Test:

F-statistic	6.511506	Prob. F(2,14)	0.0100
Obs*R-squared	15.42154	Prob. Chi-Square(2)	0.0004

Test Equation:

Dependent Variable: RESID

Method: ARDL

Date: 06/05/19 Time: 14:35

Sample: 1986 2017

Included observations: 32

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.

GDP_ANNUAL(-1)	0.213282	0.336529	0.633772	0.5364
GDP_ANNUAL(-2)	0.355862	0.221132	1.609271	0.1299
INV	-0.068282	0.655422	-0.104180	0.9185
MCP	-2.332969	3.525978	-0.661652	0.5189
MCP(-1)	2.877637	3.105968	0.926486	0.3699
MCP(-2)	0.503537	0.428327	1.175592	0.2594
ME	7.736816	13.97660	0.553555	0.5886
ME(-1)	-10.64286	11.66559	-0.912329	0.3770
POP	-59.67536	97.61598	-0.611328	0.5508
POP(-1)	99.05510	185.5462	0.533857	0.6018
POP(-2)	-41.75276	92.78235	-0.450008	0.6596
COR	4.273732	6.073064	0.703719	0.4931
COR(-1)	-5.049763	5.196658	-0.971733	0.3477
EDU	0.205085	0.248240	0.826155	0.4226
EDU(-1)	-0.153593	0.351709	-0.436706	0.6690
C	2.820370	13.40258	0.210435	0.8364
RESID(-1)	-0.987576	0.322409	-3.063117	0.0084
RESID(-2)	-0.759827	0.388213	-1.957242	0.0706

R-squared	0.481923	Mean dependent var	-1.58E-14
Adjusted R-squared	-0.147170	S.D. dependent var	1.705308
S.E. of regression	1.826488	Akaike info criterion	4.340989
Sum squared resid	46.70482	Schwarz criterion	5.165465
Log likelihood	-51.45582	Hannan-Quinn criter.	4.614279
F-statistic	0.766060	Durbin-Watson stat	2.106801
Prob(F-statistic)	0.702573		

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.846575	Prob. F(15,16)	0.6242
Obs*R-squared	14.15942	Prob. Chi-Square(15)	0.5135
Scaled explained SS	2.392575	Prob. Chi-Square(15)	0.9999

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

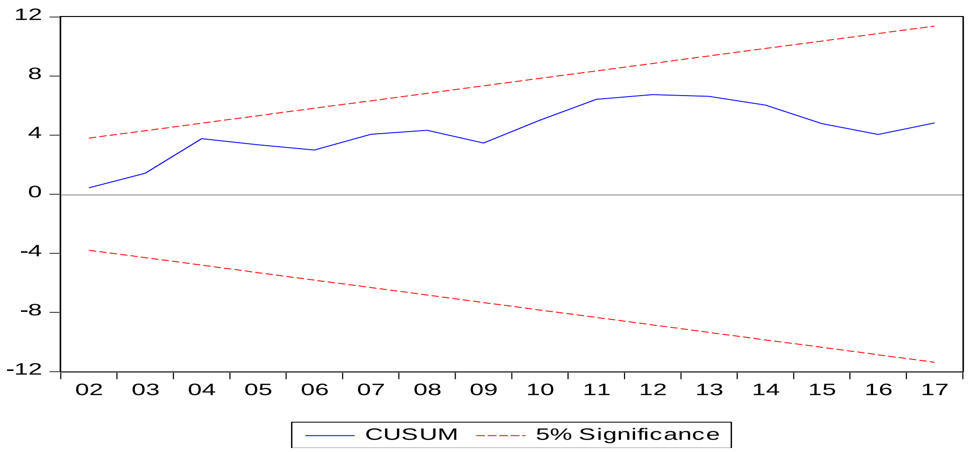
Date: 06/05/19   Time: 14:35

Sample: 1986 2017

Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	24.09748	25.29763	0.952559	0.3550
GDP_ANNUAL(-1)	-0.211587	0.376070	-0.562627	0.5815
GDP_ANNUAL(-2)	0.450132	0.358906	1.254180	0.2278
INV	0.444831	1.192131	0.373139	0.7139
MCP	-9.757700	6.538887	-1.492257	0.1551
MCP(-1)	14.20585	5.603579	2.535138	0.0221
MCP(-2)	0.371098	0.766443	0.484183	0.6348
ME	29.90713	26.03551	1.148705	0.2676
ME(-1)	-49.53277	21.31808	-2.323510	0.0337
POP	70.45337	175.8226	0.400707	0.6939
POP(-1)	-130.4337	337.5437	-0.386420	0.7043
POP(-2)	61.22343	170.0278	0.360079	0.7235
COR	18.36910	11.24724	1.633210	0.1219
COR(-1)	-23.75244	9.410134	-2.524134	0.0226
EDU	0.066945	0.445468	0.150281	0.8824
EDU(-1)	-0.135372	0.500664	-0.270385	0.7903

R-squared	0.442482	Mean dependent var	2.817199
Adjusted R-squared	-0.080191	S.D. dependent var	3.327872
S.E. of regression	3.458732	Akaike info criterion	5.626534
Sum squared resid	191.4053	Schwarz criterion	6.359402
Log likelihood	-74.02455	Hannan-Quinn criter.	5.869459
F-statistic	0.846575	Durbin-Watson stat	2.404958
Prob(F-statistic)	0.624178		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8
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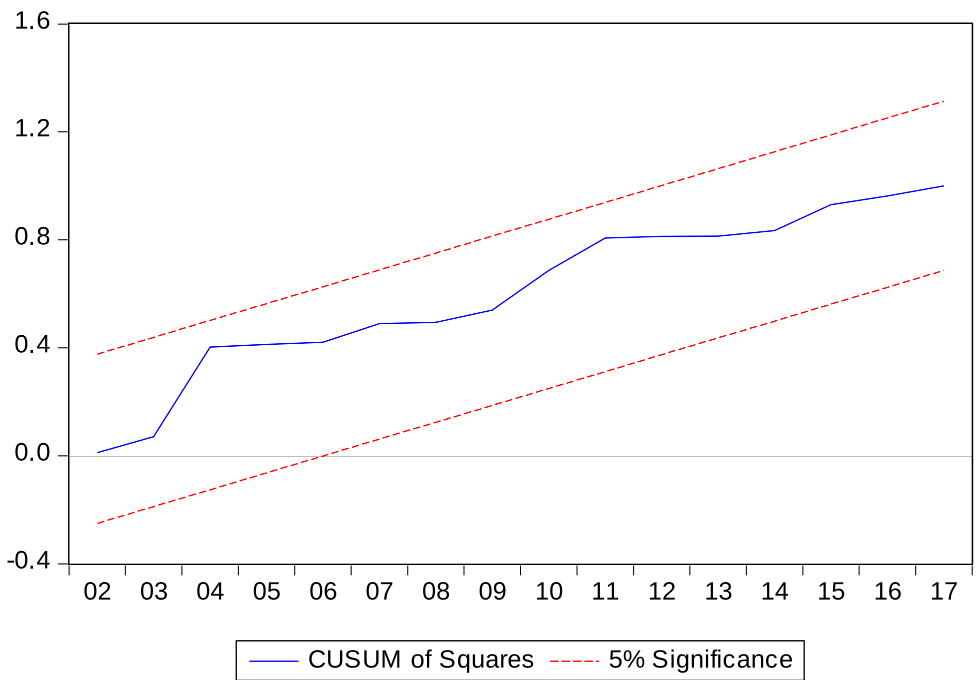
02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17
CUSUM
5% Significance


1.6
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02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17
CUSUM of Squares
5% Significance

c. Brazil Per Captia income PCI

ARDL Bounds Test

Date: 06/05/19   Time: 14:41

Sample: 1986 2017

Included observations: 32

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	3.848883	6

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.12	3.23
5%	2.45	3.61
2.5%	2.75	3.99
1%	3.15	4.43

Test Equation:

Dependent Variable: D(PCI)

Method: Least Squares

Date: 06/05/19   Time: 14:41

Sample: 1986 2017

Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PCI(-1))	0.358557	0.241777	1.483010	0.1575
D(POP)	252.6081	146.0964	1.729051	0.1030
D(POP(-1))	-243.8055	126.5398	-1.926711	0.0720
D(COR)	-7.706164	9.427685	-0.817397	0.4257

D(EDU)	0.863730	0.323077	2.673450	0.0167
D(MCP)	3.946952	5.422164	0.727929	0.4772
D(MCP(-1))	0.621271	0.453669	1.369435	0.1898
D(ME)	-19.43708	22.26528	-0.872977	0.3956
C	-16.84159	20.78730	-0.810187	0.4297
POP(-1)	8.751496	7.039238	1.243245	0.2317
COR(-1)	4.672493	7.509553	0.622207	0.5426
EDU(-1)	1.178087	0.463736	2.540428	0.0218
INV(-1)	-0.349758	0.778186	-0.449453	0.6591
MCP(-1)	-3.935905	4.226480	-0.931249	0.3656
ME(-1)	6.339904	17.11107	0.370515	0.7159
PCI(-1)	-1.829480	0.406520	-4.500345	0.0004

R-squared	0.734380	Mean dependent var	-0.170967
Adjusted R-squared	0.485362	S.D. dependent var	3.360018
S.E. of regression	2.410419	Akaike info criterion	4.904331
Sum squared resid	92.96194	Schwarz criterion	5.637199
Log likelihood	-62.46930	Hannan-Quinn criter.	5.147256
F-statistic	2.949100	Durbin-Watson stat	2.580905
Prob(F-statistic)	0.019539		

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	6.503902	Prob. F(2,14)	0.0101
Obs*R-squared	15.41220	Prob. Chi-Square(2)	0.0005

Test Equation:

Dependent Variable: RESID

Method: ARDL

Date: 06/05/19 Time: 14:43

Sample: 1986 2017

Included observations: 32

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PCI(-1)	0.211178	0.336578	0.627427	0.5405
PCI(-2)	0.353396	0.220951	1.599429	0.1320
POP	-58.39689	96.35842	-0.606038	0.5542
POP(-1)	97.13377	183.2751	0.529989	0.6044
POP(-2)	-40.45649	91.56428	-0.441837	0.6654
COR	4.207308	5.994303	0.701884	0.4943
COR(-1)	-4.984720	5.129140	-0.971843	0.3476
EDU	0.208455	0.245911	0.847685	0.4109
EDU(-1)	-0.150761	0.348555	-0.432531	0.6719
INV	-0.070442	0.646953	-0.108882	0.9148
MCP	-2.293618	3.480083	-0.659070	0.5205
MCP(-1)	2.837332	3.065224	0.925652	0.3703
MCP(-2)	0.492379	0.422013	1.166739	0.2628
ME	7.604169	13.79566	0.551200	0.5902
ME(-1)	-10.50633	11.51437	-0.912453	0.3770
C	2.789428	13.22657	0.210896	0.8360
RESID(-1)	-0.987896	0.322739	-3.060971	0.0085
RESID(-2)	-0.760815	0.388084	-1.960440	0.0702

R-squared	0.481631	Mean dependent var	-9.06E-14
Adjusted R-squared	-0.147816	S.D. dependent var	1.682420
S.E. of regression	1.802481	Akaike info criterion	4.314526
Sum squared resid	45.48511	Schwarz criterion	5.139003
Log likelihood	-51.03242	Hannan-Quinn criter.	4.587817
F-statistic	0.765165	Durbin-Watson stat	2.109200
Prob(F-statistic)	0.703356		

ARDL Cointegrating And Long Run Form

Dependent Variable: PCI

Selected Model: ARDL(2, 2, 1, 1, 0, 2, 1)

Date: 06/05/19 Time: 14:40

Sample: 1984 2017

Included observations: 32

Cointegrating Form

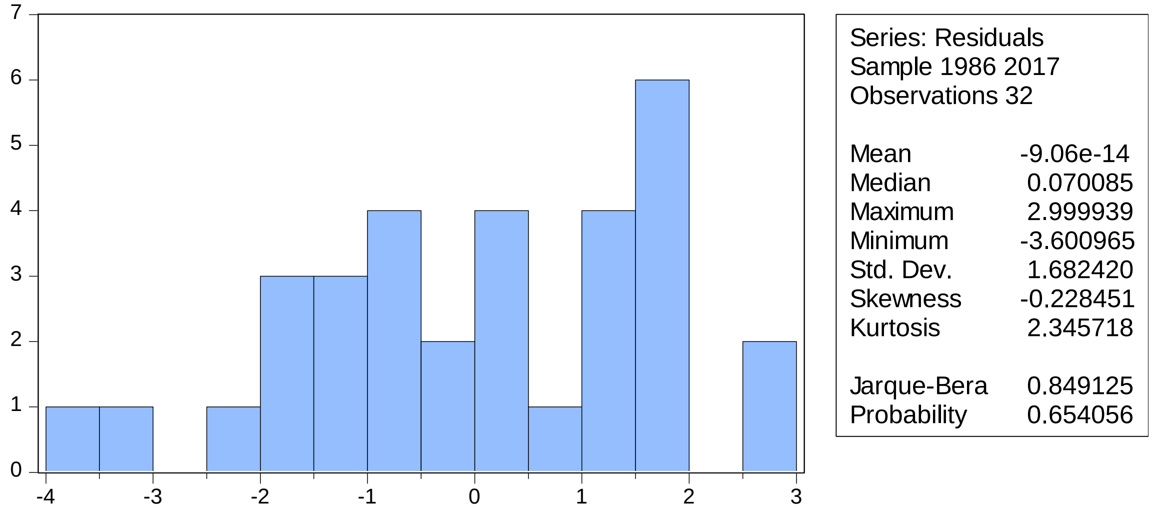
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PCI(-1))	0.434952	0.246709	1.763017	0.0970
D(POP)	222.896702	119.052399	1.872257	0.0796
D(POP(-1))	-200.534720	115.101158	-1.742248	0.1007
D(COR)	-8.015789	7.616042	-1.052487	0.3082
D(EDU)	0.969672	0.302205	3.208658	0.0055
D(INV)	-0.871493	0.807426	-1.079347	0.2964
D(MCP)	4.022663	4.427623	0.908538	0.3771
D(MCP(-1))	0.905854	0.518536	1.746944	0.0998
D(ME)	-19.433362	17.630208	-1.102276	0.2866
CointEq(-1)	-2.014027	0.415035	-4.852672	0.0002

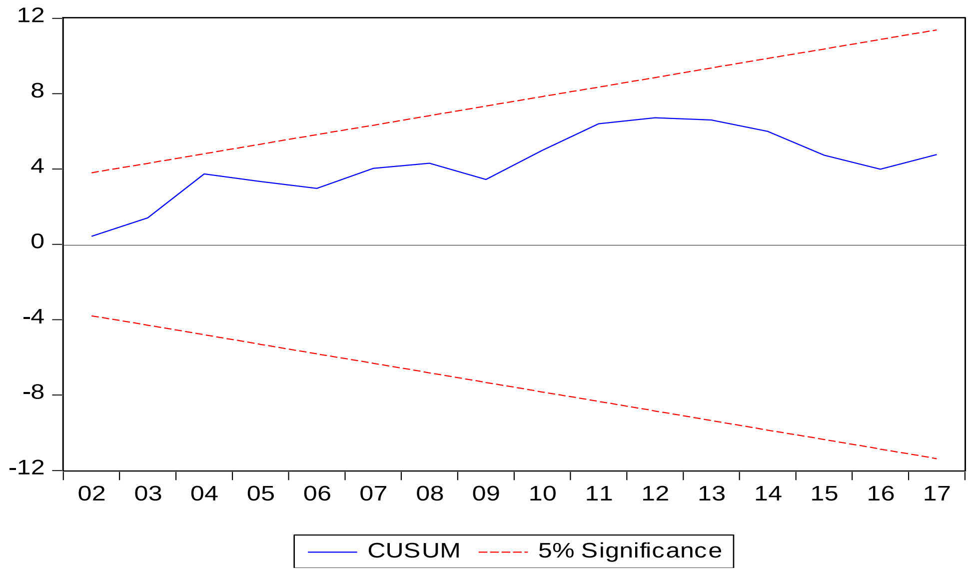
Cointeq = PCI - (4.5694*POP + 2.6423*COR + 0.6812*EDU -0.4327*INV -2.2653*MCP + 3.8319*ME -8.3783)

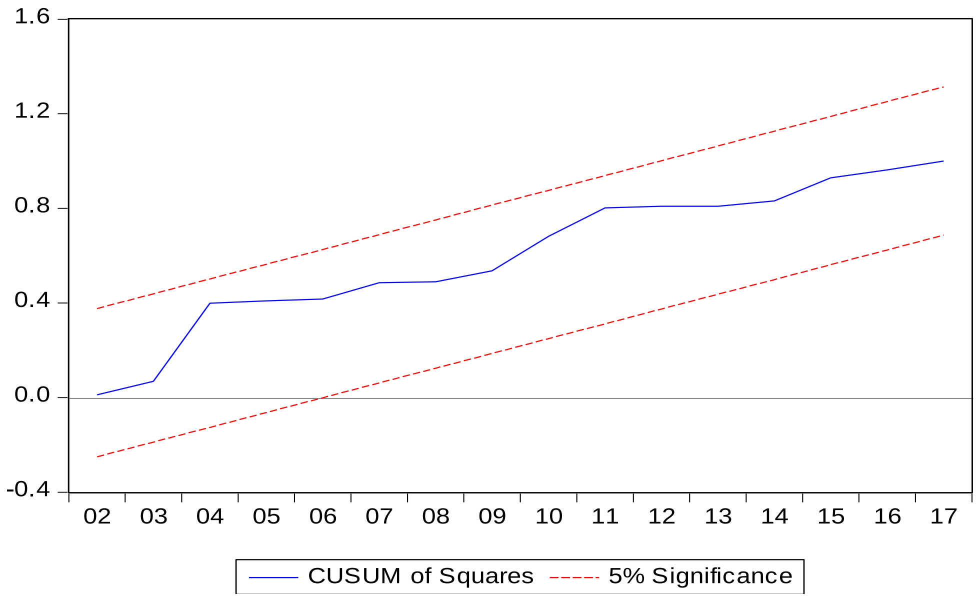
Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
POP	4.569425	2.155026	2.120357	0.0500
COR	2.642287	3.073351	0.859741	0.4026
EDU	0.681247	0.142632	4.776271	0.0002
INV	0.432712	0.379494	-1.140233	0.2710
MCP	-2.265329	1.770904	-1.279194	0.2191
ME	3.831907	6.755082	0.567263	0.5784

C	-8.378257	8.823500	-0.949539	0.3565







2. RUSSIA

a. RUSSIA INCLUSIVE GROWTH

RUSSIA

Descriptive stats

	IGI	INV_GDP	LNPOP	MCP	ME	COR	EDU
Mean	0.528722	1.410135	18.79536	5.927907	3.177122	1.491228	0.981682
Median	0.470000	1.064660	18.79151	6.469227	3.676790	1.541667	0.000000
Maximum	0.850000	4.502704	18.81737	18.13993	5.503756	3.916667	4.101750
Minimum	0.000000	0.000000	18.77655	0.000000	0.000000	0.000000	0.000000
Std. Dev.	0.160974	1.303096	0.014779	4.206297	1.630899	0.977349	1.496762
Skewness	0.675087	0.672921	0.198094	0.448618	-1.184579	-0.071159	1.030929
Kurtosis	3.274095	2.425089	1.448164	3.322691	2.997355	2.515723	2.268296
Jarque-Bera	10.51862	11.86921	14.21526	5.038278	31.10491	1.411900	26.52600
Probability	0.005199	0.002646	0.000819	0.080529	0.000000	0.493639	0.000002
Sum	70.32000	187.5479	2499.783	788.4116	422.5572	198.3333	130.5637
Sum Sq. Dev.	3.420458	224.1438	0.028831	2335.467	351.0978	126.0878	295.7193
Observations	133	133	133	133	133	133	133

Results of Correlation matrix

	IGI	INV_GDP	LNPOP	MCP	ME	COR	EDU
IGI	1.000000	-0.501608	0.061120	-0.606986	-0.763090	-0.696253	-0.358124
INV	-0.501608	1.000000	-0.718095	0.230366	0.402040	0.355910	0.457586

LNPOP	0.061120	-0.718095	1.000000	0.146906	-0.038557	0.085860	-0.373936
MCP	-0.606986	0.230366	0.146906	1.000000	0.762015	0.974468	-0.014894
ME	-0.763090	0.402040	-0.038557	0.762015	1.000000	0.756198	0.223231
COR	-0.696253	0.355910	0.085860	0.974468	0.756198	1.000000	0.058479
EDU	-0.358124	0.457586	-0.373936	-0.014894	0.223231	0.058479	1.000000

Test of seasonal dummy variable effects/ Test for structural breaks /Dummy test

Chow Breakpoint Test: 1999Q1 2005Q1 2011Q1
Null Hypothesis: No breaks at specified breakpoints
Varying regressors: All equation variables
Equation Sample: 1984Q1 2017Q4

F-statistic	39.44823	Prob. F(9,124)	0.0000
Log likelihood ratio	183.8027	Prob. Chi-Square(9)	0.0000
Wald Statistic	355.0341	Prob. Chi-Square(9)	0.0000

LAG ORDER DETERMINATION

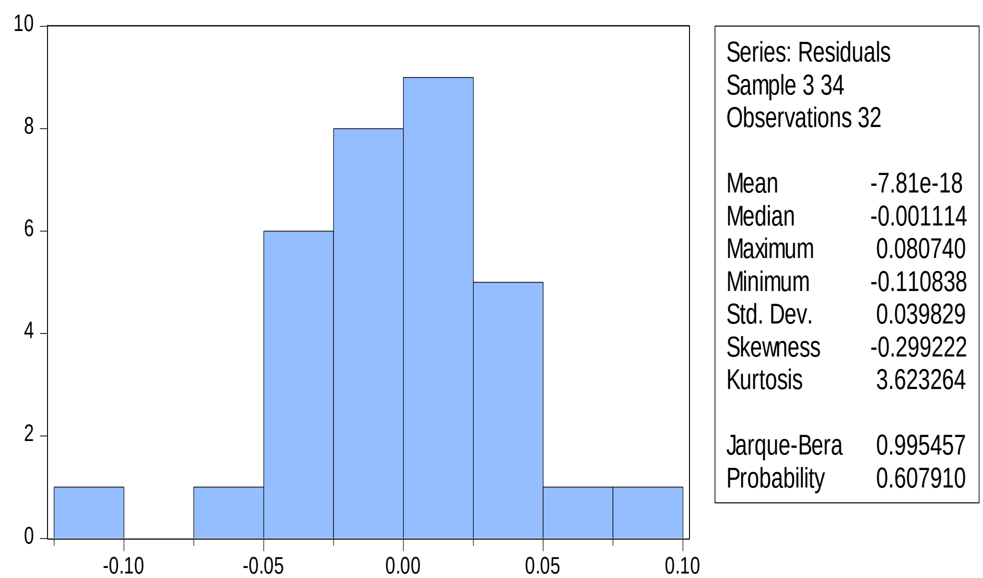
VAR Lag Order Selection Criteria						
Endogenous variables: IGI INV LNPOP MCP ME EDU COR						
Exogenous variables: C						
Date: 04/05/20 Time: 14:55						
Sample: 1984Q1 2017Q4						
Included observations: 128						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-436.1795	NA	2.40e-06	6.924680	7.080650	6.988051
1	439.1586	1641.259	5.93e-12	-5.986853	-4.739090*	-5.479880
2	453.1580	24.71774	1.03e-11	-5.439969	-3.100413	-4.489395
3	481.1258	46.32157	1.46e-11	-5.111340	-1.679991	-3.717165
4	604.3637	190.6337	4.71e-12	-6.271308	-1.748166	-4.433532
5	906.0239	433.6366	9.59e-14*	-10.21912*	-4.604189	-7.937747*
6	921.7713	20.91447	1.75e-13	-9.699552	-2.992824	-6.974574
7	949.8227	34.18762	2.73e-13	-9.372229	-1.573709	-6.203651
8	1025.619	84.08645*	2.11e-13	-9.790921	-0.900607	-6.178741
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						

SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

LR AND SR ESTIMATE

ARDL Cointegrating And Long Run Form				
Dependent Variable: IGI				
Selected Model: ARDL(5, 5, 5, 5, 4, 0, 5)				
Date: 04/05/20 Time: 14:56				
Sample: 1984Q1 2017Q4				
Included observations: 131				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(IGI(-1))	0.373180	0.119693	3.117818	0.0024
D(IGI(-2))	0.373180	0.119693	3.117818	0.0024
D(IGI(-3))	0.373180	0.119693	3.117818	0.0024
D(IGI(-4))	-0.280231	0.204974	-1.367155	0.1748
D(INV)	0.034985	0.012404	2.820486	0.0058
D(INV(-1))	-0.000000	0.016192	-0.000000	1.0000
D(INV(-2))	-0.000000	0.016192	-0.000000	1.0000
D(INV(-3))	0.077331	0.016760	4.614020	0.0000
D(INV(-4))	-0.061977	0.012978	-4.775669	0.0000
D(LNPOP)	51.919968	11.341330	4.577944	0.0000
D(LNPOP(-1))	-0.000001	3.161646	-0.000000	1.0000
D(LNPOP(-2))	-0.000000	3.161646	-0.000000	1.0000
D(LNPOP(-3))	54.222369	10.795661	5.022607	0.0000
D(LNPOP(-4))	-49.983913	10.888990	-4.590317	0.0000
D(MCP)	0.015089	0.011131	1.355612	0.1784
D(MCP(-1))	-0.000000	0.013446	-0.000000	1.0000
D(MCP(-2))	-0.000000	0.013446	-0.000000	1.0000
D(MCP(-3))	-0.065386	0.014305	-4.570892	0.0000
D(MCP(-4))	0.043752	0.010786	4.056340	0.0001
D(ME)	0.009286	0.010435	0.889838	0.3758
D(ME(-1))	0.000000	0.012892	0.000000	1.0000
D(ME(-2))	0.000000	0.012892	0.000000	1.0000
D(ME(-3))	0.033499	0.013047	2.567591	0.0118
D(EDU)	-0.004032	0.004233	-0.952500	0.3433
D(COR)	-0.072505	0.052201	-1.388968	0.1681
D(COR(-1))	0.000000	0.064543	0.000000	1.0000
D(COR(-2))	0.000000	0.064543	0.000000	1.0000
D(COR(-3))	0.310759	0.066639	4.663350	0.0000
D(COR(-4))	-0.198464	0.048472	-4.094399	0.0001
D(DM1)	-0.025305	0.020074	-1.260617	0.2099
D(DM3)	-0.001348	0.021881	-0.061620	0.9510
D(DM2)	-0.006156	0.021657	-0.284242	0.7767
CointEq(-1)	-0.562617	0.147892	-3.804232	0.0003

Cointeq = IGI - (-0.0133*INV -1.4847*LNPOP + 0.0466*MCP -0.0758*ME -0.0072*EDU -0.1836*COR + 28.6939)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
INV	-0.013326	0.016310	-0.817070	0.4159
LNPOP	-1.484741	1.370484	-1.083370	0.2814
MCP	0.046611	0.016168	2.882923	0.0049
ME	-0.075768	0.014771	-5.129629	0.0000
EDU	-0.007166	0.007635	-0.938499	0.3504
COR	-0.183616	0.067333	-2.726995	0.0076
DM3	-0.028388	0.442514	-0.064152	0.9490
DM2	-0.129605	0.407196	-0.318287	0.7508
DM1	-0.532788	0.826167	-0.644892	0.5202
C	28.693929	25.788013	1.112685	0.2687

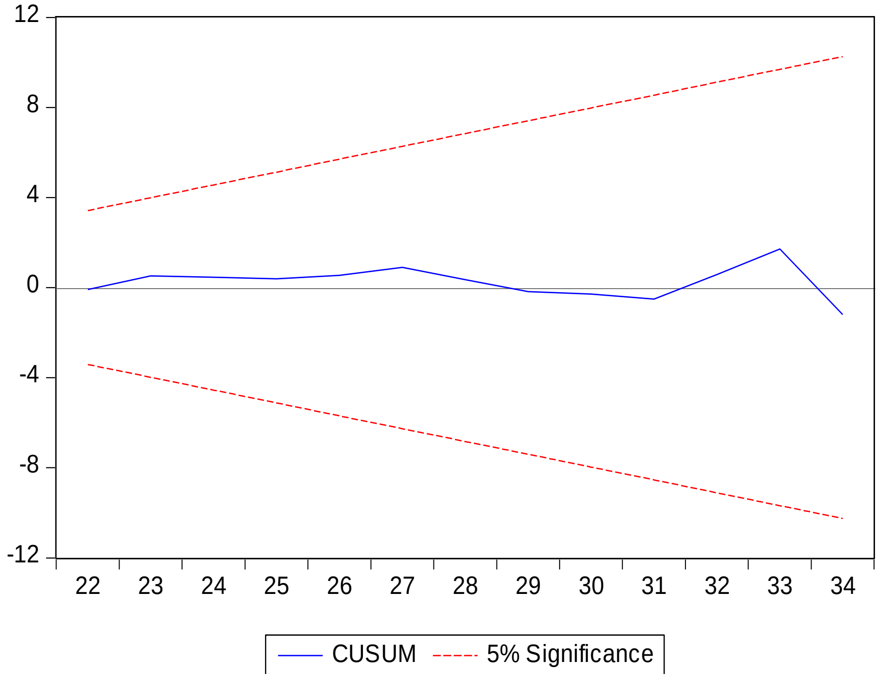


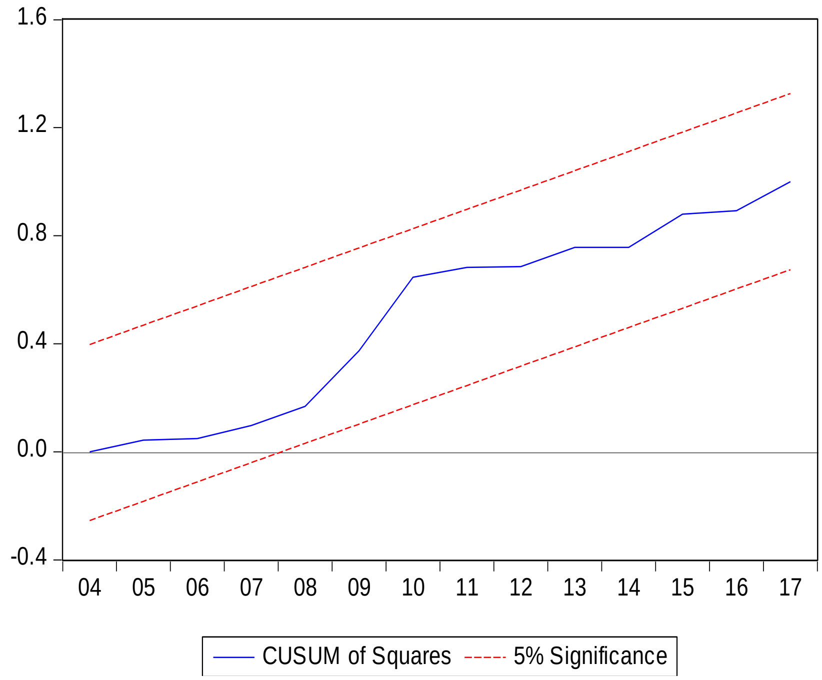
Breusch-Godfrey Serial Correlation LM Test:

F-statistic	4.703732	Prob. F(2,11)	0.0334
Obs*R-squared	14.75141	Prob. Chi-Square(2)	0.0006

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	4.642078	Prob. F(18,13)	0.0036
Obs*R-squared	27.69168	Prob. Chi-Square(18)	0.0669
Scaled explained SS	5.994433	Prob. Chi-Square(18)	0.9962





b. RUSSIA GDP growth annual

ARDL Bounds Test

Date: 06/05/19 Time: 15:21

Sample: 1986 2017

Included observations: 32

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	6.868184	6

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.12	3.23
5%	2.45	3.61
2.5%	2.75	3.99
1%	3.15	4.43

Test Equation:

Dependent Variable: D(GDP_ANNUAL)

Method: Least Squares

Date: 06/05/19 Time: 15:21

Sample: 1986 2017

Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP_ANNUAL(-1))	0.833257	0.237771	3.504454	0.0035
D(MCP)	-1.446846	1.057755	-1.367846	0.1929
D(ME)	-0.659680	0.692759	-0.952250	0.3571
D(ME(-1))	3.496989	1.270741	2.751929	0.0156
D(POP)	29.63277	10.10606	2.932178	0.0109
D(POP(-1))	-11.49768	11.59510	-0.991598	0.3382
D(COR)	-7.076233	4.584790	-1.543415	0.1450
D(COR(-1))	4.070962	1.467909	2.773307	0.0149
D(EDU)	1.161892	0.619187	1.876479	0.0816
D(EDU(-1))	-1.925267	0.509229	-3.780747	0.0020
C	-1.911578	4.806156	-0.397735	0.6968
INV(-1)	0.368640	0.902448	0.408489	0.6891
MCP(-1)	-6.552577	1.346268	-4.867217	0.0002
ME(-1)	4.622229	1.098158	4.209076	0.0009
POP(-1)	4.706717	6.095185	0.772203	0.4528
COR(-1)	15.57460	5.390331	2.889359	0.0119
EDU(-1)	3.901356	1.357031	2.874919	0.0122
GDP_ANNUAL(-1)	-2.105490	0.399804	-5.266304	0.0001

R-squared	0.895271	Mean dependent var	0.048301
Adjusted R-squared	0.768100	S.D. dependent var	5.212764
S.E. of regression	2.510257	Akaike info criterion	4.976969
Sum squared resid	88.21949	Schwarz criterion	5.801446
Log likelihood	-61.63151	Hannan-Quinn criter.	5.250260
F-statistic	7.039907	Durbin-Watson stat	2.686801
Prob(F-statistic)	0.000319		

ARDL Cointegrating And Long Run Form

Dependent Variable: GDP_ANNUAL

Selected Model: ARDL(2, 0, 1, 2, 2, 2, 2)

Date: 06/05/19 Time: 15:20

Sample: 1984 2017

Included observations: 32

Cointegrating Form

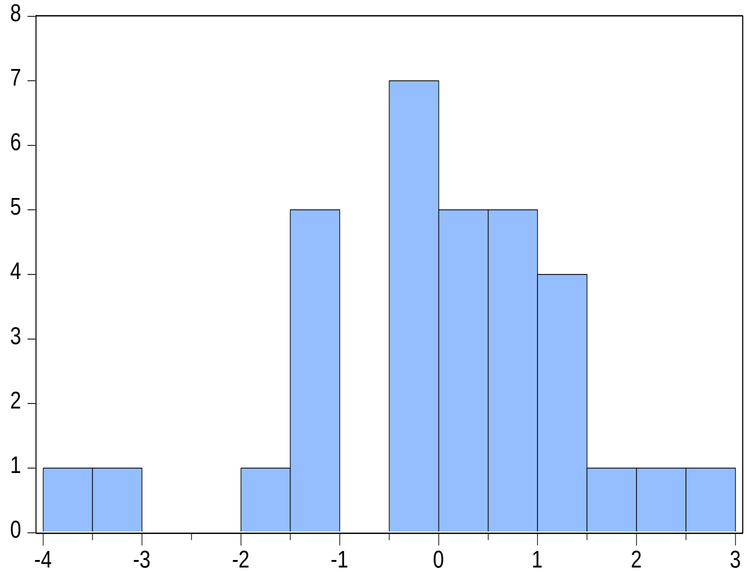
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP_ANNUAL(-1))	0.820626	0.186406	4.402347	0.0006
D(INV)	1.770927	0.695378	2.546710	0.0233
D(MCP)	-0.203676	0.985261	-0.206723	0.8392
D(ME)	-1.032801	0.572253	-1.804796	0.0927
D(ME(-1))	2.642862	1.110528	2.379824	0.0321
D(POP)	23.427671	8.762484	2.673633	0.0182
D(POP(-1))	-17.072167	9.809502	-1.740370	0.1037
D(COR)	-11.642660	4.023390	-2.893744	0.0118
D(COR(-1))	3.065264	1.284514	2.386322	0.0317
D(EDU)	1.162927	0.482424	2.410592	0.0302
D(EDU(-1))	-1.748538	0.420891	-4.154375	0.0010
CointEq(-1)	-2.161112	0.272238	-7.938309	0.0000

Cointeq = GDP_ANNUAL - (0.8195*INV -2.4073*MCP + 1.8337*ME + 1.5914*POP + 4.7348*COR + 1.7433*EDU -0.8069)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INV	0.819451	0.315339	2.598637	0.0210
MCP	-2.407256	0.523994	-4.594048	0.0004

ME	1.833696	0.373000	4.916073	0.0002
POP	1.591407	2.316045	0.687123	0.5032
COR	4.734802	2.196525	2.155587	0.0490
EDU	1.743321	0.441280	3.950597	0.0015
C	-0.806923	1.838800	-0.438831	0.6675



Series: Residuals	
Sample 1986 2017	
Observations 32	
Mean	1.25e-14
Median	0.068528
Maximum	2.533154
Minimum	-3.740578
Std. Dev.	1.402854
Skewness	-0.588041
Kurtosis	3.501980
Jarque-Bera	2.180203
Probability	0.336182

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.242888	Prob. F(2,12)	0.1487
Obs*R-squared	8.707194	Prob. Chi-Square(2)	0.0129

Test Equation:

Dependent Variable: RESID

Method: ARDL

Date: 06/05/19 Time: 15:23

Sample: 1986 2017

Included observations: 32

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP_ANNUAL(-1)	0.083581	0.154870	0.539689	0.5993

GDP_ANNUAL(-2)	0.059999	0.186156	0.322305	0.7528
INV	-0.271245	0.667088	-0.406610	0.6915
MCP	-0.310530	0.936671	-0.331525	0.7460
MCP(-1)	0.085032	0.908301	0.093617	0.9270
ME	0.107583	0.541398	0.198713	0.8458
ME(-1)	0.048137	1.408048	0.034187	0.9733
ME(-2)	-0.050135	1.071218	-0.046802	0.9634
POP	-1.758562	8.245714	-0.213270	0.8347
POP(-1)	2.030085	9.707795	0.209119	0.8379
POP(-2)	2.125090	9.354134	0.227182	0.8241
COR	1.559449	3.803103	0.410046	0.6890
COR(-1)	0.095325	4.280545	0.022269	0.9826
COR(-2)	0.187668	1.246257	0.150585	0.8828
EDU	0.116812	0.447992	0.260745	0.7987
EDU(-1)	0.067948	0.538625	0.126151	0.9017
EDU(-2)	0.040001	0.396091	0.100988	0.9212
C	-1.907279	3.794750	-0.502610	0.6243
RESID(-1)	-0.596963	0.304548	-1.960158	0.0736
RESID(-2)	-0.399734	0.318231	-1.256113	0.2330

R-squared	0.272100	Mean dependent var	1.25E-14
Adjusted R-squared	-0.880409	S.D. dependent var	1.402854
S.E. of regression	1.923706	Akaike info criterion	4.415555
Sum squared resid	44.40773	Schwarz criterion	5.331640
Log likelihood	-50.64888	Hannan-Quinn criter.	4.719211
F-statistic	0.236094	Durbin-Watson stat	2.219801
Prob(F-statistic)	0.997418		

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.482117	Prob. F(17,14)	0.2312
Obs*R-squared	20.57026	Prob. Chi-Square(17)	0.2461
Scaled explained SS	4.925493	Prob. Chi-Square(17)	0.9980

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 06/05/19   Time: 15:23

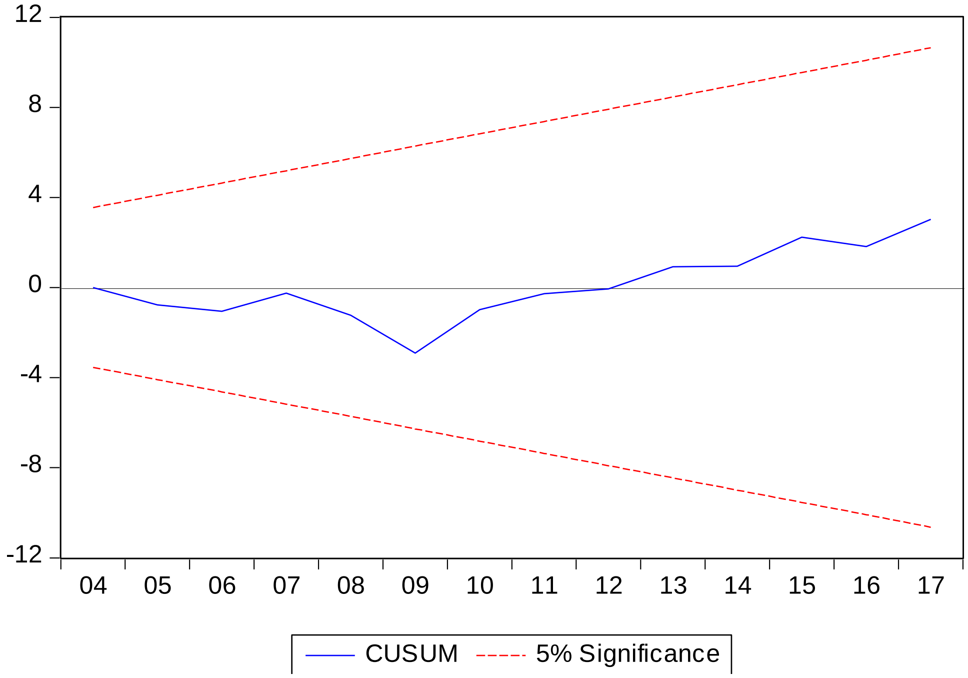
Sample: 1986 2017

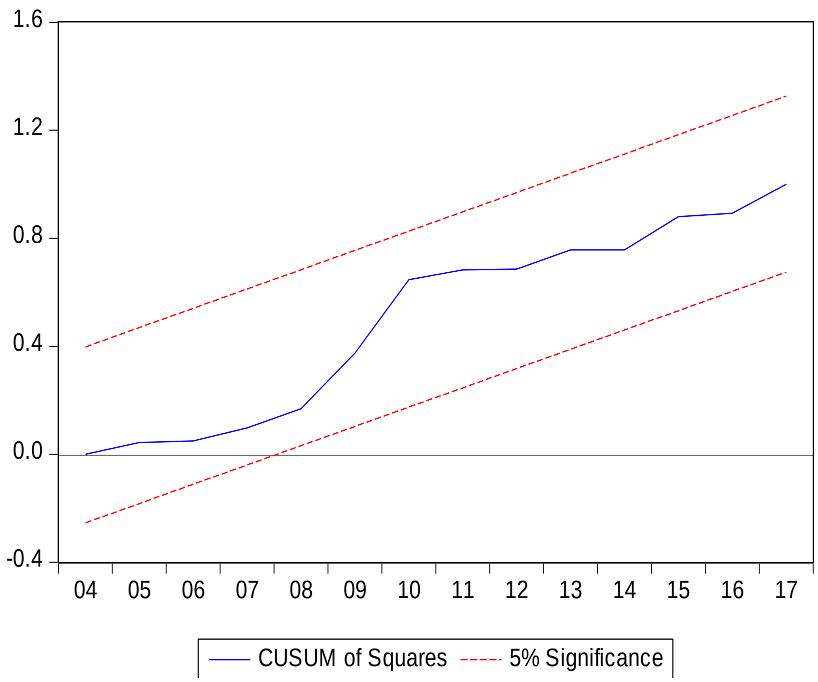
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.171427	5.188115	1.382280	0.1885
GDP_ANNUAL(-1)	0.186146	0.201302	0.924712	0.3708
GDP_ANNUAL(-2)	0.341752	0.243313	1.404579	0.1819
INV	-1.319108	0.907663	-1.453302	0.1682
MCP	0.228501	1.286041	0.177678	0.8615
MCP(-1)	0.738391	1.278957	0.577339	0.5729
ME	-0.291121	0.746951	-0.389746	0.7026
ME(-1)	-3.495772	1.957316	-1.786003	0.0958
ME(-2)	3.503432	1.449550	2.416911	0.0299
POP	-1.307752	11.43749	-0.114339	0.9106
POP(-1)	-0.314174	13.67071	-0.022982	0.9820
POP(-2)	-7.919458	12.80414	-0.618507	0.5462
COR	3.279967	5.251649	0.624559	0.5423
COR(-1)	-7.117062	6.062283	-1.173990	0.2600
COR(-2)	0.227783	1.676650	0.135856	0.8939
EDU	-0.844471	0.629698	-1.341074	0.2012
EDU(-1)	-0.517014	0.750031	-0.689324	0.5019
EDU(-2)	-0.904061	0.549380	-1.645602	0.1221

R-squared	0.642821	Mean dependent var	1.906500
Adjusted R-squared	0.209103	S.D. dependent var	3.063888
S.E. of regression	2.724789	Akaike info criterion	5.140981
Sum squared resid	103.9427	Schwarz criterion	5.965457
Log likelihood	-64.25569	Hannan-Quinn criter.	5.414271
F-statistic	1.482117	Durbin-Watson stat	2.271630

Prob(F-statistic)	0.231209





c. Russia Per capita Income

ARDL Bounds Test

Date: 06/05/19 Time: 15:26

Sample: 1986 2017

Included observations: 32

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	6.817248	6

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.12	3.23
5%	2.45	3.61
2.5%	2.75	3.99
1%	3.15	4.43

Test Equation:

Dependent Variable: D(PCI)

Method: Least Squares

Date: 06/05/19 Time: 15:26

Sample: 1986 2017

Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PCI(-1))	0.866642	0.246449	3.516515	0.0034
D(POP)	29.66817	10.24586	2.895625	0.0117
D(POP(-1))	-10.06354	11.94381	-0.842574	0.4136
D(COR)	-7.139349	4.747075	-1.503947	0.1548

D(COR(-1))	4.184441	1.473111	2.840547	0.0131
D(EDU)	1.314897	0.654523	2.008938	0.0642
D(EDU(-1))	-1.781666	0.525372	-3.391245	0.0044
D(MCP)	-1.436182	1.077383	-1.333028	0.2038
D(ME)	-0.861578	0.720307	-1.196127	0.2515
D(ME(-1))	3.627451	1.294033	2.803213	0.0141
C	-0.090041	4.964918	-0.018135	0.9858
POP(-1)	2.017327	6.284292	0.321011	0.7529
COR(-1)	15.42213	5.548573	2.779477	0.0148
EDU(-1)	4.031059	1.441191	2.797034	0.0143
INV(-1)	0.521039	0.959334	0.543125	0.5956
MCP(-1)	-6.559121	1.378837	-4.756995	0.0003
ME(-1)	4.110294	1.085405	3.786876	0.0020
PCI(-1)	-2.201984	0.426861	-5.158554	0.0001

R-squared	0.889065	Mean dependent var	0.044710
Adjusted R-squared	0.754358	S.D. dependent var	5.224163
S.E. of regression	2.589212	Akaike info criterion	5.038906
Sum squared resid	93.85627	Schwarz criterion	5.863382
Log likelihood	-62.62249	Hannan-Quinn criter.	5.312196
F-statistic	6.600010	Durbin-Watson stat	2.797288
Prob(F-statistic)	0.000457		

ARDL Cointegrating And Long Run Form

Dependent Variable: PCI

Selected Model: ARDL(2, 2, 2, 2, 0, 1, 2)

Date: 06/05/19 Time: 15:26

Sample: 1984 2017

Included observations: 32

Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.

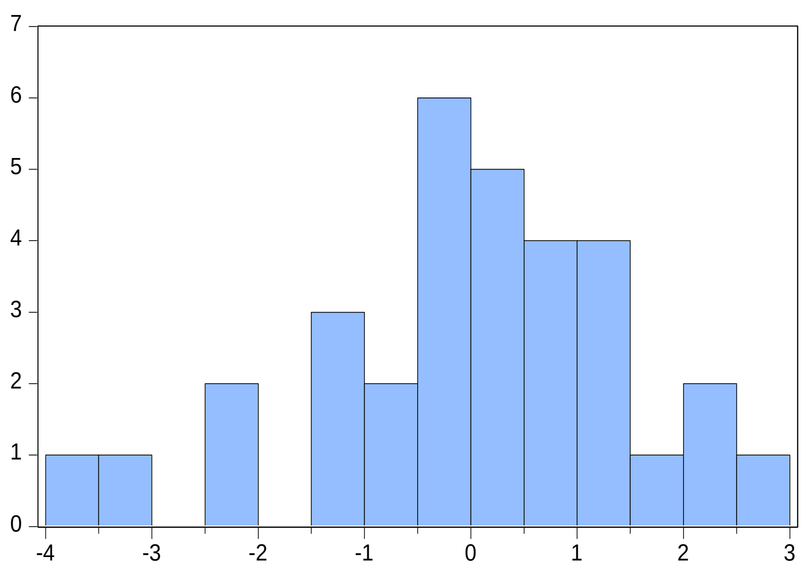
D(PCI(-1))	0.819163	0.192395	4.257715	0.0008
D(POP)	22.950359	9.122592	2.515772	0.0247
D(POP(-1))	-15.477677	10.298075	-1.502968	0.1551
D(COR)	-11.361229	4.212626	-2.696947	0.0174
D(COR(-1))	3.118404	1.327602	2.348899	0.0340
D(EDU)	1.271823	0.511821	2.484899	0.0262
D(EDU(-1))	-1.603120	0.445414	-3.599168	0.0029
D(INV)	1.783435	0.732468	2.434830	0.0289
D(MCP)	-0.226833	1.029263	-0.220384	0.8288
D(ME)	-1.220102	0.601527	-2.028340	0.0620
D(ME(-1))	2.710276	1.160774	2.334886	0.0350
CointEq(-1)	-2.193846	0.283959	-7.725931	0.0000

Cointeq = PCI - (0.3823*POP + 4.7061*COR + 1.7288*EDU + 0.8129*INV

-2.3681*MCP + 1.5576*ME -0.0055)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
POP	0.382257	2.402430	0.159112	0.8759
COR	4.706125	2.267861	2.075139	0.0569
EDU	1.728837	0.458239	3.772781	0.0021
INV	0.812926	0.329111	2.470066	0.0270
MCP	-2.368111	0.541664	-4.371921	0.0006
ME	1.557639	0.386908	4.025865	0.0013
C	-0.005504	1.900650	-0.002896	0.9977



Series: Residuals	
Sample 1986 2017	
Observations 32	
Mean	-7.09e-15
Median	0.073887
Maximum	2.581962
Minimum	-3.906524
Std. Dev.	1.473691
Skewness	-0.575588
Kurtosis	3.355451
Jarque-Bera	1.935405
Probability	0.379955

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	3.072865	Prob. F(2,12)	0.0836
Obs*R-squared	10.83800	Prob. Chi-Square(2)	0.0044

Test Equation:

Dependent Variable: RESID

Method: ARDL

Date: 06/05/19 Time: 15:28

Sample: 1986 2017

Included observations: 32

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PCI(-1)	0.102074	0.156657	0.651577	0.5270
PCI(-2)	0.055809	0.186167	0.299782	0.7695
POP	-0.348269	8.250766	-0.042211	0.9670
POP(-1)	1.464804	9.711872	0.150826	0.8826
POP(-2)	1.462910	9.286478	0.157531	0.8774
COR	1.807573	3.780638	0.478113	0.6412
COR(-1)	0.053496	4.332578	0.012347	0.9904
COR(-2)	0.063837	1.238468	0.051545	0.9597
EDU	0.141371	0.453459	0.311761	0.7606
EDU(-1)	0.038230	0.548395	0.069712	0.9456
EDU(-2)	0.027854	0.402256	0.069246	0.9459
INV	-0.370370	0.671012	-0.551957	0.5911
MCP	-0.386999	0.930607	-0.415856	0.6849
MCP(-1)	0.140257	0.916543	0.153028	0.8809
ME	0.081993	0.538547	0.152248	0.8815
ME(-1)	0.169104	1.397555	0.121000	0.9057
ME(-2)	-0.131821	1.090080	-0.120927	0.9057
C	-1.783947	3.775705	-0.472480	0.6451
RESID(-1)	-0.706057	0.298298	-2.366948	0.0356

RESID(-2)	-0.440365	0.321753	-1.368641	0.1962

R-squared	0.338687	Mean dependent var	-7.09E-15
Adjusted R-squared	-0.708391	S.D. dependent var	1.473691
S.E. of regression	1.926194	Akaike info criterion	4.418140
Sum squared resid	44.52269	Schwarz criterion	5.334225
Log likelihood	-50.69024	Hannan-Quinn criter.	4.721796
F-statistic	0.323459	Durbin-Watson stat	2.240637
Prob(F-statistic)	0.986257		

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.253703	Prob. F(17,14)	0.3382
Obs*R-squared	19.31344	Prob. Chi-Square(17)	0.3108
Scaled explained SS	4.353713	Prob. Chi-Square(17)	0.9991

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 06/05/19 Time: 15:28

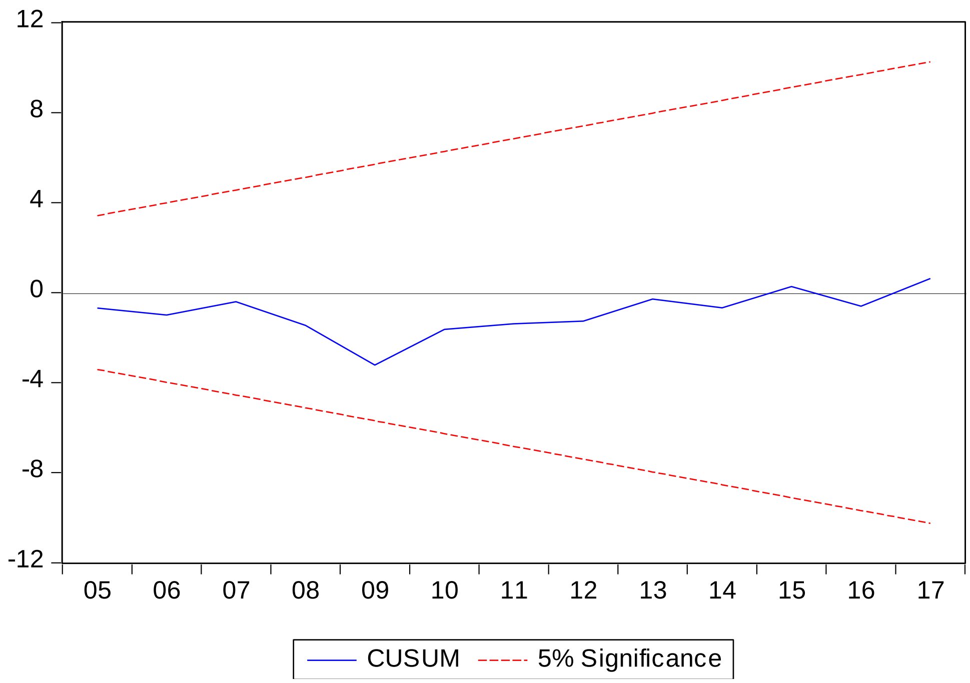
Sample: 1986 2017

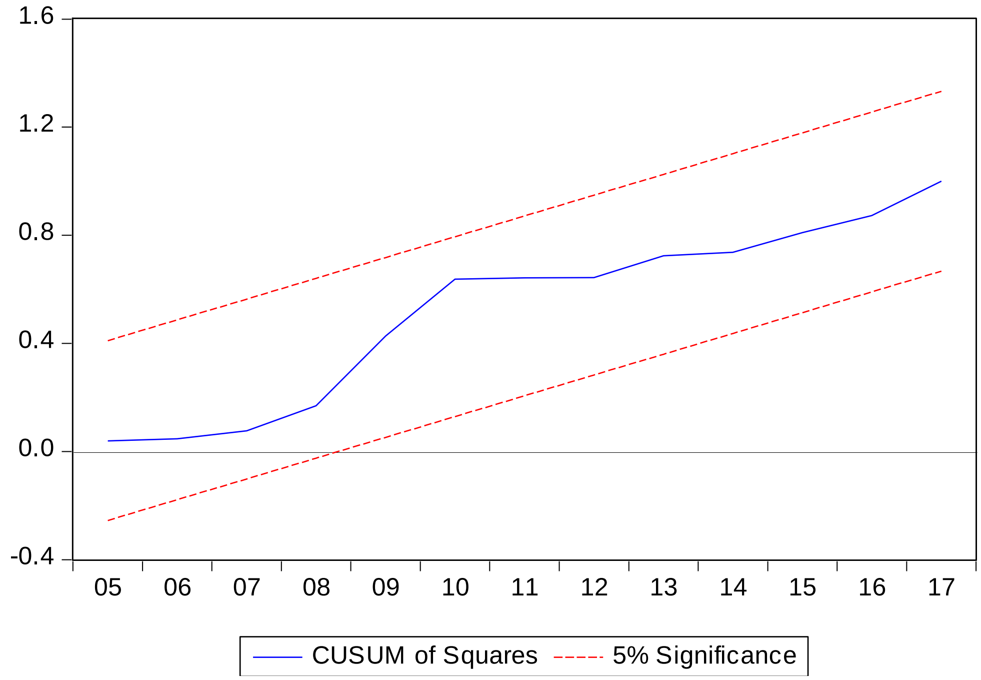
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.376878	5.844624	1.091067	0.2937
PCI(-1)	0.240702	0.228732	1.052333	0.3105
PCI(-2)	0.356783	0.269675	1.323011	0.2070
POP	-2.205338	12.78688	-0.172469	0.8655
POP(-1)	2.202074	15.45117	0.142518	0.8887
POP(-2)	-8.523424	14.43452	-0.590489	0.5643
COR	3.830290	5.904720	0.648683	0.5270
COR(-1)	-7.822247	6.910132	-1.131997	0.2767
COR(-2)	0.034416	1.860863	0.018495	0.9855

EDU	-1.054392	0.717405	-1.469730	0.1637
EDU(-1)	-0.705740	0.857598	-0.822926	0.4243
EDU(-2)	-0.896411	0.624324	-1.435810	0.1730
INV	-1.256082	1.026680	-1.223441	0.2414
MCP	0.064256	1.442689	0.044539	0.9651
MCP(-1)	0.865327	1.454799	0.594809	0.5615
ME	-0.161191	0.843144	-0.191178	0.8511
ME(-1)	-3.242868	2.160599	-1.500911	0.1556
ME(-2)	3.724245	1.627025	2.288991	0.0381

R-squared	0.603545	Mean dependent var	2.103898
Adjusted R-squared	0.122135	S.D. dependent var	3.280619
S.E. of regression	3.073758	Akaike info criterion	5.382000
Sum squared resid	132.2718	Schwarz criterion	6.206477
Log likelihood	-68.11201	Hannan-Quinn criter.	5.655291
F-statistic	1.253703	Durbin-Watson stat	2.367758
Prob(F-statistic)	0.338247		





3. India

a. **India Inclusive growth**

b. INDIA

c. Descriptive Stats

	IGI	INV_GDP	LNPOP	MCP	ME	COR	EDU
Mean	0.327857	0.997913	20.76715	7.310887	2.827267	2.558271	1.433145
Median	0.337500	0.775558	20.78363	6.665849	2.754964	2.500000	0.000000
Maximum	0.650000	3.656951	21.01532	12.69395	4.231318	3.000000	4.475090
Minimum	0.200000	0.009191	20.45440	0.000000	0.000000	1.500000	0.000000
Std. Dev.	0.061860	0.881540	0.165300	2.253869	0.570503	0.413047	1.702982
Skewness	1.162190	0.795619	-0.236739	0.395867	-0.650211	-0.683279	0.503875
Kurtosis	8.694947	2.925656	1.829448	3.665048	8.880433	2.874480	1.455885
Jarque-Bera	209.6698	14.06233	8.835490	5.924773	200.9995	10.43628	18.84083
Probability	0.000000	0.000884	0.012061	0.051695	0.000000	0.005417	0.000081
Sum	43.60500	132.7224	2762.032	972.3479	376.0265	340.2500	190.6083
Sum Sq. Dev.	0.505127	102.5790	3.606795	670.5500	42.96247	22.52019	382.8193
Observations	133	133	133	133	133	133	133

d.

e. Results of Correlation matrix

	IGI	INV_GDP	LNPOP	MCP	ME	COR	EDU
IGI	1.000000	-0.317876	-0.487934	0.249932	0.375010	-0.011816	-0.253453
INV_GDP	-0.317876	1.000000	0.839588	-0.481180	-0.525300	-0.227330	0.243565
LNPOP	-0.487934	0.839588	1.000000	-0.723062	-0.762580	-0.374679	0.438801
MCP	0.249932	-0.481180	-0.723062	1.000000	0.865781	0.755142	-0.162477
ME	0.375010	-0.525300	-0.762580	0.865781	1.000000	0.329932	-0.167215
COR	-0.011816	-0.227330	-0.374679	0.755142	0.329932	1.000000	-0.079843

EDU	-0.253453	0.243565	0.438801	-0.162477	-0.167215	-0.079843	1.000000

f.

g. Test of Seasonal Dummy variable effects/test for structural Breaks /Dummy test

h.

Chow Breakpoint Test: 1991Q1 1999Q3 2012Q1
Null Hypothesis: No breaks at specified breakpoints
Varying regressors: All equation variables
Equation Sample: 1984Q1 2017Q4

F-statistic	6.188124	Prob. F(6,128)	0.0000
Log likelihood ratio	34.63854	Prob. Chi-Square(6)	0.0000
Wald Statistic	37.12875	Prob. Chi-Square(6)	0.0000

i.

j.

k.

l.

m.

n. The ARDL lag Determinants

o.

VAR Lag Order Selection Criteria
Endogenous variables: IGI MCP POP ME INV EDU COR
Exogenous variables: C
Date: 04/07/20 Time: 18:20
Sample: 1984Q1 2017Q4
Included observations: 128

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2792.276	NA	2.33e+10	43.73869	43.89466	43.80206
1	-1781.575	1895.064	6961.263	28.71211	29.95988	29.21909
2	-1770.603	19.37254	12692.08	29.30630	31.64586	30.25687
3	-1747.299	38.59736	19279.22	29.70780	33.13915	31.10197
4	-1360.907	597.6998	102.1987	24.43605	28.95919	26.27383
5	-1057.344	436.3729	2.018589	20.45849	26.07343*	22.73987*
6	-1041.490	21.05549	3.673806	20.97641	27.68313	23.70138
7	-1011.155	36.97128	5.527162	21.26804	29.06656	24.43662
8	-869.8954	156.7094*	1.538346*	19.82649*	28.71680	23.43867

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

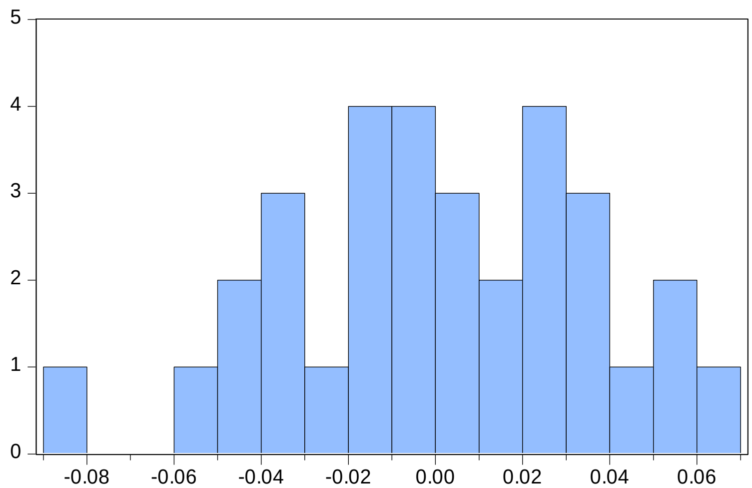
p.

q.

r.
s.
t.
u.
v.
w.
x. LR AND SR
y.

ARDL Cointegrating And Long Run Form				
Dependent Variable: IGI				
Selected Model: ARDL(5, 1, 0, 1, 0, 0, 1)				
Date: 04/05/20 Time: 15:10				
Sample: 1984Q1 2017Q4				
Included observations: 131				
		Cointegrating Form		
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(IGI(-1))	0.036259	0.057597	0.629516	0.5302
D(IGI(-2))	0.036259	0.057597	0.629516	0.5302
D(IGI(-3))	0.036259	0.057597	0.629516	0.5302
D(IGI(-4))	-0.188358	0.061914	-3.042252	0.0029
D(INV)	0.029243	0.009906	2.952070	0.0038
D(LNPOP)	-0.015581	0.043720	-0.356381	0.7222
D(MCP)	-0.000743	0.019287	-0.038509	0.9693
D(ME)	0.037472	0.047722	0.785211	0.4339
D(EDU)	-0.000346	0.001492	-0.232081	0.8169
D(COR)	-0.027625	0.056534	-0.488640	0.6260
D(DM5)	-0.235407	0.057293	-4.108809	0.0001
D(DM4)	-0.172970	0.050908	-3.397678	0.0009
D(DM2)	-0.048646	0.036220	-1.343059	0.1820
D(DM1)	-0.068156	0.025935	-2.627990	0.0098
D(DM3)	-0.128165	0.044444	-2.883756	0.0047
CointEq(-1)	-0.167315	0.056114	-2.981671	0.0035
Cointeq = IGI - (-0.0112*INV -0.0931*LNPOP -0.0781*MCP + 0.2240*ME				
-0.0021*EDU + 0.1625*COR + 1.7904)				
		Long Run Coefficients		
Variable	Coefficient	Std. Error	t-Statistic	Prob.
INV	-0.011186	0.032673	-0.342366	0.7327
LNPOP	-0.093123	0.249701	-0.372939	0.7099
MCP	-0.078073	0.108468	-0.719780	0.4731
ME	0.223959	0.296122	0.756307	0.4510
EDU	-0.002070	0.008993	-0.230191	0.8183

COR	0.162477	0.309549	0.524885	0.6007
DM5	-0.075672	0.036911	-2.050098	0.0427
DM4	-0.020533	0.036073	-0.569207	0.5704
DM2	0.002129	0.038083	0.055901	0.9555
DM1	0.022602	0.041461	0.545138	0.5868
DM3	0.055039	0.041830	1.315765	0.1910
C	1.790409	5.415044	0.330636	0.7415



Series: Residuals
Sample 3 34
Observations 32

Mean	-1.24e-16
Median	6.22e-05
Maximum	0.065167
Minimum	-0.089360
Std. Dev.	0.035084
Skewness	-0.336641
Kurtosis	2.858733
Jarque-Bera	0.631021
Probability	0.729416

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.183257	Prob. F(2,18)	0.8341
Obs*R-squared	0.638578	Prob. Chi-Square(2)	0.7267

Test Equation:

Dependent Variable: RESID

Method: ARDL

Date: 01/04/20 Time: 12:24

Sample: 3 34

Included observations: 32

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GROWTH(-1)	-0.045776	0.308345	-0.148457	0.8836
INV	-0.000985	0.023292	-0.042310	0.9667
INV(-1)	0.004369	0.026466	0.165065	0.8707
INV(-2)	-0.003549	0.024792	-0.143153	0.8878
MCP	-0.000703	0.067067	-0.010475	0.9918
ME	0.002083	0.179797	0.011585	0.9909
POP	0.005031	0.083822	0.060016	0.9528
COR	0.001946	0.195753	0.009940	0.9922
EDU	0.001434	0.006978	0.205560	0.8394
EDU(-1)	-0.000962	0.008261	-0.116463	0.9086
EDU(-2)	0.000618	0.008318	0.074318	0.9416
C	-0.001187	0.527051	-0.002253	0.9982
RESID(-1)	0.114707	0.372968	0.307553	0.7620
RESID(-2)	-0.136366	0.281069	-0.485168	0.6334

R-squared	0.019956	Mean dependent var	-1.24E-16
Adjusted R-squared	-0.687854	S.D. dependent var	0.035084
S.E. of regression	0.045581	Akaike info criterion	-3.039033
Sum squared resid	0.037397	Schwarz criterion	-2.397774
Log likelihood	62.62453	Hannan-Quinn criter.	-2.826474

F-statistic	0.028193	Durbin-Watson stat	1.989821
Prob(F-statistic)	1.000000		

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.522786	Prob. F(11,20)	0.8654
Obs*R-squared	7.146255	Prob. Chi-Square(11)	0.7871
Scaled explained SS	2.594332	Prob. Chi-Square(11)	0.9951

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 06/05/19 Time: 12:25

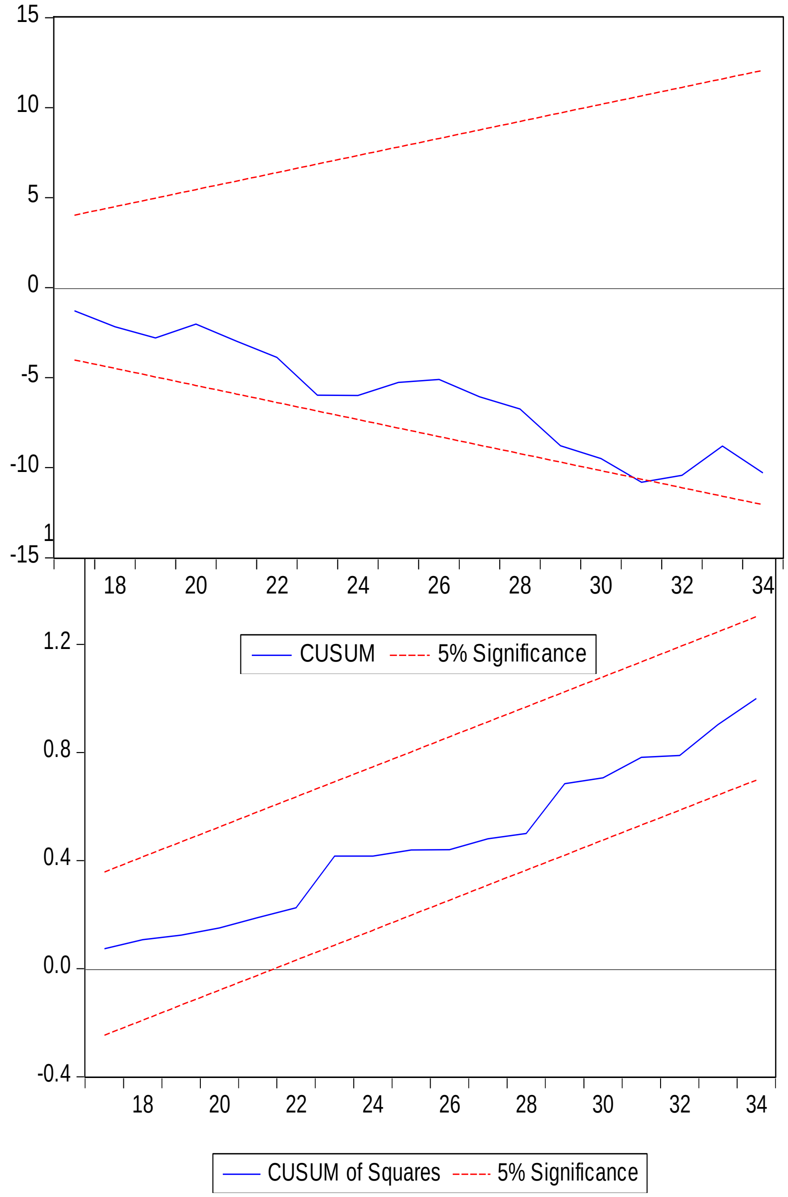
Sample: 3 34

Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.005655	0.020799	-0.271896	0.7885
GROWTH(-1)	-0.012712	0.008191	-1.551943	0.1364
INV	0.000339	0.000923	0.366866	0.7176
INV(-1)	-0.000115	0.000981	-0.116946	0.9081
INV(-2)	-0.000646	0.000942	-0.685197	0.5011
MCP	-0.001445	0.002595	-0.556720	0.5839
ME	0.003520	0.006966	0.505296	0.6189
POP	0.000666	0.003235	0.206017	0.8389
COR	0.004223	0.007623	0.553944	0.5858
EDU	-0.000132	0.000253	-0.520733	0.6083
EDU(-1)	0.000236	0.000317	0.745291	0.4648
EDU(-2)	-0.000115	0.000325	-0.355345	0.7261

R-squared	0.223320	Mean dependent var	0.001192
Adjusted R-squared	-0.203853	S.D. dependent var	0.001652
S.E. of regression	0.001812	Akaike info criterion	-9.508461
Sum squared resid	6.57E-05	Schwarz criterion	-8.958810

Log likelihood	164.1354	Hannan-Quinn criter.	-9.326267
F-statistic	0.522786	Durbin-Watson stat	2.751445
Prob(F-statistic)	0.865439		



z. India GDP growth

ARDL Bounds Test

Date: 06/05/19 Time: 15:33

Sample: 1986 2017

Included observations: 32

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	3.924320	6

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.12	3.23
5%	2.45	3.61
2.5%	2.75	3.99
1%	3.15	4.43

Test Equation:

Dependent Variable: D(GDP_ANNUAL)

Method: Least Squares

Date: 06/05/19 Time: 15:33

Sample: 1986 2017

Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP_ANNUAL(-1))	0.353649	0.196850	1.796543	0.0926
D(INV)	-0.332619	1.000347	-0.332504	0.7441
D(MCP)	2.199832	4.373088	0.503039	0.6222
D(MCP(-1))	-1.944421	0.770012	-2.525181	0.0233
D(ME)	-5.257037	11.01599	-0.477219	0.6401
D(POP)	173.0407	73.80836	2.344459	0.0332
D(COR)	-7.397200	12.35117	-0.598907	0.5582
D(COR(-1))	8.880031	2.464880	3.602622	0.0026
D(EDU)	0.384441	0.259224	1.483048	0.1588
C	81.42053	40.18919	2.025931	0.0609

INV(-1)	3.340151	1.158284	2.883708	0.0114
MCP(-1)	9.912529	5.065102	1.957024	0.0692
ME(-1)	-27.78067	15.19078	-1.828785	0.0874
POP(-1)	6.645485	3.458770	1.921343	0.0739
COR(-1)	-30.09819	14.58961	-2.062989	0.0569
EDU(-1)	0.762788	0.334396	2.281094	0.0376
GDP_ANNUAL(-1)	-1.243786	0.289324	-4.298930	0.0006

R-squared	0.811721	Mean dependent var	0.044590
Adjusted R-squared	0.610890	S.D. dependent var	2.771969
S.E. of regression	1.729118	Akaike info criterion	4.237915
Sum squared resid	44.84775	Schwarz criterion	5.016587
Log likelihood	-50.80663	Hannan-Quinn criter.	4.496022
F-statistic	4.041807	Durbin-Watson stat	2.907862
Prob(F-statistic)	0.004890		

ARDL Cointegrating And Long Run Form

Dependent Variable: GDP_ANNUAL

Selected Model: ARDL(2, 1, 2, 1, 1, 2, 1)

Date: 06/05/19 Time: 15:33

Sample: 1984 2017

Included observations: 32

Cointegrating Form

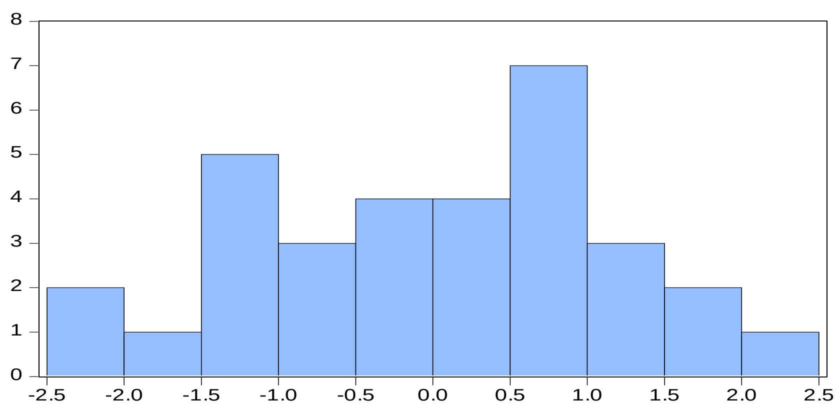
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP_ANNUAL(-1))	0.353649	0.196850	1.796543	0.0926
D(INV)	-0.332619	1.000347	-0.332504	0.7441
D(MCP)	2.199832	4.373088	0.503039	0.6222
D(MCP(-1))	-1.944421	0.770012	-2.525181	0.0233
D(ME)	-5.257037	11.015992	-0.477219	0.6401
D(POP)	173.040679	73.808361	2.344459	0.0332
D(COR)	-7.397200	12.351172	-0.598907	0.5582

D(COR(-1))	8.880031	2.464880	3.602622	0.0026
D(EDU)	0.384441	0.259224	1.483048	0.1588
CointEq(-1)	-1.243786	0.289324	-4.298930	0.0006

Cointeq = GDP_ANNUAL - (2.6855*INV + 7.9696*MCP -22.3356*ME + 5.3430*POP -24.1989*COR + 0.6133*EDU + 65.4619)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INV	2.685472	0.915955	2.931882	0.0103
MCP	7.969644	4.457542	1.787901	0.0940
ME	-22.335575	13.154600	-1.697929	0.1102
POP	5.342951	2.920733	1.829318	0.0873
COR	-24.198858	13.054565	-1.853670	0.0836
EDU	0.613279	0.268873	2.280923	0.0376
C	65.461868	35.369608	1.850794	0.0840



Series: Residuals	
Sample 1986 2017	
Observations 32	
Mean	-8.88e-16
Median	0.092536
Maximum	2.308128
Minimum	-2.408236
Std. Dev.	1.202789
Skewness	-0.057921
Kurtosis	2.248025
Jarque-Bera	0.771847
Probability	0.679823

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	12.17440	Prob. F(2,13)	0.0010
Obs*R-squared	20.86176	Prob. Chi-Square(2)	0.0000

Test Equation:

Dependent Variable: RESID

Method: ARDL

Date: 01/04/20 Time: 15:35

Sample: 1986 2017

Included observations: 32

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP_ANNUAL(-1)	0.484270	0.163768	2.957053	0.0111
GDP_ANNUAL(-2)	0.432220	0.172805	2.501192	0.0265
INV	-1.155400	0.682497	-1.692900	0.1143
INV(-1)	0.109809	0.672672	0.163242	0.8728
MCP	3.217268	2.847620	1.129809	0.2790
MCP(-1)	-1.495277	3.397187	-0.440152	0.6671
MCP(-2)	0.387204	0.494253	0.783414	0.4474
ME	-7.318436	7.139046	-1.025128	0.3240
ME(-1)	1.943986	9.404070	0.206718	0.8394
POP	-4.496768	46.78379	-0.096118	0.9249
POP(-1)	3.766170	45.91888	0.082018	0.9359
COR	-7.874757	7.994838	-0.984980	0.3426
COR(-1)	3.594649	9.370025	0.383633	0.7075
COR(-2)	-1.540561	1.612115	-0.955615	0.3567
EDU	0.094044	0.165739	0.567422	0.5801
EDU(-1)	-0.267278	0.193808	-1.379089	0.1911
C	11.40336	26.22868	0.434767	0.6709
RESID(-1)	-1.415150	0.286790	-4.934444	0.0003
RESID(-2)	-0.737240	0.296585	-2.485767	0.0273

R-squared	0.651930	Mean dependent var	-8.88E-16
Adjusted R-squared	0.169987	S.D. dependent var	1.202789
S.E. of regression	1.095802	Akaike info criterion	3.307563
Sum squared resid	15.61016	Schwarz criterion	4.177844
Log likelihood	-33.92101	Hannan-Quinn criter.	3.596037
F-statistic	1.352711	Durbin-Watson stat	2.425682
Prob(F-statistic)	0.293264		

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.245096	Prob. F(16,15)	0.3380
Obs*R-squared	18.25490	Prob. Chi-Square(16)	0.3092
Scaled explained SS	2.502969	Prob. Chi-Square(16)	1.0000

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 06/05/19 Time: 15:36

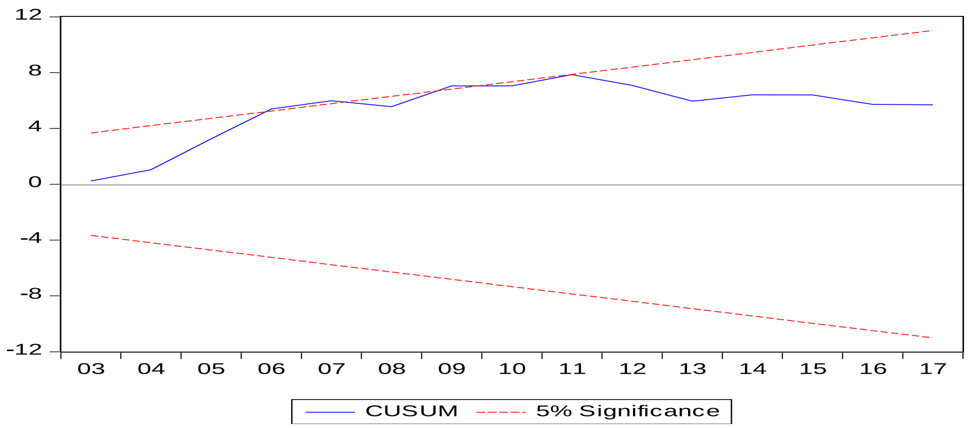
Sample: 1986 2017

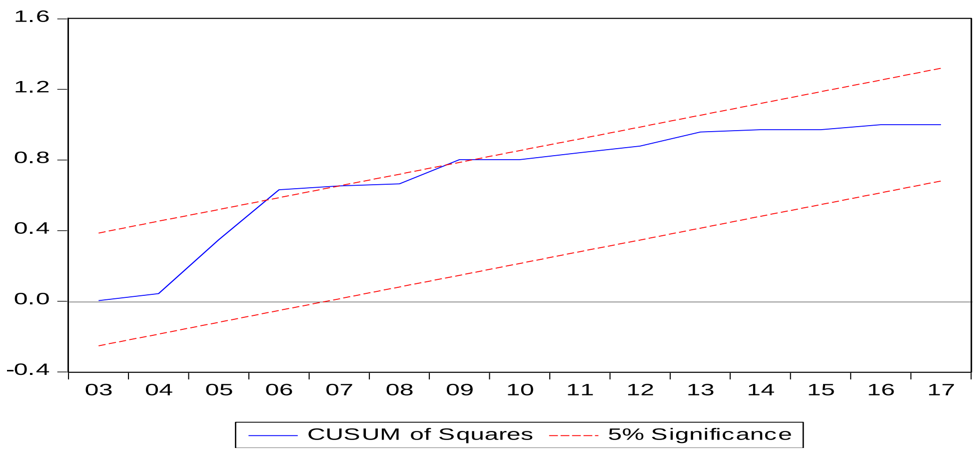
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-66.17885	34.83496	-1.899783	0.0769
GDP_ANNUAL(-1)	0.035772	0.163625	0.218624	0.8299
GDP_ANNUAL(-2)	0.003594	0.170625	0.021065	0.9835
INV	0.133032	0.867075	0.153427	0.8801
INV(-1)	-1.165917	0.899325	-1.296437	0.2144
MCP	-1.308239	3.790480	-0.345138	0.7348
MCP(-1)	-7.040080	4.532550	-1.553227	0.1412
MCP(-2)	0.225542	0.667427	0.337928	0.7401
ME	3.413382	9.548379	0.357483	0.7257
ME(-1)	20.23877	12.54369	1.613462	0.1275
POP	-8.702638	63.97519	-0.136031	0.8936
POP(-1)	6.217659	62.79542	0.099015	0.9224

COR	3.954150	10.70568	0.369351	0.7170
COR(-1)	20.42034	12.60126	1.620500	0.1260
COR(-2)	0.734392	2.136495	0.343737	0.7358
EDU	0.352026	0.224688	1.566733	0.1380
EDU(-1)	-0.084754	0.254462	-0.333072	0.7437

R-squared	0.570466	Mean dependent var	1.401492
Adjusted R-squared	0.112296	S.D. dependent var	1.590730
S.E. of regression	1.498755	Akaike info criterion	3.951961
Sum squared resid	33.69402	Schwarz criterion	4.730634
Log likelihood	-46.23138	Hannan-Quinn criter.	4.210069
F-statistic	1.245096	Durbin-Watson stat	1.984760
Prob(F-statistic)	0.337984		





aa. India Per capita Income

ARDL Bounds Test

Date: 01/04/20 Time: 18:06

Sample: 1986 2017

Included observations: 32

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	3.928960	6

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.12	3.23
5%	2.45	3.61
2.5%	2.75	3.99
1%	3.15	4.43

Test Equation:

Dependent Variable: D(PCI)

Method: Least Squares

Date: 01/04/20 Time: 18:06

Sample: 1986 2017

Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PCI(-1))	0.353662	0.196548	1.799365	0.0921
D(COR)	-7.288249	12.12100	-0.601291	0.5566

D(COR(-1))	8.719758	2.419487	3.603969	0.0026
D(EDU)	0.376975	0.254430	1.481646	0.1591
D(INV)	-0.331696	0.982099	-0.337742	0.7402
D(MCP)	2.167648	4.291553	0.505096	0.6208
D(MCP(-1))	-1.907347	0.755891	-2.523308	0.0234
D(ME)	-5.181848	10.81077	-0.479323	0.6386
D(POP)	169.4815	72.46298	2.338870	0.0336
C	80.08193	39.45254	2.029829	0.0605
COR(-1)	-29.57210	14.32144	-2.064882	0.0567
EDU(-1)	0.749136	0.328147	2.282928	0.0374
INV(-1)	3.285193	1.137168	2.888925	0.0112
MCP(-1)	9.736591	4.972165	1.958220	0.0691
ME(-1)	-27.28167	14.91253	-1.829447	0.0873
POP(-1)	5.237954	3.376864	1.551130	0.1417
PCI(-1)	-1.242356	0.288856	-4.300952	0.0006

R-squared	0.811955	Mean dependent var	0.080535
Adjusted R-squared	0.611373	S.D. dependent var	2.722695
S.E. of regression	1.697326	Akaike info criterion	4.200799
Sum squared resid	43.21372	Schwarz criterion	4.979471
Log likelihood	-50.21279	Hannan-Quinn criter.	4.458907
F-statistic	4.048006	Durbin-Watson stat	2.907631
Prob(F-statistic)	0.004852		

ARDL Cointegrating And Long Run Form

Dependent Variable: PCI

Selected Model: ARDL(2, 2, 1, 1, 2, 1, 1)

Date: 01/04/20   Time: 18:06

Sample: 1984 2017

Included observations: 32

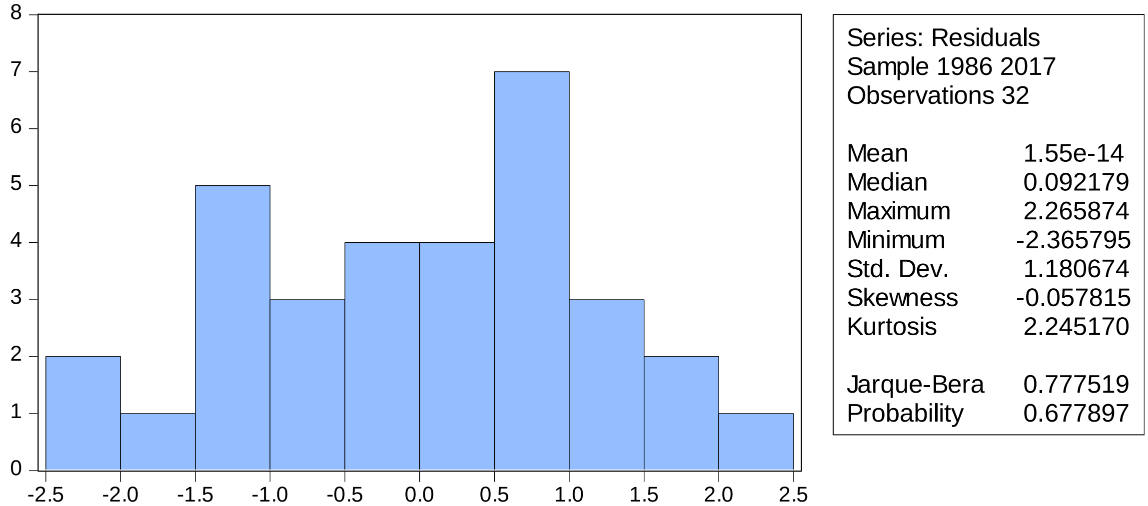
Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PCI(-1))	0.353662	0.196548	1.799365	0.0921
D(COR)	-7.288249	12.120998	-0.601291	0.5566
D(COR(-1))	8.719758	2.419487	3.603969	0.0026
D(EDU)	0.376975	0.254430	1.481646	0.1591
D(INV)	-0.331696	0.982099	-0.337742	0.7402
D(MCP)	2.167648	4.291553	0.505096	0.6208
D(MCP(-1))	-1.907347	0.755891	-2.523308	0.0234
D(ME)	-5.181848	10.810768	-0.479323	0.6386
D(POP)	169.481480	72.462983	2.338870	0.0336
CointEq(-1)	-1.242356	0.288856	-4.300952	0.0006

Cointeq = PCI - (-23.8032*COR + 0.6030*EDU + 2.6443*INV + 7.8372*MCP -21.9596*ME + 4.2161*POP + 64.4597)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
COR	-23.803245	12.823083	-1.856281	0.0832
EDU	0.602996	0.264320	2.281309	0.0376
INV	2.644325	0.900498	2.936513	0.0102
MCP	7.837201	4.378322	1.790001	0.0937
ME	-21.959629	12.921385	-1.699480	0.1099
POP	4.216146	2.871146	1.468454	0.1626
C	64.459739	34.741906	1.855389	0.0833



Breusch-Godfrey Serial Correlation LM Test:

F-statistic	12.11840	Prob. F(2,13)	0.0011
Obs*R-squared	20.82826	Prob. Chi-Square(2)	0.0000

Test Equation:

Dependent Variable: RESID

Method: ARDL

Date: 06/05/19 Time: 18:07

Sample: 1986 2017

Included observations: 32

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PCI(-1)	0.482162	0.163712	2.945185	0.0114
PCI(-2)	0.430487	0.172710	2.492548	0.0270
COR	-7.680988	7.855737	-0.977755	0.3460
COR(-1)	3.501097	9.212964	0.380019	0.7101
COR(-2)	-1.508997	1.584564	-0.952311	0.3583
EDU	0.090224	0.162857	0.554007	0.5890
EDU(-1)	-0.261508	0.190464	-1.373004	0.1930
INV	-1.131904	0.670934	-1.687058	0.1154
INV(-1)	0.105138	0.661628	0.158909	0.8762

MCP	3.141310	2.798063	1.122673	0.2819
MCP(-1)	-1.457364	3.340265	-0.436302	0.6698
MCP(-2)	0.379825	0.485919	0.781664	0.4484
ME	-7.139728	7.014922	-1.017791	0.3273
ME(-1)	1.875083	9.246450	0.202790	0.8424
POP	-4.999603	46.00269	-0.108681	0.9151
POP(-1)	5.229001	45.15961	0.115789	0.9096
C	11.08737	25.78398	0.430010	0.6742
RESID(-1)	-1.412663	0.286946	-4.923087	0.0003
RESID(-2)	-0.736841	0.296861	-2.482112	0.0275

R-squared	0.650883	Mean dependent var	1.55E-14
Adjusted R-squared	0.167490	S.D. dependent var	1.180674
S.E. of regression	1.077270	Akaike info criterion	3.273451
Sum squared resid	15.08664	Schwarz criterion	4.143731
Log likelihood	-33.37521	Hannan-Quinn criter.	3.561924
F-statistic	1.346489	Durbin-Watson stat	2.426106
Prob(F-statistic)	0.296239		

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.243982	Prob. F(16,15)	0.3386
Obs*R-squared	18.24788	Prob. Chi-Square(16)	0.3096
Scaled explained SS	2.496282	Prob. Chi-Square(16)	1.0000

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 06/05/19   Time: 18:08

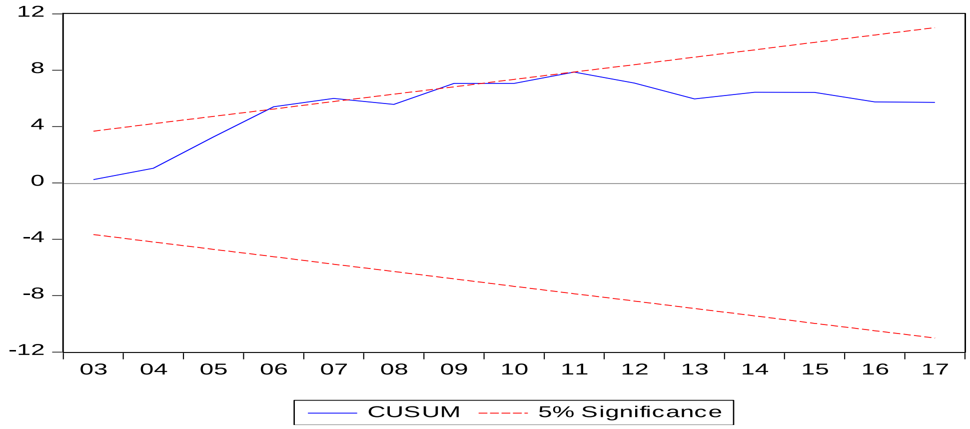
Sample: 1986 2017

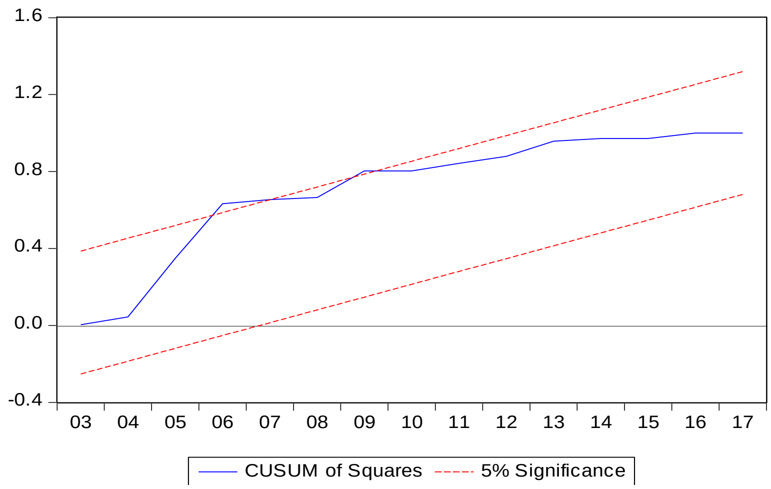
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	-63.46359	33.53782	-1.892299	0.0779
PCI(-1)	0.034780	0.160340	0.216911	0.8312
PCI(-2)	0.001513	0.167082	0.009055	0.9929
COR	3.865326	10.30382	0.375135	0.7128
COR(-1)	19.50935	12.13292	1.607969	0.1287
COR(-2)	0.722284	2.056758	0.351176	0.7303
EDU	0.340079	0.216286	1.572359	0.1367
EDU(-1)	-0.081970	0.244939	-0.334653	0.7425
INV	0.134595	0.834863	0.161218	0.8741
INV(-1)	-1.124987	0.865957	-1.299126	0.2135
MCP	-1.284889	3.648164	-0.352202	0.7296
MCP(-1)	-6.716734	4.364086	-1.539093	0.1446
MCP(-2)	0.209673	0.642568	0.326305	0.7487
ME	3.347276	9.190019	0.364229	0.7208
ME(-1)	19.32467	12.07722	1.600092	0.1304
POP	-8.399055	61.59934	-0.136350	0.8934
POP(-1)	6.060024	60.46710	0.100220	0.9215

R-squared	0.570246	Mean dependent var	1.350429
Adjusted R-squared	0.111842	S.D. dependent var	1.531017
S.E. of regression	1.442863	Akaike info criterion	3.875950
Sum squared resid	31.22780	Schwarz criterion	4.654622
Log likelihood	-45.01520	Hannan-Quinn criter.	4.134058
F-statistic	1.243982	Durbin-Watson stat	1.984726
Prob(F-statistic)	0.338614		





4. China

a. China Inclusive growth

CHINA

Descriptive stats

	IGI	INV_GDP	LNPOP	MCP	ME	COR	EDU
Mean	0.540263	3.042429	20.93908	4.665568	1.846692	2.619048	0.650017
Median	0.480000	3.484582	20.96011	3.925372	1.925132	2.000000	0.000000
Maximum	0.880000	6.186882	21.04997	9.973033	2.493258	4.500000	2.061550
Minimum	0.270000	0.483946	20.75943	0.000000	0.000000	1.000000	0.000000
Std. Dev.	0.156623	1.525980	0.082589	2.450955	0.560644	1.031335	0.848356
Skewness	1.014274	-0.141696	-0.593894	0.461273	-2.351036	0.464315	0.659472
Kurtosis	2.738695	2.089655	2.192380	2.924262	8.458567	1.860938	1.571700
Jarque-Bera	23.18239	5.037596	11.43297	4.748247	287.6425	11.96898	20.94559
Probability	0.000009	0.080556	0.003291	0.093096	0.000000	0.002517	0.000028
Sum	71.85500	404.6430	2784.898	620.5205	245.6101	348.3333	86.45225
Sum Sq. Dev.	3.238053	307.3771	0.900356	792.9476	41.49040	140.4020	95.00152
Observations	133	133	133	133	133	133	133

Results of Correlation matrix

	IGI	INV_GDP	LNPOP	MCP	ME	COR	EDU
IGI	1.000000	-0.605898	-0.460669	-0.023652	-0.476540	0.493284	0.270635
INV_GDP	-0.605898	1.000000	0.437513	-0.069113	0.187840	-0.285034	-0.027551
LNPOP	-0.460669	0.437513	1.000000	-0.231062	0.466943	-0.745218	-0.717743
MCP	-0.023652	-0.069113	-0.231062	1.000000	0.590510	0.588506	0.048351
ME	-0.476540	0.187840	0.466943	0.590510	1.000000	-0.295456	-0.516468
COR	0.493284	-0.285034	-0.745218	0.588506	-0.295456	1.000000	0.580178
EDU	0.270635	-0.027551	-0.717743	0.048351	-0.516468	0.580178	1.000000

- Test of Seasonal Dummy variable effects/ Test for structural Breaks /Dummy test
-

Chow Breakpoint Test: 2005Q1 1999Q2 2005Q3 2016Q4
Null Hypothesis: No breaks at specified breakpoints
Varying regressors: All equation variables
Equation Sample: 1984Q1 2017Q4

F-statistic	3.120839	Prob. F(1,134)	0.0796
Log likelihood ratio	3.131097	Prob. Chi-Square(1)	0.0768
Wald Statistic	3.120839	Prob. Chi-Square(1)	0.0773

- The ARDL lag Determinants
-

VAR Lag Order Selection Criteria
Endogenous variables: IGI LNPOP INV MCP ME EDU COR
Exogenous variables: C
Date: 04/07/20 Time: 18:14
Sample: 1984Q1 2017Q4
Included observations: 128

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-269.7754	NA	1.78e-07	4.324615	4.480586	4.387987
1	711.7352	1840.332	8.38e-14	-10.24586	-8.998100	-9.738890
2	727.6989	28.18588	1.41e-13	-9.729670	-7.390114	-8.779097
3	759.5471	52.74851	1.88e-13	-9.461673	-6.030324	-8.067498
4	1070.958	481.7136	3.21e-15	-13.56184	-9.038700	-11.72407
5	1364.223	421.5686	7.46e-17	-17.37848	-11.76355*	-15.09711
6	1387.694	31.17256	1.21e-16	-16.97960	-10.27287	-14.25462
7	1432.759	54.92230	1.44e-16	-16.91810	-9.119582	-13.74952
8	1596.774	181.9542*	2.81e-17*	-18.71521*	-9.824899	-15.10303*

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

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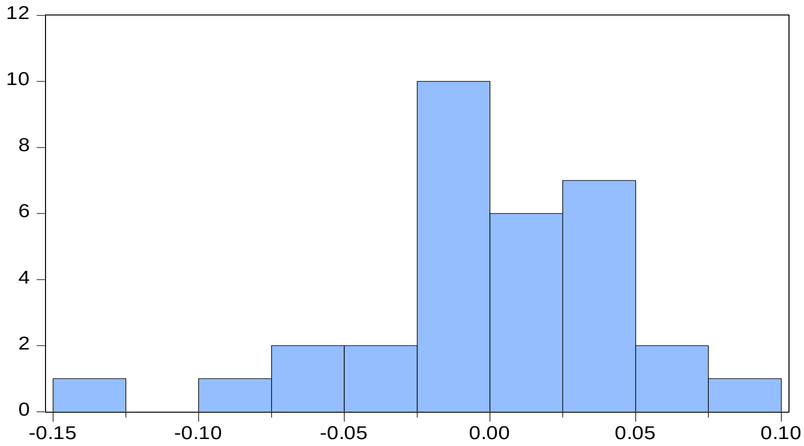
SR AND LR ESTIMATES

ARDL Cointegrating And Long Run Form				
Dependent Variable: IGI				
Selected Model: ARDL(5, 5, 5, 5, 1, 1, 5)				
Date: 04/05/20 Time: 15:18				
Sample: 1984Q1 2017Q4				
Included observations: 131				
	Cointegrating Form			
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(IGI(-1))	0.086279	0.071172	1.212256	0.2284
D(IGI(-2))	0.086279	0.071172	1.212256	0.2284
D(IGI(-3))	0.086279	0.071172	1.212256	0.2284
D(IGI(-4))	-0.293967	0.072405	-4.060053	0.0001
D(INV)	-0.025529	0.010943	-2.332806	0.0217
D(INV(-1))	-0.000000	0.014136	-0.000000	1.0000
D(INV(-2))	0.000000	0.014136	0.000000	1.0000
D(INV(-3))	0.067580	0.014517	4.655144	0.0000
D(INV(-4))	-0.055895	0.011348	-4.925641	0.0000
D(LNPOP)	151.117585	35.111552	4.303928	0.0000
D(LNPOP(-1))	0.000001	1.276404	0.000001	1.0000
D(LNPOP(-2))	-0.000001	1.276404	-0.000001	1.0000
D(LNPOP(-3))	141.493250	33.672288	4.202068	0.0001
D(LNPOP(-4))	-115.339613	35.410948	-3.257174	0.0016
D(MCP)	-0.195453	0.043190	-4.525457	0.0000
D(MCP(-1))	-0.000000	0.009109	-0.000000	1.0000
D(MCP(-2))	0.000000	0.009109	0.000000	1.0000
D(MCP(-3))	0.058007	0.009952	5.828564	0.0000
D(MCP(-4))	-0.055996	0.008131	-6.886591	0.0000
D(ME)	0.432158	0.121325	3.561976	0.0006
D(EDU)	-0.050600	0.014739	-3.433139	0.0009
D(COR)	0.405908	0.079956	5.076633	0.0000
D(COR(-1))	0.000000	0.028288	0.000000	1.0000
D(COR(-2))	-0.000000	0.028288	-0.000000	1.0000
D(COR(-3))	-0.189906	0.031029	-6.120317	0.0000
D(COR(-4))	0.178090	0.025309	7.036665	0.0000
D(DM1)	0.487734	0.062681	7.781165	0.0000
D(DM2)	0.279396	0.087823	3.181352	0.0019
D(DM3)	0.395354	0.107101	3.691419	0.0003
D(DM4)	0.428172	0.123022	3.480443	0.0007
CointEq(-1)	-0.220903	0.072651	-3.040611	0.0030
Cointeq = IGI - (-0.0449*INV + 5.4422*LNPOP -0.2260*MCP + 0.5567*ME				

-0.0265*EDU + 0.4439*COR -115.4675)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
INV	-0.044914	0.021671	-2.072562	0.0409
LNPOP	5.442216	1.931829	2.817131	0.0059
MCP	-0.226026	0.070205	-3.219494	0.0017
ME	0.556727	0.240942	2.310628	0.0230
EDU	-0.026490	0.046787	-0.566176	0.5726
COR	0.443946	0.143390	3.096083	0.0026
DM1	0.447522	0.460345	0.972145	0.3329
DM2	0.338531	0.528361	0.640718	0.5229
DM3	0.227042	0.472913	0.480093	0.6320
DM4	0.291612	0.504754	0.577731	0.5645
C	-115.467539	40.793644	-2.830528	0.0056



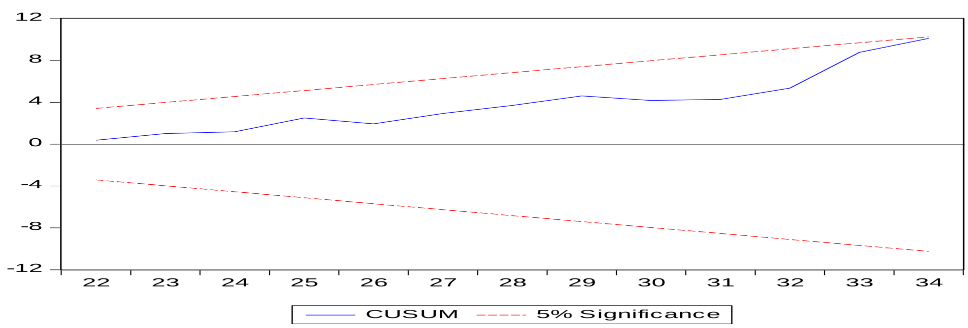
Series: Residuals	
Sample 3 34	
Observations 32	
Mean	-1.11e-16
Median	0.002332
Maximum	0.080142
Minimum	-0.134853
Std. Dev.	0.045807
Skewness	-0.774252
Kurtosis	4.113344
Jarque-Bera	4.849865
Probability	0.088484

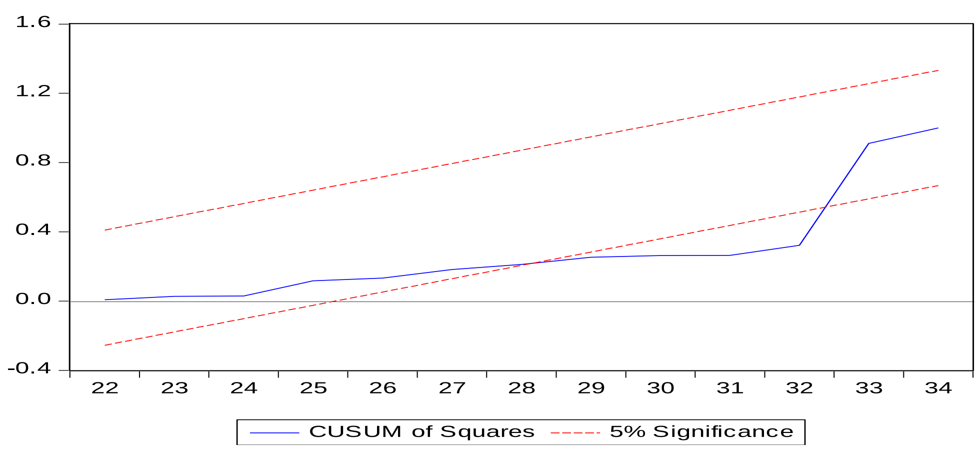
Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.228031	Prob. F(2,11)	0.7998
Obs*R-squared	1.273909	Prob. Chi-Square(2)	0.5289

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.563749	Prob. F(18,13)	0.8714
Obs*R-squared	14.02828	Prob. Chi-Square(18)	0.7272
Scaled explained SS	3.604029	Prob. Chi-Square(18)	0.9999





b. China GDP annual

ARDL Bounds Test

Date: 06/05/19 Time: 15:47

Sample: 1986 2017

Included observations: 32

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	6.339673	6

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.12	3.23
5%	2.45	3.61
2.5%	2.75	3.99
1%	3.15	4.43

Test Equation:

Dependent Variable: D(GDP_ANNUAL)

Method: Least Squares

Date: 06/05/19 Time: 15:47

Sample: 1986 2017

Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MCP)	1.018077	0.411023	2.476934	0.0248
D(MCP(-1))	1.898333	0.456875	4.155037	0.0007
D(POP)	-71.55272	20.86993	-3.428508	0.0034
D(POP(-1))	-4.881567	12.67812	-0.385039	0.7053
D(COR)	-2.191357	1.276124	-1.717198	0.1052

D(COR(-1))	-5.179473	1.028829	-5.034338	0.0001
D(EDU)	-1.150796	0.773586	-1.487613	0.1563
D(EDU(-1))	1.569129	0.713752	2.198425	0.0430
C	-7.311407	11.62380	-0.629003	0.5382
INV(-1)	0.386871	0.398508	0.970798	0.3461
MCP(-1)	-2.872911	1.590502	-1.806292	0.0897
ME(-1)	4.034340	5.361980	0.752397	0.4627
POP(-1)	-3.247801	3.080182	-1.054419	0.3074
COR(-1)	7.803183	3.602699	2.165927	0.0458
EDU(-1)	-4.380213	1.247573	-3.510987	0.0029
GDP_ANNUAL(-1)	-0.560104	0.189232	-2.959876	0.0092

R-squared	0.819035	Mean dependent var	-0.204481
Adjusted R-squared	0.649380	S.D. dependent var	2.364383
S.E. of regression	1.400026	Akaike info criterion	3.817711
Sum squared resid	31.36114	Schwarz criterion	4.550579
Log likelihood	-45.08337	Hannan-Quinn criter.	4.060636
F-statistic	4.827662	Durbin-Watson stat	1.823434
Prob(F-statistic)	0.001647		

ARDL Cointegrating And Long Run Form

Dependent Variable: GDP_ANNUAL

Selected Model: ARDL(1, 0, 2, 0, 2, 2, 2)

Date: 06/05/19 Time: 15:46

Sample: 1984 2017

Included observations: 32

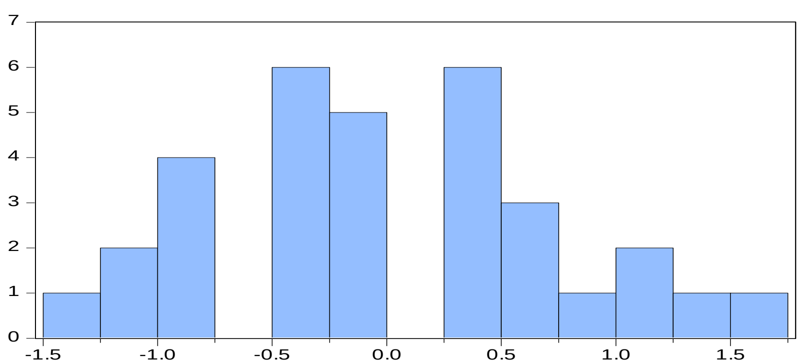
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INV)	1.086935	0.372239	2.919995	0.0100
D(MCP)	-2.383861	1.120222	-2.128025	0.0492
D(MCP(-1))	1.795606	0.344410	5.213574	0.0001

D(ME)	9.230651	3.386153	2.725999	0.0150
D(POP)	-64.977711	15.197461	-4.275564	0.0006
D(POP(-1))	14.167860	11.027533	1.284771	0.2172
D(COR)	4.400076	2.200659	1.999436	0.0628
D(COR(-1))	-4.143502	0.867431	-4.776750	0.0002
D(EDU)	-1.545214	0.553460	-2.791918	0.0131
D(EDU(-1))	1.177659	0.501321	2.349113	0.0320
CointEq(-1)	-0.724131	0.176870	-4.094145	0.0008

Cointeq = GDP_ANNUAL - (1.5010*INV -6.5919*MCP + 12.7472*ME
-0.9897*POP + 15.4620*COR -6.4421*EDU -25.7700)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INV	1.501020	0.389399	3.854709	0.0014
MCP	-6.591925	2.080233	-3.168840	0.0060
ME	12.747205	5.775693	2.207043	0.0423
POP	-0.989676	3.251947	-0.304333	0.7648
COR	15.462032	4.442594	3.480406	0.0031
EDU	-6.442079	2.059029	-3.128697	0.0065
C	-25.769992	12.932105	-1.992714	0.0636



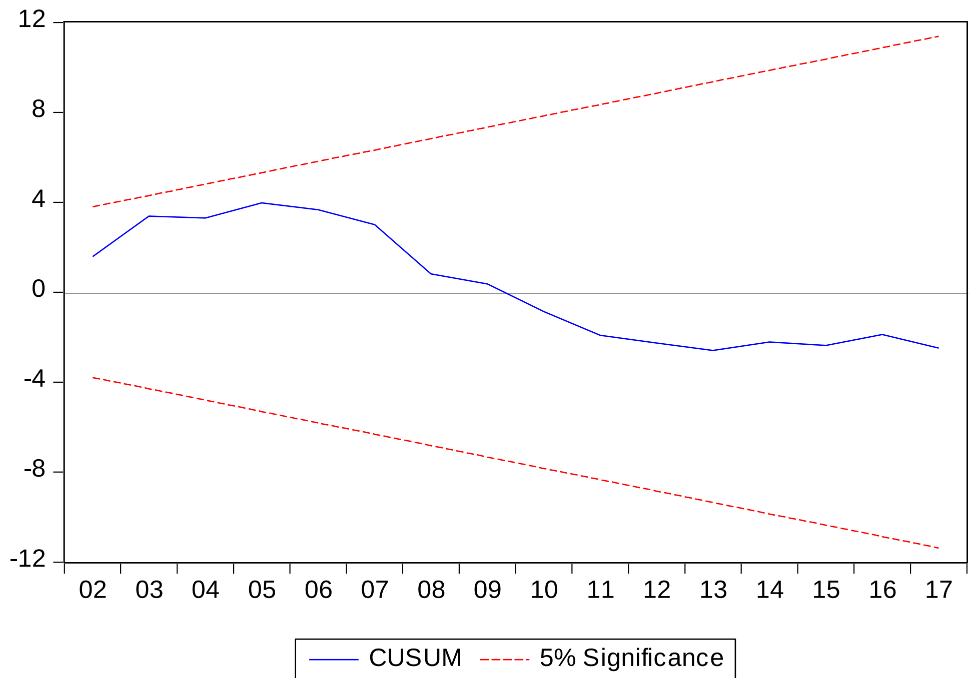
Series: Residuals	
Sample 1986 2017	
Observations 32	
Mean	1.18e-15
Median	-0.160820
Maximum	1.542697
Minimum	-1.471964
Std. Dev.	0.775839
Skewness	0.154199
Kurtosis	2.268948
Jarque-Bera	0.839394
Probability	0.657246

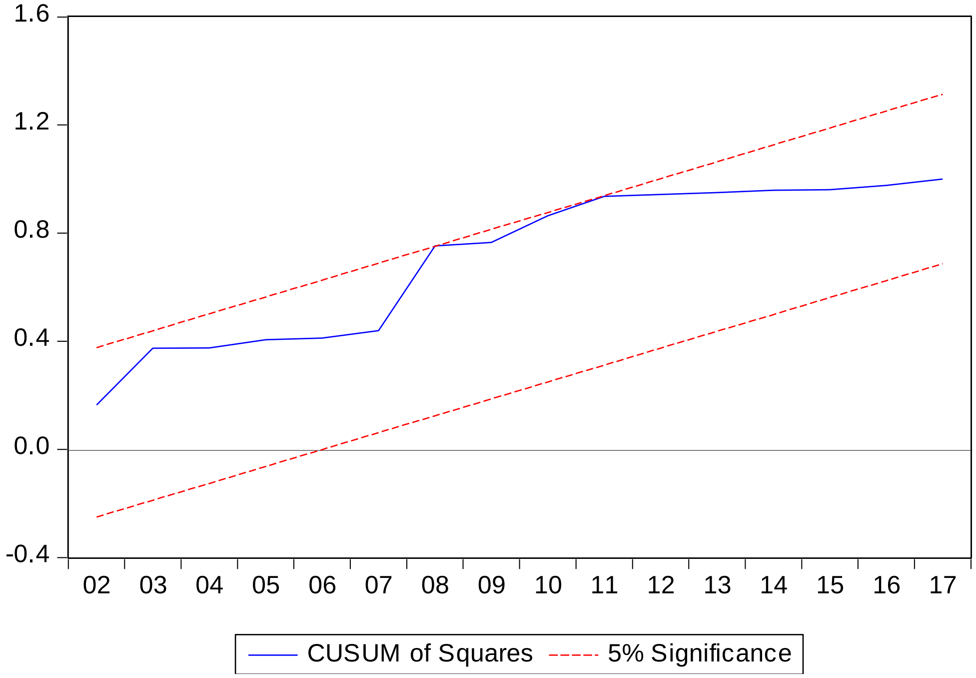
Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.139876	Prob. F(2,14)	0.1546
Obs*R-squared	7.492009	Prob. Chi-Square(2)	0.0236

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	2.641532	Prob. F(15,16)	0.0314
Obs*R-squared	22.79517	Prob. Chi-Square(15)	0.0886
Scaled explained SS	3.615737	Prob. Chi-Square(15)	0.9987





c. China Per Capita Income

ARDL Bounds Test

Date: 06/05/19 Time: 15:40

Sample: 1986 2017

Included observations: 32

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	6.294887	6

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.12	3.23
5%	2.45	3.61
2.5%	2.75	3.99
1%	3.15	4.43

Test Equation:

Dependent Variable: D(PCI)

Method: Least Squares

Date: 06/05/19 Time: 15:40

Sample: 1986 2017

Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(POP)	-71.95729	20.68289	-3.479073	0.0031
D(POP(-1))	-4.714207	12.55990	-0.375338	0.7123
D(COR)	-2.167571	1.263637	-1.715343	0.1056
D(COR(-1))	-5.112261	1.019409	-5.014925	0.0001
D(EDU)	-1.148172	0.767246	-1.496485	0.1540
D(EDU(-1))	1.550992	0.706995	2.193783	0.0434
D(MCP)	1.006882	0.407193	2.472738	0.0250
D(MCP(-1))	1.875768	0.453029	4.140499	0.0008
C	-7.233937	11.51441	-0.628251	0.5387
POP(-1)	-3.801017	3.116886	-1.219492	0.2403
COR(-1)	7.730858	3.569567	2.165769	0.0458
EDU(-1)	-4.340494	1.236141	-3.511327	0.0029
INV(-1)	0.385465	0.395357	0.974980	0.3441
MCP(-1)	-2.848334	1.575718	-1.807642	0.0895
ME(-1)	4.007298	5.311578	0.754446	0.4615
PCI(-1)	-0.559538	0.189459	-2.953348	0.0093

R-squared	0.820342	Mean dependent var	-0.175161
Adjusted R-squared	0.651912	S.D. dependent var	2.350984
S.E. of regression	1.387057	Akaike info criterion	3.799098
Sum squared resid	30.78282	Schwarz criterion	4.531966
Log likelihood	-44.78557	Hannan-Quinn criter.	4.042023
F-statistic	4.870528	Durbin-Watson stat	1.823588
Prob(F-statistic)	0.001568		

ARDL Cointegrating And Long Run Form

Dependent Variable: PCI

Selected Model: ARDL(1, 2, 2, 2, 0, 2, 0)

Date: 06/05/19 Time: 15:40

Sample: 1984 2017

Included observations: 32

Cointegrating Form

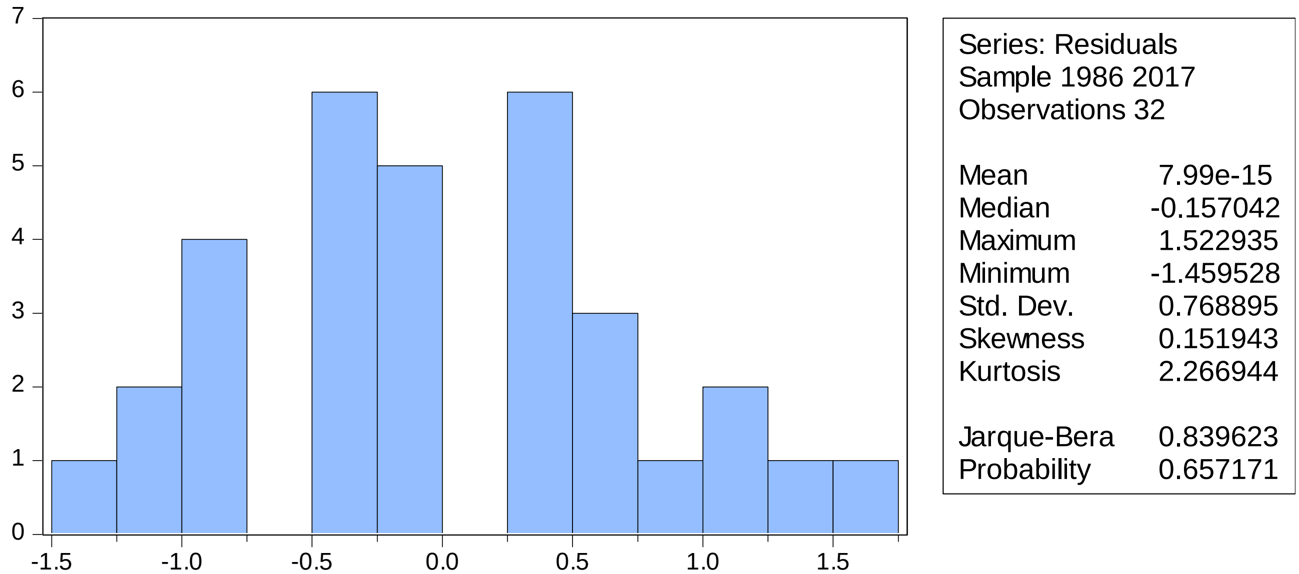
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(POP)	-65.410572	15.066226	-4.341537	0.0005
D(POP(-1))	14.137805	10.922106	1.294421	0.2139
D(COR)	4.339033	2.178985	1.991309	0.0638
D(COR(-1))	-4.085241	0.859164	-4.754900	0.0002
D(EDU)	-1.538042	0.548854	-2.802279	0.0128
D(EDU(-1))	1.163411	0.496724	2.342169	0.0324
D(INV)	1.078854	0.368659	2.926427	0.0099
D(MCP)	-2.351941	1.110047	-2.118777	0.0501
D(MCP(-1))	1.773031	0.341464	5.192444	0.0001
D(ME)	9.108357	3.356482	2.713661	0.0153
CointEq(-1)	-0.723104	0.176884	-4.088000	0.0009

Cointeq = PCI - (-2.0286*POP + 15.2956*COR -6.3928*EDU + 1.4920*INV -6.5216*MCP + 12.5962*ME -25.4077)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
POP	-2.028573	3.228987	-0.628238	0.5387

COR	15.295601	4.408808	3.469328	0.0032
EDU	-6.392787	2.042192	-3.130356	0.0065
INV	1.491976	0.386590	3.859324	0.0014
MCP	-6.521597	2.065325	-3.157661	0.0061
ME	12.596196	5.735140	2.196319	0.0432
C	-25.407715	12.843628	-1.978235	0.0654

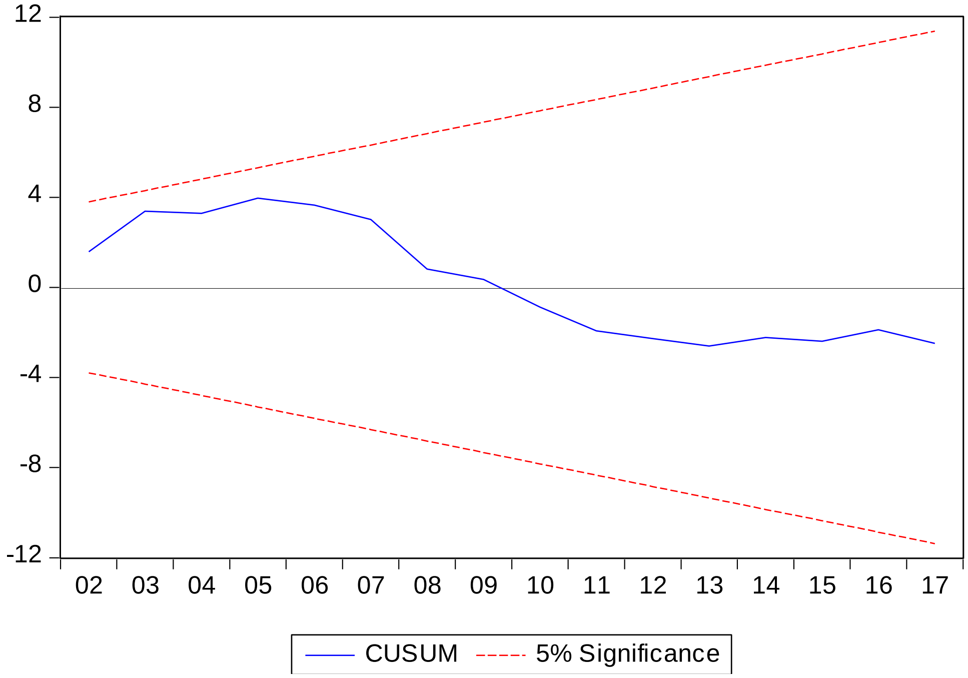


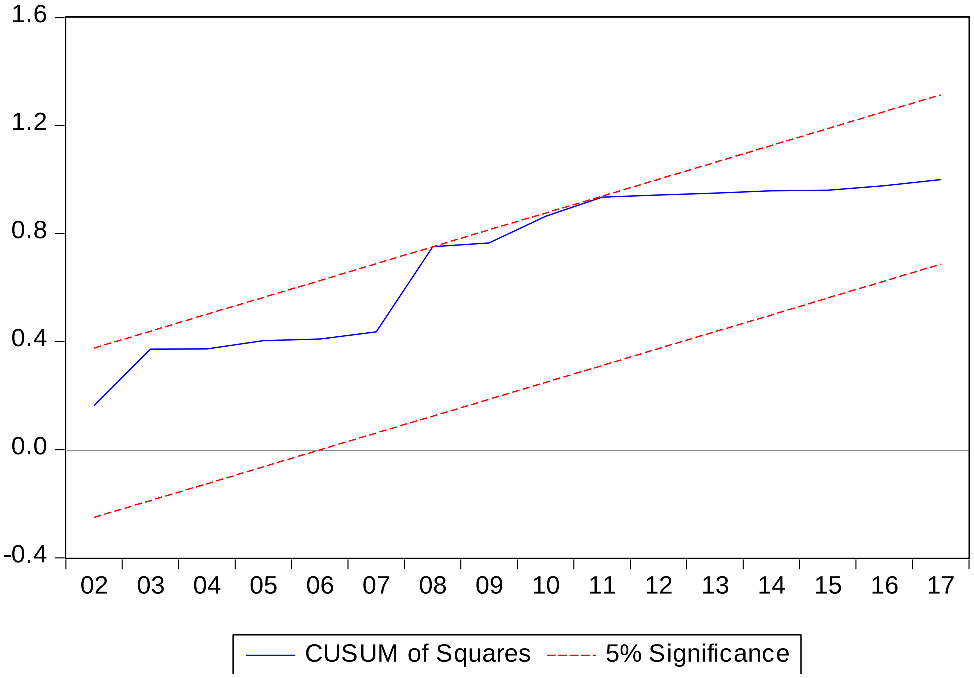
Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.180429	Prob. F(2,14)	0.1498
Obs*R-squared	7.600270	Prob. Chi-Square(2)	0.0224

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	2.668204	Prob. F(15,16)	0.0301
Obs*R-squared	22.86091	Prob. Chi-Square(15)	0.0871
Scaled explained SS	3.620437	Prob. Chi-Square(15)	0.9987





SOUTH AFRICA

a. Inclusive growth

Descriptive Stats

	IGI	INV_GDP	LNPOP	MCP	ME	COR	EDU
Mean	0.357083	1.007243	17.62070	7.358225	1.741681	3.669823	4.127302
Median	0.373750	0.744786	17.64714	4.159098	1.383167	2.973958	5.035659
Maximum	0.530000	5.978862	17.85359	27.74255	4.623759	6.000000	6.371640
Minimum	0.090000	-0.654029	17.31621	0.000000	0.000000	2.000000	0.000000
Std. Dev.	0.087459	1.140252	0.153225	7.166948	1.122477	1.315856	2.012530
Skewness	-0.334286	1.496955	-0.365061	1.514257	1.158030	0.381749	-1.102299
Kurtosis	2.826636	5.884437	1.979953	4.394859	3.758613	1.461568	2.757759
Jarque-Bera	2.623744	95.05911	8.654666	61.14642	32.66796	16.22336	27.05413
Probability	0.269315	0.000000	0.013203	0.000000	0.000000	0.000300	0.000001
Sum	47.13500	132.9560	2325.933	971.2856	229.9020	484.4167	544.8039
Sum Sq. Dev.	1.002040	170.3230	3.075591	6728.834	165.0542	226.8233	530.5862
Observations	132	132	132	132	132	132	132

Results of Correlation matrix

	IGI	INV_GDP	LNPOP	MCP	ME	COR	EDU
IGI	1.000000	0.512561	0.384919	-0.474217	-0.376637	-0.438434	0.524413
INV_GDP	0.512561	1.000000	0.525872	-0.532869	-0.484340	-0.555637	0.281283
LNPOP	0.384919	0.525872	1.000000	-0.915638	-0.914332	-0.912755	0.343184
MCP	-0.474217	-0.532869	-0.915638	1.000000	0.974136	0.859316	-0.412702
ME	-0.376637	-0.484340	-0.914332	0.974136	1.000000	0.793938	-0.292744
COR	-0.438434	-0.555637	-0.912755	0.859316	0.793938	1.000000	-0.461120
EDU	0.524413	0.281283	0.343184	-0.412702	-0.292744	-0.461120	1.000000

- Test of Seasonal Dummy variable effects/dummy test
-

Chow Breakpoint Test: 1989Q1 1994Q1 1999Q1 2005Q1 2011Q1
Null Hypothesis: No breaks at specified breakpoints
Varying regressors: All equation variables
Equation Sample: 1984Q1 2017Q4

F-statistic	7.449654	Prob. F(10,124)	0.0000
Log likelihood ratio	63.98665	Prob. Chi-Square(10)	0.0000
Wald Statistic	74.49654	Prob. Chi-Square(10)	0.0000

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- The ARDL lag Determinants
-

VAR Lag Order Selection Criteria
Endogenous variables: IGI POP ME MCP INV COR EDU
Exogenous variables: C
Date: 04/07/20 Time: 18:28
Sample: 1984Q1 2017Q4
Included observations: 128

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2830.749	NA	4.26e+10	44.33983	44.49580	44.40321
1	-1791.591	1948.422	8140.549	28.86861	30.11637	29.37558
2	-1773.222	32.43260	13222.23	29.34722	31.68678	30.29779
3	-1736.882	60.18893	16383.17	29.54503	32.97637	30.93920
4	-1466.510	418.2317	532.1660	26.08609	30.60923	27.92386
5	-1198.342	385.4913	18.27430*	22.66159*	28.27652*	24.94297*
6	-1182.549	20.97454	33.29069	23.18046	29.88718	25.90543
7	-1154.098	34.67488	51.58160	23.50153	31.30005	26.67011
8	-1077.725	84.72680*	39.56869	23.07382	31.96413	26.68600

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

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Test for structural Breaks

Multiple breakpoint tests					
Compare information criteria for 0 to M globally determined breaks					
Date: 04/07/20 Time: 05:35					
Sample: 1984Q1 2017Q4					
Included observations: 132					
Breaking variables: INV_GDP LNPOP M__CORRUPTION ME CORRUPTION					
EDUCATION					
Break test options: Trimming 0.15, Max. breaks 5					
Schwarz criterion selected breaks:				5	
LWZ criterion selected breaks:				1	
		Sum of		Schwarz*	LWZ*
Breaks	# of Coefs.	Sq. Resids.	Log-L	Criterion	Criterion
0	6	0.517321	178.4650	-5.319947	-5.115661
1	13	0.267723	221.9400	-5.719722	-5.274217
2	20	0.170105	251.8736	-5.914325	-5.224136

3	27	0.107197	282.3488	-6.117135	-5.178347
4	34	0.061619	318.8923	-6.411888	-5.220047
5	41	0.038412	350.0841	-6.625554	-5.175545
* Minimum information criterion values displayed with shading					
Estimated break dates:					
1: 1994Q4					
2: 1999Q4, 2006Q4					
3: 1989Q2, 1999Q4, 2006Q4					
4: 1989Q2, 1999Q4, 2007Q1, 2012Q3					
5: 1989Q3, 1995Q3, 2000Q2, 2007Q1, 2012Q3					

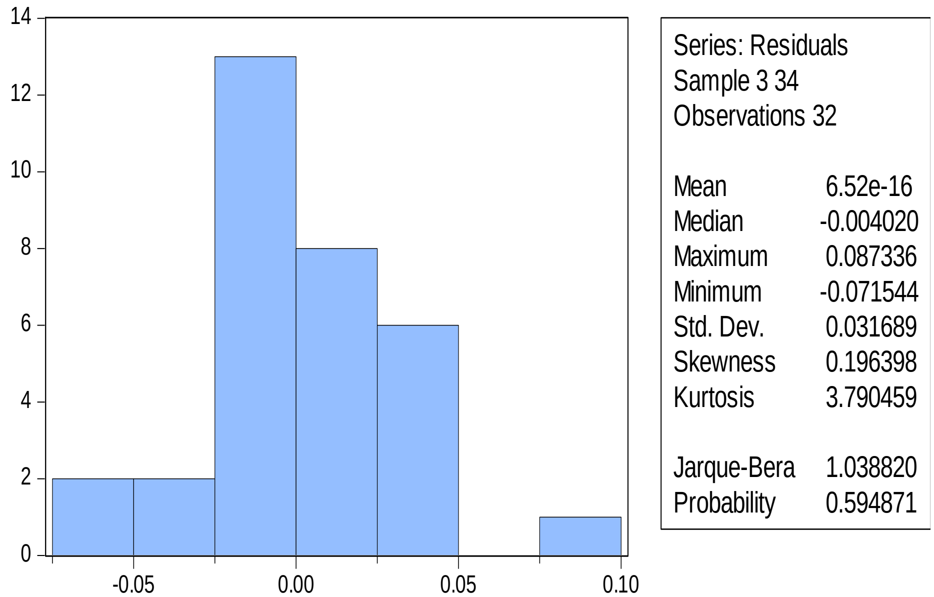
ARDL Cointegrating And Long Run Form				
Dependent Variable: IGI				
Selected Model: ARDL(5, 0, 0, 0, 0, 5, 1)				
Date: 04/05/20 Time: 15:24				
Sample: 1984Q1 2017Q4				
Included observations: 131				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(IGI(-1))	0.052673	0.089206	0.590466	0.5561
D(IGI(-2))	0.052673	0.089206	0.590466	0.5561
D(IGI(-3))	0.052673	0.089206	0.590466	0.5561
D(IGI(-4))	-0.528956	0.085373	-6.195822	0.0000
D(INV)	-0.000580	0.003814	-0.152091	0.8794
D(LNPOP)	0.111570	0.116968	0.953851	0.3422
D(MCP)	-0.015626	0.005826	-2.681943	0.0084
D(ME)	0.087747	0.036155	2.426989	0.0168
D(EDU)	0.014417	0.003025	4.766461	0.0000
D(EDU(-1))	0.000000	0.003259	0.000000	1.0000
D(EDU(-2))	-0.000000	0.003259	-0.000000	1.0000
D(EDU(-3))	-0.007774	0.003876	-2.005789	0.0473
D(EDU(-4))	0.008425	0.003070	2.744161	0.0071
D(COR)	0.074138	0.025810	2.872519	0.0049

D(DM1)	-0.127682	0.042624	-2.995553	0.0034
D(DM2)	-0.110190	0.062646	-1.758939	0.0816
D(DM3)	-0.051776	0.074290	-0.696947	0.4874
D(DM4)	-0.030734	0.088141	-0.348691	0.7280
D(DM5)	-0.075115	0.101554	-0.739652	0.4612
CointEq(-1)	-0.150152	0.082564	-1.818606	0.0716

Cointeq = IGI - (-0.0039*INV + 0.7430*LNPOP -0.1041*MCP + 0.5844*ME -0.0115*EDU + 0.1514*COR -13.4661)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INV	-0.003863	0.026497	-0.145785	0.8844
LNPOP	0.743047	0.717124	1.036148	0.3023
MCP	-0.104067	0.049354	-2.108611	0.0372
ME	0.584392	0.285228	2.048860	0.0428
EDU	-0.011508	0.021213	-0.542515	0.5885
COR	0.151391	0.086745	1.745255	0.0837
DM1	0.007596	0.088441	0.085889	0.9317
DM2	0.049426	0.096129	0.514169	0.6082
DM3	0.031379	0.105171	0.298360	0.7660
DM4	0.120996	0.089729	1.348459	0.1805
DM5	-0.133898	0.135446	-0.988564	0.3252
C	-13.466066	12.969321	-1.038302	0.3013

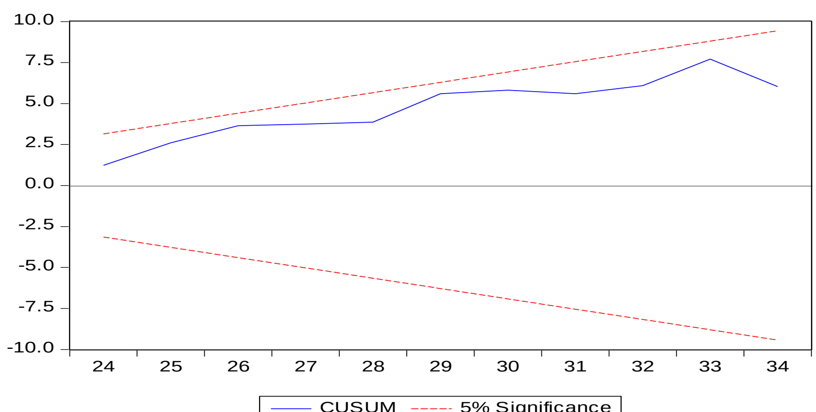


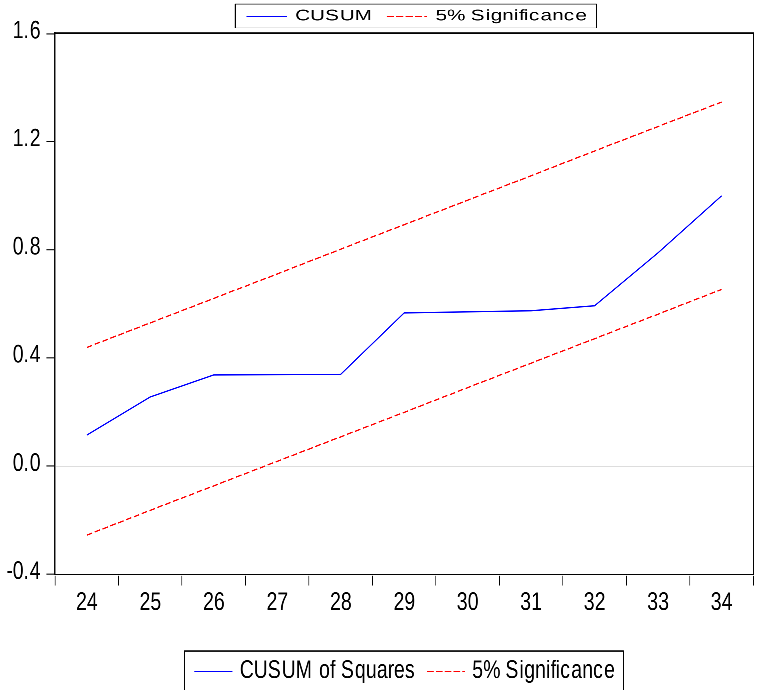
Breusch-Godfrey Serial Correlation LM Test:

F-statistic	3.152914	Prob. F(2,9)	0.0917
Obs*R-squared	13.18364	Prob. Chi-Square(2)	0.0014

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.796417	Prob. F(20,11)	0.6836
Obs*R-squared	18.92827	Prob. Chi-Square(20)	0.5265
Scaled explained SS	3.120628	Prob. Chi-Square(20)	1.0000





b. South Africa GDP growth annual

ARDL Bounds Test

Date: 06/05/19 Time: 15:53

Sample: 1986 2017

Included observations: 32

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	5.967575	6

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.12	3.23
5%	2.45	3.61
2.5%	2.75	3.99
1%	3.15	4.43

Test Equation:

Dependent Variable: D(REAL_GDP)

Method: Least Squares

Date: 06/05/19 Time: 15:53

Sample: 1986 2017

Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EDU)	0.555044	0.131570	4.218616	0.0005
D(EDU(-1))	-0.207926	0.146705	-1.417302	0.1735
D(INV)	-0.462722	0.195219	-2.370276	0.0291
D(INV(-1))	0.365763	0.206178	1.774018	0.0930
D(ME)	-0.149235	1.092329	-0.136621	0.8928
D(POP)	-30.18237	5.832979	-5.174435	0.0001

C	1.645305	1.827071	0.900515	0.3797
COR(-1)	2.019130	0.857375	2.355014	0.0301
EDU(-1)	1.345695	0.394105	3.414562	0.0031
INV(-1)	-1.384692	0.435918	-3.176498	0.0052
MCP(-1)	-0.605627	0.271011	-2.234696	0.0384
ME(-1)	3.587486	1.488547	2.410058	0.0269
POP(-1)	-7.816661	2.486690	-3.143400	0.0056
REAL_GDP(-1)	-1.333911	0.227197	-5.871152	0.0000

R-squared	0.805290	Mean dependent var	0.079007
Adjusted R-squared	0.664666	S.D. dependent var	1.895986
S.E. of regression	1.097928	Akaike info criterion	3.324362
Sum squared resid	21.69802	Schwarz criterion	3.965621
Log likelihood	-39.18979	Hannan-Quinn criter.	3.536921
F-statistic	5.726554	Durbin-Watson stat	2.168287
Prob(F-statistic)	0.000449		

ARDL Cointegrating And Long Run Form

Dependent Variable: GDP_annual

Selected Model: ARDL(1, 0, 2, 2, 0, 1, 1)

Date: 06/05/19 Time: 15:54

Sample: 1984 2017

Included observations: 32

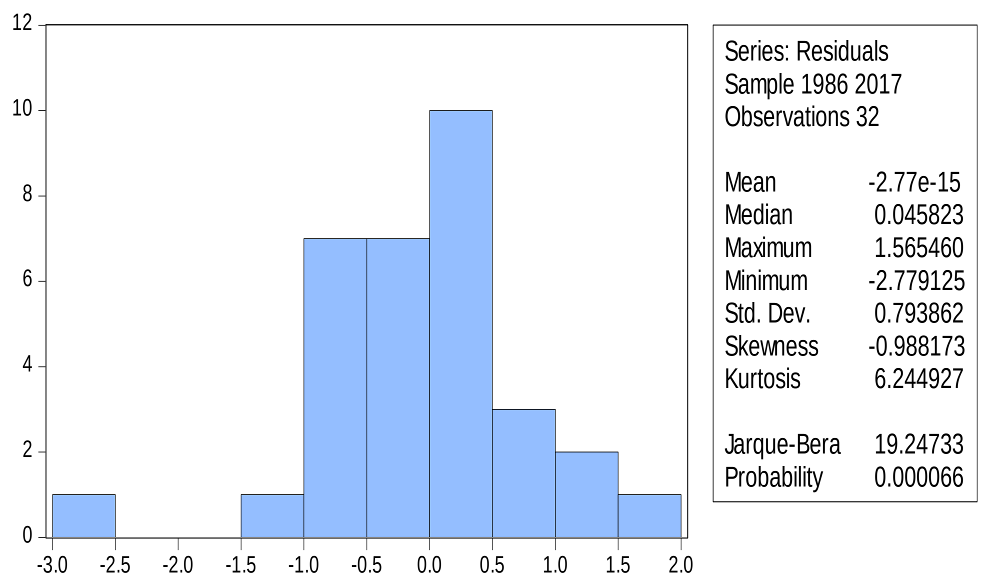
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(COR)	2.134764	0.725780	2.941338	0.0087
D(EDU)	0.453432	0.113579	3.992222	0.0009
D(EDU(-1))	-0.188272	0.124125	-1.516788	0.1467
D(INV)	-0.472791	0.185133	-2.553791	0.0199
D(INV(-1))	0.314619	0.186822	1.684063	0.1094

D(MCP)	-0.764646	0.273911	-2.791583	0.0121
D(ME)	2.599532	1.404026	1.851484	0.0806
D(POP)	-28.603988	4.906872	-5.829373	0.0000
CointEq(-1)	-1.275532	0.189187	-6.742171	0.0000

Cointeq = REAL_GDP - (1.6736*COR + 0.8779*EDU -1.0061*INV -0.5995 *MCP + 3.2385*ME -5.9320*POP + 1.4032)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
COR	1.673626	0.495893	3.374975	0.0034
EDU	0.877852	0.181566	4.834902	0.0001
INV	1.006121	0.287987	-3.493633	0.0026
MCP	-0.599472	0.197147	-3.040741	0.0070
ME	3.238539	0.964274	3.358526	0.0035
POP	-5.931991	1.190381	-4.983270	0.0001
C	1.403190	1.347110	1.041630	0.3114



Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.526772	Prob. F(2,16)	0.1113
Obs*R-squared	7.681053	Prob. Chi-Square(2)	0.0215

Test Equation:

Dependent Variable: RESID

Method: ARDL

Date: 06/05/19 Time: 15:55

Sample: 1986 2017

Included observations: 32

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REAL_GDP(-1)	0.043017	0.280461	0.153378	0.8800
COR	-0.720316	0.942974	-0.763877	0.4561
EDU	0.000355	0.105920	0.003351	0.9974
EDU(-1)	0.073310	0.143880	0.509520	0.6173
EDU(-2)	0.035127	0.134074	0.261995	0.7967
INV	0.011504	0.175639	0.065498	0.9486
INV(-1)	-0.053911	0.208484	-0.258587	0.7993
INV(-2)	0.031841	0.191478	0.166291	0.8700
MCP	0.051027	0.299469	0.170391	0.8668
ME	0.484481	1.339302	0.361741	0.7223
ME(-1)	-0.393649	1.070035	-0.367885	0.7178
POP	-1.658705	5.601253	-0.296131	0.7709
POP(-1)	3.151683	4.241195	0.743112	0.4682
C	-0.931093	1.805926	-0.515577	0.6132
RESID(-1)	-0.315674	0.398892	-0.791376	0.4403
RESID(-2)	-0.577331	0.271442	-2.126905	0.0493

R-squared	0.240033	Mean dependent var	-2.77E-15
Adjusted R-squared	-0.472436	S.D. dependent var	0.793862
S.E. of regression	0.963304	Akaike info criterion	3.069956

Sum squared resid	14.84726	Schwarz criterion	3.802824
Log likelihood	-33.11930	Hannan-Quinn criter.	3.312881
F-statistic	0.336903	Durbin-Watson stat	2.330472
Prob(F-statistic)	0.979412		

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.843145	Prob. F(13,18)	0.6166
Obs*R-squared	12.11110	Prob. Chi-Square(13)	0.5186
Scaled explained SS	10.04935	Prob. Chi-Square(13)	0.6899

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 06/05/19 Time: 15:56

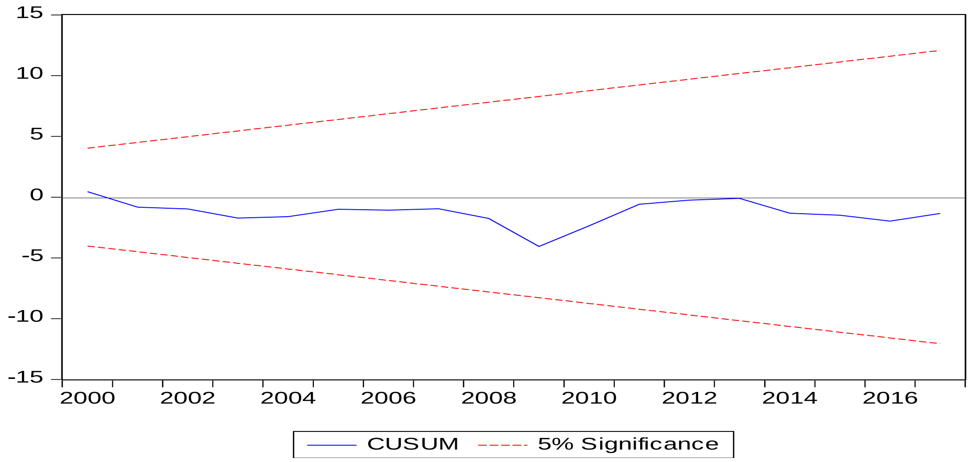
Sample: 1986 2017

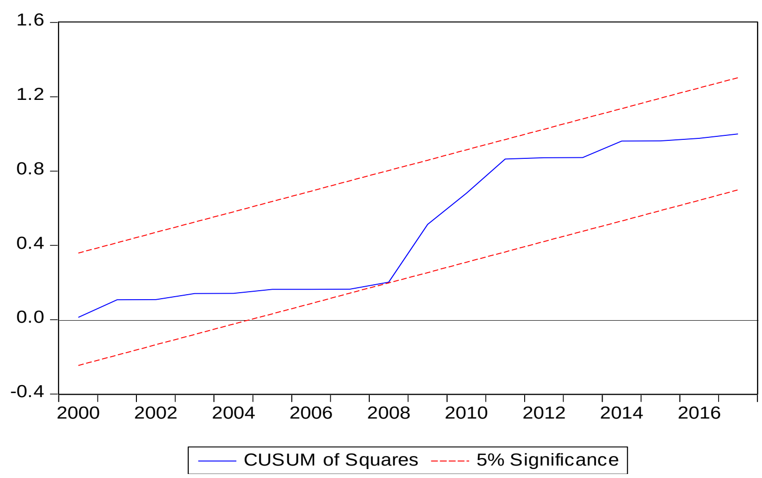
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.035648	2.455423	0.014518	0.9886
REAL_GDP(-1)	0.173487	0.266896	0.650018	0.5239
COR	-0.067824	1.023896	-0.066241	0.9479
EDU	0.034360	0.160231	0.214438	0.8326
EDU(-1)	-0.155125	0.195523	-0.793383	0.4379
EDU(-2)	-0.137538	0.175110	-0.785435	0.4424
INV	0.200341	0.261177	0.767071	0.4530
INV(-1)	0.694409	0.284522	2.440616	0.0252
INV(-2)	0.139529	0.263559	0.529402	0.6030
MCP	0.241712	0.386421	0.625516	0.5395
ME	-1.298807	1.980734	-0.655720	0.5203
ME(-1)	0.025868	1.388375	0.018632	0.9853
POP	9.265465	6.922383	1.338479	0.1974

POP(-1)	-8.556429	5.720733	-1.495687	0.1521

R-squared	0.378472	Mean dependent var	0.610522
Adjusted R-squared	-0.070409	S.D. dependent var	1.420579
S.E. of regression	1.469739	Akaike info criterion	3.907683
Sum squared resid	38.88241	Schwarz criterion	4.548943
Log likelihood	-48.52293	Hannan-Quinn criter.	4.120242
F-statistic	0.843145	Durbin-Watson stat	2.803516
Prob(F-statistic)	0.616582		





- **South Africa Per capita**

ARDL Bounds Test

Date: 06/05/19 Time: 16:00

Sample: 1986 2017

Included observations: 32

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	5.949699	6

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.12	3.23
5%	2.45	3.61
2.5%	2.75	3.99
1%	3.15	4.43

Test Equation:

Dependent Variable: D(PCI)

Method: Least Squares

Date: 06/05/19 Time: 16:00

Sample: 1986 2017

Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(POP)	-30.63181	5.742508	-5.334222	0.0000
D(EDU)	0.542524	0.129640	4.184842	0.0006
D(EDU(-1))	-0.205134	0.144653	-1.418111	0.1732
D(INV)	-0.456409	0.192598	-2.369755	0.0292

D(INV(-1))	0.362519	0.203540	1.781072	0.0918
D(ME)	-0.122294	1.077919	-0.113454	0.9109
C	1.666953	1.803729	0.924171	0.3676
POP(-1)	-9.001552	2.623517	-3.431101	0.0030
COR(-1)	1.972506	0.843653	2.338054	0.0311
EDU(-1)	1.318340	0.387874	3.398883	0.0032
INV(-1)	-1.369008	0.430100	-3.183001	0.0052
MCP(-1)	-0.600047	0.267456	-2.243538	0.0377
ME(-1)	3.562612	1.469565	2.424264	0.0261
PCI(-1)	-1.333372	0.227467	-5.861830	0.0000

R-squared	0.807981	Mean dependent var	0.111827
Adjusted R-squared	0.669301	S.D. dependent var	1.883798
S.E. of regression	1.083305	Akaike info criterion	3.297545
Sum squared resid	21.12388	Schwarz criterion	3.938805
Log likelihood	-38.76072	Hannan-Quinn criter.	3.510105
F-statistic	5.826222	Durbin-Watson stat	2.165577
Prob(F-statistic)	0.000403		

ARDL Cointegrating And Long Run Form

Dependent Variable: PCI

Selected Model: ARDL(1, 1, 0, 2, 2, 0, 1)

Date: 06/05/19 Time: 16:00

Sample: 1984 2017

Included observations: 32

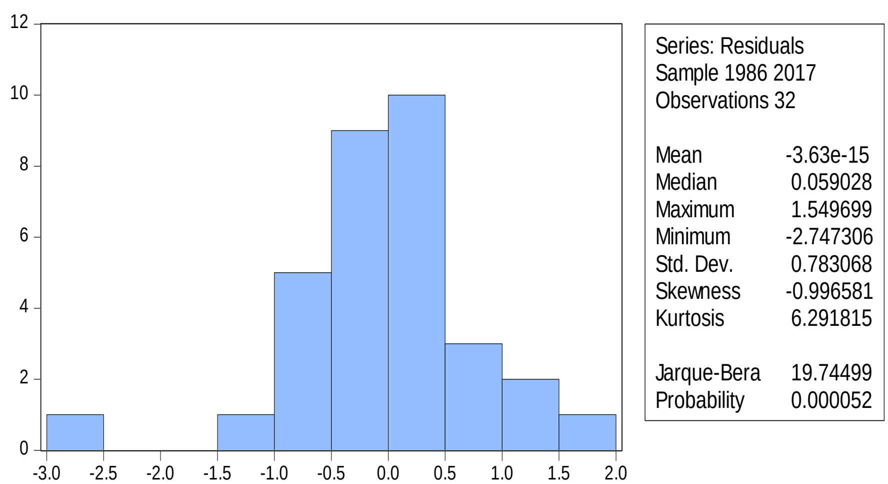
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(POP)	-29.143394	4.837003	-6.025094	0.0000
D(COR)	2.098068	0.715259	2.933300	0.0089
D(EDU)	0.444085	0.112017	3.964423	0.0009

D(EDU(-1))	-0.187564	0.122499	-1.531146	0.1431
D(INV)	-0.466476	0.182608	-2.554524	0.0199
D(INV(-1))	0.311885	0.184368	1.691645	0.1080
D(MCP)	-0.755020	0.270149	-2.794823	0.0120
D(ME)	2.588903	1.385173	1.869011	0.0780
CointEq(-1)	-1.277448	0.189705	-6.733860	0.0000

Cointeq = PCI - (-6.8370*POP + 1.6424*COR + 0.8631*EDU -0.9948*INV
-0.5910*MCP + 3.1987*ME + 1.4136)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
POP	-6.837041	1.172335	-5.831987	0.0000
COR	1.642390	0.488388	3.362882	0.0035
EDU	0.863060	0.178828	4.826190	0.0001
INV	0.994755	0.283720	-3.506112	0.0025
MCP	-0.591037	0.194180	-3.043763	0.0070
ME	3.198722	0.949724	3.368056	0.0034
C	1.413599	1.326801	1.065419	0.3008



Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.582216	Prob. F(2,16)	0.1067
Obs*R-squared	7.808470	Prob. Chi-Square(2)	0.0202

Test Equation:

Dependent Variable: RESID

Method: ARDL

Date: 06/05/19 Time: 16:01

Sample: 1986 2017

Included observations: 32

Presample missing value lagged residuals set to zero.

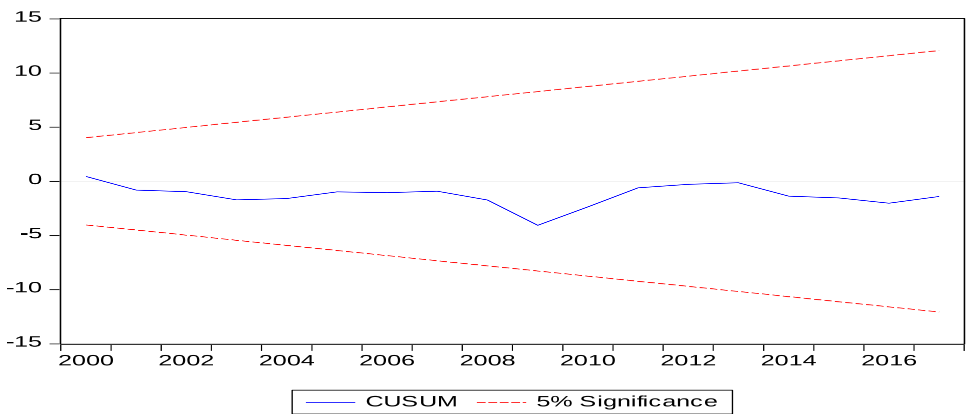
Variable	Coefficient	Std. Error	t-Statistic	Prob.
PCI(-1)	0.040162	0.280891	0.142980	0.8881
POP	-1.705965	5.517589	-0.309187	0.7612
POP(-1)	3.201163	4.029353	0.794461	0.4386
COR	-0.705249	0.925271	-0.762208	0.4570
EDU	0.000487	0.104153	0.004672	0.9963
EDU(-1)	0.073273	0.141557	0.517624	0.6118
EDU(-2)	0.035681	0.132162	0.269976	0.7906
INV	0.012465	0.172793	0.072136	0.9434
INV(-1)	-0.054173	0.205362	-0.263791	0.7953
INV(-2)	0.030348	0.188604	0.160906	0.8742
MCP	0.047696	0.294539	0.161935	0.8734
ME	0.486969	1.318586	0.369311	0.7167
ME(-1)	-0.382594	1.052083	-0.363653	0.7209
C	-0.919114	1.779067	-0.516627	0.6125
RESID(-1)	-0.315790	0.397348	-0.794744	0.4384
RESID(-2)	-0.581836	0.270826	-2.148376	0.0473

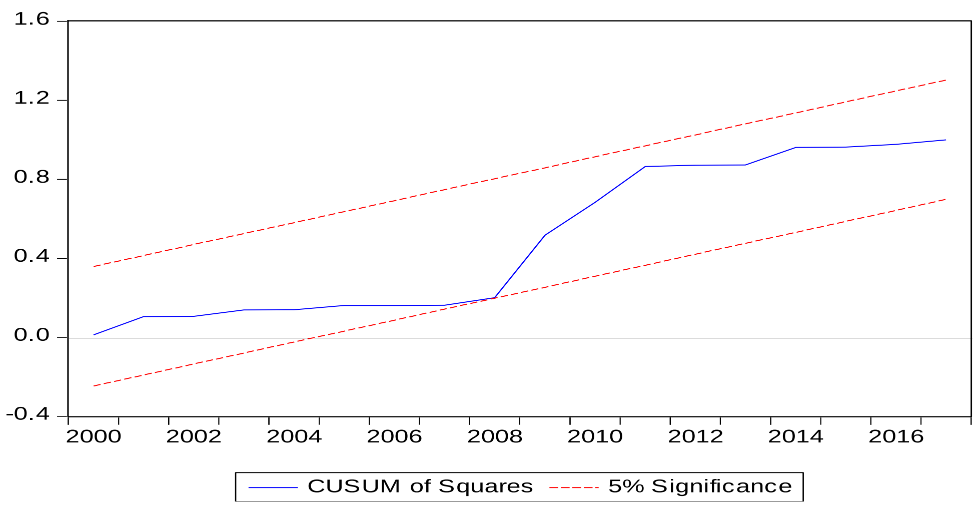
R-squared	0.244015	Mean dependent var	-3.63E-15
Adjusted R-squared	-0.464722	S.D. dependent var	0.783068
S.E. of regression	0.947714	Akaike info criterion	3.037324

Sum squared resid	14.37058	Schwarz criterion	3.770192
Log likelihood	-32.59718	Hannan-Quinn criter.	3.280249
F-statistic	0.344295	Durbin-Watson stat	2.341011
Prob(F-statistic)	0.977402		

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.840386	Prob. F(13,18)	0.6189
Obs*R-squared	12.08644	Prob. Chi-Square(13)	0.5206
Scaled explained SS	10.11855	Prob. Chi-Square(13)	0.6842





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20 March 2020

Mr Oladotun Larry Anifowose (216072573)
Scool of Accounting, Economics & Finance
Pietermaritzburg Campus

Dear Mr Anifowose,

Protocol reference number: HSS/0542/018D
New Project Title: Impacts of military expenditure and institutional quality on inclusive growth in BRICS countries
Approval Notification – Amendment Application

This letter serves to notify you that your application and request for an amendment received on 16 March 2020 has now been approved as follows:

- Change in title
- Amendment of Supervisors and additional supervisor (Dr Omolade Adeleke)

Any alterations to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form; Title of the Project, Location of the Study must be reviewed and approved through an amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

Best wishes for the successful completion of your research protocol.

Yours faithfully

....
Professor Urmila Bob
University Dean of Research

/dd

Cc Supervisor:Dr Omolade Adeleke & Co-Supervisors: Dr Phocenah Nyatanga and Dr Sophia Mukorera
Cc Academic Leader Research: Professor Josue Mbonigaba
Cc School Administrator: Ms Jerusha Singh