Economic Development, Technological Change and Growth

Application of the Multi- Dimensional Regional Economic Development Index (MREDI) in the Metropolitan Regions of South Africa

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Abstract: Over the last few decades, global growth and development have been driven by highly urbanised regions. This has made the research field of regional economic development of major importance within the research field of development economics. The quantification of the progress in regional economic development has been attempted by many researchers. Previous attempts to measure regional economic development have made use of single and limited composite indices, such as the Human Development Index (HDI). These indices are limited in extent, failing to capture important aspects of development, and therefore a gap for the formulation of a comprehensive regional economic development index exists. The primary objective of this study was therefore to apply the multi-dimensional regional development index (MREDI) in South Africa from 1997 to 2017. The research design methodology included a comprehensive literature review and the use of secondary data obtained from Global Insight. The index was applied to all eight metropolitan regions in South Africa. The findings indicate that metropolitan regions are at different stages of development, while development also occurs at a different pace across regions. The results provide economic development practitioners with detailed insight of the socio-economic strengths and weaknesses of the metros in South Africa and where interventions are required. The implications of this alternative index are that it could be utilised as a tool for the analysis and measurement of global regional efforts, as well as to compare different economic regions vis-à-vis their level of economic development.

Keywords: Metropolitan region; multi-dimensional index; regional development; South Africa

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1. Introduction

Over the past decade, the importance that policymakers, academics and key stakeholders have ascribed to regional development has increased profoundly (Jovovic, 2017, p. 259). An increasing awareness has emerged that regional development is a leading driver of national and international progress (Feldman & Lowe, 2017, p. 37). This has been primarily ascribed to an increasing globalised world where countries and their state organs have continuously struggled to maintain national and local identities. Increasing international cooperation, trade and the dismantling of various geographic boundaries, although thought to bring with it various benefits such as increased competitiveness and an influx of information, have nonetheless imposed a myriad of implications for countries and their development endeavours (Rodrik, 2018, p. 9). No more so has this been true than for countries in the earliest and middle stages of their own economic and social progress (Siddiqui, 2017, p. 521). The forces of globalisation in this regard have led to many challenges, including extensive technological production practices, widespread inequalities, continuously changing economic structures and the concentration of resources to specific regions that all have seen many societies become increasingly vulnerable to economic marginalisation (Bogović & Čegar, 2015, p. 63).

While it is naïve to assert that globalisation has only impeded these countries' developmental progress, the rise of the geographic significance in economic activity across the globe has nonetheless been in stark contrast to the notion that globalisation has brought with it a borderless and more integrated world (Ascani et al., 2012, p. 5). From this perspective, globalised international integration has ironically acted as a driver that has reasserted the modern significance of local and regional prosperity towards the achievement of national and global developmental objectives (Kahika , Karyeija, 2017, p. 13). Evidence ascribing to this feat can be seen worldwide where dense regional agglomerations of economic activity have acted as major sources of both economic and social wellbeing (Mohanty & Mishra, 2014, p. 237). The UN-Habitat (2016, p. 1) particularly points to the emergence of major city-regions in the last two decades with development comprising a complex set of internal structures, including the creation of multiple urban cores, innovation-driven processes, and a range of interconnected economic activity associated with highly efficient practices and satisfactory standards of living.

The reinforced recognition regarding the significance of regional and local development and its associated multidimensionality has, however, meant that the measurement of these processes and the subsequent analyses thereof have become intrinsically complex (Paradowska, 2017, p. 19). Nevertheless, assessing the progress that countries and regions have made in this regard remains imperative towards improving the socio-economic environment in any society (Meyer , de

Jongh, 2018, p. 97). Given the holistic nature of these processes, attempts at providing an accurate quantifiable picture on regional and local development have seen the emergence of the use of a range of composite and multi-dimensional indices and movement away from historically applied single denominators. Composite indicators such as the Human Development Index (HDI) and Weighted Index of Social Indictors (WISP) all resemble attempts to provide a comprehensive picture of the nature of development, but none have fully encompassed the necessary holistic framework that truly depicts the development process (Greyling & Tregenna, 2017, p. 890). Based on these limitations, this study seeks to add the underlining knowledge on the quantification of regional development.

In doing so, the study applies and further tests the composite multi-dimensional regional development index known as MREDI, developed by Meyer et al. (2016) and Meyer and de Jongh (2018) with the purpose of measuring and assessing the regional development progress made within the eight metropolitan regions in South Africa since the country's transition to democracy. These specific regions were selected based largely on their noteworthy contribution to the country's unique path of urbanisation and development. While metropolitan areas in developing countries generally play an enormous role towards social transformation, the development of South Africa's metropolises have had a somewhat intricate history owing to a complex political, institutional and geographical background (Turok & Borel-Saladin, 2014, p. 676). This all provides a unique and multifaceted framework that allows for a comprehensive test regarding the index's viability as meaningful measure in the regional development sphere.

2. Literature Review

Achieving sustainable economic growth and the subsequent provision of adequate and empowering living standards have undoubtedly become the most prominent policy objectives for most countries around the globe (UN, 2018, p. 3). Growing populations, the incidences of widespread poverty, inequality and the relentless occurrence of unemployment have all contributed to an endless pursuit of effectively utilising resources and increasing output as a means of improving the lives of global societies. While it may seem a simple process, the comprehension of what truly constitutes economic advancement has, however, attracted numerous debates and diverse ideological thought (Haller, 2012, p. 66). Initial protagonists such as Rostow (1959, p. 2) and Myrdal (1957) viewed the advancement and improvement of societies on the basis of improving predominantly quantitative aspects. From these beliefs, the achievement of economic growth based purely on the use of capital and labour would suffice in allowing societies and regions to prosper (Krugman, 1994, p. 417). As time passed and with the onset of numerous industrial revolutions, the introduction of technological advancements and forward

innovative thinking has somewhat altered these initial considerations (Piva & Vivarelli, 2017, p. 3). Nonetheless, the idea surrounding economic advancement as purely quantitative still remains among supporters of the ideology, even within a contemporary global context.

While these beliefs have provided a framework for understanding various economic processes throughout the evolution of economic discourse, their applicability in truly capturing and illustrating the economic progress societies have made has faded (Ivković, 2016, p. 257). The notion that the increase in output would be shared by all members of society has been surpassed by increasingly complex economic landscapes and geographies across the globe (Gala, 2018, p. 224). Instances of substantial economic activity that have been associated with a vast number of people residing in impoverished conditions and a severe unequal distribution of resources have worryingly been noticeable, especially in developing countries. This has explicitly rejected the underlining belief that economic progress is purely quantitative and based on single measures of output (Coyle, 2017, p. 17). Modern conceptualisations regarding the economic improvement of nations, regions and societies have rather increasingly been associated with more holistic ideological doctrines (Milne, 2017, p. 553). From these perspectives, economic progress has rather been associated with a range of factors that are not only limited to output, but also the improvement in standards of living, provision of quality education, structural transformation, provision of adequate employment opportunities and an overarching focus on the implementation of sustainable production practices (Todaro & Smith, 2015, p. 6).

Ascribing to the multi-dimensionality of these perspectives, economic development has gained profound significance over the last decade especially (Liu, 2016, p. 4). Meyer (2017, p. 1377) describe the process in stark contrast to economic growth, as it includes a range of social, cultural and economic factors that all contribute towards the provision of the quality of life of communities and their specific locations. Regional development in particular has drawn a tremendous amount from this framework, where improving the associated processes within specific areas was originally believed to originate from the improvement of various exogenous factors (Tiebout, 1956, p. 416). Earliest of theorists such as Perroux (1955, p. 42) and later Krugman (1979, p. 471) encouraged and advocated the idea that concentrated economic activity, a sectoral focus on production and export performances all contribute to the underlining advancement of the endogenous conditions of communities. Nevertheless, these ideas, much like the conceptualisation of economic growth, have been significantly augmented. With the onset of globalisation and more complex economic occurrences, modern considerations regarding regional development have emphasised the idea of a bottom-up approach in the effort of improving local conditions and competitiveness (Ascani et al., 2012, p. 11). From these perspectives, regional

development is driven by the enhancement of endogenous factors that emanate from a range of social, environmental and human domains that, in turn, power the performance of exogenous production processes (Antonescu, 2015, p. 2).

While the recognition regarding the importance of the endogenous nature of development has become clearer over the last decade, its associated multidimensionality has brought with it a range of implications in the measurement thereof (Feldman & Lowe, 2017, p. 44). As modern understandings have progressed, so too have the means of measuring the concept. Initial attempts in this process applied a number of indicators with the purpose of portraying the progress that societies have made, largely focusing on the quantitative aspects. Indicators such as the gross national product (GNP) as well as gross domestic product (GDP) per capita have widely been used as denominators for regional improvement (Ivković, 2016, p. 258). Notwithstanding the importance of these measures, concerns surrounding their ability to accurately portray the holistic nature of development have continuously been raised by academics (Giannetti et al., 2015, p. 11). These criticisms have largely revolved around the inability of the quantitative measures to reflect the qualitative aspects such as the quality of life and ability to meet one's own basic needs now deeply entrenched in the idea of regional prosperity (Stiglitz et al., 2010, p. 7).

As such, contemporary attempts at measuring the process have involved the use of composite indices. The OECD (2008, p. 12) describes these measures as a combination of indicators based on specific models and more generally used in the measurement of complex concepts. Within development discourse, these have come in various forms with more well-known examples including the Human Development Index (HDI) (UNDP, 1990) and the Index of Sustainable Economic Welfare (Cobb et al., 1989). These indices have widely been used and to some extent have provided considerable scope in understanding the intricacies of social and human functioning. The HDI, in particular, has extensively added to the view that the aim of development is encompassed in primarily enlarging individuals' choices (Seth & Villar, 2017, p. 4). In this sense, it considers a region's prosperity based on the underlining knowledge, health and life expectancy of people. Nevertheless, despite its widespread use, many have come to highlight the vast differences in the subjective selection of indicators when compared to other measures as a serious limitation. Schrott et al. (2015, p. 3), in fact, suggest that the extent of these dissimilarities just reflects how difficult it is to accurately capture the regional development process. Other shortcomings that have been raised include the inability of these indices to measure all domains of development, especially those surrounding pure economic as well as social processes (Majerová, 2012, p. 1).

Not disregarding these shortcomings, composite indices have still proved the most effective in measuring the development of regions and the intricate processes that are associated with it (Perišić & Wagner, 2015, p. 207). Greyling and Tregenna (2017, p. 894) explain that their ability to encompass large amounts of information through combining various indicators yet not losing any of their individual significance is at the centre of these measures' ability to depict a more accurate reflections of progress. Nevertheless, subsequent risks in their use, if not constructed correctly, can include a number of aspects such as inducing simplistic and inaccurate conclusions, contributing to misleading policy agenda and a use of subjective weighting procedures that can adversely distort analyses (Greco, 2018, p. 2). Given the aforementioned, international bodies including the OECD (2008) and IMF (2006) have provided extensive guidelines and frameworks on which these measures should be built and included indicators should be selected. These criteria predominantly revolve around a careful consideration of the relevance, reliability, and availability of the chosen indicators (OECD, 2008, p. 45). Furthermore, these should be readily accessible, easy to interpret and finally provide a sense of cohesion with one another with the purpose of providing a synergetic and viable measure.

Keeping in line with the guidelines, various measures and indices have been constructed within the South African context with the aim of assessing a range of socio-economic processes. The assessment of the country's developmental progress has nonetheless proven difficult given the intricate nature of its social, economic and cultural background (Zoch, 2016, p. 2). This has particularly been evident in the construction of indices that have differed considerably yet aiming to measure interconnected relationships. Examples of these indices include the Quality of Metropolitan Life (Naudé, 2009, p. 319), the Development Index constructed by the South African Audience Research Foundation (SAARF, 2016) and Everyday Quality of Life Index (Higgs, 2007, p. 331). All of the aforementioned aim to measure specific micro-economic living conditions of individuals and their ability to effectively function in these environments. Albeit their significant contribution to lending insight into the intricate nature of development within the country, none have fully captured the complexity of the process, especially when regional perspectives are considered (Greyling & Tregenna, 2017, p. 891). Shortcomings that have been raised surrounding these indices include the lack of the inclusion of quantitative as well as qualitative indicators and the application of weighting procedures that are based on the assumption that all domains are equally significant.

When considering regional development as the specific focus in the assessment procedure, the measurement tools have been limited within the South African context. Greyling (2013), in this regard, has thus far made the most significant contribution in the development of the Gauteng City Region Quality of Life Index.

The measuring instrument aims to assess households' standard of living focusing on the progress made within five specific dimensions. These are housing infrastructure levels, socio-economic wellbeing, social interactions, health and effectiveness and quality of governance. While it has given noteworthy insight into the progress made in the Gauteng area, the design, which is based on the use of ordinal survey data, has restricted its applicability towards measuring levels of development over a range of diverse economic geographies (Meyer, de Jongh, 2018, p. 102).

Irrespective of these limitations, the South African context in general has proven difficult in the assessment of regional prosperity (Zoch, 2016, p. 2). The country, unlike similar developing countries, has had its own unique processes characterised by historical inequities, complex geo-political transformations, vast social migration and a significant reliance on natural resources that up until now has driven the majority of urbanisation and development within the country (Turok, 2012, p. 4). These intricacies have had a range of implications in the formation of the country's metropolitan areas. Van Huyssteen et al. (2010, p. 27), in this regard, assert that the metropolises within the country have had to face a range of challenges. Among these the most telling have been a dramatic increase in population growth, worryingly high concentrations of economic and social activity all of which have brought with it extreme inequalities between the central and peripheral locations (Sinclair-Smith & Turok, 2012, p. 392). In addition to these challenges, the lack of adequate working opportunities and continuously increasing poverty levels have brought with it an influx of internal migrants, which has imposed a tremendous amount of pressure on local government officials in their service delivery obligations (Eigelaar-Meets, 2018, p. 37). Despite these challenges, these areas have remained pivotal in driving economic growth and development contributing approximately 80 percent of national output, housing majority of excellent educational institutions, providing quality infrastructure while also ensuring comparatively high living standards (Mlambo, 2018, p. 63).

The viable, holistic and accurate measure of regional prosperity has become imperative. Truly assessing and understanding regional growth and development from this perspective can possibly assist towards a more insightful picture regarding the complexities underlining these processes. Furthermore, it brings with it the probability of instilling more directive effective policy measures that can assist towards achieving national objectives. Henceforth, the study aims to further test the viability of the composite regional development index (MREDI) developed by Meyer et al. (2016) and Meyer and de Jongh (2018) to measure the progress the country has made regarding regional prosperity within the eight demarcated metropolitan areas. Applying the index to these unique and intricate urban environments provide a comprehensive framework to assess its viability as regional

development tool that allows for in-depth and comparative analyses within developing regions.

3. Methodology

This section presents the methodology that was applied in the research process. The research design and objectives are firstly discussed. This is followed by an in-depth explanation of the design of the composite multi-dimensional index and its various sub-dimensions that were used in the measurement of regional economic development levels within the eight metropolitan regions in South Africa. Finally, the section describes the weighting procedure that was applied to the selected indicators as well as the system that was utilised in classifying the lagging and leading metropolitan areas within the country.

3.1. Research Purpose and Design

The main purpose of the study was to analyse and measure the various regional economic development levels within the eight metropolitan regions within South Africa. In doing so, the study made use of both qualitative and quantitative methods. This included an extensive literature review pertaining the multidimensional nature of regional development and the noteworthy role metropolitan regions play in these processes. While this alluded to the qualitative aspects of the inquiry, the quantitative aspects pertained to the use of the MREDI developed by Meyer et al. (2016) and Meyer and de Jongh (2018). The index was used to measure and analyse the underlining regional development levels within South Africa's eight metropolitan areas. Secondary annual data obtained from the IHS Global Insight (2018) database was used with the period under observation ranging from 1997 to 2017. This timeframe was selected with the purpose of firstly ascertaining the developmental progress these regions have undergone since the democratic transition in the country. Secondly, utilising this specific interval provides context to better comprehend how each metropolis' unique socio-economic environment over the last two decades has contributed to its contemporary role in the current economic and social climate of the country.

3.2. Design of the Composite Regional Development Index

The index as utilised comprises four sub-dimensions carefully selected to illicit a comprehensive picture on the multidimensional nature of regional development. These four sub-dimensions include a total of 18 economic and social indicators pertaining to a region's performance surrounding their demographic characteristics, social developmental progress, labour market processes as well as the region's underlining economic activity. In order to calculate the index measurement, each indicator within the sub-dimensions is subsequently assigned a score ranging from 0 to 5, where higher scores are assigned to better performances pertaining to the

various social and economic aspects. The four sub-dimensions together with their scoring criteria are discussed in the following sub-sections.

3.2.1. Demographics Sub-Dimension

Any country, region or area is profoundly affected by the demographic change of its population (Matuschewski et al., 2016, p. 225). Characteristics such as population growth, density measures and urbanisation levels withhold a range of implications for the wellbeing of societies. As such, the first sub-dimension of the composite index pertains to an overview of the demographic characteristics of the region. The sub-dimension includes four indicators including population growth (% annual growth), household size (number of people in the household), population density (number of people per square km) and the level of urbanisation present within an area. The scoring criteria pertaining to the level of urbanisation and density attribute positive associations with these respective indicators as higher levels of both are associated with better developmental characteristics (Bairoch & Braider, 1991, p. 19). The scoring criteria, however, for population growth as well as household size attribute more complex associations. As such, both were assigned maximum and minimum thresholds (shown in Table 1) that affect index scores.

Table 1. Scoring Criteria for the Demographic Sub-Dimension

Index score	0	1	2	3	4	5
Population growth rate	< 0% and > 4%	0.0% - 1.0%	1.1% - 2.0%	2.1% - 3.0%	3.1% - 3.5%	3.6% - 4.0%
Household size	> 6.0 and < 2.5	5.0 - 6.0	4.5 - 4.9	4.0 - 4.4	3.5 - 3.9	2.5 - 3.4
Population density	0-20	21-50	51-100	101-150	151-200	200+
Level of urbanisation	0 - 30%	31-40%	41-50%	51-60%	61-70%	70%+

3.2.2. Social Development Sub-Dimension

Closely associated with the first-sub-dimension, the social wellbeing and dynamics that are associated with a region's population play a vital role in providing adequate living standards and inclusive societal cohesion. Nevertheless, these processes encompass a range of aspects that impact the possibility of social development, ranging from levels of education and equality to low levels of poverty and a safe and satisfactory living environment (Peach & Petach, 2016, p. 32). Given the myriad of facets, the sub-dimension includes seven indicators that are shown in Table 2 below. Among these, HDI, literacy levels as well as infrastructure index (ranging from 0% - 100%) scores were positively associated with scoring criteria. Contrastingly, lower scores pertaining to the Gini coefficient,

poverty levels, informal housing (% of the housing stock) and the crime index contributed positively to the aggregate scoring of the sub-dimension.

Table 2. Scoring Criteria for the Social Development Sub-Dimension

Index score	0	1	2	3	4	5
HDI	< 0.40	0.40 - 0.54	0.55 - 0.64	0.65 - 0.69	0.70 - 0.79	0.80 - 1.00
Gini coefficient	1.00 - 0.80	0.79 - 0.70	0.69 - 0.60	0.59 - 0.40	0.39 - 0.30	< 0.30
Poverty levels	60%+	51 - 60%	41 - 50%	31 - 40%	21 - 30%	0 - 20%
Literacy	< 60%	60 - 74%	75 - 84%	85 - 89%	90 - 94%	95-100%
Infrastructure index	< 60%	60- 69%	70 - 79%	80 - 89%	90 - 94%	95-100%
% household in informal housing	> 30%	21 - 30%	16 - 20%	11 - 15%	6 - 10%	0 - 5%
Crime index	> 101	81 - 100	61 - 80	41 - 60	21 - 40	0 - 20

3.2.3. Labour Sub-Dimension

Debatably one of the most important resources driving economic prosperity, labour and the effective employment thereof make a significant contribution to regional development (de Jongh, 2017, p. 12). Underlining this notion is that the prevalence of a healthy absorption of human resources into economic processes brings with it enhanced spending, safer environments together with an improved utilisation of resources towards productive investment and away from needed social security provisions (Goodman, 2015, p. 3). By means of measuring the effective use of these resources, the index includes two indicators. The first of these, as shown in Table 3, pertain to the percentage of the population who are economically active (EAP) and this is positively correlated with index scoring. The second includes the strict unemployment rate (% of the EAP who are unemployed), where higher unemployment levels are negatively associated with the scoring criteria.

Table 3. Scoring Mechanism for the Labour Sub-Dimension

Index score	0	1	2	3	4	5
Economic active population	0-10%	11-20%	21-30%	31-40%	41-50%	50%
Unemployment	> 30%	26-30%	16-25%	11-15%	6-10%	0-5%

3.2.4. Economics Sub-Dimension

The fourth and final sub-dimension attempts to measure regional economic progress. While economic activity and development are arguably not synonymous, the wellbeing of any economic system is a fundamental pillar for development (Haller, 2012). This transcends not only from the associated monetary gains made from these processes, but also from the various linkages that economic activity has

with a range of social factors (Gnade, 2017). As such, the sub-dimension consists of five individual indicators, including the GDP growth rate (% annual growth), trade surplus (export less import per capita), household annual income (average income), GDP per capita and tress index scores (levels of economic diversification). Among these, all but the latter have a positive correlation with the scoring criteria, given that higher levels of economic diversification are shown in accordance with lower tress index scores. Therefore, lower scores (or higher diversification) bring with it enhanced regional wellbeing (Kaulich, 2012).

Table 4. Scoring Mechanism for the Economics Sub-Dimension

Index score	0	1	2	3	4	5
GDP growth rate	< 0.0%	0.1-1.0%	1.1-2.0%	2.1-3.0%	3.1-4.0%	4.0%
Trade surplus (R per capita)	< 0.00	0.00-500.00	501-1000	1001-1500	1501-2000	2000+
Household annual income (R)	0-50 000	50 001-100 000	100 001-150 000	150 001-200 000	200 001-250 000	250 000+
GDP per capita (R)	0-20 000	21 000-40 000	41 000-60 000	61 000-80 000	81 000-100 000	100 000+
Tress Index	70+	61-70	51-60	41-50	21-40	0-20

3.3. Applied Weighting and Classification System

As prescribed by the OECD's (2008) principles and guidelines pertaining to the construction of composite indices, all included indicators were weighted. This procedure entailed the use of a participative methodology, where a total of 30 national and international regional economic development specialists ranked indicators in accordance with their perceived importance of each included measure. In doing so, a four-point weighting scale was utilised ranging from 1 limited importance to 4 very high importance. Subsequent to obtaining each of the expert's scoring sheets, scores were then aggregated and an average weighted score (out of a maximum of 4) for each of the 18 indicators was calculated. Results from this process showed that household size obtained the lowest score of 2.13, while literacy levels obtained the highest score at 3.78. Thereafter, scores were normalised through the use of the highest obtained average to provide a final score with a ratio between 0 and 1. After applying each of the individual weighted ratios to the scoring criteria, an index score with a possible maximum value of 73.86 was eventually obtained. Finally, these scores were then converted to a percentage, while a classification system was also added, as shown in Table 5 below.

Table 5. Index Classification System

Index score	Classification
0-10	Very low index
11-20	Low index
21-30	Medium low index
31-40	Upper low index
41-50	Low medium index
51-60	Medium index
61-70	Upper medium index
71-80	Low high index
81-90	Medium high index
91-100	High index

Source: Amended from Meyer and de Jongh (2018)

4. Results and Discussion

Annexure A provides a summary of the most important socio-economic data for South Africa (SA) and the eight metropolitan regions in the country. The applicable and relevant data was sourced from Global Insight. The data, as presented, was utilised to allocate the 'scores' in the index as contained in Annexure B. All the scores, as allocated, were aggregated to provide a total development index for each of the metropolitan regions. The following section provides highlights of the main results from Annexure A. The data for South Africa was used as the baseline to compare the various regions. Table 6 provides a summary of the metropolitan regions in South Africa with the abbreviations used in the analysis in the two annexures.

Table 6. Metropolitan Regions in South Africa

Metro region	Abbreviation	2017 Index classification from annexure B
City of Cape Town Metropolitan Municipality	CPT	Medium index – 58.1
eThekwini Metropolitan Municipality	ETH	Medium index – 54.6
City of Ekurhuleni Metropolitan Municipality	EKU	Medium index – 57.9
City of Johannesburg Metropolitan Municipality	JHB	Upper medium index – 65.8
Nelson Mandela Bay Metropolitan Municipality	NMA	Medium index – 53.4
City of Tshwane Metropolitan Municipality	TSH	Upper medium index – 65.9
Mangaung Metropolitan Municipality	MAN	Low medium index – 49.3
Buffalo City Metropolitan Municipality	BUF	Low medium index – 47.4

In terms of population growth, a general decline in the growth rate has been experienced from 1997 to 2017. South Africa (SA) had a constant growth rate of between 1.6 and 1.7% from 1997 to 2017, while City of Cape Town Metropolitan Municipality (CPT) had the highest population growth in 2017 of 2.9%, and Buffalo City Metropolitan Municipality (BUF) had the lowest at 1.4%. All metro regions had higher population growth rates if compared to the country's growth rates, except for BUF and Mangaung Metropolitan Municipality (MAN). Household sizes have also declined in general and for SA from 1997 to 2017; this decline is significant from 4.7 to 3.5 people per household. Nelson Mandela Bay Metropolitan Municipality (NMA) had the largest households in 2017, with 3.6 people, while the City of Johannesburg Metropolitan Municipality (JHB) and City of Ekurhuleni Metropolitan Municipality (EKU) had the smallest households with average of 3.1 persons per household. In general, the metro regions have smaller household than the country on average. All the metro regions have much higher population densities than the country as a whole. JHB had by far the highest population density of the metros, followed by EKU, while MAN had the lowest population density. Population densities have increased significantly in most metros. All the metro regions also have much higher levels of urbanisation than the country as a whole. CPT, JHB and EKU had the highest level of urbanisation, while BUF had the lowest level of urbanisation.

In terms of HDI, all the metros had higher HDI than the country on average with CPT the highest at 0.74 (SA=0.66), while the metros of MAN and BUF had the lowest HDI 0.67. All metros have experienced improved HDI since 1997. Regarding income inequality (GINI coefficient), SA had an index of 0.63, while the metros had similar indexes of between 0.62 and 0.64, indicating high levels of inequality. The GINI coefficient has increased for all metros and SA. Poverty is a huge problem in SA, with a poverty level of 58%. Poverty is also a problem in the metro regions, where poverty levels range between 44.5% (City of Tshwane Metropolitan Municipality TSH) and 58.4% (BUF). Poverty levels have significantly declined since 1997, but are still very high. Literacy levels are high for all metro regions and have also increased over the last 20 years. Basic infrastructure provision has also improved significantly over the last 20 years, with NMA having the highest index of 0.92, and BUF having the lowest index of 0.74. Housing provision in SA has been focused in the metro regions and the backlogs for housing have declined significantly for all regions as well as for SA. Crime is also still a major issue in SA, but the data shows that SA and all metro regions have slightly declining crime levels. CPT has the highest crime levels, followed by MAN. The crime rates in the metro regions are generally higher than for SA in general.

The economically active population (EAP) has also increased over time for SA and all the metros, while all the metros have higher EAPs if compared to SA.

Unemployment is a structural problem in SA with high levels of unemployment. SA had an unemployment rate of 27.2% in 2017, while EKU, NMA and BUF had even higher levels of unemployment than the national average. In recent times, economic growth has been low in SA and the metros also have been affected. In 2017, SA had a growth rate of only 1.3%, while the metros had growth rates ranging between 0.6% and 1.3%. BUF even had a negative growth rate. GDP per capita has been steadily increasing over time for all metros, with TSH and JHB with the highest per capita output. BUF again was worst off of all the metros regarding GDP per capita. In terms of trade surplus, most metros had negative results, indicating a higher level of imports as compared to exports, having a negative impact on economic growth. TSH had the most positive trade surplus, while EKU and CPT had the highest negative trade surpluses. Household income has been increasing steadily and most households in the metros have higher levels of income than for SA on average. Only BUF and MAN have lower income levels than the national average. CPT has the highest income levels, followed by TSH. Lastly, the tress index indicates the level of diversification of the economy with a lower score indicating higher levels of diversification. ETH had the most diversified economy of all the metros, while TSH had the lowest level of diversified economy.

5. Application of Index Including Results and Discussion

Annexure B provides detail regarding the application of the index to all the metro regions in SA, and Tables 5 and 6 provide index classification results. Firstly, in terms of the overall ranking, it was found that TSH has the highest composite index of 65.9, indicating a upper medium development index, followed by JHB with an index of 65.8 (upper medium index). Interestingly, CPT had only the third highest index of 58.1 (medium index). The metro with the lowest index is BUF, with 47.4 (low medium index), followed by MAN (low medium index) and NMA (medium index). All of the metros achieved higher development index scores if compared to SA, which had a score of 45.64 (low medium index). Different regions grow and develop at different paces and tempos. The question of convergence between leading and lagging metro regions is evident in that the index of the metro with the lowest index also had the highest overall annual growth rate of 1.6%, followed by MAN with 1.4% and NMA with 1.1%. The leading metros of TSH and JHB have for example only improved by 0.8% and 0.9% respectively per annum over the last 20 years.

In terms of the **sub-index: Demographic development** (maximum score of 13.31), the metros with the highest overall indexes, namely CPT, EKU, JHB and TSH had the highest scores of 12.1, while the metro with the lowest score was MAN with a

sub-index of 9.4. CPT and BUF were improving the fastest in terms of this sub-index at 1.7% and 1.3% per annum since 1997, while the metros with the lowest growth were JHB and EKU at -0.3%. Regarding the **sub-index: Social development** (maximum score of 31.73), EKU has the highest score of 17.5, followed by TSH with 17.4, while the metros with the lowest scores were BUF and MAN with sub-indexes of 13.5 and 14.4, respectively. BUF and MAN were improving the fastest in terms of this sub-index at 4.3% and 3.9% per annum since 1997, while CPT and TSH were growing the slowest at 1.0% and 1.8%.

The **labour sub-index** (maximum score of 9.3) has in most of the metros and also SA moved backwards. For SA, the index declined from 3.72 in 1997 to 3.6 in 2017, while CPT, EKU, JHB, NMA, TSH and MAN also had negative growth rates for this sub-index. The only metro that had an improvement in this index was BUF. CPT had the highest index of 5.45, followed by JHB at 5.33, while the other metros had indexes ranging between 4.46 and 4.59. BUF had the highest growth rate followed by TSH in growth of the index per annum. Lastly, the fourth **sub-index: Economics** (maximum score of 19.52) indicates that JHB had the highest index of 14.6, followed by TSH with 13.8, while BUF is again the lowest at 5.6. JHB had the highest annual improvement growth rate of 1.8%, while ETH and BUF had the lowest improvement rates of -0.68% and -0.65%, respectively. The comparative index indicates that it is possible to facilitate economic development over a period of time; in this case, over 20 years. For South Africa, the overall index improved by an average of 1.33% per annum. BUF, which has the lowest total index of 47.4, also has the highest annual improvement growth rate of 1.6%, compared to a growth rate of 0.8% for TSH, which had the highest overall index. This indicates some convergence over time where lagging regions can catch up with leading regions. Overall, for all the metros combined, the average annual improvement rate of the total index from 1997 to 2017 was 0.94%. The sub-index that improved the most is social development with 2.47% growth, followed by the demographic sub-index at 0.35% and the economic sub-index at 0.24%. The labour sub-index had the lowest improvement rate of 0.13%. Developmental processes are slow and long-term processes. The results of the index could be used to identify weaknesses and strengths for a specific region, comparison of regions, determine the speed and tempo of development and be utilised to compile strategic development policy for regions.

6. Conclusion and Recommendations

Globally, regions and especially highly urbanised regions are driving development and growth. The main aim of this study was to apply and further test the multi-dimensional regional development index (MREDI) developed by Meyer et al. (2016) and Meyer and de Jongh (2018) with the purpose of measuring and

assessing the regional development progress made within the eight metropolitan regions in South Africa since the country's transition to democracy. The index was developed with the aim to comply with accepted guidelines, such as multi-dimensionality of indicators, quantitatively measurable indicators, grouping of indicators and allocation of weights to indicators. The analysis of the metropolitan regions in South Africa produced interesting and realistic results. South Africa has a dominant focus on social development and this shows in the results when the four sub-indexes are analysed. The social development sub-index had by far the highest annual growth rate over the study period. Most of the metros significantly improved regarding this sub-index. On the other hand, however, most of the metro regions lost ground concerning the economic and labour sub-indexes.

It was surprising to find that TSA had the highest development index with a high development classification, followed by JHB with a medium development classification. It was surprising to find CPT, with its high average income only with the third highest index, also with a medium development classification. Convergence between metros is taking place with the lowest developed metros growing at significantly high growth rates when compared to the top three metros. Each metro is at a different level of development and is developing at a different pace. One of the limitations of the formulation of a comprehensive index is the use of subjective indicators that require surveys, making the index slow and costly to update even on an annual basis. Future studies will include the development of a more comprehensive regional classification system, the application of econometric models and further testing and refinement of the index in other regions on a global scale. The implications of the research are that regions could be rapidly assessed and compared. The index has been successful in its original purpose, which was to compare the level of development of a region. However, the index also makes it possible to compare regions, allow in-depth analysis of regions for strategy development, and to determine the pace and the stage of development of a region.

7. References

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Annex A. Regional profile

Indicator	South Africa		CPT		ETH		EKU		JHB		NMA		TSH		MAN		BUF	
	1997	2017	1997	2017	1997	2017	1997	2017	1997	2017	1997	2017	1997	2017	1997	2017	1997	2017
Population Growth Rate in %	1.6	1.7	6.8	2.9	2.7	1.9	4.3	2.3	4.1	2.7	1.7	1.8	3.8	2.7	1.8	1.5	0.9	1.4
Household Size	4.7	3.5	4.0	3.4	4.5	3.5	3.9	3.1	3.7	3.1	4.4	3.6	4.0	3.1	4.0	3.2	4.6	3.4
Population Density*	35	46	1036	1707	1135	1513	1066	1786	1652	3065	502	650	299	525	66	86	266	312
Level of Urbanization in %	56	64	99	99	84	82	99	99	99	99	98	97	86	91	92	91	74	79
HDI (0-100)	0.56	0.66	0.69	0.74	0.60	0.67	0.66	0.71	0.69	0.73	0.62	0.68	0.69	0.73	0.58	0.67	0.58	0.67
Gini Coefficient (0-100)	0.61	0.63	0.55	0.62	0.58	0.63	0.58	0.63	0.61	0.63	0.57	0.63	0.57	0.62	0.58	0.62	0.58	0.64
Poverty Levels** in %	73.7	58.2	51.4	44.9	57.8	54.0	53.2	49.4	51.2	46.9	65.7	57.4	47.9	44.5	68.1	54.8	74.4	58.4
Literacy *** in %	68.0	84.1	85.2	92.2	78.1	88.2	81.2	91.0	84.1	92.2	80.9	89.8	83.0	91.3	72.6	85.2	74.1	86.9
Infrastructure Basic Index (0-100)	0.63	0.75	0.87	0.89	0.76	0.83	0.80	0.83	0.84	0.87	0.79	0.92	0.78	0.86	0.68	0.82	0.64	0.74
% of Households in Informal Housing	14.4	10.2	18.1	11.7	19.1	4.9	25.9	12.3	18.8	11.8	22.8	2.5	17.6	10.8	20.5	8.9	21.4	5.4
Crime Index****	146	98	194	159	144	99	193	98	235	123	246	119	171	105	202	127	185	115
Economically Active Population in %	28	39	39	48	36	40	40	49	42	51	32	43	38	49	33	44	30	43
Unemployment in %	20.6	27.2	12.4	24.3	18.0	16.7	22.2	32.5	19.9	26.5	19.1	29.8	16.1	23.9	18.6	26.7	23.3	28.7
GDP Growth Rate %	11.7	1.3	8.2	0.6	11.5	0.5	8.3	1.0	9.6	0.9	16.1	0.6	8.6	1.2	14.9	1.1	15.0	-0.2
GDP per capita in R (X000)(Constant)	43.2	55.3	65.2	73.4	53.8	78.4	63.1	61.7	85.6	95.0	54.5	66.1	75.6	95.4	48.4	76.3	42.1	53.1
Trade Surplus per Capita (R1 000)	0.3	1.7	-2.2	-16.1	0.1	-8.5	-5.2	-16.4	-4.6	10.7	-2.9	-4.2	14.2	32.2	-0.3	-0.2	-2.2	-3.3
Average Income per Household (Rx1000)	51	202	76	287	62	223	71	221	83	253	57	217	89	273	49	198	48	195
Tress Index (0-100)	40.8	40.2	53.4	52.9	49.1	45.6	53.1	46.9	49.6	54.1	56.8	52.5	54.1	54.5	53.7	54.8	56.2	53.1

*Number of people per km² ** Share below upper poverty line ***Functional literacy: age 15+, completed grade 7 or higher ****Weighted average /100 000

Source: Global Insight(2018)

Annexure B. Scoring and calculation of the development index

Indicator	South Africa		CPT		ETH		EKU		JHB		NMA		TSH		MAN		BUF	
	1997	2017	1997	2017	1997	2017	1997	2017	1997	2017	1997	2017	1997	2017	1997	2017	1997	2017
Population Growth Rate (%)	1.26	1.26	0.00	1.88	1.88	1.26	3.14	1.88	3.14	1.88	1.26	1.26	3.14	1.88	1.26	1.26	0.63	1.26
Household Size	1.12	2.25	1.69	2.81	1.12	2.25	2.25	2.81	2.25	2.81	1.69	2.25	1.69	2.81	1.69	2.81	1.12	2.81
Population Density*	0.68	0.68	3.39	3.39	3.39	3.39	3.39	3.39	3.39	3.39	3.39	3.39	3.39	3.39	1.36	1.36	3.39	3.39
Level of Urbanisation (%)	2.38	3.17	3.97	3.97	3.97	3.97	3.97	3.97	3.97	3.97	3.97	3.97	3.97	3.97	3.97	3.97	3.97	3.97
Sub-index: Demographic Development	**5.44**	**7.36**	**9.04**	**12.05**	**10.36**	**10.86**	**12.75**	**12.05**	**12.75**	**12.05**	**10.30**	**10.86**	**12.18**	**12.05**	**8.27**	**9.39**	**9.11**	**11.42**
HDI (0-100)	1.98	2.98	2.98	3.97	1.98	2.98	2.98	3.97	2.98	3.97	1.98	2.98	2.98	3.97	1.98	2.98	1.98	2.98
Gini Coefficient (0-100)	1.74	1.74	2.60	1.74	2.60	1.74	2.60	1.74	1.74	1.74	2.60	1.74	2.60	1.74	2.60	1.74	2.60	1.74
Poverty Levels**(%)	0.00	0.95	0.95	1.90	0.95	0.95	0.95	1.90	0.95	1.90	0.00	0.95	1.90	1.90	0.00	0.95	0.00	0.95
Literacy ***(%)	1.00	2.00	3.00	4.00	2.00	3.00	2.00	4.00	2.00	4.00	2.00	3.00	2.00	4.00	1.00	3.00	1.00	3.00
Infrastructure Basic Index (0-100)	0.90	1.80	2.70	2.70	1.80	2.70	2.70	2.70	2.70	2.70	1.80	3.60	1.80	2.70	0.90	2.70	0.90	1.80
% of Households in Informal Housing	2.28	3.04	1.52	2.28	1.52	3.80	0.76	2.28	1.52	2.28	0.76	3.80	1.52	3.04	1.52	3.04	0.76	3.04
Crime Index****	0.00	0.88	0.00	0.00	0.00	0.88	0.00	0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sub-index: Social Development	**7.90**	**13.38**	**13.75**	**16.59**	**10.86**	**16.04**	**11.99**	**17.46**	**11.88**	**16.59**	**9.15**	**16.07**	**12.80**	**17.35**	**8.01**	**14.41**	**7.25**	**13.50**
Economic Active Population (%)	1.74	2.60	2.60	3.47	2.60	2.60	2.60	3.47	3.47	4.34	2.60	3.47	2.60	3.47	2.60	3.47	1.74	3.47
Unemployment (%)	1.98	0.99	2.98	1.98	1.98	1.98	1.98	0.99	1.98	0.99	1.98	0.99	1.98	1.98	1.98	0.99	1.98	0.99
Sub-index: Labour	**3.72**	**3.60**	**5.58**	**5.45**	**4.59**	**4.59**	**4.59**	**4.46**	**5.45**	**5.33**	**4.59**	**4.46**	**4.59**	**5.45**	**4.59**	**4.46**	**3.72**	**4.46**
GDP Growth Rate (%)	3.97	1.59	3.97	0.79	3.97	0.79	3.97	0.79	3.97	0.79	3.97	0.79	3.97	1.59	3.97	1.59	3.97	0.00
GDP per capita	1.85	1.85	2.78	2.78	1.85	2.78	2.78	2.78	3.70	3.70	1.85	2.78	2.78	3.70	1.85	2.78	0.93	1.85
Trade Surplus per Capita (R1 000)	0.67	0.67	0.00	0.00	1.34	0.00	0.00	0.00	0.00	3.35	0.00	0.00	3.35	3.35	0.00	0.00	0.00	0.00
Average Income per Household	0.74	2.94	0.74	3.68	0.74	2.94	0.74	2.94	0.74	3.68	0.74	2.94	0.74	3.68	0.00	2.21	0.00	2.21
Tress Index (0-100)	2.33	2.33	1.55	1.55	2.33	2.33	1.55	2.33	2.33	3.11	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55
Sub-index: Economics	**9.55**	**9.38**	**9.03**	**8.80**	**10.22**	**8.84**	**9.03**	**8.84**	**10.74**	**14.63**	**8.11**	**8.07**	**12.38**	**13.87**	**7.37**	**8.12**	**6.45**	**5.61**
Total index score, max 73.86	26.61	33.71	37.41	42.90	36.04	40.33	38.36	42.82	40.82	48.60	32.14	39.46	41.95	48.72	28.23	36.38	26.52	35.00
Index out of 100 score	36.03	45.64	50.65	58.08	48.79	54.61	51.93	57.98	55.27	65.80	43.52	53.42	56.80	65.97	38.23	49.26	35.91	47.39
Overall ranking			4	3	5	5	3	4	2	2	6	6	1	1	7	7	8	8

*Number of people per km² ** Share below upper poverty line ***Functional literacy: age 15+, completed grade 7 or higher ****Weighted average /100 000 people.

Military Expenditure, Institution and Inclusive Growth in South Africa

Anifowose Oladotun[1], Nyatanga Phocenah[2]

Abstract: The effect of military expenditure on growth is a longstanding debate in defence economics and peace literatures. The paper investigated the combined impact of military expenditure and Institutional quality on South Africa Inclusive growth. The authors add to the defence literature by constructing an inclusive growth index for South Africa, so as to capture the joint real effect of military expenditure and institutional quality. Only corruption was selected as a reliable proxy for institutional quality, since corruption is often a symptom of bad institution. Using data from 1984 to 2017, the result suggests that the impact of military expenditure on South Africa inclusive growth is positive and significant whereas military expenditure impact in the presence of corruption retards South Africa inclusive growth.

Keywords: military expenditure; institution quality; South Africa; inclusive growth

JEL Classification: H50

Introduction

The question of how military expenditure affects economic growth is a longstanding one in the literature, dating back to empirical studies by(Benoit, 1973, Benoit, 1978) which argued that military expenditure has a positive impact on economic growth. Although, this subject matter has secured a growing attention in wide–ranging empirical studies which made use of various methodologies and theoretical frameworks, a consensus has not been reached (Dunne, 2005, Alexander, 2015).

A positive link of military expenditure and economic growth are found in developed and emerging countries, which may be because military expenditure provides the enabling environment (Security) for local and international

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investment. Furthermore, it contributes to growth via utilization of resources, particularly in employment generation, Research and Development, provision of vocational training (Menla Ali and Dimitraki, 2014, Meng , 2015, Zhao, 2015). Recent empirical findings suggested that military expenditure have an adverse, positive or insignificant impact on growth depending on the number of countries considered, time span or empirical method employed in the study.

Conversely, adverse link between military expenditure and economic growth happens as a result it crowd-outs public investment, from productive activities to unproductive ones(Ward and Davis, 1992, Mintz and Stevenson, 1995, Klein, 2004, Kentor and Kick, 2008, Shahbaz and Shabbir, 2012). The economic impact of military expenditure is mixed and inconclusive with results depending on the country or sample of countries, the time period or methodology used (Smith, 2000, Dunne, 2005, d'Agostino, 2017).

The below commences the clarion call for an empirical investigation on why military expenditure is positive in some countries and negative in other countries, or what environment influence changes in military expenditure-growth impact.

A potential explanation for the diversity of these conclusions could be the institutional environment that the military expenditure is taking place. For example, a common concerned is whether military expenditure exert positive to growth during high threat periods or whether high military expenditure is influence by rent seeking or corruption. (Aizenman and Glick, 2006) postulate that an economy with high military expenditure in an environment with widespread corruption and rent seeking tend to lead to adverse impact of military expenditure on growth and vice versa.

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

Recently (Compton and Paterson, 2016) consider how institutions can impact military expenditure-growth nexus. Based on 100 countries of annual data from 1988 to 2010 by employing Panel Ordinary Least Square (OLS) and system generalized methods of moments (GMM), the authors find 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.

Consequently, with diverse of ideas and empirical findings on the relationship between military expenditure and growth, it is imperative that a study on South Africa will not only contribute to the debate but also set a benchmark for other

studies that will follow this research work. This is because there has been no previous studies on South Africa to the best of the authors' knowledge.

The structure of this chapter is as follows Section 1.2 present literature review on military expenditure, institutional quality and economic growth. Section 1.3 provides the empirical review of literature on military expenditure and economic growth. Section 1.4 and 1.5. present the model and data and result presented respectively. Section 1.6 presents the conclusion.

Literature Review on Military Expenditure, Institution and Growth

(Aizenman and Glick, 2006, Compton and Paterson, 2016) affirms that high military expenditure in the presence of high threat environment leads to economic growth via the provision of security while high military expenditure in the presence of low threats will retard economic growth via wide spread corruption and rent seeking (d'Agostino et al., 2012) further examined military expenditure-growth in the presence of corruption using African sample from 2003 to 2007.They found that corruption does influence the impact of military expenditure on growth. In related paper, (d'Agostino et al., 2017) re-examined the military expenditure – growth using 1996-2007 period by employing a System GMM estimation confirms that military expenditure and corruption does retard economic growth.

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Data and Empirical Approach

Data

Considering the connection between military expenditure and institutions on inclusive growth in BRICS countries, (1984-2017). Inclusive growth index data that covers from 1984 to 2017 were presented in the appendix. Military expenditure data were obtained from Stockholm International Peace Research Institute extended database 1948 to 2017, which is relatively the standard in the literature.

Another variable of concern is institutional quality variables. Here, the proxy for institutional quality is corruption. The institutional quality proxy variable is source from IRIS/International Country Risk Guide (ICRG) database. Each of the ICRG

measures range of 0 to 6, with higher values representing less corruption. In other words, higher scores indicate better institutions.

Other variables were obtained from World Bank Development Indicators (WDI).

Study Period

The study period is 1984 to 2017. Data source for military expenditure at share of GDP were obtained from SIPRI database because it has more complete data series.

Description of Variables and data source

Variables	Definition	Sources
Key variables		
I.G	Inclusive growth Index	Author computatio
ME	Military expenditure (Share of GDP)	World Bank and Stockholm International Peace Research Institute new extended database 1984-2017
External Threat	External threats are classified as wars involving two independent countries	International Country Risk Guide (ICRG) database 1984 -2017
Internal threat	Internal threats include Civil war, insurgency crisis and communal clashes	
Institutional quality	Corruption as proxy for institutional quality	
POP	BRICS Population growth rate	World Bank Development Database 2018 **(WDI)**
Security Web	BRICS Security Web measured by averaging of the ratio of military expenditure to GDP of BRICS neighboring countries	
INV.	Investment	
EDU	BRICS Education	

The authors employed Z-sum score technique in this study. In this approach, equation for the normalized value according to KOTHARI, C. R. 2004. *Research methodology: Methods and techniques*, New Age International, ULLAH, S. & KIANI, A. K. 2017. Maqasid-al-Shariah-based socio-economic development index (SCECDI): The case of some selected Islamic economies. *Journal of Emerging Economies & Islamic Research,* 5..After finding the Z-sum score, the authors evaluate the average of the area under the curves already normalized. These values are considered as inclusive growth index by the following: Inclusive Growth Index (I.G.I.) = Average of Z score is divided by number of observation that is I.G.I.= 50% of Social Growth indicators + 50% of Economic Growth Indicators (IGI=$\frac{\sum x}{n}$) 0<IGI<1.

The values of the IGI index vary between 0 and 1; if values close to 0 indicates that BRICS countries has very low level of inclusive Economic growth. On the other hand, values close to 1 indicates that the BRICS countries has a very high level of inclusive Economic growth.

Empirical Approach

For the empirical analysis, times series panel approach was adopted. The panel growth equation for this research adopt (Aizenman and Glick, 2006) and (Compton and Paterson, 2016) empirical approaches written as

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

Where Y- is the inclusive growth index, $M.(Institution)_{it}$- is the interaction of military expenditure with institution, X_{it} – is the set of control variables – education, population and Investment variables. ϵ_{it} is the error term.

Data Estimation and Interpretation

The study begins the analysis of the impact of military expenditure and institutional quality on inclusive growth in BRICS countries with descriptive analysis. Results of the descriptive statistics are reported in Table 6. Summary of the descriptive results shows that all the series show a high level of consistency as their means and medians fall within the maximum and minimum values of these series. Results of standard deviation, which measures the level of variation or degree of dispersion of the variables from their means, reveal that the actual deviation of the data from their means are very small as all the standard deviations are very low. Also, the most volatile is the variable of interaction between military expenditure and corruption (4.15%) while the least volatile is the GDP (0.18%) follow by population growth (0.41%).

Table 1. Summary of Descriptive Statistics

	Growth	**Military**	**Corrupt.**	**Mil*Corr.**	**Education**	**Pop.**	**Invest.**
Mean	0.560548	1.675531	1.888973	3.961608	1.997633	8.234231	1.350123
Median	0.530000	1.512503	2.000000	3.344052	1.627790	8.160083	0.777008
Maximum	0.920000	5.503756	5.330000	20.78054	6.371640	9.097859	6.186882
Minimum	0.000000	0.000000	0.000000	0.000000	0.000000	7.546916	-0.178437
Std. Dev.	0.182348	1.390113	1.618897	4.151119	2.268775	0.412856	1.581964
Observation	146	146	146	146	146	146	146

Table 2 presents the correlation matrix of the exogenous variables used to achieve the second objectives. Correlation matrix shows the degree of association and

direction of relationship among the variables. Results in Table 2 show that the degree of association that exists among the independent variables. It can be deduced that that all independent variables can be included in the same model without the fear of multicollinearity. Furthermore, result shows that while all other independent variables and the interactive variable have negative relationship with inclusive growth, population growth is the only variable that has positive relationship with inclusive growth.

Table 2. Correlation Matrix

	Corruption	**Education**	**Growth**	**Investment**	**Military**	**Mil*cor**	**Pop**
Corruption	1.000000						
Education	0.442204	1.000000					
Growth	-0.409220	-0.389133	1.000000				
Investment	0.310443	0.311967	-0.186814	1.000000			
Military	0.356456	0.006495	-0.539541	0.237188	1.000000		
Mil*cor	0.774648	0.203598	-0.497215	0.166961	0.700897	1.000000	
POP	-0.194754	-0.279060	0.283095	0.132430	-0.260201	-0.243763	1.000000

The next step is to examine whether long-run relationship exists among the variables. The accepted method to test the unit root for stationarity of variables and settle the degree of integration of a time series is to apply the Augmented Dickey-Fuller (ADF) test. Therefore, these tests for unit root process at the level and at the first differences of all variables have been performed and reported in Table 3.

According to Table 3, ADF unit root test reveals that Military expenditure, Corruption (as proxy for institutions quality) and Inclusive growth (IG), all the time series are I(1) and I(0).

Table 3. UNIT ROOTS TEST RESULT

South Africa		**ADF Statistics**	**Order of Integration**
	IG	-9.214333	I(1)
	ME	-4.966555	I(1)
	Corr.	-4.156739	I(1)
	M*Corr.	-4.006266	I(1)
	Edu	-5.050282	I(1)
	INV	-4.320993	I(0)
	POP	-1.611576	I(1)

Note: The unit root test for South Africa was conducted using EVIEWS 15.0.

All the tests have been carried out starting from the most general (with drift and trend) to the most restricted model (without drift and trend) as also suggested by Enders (1995). Then, the above conclusions have been reached.

Having found out that the time series are I(1), cointegration analysis can be considered to identify the long-run relationship between Military expenditure (Me), Institutions (Is) and Inclusive growth (IG).

To Perform The Standard Ardl Bound Test, All Economic Variables In The Model Must Have The Same Order Of Integration.

Ardl Bound Testing

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. If calculated value of the statistics (Johansen trace test statistic) is greater than 95% critical value, the null of r= 0, which indicates no long-run relationship, is rejected against the alternative hypothesis.

Now that we have established that, IG, Me, Corr., Edu. Pop and M*Corr. are non-stationary at level and integrated to the same order I (1), we can test for the presence of integration.

ARDL Bounds Test		
Test Statistic	Value	k
F-statistic	7.048656	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

The ARDL bound test results are reported above. Results indicate that there is a relationship between military expenditure, institutional quality and inclusive growth in South Africa since the calculated value of the statistics is greater than 5% critical value. The ARDL bound test results for South Africa (7.048 is greater than 2.45 at 5%), and statistically significant at α= 1% and 5% respectively. This shows that there is a long-run relationship among the among military expenditure, institutional quality and inclusive growth.

Ardl Cointegrating And Long Run

Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GROWTH(-1))	0.592783	0.382688	1.548999	0.1497
D(COR)	0.235052	0.081168	2.895879	0.0146
D(COR(-1))	-0.292282	0.128109	-2.281505	0.0434
D(EDU)	0.026773	0.011595	2.309041	0.0414

D(EDU(-1))	-0.010868	0.010092	-1.076838	0.3046
D(INV)	0.011503	0.013460	0.854589	0.4110
D(INV(-1))	0.030617	0.010002	3.060922	0.0108
D(MCP)	-0.026138	0.035795	-0.730217	0.4805
D(MCP(-1))	0.088567	0.043436	2.039025	0.0662
D(ME)	-0.032302	0.138514	-0.233203	0.8199
D(ME(-1))	-0.351244	0.203179	-1.728738	0.1118
D(POP)	-3.081832	0.905659	-3.402863	0.0059
D(POP(-1))	2.509094	0.895300	2.802519	0.0172
CointEq(-1)	-2.479577	0.636630	-3.894848	0.0025
Cointeq = GROWTH - (0.2057*COR + 0.0219*EDU -0.0039*INV -0.0427				
*MCP + 0.2143*ME -0.5048*POP + 0.2939)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
COR	0.205664	0.027275	7.540482	0.0000
EDU	0.021915	0.009918	2.209576	0.0493
INV	-0.003913	0.011707	-0.334240	0.7445
MCP	-0.042703	0.010504	-4.065449	0.0019
ME	0.214268	0.057919	3.699453	0.0035
POP	-0.504764	0.075661	-6.671357	0.0000
C	0.293911	0.061740	4.760442	0.0006

Interpretation of ARDL Cointegrating and Long Run

Considering the individual variable in the context of South Africa, the long run relationship and impact of corruption, the result is an indication that corruption exhibits a positive long run relationship with inclusive growth which is a proxy for institutional quality. The long run coefficient of corruption is 0.205664 and it is statistically at 5% level. The implication of this is that there is presence positive additive of corruption (i.e. greasing the wheels for growth) reduces government red tape[1] bureaucracies, therefore promoting inclusive growth. Therefore, according to the result, a unit in corruption will retards inclusive growth by 20 %.

Another variable employed in the model Education. The long run relationship and impact of education shown, the result is an indication that education exhibits a positive long run relationship with inclusive growth which is a proxy for human development. The long run coefficient of education is 0.021915 and it is

[1] 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 organizations.

statistically at 5% level. The implication of this is that South Africa education system that stimulate inclusive growth. Therefore, according to the result, a unit in education will retard inclusive growth by 2.1 %.

Investment long run coefficient is -0.003913. The result is an indication that investment exhibits an adverse long run relationship with inclusive growth and it statistically significant at 5%. The implication of this is that there is need more investment in more inclusive sectors to stimulate inclusive growth.

Another variable employed the military corruption interactive. The long run relationship and impact of education, the result is an indication that military-corruption interactive exhibits an adverse long run relationship with inclusive growth. The long run coefficient of military corruption interactive is -0.042703. The implication of this is that military-corruption interactive retards inclusive growth. Therefore, according to the result, a unit in military expenditure-corruption interactive will retard inclusive growth by 4.2 %.

Military expenditure indicates a significant positive long run relationship on inclusive growth, the result is an indication that military expenditure exhibits a positive long run relationship with inclusive growth. The long run coefficient of military expenditure is 0.214268. The implication of this is that there is military expenditure stimulate inclusive growth. Therefore, according to the result, a unit in military expenditure will stimulate inclusive growth by 21 %.

Population long run coefficient is -0.504764. The result is an indication that population exhibits a negative long run relationship with inclusive growth and it is statistically significant at 5%. The implication of this is that South Africa population growth rate undermines the actualization of inclusive growth.

Under the short run aspect of the cointegration regression, the result show that all the variables used as a determinant for inclusive growth in South Africa during the under review. The result show that the lagged values of corruption, education, investment, military expenditure, military corruption all have short run significant impact on military expenditure in South Africa.

Diagnostic Tests (Post Estimation)

The below present the post estimation diagnostic tests ranging from heteroskedasticity and serial correlations. The rationale of the post estimation tests is to ascertain the how robustness the previous estimations results.

Test For Heteroskedaticity For South Africa

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
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

The result of the heteroskedasticity test is presented above for South Africa. The null hypothesis is that there is heteroskedasticity. 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 heteroskedasticity which may affect the validity of the result.

Test For Serial Correlation For South Africa

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	2.497440	Prob. F(2,14)	0.1182
Obs*R-squared	8.414697	Prob. Chi-Square(2)	0.0149

The null hypothesis for South Africa indicates that there is no serial correlation. Since the F-statistic and the probability, it is obvious that the null hypothesis is to accepted while we rejected the alternative hypothesis that there is serial correlation. Consequently, the estimates from our model are valid and can be used for forecasting.

Conclusion and Recommendations

The paper investigate the combined effect of military expenditure and institutional quality on South Africa inclusive growth. The research employed Autoregressive Distributed Lag (ARDL) estimation technique with data spanning over more than 30 years.

We add to this literature by constructing an inclusive growth index for South Africa so as to capture the joint real effect of military expenditure and institutional quality. We used only corruption as a reliable proxy for institutional quality, since corruption is often a symptom of bad institution.

In conclusion, our result suggests that the impact of military expenditure on South Africa inclusive growth is positive and significant whereas military expenditure impact in the presence of corruption retards South Africa inclusive growth. The followings are recommendations that can be explored by South Africa policymakers:

1. There is need for the government to strengthen constitutional

anticorruption institutions and civil societies to ensure that corrupt tendencies within military sector are reduced to the barest minimum.
2. Aggressive public education to change the mind set of South Africa citizens to make them see corruption as evil and a common enemy.
3. Establishment of special courts to deal with corruption cases separately and strengthen the weak legal system.

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Appendix

South Africa Inclusive Growth Index from 1984 to 2017

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 Computation

Exchange Rate Volatility and Foreign Capital Inflows in Nigeria: A Vector Error Correction Model Approach

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Abstract: The aim of this study is to examine the relationship between exchange rate volatility and foreign capital inflows in Nigeria. The results of the past studies were inconclusive and the uniqueness of this work also lies in the consideration of other important variables such as external debt and remittances as parts of strategic variables to capture foreign capital inflows which the bulk of the past studies have failed to recognize. Data were collected from CBN Statistical Bulletin and UNCTAD investment report from 1990 to 2016. Relevant pre-estimation tests such as unit roots and Johansen conitegration were carried out. Because all the study variables were integrated of order one i.e I(1) and have two cointegrating equations vector error correction model was estimated. Consequently, the error correction model reveals that about 32 percent of total disequilibrium due to external shock in the previous year is corrected in the current year. Therefore, it will take about three (3) years for the system to adjust back to its long run equilibrium path. Results further showed that FDI inflows increase the level of volatility in exchange rate in the short run but the volatility dies away over time. Conversely, remittance reduces exchange rate volatility while increases in external debt increase exchange rate volatility. It is recommended that the Central Bank of Nigeria should make more efforts to stabilize the exchange rate. In addition, policies and practices which may ease receipt of remittances from citizens in diaspora should be put in place while external debt should be discouraged as much as possible in the country.

Keywords: Exchange Rate Volatility; Foreign Capital; VECM and Nigeria

JEL Classification: F02; F21; F24; F31

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Introduction

The current wave of globalization orchestrated by various economic integration projects, financial market liberalization and the advent of digital technology has been an engine room for the flows of capital among the countries of the world. Meanwhile, it has been established in the literature that capital moves from developed economies to developing economies due to investment opportunities and better returns on these investments (Lucas, 1990). The stability of macroeconomic indicators such as exchange rate, inflation rate are crucial factors that determine the inflows of foreign capital from the global community into the domestic economy. Since the introduction of the Structural Adjustment Programme in Nigeria in 1986, the country has relied heavily on the foreign capital in the forms of external debt, foreign direct investment and official development assistance to augment the deficient saving-investment gap in the economy. Exchange rate volatility has been conceptualized as a haphazard fluctuation in exchange rate which could manifest in the form of appreciation or depreciation of domestic currency. It is worth of note that a cursory look at the exchange rate data shows that exchange rate volatility has been in the form of depreciation since the implementation of the Structural Adjustment Programme. This statement is further reinforced by Aliyu, (2011) who submitted that Nigeria`s currency has been depreciating on a continuous basis from 1980`s to 2010. This trend has since continued till present. In the recent time, the aftermath effect of volatility in exchange rate on other economic variables has been the major concern of scholars and policy makers. This has generated several arguments in the literature regarding what actually causes volatility in exchange rate of domestic currency. However, massive capital inflows has been identified as one of the variables that could cause adverse effect to the exchange rate of the domestic economy (De Paula, 2012, Ghosh, 2010).

Consequently, an attempt to verify this claim in Nigeria has sparked off researches in different quarters with different propositions. See (Amasoma, Nwosa and Fasoranti**,** 2015; Caruana, 2011; Osinubi and Amaghionyeodiwe 2009; Udoh and Egwaikhide, 2008; Ogunleye, 2008). Considering the fact that the results of the past studies were inconclusive the need for further studies on this subject matter becomes imperative. The uniqueness of this work also lies in the consideration of other important variables such as external debt and remittances as parts of strategic variables to capture foreign capital inflows which the bulk of the past studies have failed to recognize. Therefore, this study will contribute to the existing literature by establishing the nature of relationship which exists between foreign capital inflows and exchange rate volatility in the country.

The later parts of this paper are organized as follows: section two consists of the review of related literature meanwhile section three presents the research

methodology, discusses the estimated results, summarized and concluded accordingly.

Literature Review

Empirical literature

In this section of the paper, an attempt has been made to briefly review the relevant existing studies that focus on the subject matter of this study.

Author(s)	Year	Study & Countries	Methodology	Results & Conclusion
Aliyu et al	2009	Examination of exchange rate pass-through in Nigeria between 1986 and 2007.	Vector Error Correction Model	The exchange rate pass-through was low and decreasing in Nigeria, which partly contradicts the conventional submission in the literature which states exchange rate pass-through in developing countries is always significantly higher than those of developed ones. However, the authors opined that if the appropriate policy measure is put in place Nigeria, exchange rate pass through has the possibility to increase in the long run in the country.
Due and Sen	2006	Investigation into a relationship between capital flows, real exchange rate, fiscal and monetary policy indicators and the current account surplus in India from 1993 to 2004.	Cointegration and granger causality approach	There was a long run relationship between all the variables of interest in the study. Similarly, there was an existence of a unidirectional feedback running from all of the studied variables to the real exchange rate in the country.
Caporale *et*.	2013	Analysis of the relationship between exchange rate uncertainty and different components of portfolio flows, such as equity and bond flows, alongside with the dynamic linkages between exchange rate volatility and the variability of these two types of flows in Australia, the UK, Japan, Canada, Sweden and the Euro area between 1988 and 2011.	Bivariate GARCH-BEKK-in-mean model	The impact of exchange rate uncertainty on equity flows was negative in the UK, Sweden and Euro area. Meanwhile, it was positive in Australia. However, the impact on bond flows was negative in all countries apart from Canada where it is positive.

Teddy	2015	Estimation of the relationship between exchange rate volatility and private capital inflows in Zambia.	GARCH model, Johansen cointegration test and error correction model	The nominal exchange rate volatility and foreign portfolio investment had a significant negative relationship with each other in Zambia.
Ogun, Egwaikkhide and Ogunleye	2012	Analysis of real exchange rate and foreign direct investment in Sub-Saharan Africa.	Granger causality and simultaneous techniques	FDI flows in Sub Saharan Africa were sensitive to real exchange rate movements. In the same vein, there was an existence of statistically significant linkage between the two variables in the continent.
Nwosa and Amassona.	2014	Evaluation of a relationship between capital inflows and exchange rate in Nigeria between 1986 and 2011.	Granger causality and error correction model	Foreign portfolio inflows had an insignificant relationship with exchange rate in the country.
Chonnikara	2010	Investigation into the relationship between exchange rate volatility, foreign direct investment and portfolio flows in Thailand between 2005 and 2009.	Panel data analysis.	Negative relationship existed between exchange rate risk and foreign portfolio investment. The implication of this is high exchange rate risk lowered each firm –specific foreign portfolio flow to Thailand.
Osinubi and Amaghionyeodiwe	2009	Estimation of effect of exchange rate volatility on foreign direct investment (FDI) in Nigeria between 1970 and 2004.	Ordinary Least Square (OLS) and the error correction model (ECM) estimation approach	There was a significant positive relationship between real inward FDI and exchange rate. It was submitted in the study also that exchange rate volatility should not be a source of worry for foreign investors in Nigeria.
Udoh and Egwaikhide	2008	Assessment of the link between exchange rate volatility, inflation uncertainty and foreign direct investment in Nigeria between 1970 and 2005.	GARCH model	Exchange rate volatility and inflation uncertainty had significantly negative effect on foreign direct investment. Meanwhile, the study posited that the principal determinants of FDI inflow in Nigeria were appropriate size of the government sector, infrastructural development and international competitiveness.
Abdul	2009	Analysis of real effective exchange rate volatilities	Granger causality	There was a causal relationship between foreign capital inflows

		and capital inflows in Pakistan between 1991 and 2007.	test	and exchange rate volatility in the country.
Odusola and Akinlo	2001	Estimation of the link between Nigeria's Naira Depreciation, Output and Inflation.	Structural VAR model	The parallel exchange rate had a negative impact on output in the short run alone. Consequently, the strategic sources of perturbations in the official exchange rate prices were parallel exchange rate and lending rate. It was discovered in the study that, the notable causes of inflation dynamics in Nigeria were output and parallel exchange rate.
Harris	2002	Assessment of the relationship between new economy and the exchange rate regime	Generalized Least Square model	If the real exchange rate is adequately managed it would spur productivity and economic growth in both short and long run simultaneously. This conclusion was supported by the competitiveness hypothesis, which stipulates that productivity and growth could come from exchange rate depreciation in the short run.

Source: Authors` Compilation (2018)

In a nutshell, the compiled literature above shows that the studies on exchange rate volatility and foreign capital are inconclusive in Nigeria and beyond. This attests to the relevance of this study.

Methodology

Secondary data from 1990 to 2016 is used for this study. Exchange rate, external debt and remittances data were extracted from the CBN Statistical Bulletin. In the same vein, data on FDI inflows in Nigeria was adopted from UNCTAD database published by World Bank.

Model Specification

The model for this study can be specified in the general form as follows:

$$EXr = F (FDI, RMT, ExtD,) \quad \text{……..…. (1)}$$

Model (I) could be expatiated in a linear form as thus;

$$LnEXrt = \alpha_1 + \alpha_2 LnFDIt + \alpha_3 LnRMTt + Ln\alpha_4 ExtDt + e_i \text{ …….. (2)}$$

Where

FDI represents Foreign Direct Investment which is measured by the annual FDI inflow into the country.

EXr is used to proxy exchange rate. It is measured by the annual Naira/Dollars official exchange rate. However, Exchange Rate Volatility is estimated by using the Standard Deviation of the first difference of logarithms of the exchange rate. The standard deviation is computed over a one year period as an indicator of short run volatility as well as over 26 years period to capture long run variability. ExtD connotes external debt. RMT stands for remittances from overseas. ei captures error term which is assumed to be stochastic and t represent years.

$\alpha 1$ *is an intercept and* $\alpha 2$, $\alpha 3$ *and* $\alpha 4$ *are slope parameters* to be estimated. It is expected that coefficient of the variables to have the following signs: $\alpha_{2<0}$, $\alpha 3_{<0}$, $\alpha_{4>0}$

Pre-estimation analysis:

(a) Unit root test:
(b) Cointegration test.

Model Estimation

It is pertinent for this study to examine various diagnostic tests such as unit roots and cointegration before the estimation error correction model. The standard augmented Dickey Fuller test, Philips Perron test and Johansen cointegration technique would be employed to determine the order of integration and the existence or otherwise of long run equilibrium among the variables systematically. Furthermore, the existence of a cointegrating relationship among the set of the adopted variables in the model symbolizes the existence of a long-run relationship among the variables. Hence, a simple VAR model with i lags could be illustrated as follows to mark the beginning of ECM estimation in this work.

$$y_t = \alpha_1 + \alpha_2 y_{t-1} + \alpha_3 y_{t-2} + ... + \alpha_k y_{t-i} + U_t \quad \text{(III)}$$

In order to estimate the long run relationship alongside with the short run relationship between the variables, the short run error correction model is specified explicitly as follows.

$$\Delta EXr_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta EXr_{t-1} + \sum_{i=0}^{p} \beta_2 \Delta RMT_{t-1} + \sum_{i=0}^{p} \beta_3 \Delta ExtD_{t-1} + \emptyset ECM_{t-1} + U_t \text{-- (iv)}$$

The ECM_{t-1} is the error correction term of the short run equation.

Results and Discussion

Table 1. Descriptive Statistics of Annual Data Series (1990-2016)

Descriptive Statistics	EXr	LFDI	LExtD	LRMT
Mean	201.2311	2.186300	24.48834	2.396482
Median	220.7902	2.114852	34.90157	2.048133
Maximum	353.9423	32.12595	34.04959	34.72861
Minimum	9.307808	-1.440286	31.15545	-4.246120
Std. Deviation	76.23267	5.212966	1.957753	5.566975
Skewness	1.202722	5.276509	-3.045381	5.321533
Kurtosis	3.123479	33.49586	10.361635	31.52543
Jargue-Bera	1.968266	694.9094	85.15226	555.9447
Probability	0.802599	0.001000	0.000010	0.000001
Sum	3753.669	59.40011	743.0950	62.82500
Sum. Sq. Deviation	215451.7	541.7901	10.920012	663.7829
Observation	27	27	27	27

Source: Authors` Computation (2018)

In table 1, various descriptive statistics of the data utilized in this study are shown. The mean and median values of the selected variables are very close. This shows that the distribution of the data series is near symmetry. This is reinforced by the argument of Karmel and Polasek (1980) who concluded that a distribution becomes perfectly symmetrical the moment the mean, mode and median converge.

Table 2. Unit Root Test

Variables	ADF Test			PP Test		
	Level	1st Difference	Remarks	Level	1st Difference	Remarks
LEXr	-2.98104***	-2.98623***	I (1)	-2.98104***	-2.98623***	I (1)
LFDI	2.988620***	2.99183***	I (1)	2.97620***	2.99192***	I (1)
LExtD	-2.98104***	-2.98623***	I (1)	-2.98104***	2.99182***	I (1)
LREMT	2.98622***	2.99180***	I(1)	2.98621***	2.99180***	I(1)

*Source: Authors` Computation (2018) *** %5 level of significance*

In the table 2 above, an attempt has been made to verify the stationarity of the data used in this work in order to eliminate the problem of spurious result that is always linked to time series data. In view of the above, the dataset was subjected to a unit

root test. Consequently, the estimated standard Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests confirmed the presence of unit root in all the variables of interest. The series subsequently became stationary after first differencing.

Table 3. Johansen Cointegration Test (Trace Statistics) and (Maximum Eigenvalue)

Null Hypothesis	Eigenvalue	Trace Statistics	P-value	Eigenvalue	Maximum Eigenvalue	P-value
r=0*	0.441390	38.05584	0.2996	0.441390	14.55759	0.2996
r≤1*	0.389042	23.49825	0.2224	0.389042	23.49825	0.2224
r≤2*	0.252723	11.18008	0.2007	0.252723	7.282984	0.4562
r≤3	0.144342	3.897100	0.0484	0.144342	3.897100	0.0484

Source: Authors` computation (2018)

The non-stationarity nature of the variables of interest necessitated the examination of the long run equilibrium among these variables because these variables might wander away in the short run, yet the probability of their convergence in the long run is high. As a result of the above, this paper applied Johansen and Juselius (1990) cointegration test to verify if these variables are cointegrated. However, as shown in the above, the estimated results from Trace statistics and Maximum eigenvalue statistics model at a lag interval of 1 to 1 indicated the existence of at most three cointegrating vectors in the systems. This implies that the variables do have a long run equilibrium relationship with one another, though they might likely show some adjustment to short run disequilibrium. Hence, vector error correction model was estimated to capture the long run relationship alongside with the short run disequilibrium in the model.

Table 4. Vector Error Correction Estimates for Exchange Rate Volatility and Foreign Capital Inflows in Nigeria

Parsimonious Short Run Regression Estimate				
Endogenous Variable: LEXr, LFDI, LExtD, LRMT				
Econometric Method: VECM Estimate				
Sample: 1990-2016				
Equation	**D(LEXT)**	**D(LFDI)**	**D(LEXTDEBT)**	**D(LRMT)**
ECM	-0.321395**	-10.51834**	-2.471561*	-2.767213
	(2.520440)	(-2.394239)	(-1.799198)	(-0.984129)
D(LEXT(-1)	0.011237	1.115463	0.002718	-0.794059
	(0.052082)	(0.350566)	(0.007021)	(0.488386)
D(LFDI(-1)	0.202904*	2.604044	2.097455**	3.200167
	(1.912023)	(0.793684)	(2.387791)	(0.957861)
D(LEXTDEBT(-1)	0.065231	-0.577217	0.324293	3.571089
	(0.233589)	(0.140159)	(0.647117)	(0.977319)
D(LRMT(-1)	-0.057896***	-4.035478**	-1.642844*	-0.794059

	(4.740272)	(2.000382)	(1.941677)	(0.488386)
R-Squared	0.634705	0.654262	0.685712	0.542285
Adj. R-Squared	0.502058	0.531393	0.578567	0.413428
Long Run Regression Estimate				
Endogenous Variable: LEXr, LFDI, LExtD, LRMT				
Econometric Method: VECM Estimate				
Sample: 1990-2016				
Equation	**LEXT**	**LFDI**	**LEXTDEBT**	**LRMT**
LEXT(-1)	-0.233226	8.927332	2.581622	1.165207
	(0.552950)	(2.713131)	(1.876395)	(0.548947)
LFDI(-1)	-0.160377*	0.033909	2.097455	-4.532046
	(1.235566)	(2.187059)	(2.387791)	(2.098333)
LEXTDEBT(-1)	0.119527	5.603851	0.209310	3.571089
	(0.545966)	(1.581550)	(1.827755)	(0.977319)
LRMT(-1)	-0.057896**	-4.035478	-1.642844	-0.049499
	(2.740272)	(2.000382)	(1.941677)	(3.497761)
Durbin-Watson stat	1.963654	1.503397	1.615378	1.480960

*Source: Authors` computation (2019) *Significant at 10%, **Significant at 5%, ***Significant at 1%*

The table above presents the results of the estimated vector error correction model. The error correction term, ECM(-1) has an expected sign and significant. It reveals that about 32 percent of total disequilibrium due to external shock in the previous year is corrected in the current year. This shows that all the variables of interest in the model converged in the long run as earlier validated by the cointegration test. Similarly, the first differenced lagged value of the dependent variable- DL(EXr(-1) is positive. This implies that the volatility in exchange rate in the previous year increases the level of volatility in the exchange rate in the current year, though not significant. However, the coefficient of FDI shows that FDI inflows has a positive relationship with exchange rate volatility in the short run. In another words, FDI inflows increase the level of volatility in exchange rate in the country. A unit change in the stock of FDI increases exchange rate volatility by 20% on annual basis in the country, though not significant at 5 % level of significance. This result contradicts the a priori expectation. It is worth of note that exchange rate volatility increases the level of uncertainty and risk factors in the economy. This could discourage the foreign investors and thereby leads to declining of FDI inflows in the future. This argument aligns with the propositions of Osinubi and Amaghionyeodiwe (2009), Ogunleye (2008), Udoh and Egwaikhide (2008) who corroborated that exchange rate volatility had a negative impact on FDI inflows in Nigeria. However, in the long run FDI reduces exchange rate volatility in the country. As a unit change in the stock of FDI reduces exchange rate volatility by 16%. This finding is supported by Chege (2009) and Barrell et al. (2004) while examining emerging economies. Meanwhile Ellahi (2011) reported contrary result while carrying out similar study in Pakistan. In the same vein, remittance and

exchange rate volatility have a negative and significant relationship in both short run and long run. However, external debt and exchange rate volatility have a non-significant positive relationship with each other in the short run and long the long run concurrently. As external debt changes by a unit, volatility in exchange rate increases by 7% in the country. This finding is consistent with the similar work of Masuku (2012) in Kenya. Meanwhile Cavallo et al (2005) and Siregar and Pontines (2005) reported contrary argument in East Asian economies. The model has R-squared value of 63% which indicates that the fitness of the model is good. Meanwhile, after the degree of freedom was adjusted, the explanatory power of the model declined to 50%.

Diagnostic and Stability Tests

Table 5. Diagnostic Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.055395	Prob. F(2,18)	0.9463
Obs*R-squared	1.152933	Prob. Chi-Square(2)	0.9264

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.892271	Prob. F(8,16)	0.1321
Obs*R-squared	12.15403	Prob. Chi-Square(8)	0.1445
Scaled explained SS	21.64852	Prob. Chi-Square(8)	0.0056

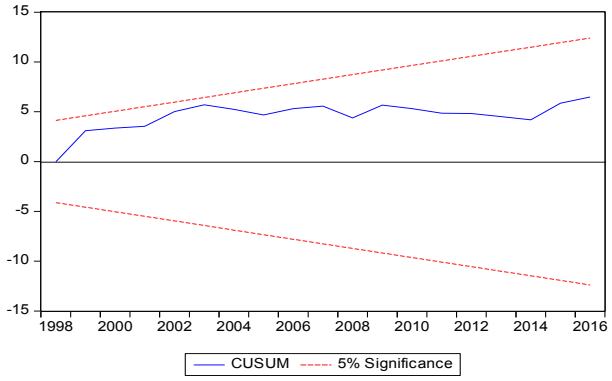

Figure 1. Stability Tests

CUSUM Stability Test

Source: Authors` Computation (2019)

It is important to establish the appropriateness of the short run (parsimonious) model adopted for this work. In view of the above, further attempt was made to subject the data to diagnostic test (the Serial Correlation LM test) and stability tests (Cumulative Sum (CUSUM) on the residual of the short run model. The results presented in the above table shows that the F-statistics of the Serial Correlation LM test of the model is not significant, this proved that there is no serial correlation in the residuals of the ECM regression estimate. The Breusch-Pagan-Godfrey test confirmed the absence of heteroskedacity since the observed Chi-Square is greater critical value. In the same vein, the results of cumulative sum (CUSUM) test shows that the residuals of the error-correction model lies within the critical bounds of five percent significant level. This confirms the stability of the estimated parameters over the period 1990-2016. Hence, the model has been reasonably specified.

Conclusion and Recommendations

This paper has examined the relationship between exchange rate volatility and foreign capital inflows between 1990 and 2016 in Nigeria. The test for cointegration proved that there is a long-run equilibrium relationship between exchange rate volatility and foreign capital inflows in Nigeria, while the error correction term indicated that about 32% of the total disequilibrium in the previous year would be corrected in the current year. However, FDI inflows increase the level of volatility in exchange rate in the short run but the volatility dies away in the long run. Meanwhile, remittance reduces exchange rate volatility in the both short run and the long run. However, external debt contributes to exchange rate volatility in the short run and the long run. Therefore, due to the findings that emerged in this paper it is expedient we make the following recommendations for the policy makers, investors and future researcher. The negative impact of foreign direct investment inflows on the country`s exchange rate in the short run calls for the urgent attention of the appropriate authorities in the Central Bank of Nigeria to come up with a policy measure that has the capacity to insulate the country`s exchange rate from the short run FDI inflows shocks. In addition, mechanism to facilitate ease of receipt of remittances from the citizens in the diaspora should be put in place, while external debt should be discouraged in the country. Furthermore, it is instructive that the policy measures that would stabilize the exchange rate in the country should be initiated and implemented.

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An Empirical Investigation of Macroeconomic Convergence in the African Tripartite Region

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Abstract: The study empirically tested if the macroeconomic variables of the 26 member countries of the Tripartite Free Trade Area are converging or not over the 15 year period. Convergence is important because it indicates if the countries are moving towards a similar level of development and wealth and business cycles are becoming synchronised. The paper does not employ the traditional method of testing for absolute and conditional convergence but rather uses the macroeconomic variables identified under the 'convergence criteria' by the three regional economic communities (COMESA, EAC, SADC) which make up the TFTA. The study observed evidence of relatively strong forms of convergence of macroeconomic variables across the TFTA member countries. However, as expected, the evidence is scattered because it was detected in the majority but not all economies or sub-periods. Nonetheless, the paper acknowledges the progress made by the member countries over the 15 year period in stabilising key macroeconomic variables especially inflation and service debt. Although cross-country dispersion of deficit was decreasing over time (which indicates convergence), the evidence remained weak and unstable. In general, the magnitude of convergence was stronger for monetary variables but the majority of TFTA countries were still struggling to fuse (move towards convergence) and stabilise their fiscal positions.

Keywords: macroeconomic convergence; economic integration; business cycles; tripartite region

JEL Classification: B22; E32; E63; F13; F16; F42; F43; F63

Introduction

Macroeconomic convergence remains a key developmental issue because it reflects that economies are moving towards a similar level of development and wealth. In the case of economically integrated countries, convergence is signalled when the business cycles of the respective economies are moving in a systematic fashion (Mundell, 1961, 1973) or simply that economic systems are well coordinated (Masalila, 2000). There are two schools of thought which argue on the benefits of economic integration and economic convergence. The first school of thought

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believes in *ex-ante* convergence of macroeconomic variables as a necessary prelude for a successful economic integration process. The second one believes that economic integration leads to *ex-post* convergence among macroeconomic variables. Thus, the former school of thought argues that variables must first be synchronised for the integration process to be successful. However, the latter school argues that once economies are integrated, the convergence process will begin. In Africa, intensity on the subject of economic integration is increasing as signalled by the African Development Bank placing it among its 'high five' priorities (AfDB, 2014), the signing of the Tripartite Free Trade Agreement in July, 2015 in Egypt, and the recent signing of the Continental Free Trade Agreement in March, 2018 in Kigali Rwanda. The rationale behind this study is to establish if, prior of the signing of the TFTA, the already existing RECs have been leading to ex-post macroeconomic convergence. Establishing this aim is vital on two fronts: firstly, it indicates whether or not the economies have been moving towards a similar level of development and wealth. Secondly, it will give an indication of the macroeconomic indicators which need policy adjustments and will ultimately feed into the broader and recently signed Continental Free Trade Agreement (CFTA) for it to become more effective.

Problem Statement

The African paradigm of regional economic integration was implemented without first ensuring if the macroeconomic variables are synchronised according to the belief of the first school of thought which argues for *ex-ante* convergence as a prelude for a successful integration process (Mundell, 1961; Bernard *et al*., 1996; Aziz Wane, 2004; Phillips and Sul, 2007; Duede and Zhorin, 2016). Lack of convergence will increase vulnerability of countries within the regional integration arrangement (RIA) to deal with asymmetric shocks and this will undermine the economic performance of member states (Mundell, 1973; Masalila, 2000; Carmignani, 2005). African economies respond differently to economic shocks which implies that there is a high possibility of a lack of macroeconomic convergence. Lack of macroeconomic convergence, coupled with low intra-regional trade volumes will most likely lead to continental agreements such as the TFTA and CFTA being ineffective.

Literature Review

The aspect of convergence and divergence in economic integration is highly related to the new developments in economic geography (Grossman and Helpman, 1991). New economic geography theory explains the rationale behind the location of

industries. Shaw *et al.* (1999), and Giroud and Mirza (2006) highlighted that firms usually locate where there are abundant resources and larger domestic markets with effective demand in order to minimise costs and maximise profits. Other factors such as access to the sea or efficient transport infrastructure which also lower transaction costs have an influence on the convergence of economic activities. Demetriades and Law (2006), Te Velde (2011), and Hwang and Lee (2015) highlighted that there should be proper institutional frameworks which minimise firms concentrating in some parts of the regional leading to an uneven clustering of economic activities which would create further divergence thereby creating tension among member countries of the economic integration scheme. On the other hand, authors such as Schiff and Winters (2003) used the terms agglomeration and dispersion synonymously with convergence and divergence, respectively. They argued that economic integration results in deep microeconomic integration which is based on a simultaneous process of agglomeration and decentralisation of sectorial activities. This in turn results in an increase in both intersectorial and intrasectorial trade.

Madariaga *et al.* (2003) hypothesised that there exists a bell-shaped link between link between transport costs and agglomeration of economic activities in a two-economy scenario where one is poorer and the other is richer. Using the case studies of NAFTA and Mercosur regions, Madariaga *et al.* (2003) constructed various measures of agglomeration of economic activities with the aim of measuring the effect of regional economic integration on agglomeration or economic convergence. The authors employed standard convergence regressions with a Gini index on three different variables namely land area, population and sectorial activity. They find some evidence on divergence across regions in NAFTA and agglomeration (or convergence) in Mercosur, although there was slowdown in the process in Mercosur after 1991. The authors included agglomeration measures in the standard regression models and claimed that there is a positive relationship between the growth rate and the density of economic activities. They also argued that using these regressions, that NAFTA did not play a significant role in the convergence process between Mexico and the U.S.

However, they observed convergence across countries in the Mercosur over the period 1985-2000, which accelerated after 1994. The study illustrates how disparities in the density of economic activities and wage rates across different locations can stimulate workers to migrate from the poorer to the richer location thereby worsening the income distribution. In Africa, there has been a notable observance of labour migration to South Africa which is considered a relatively richer economy. This leads to polarisation of both industry location and welfare benefits accrued by the owners of the factors of production within that locality. The creation of a free trade areas like the Southern African Development Community (SADC) and the South African Customs Union (SACU) has allowed a much freer

movement of capital and labour into the already economically developed regions and several companies in this region have since moved their headquarters. Industry location became more concentrated in these richer locations. However, Licandro (2004) criticised the study by Madariaga *et al*. (2003) for not analysing whether the movements in regional agglomeration were caused by changes between countries or changes within the respective country, the model only predicts the former. The criticism by Licandro (2004) is vital because countries like Zimbabwe and Mozambique, for instance, have within those same periods been characterised by political instability and several inconsistent macroeconomic policies which pushed investment away. Therefore, migration from these poor economies to greener pastures cannot solely be the resultant effect of economic integration.

Rodrik (2003) highlighted that Latin America faced the main challenge of finding a growth strategy which would allow them to converge to the living standards of advanced economies, more particularly the European standards. Over the period (1980-2000), Latin America paradoxically introduced a sizeable number of orthodox reforms but failed to deliver economic benefits. Licandro (2004) then questioned if the framework of the Euro-Latin network of regional economic integration was the appropriate growth strategy for Latin America. He argued that if a poor region is to desire to converge with a richer region, they must take into account the institutional innovations since they do not travel very well from one region to another (Mutoti and Kihangire, 2006; Phillips and Sul, 2007; Fabra, 2013). The inability institutional networks to travel well from one geographical space to another is another significant factor hampering the successful implementation of European integration and convergence models in Africa. Similar to the Latin-American case, Africa's institutions are significantly different from those in Europe to an extent that the possibility of economic convergence predicted by European models due to economic integration is also weakened.

Since macroeconomic convergence provide the necessary environment for free trade areas to develop and evolve into deeper economic integration arrangements such as monetary unions, Levy Yetaye and Sturzenegger (1999) highlighted that developing countries should learn from the success of the Europe's Economic and Monetary Union (EMU). They argued that there is need for a country which will provide the necessary credibility of monetary and fiscal discipline, one with 'hegemonic powers'. In the case of the EMU, it was German which assumed the responsibility. Africa could use countries like South Africa in the southern hemisphere, Kenya in the central and eastern parts, Egypt in the Northern parts and Nigeria and Ghana in West Africa to act as hegemons and provide the fiscal and monetary benchmarks which can be used as convergence criteria. Levy Yetaye and Sturzenegger (1999) provided the relevant rationale that certain institutional pre-requisites must be met before any economic community can adopt a model which was previously successfully implemented in another regional integration

arrangement. The fulfilment of these pre-requisites will in turn stimulate the convergence progress among integrated economies (Kumo, 2011; Fabra, 2013).

African Studies on Macroeconomic Convergence in the Context of Economic Integration

Ghura and Hadjimichael (1996) investigated 29 Sub-Saharan African countries which belonged to a regional economic integration scheme and found a proclivity of income per capita convergence increasing by approximately 2%. Taking the old East African Community (EAC) into account (1960-1977), Venables (1999) argued that the production structure of Kenya moved in the opposite direction as it would have done under free market conditions and was able to expand its manufacturing production base at the expense of the poorer countries since they had to shift their manufacturing imports from the Rest of the World to Kenya. At the same time countries which were losing, Tanzania and Uganda were unable to exploit the trade creation benefits since their limited product range were also produced more efficiently in Kenya. In other words, the study by Venables (1999) indicated divergence within the East African Community.

Using data from 46 African countries, Hammouda *et al.* (2007) used econometric analysis to assess the level and rate of income convergence for members of SADC, COMESA, ECOWAS, CEMAC and UEMOA. They found a weak relationship between regional economic integration and income convergence. The weak relationship was attributed to various reasons. Firstly, the slow growth of output, productivity and accumulation of factors of production. Secondly, low levels of intra-regional trade, bias towards commodity trade and the low factor mobility. The third reason was the limited inflow of foreign direct investment (FDI) which would further constrain capital accumulation.

Several other studies have found conflicting evidence in Africa. For instance, studies by Holmes (2005) found convergence in SADC between 1960 and 2000. Holmes (2005) found no convergence in ECOWAS over the same time period 1960-2000 while Jones (2004) found convergence in ECOWAS over the period 1960-1990. No convergence over 1980-2002 was found in COMESA (Carmignani, 2006), while convergence was found in the same COMESA region between 1995 and 2004 (Mutoti and Kihangire, 2006). There was limited convergence in UEMOA from 1990 to 2003 (van den Boogaerde and Tsangarides, 2005) while Aziz Wane (2004) found convergence across UEMOA, 1965-2002. The conflicting evidence could be due to varying time periods and methodologies employed. The

methodologies used were either statistical which described the income levels or econometric which would make use of standard growth models.[1]

Several studies have since discussed the factors behind convergence and divergence of incomes within regional economic communities. Holmes (2005) concluded that the size of the group does not matter. Carmignani (2005) highlighted that integration and harmonisation of policies, different institutions and trading rules have a significant influence on convergence (or divergence) of regional incomes while van den Boogaerde and Tsangarides (2005) and Konseiga (2005) emphasised on labour mobility. Rossouw (2006) placed emphasis on macroeconomic convergence while Venables (1999) emphasised on competitive advantage.

Empirical Modelling Specification on Macroeconomic Convergence

Economic literature suggests two notions of convergence. The first one takes place when the time-varying difference between the two series dies over time. The second notion holds that the two series converge when they share a common stochastic trend. Econometric tests linked with these two notions demand high frequency data covering sufficiently long periods of time. This study adopts the methodology applied by Carmignani (2006) who suggested that econometric convergence tests can be set up as $(x_{i,t} - x_{j,t})$, where x is the macroeconomic policy variable, i is the generic country, j is the benchmark for convergence and t is the generic time. The study employed the regional average or the macroeconomic target set by the convergence criterion as the benchmark for convergence. The difference $(x_{i,t} - x_{j,t})$ is modelled as a first-order autoregressive process such that:

$$(x_{i,t} - x_{j,t}) = \phi(x_{i,t-1} - x_{j,t-1}) + \varepsilon_t.. \quad (1)$$

Where initial values $x_{i,0}$ and $x_{j,0}$ are given, ϕ is a parameter that can be estimated and ε is a stochastic disturbance with zero mean and finite variance. Convergence occurs for $\phi < 1$. The test of convergence thus amounts to testing for a unit root in the process $(x_{i,t} - x_{j,t})$ and rejecting the null hypothesis implies a form of convergence in the expectation (mean) between the two series x_i and x_j. Elliott *et al*. (1996) improved the unit root analysis from the traditional Dickey-Fuller by estimating a simple transformation of equation (1). Denoting the process $(x_{i,t} -$

[1] A standard growth model can be presented in the form $g_{it} = \alpha + \beta Y_0 + \delta X_{it} + \varepsilon_{it}$; where g_{it} which is growth rate computed as the first difference of real per capita GDP; Y_0= logarithm of the initial level of real GDP per capita; X is a vector of explanatory variables; and subscripts i and t represents countries and time respectively.

$x_{j,t}$) by z_t and defining the quasi-difference $d(z_t|a) = z_t - az_{t-1}$, where a is a known parameter and $t > 0$ (for $t = 0$, the quasi-difference boils down to the initial value z_0). Therefore, the transformed equation can be written as:

$$\Delta z_t^{GLS} = \alpha z_{t-1}^{GLS} + \sum_{k=1}^{n} \beta_i \Delta z_{t-i}^{GLS} + v_i \quad (2)$$

The superscript Generalised Least Squares (GLS) reflects that the original data are detrended[1], Δ represents first differencing and $\alpha = \phi - 1$. This implies that stationarity requires $\alpha < 0$. The test based on equation (2) is known as GLS detrended unit root test and is applied in this study to yearly inflation and money growth over the period 2000-2015. The number of lags is chosen on the basis of the Schwarz Information Criterion (SIC). For each TFTA member country, four benchmarks were considered: (i) unweighted regional average inflation rate; (ii) average inflation target specified by convergence criterion among the three regional economic communities (RECs), (iii) the average inflation of industrial countries and (iv) the average inflation targets set in accordance with the convergence criterion.

The study will include full sample estimates (2000-2015) and also four sub-periods. A significantly negative α signifies convergence. The study specifies t-statistic of the panel based unit root test as consisting of all member countries of the TFTA. Following Perasan and Tosetti (2011) which allows for individual heterogeneity, the study specifies the null hypothesis as $H_0: \phi_i = 1, \forall i$ against $H_1: \phi_i < 1, 1 = 1,2, \dots M_1, \ \phi_i = 1, i = M_1 + 1, M_2 + 2, \dots, P$ (given that P is the total number of countries in a panel). This formulation of H_1 is more general than $\phi_i = \phi < 1$ since it allows for individual unit root processes in panels which would otherwise assume common unit root process. A rejection of the null hypothesis would imply that the panel-based tests indicate that there is convergence of macroeconomic variables for the either for the sub-period or the full sample period.

Carmignani (2006) highlighted that the second notion convergence involves testing whether or not there exists a co-integrating relationship between the countries monetary policy variables. Variables should share a common stochastic trend for there to be convergence and thus there should be $p - 1$ co-integrating equations (where p is the number of series, or countries). Findings of less than $p - 1$ implies that some countries are converging in the long run and others are not. This is also referred to as partial convergence (Hafer and Khan, 1994). The co-integration test follows a Johanssen-Fisher (1999) and is performed on yearly inflation, money

[1]Detrending is done in two steps. First, the quasi-differenced data are regressed on either a constant or a constant and a trend using Ordinary Least Squares (OLS). Then, the detrended z_t is computed as the original z_t minus the fitted values from the first step OLS regression evaluated at a specific value of a recommended by Elliott (1996).

growth, domestic credit and debt service over the period 2000-2015. The selection of the macroeconomic variables was based on the variables which were identified by the convergence criteria in the three RECs. The number of lags is selected using the Schwarz Information Criterion (SIC). The tests are conducted under three different assumptions as follows; (i) assumes that level data have no deterministic trends and the co-integrating equations have intercepts, (ii) assumes that level data have linear trends but the co-integrating equations have only intercepts, (iii) assumes that the level data and the co-integrating equations have linear trends.

Findings and Discussion of Results

Table 1 below provides some summary statistics of six key indicators selected under the convergence criteria by COMESA, EAC and SADC. Macroeconomic data are averaged over the four-year sub-periods. The summary statistics has two indicators. The first indicator of convergence is signalled by a decrease in convergence over time (sub-periods) and the second indicator is the decline in the percentage of countries falling in the tails of the distribution. With the exception of domestic credit and tax revenue, the standard deviation of the other indicators are generally declining. This indicates some level of convergence within the region. However, an interesting observation for most variables is that the standard deviation for the period 2012-2015 is generally greater than that of the preceding period of 2008-2011 even though the general trend is still downward. This could be attributed to a major economic turbulence of the 2009 Global Financial Crisis.

Taking a closer look at specific indicators, the study observes that debt service signals convergence over the period with the latest standard deviation figures approximately 3.93 from 11.18. There was a slight upward shock in debt service in the period 2004-2007 to 15.05 but it later trended downward indicating an overall tendency to converge for the variable. The IMF postulated the notion that the proclivity for debt service ratios to converge towards more sustainable levels was likely facilitated by the participation of several countries in initiatives such as the Highly Indebted Poor Countries (HIPC)[1] apart from being part of regional economic integration. The IMF estimated that the average benefit for a country can be quantified as a reduction of debt service by 50% (Carmignani, 2006). However, Thirwall (2012) cautioned that the picture presented by the debt service might be over-optimistic since data on debt service only included paid debt. It is likely that unpaid debt is large, for some countries at least.

[1] TFTA countries which have participated in the HIPC include Angola, Burundi, DRC, Ethiopia, Kenya, Madagascar, Malawi, Rwanda, Sudan, Uganda and Zambia.

Money growth also indicates some level of convergence due to the overall decrease over time. However, the figures of money growth in the first period under study (2000-2003) appears to be too inflated and distorted. Claims on central government and domestic credit have been generally oscillating within the same range, slightly going up or down but with no significant change to determine either an upward or downward trend.

The standard deviation of inflation significantly decreased from 81.68 in the first period to 7.19 in the last period of 2012-2015. This indicates that most TFTA countries managed to tame inflation to manageable figures below 10% which indicates convergence. Although the set target of 5% was not achieved by some communities as reflected in the mean values (while the target of 10% for others like COMESA was achieved), there were significant efforts by African countries to commit to the convergence criteria resulting in most countries significantly reducing their inflation levels and moving towards single digit inflation, which is convergence. However, inflation data excludes two extreme countries of Democratic Republic of Congo and Zimbabwe which experienced hyperinflation at some stage during the period of study

Table 1. Summary Statistics for Macroeconomic Variables

VARIABLE	PERIOD	MEAN	MEDIAN	MAXIMUM	MINIMUM	STANDARD DEVIATION	SKEWNESS	KURTOSIS
INFLATION (ANNUAL % CHANGE OF CPI)								
	2000-2003	28.26	6.36	513.91	-9.79	81.68	4.40	22.57
	2004-2007	13.88	7.90	302.12	-2.20	39.65	6.77	48.01
	2008-2011	9.66	8.83	44.39	-8.24	7.71	1.75	8.08
	2012-2015	7.53	5.79	37.39	-8.12	7.19	2.08	8.36
	2000-2015*	14.83	7.09	513.91	-9.79	46.25	7.72	67.77
	2000-2015#	161.27	7.11	35411.03	-9.79	2106.33	14.99	231.89
CLAIMS ON CENTRAL GOVERNMENT (% OF GDP)								
	2000-2003	12.72	4.52	114.99	-88.53	31.91	1.03	6.80
	2004-2007	7.18	2.38	97.60	-74.33	28.64	0.79	6.07
	2008-2011	2.23	2.12	110.23	-162.59	32.08	-0.86	12.25
	2012-2015	4.30	3.55	60.64	-25.48	13.77	1.48	8.22
	2000-2015	6.77	2.91	114.99	-162.59	28.16	0.40	10.44
DEBT SERVICE (% OF EXPORTS)								
	2000-2003	11.48	7.91	62.12	1.21	11.18	2.60	10.42
	2004-2007	8.38	5.79	134.71	0.72	15.05	7.07	58.71
	2008-2011	3.70	2.49	16.48	0.40	3.28	2.00	7.20
	2012-2015	4.72	3.19	17.18	0.43	3.93	1.20	3.66
	2000-2015	6.94	4.76	134.71	0.40	10.05	7.30	81.50
DOMESTIC CREDIT (% OF GDP)								
	2000-2003	23.37	14.07	138.79	0.49	26.93	2.45	9.34
	2004-2007	23.71	13.38	160.12	1.09	29.56	3.04	12.79
	2008-2011	26.67	17.71	148.98	3.91	29.28	2.95	11.52
	2012-2015	30.97	21.10	151.03	5.13	32.26	2.66	9.38
	2000-2015	25.99	17.21	160.13	0.49	29.49	2.79	10.96
MONEY GROWTH (ANNUAL % CHANGE)								
	2000-2003	1080.31	15.29	108613.3	-99.88	10699.52	10.00	101.01
	2004-2007	19.64	17.41	81.85	-54.69	15.95	0.07	8.71
	2008-2011	19.39	16.46	66.16	-4.47	14.27	1.43	5.22
	2012-2015	16.75	13.42	39.14	-2.29	7.51	0.75	4.30
	2000-2015	293.35	15.59	108613.3	-99.88	5450.22	19.85	394.98
TAX REVENUE (% OF GDP)†								
	2000-2003	16.87	16.87	32.96	0.78	8.04	-0.08	2.26
	2004-2007	20.34	21.67	49.35	5.28	10.18	0.76	3.55
	2008-2011	20.14	17.03	58.41	6.58	10.06	1.45	6.05
	2012-2015	21.45	18.49	48.92	8.99	9.67	0.98	3.79
	2000-2015	19.82	17.25	58.41	0.78	9.68	0.99	4.66

Inflation data was removed for Zimbabwe for period 2006-2008. # Inflation data including Zimbabwe for the period 2006-2008.

The following countries were not included in the data analysis for Tax Revenue (Sudan, Rwanda, Mozambique, Libya, Kenya, Eritrea, Djibouti, Comoros, Tanzania, Uganda, and Zimbabwe) due to missing data. Shares of GDP were employed as weights in computing weighted regional averages. Standard deviation

measures the average dispersion of each variable across countries in a given period. The percentage of countries which fall outside the range of ±50% of the weighted mean are indicated in the kurtosis (tail) column. The following subsection provides a relatively more rigorous econometric analysis in testing for convergence among the macroeconomic variables among the tripartite countries.

Evidence on Convergence of Monetary Variables

The second notion holds that the two series converge when they share a common stochastic trend. Econometric tests linked with these two notions demand high frequency data covering sufficiently long periods of time. For this reason, this study adopts two monetary indicators namely inflation and broad money growth for reasons of availability of quality data and also for summary purposes. The table below presents full sample estimates (2000-2015) and also estimates for the two sub-periods (2000-2008 and 2009-2015). The reason for this split is that 2008-2009 period marks a structural break for many economies due to the Global Financial Crisis. The table below reports the estimated α using the unweighted TFTA average inflation rate as the benchmark. The results obtained using other benchmarks are quantitatively similar to those presented in the table above. A significantly negative α signifies convergence.

The evidence from the Table 2 below is, at best, mixed. On one hand, there is evidence of convergence for thirteen countries for inflation and seventeen countries for money growth for the full sample period. On the other hand, taking sub-periods into account, convergence is detected for eight countries in the first sub-period (2000-2008) and only four countries in the second sub-period (2009-2015) for the inflation variable. There is relatively more number of countries converging for the money growth variable with twelve countries in the first sub-period and eleven countries in the second sub-period. Overall, results can be interpreted as providing evidence of convergence among monetary variables, even though this process appears to have been disrupted by the Global Financial Crisis of 2008.

The last row of Table 2 reports the t-statistic of a panel based unit root test consisting of all member countries of the TFTA. Equation (1) is estimated on the pooled cross-section time-series data. Following Perasan and Tosetti (2011) which allows for individual heterogeneity, the study specifies the null hypothesis as $H_0: \phi_i = 1, \quad \forall i$ against $H_1: \phi_i < 1, 1 = 1,2, \dots M_1, \quad \phi_i = 1, i = M_1 + 1, M_2 + 2, \dots, P$ (given that P is the total number of countries in a panel). This formulation of H_1 is more general than $\phi_i = \phi < 1$ since it allows for individual unit root processes in panels which would otherwise assume common unit root process. The group stat results in the table clearly indicate the rejection of unit root null hypothesis implying that panel-based test indicates that there is convergence of

both inflation and money growth for both the sub-periods and the full-sample period.

Table 2. Econometric Convergence of Monetary Variables

	INFLATION			MONEY GROWTH		
	2000-2015	2000-2008	2009-2015	2000-2015	2000-2008	2009-2015
ANGOLA	-6.8052***	-7.1031***	-1.0513	-1.7495	-1.3264	-4.4106**
BOTSWANA	-2.2366	-3.0353*	0.2524	-3.8712**	-4.9151***	-1.5846
BURUNDI	-4.3434***	-2.8038	-1.7269	-3.8642**	-3.3992**	-3.0134*
COMOROS	2.3787	-3.0393*	1.2182	-1.5760	-2.5637	-5.2284***
CONGO, DR	-5.6405***	-3.5140**	-1.254	-3.3370**	-7.4641***	-2.3207
DJIBOUTI	-3.2225**	2.2493	-1.8525	-3.7677**	-2.2257	-2.9695*
EGYPT	-2.2675	-0.3432	-1.7684	-2.8281*	-2.9652*	-1.1742
ERITREA	-2.8348*	-2.1462	-2.4574	-2.1777	-1.4801	-1.7626
ETHIOPIA	-3.0150*	-0.2294	-1.7204	-2.6162	-0.3497	-1.8218
KENYA	-3.3772**	-0.7959	-2.7672	-2.3324	-1.5017	-1.4214
LESOTHO	-5.3919***	-3.8423**	-3.7092**	-4.3092***	-2.3526	-4.0565**
LIBYA	-2.0822	-0.0588	-2.4389	-2.4866	0.7843	-3.2101*
MADAGASCAR	-4.3462***	-3.6594**	-1.2018	-4.4200***	-4.1365**	-1.7447
MALAWI	-2.4649	-2.8775*	-0.9869	-3.8099**	-0.8419	-3.1183*
MAURITIUS	-2.0959	-0.7690	-1.6170	-2.4271	-2.9654*	-2.3604
MOZAMBIQUE	-2.4493	-3.1422*	-1.6995	-3.4382**	-4.1943***	-3.5419**
NAMIBIA	-3.2499**	-2.3053	-3.4403	-4.3591***	-4.2602***	-15.207***
RWANDA	-1.9043	-0.6290	-3.7446**	-4.6700***	-1.6419	-2.8724
SEYCHELLES	-3.2119**	-0.7694	-13.919***	-4.2202***	-3.3270**	-2.0183
SOUTH AFRICA	-3.4878**	-1.5132	-4.0639**	-1.8817	-3.2221*	-2.2898
SUDAN	-1.4839	-1.1530	-1.6957	--3.3325**	-1.8644	-3.1762*
SWAZILAND	-2.5014	-2.2461	-2.4914	-3.9336**	-3.0987*	-4.8467**
TANZANIA	-2.1906	1.2880	-1.6413	-3.4382**	-3.1133*	-1.3811
UGANDA	-2.9201*	-1.6632	-2.0036	-3.6981**	-1.7614	-2.0835
ZAMBIA	-2.0096	-1.3301	-3.2817	-5.5755***	-4352.2	-4.0525

ZIMBABWE†	-1.6555	-1.3971	1.0255	0.3799	-1.6916	
GROUP (T-STAT)	-7.11652***	-1.04593	-2.54396***	-9.01450***	-625.058***	-5.62959***

, **, * denote rejection of the null hypothesis $H_0: \alpha = 0$ at 10%, 5% and 1% level of significance, respectively.*

There is no data for money growth for Zimbabwe since 2009. This is because Zimbabwe adopted a multicurrency regime since 2009 where it started using five currencies (USD, Rand, Rupee, Yuan and Yen) for official transactions.

Carmignani (2006) highlighted that the second notion convergence involves testing whether or not there exists a co-integrating relationship between the countries monetary policy variables. Variables should share a common stochastic trend for there to be convergence and thus there should be $p-1$ co-integrating equations (where p is the number of series, or countries). Findings of less than $p-1$ implies that some countries are converging in the long run and others are not. This is also referred to as partial convergence (Hafer and Khan, 1994). The co-integration test follows a Johanssen-Fisher (year) and is performed on yearly inflation, money growth, domestic credit and debt service over the period 2000-2015. The number of lags in the VAR is selected using the Schwarz Information Criterion (SIC).

The results of the co-integration analysis are summarised in Table 3.The results includes 416 observations from seventeen countries. Nine countries were dropped from the analysis due to incomplete data in some of the variables. These are Burundi, Comoros, DRC, Eritrea, Ethiopia, Libya, Namibia, Seychelles and Zimbabwe. The test is conducted under three different assumptions as follows; (i) assumes that level data have no deterministic trends and the co-integrating equations have intercepts, (ii) assumes that level data have linear trends but the co-integrating equations have only intercepts, (iii) assumes that the level data and the co-integrating equations have linear trends. The co-integration tests confirms that there is strong evidence of convergence. The results are largely robust to changes in trend assumptions and are not dependent upon the test statistic employed. However, the number of co-integrating vectors is less than $p-1$ which suggests that some policies in some countries are independently established, that is, are not guided by regional policies such as the convergence criteria.

The results discussed above are complimented by the Kao and the Pedroni residual cointegration tests in Table 4. The test also confirms the presence of panel co-integrating relationship among the variables. The ADF test-Statistic from the Kao test is -11.2000 and is significant at 1% and the lag length is based on the Schwarz Information Criterion (SIC). The null hypothesis of the Kao is no cointegration. The Pedroni test-statistic values are presented below as a complimentary table. The

Pedroni test includes 22 countries and drops only four countries in its analysis. The four countries dropped are Eritrea, Libya, Namibia and Zimbabwe.

Table 3. Johansen Fisher Panel Cointegration Test

	No trend (restricted constant)		Linear deterministic trend		Linear trend (restricted)	
Hypothesised Number of CE (s)	Fisher Stat (from Trace Stat)	Fisher Stat (max-Eigenvalue)				
None	356.6***	246.2***	324.3***	220.2***	386.1***	779.4***
At most 1	1273***	1254***	225.3***	190.3***	291.6***	224.5***
At most 2	85.47***	74.60***	94.75***	74.97***	1159***	170.3***
At most 3	43.69	43.69	73.57***	73.57***	40.62	40.62

Table 4. Pedroni Residual Cointegration Test

	No trend		Deterministic intercept and trend		No intercept or trend	
(Within dimension)	Statistic	Weighted Statistic	Statistic	Weighted Statistic	Statistic	Weighted Statistic
Panel v-Statistic	0.5653	-1.8134	-1.6217	-3.6786	0.7677	-1.9394
Panel rho-Statistic	-2.0679***	-0.5247	-0.2301	1.7671	-3.0540***	-1.4361*
Panel PP-Statistic	-10.5881***	-7.0155***	-13.6412***	-11.1793***	-8.4699***	-5.9605***
Panel ADF-Statistic	-8.8839***	-6.7092***	-13.0868***	-9.0460***	-8.4959***	-5.6493***
(Between dimension)						
Group rho-Statistic	1.3308		3.2553		-0.3081	
Group PP-Statistic	-12.2517***		-15.3046***		-9.7391***	
Group ADF-Statistic	-11.6000***		-10.2257***		-8.7105***	
Decision/Conclusion	There is cointegration		There is cointegration		There is cointegration	

,,*** denotes rejection of null hypothesis at 10%, 5%, 1% level of significance.*

The results from both the statistical and econometric analysis indicate evidence of convergence of macroeconomic variables within the TFTA region. However, the evidence is to some extent scattered since it was detected in some but not all of the countries or sub-periods. However, the study recognises progress made by the TFTA countries to stabilise inflation and service debt. For other variables, evidence of convergence is there but remains weak. For instance, although cross-country dispersion of deficit decreasing over time, the majority of TFTA countries are still struggling to fuse and stabilise their fiscal positions.

Macroeconomic Convergence Policies

The study recommends that TFTA countries should develop policies which are able to deal with asymmetric shocks. This recommendation is derived from the convergence results which indicated that there was a structural break in the convergence trend for most macroeconomic variables especially during the period of the Global Financial Crisis. The challenge of asymmetric shocks is that they can undermine the real economy and the effect is usually larger in smaller economies thereby worsening the welfare positions of the citizens in these countries. Policies which address these shocks will spread the effect of the shock across the TFTA region thereby dampening the negative effects of the shocks. Using Robert Mundell's (1973) argument on international risk sharing, larger free trade areas such as the TFTA are better able to cope with asymmetric shock than smaller ones. The author also highlighted that the positive effects could be expatiated if free trade areas are complemented by common currencies, an area beyond the scope of this study.

The general result from the econometric techniques is that convergence is detected for some countries and some macroeconomic policy variables especially monetary variables. However, with respect to fiscal policy stance, the TFTA is still characterised by some level of mild divergence and heterogeneity. The macroeconomic convergence results suggests that action should be undertaken to sustain the process of economic integration in the TFTA region. There is need for a strengthening of the policy harmonisation framework. This can be achieved by designing effective mechanisms for monitoring and enforcement especially with regards to the macroeconomic convergence criteria. Currently, there are no strict enforcement and accountability procedures which indicates that countries still have a relatively stronger level of autonomy than would be desired in order to achieve much better results in terms of macroeconomic convergence. There is need for policies which stimulate fiscal discipline, increase transparency and accountability to the 'higher authority.' The study also recommends that the member countries should minimise incurring more debt and consistently continue to service their respective debt obligations. In addition, African countries must not only depend on

financial institutions such as IMF to introduce programs such as HIPC but also introduce their own initiatives in order to service debt thereby ensuring that the convergence momentum is sustained.

There is need to have a 'higher authority' within the TFTA structures which has actual authority to set and enforce a stricter set of operational targets and parameters in terms of macroeconomic convergence criteria. This is because although there is a decrease in terms of cross-country dispersion over-time (that is, convergence), the majority of TFTA countries are still struggling to fuse (integrate) and stabilise their fiscal positions. This could be indicative of lack of fiscal discipline among some member countries which can be addressed if the 'higher authority' of the TFTA can set targets which are enforceable. The lack of fusion and stability makes it increasingly challenging to have meaningful and sustainable coverage.

Complementary to the argument raised in the paragraph above, the study recommends that the TFTA should establish communitarian institutions in order to deepen macroeconomic integration. This is because deep macroeconomic integration and convergence demands efficient management of macroeconomic criteria which can be achieved through communitarian institutions. These institutions include but are not only limited to a regional system of central banks, surveillance procedures for the banking and credit sectors, data collection and analysis formats and regulatory frameworks for cross-border financial services. Another important factor to be considered include addressing matters concerning the design of the institutions especially during the transitional phases.

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The Dynamics of Fiscal Deficits in Burundi: An Exploratory Review

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Abstract: The major objective of this study is to undertake an exploratory review of fiscal deficits in Burundi during the period 1980 – 2017. Burundi emerged from conflict with large state and peacebuilding challenges, and extreme institutional and socio-economic deficits. Many years of conflict affected Burundi's productive capacity, policy and institutional capacity, and the ability to make meaningful public investments. While the country has undertaken various fiscal policy reforms, revenue growth has been lower than anticipated, and little progress has been achieved in improving public expenditure efficiency. Consequently, fiscal deficits remain large as a percentage of GDP. The study approach considers a systematic review of literature, reforms, and trends. Findings indicate that the major factors contributing to the persistently large fiscal deficits in Burundi include the following: low and volatile economic growth, small economic base with low incomes, large informal economy, and dominance of the primary sectors. In addition, conflict and fragility, large expenditure on military and peace operations, as well as dependency on aid have been identified as major determinants of fiscal deficits in Burundi. The authorities in Burundi should put in place strategies for operating a fiscal policy that is consisted with sustainable fiscal balances and maintenance of sustainable levels of public debt in line with the East African Monetary Union convergence criteria. To the best of the authors' knowledge, this is the first paper to provide a systematic review of the fiscal policy trends and reforms in Burundi.

Keywords: Fiscal policy; revenue; expenditure; conflict; Burundi

JEL Classification: E62; E62

1. Introduction

Burundi's macroeconomic performance has been invariably shaped by its failure to emerge from recurring cycles of internal political conflict (Nkurunziza and Ngaruko, 2008). Consequently, Burundi's economy has been characterised by fragility and instability since its independence in 1962. Overall, Burundi remains one of the poorest countries in the world and lags on many human development

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indicators. Poverty is ubiquitous. The World Bank estimates that close to 73 per cent of Burundians lived below the international poverty line of US$1.90 per day in 2014, nearly double the average for Sub Saharan Africa and other low-income countries (World Bank, 2018). With these development challenges, Burundi needs to realign fiscal policy to address growth, fragility, and vulnerability. However, fiscal space has been constrained by a combination of low economic growth, climate change induced natural disasters, and conflict that affected productivity (World Bank, 2018). With a low economic base and high military expenditures, the country has often found itself in fiscal crises, with rising fiscal deficits and large macro-fiscal imbalances (Ndikumana, 2001).

Many years of conflict have affected Burundi's productive capacity, policy and institutional capacity, and the ability to make meaningful public investments. These challenges resulted in an inability to mobilise sufficient revenues, low budget execution capacity, leading to recurring cycles of low growth. With a narrow economic base and limited potential for revenue mobilisation, the country did not have enough fiscal space to meet the large expenditure needs arising out of the large reconstruction needs, often leading the country to rely on inflation tax (Nkurunziza 2005). With weak institutions and governance structures, fiscal policy played a limited role in the resource mobilisation and allocation that would have facilitated a better economic trajectory. Fiscal deficits have traditionally been high in Burundi, although their magnitude has varied widely through the period of analysis. Grants, which averaged 17.3 per cent of GDP during 2010 – 2017, have increasingly played a major role in meeting the financing needs of the country.

Real GDP per capita growth has been low, constrained by low productivity and a high population growth rate. Consequently, improvements in incomes per capita have been minimal. Indeed, absolute real incomes per capita have been declining for the last three decades. Specifically, GDP per capita declined remarkably during the period 1990 – 2005, dropping by 35 per cent to $220 from $ 340 and only recovered slightly until 2014 when it reached a value of $244, before starting to declining again (figure 1). This drop highlights the effects of the conflict which eroded the productive capacity or the country, leading to loss of production bases.

The current account has been deteriorating, reflecting underperformance in the export sector, which is dominated by coffee and other primary commodities. Military expenditure relative to the size of the economy is high and rose substantially during the conflict years during 1990 – 2010.

Economic growth remains volatile due to dependence on the widely fluctuating agricultural sector, which constitutes about 46 per cent of GDP. Earlier studies have highlighted the country's vulnerability to exogenous shocks related to commodity exports, rain-fed agriculture, and volatile foreign aid (World Bank, 2013; Lim and Rugwabiza, 2009). However, Burundi's measured agricultural

sector is dominated by coffee, and the volatility in coffee prices account for recent variations in growth, export performance and government receipts, which affect government finances. As an example, it is estimated that the 2005 drought limited real GDP growth to only 0.9 per cent (World Bank 2014). However, the economy has been more diversified recently, with the service sector, which accounts for 37 per cent of GDP, beginning to recover mainly due to growth in public services and, to a lesser extent, in the transport and trade sub-sectors. Burundi's industrial sector, which contributes about 17 per cent of GDP, is dominated by agricultural processing.

Despite the return of steadier growth and increases in external financing, large fiscal deficits (including grants) persisted, averaging 18 per cent of GDP during 2010 - 2017. Revenue raising efforts remained erratic even as the government increased spending on service delivery and expanded the public service. The situation was often not helped by policy inconsistencies and reversals, including failure to streamline tax subsidies and to broaden the tax base. To restore the fiscal base and improve tax collection, the Burundi Revenue Authority (OBR) was established in 2009. Further reforms intended to strengthen budget transparency and integrity included the creation of a court of audit, adoption of modern budget laws, and introduction of a single treasury account. These reforms, discussed in greater detail in the following section, were expected to improve fiscal outcomes and transparency in fiscal management in Burundi. The rest of the paper is structured as follows: section two discusses the fiscal policy reforms in Burundi. Section three presents the trends of fiscal deficits during the period 1980-2016. Section 4 discusses the determinants of fiscal deficits. Section five concluded.

2. Fiscal Policy Reforms in Burundi

The authorities in Burundi have undertaken various reforms intended to improve the fiscal position of Government. These reforms have focused on creating fiscal space for growth-enhancing investment by improving revenue and expenditure management, as well as overall budgetary quality and credibility. These reforms started with the structural adjustment program which broadly sought to improve production incentives by opening up the economy to market forces, promote private sector development, and increase the efficiency of fiscal policy. Five areas were targeted, and these included: public expenditure management; public enterprise reform; trade, industrial, and credit policies; agriculture; and labour policy and the social sectors. Second generation reforms included improving efficiency in expenditure and raising more domestic revenue.

2.1. The Structural Adjustment Program

The coffee boom starting in the early to mid-1970s had led to a period of relatively good performance and growth. During this period, Burundi also benefitted from increased foreign aid. However, starting in 1981, Burundi's economy faced serious economic and financial difficulties. Terms of trade shocks, caused by a decline in international coffee prices, oil price increases and weak capacity to oversee any meaningful adjustment policies, led to large budget deficits and a deteriorating balance of payments position (World Bank, 1988).

Faced with growing macro-fiscal imbalances, the Government took some adjustment measures at the end of 1983. The Burundi Franc was depreciated by 30 per cent against the U.S. dollar; producer prices of the main export crops were increased significantly; some tax rates were raised; public wages were frozen; and an effort was made to control both recurrent and capital expenditures policies (World Bank, 1988). In recognition of the serious economic consequences that could result from failure to correct the financial imbalances, the Government embarked in 1985 on the preparation of a major program of economic reforms. The program aimed at redressing the main financial imbalances, accelerating economic growth, diversifying the country's productive base, and reducing the economy's dependence on coffee.

With the assistance of the World Bank and the International Monetary Fund, preparation for the first Structural Adjustment Program began in May 1985, and the first measures were implemented in mid-1986. The government adopted a wide-ranging set of economic reforms broadly consistent with three major objectives: (i) reducing the budget deficit (ii) maintaining a sustainable balance of payments position; and (iii) containing inflation to about 5-6 per cent a year; and (iv) increasing credit to the private sector. The medium-term structural adjustment program was geared towards rationalising the incentive system through liberalisation of the economy and improving efficiency in resource allocation and utilisation.

With these reforms, the government aimed to achieve an average real GDP growth of 4 per cent per year, based on improved agricultural performance and expansion of the industrial sector. The domestic savings rate was expected to increase from 4 per cent in 1982-85 to 6-7 per cent during 1986-90, and the private sector was expected to emerge as the new engine of investment and growth. In the process, the Government implemented major changes in trade and industrial policies and took important steps to strengthen public expenditure management and rehabilitate the public enterprise sector.

These reforms were largely successful. The overall financial position of the government improved with revenues increasing by about 20 per cent in nominal

terms and expenditures by 9 per cent. Subsequently, the overall deficit (on a cash basis and excluding capital grants) declined from 9.4 per cent of GDP in 1985 to 7.5 per cent in 1986. The balance of payments position improved as well, with the current account deficit reducing to 5.6 from 7.4 per cent of GDP per cent. However, coffee exports were adversely affected by lower-than-expected average prices and by transportation and marketing problems which prevented Burundi from exporting all its coffee production. Therefore, overall improvements in the external position were less favourable than envisaged under the Government's program. Foreign exchange reserves increased to 2.5 months of imports at the end of 1986, nearly twice the level at end-1985, but lower than the 4.5 months estimated under the program. The debt service ratio, as a proportion of exports of goods and non-factor services and private transfers, rose to 22.1 per cent, compared with the 16.3 per cent programmed, reflecting the weaker export performance rather than an increase in short-term debt.

In addition, the necessary steps were taken to improve the management of public expenditures. The first three-year rolling public expenditure program (PEP) was prepared in 1988, and the capacity to prepare and appraise projects was strengthened with World Bank support. The PEP focused on three pillars, meant to improve the overall environment for macroeconomic and fiscal policy management. These were: (i) accelerate the preparation of a comprehensive PEP (1989-91), paying attention to the economic justification of major projects and the adequate allocation of recurrent expenditures to priority programs; (ii) move into a single consolidated budget and improve the accounting system of the Ministry of Finance; and (iii) strengthen the project implementation and follow-up process.

2.2. Tax Policy Reforms in Burundi

The major reform in Burundi's reforms involved creating a semi-autonomous revenue authority (SARA). Subsequently, the Burundi revenue authority, officially known as the Office Burundais des Recettes (OBR), was established in 2009 by an act of parliament, under Article 6 of Law Number 1/11. Although the OBR is the agent for tax collection, the Ministry of Finance determines the tax policy. In the same year, the VAT was introduced, replacing the transactions tax (Ndoricimpa 2017). At the same time, a number of reforms were undertaken within the OBR in the years that followed its creation. These included: investment in IT systems, efforts to widen the tax base, and a drive to professionalize customs operations at the borders. With these actions, the creation of the tax authority was immediately successful. By 2012, taxes collected by the revenue authority rose to more than USD 350 million, 75 per cent more than in 2009 in real terms. Consequently, the contribution of tax revenues to GDP was 16.7% against 13.8% in 2009 (Holmes 2013).

2.3. Budgetary and Expenditure Reforms

The budgetary and expenditure reforms started with the adoption of the interim poverty reduction strategy paper in 2003, supported jointly by the World Bank and the International Monetary Fund. At the time, Burundi was emerging from conflict with huge state and peacebuilding challenges, and extreme institutional and socio-economic deficits. Focus was on promoting peace and good governance, reintegrating victims of conflict, ex-combatants, and their families; promoting sound economic growth to reduce poverty; expanding access to basic social services; prevention and mitigation of HIV/AIDS and other sexually transmitted diseases (STDs); and advancing the role of women in development (World Bank 2004).

Building on the interim PRSP, the first poverty reduction paper was published in 2006. While the implementation of the first PRSP brought remarkable progress in terms of macroeconomic stability and access to basic social services, the general pace of economic growth remained low and did deliver the expected poverty reduction dividend. In addition, the repercussions of the 2009 international economic and financial crisis greatly frustrated the efforts of the government, which had been forced to contend with previous shocks – the 2006-2007 energy crisis and the sharp rise in prices of staples from 2007-2009 –whose effects were still felt (World Bank 2007). A second PRSP was published in 2012 with a focus on growth and job creation as a basis for future poverty reduction programs (World Bank 2012). The development of the Growth and Poverty Reduction Strategy Papers, as well as focus on implantation of the Millennium Development Goals (MDGs) marked a significant turning point in the formulation of spending plans and constituted the basis of the first Priority Action Plan (PAP 2007-2010) for short-term and medium-term development (GoB, 2011).

The authorities in Burundi enacted a budget law in 2008. Rules on commitments were tightened and exception public spending procedures, which were used widely in the past, were brought under control. With these developments, most of the existing extra-budgetary accounts were closed or integrated into standard budget documents. The level of unreported extra-budgetary expenditures does not exceed 5 per cent of total expenditures. Consequently, budget execution rates improved significantly, rising from 81.4 per cent in 2006 to 97.6 per cent in 2013, with development spending showing the largest improvement, increasing from 45.9 per cent in 2006 to 85.4 per cent in 2013 (World Bank 2015).

The introduction of the Integrated Financial Management Information System (IFMIS) in 2006 improved budget monitoring and internal control systems. Following these reforms expenditure commitments were aligned with projected cash flows with the setting up of commitment ceilings for each line ministry on a quarterly basis. Internal budgetary controls were further improved in 2012 with the

appointment of controllers of committed expenditures in three pilot ministries, including in health, education, and agriculture (World Bank 2013).

Authorities in Burundi gradually introduced the Medium-Term expenditure framework (MTEF), aligning the PRSP priorities to the budget. Starting in 2011, the central MTEFs consistent with the macroeconomic framework are used in the preparation of the budget. This involves making three-year forecasts of fiscal aggregates on a rolling annual basis through the central MTEF and Medium-Term Budgetary Framework (MTBF). As a result of these initiatives, the composition of public expenditure has significantly improved toward priority sectors, including education, health, and agriculture (World Bank 2013). Medium-term budgeting was introduced through the 2012 Decree on Budgetary Governance, based on three documents: The Medium-Term Budgetary framework (MTBF), the Medium-Term Financial Framework (MTEF) and the Background to the Budget (UNICEF, 2017). Table 2 summarises the key fiscal policy reforms undertaken in Burundi since 1980.

On the basis of the extensive reform agenda that was undertaken by Burundi authorities, the country was awarded in January 2009 HIPC debt relief worth USD 832 million (Specker et al. 2010). Despite these reforms, many challenges for prudent fiscal management remain, especially in the area of cash management, public accounting, and external budget control. The Treasury Single Account was introduced starting from 2010, starting a process of consolidating and unifying government's banking arrangements to ensure that transfers are easily traceable, and enabling the Ministry of Finance to monitor the government's cash flows better. However, the process of effectively integrating all relevant accounts and of creating safeguards against the creation of new separate accounts was much slower, limiting progress on short-term cash management (World Bank 2013). As a result, weaknesses persist in the execution and control of the expenditure chain, with significant accumulation of arrears (IMF 2014). While a consolidated Government statement is prepared annually, with information on revenue and expenditure, the public accounting information remains weak with account balances often incomplete.

Table 1. Summary of Key Fiscal Policy Reforms in Burundi

Year	Reform
1985	Burundi embarks on structural adjustment program
1988	First Public Expenditure Program (PEP) prepared
2003	Interim Poverty Reduction Strategy Paper (PRSP) prepared
2006	First Poverty Reduction Strategy Paper (PRSP) prepared
2006	Integrated Financial Management Information System (IFMIS) introduced
2007	First Priority Action Plan (PAP) prepared
2008	Budget law enacted
2009	Burundi Revenue Authority established
2009	VAT law enacted
2010	Treasury Single Account (TSA) introduced
2011	Medium-Term expenditure framework (MTEF) introduced
2012	Second Poverty Reduction Strategy Paper (PRSP) prepared

Source: Author review of literature

On the basis of the extensive reform agenda that was undertaken by Burundi authorities, the country was awarded in January 2009 HIPC debt relief worth USD 832 million (Specker et al. 2010). Despite these reforms, many challenges for prudent fiscal management remain, especially in the area of cash management, public accounting, and external budget control. The Treasury Single Account was introduced starting from 2010, starting a process of consolidating and unifying government's banking arrangements to ensure that transfers are easily traceable, and enabling the Ministry of Finance to monitor the government's cash flows better. However, the process of effectively integrating all relevant accounts and of creating safeguards against the creation of new separate accounts was much slower, limiting progress on short-term cash management (World Bank 2013). As a result, weaknesses persist in the execution and control of the expenditure chain, with significant accumulation of arrears (IMF 2014). While a consolidated Government statement is prepared annually, with information on revenue and expenditure, the public accounting information remains weak with account balances often incomplete.

3. Fiscal Deficit Trends in Burundi

Fiscal deficits have varied widely during the period of study, but the trends provided in figure 2 suggest four distinct periods of note. The first period corresponds to the ten years during 1980 – 1990. The second period corresponds to the six years during 1991 – 1995. The third period corresponds to the five years

during 1996 – 2000. The fourth period corresponds to the period during 2001 – 2017.

The period during 1980 – 1989 represents Burundi's best performance. Fiscal deficits, which averaged 15 per cent of GDP during this period, were low and stable. At the same time, GDP performance was high but volatile, reaching 12 per cent between 1981 and 1985. During this time, fiscal deficits were contained partly due to a slowdown in public investments, as well as due to the structural adjustment measures undertaken starting from 1983 (World Bank 1988). Overall, the government financial position improved with expenditures declining from 31 per cent of GDP in 1980 to 25 per cent in 1988. Consequently, the fiscal deficit declined to 7 per cent of GDP from 14 per cent of GDP over the same period.

During the period 1991 – 1996, fiscal deficits widened rapidly as government expenditure accelerated. This period coincided with the onset of the civil war in 1993 which led to a rise in peace and military spending to an average of 3.8 per cent of GDP from an average of 2.9 per cent of GDP during 1985 – 1990. At the same time, the civil conflict led to near total destruction of the social and economic infrastructure. Owing to the effects of conflict, real economic growth rates were negative and averaged -3.2 per cent during that period.

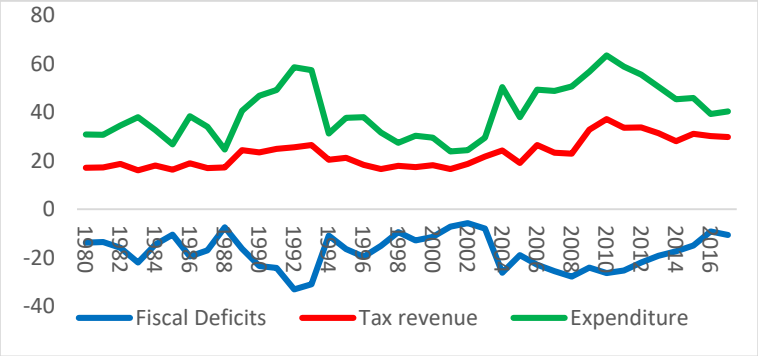

Figure 1. Trends in Government Revenue, Expenditure, and Deficits (% GDP)

Source: Author construction using World Bank, IMF, and ICTD datasets

During the period 1995 – 2000, the fiscal position improved somewhat, even as revenues declined from 21 per cent of GDP in 1995 to 18 per cent in 2000. The decline in revenues was offset by a corresponding decline in expenditures from 38 per cent of GDP in 1995 to 30 per cent, with the overall effect being that the overall government fiscal balance improved by five percentage points from -16 per cent of GDP to -11 per cent of GDP.

During the period 2001 - 2017, the fiscal deficit widened considerably despite improved revenue performance. The Arusha Peace agreement signed in 2000 had led to a period of relative peace following a debilitating conflict. However, new fiscal pressures soon emerged including efforts to resettle and reintegrate refugees (IMF 2014). At the same time, increased expenditure pressures arose from government efforts to demobilize and reintegrate former combatants into the national security forces as well as a reconstruction agenda that focused on poverty reduction and social service delivery (Ndoricimpa 2017). Consequently, current expenditure on salaries increased as the civil service expanded. Between 2005 and 2010 expenditure on salaries increased by more than 80 per cent in real terms as the number of civil servants increased by more than 50 per cent (IMF 2011). Efforts to increase revenues did not match the increase in expenditure, despite efforts to widen the tax base and improved tax revenue effort. The fiscal deficit excluding grants widened from 11 per cent of GDP in 2008 to 27 per cent of GDP in 2008, before starting to decline as the country embarked on fiscal consolidation reforms.

4. The Determinants of Fiscal Deficits in Burundi

The main drivers of fiscal deficits in Burundi are related to the conflict and the political turmoil that perpetuated large military and security expenditures and to the structure of the economy with a large informal economy and low per capita incomes. These factors can be summarized as structural factors, policy and institutional factors, and the effects of civil war. In a persistently fragile political, economic, and social environment, military expenditures have necessarily and historically been high in Burundi, crowding out investments in the rest of the sectors. While this meant that economic growth was much slower, it also resulted in increased reliance on official development assistance to meet the investment gaps in the social sectors and basic infrastructure (Nielsen and Madani 2010). With a low economic base, sources of domestic revenue were always meagre. These factors largely explain the evolution of fiscal balances in Burundi.

In the 1980s and early 1990s, Burundi experienced large budget deficits. In the ten-year period Between 1980 - 1989 fiscal deficits averaged 15 percentage points of GDP. During the ten-year period between 1990 – 1999 fiscal deficits decreased, averaging 19.58 percentage points of GDP, with these deficits reaching 33.1 percentage points of GDP in 1992 before gradually declining and reaching 12.87 per cent in 1999. To meet higher spending, the government authorities often resorted to higher monetary financing of the deficit and keeping interest rates artificially low to ease government borrowing from the banking sector (IMF 1997). The monetization of the deficit often added upward pressure on prices, which were

already under pressure from supply-side constraints due to bottlenecks in production and international trade.

Burundi embarked on compressive structural adjustment policies in 1991 aimed at strengthening economic performance and restoring macroeconomic stability. However, the reforms were short lived as the country plunged yet again into political turmoil following the assassination of President Ndadaye in 1993. The macroeconomic instability that followed led to a sharp pressure on prices, with inflation increasing from 7 per cent in 1990 to 31 per cent in 1999 and remained in double digits up to 1998. Military expenditure, which had averaged 3 per cent as a percentage of GDP during 1980 – 1989 rose and averaged 4.77 per cent during 1990 - 1999. The dire macroeconomic situation was exacerbated starting in 1996 when Burundi's regional neighbouring countries and the international community imposed a total economic embargo on the country following a military coup. By the year 2010, the fiscal deficit had soared to 26.10 per cent, mainly on account of high military expenditures, low economic growth, and a limited base for domestic revenue mobilisation.

The Government's prudent fiscal policy led to the reduction of fiscal deficit to about 14.2 per cent of gross domestic product (GDP) on average during the five years from 2013 to 2017. According to the World Bank (2018), a series of measures contributed to this performance, including the improvement of the allocation of the budget (efficiency) toward growth and poverty reduction sectors and progress toward controlling the size of the wage bill (civil services and army forces) and purchases of goods and services through the budget. In a context of gradually declining aid, another important measure was domestic revenue mobilisation reforms through the creation of the Burundi Revenue Office (Office Burundais des Recettes, OBR). Monetary and exchange rate policy by the Central Bank were also critical to keep the inflation in check and promote exchange rate flexibility to mitigate the impact of shocks on the economy (World Bank, 2018).

Ndikumana (2001) argues that Burundi runs high public deficits because of the low tax base and institutional weaknesses that constrain tax revenue mobilisation. Moreover, conflict and ethnic tensions disrupt economic activity, eroding the tax base, lead to misallocation of the budget, including increased expenditures on the military and security sectors, and weaken state capacity, and drive including in fiscal policy management. These factors lead to the deterioration of fiscal deficits Ndikumana (2001). Figure 3 shows that fiscal deficits have been procyclical, reducing during economic downturns, and rising during the period of positive economic growth.

Growth has been consistently low, and this has affected fiscal policy in Burundi. Unfortunately, Burundi's immediate post-colonial history was dominated by military dictatorships. During the period 1960 – 2000, Burundi's GDP per capita

fell from about 620 dollars to 370, signifying the debilitating effects of conflict. Consequently, Burundi remains one of the poorest countries in the world and lags its East African neighbours. Average per capita consumption is only US$270 per year, placing Burundi at the bottom of the low-income category (World Bank 2018). Poor governance has suffocated innovation and entrepreneurship, frustrating sector development and diversification of the economy. Moreover, the creation of state-owned public enterprises that were badly governed created additional layers of corruption, bureaucratic expansion, and predation that benefited from the public resources, which affected budget deficits (Nkurunziza and Ngaruko 2002).

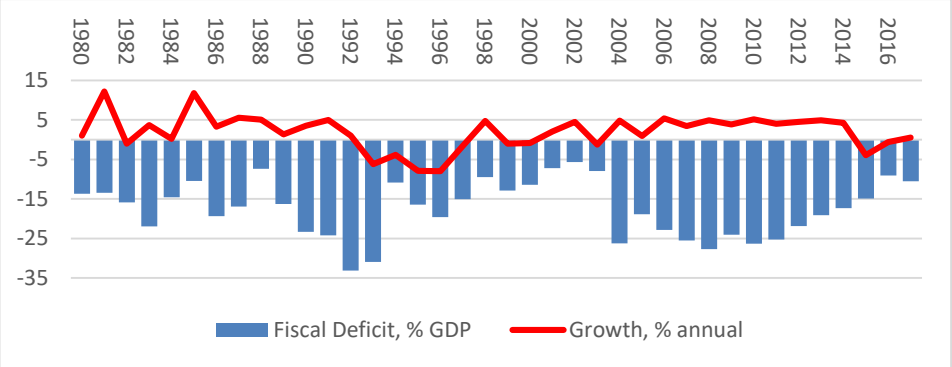

Figure 2. Fiscal Deficits And Growth In Burundi, % GDP

Source: Author Construction Using World Bank, IMF, and ICTD Datasets

The Ministry of Finance and Economic Development Planning oversees fiscal policy development and implementation. The budget is the main tool for fiscal policy implementation as it lays down the revenue and expenditure plans and priorities, as well as sources of revenue. One of the major challenges in Burundi has been the management of public expenditures. According to Ndikumana (2001), fiscal policy in Burundi has been shaped by three factors: the structure of the economy, policy and institutional factors, and the effects of civil war.

The two major structural factors that constrain tax revenue mobilisation in Burundi are related to the level of development with low levels of development with low per capita incomes, a large informal economy, and dominance of the primary sectors. In Burundi, incomes are so low that taxation without discouraging consumption, savings, and investment is difficult. With the services sectors dominated by small, informal, and unproductive firms, the manufacturing and agricultural sectors are the key sources of tax revenue. Taxes on good and services, which constitute over 50% of total tax revenue have continued to play a major role (table 3). The experience of Burundi is consistent with recent research which shows that countries that operate closer to their tax potential have high levels of

income, large shares of non-agricultural output, smaller shares of rural populations, and low corruption scores (Fenochietto and Pessino, 2013; Mawejje and Sebudde, 2019).

However, the importance of trade taxes is gradually diminishing as domestic taxes start to play an important role. This has been made possible by the reforms, including the institution of the Office Burundais des Recettes (OBR) which is mandated with collecting domestic revenue, improving efficiency and ensuring compliance in tax administration. In addition, the shift of domestic revenue from international trade reflects the effects of trade liberalization characterized by a systematic decline in tariff rates, particularly for products originating from within Burundi's regional trading blocs.

The third factor that contributes to the fiscal revenue crisis in Burundi is the civil conflict which has disrupted economic activity, trade, and led to the erosion of the tax base. The economic sanctions on Burundi following the 1996 military coup had severe effects on government revenue by reducing the volume of international trade. Recent research shows that that government changes during periods of conflict are related to steep rises in the fiscal deficit (Dalyopy 2017). Owing to the prolonged conflict, the authorities usually faced a tradeoff between allocating funds between military expenditures and service delivery Ndikumana (2001). Thus, the conflict and dominance of the military have been an important determinant of fiscal outcomes in Burundi.

5. Conclusion

Burundi emerged from conflict with large state and peacebuilding challenges, and extreme institutional and socio-economic deficits. Many years of conflict affected Burundi's productive capacity, policy and institutional capacity, and the ability to make meaningful public investments. These challenges resulted in an inability to mobilise sufficient revenues, low budget execution capacity, leading to recurring cycles of low growth. With a low economic base and high military expenditures, the country has often found itself in fiscal crises, with rising fiscal deficits and large macro-fiscal imbalances. The country embarked on a reform process, starting with the adoption of the poverty reduction strategies that were meant to better align fiscal objectives to the development needs of the country. Subsequent reforms have focused on improving revenue mobilisation and improving the efficiency of budgets. While these reforms have started to yield some positive results, such as improved revenue collection and congruence in budget execution, challenges still remain, particularly in the execution and control of the expenditure chain, which often result in the accumulation of arrears. Fiscal deficits are linked to the structure of the economy with large informal sectors, large military spending, low levels of

development and incomes, weak institutions, a non-diversified economy with a large reliance on commodity exports, as well as weak growth that has characterised the post-conflict period. The authorities in Burundi should put in place fiscal strategies for operating a fiscal policy that is consisted with sustainable fiscal balances and maintenance of sustainable levels of public debt in line with the East African Monetary Union convergence criteria.

Table 3. Burundi Fiscal Operations, % GDP

	2010	2011	2012	2013	2014	2015	2016
Revenue and grants	37.3	35.9	31.4	30.0	26.7	19.5	18.0
Tax revenue	13.7	14.2	13.6	12.3	13.7	12.1	12.3
Taxes on income	4.4	4.4	4.3	3.9	2.8	2.5	2.9
Taxes on goods and services	7.8	8.3	7.9	7.2	8.0	7.6	7.3
Taxes on international trade	1.6	1.5	1.4	1.2	1.1	1.1	0.9
Nontax revenue	0.9	1.1	1.0	0.9	1.7	0.9	1.2
Grants	22.7	20.6	16.9	16.8	13.0	9.4	5.7
Total Expenditures	41.0	39.8	35.1	31.9	30.1	26.7	23.6
Current expenditures	29.0	24.3	21.9	19.2	18.8	18.8	16.1
Compensation of employees	8.6	8.6	7.8	7.0	6.6	6.7	7.2
Development expenditures	12.0	15.5	13.2	12.7	11.4	7.8	7.4
o/w domestically financed	2.0	3.5	2.5	2.3	2.0	2.4	2.5
Fiscal deficit excluding grants	-27.3	-25.6	-21.5	-19.6	-16.4	-14.6	-11.3

Source: IMF and World Bank data

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Navigating on The Precursors of Entrepreneurial Inclination Among Students in South Africa

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Abstract: In the present contemporary business environment, students are bound to be inclined towards entrepreneurship. Hence, this study explored the impact of perceived family support, perceived desirability and opportunity recognition on entrepreneurial inclination among the students within the Gauteng Province of South Africa. Despite the extended research on entrepreneurship, the significance of determining the precursors of entrepreneurial inclination has largely been overlooked, especially in developing nations of Southern Africa. Hence, the essential goal of this investigation is to fill this void. The study adopted a quantitative approach and a structured questionnaire was used to collect data from 261 students. The collected data was examined using structural equation modeling, exactly by means of the AMOS 25 software. This investigation found that perceived family support; perceived desirability; opportunity recognition positively impacted entrepreneurial inclination in a significant way. The paper gives helpful implications and a couple of recommendations. For example, this investigation extends the information base that exists in the field of entrepreneurship by systematically exploring the impact of perceived family support, perceived desirability and opportunity recognition on entrepreneurial inclination This study stands to add new knowledge to the present body of entrepreneurship and small business management literature in Africa – a setting that is regularly overlooked by academics in developing nations.

Keywords: perceived family support; perceived desirability; opportunity recognition; entrepreneurial inclination.

JEL Classification: L26

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1. Introduction

South Africa is encountering high rates of unemployment and poverty, especially among the youth (Mbuya & Schachtebeck, 2016). The youth unemployment rate in South Africa was 54.70% in the fourth quarter of 2018 (Trading Economics, 2018). This nation particularly has much lower rates of entrepreneurship than other developing and developed countries, and it needs to help potential and current entrepreneurs to address these issues (Mbuya & Schachtebeck, 2016). The starting point of term entrepreneurship can be followed to the French word "Entreprendre", which is "to undertake". Even though the strict meaning of entrepreneurship is yet to develop, it is broadly considered as the identification and exploitation of new prospects (Gupta, 2018, p.1401). According to Păunescu, Popescu, and Duennweber (2018), entrepreneurship is defined as "an intentional behavior to develop a business idea, create new products and services and obtain and generate economic and social benefits". Entrepreneurship is synonymous with self-employment, it is accepted to be a powerful technique for dealing with the issue of employability, especially among the youth (Sahban, 2016, p. 1).

In a cutting-edge work atmosphere, perfect employment opening is inadequate. Therefore, entrepreneurship courses occupied a crucial role in a scholastic field; that incite the enthusiasm for business graduates toward the creation of employment for others by means of establishing a new business. Entrepreneurship encourages the student to end up being a wellspring of employment creator as opposed to employment seeker (Khan, Rasheed & Alam, 2018). As indicated by research, entrepreneurship is a purposeful and arranged conduct that can grow economic proficiency, introduce innovation to business sectors, generate new jobs, and raise jobs levels (Karimi, Biemans, Lans, Chirazi & Mulder, 2016). Policymakers are pursuing answers about what makes an individual willing to become an entrepreneur, how these impacting elements can be intensified, and how the quantity of potential or real entrepreneurs can be expanded to give increasingly noteworthy economic growth (Pfeifer, Šarlija & Sušac, 2016).

Entrepreneurial inclination is essential for a nation to have economic growth since entrepreneurship is related to employment creation, innovation, and venture creation. It is imperative to improve the entrepreneurial inclination among students as they are the potential entrepreneurs (Ranwala & Dissanayake, 2016). Entrepreneurial inclination is the tendency to make new enterprises. For the better comprehension of the essential elements of entrepreneurship different firms over the world host conferences, seminars, and workshops. To improve the entrepreneurship inclination most of the higher education institutions around the world are giving entrepreneurial education that provides the students essential information and abilities of entrepreneurial accomplishment (Baloch, Rahim & Manzoor, 2017). Entrepreneurship persists to attract much curiosity and

consideration from different stakeholders. As a result of contemporary difficulties and vulnerability in their future, there is more need for students with entrepreneurial abilities. Hence, students all over the world are urged to think about an entrepreneurial profession route (Koloba, Dhurup & Radebe, 2015).

Given the growing importance of entrepreneurship for students, numerous authors have examined on entrepreneurship inclination in different settings by focusing on factors related to the entrepreneurial inclination of students of a University of Technology in South Africa (Iwu, Ezeuduji & Eresia-Eke, 2016, p. 166); effects of self-efficacy on entrepreneurial inclinations among students in selected universities in the Southern Gauteng region of South Africa (Koloba, Dhurup & Radeba, 2015, p.65); motivations and obstacles to graduate entrepreneurial inclinations in South Africa (Fatoki, 2010, p.88); assessed the tourism entrepreneurial inclination of South African youth, and the mental attitude of those who have this inclination (Ezeuduji & Ntshangase, 2017, p.144).

Henceforth, concluding from the previously mentioned, there is a lacuna in studies that have examined perceived family support, perceived desirability and opportunity recognition as prognosticators of entrepreneurial inclination among students in South Africa. In this manner, given the various perspectives that impact entrepreneurial inclinations, this investigation aims to precisely explore the impact of perceived family support, perceived desirability and opportunity recognition on entrepreneurial inclination among the students within the Gauteng Province of South Africa.

The rest of this article is apportioned as follows: the next section outlines the review of the literature and the development of the conceptual model as well as the hypotheses. The methodology that guides the study is then discussed. Finally, the results of the study, discussions, implications, recommendations, and conclusions are provided.

2. Empirical Literature

This section of the literature review discusses the different research variables undertaken as part of this study.

2.1 Perceived Family Support

As indicated by Sahban, Ramalu, and Syhputra (2016) when an individual intends to start new business, the individual seeks support from different sources. Sources of support for the entrepreneurship activity of individuals are generally family, partner, and friends to whom they can trust to share the entrepreneurship ideas, the potential challenges to be experienced alongside the way and the manner to deal with these issues (Mustikawati & Bachtiar, 2008). Initially, as the closest

environment, the support of family can encourage the interest for entrepreneurship (Sahban, Ramalu & Syhputra, 2016). The family assumes an essential role in inspiring children to pursue entrepreneurial careers; parents are generally inclined to urge their children to take more challenging profession that permits self-freedom and autonomy (Buang & Yusof, 2006). According to Bhatia & Srilatha (2016), family members are an important source of social support. Families play a vital role in the new venture creation development. The role of family support, subsequently, needs more attention by research studies concentrating on understanding entrepreneurship. The family connections act as most grounded business ties in the business networks and the family of an entrepreneur is considered as offering various resources, extending from expert to non-expert resources, which strongly affect new venture creation and its activities (Sahban, et al., 2016). As stated by Anderson, Jack and Dodd (2005) family take a considerable part in new venture creation; this is because of the solid relationship among family members.

2.2 Perceived Desirability

Moghavvemi, Phoong, and Lee (2017) described perceived desirability as the level of interest an individual perceives towards particular conduct with regards to entrepreneurship. Moreover, Fitzsimmons and Douglas (2011) show that elevated levels of perceived desirability will prompt elevated levels of behavioral expectation to act. According to Barton, Schaefer, and Canavati (2018), the term "perceived desirability" identifies with the fact how interesting it is to a person to create an entrepreneurial event, for example, creating a new venture. The dimension of perceived desirability shifts depending on individual attributes and is influenced by individual's qualities, needs, aptitudes and capacities (Barton, Schaefer & Canavati, 2018). In addition, Riquelme and Al Lanqawi (2016, p.129) contended that the perceived desirability is a particular character that emulates "the valence (positive or negative) of an action's end state and does not have the connotation of personal motivation to achieve an end state". The authors confined the idea of perceived desire for entrepreneurship as intrinsic inspiration or enthusiastic reaction to the possibility of self-employment, in the analysis of Theory of Planned Behavior which underlines the significance of perceived desirability as the aspect of attraction and frame of mind toward entrepreneurship. Initially, the idea of "desire" described by Bagozzi (1992) aligns the Gollwitzer's (1996) concept of wishes or "volitional desires" as the driving force of changing certain manners and perceived desirability into intentions. The literature highlights that individuals who experience high desirability of entrepreneurship will in general build up a high entrepreneurial intention and later behavior (Păunescu, Popescu and Duennweber, 2018; Borton, et. al., 2018; Boukamcha, 2015), desirability being a determinant indicator of entrepreneurial inclination.

2.3 Opportunity Recognition

Opportunity recognition is described by being aware of potential business openings, effectively pursuing and assembling data about them, communicating on them, addressing client needs, and assessing the practicality of such potential entrepreneurial activity (Kuckertz, Kollmann, Krell & Stöckmann, 2017). Besides, Ndofirepi and Rambe, (2016) characterize opportunity recognition as perceiving a possibility to create new businesses, or significantly improving the position of an existing business enterprise which results in new profit potential. Additionally, White and D'Souza (2014, p.22) describe opportunity recognition as the ability to retrieve information and process that information to make a decision regarding the pursuit of a value creation effort. While mental processing is basic to opportunity recognition, the desire to seek after the identified opportunity makes an entrepreneurial activity a reality (Ndofirepi & Rambe, 2016). In that instance, opportunity recognition is a principal component of the entrepreneurship process as it establishes the developmental phase of the venture creation process (Singh & Gibbs 2013, p. 643). It is obvious that opportunity recognition is the beginning stage from which all entrepreneurship develops (White & D'Souza 2014, p. 22) and it is the distinctive characteristic of an entrepreneurial from a non-entrepreneurial mentality (McGrath & MacMillan 2000).

2.4 Entrepreneurial Inclination

As per Okeke, Okonkwo, and Oboreh (2016) an inclination basically implies the manner in which an individual feel about something, or it can be a feeling that drives an individual to settle on a decision or choice. In this way, entrepreneurial inclination could allude as the extent to which an individual is prone to taking up entrepreneurial activities (Okeke, Okonkwo & Oboreh, 2016). An entrepreneurial inclination is an individual's expressed behavior to become a business person (Ranwala & Dissanayake, 2016, p. 87). Molvi, Rauf and Gulzar (2018, p. 418) describe entrepreneurial inclination as the tendency and expectation of mind molding the decision of profession as an entrepreneur.

3. Conceptual Model and Hypothesis Development

A conceptual model depicts the relationship between variables examined in the study (Gunzler & Morris 2015). Additionally, Sekaran and Bougie (2016) include that a schematic diagram of the conceptual model assists the reader to imagine the theorized relationship between the variables in the model and hence to get a quick idea regarding how you consider that the management issue can be solved. In this examination, the conceptual model suggests that perceived family support, perceived desirability, and opportunity recognition are the independent or predictor

variables. Moreover, the dependent or outcome variable for the present investigation model is entrepreneurial inclination. Based on a synthesis of the converging literature related to the research variables, a conceptual model was proposed to guide the empirical study as shown in Figure 1

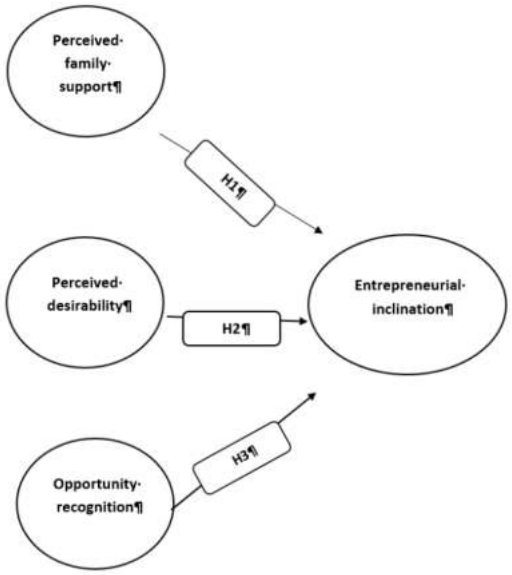

Figure 1. Conceptual Model

4. Proposed Hypotheses

The literature throws a spotlight upon a few validated works, subsequently showing the prospects to test a series of hypotheses in this work. This investigation utilized hypotheses to state explicit relationships between variables so that the relationships can be empirically tested. Moreover, the hypotheses were utilized to validate the theories utilized in the exploration and to permit consistent analysis of relationships of variables in order to derive the interaction of those variables. In view of logical proof in regard to perceived family support, perceived desirability, opportunity recognition as well as entrepreneurial inclination and in light of the fundamental theory, the study developed three hypothesis statements which are discussed in the subsequent sections.

4.1 Perceived Family Support and Entrepreneurial Inclination

Accordingly, as the closest environment, family support can synergize the enthusiasm for entrepreneurial inclination (Sahban, Ramalu & Syahputra, 2016). According to the study conducted by Mbuya and Schachtebeck (2016), it is

demonstrated that family support is an essential influencer in entrepreneurial inclination among students. Denanyoh, Adjei and Nyamekye (2015) uncovered that perceived family support positively affected the individual's inclination toward becoming an entrepreneur. Moreover, it recommended that family support offered an essential "emotional" support to a person who proposed to go into entrepreneurship. A critical connection has been found between perceived family support and entrepreneurial inclination (Molino, Dolce, Cortese & Ghislieri, 2018). In light of the above, this study proposes the following hypothesis:

H1: Perceived family support has a positive and significant effect on entrepreneurial inclination among students

4.2 Perceived Desirability and Entrepreneurial Inclination

Based on the findings by Urban and Kujinga (2017) perceived desirability is one of the attitudes and predictors that found to influence the entrepreneurial inclinations of becoming an entrepreneur. Bhandari (2016) revealed that the situational element such as perceived desirability can have a huge impact or effect on a person's entrepreneurial inclination. Furthermore, perceptions of the desirability of creating a business, just as the inclination to follow up on opportunities, are considered as key drivers of entrepreneurial inclination (Zampetakis, Gotsi, Andriopoulos & Moustakis, 2011). It has been found that students' perceived desirability significantly leads to the development of students' entrepreneurial inclinations to become entrepreneurs (Yousaf, Shamim, Siddiqui & Raina, 2015). Perceived desirability is noted to be a significant indicator of entrepreneurial inclination of students (Saadin & Daskin, 2015). Therefore, we formulated the following hypothesis:

H2: Perceived desirability has a positive and significant effect on entrepreneurial inclination among students

4.3 Opportunity Recognition and Entrepreneurial Inclination

Opportunity recognition is an essential part of the entrepreneurship process. People having this ability have possibly a higher inclination to entrepreneurship than the ones who do not possess them (Wasdani & Mathew, 2014). Within entrepreneurship literature, few studies have dissected the connection between opportunity recognition and entrepreneurial inclination. Moreover, proof has been discovered that opportunity recognition is positively connected with the entrepreneurial inclination (Camelo-Ordaz, Diánez-González & Ruiz-Navarro, 2016). Opportunity recognition has for quite some time been acknowledged as a key phase in the entrepreneurial inclination. Indeed, without opportunity recognition, there is no entrepreneurship (Karimi, Biemans, Lans, Chirazi & Mulder, 2016). Opportunity recognition is considered to impact entrepreneurial inclination. At the point when people have a positive attitude towards the

entrepreneurial behavior, they may take part in an active search for opportunities and in this way have more grounded goal to entrepreneurial inclination (Dahalan, Jaafar & Rosdi, 2015). Based on the above, the following hypothesis is formulated:

H3: Opportunity recognition has a positive and significant effect on entrepreneurial inclination among students

5. Research Methodology

This study adopted a positive paradigm in investigating the influence of perceived family support, perceived desirability, and opportunity recognition on the entrepreneurial inclination of students. The choice of this paradigm was justified by the need to analyze the data quantitatively in a more objective way in order to achieve the objectives of this study. A quantitative approach in research is "a formal and objective methodical process of describing and testing relationships and examining the cause-effect relations among variables of interest" (Burns & Grove 1993, p.777). Using a structured questionnaire, the study used a quantitative research design. The design was suitable for requesting the required information regarding perceived family support, perceived desirability, opportunity recognition, and entrepreneurial inclination. Moreover, the approach made it possible to examine the causal relationships with the variables used in the study. The measuring instrument was compiled from several existing scales, which were adapted for the purpose of the study, being quantitative in nature. Once the reliability and validity of the scale were established, structural equation modeling (SEM) was used to test the model fit, followed by testing hypotheses and path modeling. Using AMOS 25 software, SEM was performed, and the descriptive statistics were obtained using SPSS 25.0 software.

5.1 Sample and Data Collection

Data were collected from students studying at a university in the metropolitan area of Johannesburg for this research. These students were conceived as potential entrepreneurs as they were exposed to entrepreneurial education aimed at providing students with the knowledge, skills, and motivation to foster entrepreneurial success in a variety of environments. The sampling framework was constituted by students from the Faculty of Commerce, Law and Management at this university in South Africa. The researchers chose university students as their sample for the purpose of this examination. Having completed a preliminary subject in entrepreneurship, the students were considered to have a range of career options. These were people on the precarious edge of settling on basic vocation decisions about whether to pursue a formal job or focus on being entrepreneurs. As regards to the sampling frame, a list of registered students within the university database was used as a sampling frame. Thus, this study used a simple random sampling

technique because each element of the population had an equal and known chance of being selected as part of the sample (Weideman, 2014); for example, where every name in the list of students registered in the university database had an equal chance of being selected. The questionnaires made it clear that the respondents' anonymity would be guaranteed and that the study was for academic purposes only. The sample size Raosoft calculator was used to calculate the sample size (Raosoft Inc. 2004). The calculation considered the total student population enrolment of approximately 33 346, a 5 percent margin of error, 90 percent interval of confidence, and the recommended 50 percent distribution, and returned a minimum sample size of 377 respondents. Of the 377 questionnaires distributed, 261 questionnaires returned were usable, resulting in a response rate of 69 %.

5.2 Measuring Instrument

A self-administered questionnaire will be used for this study to collect the data needed. Leedy and Ormrod (2010, p.197) argue that a questionnaire is research in which the researcher asks willing participants a series of questions, summarizes their responses with percentages, frequency counts, or more sophisticated statistical indexes on which references are drawn about a population. The questionnaire will be divided into four sections, Section A, which will consist of questions related to the demographic factors of the respondents, including age, gender, study year and allowance.

Section B evaluated “perceived family support” and include adapted questions from (Shen, Osorio & Settles, 2017). Section C measured “perceived desirability” in accordance with the scales used by (Shen, Osorio & Settles, 2017). Questions on “opportunity recognition” included in Section D of the questionnaire had questions adopted from (Kuckertz, Kollmann, Krell & Stöckmann, 2017). Section E measured “entrepreneurial inclination” from the scales used by (Keat, Selvarajah, & Meyer, 2011). Responses were measured by a Likert scale of five points where one scale item denotes strong disagreement and five strongly denotes agreement.

6. Data Analysis

Data analysis refers to the process of transforming the collected data into a more manageable size to enable behavior categorization and statistical techniques to be applied (Cooper & Schindler, 2016, p.94). Initially, preliminary data analysis was performed using the SPSS version 25.0 statistical software. Using the AMOS software package, a structural equation modeling (SEM) procedure was then applied to test the hypotheses.

6.1 Research Results: Demographic Profile of Respondents

Table 1 shows the participants' representation. The respondents were asked to report their demographic information, including age, gender, study year and allowance. Most of the respondents were presented by 73.9% between the ages of 18-24 years. This was followed by those who were presented by 13% of the total sample between the ages of 25.29 years. This was followed by those presented by 8.4% of the total sample between the ages of 30-35 years. The smallest group was those over 36 years of age and 4.6% of the total sample was presented. Table 1 also shows the respondents' gender. Most respondents were male, representing 48.3% of the total number of the study. Followed by 44.1% female respondents and 7.7% of the total number of the study was represented by the minority of respondents who preferred not to state their gender. Table 1 also illustrates respondents' year of study. Most respondents were first-year students, representing 33.7% of the study's total number. Followed by 2-year students, representing 29.9%, followed by 3-year students, representing 22.2%, followed by postgraduate students representing 14.2%, of the total number of study. In addition, Table 1 shows respondents' allowance. Most of the respondent's allowance ranged from 100-1000 and represented by 47.1% of the total sample. Followed by those 1000-2000 allowances, representing 30.7%, followed by 2000-3000 allowances and represented by 9.6%, followed by 3000-4000 allowances and represented by 5%, followed by 4000-5000 allowances, representing 3.4%, and finally, those above 5000 allowances are representing 4.2% of the total sample.

Table 1. Sample demographic characteristics

Characteristics	**Frequency**	**%**
Age		
18-24 years	193	73.9
25-29 years	34	13
30-35 years	22	8.4
Above 36 years	12	4.6
18-24 years	193	73.9
Total	261	100
Gender		
Male	126	48.3
Female	115	44.1
Prefer not to say	20	7.7
Total	261	100.0
Year of study		
1 year	88	33.7
2 year	78	29.9
3 year	58	22.2
Postgrad	37	14.2

Total	261	100.0
Allowance		
100-1000	123	47.1
1000-2000	80	30.7
2000-3000	25	9.6
3000-4000	13	5.0
4000-5000	9	3.4
Above 5000	11	4.2
Total	261	100.0

6.2 Scale of Accuracy Analysis

The scale accuracy analysis is presented in Table 2 followed by a discussion of the measurement scale reliability and validity.

Table 2. Scale accuracy analysis

Research constructs		**Descriptive Statistics**				**Cronbach's test**		**CR**	**AVE**	**Factor loadings**
		Mean Value		**Standard Deviation**		**Item-total**	**α value**			
PFS	PFS1	3.480	3.660	1.302	1.245	0.644	0.919	0.870	0.570	0.638
	PFS2	3.690		1.257		0.690				0.683
	PFS3	3.670		1.220		0.780				0.794
	PFS4	3.730		1.267		0.788				0.818
	PFS5	3.740		1.236		0.753				0.810
PD	PD1	3.550		1.153		0.640	0.890	0.790	0.550	0.686
	PD2	3.630		1.215		0.687				0.743
	PD3	3.543		1.344		0.689				0.801
OR	OR1	3.420	3.652	1.263	1.198	0.512	0.905	0.840	0.510	0.571
	OR2	3.570		1.201		0.737				0.758
	OR3	3.570		1.198		0.708				0.722
	OR4	3.630		1.196		0.718				0.729
	0R5	3.640		1.156		0.755				0.766
EI	EI1	3.570	3.638	1.233	1.202	0.611	0.848	0.740	0.420	0.675
	EI2	3.590		1.213		0.595				0.620
	EI3	3.570		1.135		0.565				0.612
	EI4	3.570		1.233		0.611				0.675

Note: PFS=Perceived Family Support; PD=Perceived desirability; OR= Opportunity recognition; EI= Entrepreneurial inclination; SD= Standard Deviation; CR= Composite Reliability; AVE= Average Variance Extracted

6.3 Reliability

According to Cortina (1993), if Cronbach's alpha is 0.70 or higher, the reliability of a measure is supported. Table 2 illustrates the results ranged from the lowest Cronbach alpha of 0.848 to the highest of 0.919. Cronbach's alpha scores showed strong internal reliability in each construct (Tak, 2012). Cronbach's construct alpha values, therefore, exceeded the recommended 0.70 thus meeting the required threshold and showing that the constructs used to measure variables are very reliable for all variables.

The loading of each item on their particular construct is shown in table 2 above. For the research constructs, the lowest value for each respective item load is 0,551. The recommended value of 0.5 (Anderson & Gerbing 1988) was therefore exceeded by all individual item loadings. This indicates that all measuring instruments are acceptable and reliable as all items converged well and with more than 50% of the variance of each item shared with their respective construct (Fraering & Minor 2006).

The formulae proposed by Fornell and Lacker (1981, p.22) were also used to calculate composite reliability (CR) and average variance extracted (AVE) for each construct i.e.

$CR\eta = (\Sigma\lambda yi)2/[(\Sigma\lambda yi)2+(\Sigma\varepsilon i)]$

Where

$CR\eta$ = Composite reliability, $(\Sigma\lambda yi)$ 2= Square of the summation of the factor loadings; $(\Sigma\varepsilon i)$= Summation of error variances.

$V\eta=\Sigma\lambda yi2/ (\Sigma\lambda yi2+\Sigma\varepsilon i)$

Where

$V\eta$= Average Variance Extracted (AVE); $\Sigma\lambda yi2$= Summation of the squared of factor loadings; $\Sigma\varepsilon i$= Summation of error variances".

As shown in Table 2 results, the lowest composite reliability (CR) value of 0.740 is well above the recommended value of 0.6 (Hulland, 1999), whereas the lowest obtained average extracted variance (AVE) value of 0.420 is also above the recommended value of 0.4 (Anderson & Gerbing, 1988). This indicates the achievement of convergent validity, and this further confirms the excellent internal consistency and reliability of the measuring instruments used. "As such, a sufficient level of discriminating validity was revealed by all pairs of buildings (see Table 2). These results have generally provided evidence of acceptable levels of reliability of the research scale" (Chinomona & Chinomona, 2013, p.20; Chinomona & Mofokeng, 2016).

7. Discriminant Validity

The matrix of inter-construction correlation is used to evaluate the validity, specifically discriminating validity of measuring instruments. Constructs correlations were assessed to see if they were below 1. The higher the variable correlation, the lower the variable validity. To indicate discriminating validity, the inter-construct values must be below 0.6 and in some cases below 0.85. The highest correlation value was 0.673, according to Table 3, with the lowest correlation value being 0.499. These correlation values are below 0.85 and it can, therefore, be concluded that there is discriminant validity between all the constructs (Morar et al., 2015).

Table 3. Correlation Matrix

	PFS	**PD**	**OR**	**EI**
PFS	**1**	-	-	-
PD	0.547**	**1**	-	-
OR	0.517**	0.654**	**1**	-
EI	0.499**	0.576**	0.673**	**1**

**. Correlation is significant at the 0.01 level (2-tailed).

Note: PFS=Perceived Family Support; PD=Perceived desirability; OR= Opportunity recognition; EI= Entrepreneurial inclination

8. Measurement Model Evaluation

A confirmatory model development strategy was followed in order to confirm both the dimensional structure of the constructs used in this research and the level of internal consistency between the respective indicators. It was attained precisely using the technique of maximum probability extrapolation (MLE) that a measurement model was specified. Estimation of the initial model was extrapolated to CMIN/DF=2.464 (< 3.0); p.0.01. It is imperative to note that due to the sensitivity of the index to large sample sizes and many indicators, researchers ignore the significant chi-square value (Malhotra, 2010). To overcome this limitation, Byrne (2010,p.77) suggests that reporting on multiple indices that are not based on central distribution is a more “pragmatic approach.” Consequently, the following indexes showed adequate fit as follows: CMIN / DF 1.711, CFI 0.931, GFI 0.918, NFI 0.927, TLI 0.912 and RMSEA 0.052.

9. Structural Model Assessment and Hypothesis Testing

Hypotheses have been tested in this study using the method of Structural Equation Modeling (SEM). SEM is a statistical procedure to estimate the relationship between the constructs in a proposed model (in this case Figure 1), according to Bagozzi and Yi (2012). However, before testing the relationship, it is necessary to perform another model fit analysis to verify whether the data collected fit the model proposed (Westland, 2015). When the structural model was tested, it was observed that all the statistics of the structural model fit were within the tolerable ranges: CFI=0.920, IFI=0.923; TLI=0.934; RMSEA=0.042. A good fit is usually considered to exist when NFI, GFI, and CFI were all above 0.9 (Chang & Chen, 2009). Figure 3 also depicts a model of a structure. An examination of a structural model aims to assess the strength and direction of relationships in a model between constructs (Lee, 2009). It should also be noted that the results of the individual hypothesis testing are reported in Table 4.

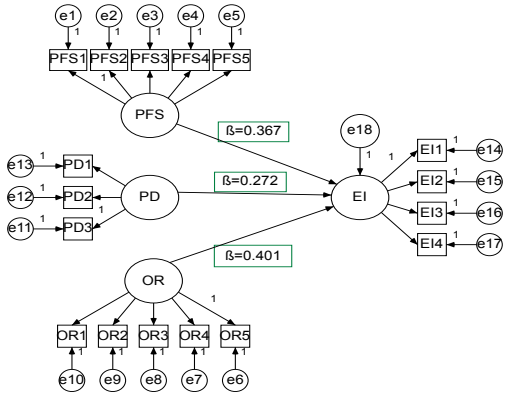

Figure 3. The Final Structural Model Of The Study

Note: PFS=Perceived Family Support; PD=Perceived desirability; OR= Opportunity recognition; EI= Entrepreneurial inclination

Table 4. The Summary of the Hypotheses Testing

Relationships	Hypothesis	Path Coefficient β	P-Value	Remarks
EI ← PFS	**H_1**	0.367	***	Supported
EI← PD	**H_2**	0.272	***	Supported
EI ← OR	**H_3**	0.401	***	Supported

Note PFS=Perceived Family Support; PD=Perceived desirability; OR= Opportunity recognition; EI= Entrepreneurial inclination.

10. The Outcome of Hypotheses Testing

In this study, path coefficient values, as well as p-values for the structural model, were used to determine the testing of the hypotheses. In the model, the construct relationships suggested in this study generate the path coefficients. Hypotheses are examined on the basis of these coefficients.

10.1. Outcome of Testing Hypothesis 1

Hypothesis 1 states that "Perceived family support has a positive and a significant effect on entrepreneurial inclination among students". Based on the results of the final model testing, the relationship between perceived family support and entrepreneurial inclination shows a $\beta = 0.367$ at p-value < 0.01. This evidence demonstrates that hypothesis 1 is supported. Hence, it can be noted that if students are to have family support then they will be inclined to start new entrepreneurial ventures. It is also worth to mention that these findings reinforce the results obtained in the studies of Sher, Adil, Mushtag, Ali, and Hussain (2017); Shamsudin, Al Mamun, Nawi, Nasir, and Zakaria (2017) who established that perceived family support has an influence on entrepreneurial inclination.

10.2 Outcome of Testing Hypothesis 2

Hypothesis 2 asserts that **"**perceived desirability has a positive and a significant effect on entrepreneurial inclination among students". The final structural model presents the relationship between perceived desirability and entrepreneurial inclination results in a coefficient $\beta = 0.272$ at p-value < 0.01. Thus hypothesis 2 is supported. These results mean that if students have the desire to engage in entrepreneurship then there are inclined in starting to be engaged in entrepreneurial activities. It is also essential to mention that these findings corroborate the results obtained in the works of (Afolabi, Ola-Olorun, Abereijo & Uchegbu, 2016) who elucidated that perceived desirability influence entrepreneurial inclination.

10.3 Outcome of Testing Hypothesis 3

Hypothesis 3 states that "opportunity recognition has a positive and significant effect on entrepreneurial inclination among students". Based on the results of the final model testing, the relationship between opportunity recognition and entrepreneurial inclination shows a $\beta = 0.401$ at p-value < 0.01. This evidence demonstrates that hypothesis 3 is supported. In addition, these results imply that students who recognize opportunities in entrepreneurship are inclined in starting to be involved in entrepreneurial activities. The results obtained in this study are also in accord with Camelo-Ordaz et al (2016) who examined the influence of gender on entrepreneurial inclination. Their study revealed that opportunity recognition has an effect on entrepreneurship inclination.

11. Managerial Implications

The present study offers implications for academics. For example, research findings show that perceived family support and entrepreneurial inclination have a strong influence on each other, as indicated by a 0.367 path coefficient. This finding, therefore, enhances their understanding of the relationship between perceived family support and entrepreneurial inclination for academics in the field of entrepreneurship and small business management, as this is a useful contribution to the existing literature on these two variables.

Moreover, this study provides that the implications of these findings can benefit students. For example, given the robust relationship between opportunity recognition and entrepreneurial inclination, as indicated by a path coefficient of 0.401, South African students should be careful or alert to take advantage of any opportunities that come along. Taking advantage, for example, of government funding that supports business ventures like SMEs. Obtaining this funding will equip them to be financially stable in order to improve their entrepreneurial ventures' business performance across different sectors of the South African economy.

12. Limitations and Future Research Suggestions

The findings from this examination may not be generalizable to students at other South African higher learning institutions, given the relatively small student sample used and the key focus of the inquiry on a solitary university. Therefore, future study should include students from other organizations to increase the representativeness of the sample. Furthermore, concentrating on university students limits the generalizability of findings as they do not reflect to the entire population of prospective entrepreneurs, and consequently, distinct students should be included in future inquiries, for instance secondary schools and other training centers. In conclusion, the examination's quantitative character may have resulted to disregard for more enlightening and extravagant data that a qualitative methodology could have produced if it had been included in the inquiry. Future examinations may, as needed, use a mixed-method method to explore indistinguishable points from the present examination to enhance the expansiveness of the examination outcomes.

13. Conclusion

The purpose of this study was to examine the influence of three factors, namely perceived family support, perceived desirability, and opportunity recognition on entrepreneurial inclination among students in South African. The study shows that perceived family support, perceived desirability, and opportunity recognition are positive predictors of entrepreneurial inclination among students. On the nexus between opportunity recognition and entrepreneurial inclination, a positive and significant robust relationship was found. All postulated hypotheses are supported. The managerial implications of the findings have been discussed. This study, above and beyond, contributes new knowledge to the African setting's existing body of entrepreneurship and small business management literature – a research context that most academics neglect.

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Appendix: Measurement Instruments

Perceived Family Support

PFS1: My family members will approve of my actions.

PFS2: My family members will encourage me to start my business.

PFS3: If necessary, my family members will loan me money to help me start my own business

PFS4: If necessary, my family members will provide me materials and equipment to help me start myown business.

PFS5: My family members will give me the advice to start my own business.

Perceived Desirability

PD1: I would love starting my own business.

PD2: I would be enthusiastic if I started my own business.

PD3: The idea of starting my own business is attractive to me.

Opportunity Recognition

OR1: I am always alert to business opportunities.

OR2: I research potential markets to identify business opportunities.

OR3: I search systematically for business opportunities.

OR4: I look for information about new ideas on products or services.

OR5: I regularly scan the environment for business opportunities.

Entrepreneurial Inclination

EI1: I seriously consider entrepreneurship as a highly desirable career option.

EI2: I have been planning to open a new venture

EI3: I would like someday to start my own business.

EI4: I could easily pursue a career involving self-employment.

Assessment of Training needs of Women in Irrigation Farming in the North West Province, South Africa

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Abstract: The study assessed the training needs of women in irrigation schemes in the North West Province. Primarily data were collected from 83 women selected using simple random sampling. A list of 23 competencies categorized into Pre and Post Planting, Irrigation management and Marketing was prepared. Descriptive statistics such as frequency distribution, percentages, the mean and standard deviation were employed. Training on the appropriate application of herbicides and fungicides along with selecting appropriate planting methods for various crops (81%) were the most prominent and important needs under pre- and post-planting. The results revealed that 74% of the respondents suggest training on recommendation suitable profile and water conservation measures for specific farmland as the most important need under irrigation management. With regard to marketing, it was revealed that training needs on knowledge of marketing contracts emerged the most important with 81%. The linear multiple regression results showed that the independent variables were significantly related to the F value of 39.802, $P \leq 0.05$. The study concludes that extension agencies and agents should design regular training programmes for women farmers in the area of deficiencies identified and strengthen water user associations such that their problems could be addressed.

Keywords: competency analysis; education; irrigation farming; need assessment; training needs

JEL Classification: Q1; Q15

1. Introduction

According to Njoko and Mudhara (2017); Bacha *et al*., (2011); Van Averbeke *et al*., (2011), smallholder irrigation is an important rural development factor, creating employment opportunities, generating income and enhancing food security in Africa in general, and in South Africa (SA) in particular. On the other hand, the agriculture sector, being the largest water user, is under pressure to release water to other sectors (Kanyoka *et al*., 2008). The growing water scarcity continues to put

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pressure on farmers to use water more efficiently. A growing area of interest in SA is that of finding balanced and effective resource management strategies for allocating water among the key sectors (Speelman, 2009; Yokwe, 2009).

Women contribution in many developing countries economy has often been not considered and undervalued (Yikeni and Oguntade, 2012). Most emerging countries have a larger percentage of women who are contributing more in the agricultural sector but recent confirmations suggest the productivity is pressurized by lack of relevant skills training (Collet and Gale 2009). Women are faced with a serious challenge in accessing training and education which contributed to high illiteracy level. Adesoji (2006) indicated that for any farming enterprise to be successful, adequate skills and knowledge from the farmers is essential. The space between how a particular task is being performed and how it should be undertaken emphasizes the necessity for training.

Human advancement and improved performance in any given situation require training. It delivers a logical improvement of knowledge and skills which in return assist trainees to perform effectively and efficiently in their assigned duties (Sajeev *et al*., 2012*).* Training is a skill's empowerment process on which acquiring of new skills or gathering of knowledge is intended to improve an individual's abilities towards work or tasks assigned to complete. Most researchers consider training as a systematic process aimed at conveying knowledge, skills and changing the attitude of people towards learning. Sahu *et al*., (2011) state that a well-planned training aimed at disseminating information on knowledge gap and training needs will help improve the capacity of farmers. Ghuman *et al*., (2010) classified training into different types, business function training, technical skill training, performance-management training, interpersonal skills, problem-solving/decision-making training, mandatory training, and the personal training which enables an individual to manage life in a better manner.

Ferreira and Abbad (2013) indicated that training needs assessment is a process that has a strategic role because it provides clear guidelines as to which professional skill deficiencies must be remedied and what the profile of future trainees should be. Training needs emanates from underdeveloped skills, insufficient knowledge or inappropriate work attitudes. Dahiya and Jha (2011) stated that a needs assessment should be designed to identify and prioritize needs, while a needs analysis should break and identify needs into its component parts and determine solution requirements. Gould *et al*., (2004) consider training needs analysis as the initial step in a cyclical process, which contributes to the overall training and educational strategy of staff in an organization or a professional group. The cycle commences with a systematic consultation to identify the learning needs of the population considered, followed by course planning, delivery, and evaluation.

1.1. Training Needs

A training need is a shortage of skills or abilities, which could be reduced or eliminated by means of training and development. Training needs hinder employees in the fulfillment of their job responsibilities or prevent an organization from achieving its objectives. They may be caused by lack of skills, knowledge or understanding, or arise from a change in the workplace.

1.2. Education

Education is a social foundation and the process of accomplishing knowledge and skills that people are projected to have in any society. It develops the critical thought of an individual and promotes the process of learning accepted facts. Education inspires one to be competent and encourages intellectual inquisitiveness which will lead to lifetime learning (Türkkahraman, 2012).

Rousan (2007) stated that the role of women in agricultural activities grant them a vast opportunity of accessing proper training and education but the current status of efforts that are projected into making sure that the programmes are addressing challenges faced by women farmers are far from being recognized. This implies that implementers must properly understand the needs of farmers in order to practice an efficacious training exercise. Regardless of the fact that several studies (Mech, *et al.,*2010, Yikeni & Oguntade 2012, Sahu, *et al*., 2011) have been conducted on training needs of women farmers in the agricultural sector, this study found it necessary to investigate the training needs of women in irrigation farming in the North West province, South Africa. Based on the foregoing, the study was set to achieve these objectives.

2. Purpose and Objectives

The main objective of the study was to analyze training needs among women involved in irrigation farming in the North West Province. The specific objectives were to;

1. Determine the demographic characteristics of women in irrigation schemes;
2. Identify the source of information for women in irrigation farming;
3. Discern the training needs of women based on the 23 competencies related to irrigation farming;
4. Examine the socio-economic characteristics of the women and their relationship with the training needs.

3. Materials and Methods

The study was carried out in the North West Province, South Africa. The study population included all women involved in irrigation farming (120) in the province. The sites of irrigation schemes include Taung irrigation scheme which is situated in 27° 34' South and 24° 44' East. The scheme is divided into five cooperatives as follows: Bosele; Ipelegeng; Reaitlhoma; Rethuseng; and Tshidiso (Acha, 2014). The second irrigation scheme is situated in Dinokana Village in Ramotshere Moiloa Local Municipality, Its GPS coordinates are 25° 17' South and 26° 02' East (Tekana & Oladele, 2014). A simple random sampling technique was used to select respondents. A sample of 83 women farmers was randomly selected to obtain a representative sample from female farmers on the irrigation schemes. A structured questionnaire with open and close-ended items was used consisting of farmer's personal characteristics and 23 farming tasks categorized into Pre and Post Planting, Irrigation management and Marketing. To determine the validity of the questionnaire, the researcher used a panel of experts in agricultural extension; the questionnaire was face validated by a panel of agricultural extension experts and researchers. Reliability of the instrument was improved through a number of ways. Firstly, a pilot test was performed on a selected group of women farmers in the Taung Irrigation Scheme. Secondly, undergraduate students who were assisting with data collection were given training on the questionnaire before the data collection process. In order to declare the dependability of the questionnaire, a split-half technique was used to determine r^2 (0.85) reliability coefficient. Permission to conduct interviews with participants in the study area was requested and obtained from community leaders and traditional heads.

The farmers response was calculated from the rating scale of very important (VI) (3), important (I) (2) and (NI) (1) with the cut-off point of 2. The cut-off point implies that an indicator above 2 indicates that the task is very important and WS rating will be in between the range of 2-3. The WS rating at 2 implies important while tasks that are not important are below 2 and WS rating will be in between the range of 1-2.

Analytical Model

$$\text{Weight score (WS)} = \frac{(\text{No of V1} \times 3) + (\text{No of I} \times 2) + (\text{No of NI} \times 1)}{\text{Total no. of VI} + \text{I} + \text{NI}} \text{ x } 100$$

3.1. Linear Multiple Regression

This regression model was used to segregate factors determining women farmers' training needs with specific reference to the effect of socio-economic characteristics and types of irrigation on the irrigation scheme. The F test was used to test the significance of the linear regression.

Model specifications for training needs:

Training needs (Y) = f (ß $_0$ Y_0 + ß$_1$ Age+ ß$_2$ Marital status + ß$_3$ Number of dependents + ß$_4$ Number of households + ß$_5$ Level of educational + ß$_6$ Tenure status + ß$_7$ Farm size + ß$_8$ Member of farmers' group + ß$_9$ Contact with Extension Services + ß$_{10}$ Number of years in farming+ ß$_{11}$ Duration of being part of the irrigation scheme + ß$_{12}$ Number of workers in the irrigation scheme + ß$_{13}$ Central Pivots irrigation + ß$_{14}$ Flood irrigation system + ß$_{15}$ Sprinkler irrigation + ß$_{16}$ Micro Irrigation + ß$_{17}$ Drip irrigation + ß$_{18}$ other irrigation.

$$Y = f(\beta_0 Y_0) + \beta 1 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1$$

4. Results and Discussions

The results in table 1 revealed that a greater proportion of farmers in the schemes were married (42.2%) while 31.3% were single and 26.5% widows. The results showed that 34.9% of respondents interviewed had a primary school education, 24.1% had a high school education, and 10.8% had no formal schooling while only 2.4% had college and tertiary education. The low level of education could have a negative impact on decision-making in managing irrigation schemes. These results imply that there is a need for agricultural extension agents to address all the challenges of women farmers as their educational needs are obvious, therefore, there is a need to devise educational strategies to enhance their contribution to agriculture (Ndifon *et al*., 2012). Education is one of the key catalysts towards improving farm production because of the rapid changes in technology and the economy (Montenegro & Patrinos, 2014). According to Action Aid (2015), not being exposed to education and training has an impact on women farmers as they are not well represented in most state-led efforts to improve land and water management, rural infrastructure, access to markets and agricultural research.

About 88% of the farmers are not involved in non-farming activities mainly because the existing schemes and farming have always been their only work and a source of income. This may be because their educational background limits them from exploring and getting involved in other activities besides farming. Oya (2010) argues that in Mozambique and Tanzania, husbands prevent women from engaging in off-farm paying work because they are likely to come in contact with other men. Majority of the women in Sri Lanka earn their living through farming, as women are not allowed to perform any off-farm jobs (Molen, 2001).

Table 1 shows that 96.4% of farmers had contact with extension services while 3.6% indicated they did not have any contact with extension services. Of those who had contact with extension officers, 56.6% indicated occasional contact while 32.5% indicated regular contact. Extension services are important in terms of

boosting agricultural productivity and also as a form of disseminating information to farmers. The results are in line with the findings of Njuki *et al*. (2013) who found that in Ghana, women have access to extension services, and the majority of them are satisfied with the services they receive. In Bangladesh, extension services are generally directed towards male farmers (Njuki *et al*., 2013). Women are less likely to access resources and may, therefore, be by-passed by extension service providers (Meinzen-Dick *et al.*, 2010).

Table 1. Personal Characteristic of Respondents

Marital status	Frequency (%)
Single	26(31.3)
Married	35(42.1)
Widowed	22(26.5)
Level of education	
Primary School	29(34.9)
Secondary school	21(25.3)
High School	20(24.1)
College	2(2.4)
University	2(2.4)
Non Formal Education	9(10.8)
Engagement in non-farming activities	
No	73(88)
Yes	10(12)
Contact with extension agent	
No	3(3.6)
Yes	80(96.4)

Table 2 shows that about 66.3% of farmers indicated that they receive information through extension officers, 59% receive information through the radio while 56.6% do so through community meetings. The newspaper is not a common source of information for farmers. The findings are in line with those of Isaya *et al*., (2016) who found that in Hai and Kilosa districts of Kilimanjaro and Morogoro regions, majority of women farmers have reported high usage of radio and extension workers as their primary sources of information. The results are contrary to the findings of Rio (2013) who found that women farmers do not prefer radio as a source of information because of some programmes which are not accessible or were too general for them and maybe broadcasted when they are busy working.

Table 2. Showing the Source Of Information for Women in Irrigation Farming

Sources of information		
	Yes	No
Television	32(38)	51(62)
Radio	49(59)	34(41)
Newspaper	1(1.2)	82(98.8)
Cell phones	42(50.6)	41(49.4)
Internet	1(1.2)	82(98.8)
Community meetings	47(56.6)	36(43.4)
Extension officers	55(66.3)	28(33.7)

4.1. Training needs of farmers

Table 3 shows the list of 23 farming activities for women involved in irrigation farming developed from the operations and activities carried on existing field by farmers. The farming activities are divided into three categories namely; Pre- and Post-Planting (10), Irrigation (4) and Marketing (9).

4.2. Importance of Pre- and Post-Planting Tasks

Training on the appropriate application of herbicides and fungicides along with selecting appropriate planting methods for various crops (81%) were the most prominent and important needs under pre- and post-planting tasks followed by calibrating of planters and seeders for various crops and evaluation of soil profile in farming (78%). The results overwhelmingly revealed high importance attached to competency and training needs for women in irrigation schemes. The entire mean for the level of importance of training needs was above cut-off point 2 in pre- and post-planting tasks. The percentage distribution of the WS and ranking of the tasks revealed that more training is required to meet the training needs of respondents. Beaman *et al*., (2013) argue that even if women are given chemicals such as fertilizers, fungicides, and herbicides for free, it may not improve farm returns if they do not have knowledge on how to use or apply them.

4.3. Importance of Irrigation Management Tasks

The results revealed that 74% of respondents suggest training on recommendation suitable profile and water conservation measures for specific farmland is the most important need, followed by evaluation of farming land for soil and water conservation (68%) and knowledge on the amount of water to use (58%). The entire mean for the level of importance of training needs was above cut-off point 2 in irrigation management tasks. The results are in line with the findings of Adekunle *et al*., (2015) who highlighted that in Kwara State, Nigeria, most women farmers involved in irrigation farming might not know their responsibilities in

terms of water distribution and, therefore, rely on cooperatives more than water user associations.

4.4. Importance of Marketing Tasks

With regard to marketing, it was revealed that training needs on knowledge of marketing contracts emerged the most important. 81 percent of the respondents expressed interest in it, followed by farm record-keeping (68%) and price determination for your produce and financial management (58%). The actual means identified revealed that there was high importance for needs to be devoted to the competency and training needs for women in irrigation schemes since all the tasks were above the cut-off point of 2. According to Rekha and Rojas (2008), most women in developing countries are keenly involved in crop production and marketing, constraints such as lack of marketing information and technical information are affecting their development in agricultural production. Nichols and Hilmi (2009) argue that it is important for farmers to know how to conduct marketing research, as this will enable them to investigate what consumers' want, where they are and what price they are willing to pay.

Table 3. Weighed Score and the Ranks of the Training Needs of Women in Irrigation Farming: Pre and Post-Planting, Irrigation Management and Marketing

Thematic area	North West Irrigation Schemes (n= 83)				
	VI	I	NI	WS	Rank
Pre- and post-planting					
Soil preparation for ploughing	47	31	5	2.50	9
Determining inter antra row spacing	47	30	6	2.49	10
Determining seed depth	53	25	5	2.58	8
Selecting appropriate planting methods for various crops	81	2	0	2.97	1
Knowledge of crop rotation	58	20	5	2.63	7
Calculating the amount of fertilizer to apply for various crops	57	24	2	2.66	6
Appropriate application of herbicides and fungicides	81	2	0	2.97	
Calibrating planters and seeders for various crops	78	4	1	2.97	
Planning and carrying out harvesting appropriately for various crops	68	10	5	2.76	5
Evaluating soil profile in farming	78	4	1	2.93	4
Irrigation management					
Evaluating farming land for soil and water conservation	68	10	5	2.76	2
Recommendation suitable profile and water conservation measures for specific farmland	74	4	5	2.83	1
Irrigation scheduling and frequency	47	31	5	2.50	4
Knowledge of the amount of water to use	58	20	5	2.64	3

Marketing					
Knowledge of the market for your produce	57	23	2	2.64	6
Price determination for your produce	58	20	5	2.64	
Knowledge of reading and interpreting marketing information	57	21	5	2.63	
Knowledge of marketing contracts	81	2	0	2.98	1
Value adding	57	23	2	2.64	
Farm record-keeping	68	10	5	2.76	2
Service provider for storage facilities	47	31	5	2.51	5
Financial management	58	20	5	2.64	4
Packaging	60	23	0	2.72	3

VI= Very Important, I= Important, NI= Not Important, WS= Weighed Score

4.5. Linear Multiple Regression Analysis Showing the Relationship Between Socio-Economic Characteristics and Training Needs

Table 4 displays the outcomes of the linear multiple regressions used to determine the effect of the independent variables on the training needs status of women involved in irrigation farming. The independent variables were significantly related to the F value of 39.802, $P \leq 0$ .05. Seven out of the eighteen explanatory variables were significant while eleven variables were insignificant. The significant variables include the number of households ($T = 1.720$, $P \leq 0.090$), use of central pivots irrigation type ($T = 2.290$, $P \leq 0.001$), usage of flood irrigation system ($T = 3.097$, $P \leq 0.003$), using flood irrigation system ($T = 3.097$, $P \leq 0.003$), use of drip irrigation type ($T = 2.251$, $P \leq 0.028$) and the use of other irrigation types ($T = 3.845$, $P \leq 0.000$). These findings imply that the higher the number of households, use of central pivots irrigation type, use of flood irrigation system, use of sprinkler irrigation type, use of micro-irrigation type, use of drip irrigation type and use of other irrigation types, the higher the training needs among women in irrigation farming. However, age, marital status, number of dependents, level of educational, tenure status, farm size, member of farmers' group, contact with extension services, number of years in farming, number of years in being part of the irrigation scheme and number of workers in the irrigation scheme did not have a significant relationship with competence of women involved in irrigation farming.

Table 4 Linear Multiple Analysis of the Competence Level of Women Involved In Irrigation Schemes

Parameters	B	Stand Err	Beta	T	SIG
Constant	15.556	4.827		3.223	0.002
Age	0.047	0.032	0.064	1.451	0.152
Marital status	-1.353	0.523	-0.116	-2.588	.012**
Number of dependents	-0.476	0.191	-0.121	-2.497	.015**
Number of members in household	0.209	0.122	0.071	1.72	.090*
Level of education	-0.042	0.226	-0.007	-0.188	0.852
Tenure status	-0.414	0.334	-0.048	-1.241	0.219
Farm size	-0.022	0.014	-0.064	-1.538	0.129
Member of farmers' group	-2.162	0.944	-0.092	-2.29	.025**
Contact with extension services	-1.248	1.969	-0.026	-0.634	0.529
Number of years in farming	-0.431	2.974	-0.482	-0.145	0.885
Number of years spent in the irrigation scheme	0.415	2.972	0.465	0.14	0.889
Number of workers in the irrigation scheme	0.008	0.03	0.01	0.245	0.805
Use of central pivots irrigation type	2.963	0.871	0.19	3.401	.001**
Use of flood irrigation system	3.111	1.005	0.195	3.097	.003**
Use of sprinkler irrigation type	2.836	1.149	0.164	2.468	.016**
Use of micro irrigation type	2.773	1.112	..168	2.492	.015**
Use of drip irrigation type	2.775	1.233	0.174	2.251	.028**
Use of other irrigation types (canal, dragline or furrow)	3.843	0.999	0.246	3.845	.000***
R	.958[a]				
R Square	0.918				
F	39.802				
Sig	.000[b]				
P	0				

***1% significance ** 5% significance *10 % significance

5. Conclusion and Recommendations

The study examined the training needs of women in irrigation farming based on the identified tasks through the application of Weight Score (WS) and linear multiple regression analyzing the relationship between dependent and independent variables. The implication of the results indicates more work needs to be done to meet the training needs of women in irrigation farming. Based on the finding of the study, it can be concluded that women farmers in the irrigation schemes were

mostly illiterate which is expected to be a critical factor affecting training needs. This implies that the majority of the respondents was or has never been involved sufficiently in the agricultural training programmes in the study area.

It is, therefore, recommended that the identified training needs of respondents should be the area of focus and priority of the extension agents and agencies in the study area and also, that it is of great importance to inform women farmers adequately about training programmes especially those who are still struggling with the traditional ways of receiving information and that there should be sensible efforts to arrange adult education programmes for women farmers since most of them have not received any form of formal education.

It is also recommended that the concerned stakeholders and policymakers should focus on the specific most important needs as identified in the study and the parameters with significant indication to the competency level of the respondents should be considered when planning and implementing new training programmes for women farmers in the study area, and in similar irrigation schemes in South Africa at large.

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Impact of Open Market Operations and Money Supply on Inflation in Nigeria

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Abstract: The results of monetary policy outcomes suggest that Nigeria does not often enjoy ideal conditions to adopting a monetary policy regime aimed primarily at stabilizing prices due to increasing internal debt resulting from sales of government securities. This has also push-up the volume of money supplied into her economy. This has made the economy particularly exposed to price and quantity-type external shocks, which renders price stabilization all the more complicated. This study examines the impact of open market operations and money supply on inflation rate in Nigeria within the period of 1981-2016. Using the vector error correction model approach, the result revealed that Treasury bill, government bonds, and money supply have positive and significant relationship with inflation rate in Nigeria. However, total value of money market instruments, income per capita and interest rate had negative and significant impact on inflation rate in Nigeria. The study concluded that open market operations while controlling the supply of money had significantly impacted on price stability in the long-run in the Nigerian economy. The study suggests that there is need for an increase use in the open market operations as a tool for achieving stability of price in the country.

Keywords: Treasury bill; government bonds; interest; income; inflation rate

JEL Classification: E31; E51; E52; O43

1. Introduction

The goals of indirect monetary policy in the developing countries like Nigeria are usually to contribute to the stability of overall output growth, achieve and maintain low unemployment, and maintain predictable exchange rates with other currencies. Apart from the stated objectives, the policies are adopted to stabilize prices, control money supply and monitor credit creation by financial institution. In Nigeria, the

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outcomes of the indirect monetary tools suggest that Nigeria does not often enjoy ideal conditions to adopting a monetary policy regime aimed primarily at achieving the objectives. One of the reasons is that the Nigerian macroeconomics environment often faces a very volatile macroeconomic environment and a more acute inflation-output trade-off than other emerging market economies which have embraced price stabilization programs (Alimi and Alese, 2017). Moreover, it could often be observed that the apex bank adopted different mix of indirect tools to stabilize price and control the supply of money in circulation. The use of these policy instruments has exposed the country to price and quantity-type shocks, which renders price stabilization to be more complicated. Thus, given the above, the problems associated with the use of indirect monetary policy tools owing to its objective of maintaining stability are inflation and money supply.

As emphasized in Favero and Giavazzi (2003), large and variable term premia and credit risks reinforce the possibility that a vicious circle might arise, making the fiscal constraint on monetary policy more stringent. Given these conditions, it is reasonable to expect that aiming for and adopting stable prices in the long run in Nigeria may not lead to successful outcomes. If the apex bank is unable to achieve her aims to stabilise price, it does implies that the credibility of the institution is at stake. Sims (2003) emphasized that when conditions are such that an inflation targeting commitment has a high probability of proving unsustainable, likewise, the necessary fiscal backup to monetary policy is not available, embracing explicit inflation targets can be unproductive or lead to an initial success that only amplifies a later failure.

Furthermore, one of the requirements for joining the Economic Community of West African States (ECOWAS) common currency zone is a single-digit rate of inflation. Unfortunately, inflation has persistently remained above a single-digit mark in Nigeria. The Central Bank of Nigeria has made inflation fighting one of the key objectives of the monetary policy framework. Despite the apex bank's position on inflation, it has in many cases failed to attain the end of year targeted rate of inflation. The question begging to be asked then is "why has the Nigerian inflation persistently remained above the policy target?" This study sheds light on this question by providing robust evidence on the determinants of inflation in Nigeria from both the open market operations and total money supply into the economy. Thus, this study finds out the impact of open market operations and money supply on price instability in Nigeria. The study covers a period of 36 years; 1981-2016.

Other parts of the study are divided into four sections. The second section provides the review of previous studies while the methodology is discussed in section three. The fourth section presents results and discussion of findings, and the last section provides the concluding part.

2. Literature Review

Some of the major theories explaining the behaviour of inflation and its determinants include the quantity theory of money, Keynesian demand pull theory, the monetary theory put forward by Milton Friedman, also are the Cost push theory and the rational expectation theory by Lucas, McCallum, Sargeant and Hansen. All of these theories in their individual piece made attempt to uncover the peculiar nature of inflation, which has been seen to be a persistent general rise in the price of goods and services, based on the tenets of their schools of thought. Keynes (1946) and his cohorts in their support for the demand pull inflation theory, opine that inflation is majorly caused by increase in aggregate demand, which is composed of investment, government expenditure and consumption. They explain this, using the concept of the inflationary gap; the excess of aggregate demand over aggregate supply. Keynes submitted that the larger the gap between aggregate demand and aggregate supply, the more rapid inflation is and to reduce inflationary tendencies in any economy, entails initiating policies that reduce those components of total demand. The monetary theorists on the other hand, favoured money matters as key factor influencing the behaviour of inflation in any economy. In Milton Friedman's submission, only money matters, and monetary policy is potential in ensuring economic stabilization as against the fiscal policy, which is vehemently supported by the Demand Pull theory. According to the monetarists, money is the dominant but not elusive determinant of inflation in an economy.

Empirical studies conducted on the factor determinants of inflation in different countries, both developed and developing, including Nigeria are reviewed in this section. Komijani and Nazarian (2004) reviewed the pattern of velocity of money in Iran during the period 1968 to 1979. They pointed out that velocity displayed three general trends during the period. It was shown that velocity registered a decreasing trend from its initial amount of 5.7 in 1968 until 1979, which coincided with the Iraq war, during which it reached its lowest level of 1.47. The second period synchronized with the war era in which velocity maintained an almost linear trend of 1.47 to 1.42. The third period was the post-war era in which velocity experienced an upward trend, rising with a smooth slope of 1.48. They attributed the upward trend to technical efficiency of the payments system and steps taken by the country's capital market. Their study further indicated that the velocity of liquidity was unstable during the period.

Mehrotra and Slcik (2009) investigate the monetary determinants of inflation in four Central and Eastern European member states, namely Czech Republic, Hungary, Poland and Slovakia by using the McCallum rule for money supply. The deviation of actual money growth from the rule is included in the estimation of Phillips curves for the four economies by Bayesian model averaging. They find that money provides information about price developments over a horizon of ten

quarters ahead, albeit the estimates are in most cases rather imprecise. Moreover, the effect of excessive monetary growth on inflation is mixed. It is positive for Poland and Slovakia, but negative for the Czech Republic and Hungary. Nevertheless, these results suggest that money does provide information about future inflation and that a McCallum rule could potentially be used in the future as an additional indicator of the monetary policy stance once the precision of the estimation improves with more data available.

Leao (2005) attempted to provide an alternative explanation to the pro-cyclical behavior of velocity by using data over the period 1982 to 2003. He distinguished between expenditures related to durable consumption, export and investment goods on the one hand (DGEI), and expenditures related to non-durable goods and services (NDGS) on the other. The result showed that money involved in expenditures related to NDGS because agents usually synchronize their expenditures on the former category the moment that liquid capital has become available. Following this, he explained the pro-cyclical behaviour of velocity in terms of the increasing share of the DGEI in total expenditures during expansions and decreasing during downturns. The finding of Leao (2005) was further confirmed by Barros *et al*. (2007). They used a VAR model to analyze the determinants of the velocity of both M1 and M2 in the USA during the period 1964 to 2005 and found evidence in support of expenditure composition hypothesis. They showed that increases in the weight of investment and durable consumption in total expenditure raise the velocity of both narrow and broad money. As a result, they stressed that the more a central bank's interest decision responds to money growth, the more volatile economic growth will be. In other words, a monetary policy which puts emphasis on money growth is de-stabilising.

Akhtaruzzaman (2008) investigated the income velocity of money for Bangladesh using data for the period 1973 – 2007. Based on co-integration analysis, he found that the velocity for both M_1 and M_2 was negatively related to real GDP (growth) and financial development (demand deposit – time deposit ratio) reflecting the early stages of economic and financial development in the country; and that the two variables jointly account for about half of the variance of the speed of income velocity.

Using Libyan annual data for the period 1964 – 2010, Cevik and Teksoz (2013) adopted the cointegration and error correction models to investigate inflation dynamics. The study found inflation inertia to be a key determinant of consumer price inflation in Libya. The result also indicated that government spending, money supply growth, global inflation, exchange rate pass-through and imposition and subsequent removal of international sanctions played central roles in the Libyan inflation process. Kabundi (2012) employed single-equation error correction model based on the quantity theory of money to identify the main factors underlying

inflation in Uganda. The study showed that both external and domestic factors affects inflation in Uganda, amongst which are money growth, world food prices, domestic supply and demand effects in the agricultural sector, energy prices and inflation inertia.

For Nigerian studies, Odusanya and Atanda (2010) analyzed the dynamic and simultaneous inter-relationship between inflation and its determinants for the period 1970 and 2007. They adopted cointegration and error correction modeling to analyze the role of variables like GDP growth, broad money growth, fiscal deficit/GDP ratio, interest rate, import/GDP ratio, exchange rate and inflation inertia; in inflationary process in Nigeria. The data indicated that only GDP growth and inflation inertia were significant in explaining the inflationary process in Nigeria. The paper estimated 0.39 as the degree of inflation inertia. Furthermore, Imimole and Enoma (2011) examine the impact of exchange rate depreciation on inflation in Nigeria. Their study utilized Autoregressive Distributed Lag (ARDL) bounds test cointegration procedure and annual time series data for the period 1986 to 2008. Their result revealed that inflation inertia was 0.69; while exchange rate depreciation, money supply and real GDP were identified as the main determinants of inflation in Nigeria.

Olatunji *et al.* (2010) also look at the factors affecting inflation in Nigeria using cointegration and error correction modeling. The authors indicated that exports, imports, consumer price index for food, interest rate and exchange rate were important in explaining the inflationary process in Nigeria. Bayo (2011) investigated the determinants of inflation in Nigeria between 1981 and 2003 using the ordinary least square estimation procedure. The study indicated that fiscal deficits, money supply, interest and exchange rates significantly impacted on the rate of inflation in Nigeria. Omotosho and Doguwa (2012) indicated that periods of high inflation volatility were associated with periods of specific government policy changes, shocks to food prices and lack of coordination between monetary and fiscal policies. They added that the announcement of fuel price hikes, announcement of an upward review in the wages of public sector workers, food crises and exchange rate instability also led to major positive inflationary shocks in the economy.

In a study by Akinlo (2012) on financial development and income velocity in Nigeria; using co-integration and error correction mechanism, the result showed a positive relationship between velocity and income growth which suggests that Nigeria might possibly be at later stages of economic growth. However, exchange rate has a negative relationship with income velocity in the short run model. The opportunity cost variables namely interest rate and expected rate of inflation were not significant in the short run model, thus conclusive inference cannot be drawn from them. This positive effect of financial development variable (demand deposit-

time deposit ratio) possibly arises from the fact that financial innovation encourages the use of money substitutes or quasi-money that reduces the demand for money and, thus, brings the speed of velocity of money up. The author, therefore, concluded that any attempt by government or monetary authorities in the country to exercise greater command over resources by printing more money would precipitate inflationary pressure.

3. Model Specification and Estimation Strategy

3.1 Model Specification and Theoretical Expectation

This study adopts the model of Adam *et al.* (2010) and Akinlo (2012) to examine the impact of open market operation and money supply on inflation. Following the theoretical submission of the monetary theory of inflation, open market operations variables measured by the total value of money market instruments is incorporated into the model, which becomes:

$$p = f(ms, omo, y, i) \tag{1}$$

Where: p is price; ms represents money supply; omo is open market operation measured by money market instruments; y represents real income per capita; and i refers to the cost of holding cash and it represents interest.

Log-linearising equation (1), the model becomes a static long run model for monetary determinants of inflation in Nigeria. Equation (2) is the key reference model for the empirical section of the study.

$$\ln p_t = \alpha_0 + \alpha_1 \ln ms_t + \alpha_2 \ln omo_t + \alpha_3 \ln y_t + \alpha_4 \ln i_t + \mu_t \tag{2}$$

Where: p is price; ms represents money supply; omo is open market operation measured by money market instruments; y represents real income per capita; i is interest rate; t is time; α_0, α_{1-4} are parameters; μ is error term.

The study also considers individual money market instrument based on data availability. The two instruments considered are Treasury bills and government bonds. Equation (2) becomes:

$$\ln p_t = \beta_0 + \beta_1 \ln ms_t + \beta_2 \ln tr_t + \beta_3 \ln gb_t + \beta_4 \ln y_t + \beta_5 \ln i_t + \varepsilon_t \tag{3}$$

Where: p is price; ms represents money supply; tr is treasury bills; gb is government bonds; y represents real income per capita; i is interest rate; t is time; β_0, β_{1-4} are parameters; and ε is error term.

The study expects positive relationship between money supply and inflation rate. Specifically, an increase in money supply without corresponding increase in supply

of goods and services will leads to an increase in price. Similarly, economic theory postulates positive relationship between inflation and interest rate. The inflation rate is expected to be low when high volume of the government securities are sold by the government. The rate of inflation is expected to be negatively correlated with the level of real income, it is therefore expected that the coefficient on income be negative. An increase in real income leads to an increase in real money demand and via Equation (2 & 3) results in a fall in the price of non-tradables and given the price of tradables, the general price level falls. In this paper we use the real GDP as a proxy for real income.

3.2 Estimation Techniques and Procedures

Before estimating the model, it is necessary to examine the statistical characteristics of the variables included in the function in order to verify their stationarity. The test of stationary on the variables would be done using the Augmented Dickey-Fuller (ADF) test ((Dickey and Fuller, 1979) in order to detect the presence of the unit root in the series and to determine the order of integration of the variables.

The cointegration technique makes it possible to test the existence of a relationship of long term equilibrium relationship among non-stationary economic variables. The multivariable system cointegration test developed by Johansen (1988) was employed in this study. The technique used the maximum likelihood estimator to determine the coefficients, the coefficients, the number and the significance of the cointegration vectors in the series (Alimi, Alese, and Yinusa, 2015; Adesoye, Adelowokan and Alimi, 2018).

In order to capture the short-run deviations that might have occurred in estimating the long-run cointegrating equations, a dynamic vector error correction model (VECM) is formulated. The error correction term depicts the speed of adjustment to equilibrium once the equation is shocked. The study also conducted diagnostic tests such as serial correlation, normality, functional form and heteroskedasticity tests.

3.3 Data Requirements and Sources

This research work uses annual time series data for the period of 36 years (1981-2016). The study uses secondary data published by the Central Bank of Nigeria (CBN) statistical bulletin, volume 29, 2018, while real income per capita and inflation data were sourced from World Development Indicators (WDI), 2018.

Table 1. Descriptive Statistics

	TB	GB	OMO	MS	P	Y	I
Mean	695.1027	78.06283	3433.120	4172.187	19.60389	139491.7	19.60305
Median	291.7800	8.674248	323.1978	558.5490	12.55000	41953.29	12.54679
Maximum	3277.280	822.7009	41793.98	21607.68	72.84000	545672.8	72.83550
Minimum	5.782000	0.073000	11.70350	14.47100	5.380000	1918.740	5.382224
Std. Dev.	925.6598	170.2132	8747.403	6363.748	17.69075	177847.8	17.69043
Skewness	1.534101	3.012218	3.600548	1.450980	1.664644	1.125211	1.664533
Kurtosis	4.177938	12.25656	15.02705	3.742182	4.526998	2.812333	4.526585
Jarque-Bera	16.20210	182.9666	294.7586	13.45831	20.12382	7.649422	20.11972
Probability	0.000303	0.000000	0.000000	0.001196	0.000043	0.021825	0.000043
Observations	36	36	36	36	36	36	36

Source: Authors' computation (2018).

4. Data Analysis and Discussion

4.1. Descriptive Statistics

Table 1 presents the descriptive analysis of the time series properties of the variables included in the model. The descriptive statistics was carried out between open market operation, money supply and price stability in Nigeria from 1981 to 2016.

The table shows that the mean value of Treasury bill volume (TBV), government bonds (GB), total value of money market instruments (OMO), money supply (MS), inflation rate (P), real per capita income (Y) and interest rate (I) stood at ₦695.10 billion, ₦78.06 billion, ₦3433.12 billion, ₦4,172.19, 19.6%, ₦139,491.7 and 19.6% respectively. The standard deviation of Treasury bill volume (TBV), government bonds (GB), total value of money market instruments (OMO), money supply (MS), inflation rate (P), real per capita income (Y) and interest rate (I) from their respective long term mean values every year point at ₦925.66 billion, ₦170.21 billion, ₦8747.4 billion, ₦6,363.75, 17.69%, ₦177,847.8 billion and 17.69% correspondingly. The probability values of all the variables show their distribution level at mean zero and constant variance. This reveals that these variables are not normally distributed among all the variables of interest.

4.2. Unit Root Test Results

Table 2 presents the results of the time series properties of the variables included in the model. This pre-test was carried out before estimating the long-run and short-run relationship among open market operation, money supply and price stability in Nigeria (1981-2016). The Augmented Dickey Fuller (ADF) unit root test results is

presented in Table 2 indicate that Treasury bill volume (TBV), government bonds (GB), total value of money market instruments (OMO), money supply (MS), inflation rate (P), real per capita income (Y) and interest rate (I) were reported to be stationary at first difference [I(1)]. Thus, these series are non-mean reverting at levels and do not converge to their long-run equilibrium until they are first differenced.

Table 2. ADF Unit Root Test Results

Variable	ADF Tau Statistics		Order of Integration
	Intercept	Linear Trend	
TB	-4.8935 (0) [-3.6494]*	-4.8269 (0) [-4.2529]*	1
GB	-7.3323 (0) [-3.6394]*	-7.7345 (0) [-4.2529]*	1
OMO	-6.4813 (0) [-3.6394]*	-6.7370 (0) [-4.2529]*	1
Y	-3.0774 (1) [-2.9511]**	-3.5549 (0) [-3.5485]**	1
I	-7.2004 (0) [-3.6394]*	-7.1469 (0) [-4.2529]*	1
P	-5.7671 (0) [-3.6394]*	-5.6834 (0) [-4.2588]*	1
MS	-3.2976 (0) [-2.9511]**	-3.2613 (0) [-3.2071]***	1

Note: * significant at 1%; ** significant at 5%; *** significant at 10% Mackinnon critical values and are shown in parenthesis. The lagged numbers shown in brackets are selected using the minimum Schwarz and Akaike Information criteria.

Source: Authors' computation (2018).

4.3. Co-integration Test

A co-integration test was performed using the Johansen (1988) approach to find out the existence or inexistence of a long-run relationship among the variables employed for this study and the results are presented in Table 3. From the first equation, the table indicates that four (4) cointegrating equations since the Trace Statistics and Maximum Eigen value of the hypothesized number of co-integrating equations are greater that their critical values at 5% significance level respectively. For the second equation, the table indicates that two (2) cointegrating equations since the Trace Statistics and Maximum Eigen value of the hypothesized number of co-integrating equations are greater that their critical values at 5% significance level respectively. This implies long-run relationships between total value of money market instrument, money supply and inflation rate in Nigeria during the periods, 1981-2016. This indicates the appropriateness of the vector error correction model (VECM) estimation technique which captures both the long-run and short-run information.

Table 3. Cointegration Rank Test Results

Johansen Cointegration Test				
Variables: P TB GB MS Y I				
Lags interval (in first differences): 1 to 2				
Trend assumption: Linear deterministic trend				
Variables: P TB GB MS Y I				
Hypothesized No. of CE(s)	**Trace Statistic**	**Prob.****	**Max-Eigen statistics**	**Prob.****
None *	180.2237	0.0000	63.87190	0.0000
At most 1*	116.3518	0.0000	43.78502	0.0024
At most 2*	72.56678	0.0001	34.08857	0.0063
At most 3*	38.47822	0.0039	24.54097	0.0159
At most 4	13.93724	0.0847	9.170173	0.2723
At most 5*	4.767069	0.0290	4.767069	0.0290
Variables: P OMO MS Y I				
Hypothesized No. of CE(s)	**Trace Statistic**	**Prob.****	**Max-Eigen statistics**	**Prob.****
None*	87.72003	0.0010	35.44637	0.0322
At most 1*	52.27366	0.0182	30.34414	0.0215
At most 2	21.92952	0.3024	13.23299	0.4310
At most 3	8.696532	0.3942	8.687183	0.3131
At most 4	0.009349	0.9226	0.009349	0.9226

Note: *indicates 4cointegrating equations at 5% level and rejection of the hypothesis at 5% level. ** MacKinnon-Haug-Michelis (1999) p-values.
Source: Author's Computation (2018).

4.4. Vector Error Correction Estimates

4.4.1. Impact of Treasury bill, Government Bonds and Money Supply on Inflation Rate

The short-run estimates of the relationship among treasury bills, government bonds, money supply and inflation rate from the VEC model are reported in Table 4, likewise, the long-run estimates. The lag length on all variables as the model was set at two to ensure sufficient degree of the freedom based on automatic selection of Schwarz Information Criterion (SIC). The coefficient of the short-run lag one of change in inflation has negative and significant impact on the current changes in inflation rate at 5%. This implies that the changes in inflation rate measuring price instability in the first period in the short-run dictate the current level of price in Nigeria. The short-run parameter estimates of treasury bills and income per capita were found to be negative indicating that they negatively influence changes in inflation rate in the short-run. The short-run coefficient of income per capita was

statistically significant at 5%. However, the coefficients of government bonds, money supply and interest rate were positive implying that they directly influence changes in inflation in the short run. The coefficient of interest rate was statistically significant at 5%. The coefficient of the ECM is found to be negative and statistically significant at the conventional level. The ECM value (-0.4151) implied that the model corrects its short-run disequilibrium by 41.5% speed of adjustment in order to return to the long run equilibrium.

Table 4. Short-Run Cointegrating Estimates

Dependent Variable: Δ(INF)				
Short-Run Estimates				
Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
Δ***(P(-1))***	-0.539921	(0.27983)	-1.92946	0.0527
Δ***(TB(-1))***	-0.728564	(0.61742)	-1.18001	0.2542
Δ***(GB(-1))***	0.157805	(0.11480)	1.37461	0.1623
Δ***(MS(-1))***	0.627171	(1.48730)	0.42168	0.4837
Δ***(Y(-1))***	-2.302856	(1.56762)	-1.46901	0.0982
Δ***(I(-1))***	0.924467	(0.51120)	1.80842	0.0586
ECT(-1)	-0.415107	(0.15655)	-2.65162	0.0068
Long-run Estimates				
TB	2.004683	(0.19898)	10.0746	0.0000
GB	0.126310	(0.03949)	3.19880	0.0072
MS	0.581440	(0.25194)	2.30789	0.0197
Y	-2.600831	(0.33140)	-7.84812	0.0000
I	-1.442819	(0.30682)	-4.70252	0.0000
Constant	-7.857690	(0.90991)	-8.63561	0.0000
R-squared	0.7587	**F-stat**	10.850*	
Adj. R-squared	0.4713			

Note: * denotes significance at 1%; ** denotes significance at 5%

Source: Author's Computation (2018).

The long-run estimates from Table 4 indicated that change in inflation rate was positively affected by treasury bills, government bonds and money supply. The result shows that only money supply was in tandem with the theoretical expectations. On magnitude basis, 10% increase in treasury bills, government bonds and money supply; change in inflation rate increased by 20.05%, 1.26% and 5.81% respectively. Consequently, the table reported that income per capita and interest rate have indirect effects on change in price instability, where only the former conforms to a'priori expectations. A 10% increase in income per capita and interest rate reduce change in inflation rate by 26.01% and 14.43% correspondingly. In terms of partial significance, all indicators were had significant effects on change in inflation rate in Nigeria during the reviewed periods.

The coefficient of determination (Adjusted-R^2) is moderate (47.13%) indicating that about 47.13% of the total variations in inflation rate was explained by the variables in the model. The overall test using the F-statistic (10.850) is statistically significant at 5% level of significance showing that model is well specified and statistically significant.

4.4.2. Impact of Total Value of Money Market Instruments, Money Supply on Price Instability

The shot-run and long-run estimates of the relationship between open market operation measured by total value of money market instruments, money supply and inflation from the VEC model are shown on Table 5. The lag length on all variables as the model was set at two to ensure sufficient degree of the freedom based on automatic selection of Schwarz Information Criterion (SIC). The coefficient of the short-run lag one of change in inflation has negative and significant impact on the current changes in inflation rate at 5%. This implied that the changes in inflation rate measuring price instability in the first period in the short-run dictate the current level of price in Nigeria. The short-run parameter estimates of the total value of money market instruments and income per capita were found to be negative indicating that they negatively influence changes in inflation rate in the short-run. The short-run coefficient of income per capita was statistically significant at 10%. However, the coefficients of money supply and interest rate were positive implying that they directly influence changes in inflation in the short run. The coefficient of the two variables was statistically insignificant at 5%. The coefficient of the ECM is found to be negative and statistically significant at the conventional level. The ECM value (-0.5235) implied that the model corrects its short-run disequilibrium by 52.4% speed of adjustment in order to return to the long run equilibrium.

Table 5. Short-Run Cointegrating Estimates

Dependent Variable: Δ(INF)				
Short-Run Estimates				
Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
Δ(P(-1))	-0.514052	(0.19777)	-2.59921	0.0097
Δ(OMO(-1))	-0.567039	(0.79432)	-0.71387	0.3976
Δ(MS(-1))	0.147176	(0.15572)	0.94517	0.3576
Δ(Y(-1))	-0.248685	(0.15455)	-1.60908	0.0721
Δ(I(-1))	0.529671	(0.54577)	0.97050	0.3498
ECT(-1)	-0.540740	(0.21960)	-2.46264	0.0168
Long-run Estimates				
OMO	-0.215779	(0.12191)	-1.77004	0.0613
MS	0.695856	(0.23529)	2.95748	0.0037
Y	-0.619513	(0.17728)	-3.49450	0.0000
I	-0.341988	(0.06840)	-4.99955	0.0000
Constant	0.523509	(0.24473)	2.13914	0.0209
R-squared	0.7062	**F-stat**	11.957*	
Adj. R-squared	0.4475			

Note: * denotes significance at 1%; ** denotes significance at 5%

Source: Author's Computation (2018).

The table reported that total value of money market instruments (OMO) and income per capita have indirect effects on change in price instability, where all conform to a'priori expectations. A 10% increase in total value of money market instruments and income per capita reduce inflation rate by 2.16% and 6.19% correspondingly. The long-run estimates from Table 5 also indicated that change in inflation rate was positively affected by money supply and interest rate. The result shows that they were in tandem with the theoretical expectations. On magnitude basis, 10% increase in money supply and interest rate; inflation rate increases by 6.96% and 3.42% respectively. In terms of partial significance, all indicators were had significant effects on change in inflation rate in Nigeria during the reviewed periods.

The coefficient of determination (Adjusted-R^2) is moderate (44.75%) indicating that about 44.75% of the total variations in inflation rate was explained by the variables in the model. The overall test using the F-statistic (11.957) is statistically significant at 5% level of significance showing that model is well specified and statistically significant.

4.5. Discussion of Results

The findings show that treasury bills value, monetary policy rate and money supply have positive impact on inflation rate in Nigeria. This revealed that the action of the monetary committees to push monetary policy rate up coupled with increase in money supply lead to price instability in Nigeria. The coefficients of treasury bill

rate and income per capita were negative. It implies that high rate of treasury bill propel investors to buy more invariably reducing the volume of money supply in the economy, thus, reduce price instability. Also, increase in per capital income indicating that improvement in economic activities was reported to be responsible for decrease in inflation rate.

5. Conclusion and Policy Recommendation

This study examined the role of open market operation and money supply on price stability in the Nigerian economy between 1981 and 2016. The unit root test result indicated that all the indicators were reported to be stationary at first difference. The Johansen cointegration results show that all the indicators have equilibrium condition that keeps them together in the long-run. It implies that there is a long-run relationship between open market operations, money supply an inflation rate in Nigeria. The estimated VECM model results revealed that Treasury bill, government bonds, and money supply have positive and significant relationship with inflation rate in Nigeria. However, total value of money market instruments, income per capita and interest rate had negative and significant impact on inflation rate in Nigeria. Thus, there is need for an increase use in the open market operations as a tool for achieving stability of price in the country. Financial sector reforms by the monetary authority should be implemented accordingly with great care to avoid financial instability on other monetary variables such as exchange rate, interest rate and domestic credit.

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