Financial Inclusion Condition of African Countries

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Abstract: We assessed the financial inclusion environment and its determinants in Africa. We used the Financial Inclusion index computed through the Principal Component Analysis that is generally acknowledged as the best at estimating the financial inclusion level and the two-step system GMM approach with robust and orthogonal deviation option to study countries for the period 2004 to 2016. We found wide discrepancies in financial inclusion amongst the 49 African countries under study. Only two countries had an average financial inclusion index above 50 percent, and the majority are below 40 percent validating the argument that the African region need immediate intervention. Hence, we concluded that the African region has financial inclusion gaps and is contestable. As such, we recommend, among other things, that policy makers should device measures to ensure an ongoing financially inclusive environment while stimulating other variables which acts as barriers to financial inclusion.

Keywords: Financial inclusion condition; Africa; Financial Inclusion index; Principal Component Analysis

JEL Classification: G21; L10

1. Introduction

The concept of financial inclusion has become the catchphrase for researchers, market practitioners, regulators, policymakers, and other stakeholders. A number of theoretical and empirical studies have reported the significant role of financial inclusion in ensuring economic growth (Gurley & Shaw, 1955; Law & Singh, 2014; Sharma, 2016; Lenka & Sharma, 2017; Adeola & Evans, 2017; Kim, Yu & Hassan, 2018). This has steered more than 50 countries to set formal targets of attaining universal financial access by 2020 and many more countries tasking their supervisory and regulatory agencies with encouraging financial inclusion (Sahay et al., 2015). The African region has progressed well from these efforts, but whether the progress has translated into the much anticipated financially inclusive

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environment still leaves a lot to be desired. According to Dermiguc Kunt *et al.*, (2015), more than 75 per cent of the adult population in Africa remained unbanked in 2014. The region is also characterised by a wide heterogeneity in account ownership across countries. Whilst 82 percent, 75 percent and 70 percent of the adult population in countries like Mauritius, Kenya and South Africa are respectively banked, only 7 percent have a formal bank account in Burundi, Guinea and Niger (Demirgüç-Kunt et al., 2015).

There is scarcity of information on the condition of financial inclusion across the globe. This according to Lenka and Sharma, (2017) has limited the ability of financial service providers and policy makers to locate where opportunities exist, what is working and what is not working, thereby hindering policy. Musau, Muathe and Mwangi (2018) have contended that the aspirations for development in Africa will be unpacked once issues of financial inclusion are addressed. Then the question is, how financial inclusive are African economies? The purpose of this study is to investigate the financial inclusiveness of African countries. This is imperative since policy makers and regulators have to first know how countries have reacted to existing policies and regulations for them to be able to craft good policies. Our study differs from existing literature in various ways. First, we documented topical financial inclusion trends for 49 African countries by showing the progress from 2004 to 2016 covering almost the entire continent. Second, we focused on comprehensive indicators of financial inclusion making the study unique. Thirdly, unlike most existing studies, we considered both macro and micro-level factors of financial inclusion. This allows the understanding of their importance as contributing factors of financial inclusion.

The rest of the paper is structured as follows. Section 2 reviews theories and empirical literature on financial inclusion. The data and methodology of the study is considered in Section 3. Section 4 presents the results of the study. Section 5 presents the conclusions as well as policy implications of the paper.

2. Concepts and Measurement of Financial Inclusion

There is no consensus over the definition of financial inclusion as differences emanate from the context wherein the term is used, the state of economic development and geographical location of the area. Sarma (2008) defines financial inclusion as a process of ensuring ease access to, availability, and usage of formal financial systems to all members of an economy. In contrast, Amidžić, Massara and Mialou (2014) and Sharma (2016) define financial inclusion as the process of maximising access and usage while minimising involuntary financial exclusions. Therefore, they focus more on access, usage, and barriers, which capture both the demand and supply-side of financial access. World Bank concurred with Sarma

(2008) and defined an inclusive financial system as one that ensures easy access to or use of affordable financial services and products (transactions, credit, savings, payments, and insurance) that meets the necessities of businesses and individuals, conveyed in a responsible and viable manner (World Bank, 2017). Although different definitions of financial inclusion have been put forward, they all seem to concur that financial inclusion ensures easy access to and usage of formal financial services. This study follows the definition by Sarma (2008) and the World Bank (2017) which includes numerous dimensions such as availability, accessibility, and usage, which can be discussed separately. The definition is also measurable and can be easily incorporated into theoretical and empirical work.

For policy makers to understand the concept of financial inclusion and be able to design policies to improve financial inclusion, they require reliable information on the prevailing state of financial inclusion. The information can be used for monitoring and also to deepen understanding around factors of financial inclusion and successively, the effect of policies (Lenka & Barik, 2018). There appears to be no standard method of measuring financial inclusion (Young & Mercado, 2015). The difficulties in differentiating between voluntary and non-voluntary financial exclusion bring about challenges in measuring financial inclusion (World Bank, 2008). Voluntary financial exclusion denotes the population that has the capacity to access financial services, but does not do so voluntarily. This population segment needs to be excluded from financial exclusion estimations, posing measurement challenges.

An early attempt to measure financial inclusion has been made by Honohan (2008) who constructed estimates of the proportional formally banked households and subsequently compared them to inequality and poverty. Using average deposit size, household access and GDP per capita, to calculate the estimates for more than 160 countries, the study found that Latin America and the Caribbean had the highest mean percentages, but countries in Africa and Eastern Europe and Central Asia had the lowest mean percentages. Each of the indicators mentioned above provides useful and important information on financial system outreach of an economy. While used individually, they however fail to offer a comprehensive measure on the inclusiveness of the banking system. The use of singular indicators may correspondingly lead to wrong interpretation of the results on financial inclusion in an economy. A country may be well positioned in one dimension, but not in the other. For instance, in 2015, Zimbabwe had 14.38 branches per 100 000 adults whereas Angola had 11.75 branches per 100 000 adults. On the other hand, Zimbabwe had 81 depositors per 1000 adults whilst Angola had 592 depositors per 1000 adults. Using bank branches per 100 adults Angola ranks lower than Zimbabwe but looking at the other dimension, Zimbabwe ranks lower than Angola within the same year.

Sarma (2008) proposed a multidimensional financial inclusion index on the banking sector outreach using macroeconomic data in an effort to combine meaningfully several indicators, such as availability, accessibility and usage of banking services. Adopting the Human Development Index (HDI) concept on one usage variable and three accessibility variables, Sarma (2008) computed a comprehensive financial inclusion index which is comparable across countries or provinces at a particular point in time. The measure also enforces non-varying weights for each dimension. The measure can also be used to monitor financial inclusion initiatives policy progress in countries over time (Beck et al., 2007) and Honohan (2008). Following Sarma's (2008) method, a number of researchers have also calculated the financial inclusion index for specific countries and examined how it relates to other social factors such as inequality, urbanisation, income, or even literacy (Kumar & Mishra, 2009; Mehrotra et al., 2009; Arora, 2010; Sarma & Pais, 2011; Gupte et al., 2012; Sarma, 2010; 2012; Kumar, 2016). Pal and Chakravarty (2010) improved upon Sarma's method by employing the axiomatic measurement approach to establish how various factors contribute towards inclusion. Cáamara and Tuesta (2014) measured financial inclusion levels at country level using the supply-and-demand information for eighty-two countries. They used a two stage PCA to compute a composite index of financial inclusion. In addition, the global Findex database which was initiated by the World Bank make available indicators of financial inclusion based on a primary survey conducted 148 countries on 150 000 adults during 2011 (Demirgüç-Kunt & Klapper, 2012). Amidžić, Massara, and Mialou (2014) computed a financial inclusion index as a compound indicator of variables in relation to outreach (demographic and geographic penetration), usage (lending and deposit), and quality (cost of usage, disclosure requirement, and dispute resolution).

Following the argument made by Sarma (2008) and Gupte *et al*. (2012), this study constructed a multidimensional index of financial inclusion to measure the level of financial inclusion between countries. The study used several dimensions and current time trend which were omitted in previous studies and tested whether adding more indicators and dimensions to the index makes it more holistic and comprehensive. The index is built across many years (2004–2016) and several countries (49), a time-series estimation, which, to the best of the researcher's knowledge has not been done before. This study also contributed to literature by constructing a unique financial inclusion index and combining the normalised weights from Camara and Tuesta's (2014) principal component analysis with Sarma's (2008) multidimensional approach to address the weaknesses of each methodology.

3. Methodology

An inclusive financial system reduces poverty and drives economic growth (Sharma, 2016). This suggests that for African countries to tap its potential for growth, its

economies should have enhanced financial inclusion. It has been argued that developmental aspirations in Africa will be unlocked once issues of financial inclusion in Africa are addressed. Then the question is how financially inclusive are African economies?

3.1. Model Specification

We computed a new index of financial inclusion by combining the Sarma's (2008) and Camara and Tuesta's (2014) approaches to overcome the weaknesses of each methodology. Like Sarma (2008), we used usage, access, and availability as dimensions of the financial inclusion index. We computed the indicator for each dimension as:

$$\wp_{i,d} = \frac{\varkappa_{i-m_i}}{M_{i-m_i}} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(1)$$

Where $\varkappa_i$ is the value of indicator i, m_i is the minimum (lowest) value of indicator i, M_i is the maximum (highest) value of dimension i. $\wp_{i,d}$ is the standardised value of indicator i with d being the dimension. We followed the footsteps of Camara and Tuesta (2014) in using PCA in aggregating each indicator to a dimension index. We denotes λ_k ($k = 1\dots p$) as the kth eigenvalue, subscript k is the number of principal components that also matches with the number of standardised indicators p. we assumed that $\lambda_1 > \lambda_2 > \cdots \lambda_p$ and denote P_l ($k = 1\dots p$) as the lth principal component. Each dimension index was derived in line with the weighted averages:

$$\mathfrak{H}_d = \frac{\sum_{k,l=1}^{p} \lambda_k P_l}{\sum_{l=1}^{p} \lambda_k} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(2)$$

Where $\mathfrak{H}_d$ is dimension d index and $P_l = \mathfrak{R}\lambda_k$. λ_k signifies the variance of the principal component (weights) and $\mathfrak{R}$ is the indicators matrix. Following Camara and Tuesta (2014), we also took into account 100 percent of the total variation in the indices of dimensions to avoid dumping information that could precisely estimate the overall financial inclusion index of a country. Having established the dimension indices, we ran another principal component analysis as in Equation 3 below to compute the dimension weights for the overall financial inclusion.

$$FII_i = \frac{\sum_{k,l=1}^{p} \lambda_k P_{li}}{\sum_{l=1}^{p} \lambda_k} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3)$$

Where FII_i is the aggregate financial inclusion index for country i. $P_l = \mathfrak{R}\lambda_k$. λ_k is the variance of the kth principal component (weights) and $\mathfrak{R}$ is the dimensions matrix. Decreasing weights were assigned to each component and we also account for 100 percent of the total variation in the FII. The above equation can also be represented as:

$$FII_i = \omega_1 \mathfrak{H}_{1k} + \omega_2 \mathfrak{H}_{2k} + \omega_3 \mathfrak{H}_{3k} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (4)$$

Where ω represents the weights obtained from PCA and $\mathfrak{H}_i$ are the dimensions. Equation 4 above shows that the financial inclusion index for the sampled size is a weighted average of individual dimensions.

We followed the footsteps of the OECD's handbook in constructing composite indicators of financial inclusion. We began with data selection followed by an identification and treatment of missing data; multivariate analysis; normalisation; aggregation and weighting before linking the index to other variables respectively. A PCA was performed for both access and usage indices to examine the statistical balance and importance of the indicators used for the index. Given that the indicators are not expressed using the same scales, we used the Min-Max method to normalise the data thereby making the indicators comparable. The Factor Analysis was later used to allocate the weights for the singular indicators of the indices before aggregating the indices. Finally, we related the index to other specific factors, so as to ascertain linkages through regressions. Therefore, we combined together time series data of the sampled cross-sectional countries in Africa using the generalised method of moments (GMM). The benefits offered by the technique to the study justify the choice of panel data analysis.

3.2. Generalised Method of Moments

The application of the regression of the link between financial inclusion and other determinants in Africa banks is done using the GMM regression. The conventional estimators of dynamic panel data like; pooled OLS, first difference, and generalised least squares are inept in handling dynamic panel bias, thus the proposed use of instrumental variables to alleviate endogeneity issues in the lagged endogenous variables. The GMM is free from normality and has greater assumptions of data generating process and adaptability in the presence of lagged variables. The estimation model is based on Arellano and Bond (1991) and Arellano and Bover (1995) GMM which is considered more applicable for unbalanced panels by Roodman (2006).This allows the application of the economies specific variables that drive financial inclusion while controlling for various macroeconomic variables.

Financial institutions normally expand their service provision if there exists a significant market for their product. This study used population size as a proxy for market size in line with Beck and Feyen (2013). A larger population size is expected to enhance financial inclusion as a result of scale effects, which potentially give rise to efficient service provision in bigger economies than smaller ones, whose population may be less urbanised and/or more highly dispersed (Beck & De la Torre, 2008). The variable is expressed in logarithm form in the model estimation. Financial inclusion is expected to increase with an increase in population density and size. Financial institutions can easily accumulate savings when potential depositors have easy access to them. As population size increases there exists greater chances of individuals and businesses making savings, deposits and insurance to cushion

against risk. This study also used population size and density as determinants of financial inclusion consistent with Beck and Feyen (2013). The relationship between inflation and financial inclusion could be either direct or indirect. Access to bank accounts by the poor can cause them to invest the money and not use it leading to curve inflation. Inflation can also affect money supply within an economy thereby reducing financial inclusion. The level of income is also expected to positively contribute towards financial inclusion. Higher income levels may encourage individuals and firms to save and insure their assets against risk thus increasing financial inclusion levels. Below is an expression of the estimable form of the model;

$$FII_{it} = \delta_{it} + \lambda\ FII_{it-1} + \Psi_{it}\ \sum \chi_{it} + \varrho_{it} \sum \aleph_{it} + v_{i,t} \dots\dots\dots\dots\dots\dots\dots\dots (5)$$

Where the subscripts *it* represents the country and year respectively. *FII* measures the one period lagged financial inclusion, δ is the intercept, whilst λ, Ψ and ϱ are coefficients. $\sum \chi$ represent the country specific variables that drives financial inclusion, these are; population density, population size, broad money, and financial development. The macroeconomic variables considered are the level of income measured by GDP per capita, inflation rate represented by $\sum \aleph_i$ with v as the error term.

3.3. Data

To compute the degree of financial inclusion of African countries, we used a panel of 49 countries from the African region sourced over the period 2004-2016. The choice of period is informed by the availability of data on the World Development Indicators (WDI) Databases, which provides data for 189 countries across the globe. The WDI Database is much broader and contains significant details on financial inclusion and other variables. In addition, it facilitates better comparison across countries. However, the major limitation of this database is that of missing data on several countries. Countries with issues on data integrity were also excluded.

3.4. Empirical Results

Table 1 below provides a summary of the indicators of financial inclusion used in this study. The data shows the presence of great discrepancies between various indicators of financial inclusion. For example, the mean number of ATMs per area in Africa is only 12 which differs greatly from the East Asia and Pacific and Middle East which have 215 and 125 respectively. This figure is also far from the average World figure of 75, thereby providing evidence why financial exclusion is high in Africa. Generally, the African region ranks lowest on almost all indicators of financial inclusion, except on branches of commercial banks per 1 000 km^2 and the number of ATMs per 1000 adults where it is ranked second lowest and also the indicators of financial inclusion in the African region rank far below world average. The region also ranks below average, even when compared to other countries in the same income groups. Numerous studies also allude to the same (Demirgüç-Kunt,

Beck & Honohan, 2008; Beck et al., 2007). On average the East Asia and Pacific continent, Europe and Central Asia have recorded the highest levels of financial inclusion over the period under review. Although financial inclusion has been contemplated as a universal challenge, the situation in Africa requires immediate action. These large discrepancies may be as a result of a number of political or socio-economic reasons like regime durability and transition, levels of autocracy, executive and legislative electoral competitiveness, checks and balances, gender, age, bank concentration in rural areas, but it is still interesting to realise that these differences and are widespread in almost all the variables. Both policy makers and private sectors should make a united effort towards improving financial inclusion within Africa.

3.4.1. Pearson Correlation and Multi-collinearity Test

Correlation analysis helps in tracing the existence of multi-collinearity within the econometric model. Table 2 below presents the empirical correlations matrix between the indicators of financial inclusion under study. As shown in Table 2, a strong significant correlation exists among the financial inclusion indicators. The 0.96 significant correlation coefficient between ATMs per 1000 km^2 and bank branches per 1000 km^2 indicates a near perfect multi-collinearity scenario. It simply indicates that ATMs per 1000 km^2 and bank branches per 1000 km^2 have a 0.96 significant positive relationship. The findings also indicate 0.87 and 0.96 significant positive correlation between ATMs per 1000 km^2, outstanding loans as a percentage to GDP and bank branches per area. The variable ATMs per 1000 km^2 was dropped to deal with the problem of multicollinearity

Table 1. Summary Statistics-Indicators of Financial Inclusion

Variable	World			EAP	LAC	ECA	ME	SA	NA	Africa	LICs
	Mean	Max	Min	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Outstanding deposits with comm. banks (% of GDP)	53.9	496.3	1.2	72.2	47.7	58.4	63.6	43.8	60.3	31.5	38.1
ATMs per 1 000 km2	74.8	3963	0.01	214.2	36.9	84.1	124.2	36.0	18.4	9.7	12.0
ATMs per 100 000 adults	60.0	288.6	0.01	47.2	40.9	67.6	47.6	8.3	198.3	10.2	18.6
Branches of commercial banks per 1 000 km2	34.8	1418	0.01	73.7	19.1	54.5	53.5	31.8	5.3	6	8.6
Branches of commercial banks per 100 000 adults	18.8	287.2	0.1	14.3	20.1	34.9	17.4	9.4	29.5	6.3	12.8
Borrowers at commercial banks per 1 000 adults	198.9	1233	0.01	238.4	206.5	306.8	321.6	67.6	N/A	52.6	80
Commercial banks deposit accounts per 1 000 adults	1149.6	7988	1.3	1515	963.8	2033	1333.2	642.6	N/A	409.9	505
Depositors with commercial banks per 1 000 adults	673.5	3380	0.4	763	679.8	1108	781.3	458	N/A	250.7	101.1
Commercial banks loan accounts per 1000 adults	307.9	1854	0.4	266.8	411.1	601.8	402.5	83.4	N/A	81.5	119.3
Number of countries	184			24	32	49	20	8	2	49	77

Source: Financial Access Survey-International Monetary Fund (2017)

Key: EAP- East Asia and Pacific, ME- Middle East, LAC- Latin America and Caribbean, LICs- Low Income Countries, SA- South Asia, ECA- Europe and Central Asia, NA- North America

Table 2. Correlation Financial Inclusion Indicators

	ATMs per Pop.	ATMs per area	Bank Branches per pop.	Bank Branches per area.	Outstanding Loans(% GDP	Bank Accounts per pop.
ATMs per pop.	1.0000					
ATMs per area.	0.6899*	1.0000				
Bank Branches per pop.	0.6432*	0.3115*	1.0000			
Bank Branches per area	0.5716*	0.9584*	0.2427*	1.0000		
Outstanding Loans (% GDP)	0.7407*	0.8756*	0.5520*	0.8902*	1.0000	
Bank Accounts per pop.	0.7676*	0.6606*	0.6415*	0.5490*	0.7472*	1.0000

Source: Authors' calculations from World Bank Development Indicators (2017)

Standard error in parentheses; $* p < 0.05$

3.4.2. Trends in Indicators of Financial Inclusion

Although the African region ranks lowest in all financial inclusion indicators, the data suggest that, there have been a steady increase over the years, in basically all the indicators as shown in Figure 1 below. Sarma (2008) cited access to banking services as the first aspect of financial inclusion. All the indicators, that is, ATMs per 100 000 adults, ATMs per 1 000 km^2, bank branches per 100 000 adults, branches of commercial banks per 1 000 km^2 have shown an increase as highlighted in Figure 1. There were 7 ATMs per 1 000 km^2 in 2004; no increase from 2004 to 2005; increased from 7 to 9 in 2009 then to 12 in 2013 before increasing by slightly less than 50 percent to 17 in 2016. There has been a tremendous improvement in increase of ATMs per 100 000 as they increased by 100 percent from 2004 to 2009; no increase from 2009 to 2011 and increased by 70 percent from 2011 to 2016. Despite an increase in percentages; the number of ATMs per population and per area is still very low reaching 17 in 2016 thereby justifying why financial inclusion is low in Africa. Access to financial services measured by bank branches per 1 000km^2 increased by approximately 150 percent from 4.1 in 2004 to 10.4 in 2016. Bank branches per 100 000 adults improved from 4.3 in 2004 to 9.41 in 2016 an increase of slightly more than 100 percent. The number of commercial bank branches abruptly increased between 2007 and 2008, which is the same period the World Bank published the first global financial inclusion report which gave emphasis to financial inclusion and this could have stirred the need for increased financial inclusion for countries in Africa, as suggested by the data. Generally, all the dimensions show that financial inclusion has been improving from 2004 to 2016. Despite the increase in access indicators, Africa has a long way to go with respect to financial inclusion indicating that access alone is not enough but should be coupled with usage and quality of services. Bhattacharya and Wolde (2010) established that low access to

finance is one of the leading factors that have contributed to lower economic growth in the Middle East and North Africa (MENA) compared to other regions.
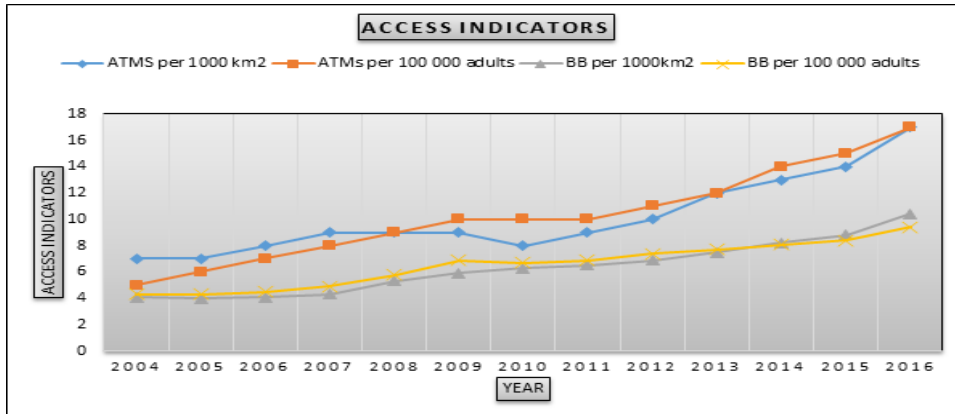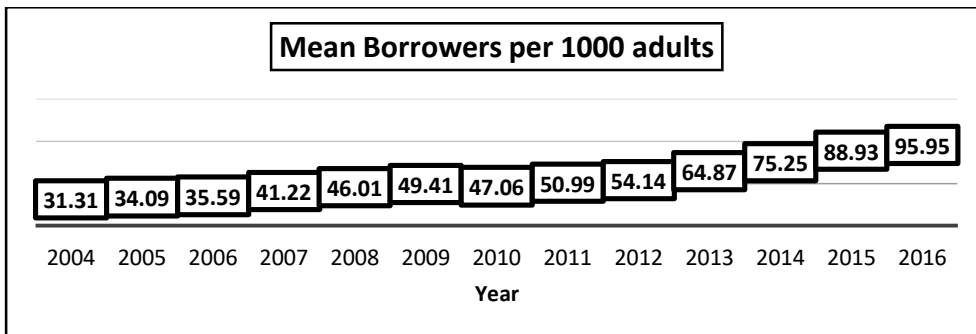
3.4.2.1. Access Indicators

Figure 1. Trend in Access to Finance Indicators

Source: World Development Indicators Database, World Bank (2017)
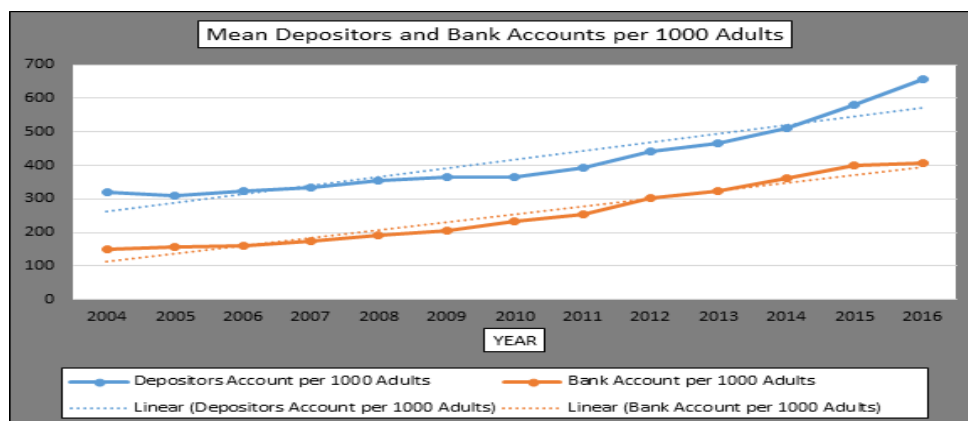
3.4.2.2. Penetration Indicators

Figure 2. Trend in Penetration Indicators

Source: World Development Indicators Database, World Bank (2017)

As much as penetration is concerned, it can be seen that generally the number of deposits accounts with commercial banks have increased by more than 100 percent from 2004 to 2016. From 2004 to 2005, the number of accounts decreased from 322 to 309 but gradually increased between 2005 and 2016. This might have been caused by closure of inactive bank accounts due to requests by central banks regulators. The loan accounts per 1 000 adults which is another indicator of penetration shows an increase of more than 200 percent from 2004 to 2016. Loan accounts only decreased in 2010 possibly due to the global financial crisis and continued to increase until 2016. Unlike Ndlovu (2017) and Yorulmaz (2016), we included bank accounts per 1000 adults which is another indicator of penetration. Generally, the number of bank accounts has increased by more than 250 percent from 151 in 2004 to 407 in 2016.

3.4.2.3. Usage Indicators

Figure 3 below shows the usage of financial services. It is a significant dimension of financial inclusion as it compares outstanding loans and deposits with GDP. In line with Sharma (2016), the indicators reflect an important contribution of commercial banks in Africa to the economic growth as both outstanding loans and deposits with commercial banks have increased from 2004 to 2016.
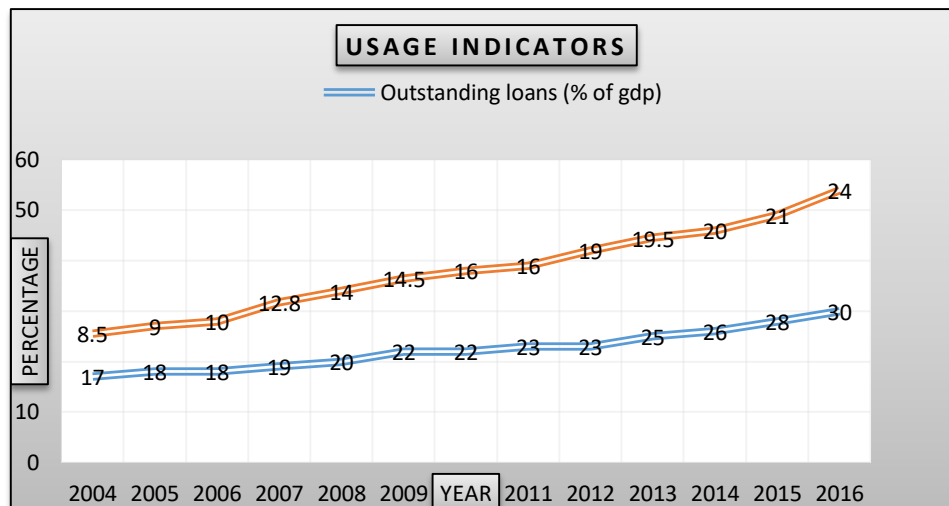
Figure 3. Trend in Usage Indicators

Source: World Development Indicators Database, World Bank (2017)

The period 2010 and 2011 saw the number of borrowers largely unchanged compared to a striking element within the same period where a sharp increase in loan accounts was witnessed. This action increases the number of loan accounts without growing the number of borrowers. This may also signal customers' credit kite flying where multiple loan accounts are opened by a single customer. However, the number of loan accounts evens out between 2011 and 2012 as they remain fairly stable, whilst there was a notable increase in the number of borrowers in the same period, hence reversing the anomaly thus validating the inclusion of both usage and access indicators in capturing financial inclusion. Generally the usage trend is increasing.

3.4.2.4. Regional Comparison-Indicators of Financial Inclusion

(a) Access Indicators

African countries should come up with strategies to overcome the barriers that hinder people from accessing formal financial services. The region has the lowest number of ATMs per area and per capita, with 9.83 ATMs per area and 10.29 ATMs per capita compared to other regions such as East Asia and Pacific with 214 ATMs per area and North America with 199 ATMs per capita (World Bank, 2017).
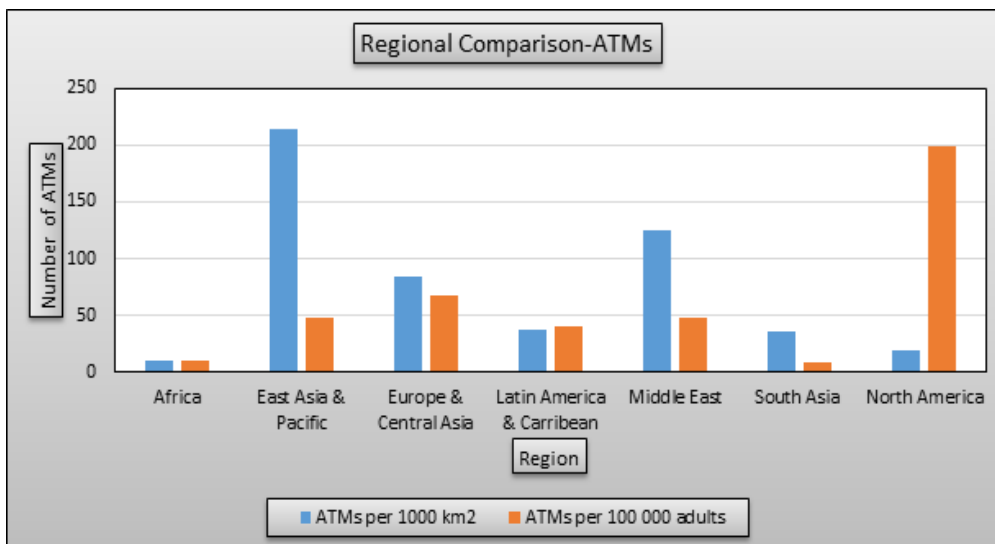
Figure 4. Trend in Access Indicators (Regional)

Source: World Development Indicators Database, World Bank (2017)

b) Penetration Indicators
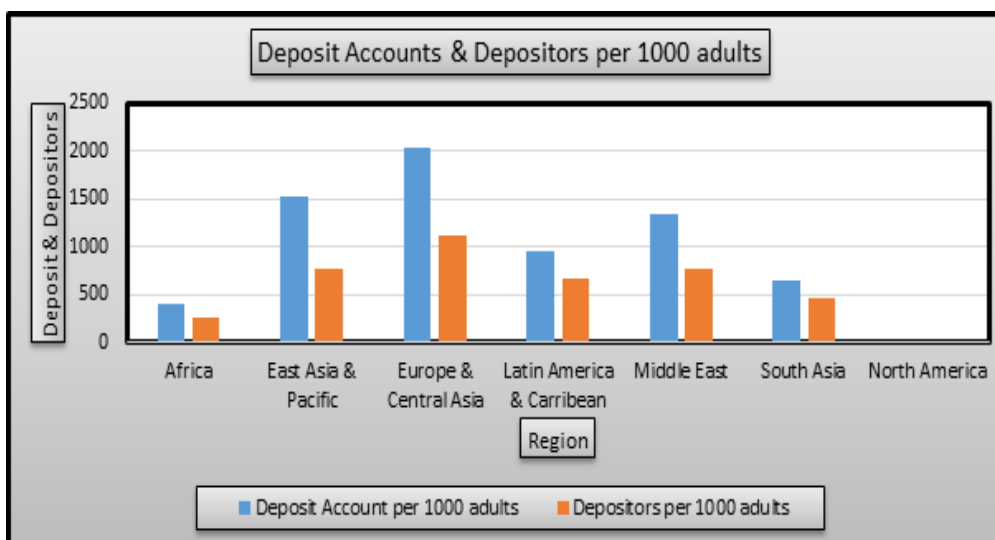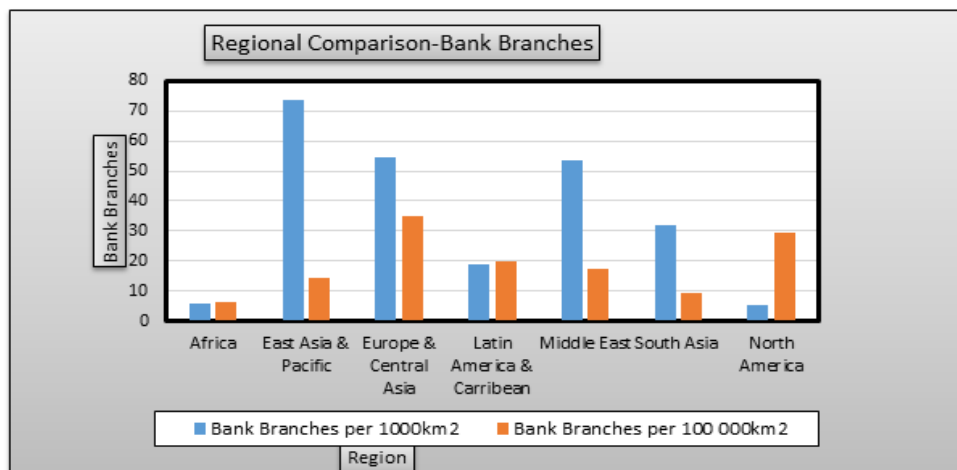
Figure 5. Trend in Penetration Indicators (Regional)

Source: World Development Indicators Database, World Bank (2017)

This graph shows a low penetration rate in Africa as compared to other regions. The region had 6 bank branches per area and per capita compared to East Asia and Pacific with 74 branches per area and North America with 30 branches per capita. Presumably, the low bank branch penetration in Africa could be due to difficulties in achieving minimum viable scale in low-income areas and sparsely populated areas, though technological innovations is rising to meet that challenge (Beck & Cull, 2013). The trend is also the same for depositors' accounts and deposits per 1000 adults.

Usage Indicators
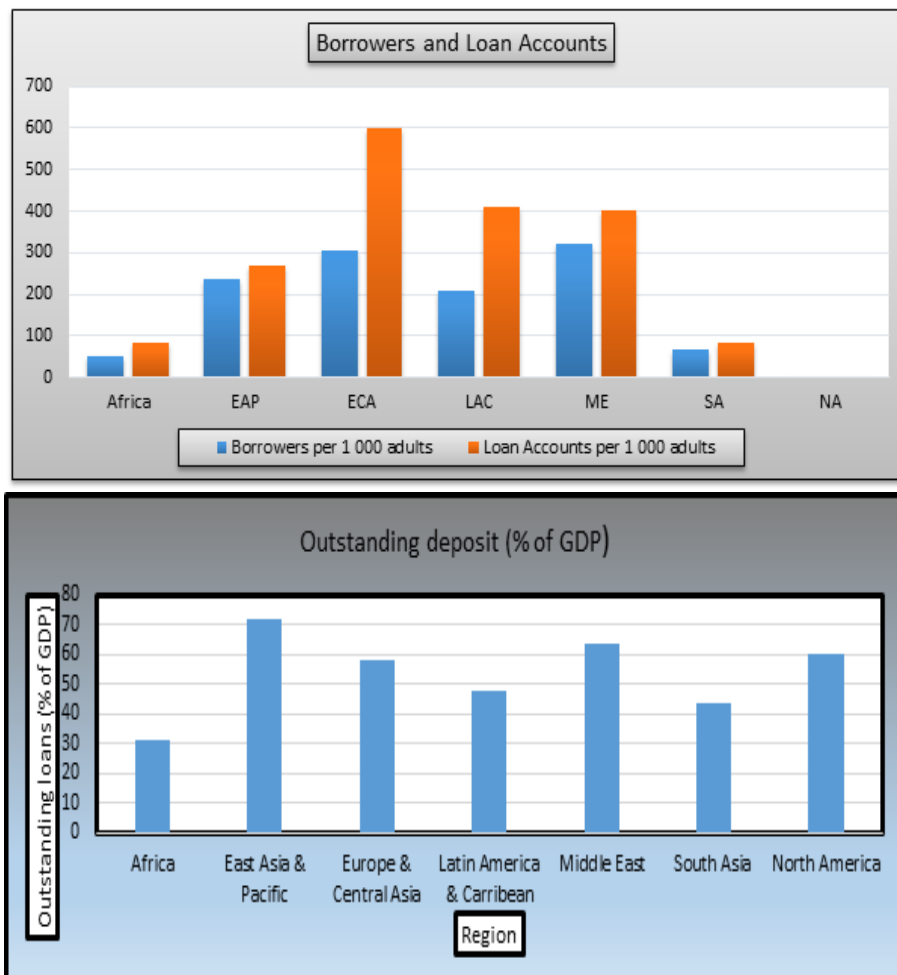
Figure 6. Trend in Usage Indicators (Regional)

Source: The World Bank-Global Financial Development Database June 2017

As shown above and below, the region lags behind all global regions, in all dimensions of financial inclusion.

3.4.3. Financial Inclusion Index Results

Table 3 shows the summary statistics of the financial inclusion indices for the African countries for the period 2004-2016. This summary shows some remarkable features of the nature of financial inclusion in the African region. We found that the average financial inclusion in Africa ranges between 0 in 2011-2013 and 0.88 in 2016 as portrayed by the maximum and minimum values. The implication is that despite the fact that some countries have low financial inclusion levels, others have

high degrees of financial inclusion supporting the view that Africa is characterised by severe financial inclusion disparities (Ndlovu, 2017). However, despite the existence of large disparities in financial inclusion within Africa, their mean values are close to the standard deviation than to the minimum value. Two possible implications can be construed from this. Firstly, it is implied that there are very few countries with high financial inclusion levels. This is consistent with literature; using the Boone indicator, the study found that banking sectors in Africa are somehow concentrated. Secondly, the closeness of the means to the standard deviation suggest some kind of financial inclusion within the region as the minimum values are near to zero which meant a financially exclusive region. The standard deviation confirms this suspicion providing credibility to the conclusion of a region characterised by low levels of financial inclusion. The descriptive statistics also show severe gaps between the maximum values and minimum values thereby confirming the presence of wide variations in all sample indicators across economies. These figures index the existence of severe financial exclusion within the African region.

Table 3. Financial Inclusion Index Summary Statistics-Africa

Year	Mean	Standard Deviation	Maximum	Minimum
2004	0.13	0.16	0.80	0.01
2005	0.14	0.17	0.84	0.01
2006	0.10	0.17	0.17	0.00
2007	0.14	0.18	0.82	0.01
2008	0.15	0.18	0.83	0.01
2009	0.16	0.18	0.78	0.01
2010	0.16	0.18	0.77	0.01
2011	0.16	0.18	0.75	0.00
2012	0.16	0.18	0.79	0.00
2013	0.16	0.19	0.86	0.00
2014	0.17	0.18	0.86	0.02
2015	0.17	0.18	0.87	0.03
2016	0.17	0.19	0.88	0.02
Average	0.15	0.18		

Source: Author's Estimation (2018)

3.4.4. Financial Inclusion Analysis

Figure 7, Figure 8, and Table 4 portrays the financial inclusion index results, giving a picture of the analysis of the financial inclusion trend in the regions between the periods 2004 to 2016. Precisely, Figure 7 indicates the country analysis of financial inclusion providing a pictographic view of the descriptions of financial inclusion. It serves to say that the graph clearly shows wide discrepancies in financial inclusion among the countries of the region, with Chad and Guinea having the least at 0.01 and Seychelles and Cape-Verde with the highest at 0.82 and 0.63 respectively. Over the period 2004 to 2016, only Cape-Verde and Seychelles had an average financial inclusion index above 50 percent as shown in Figure 7, and the majority falls below

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40 percent. This validates further the argument this study raised earlier that, the African region is characterised by very high levels of financial exclusion and also confirms the argument that most African countries need immediate intervention although financial exclusion is a global concern. These findings are also consistent with those obtained by Ndlovu (2017) who used less indicators and data span in his study. Mauritius was however excluded from the sample due to unavailability of data on bank accounts per 1000 adults; however, it had higher values for the other indicators of financial inclusion. The average index of financial inclusion is 0.15, which would suggest that the average financial inclusion level is at 15 percent based on the index. Figure 8 portrays the evolution of year-on-year access to finance in the African region from 2004 to 2016. The indices were highest in 2016 at 0.17 and least in 2004 at 0.13. The study noted an upward trend in financial inclusion from the graph over the period as shown by the trend line. This upward movement continued between 2004 and 2016.
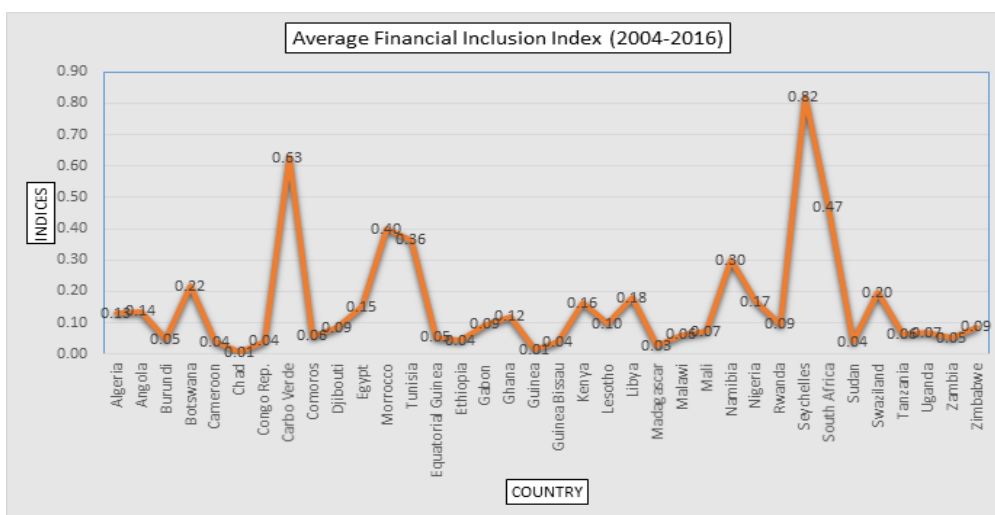

Figure 7. Average African Financial Inclusion Index by Country (2004-2016)

Source: Own Calculations from International Monetary Fund - Financial Access Survey (2017)
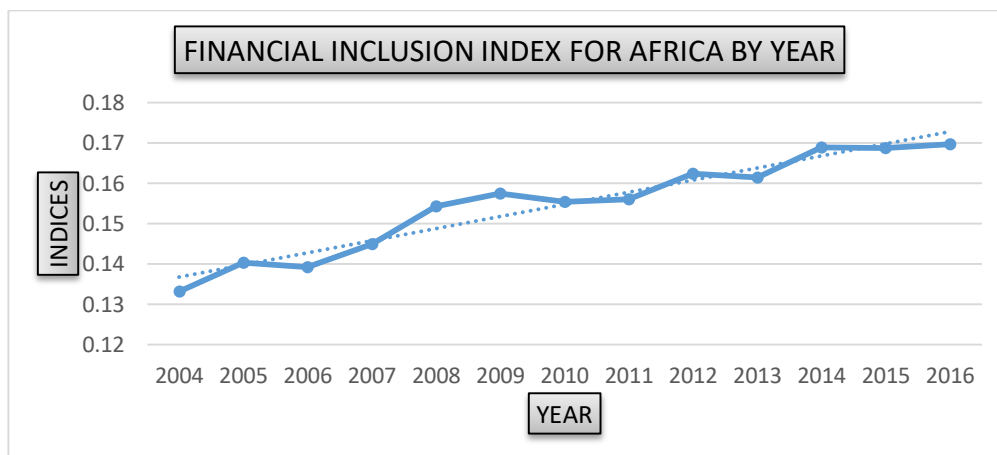
Figure 8. Average African Financial Inclusion Index by Year (2004-2016)

Source: Own Calculations from International Monetary Fund - Financial Access Survey (2017)

Table 4 below indicates the rankings of African countries depending on their FII values. Borrowing from Sarma (2008), those countries that fall within the 0-0.3 range are classified as low financial inclusion, those from 0.3-0.5 are classified as medium financial inclusion, and those from 0.5 to 1 are classified as high financial inclusion. As shown in Table 5.4, Seychelles, Cape Verde and South Africa have the highest overall FII values over the period 2004-2016. On the other end of the spectrum, Chad, Guinea and Madagascar had the lowest overall rank of FII at most of the years during these periods. The overall index shows that only Seychelles falls within the high level FII category. In addition, the medium level FII category varies across the years. Thus, there were only three countries in this category, in 2004, while there were only four in 2010 and 2016.

More than 95 percent of the African countries falls within the low financial inclusion range thereby justifying the call for immediate action in Africa. The FII values that the study computed across the African countries is consistent with other studies which concluded that financial exclusion is high in Africa (Ndlovu, 2017). The study computed the mean FII by aggregating the index of financial inclusion values for each country between 2004 and 2016 and dividing by 13 which is the time interval between 2004 and 2016. The ranking of countries is done according to the alphabetical order of the sampled countries.

Table 4. Ranking of Countries according to Financial Inclusion Index

Country	2004	Ranking	2005	Ranking	2006	Ranking	2007	Ranking	2008	Ranking	2009	Ranking	2010	Ranking
Algeria	0,15	19	0,14	10	0,13	11	0,14	11	0,13	12	0,14	11	0,12	12
Angola	0,03	29	0,06	15	0,07	15	0,09	14	0,10	14	0,15	10	0,14	11
Burundi	0,06	26	0,05	16	0,05	17	0,05	18	0,05	18	0,04	20	0,05	17
Botswana	0,22	6	0,21	7	0,21	7	0,27	6	0,25	5	0,24	7	0,22	6
Cameroon	0,03	29	0,04	17	0,04	18	0,04	19	0,04	19	0,04	20	0,04	18
Chad	0,01	31	0,01	20	0,01	20	0,01	21	0,01	22	0,01	23	0,01	20
Congo Rep.	0,01	31	0,01	20	0,01	20	0,02	20	0,02	21	0,02	22	0,03	19
Cape-Verde	0,46	2	0,49	2	0,53	2	0,59	2	0,62	2	0,65	2	0,69	2
Comoros	0,04	27	0,03	18	0,03	19	0,03	20	0,03	20	0,04	20	0,05	17
Djibouti	0,06	26	0,05	16	0,05	17	0,06	17	0,07	16	0,09	15	0,10	13
Egypt	0,20	8	0,20	8	0,17	9	0,16	10	0,15	10	0,13	12	0,12	12
Morocco	0,29	5	0,35	5	0,33	5	0,36	5	0,37	4	0,43	4	0,43	4
Tunisia	0,37	4	0,38	4	0,37	4	0,38	4	0,37	4	0,37	5	0,38	5
Equatorial Guinea	0,03	29	0,03	18	0,04	18	0,04	19	0,05	18	0,05	19	0,05	17
Ethiopia	0,06	26	0,06	15	0,05	17	0,05	18	0,05	18	0,04	20	0,04	18
Gabon	0,08	24	0,09	13	0,08	14	0,08	15	0,08	15	0,08	16	0,07	15
Ghana	0,11	22	0,12	11	0,11	12	0,12	12	0,12	13	0,12	13	0,10	13
Guinea	0,01	31	0,01	20	0,01	20	0,01	21	0,01	22	0,01	23	0,01	20
Guinea Bissau	0,01	31	0,01	20	0,01	20	0,02	20	0,03	20	0,04	20	0,03	19
Kenya	0,10	23	0,10	12	0,10	13	0,11	13	0,14	11	0,15	10	0,16	9
Lesotho	0,08	24	0,10	12	0,10	13	0,09	14	0,08	15	0,08	16	0,09	14
Libya	0,21	7	0,19	9	0,18	8	0,17	9	0,16	9	0,16	9	0,15	10
Madagascar	0,03	29	0,03	18	0,03	19	0,03	20	0,03	20	0,03	21	0,04	18
Malawi	0,04	28	0,05	16	0,05	17	0,06	17	0,06	17	0,07	17	0,07	15
Mali	0,07	25	0,07	14	0,07	15	0,07	16	0,07	16	0,06	18	0,06	16
Namibia	0,21	7	0,22	6	0,22	6	0,22	7	0,28	6	0,30	6	0,31	5
Nigeria	0,12	21	0,12	11	0,11	12	0,16	10	0,20	8	0,24	7	0,18	8
Rwanda	0,02	30	0,04	17	0,03	19	0,04	19	0,10	13	0,10	14	0,10	13
Seychelles	0,80	1	0,84	1	0,82	1	0,82	1	0,83	1	0,78	1	0,77	1
South Africa	0,41	3	0,44	3	0,45	3	0,47	3	0,51	3	0,52	3	0,50	3
Sudan	0,01	31	0,02	19	0,04	18	0,04	19	0,04	19	0,04	20	0,04	18
Swaziland	0,18	18	0,21	7	0,21	7	0,21	8	0,22	7	0,20	8	0,19	7
Tanzania	0,06	26	0,06	15	0,06	16	0,06	17	0,07	16	0,06	18	0,07	15
Uganda	0,05	27	0,06	15	0,06	16	0,06	17	0,08	15	0,07	17	0,07	15
Zambia	0,03	29	0,04	17	0,04	18	0,05	18	0,07	16	0,06	18	0,05	17
Zimbabwe	0,14	20	0,14	10	0,14	10	0,09	14	0,08	15	0,06	18	0,07	15

Source: Own computation from World Development Indicators Database

Country	2011	Ranking	2012	Ranking	2013	Ranking	2014	Ranking	2015	Ranking	2016	Ranking	overall	Ranking
Algeria	0,11	12	0,11	15	0,12	12	0,13	12	0,15	12	0,11	15	0,13	11
Angola	0,14	11	0,18	10	0,17	9	0,17	10	0,18	10	0,28	8	0,13	11
Burundi	0,05	17	0,05	21	0,05	19	0,05	17	0,04	20	0,01	21	0,05	17
Botswana	0,20	7	0,21	7	0,21	7	0,19	7	0,21	8	0,43	5	0,22	7
Cameroon	0,04	18	0,04	22	0,04	20	0,04	18	0,04	20	0,05	19	0,04	18
Chad	0,00	22	0,00	25	0,00	24	0,00	20	0,01	23	0,01	21	0,01	19
Congo Rep.	0,03	19	0,03	23	0,04	20	0,14	12	0,07	17	0,11	15	0,04	18
Cape-Verde	0,69	2	0,70	2	0,67	2	0,65	2	0,64	2	0,63	4	0,61	2
Comoros	0,10	13	0,08	18	0,08	16	0,07	15	0,07	17	0,06	18	0,06	16
Djibouti	0,09	14	0,09	17	0,09	15	0,13	13	0,10	15	0,13	13	0,08	14
Egypt	0,15	10	0,14	12	0,14	11	0,13	13	0,15	12	0,21	10	0,16	10
Morocco	0,43	4	0,43	4	0,43	4	0,42	4	0,42	4	0,37	7	0,39	4
Tunisia	0,39	5	0,38	5	0,38	5	0,18	9	0,40	5	0,41	6	0,37	5
Equatorial Guinea	0,05	17	0,04	22	0,04	20	0,06	16	0,08	16	0,12	14	0,05	17
Ethiopia	0,03	19	0,04	22	0,04	20	0,04	18	0,04	20	0,00	22	0,04	18
Gabon	0,07	15	0,10	16	0,11	13	0,15	11	0,11	14	0,20	11	0,09	13
Ghana	0,10	13	0,12	14	0,12	12	0,13	13	0,15	12	0,07	17	0,12	12
Guinea	0,01	21	0,01	24	0,01	23	0,02	19	0,03	21	0,02	21	0,01	19
Guinea Bissau	0,04	18	0,04	22	0,04	20	0,13	13	0,05	19	0,06	18	0,04	18
Kenya	0,17	9	0,17	11	0,19	8	0,22	6	0,23	7	0,12	14	0,16	10
Lesotho	0,10	13	0,10	16	0,10	14	0,10	14	0,10	15	0,21	10	0,09	13
Libya	0,19	8	0,20	8	0,19	8	0,13	13	0,23	7	0,06	18	0,18	9
Madagascar	0,02	20	0,02	24	0,02	22	0,02	19	0,02	22	0,03	20	0,03	19
Malawi	0,06	16	0,08	18	0,07	17	0,07	15	0,05	19	0,07	17	0,06	16
Mali	0,06	16	0,07	19	0,07	17	0,13	13	0,08	16	0,06	18	0,07	15
Namibia	0,33	6	0,33	6	0,33	6	0,34	5	0,35	6	0,90	3	0,29	6
Nigeria	0,17	9	0,17	11	0,16	10	0,17	10	0,17	11	0,23	9	0,16	10
Rwanda	0,10	13	0,13	13	0,12	12	0,13	13	0,12	13	0,07	17	0,09	13
Seychelles	0,75	1	0,79	1	0,86	1	0,86	1	0,87	1	1,00	1	0,82	1
South Africa	0,48	3	0,47	3	0,44	3	0,46	3	0,46	3	0,96	2	0,47	3
Sudan	0,03	19	0,03	23	0,03	21	0,13	13	0,02	22	0,06	18	0,04	18
Swaziland	0,19	8	0,19	9	0,17	9	0,19	8	0,19	9	0,43	5	0,19	8
Tanzania	0,06	16	0,06	20	0,06	18	0,06	16	0,07	17	0,08	16	0,06	16
Uganda	0,07	15	0,07	19	0,06	18	0,13	13	0,06	18	0,05	19	0,07	15
Zambia	0,05	17	0,06	20	0,05	19	0,05	17	0,06	18	0,15	12	0,05	17
Zimbabwe	0,07	15	0,07	19	0,06	18	0,13	13	0,06	18	0,05	19	0,09	13

Source: Own computation from World Development Indicators Database

3.4.5. GMM Results

The financial inclusion index computed through the PCA as a proxy of financial inclusion (FII) is regressed against total population, financial development index, income (GDP per capita), inflation, broad money (Money), population density and proportion of domestic credit provided by financial sector to GDP (Credit). The regression results using Arellano-Bond and Arrelano-Bover/Bundell-Bond system dynamic panel-data and the economic implications of the regressions of significant variables are shown in Table 5 and 6 respectively.

Table 5. GMM Regression Result

Dependent Variable: FII	Arrelano-Bond GMM Model (FII)	Arrelano-Bover/Bundell-Bond
Lagged FII p-Value	0.121*** (0.000)	0.549*** (0.000)
Financial Development Index p-Value	0.062*** (0.004)	0.189*** (0.000)
Money (M2GDP) p-Value	-0.0001 (0.184)	-0.0005 (0.332)
Inflation	-0.0385***	-0.0426***

p-Value	(0.000)	(0.000)
Population (log Pop)	-0.022	-0.101***
p-Value	(0.149)	(0.000)
Population Density	0.0001	-0.00001
p-Value	(0.184)	(0.617)
Income (log GDP per capita)	0.024***	0.059***
p-Value	(0.000)	(0.000)
Credit (% GDP)	0.003	0.002
p-Value	(0.128)	(0.294)
Constant	0.118	0.488***
	(0.239)	(0.000)
Observations	360	395
R-Squared		
Wald (Chi^2)	6374.99	10732.83
Prob>$F/Chi^2 =$	0.000	0.000
Sargan Test	0.130	0.285
AB Test	0.516	0.702

Source: Author's Estimation (2018)

Standard error; ** $p < 0.05$, *** $p < 0.01$,

A glance at the results showed that the economic implication of the lagged value of financial inclusion (L.FII) is positive and strongly significant indicating that financial inclusion in the past period has a significant effect in certifying financial inclusion in the current period and is persistent over time. Statistically significant lagged FII estimates mean that lagged financial inclusion has a significant impact on contemporary financial inclusion and would hence indicate a "catch-up effect". A zero coefficient implies a full catch-up, and a between zero and one coefficient would denote partial catch-up, which is the case in the models of this study. Since the lagged financial inclusion estimates falls between zero and one, it implies that countries with undersized financial inclusion have a propensity to recover most of any financial inclusion deficit incurred in the past. In fact, the lagged financial inclusion has an impact of up to 0.42 percent on the current financial inclusion of the African continent. The study also found financial development to be positive and strongly related to financial inclusion. This is also in line with the theoretical expectations and coefficient of correlation obtained earlier on. An increase in financial development also increases financial inclusion. In fact, the economic implication indicates that a one standard deviation increase in financial development increases financial inclusion by 4.3 percent in line with Ndlovu (2017) and Lenka and Barik (2018). The economic implication of the outcome of the regression of money supply (M2GDP) and financial inclusion shown in Table 6 shows that a one standard deviation increase in money supply result in a fall of 7 percent in financial inclusion. This could have been caused by too much money that is circulating in the informal financial system. For example, more than 40 percent of the population in

Africa set aside or saves money regularly, but only half of them do so in the formal financial system (Demirgüç-Kunt & Klapper, 2012).

Table 6. Economic Impacts of Regression Results

Dependent Variable: FII	FII
Financial Development Index	0.0426
Money (M2GDP)	-0.0696
Inflation	-0.3087
Population (log Pop)	-0.4011
Population Density	-0.0068
Income (log GDPPC)	0.1609
Credit (% GDP)	0.2117

Source: Author's Estimation, 2018, from Table 3.8 with Economic

Impact= $\dfrac{SD\ of\ independent\ variable * R.C\ of\ independent\ variable}{SD\ of\ dependent\ variable}$

Where R.C is regression coefficient and S.D is standard deviation

The study found a significant inverse relationship between inflation and financial inclusion. The study found the economic implication of inflation being negative as a one standard deviation increase in inflation significantly reduced financial inclusion by 31 percent. The inverse relationship signifies that economic volatility and price increase lower the level of financial access. Since inflation erodes the time value of money, lenders normally increase interest rates to compensate for the loss. The significant inverse relationship signifies that an increase in financial inclusion reduces inflation which is at times used to proxy the effectiveness of the monetary policy in Africa. The implication is that, it is vital to enhance the drive for financial inclusion at basic level, since financial inclusion stabilises prices and curbs inflation which is vital for economic growth. Also, headline inflation is the most relevant for the conduct of monetary policy in an economy with a low level of financial inclusion, but as more consumers are on board, central banks may focus more on core inflation to improve welfare. This is in keeping with Hung (2016) who found the same results in his study. Similarly, the study found a significant inverse association between population and financial inclusion and also between population density and financial inclusion though the effect was insignificant. The result of the study shows a significant inverse relationship between population size and financial inclusion. This is consistent with Allen *et al*. (2014) despite their coefficient being insignificant. This shows that countries with large population size are not immune to challenges in enhancing financial inclusion. This could be a result of high dependency from the high population, which may be caused by negative externalities like unemployment, reduced savings and poverty, which reduces the demand and supply of financial services. Beck and De la Torre (2007) found that most African countries are characterised by a lower bankable population than the banked. This suggests the

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implementation of policies aimed at improving financial inclusion by focusing on increasing the bankable population, by either taking advantage of economies of scale or by encouraging banks to expand services to the unbanked or by liberalising the market to increase foreign market and/or non-bank participation.

The study also found a significant positive economic impact of the level of income on financial inclusion. This also reiterates the literature rooting for levels of income as the fundamental reasons for financial inclusion (Chithra & Selvam, 2013; Tuesta, et al., 2015; Fungáčová & Weill, 2015). This shows that countries with high income per capita have financial systems which are highly inclusive. Countries with low income levels have comparatively lower literacy rates and poorer connectivity and appear to be more financially exclusive. High income is expected to be correlated with higher usage of formal credit and accounts. It is thus vital for policy makers to craft and implement policies that facilitate productive employment thereby boosting income and increased use of financial services to spur economic growth. Financial status of people always plays a fundamental role in accessing financial services. Poor people with low income face challenges in accessing financial services. Finally, the economic implication of credit availability on financial inclusion is significant and positive. This was anticipated and could be as a result of variables such as lack of credit information and collateral amongst others which extremely subdue credit in Africa. This result contradicts Chithra and Selvam (2013) who found a significant association between credit and deposit penetration and the level of financial inclusion in India. Policy makers should come up with credit registry or other means of identifying credit worthy customers such as 'know your customer' so as to enhance the distribution of credit. Overall, the results are in agreement with the GMM regression models requirements as shown in Table 3.8 above. The fitness of the overall result is good as shown by the Wald test probability, and the Hansen J statistics results gives the confidence that the instruments are not over identified and AR(2) confirms the absence of serial correlation.

3.6. Conclusions

We constructed a new index of financial inclusion for 49 African economies using weights derived from principal component analysis in aggregating indicators for access, availability, and usage. Using the World Bank's Global Findex database, we combined Sarma's (2008) multidimensional approach with the normalized weights from principal component analysis of Camara and Tuesta (2014) in deriving our index. The financial inclusion index shows that there exist wide discrepancies in financial inclusion among the 49 African countries, with Chad and Guinea having the least at 0.01 and Seychelles and Cape-Verde with the highest at 0.82 and 0.63 respectively. Over the period 2004 to 2016, only Seychelles and Carbo-Verde had an average financial inclusion index above 50 percent, and the majorities are below 40 percent. This validates further the argument that, the African region is

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characterised by very high levels of financial exclusion and thus needs immediate intervention. We also found that the lagged financial inclusion, financial development, income, credit and inflation are significant factors in explaining financial inclusion. Interestingly, we found an insignificant inverse link between financial inclusion and population density and population size.

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