Journal of EconomicsBibliography
www.kspjournals.org
Volume 5 September 2018 Issue 3

Do financial inclusion drive boom-bust cycles in Africa?

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Abstract. The paper probes the roles of Financial Inclusion and human capital financing as catalysts for economic growth in Africa during the boom and burst periods. It adopts a battery of estimators like the Pooled OLS, Fixed Effect, Generalized Method of Moment and the Pairwise Granger Causality Tests for a panel of 57 African countries over the period stemming 2004-2015. The results show that financial inclusion has led to increased economic growth and stability in African while the impact of human capital still needs more commitments. The emanating policy antidotes are that there is urgent need for the CBs in Africa to intensify more efforts in banking the unbanked population and also, government should raise the percentage of budget allocation on education in other to improve on the level of human capital and achieve the very much needed sustained development in Africa.
Keywords. Financial education, Financial inclusion, Financial literacy, Africa.
JEL. D14, D18, G21, I28.

1. Introduction

The basic objective of setting up financial institutions is to mobilize deposits from the surplus units while disbursing such funds to the need of the investment sectors in order to enhance economic prosperity (Mainelli, & Mills, 2016; Amore, Berholz, & Vaubel, 2012; and Tufano, 2003). As it were, two billion adult's population worldwide remained financially excluded and more than half of the world adult population developing countries without (about 2.5 billion adults with 2.2 billion located in Africa, Asia, Latin America and middle east countries) access to affordable financial services (Mckinsey, & Co, 2010). Plausibly, the ratio of the unbanked population among African countries still remains a puzzle that is yet to be resolved. While, there are growing concerns that the current economic trends demand studies that will urgently address and provide suitable policies to motivate the unbanked population with a view of enhancing stability and resolving policy inconsistencies. This is crucial, particularly when most of the Central Banks (CBs) in most of these African countries cannot account for the volume of money in circulation. Certainly, the motivation as well as commitment on Financial Inclusion has grown spontaneously since the Maya Declaration and the G-20 Financial inclusion action plan, but the significant impact of this awareness is yet to be embraced by the majority of the unbanked population who still have their various reasons not to bank (such as, proximity, delay and growing queues, access to loanable fund, usage and quality of service among others). Clearly, the CBs partially need to be blamed for poor supervision, lack of policy effectiveness and the issues of multiple accounts (Shobande, 2017).

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Admittedly, there are numerous survey reports that have documented some interesting findings on Financial Inclusion in Africa. Among these are, CGAP Access report, World Bank Development Indicators-Financial Sector report, Africa Development bank –Making Finance work for Africa partnership, World Bank Financial Development and Structure Database, IMF Financial Access Survey, IMF International Financial Statistics, World Bank Payment System Survey, MIX Market, and GSMA Mobile Development Intelligent among others (see Broadbent, 2016 and Reskin, & Yermack, 2016).

While, *CGAP Access* report provides regulators and financial institutions with data covering most Africa countries with specific focus on saving potentials and credit regulatory mechanism, the *World Bank Development Indicators-Financial Sector* report- is concerned with the health of the financial sectors in majority of these African countries as well as the macroeconomic indicators (Demirguc-Kunt, & Klapper, 2012). The Africa Development bank –*Making Finance work for Africa partnership survey* - was set up to provide measures and regulatory framework and financial structure for African banks in order to motivate and serve the unserved. In a bid to capture the deposit taking institutions, microfinance and non-financial institutions such as insurance providers and pension administrators in Africa, the IMF International Financial Statistics is noted for providing macroeconomic indicators, bank distribution services, and export and imports reports with a view to enhance financial inclusiveness Arthur, (2017); Dobrowski, (2017) and IFC, (2017). Majority of the African populace have remained unbanked owing to lack of access to credit as indicated by the report of the *Market Mix Survey* of 2010 (see Demirguc-Kunt, & Levine, 2008 and Mesagan & Shobande, 2017). MIX Market decided to introduce microfinance organization that comprised of 14 African countries in 2011 to provide financial inclusiveness of the formal sector, in form of micro credit deposit mobilization and establishment of micro-banks for the rural African population, that constituted the highest ratio of the unserved. Some earlier studies provided support for mobile banking as a way-out of Financial Inclusion. As a result, GSMA survey is dedicated to provide 53 African countries with mobile networks to ensure financial inclusiveness in the areas of mobile money and mobile health data issues.

A number of studies have been dedicated to investigate the nature, trend and pattern of financial literacy among African countries in order to provide appropriate policy options to support Financial Inclusion effort. Among these prominent studies are that of the Organization for Economic Cooperation and Development (OECD) and Making Finance Work for Africa (MFW4A) partnership. In some African Countries, particularly in Nigeria, Ghana, South Africa, Algeria, Egypt, Burundi and Kenya, the Central Banks have been dedicated to implementing independent survey in order to formulate strategies for enhancing financial inclusiveness of their various countries which is yet to be materialized.

Despite efforts made by prominent international organizations, the independent Central Banks and policy makers, the issue of Financial Inclusion remains inconclusive and controversial in nature. Given the fact that 80% of the adult population in Africa are without any formal account or association with any financial institution (Demirgic-Kunt, & Klapper, 2012; World Bank, 2012), access to loanable fund, cost, proximity, and documentation difficulties have been cited by more than 30% of the unbanked adult population as the causative factors. In West Africa, documentation, lack of credit access, unemployment, religion and bank proximity are often cited as key reasons for their failure to have accounts with any formal institution (Oke, & Shobande, 2016). In East Africa, cost is the second most frequently cited reason accounting for 46% of the adult population while distance is the third.

In Africa, financial literacy and the role of human capital is among the major factors often cited as the reasons for non-financial inclusiveness of more than half of the adult population. This undoubtedly contributed to the reasons why documentation and usage of mobile banking as well as financial innovation such as

POS machine usage and internet banking has proved ineffective in Africa (Oke, & Shobande, 2016; Demirgic-Kunt, & Klapper, 2012; World Bank, 2012). At this point, it is pertinent to clarify the difference(s) between Financial Inclusion and human capital (financial literacy). While Financial Inclusion means the ability to have access to save and make easy transactions in order to contribute to economic prosperity through easy access to credit facility and sound financial viability, its purposes are to enhance fund mobilization, efficient financial development and the creation of wealth for the informal sector for investment (Pawar *et al.,* 2011). On the other hand, financial literacy is the process by which financial consumers (prospective and existing) improve their understanding of the rationale behind financial products, information risks and opportunities (OECD, 2017). Financial literacy is an initiative designed to create awareness on the importance of the financial sector to the economy and the range of financial products available to an individual, so as to perform their civic functions, given the ability to work and earn income coupled with adequate savings for present and future investments. The OECD must be credited for their efforts to provide financial education to majority of African countries in recent years. The effort of OECD (documented in 2008) in creating the International Network on Financial Education (NFE) which was aimed at bringing together highly rated experts and 85 developed and developing countries to discuss and exchange ideas on Financial Inclusion have immensely contributed to the expansion and education of Africans on the need to be associated with a formal financial institution (Wyman, 2017). While, it has been observed that financial education cannot address the issues, the paper argued that the role of human capital in empowerment of the people through improvement in income, education and sound health is crucial, if any meaningful financial inclusiveness must occur (IFC, 2017). Although, it is opined that financial literacy has the chance of increasing awareness about products and services, as well as, confidence and ability of using them, the need to find the link between financial inclusion and human capital is important, to ensure that credit access is effectively invested alongside the required knowledge and skill of the investors (World Bank, 2008). Also, the issue of financial exclusion and financial literacy are all embedded in human capital financing (education, health and income growth). For instance, the level of human capital in Nigeria, Tanzania, Uganda, Niger among other African countries account for the ratio of the unbanked population (OECD, 2016).

In Enhancing Financial Inclusion and Access (EFInA), it was reported that outof the total number of adults in Nigeria, 60.5% were financially served, while 39.5% were excluded due to financial literacy (Oke, & Shobande, 2016). The report questioned the role of financial institutions in promoting Financial Inclusion since there existed a widening gap between fund mobilization and disbursement, caused by financial literacy and poor human capital financing. This notion was supported by Archana (2013) who asserted that financial institutions were expected to play pivotal roles in the mobilization and allocation of resources in any country, which was however, not the case in Nigeria. Sekhar (2013) classified the role of financial exclusion into two: the first is not having access to bank accounts resulting in the exclusion from payment system, while the second is exclusion from formal credit markets. The study further stated that limited access to affordable financial services such as savings, loans, and poor insurance services, by a vast majority in the rural environment, constrained growth and economic development.

The pertinent concern of this paper is to examine the determinants of Financial Inclusion and long term economic growth in Africa anchored on the role of human capital financing. The paper inquires whether Financial Inclusion and human capital financing matter for a long-term economic growth in Africa. While a number of interesting variables have emerged to test various hypotheses to prescribe strategies to serve the unserved, this paper hopes to contribute to the existing literature on Financial Inclusion by analyzing the three dimensions in the African context. First, we look at the scenario for accessing formal financial services, which determines the necessary but not sufficient conditions for stable

and sound financial system; the second adopts appropriate dataset to analyze the stylized facts about African financial services and their complexities; and the final aspect involves the use of panel econometric techniques to analyze empirical results and options for a long-term economic growth in Africa.

The next section of our paper critically reviews the literature, followed by the methodology, while the subsequent section contains empirical results and discussion. The final section concludes and make relevant policy prescriptions and developmental strategies.

2. Stylized facts on financial inclusion and human capital in Africa

The increasing rate of financial inclusion across the global economy has recorded an unprecedented success and has not only significantly reduced the number of the unbanked population, but also served as a fundamental drive for trickled down economic growth and development in many countries. Figure 1 presents an overview of the two key indicators of financial inclusion across the world based on continents/region. Analysis of figure 1a reveals an increasing trend in commercial bank branches for all regions except for Europe & Central Asia with 0.01% decrease. This is attributable to the rate of online banking usage prevalent in these regions, which has included more population through technology and promotes the cashless policy than on the counter banking. Figure 1b presents the number of ATMs per 100,000 adults where East/Asia and Europe/Central Asia recorded the highest level of financial inclusiveness in terms of growth and volume. It is however noted that though African recorded a growing trend in both number of commercial bank branches and ATMs, the continent remains far behind in comparison to other regions. Hence, the instigating factors needed to sustain the increasing trend and ensure the region closes up with the leading regions remain elusive and focal point of empirical discuss of which this study seeks to contribute.

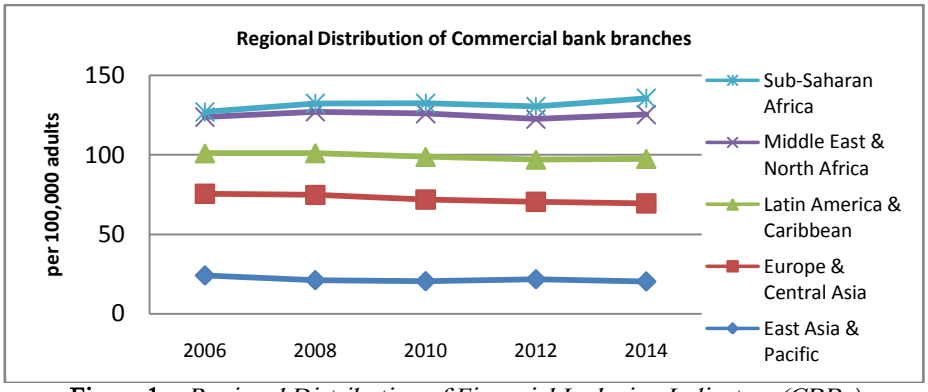

Figure 1a. *Regional Distribution of Financial Inclusion Indicators (CBBs)*
Source: Authors' computation with underlying data from WDI (2016).
Note: Computation is based on biennial summation for comparison purpose.

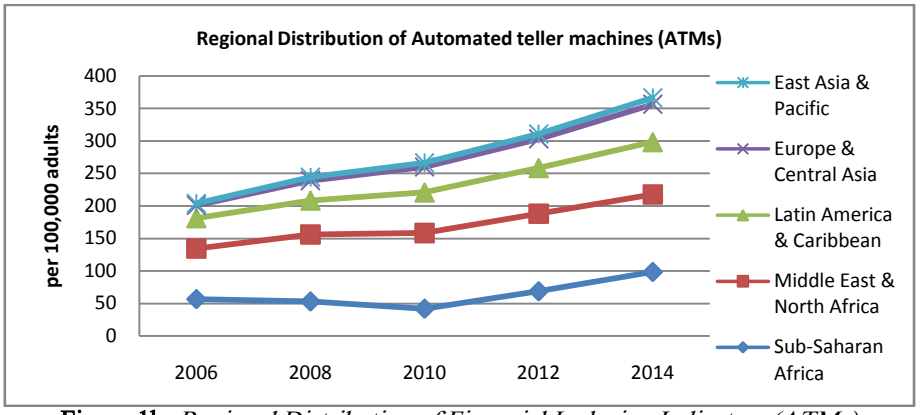

Figure 1b. *Regional Distribution of Financial Inclusion Indicators (ATMs)*
Source: Authors' computation with underlying data from WDI (2016).
Note: Computation is based on biennial summation for comparison purpose

Figures 2a&b present the distribution of human capital indicators as evident among the regions. In terms of government expenditure on health, East Asia & Pacific recorded highest followed by Europe & Central Asia for a period of 10 years. This trend suggests why longevity is equally higher at these two regions as against Africa country where the health service and facilities are not only insufficient but also have suffered from years of neglect and lack of adequate personnel. In terms of enrolment, the region is equally far behind others.

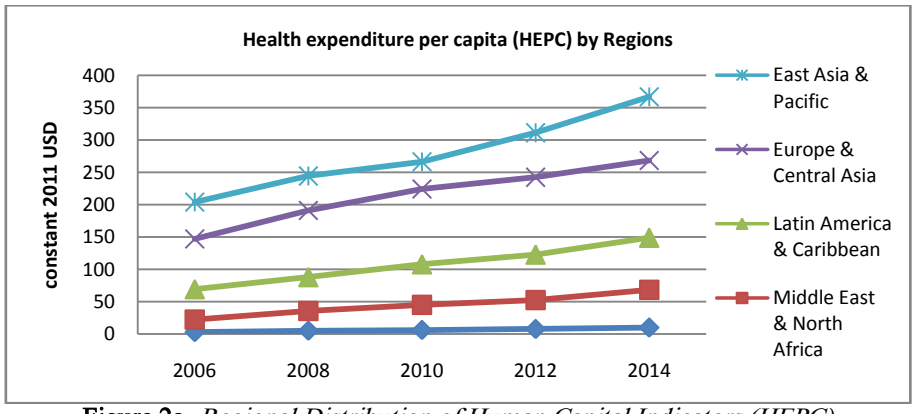

Figure 2a. *Regional Distribution of Human Capital Indicators (HEPC)*
Source: Authors' computation with underlying data from WDI (2016).
Note: Computation is based on biennial summation for comparison purpose

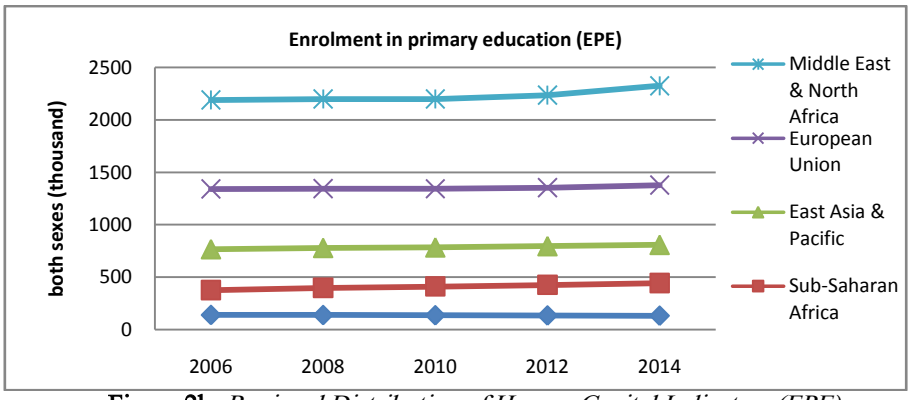

Figure 2b. *Regional Distribution of Human Capital Indicators (EPE)*
Source: Authors' computation with underlying data from WDI (2016).
Note: Computation is based on biennial summation for comparison purpose

3. Literature review

The history of economic thought reveals that the view about the relations between financial inclusion and human capital as it affects economic growth are subject of much intense contest of interest. Perhaps this justify why the choice of a modelling framework has remained inconclusive both theoretically and empirically. As it were, much of the earlier work on human capital and growth nexus are through the extensions of the Solow neoclassical growth model (Solow, 1957) or through endogenous growth equations, as developed by Mankiw, Romer & Weil (1992) and used by Shobande, *et al.,* (2014). A current application of such model is shown in the associated study by Iziushi & Huggins (2003), which is modified by Artige (2010), Hermannssona (2014) Sheriffdeen & Osoba (2017) and Shobande & Etukomeni (2017) using overlapping generation model.

Evidently, a number of studies have investigated the impact of financial inclusion and human capital investment on economic growth. While some studies focus on the subject matter in developed economies, others looked at it from developing countries perspective. In terms of empirical evidence with developing countries, Arora (2012) search for the impact of financial inclusion on human capital in developing Asia as part of the commitment of Australian government to allocate large fund to improve financial inclusion in developing countries by looking at 21 countries of developing Asia. The results show that a significant negative relationship exists between financial development proxies as M2 ratio to gdp and pupil teacher ratio and a strong positive relationship between physical access to bank and expected years of schooling. This Evans, *et al.,* (2002) examines the contribution of human capital and financial development to economic growth by looking at 82 countries between 1972 and 1993 using Cobb Douglas production function. Their result shows that both financial development and human capital contributed equally to economic growth in the countries observed. Some other studies looked at the impact of financial education and financial inclusion as a driver of economic growth (Atkinson, 2015; OECD, 2013; Khalily, 2016 and Grohmann, *et al.,* 2017, Demirguc-Kunt, Klapper & Singer, 2017). Prominent among this studies, is the celebrated examination of Grohmann, *et al.,* (2017) that beam searchlight on the effect of financial literacy on financial inclusion at a cross country level. The study proxies inclusion by two measures of access to finance and two measure of use of financial services. Their results indicated that financial literacy is always strong related to higher financial inclusion. Therefore, the study suggested that average marginal effect of financial literacy on financial inclusion tends to be largest in countries with low income with a less financial sector and fewer bank branches. Using Generalized Method of Moment panel estimator and Cross sectional instrumental variable, Levine (2000) established that there was a positive relationship between financial development and economic growth. In Kenya, Ditus & Klein (2011) showed that the use of mobile payment system could enhance the financial inclusiveness of small and medium scale industries in the country. The celebrated examination by Demigic-Kunt, Klapper & Singer (2017) provided an overview of Financial Inclusion around the world and reviewed the recent empirical evidence on how the use of financial products such as payment services, saving accounts, loans and insurance can contribute inclusively to growth and economic development while providing challenges to achieving greater future research. The study discovered that dimension of Financial Inclusion which mattered for financial risk control as well as decision making should be considered for capital accumulation. This is in agreement with Lenka & Bairwa (2016) who once acknowledged that Financial Inclusion is the focal point of an economy since it included savings and investments which could speed up the economic growth level.

Therefore, judging from the existing literature, the questions of convergence in correlates of financial inclusion remains scarce. It appears that, there is clear signs of confusion concerning the extent to which existing literature can explain the role of financial inclusion and human capital can affect economic growth. Apparently,

it appears that the same disagreements in the theories also reflected on the policy focus as well as the outcomes of the majority of studies that were documented. Therefore, this study is timely.

4. Methodology

4.1. Model Specification

Drawing from Levine (2007) model on financial inclusion, which was adopted by Lenka & Bairwa (2016) and extended by Demigic-Kunt, Klapper & Singer (2017), our model is specified as:

$$GDPP = F(finInc, HumCap) \tag{1}$$

$$GDPPC_{it} = \alpha_0 + \alpha_1 \sum_{i=1}^{n=3} FinInc_{it} + \alpha_2 \sum_{i=1}^{n=2} HumCap_{it} + \ell_{it} \tag{2}$$

$$GDPPC_{it} = \alpha_0 + \alpha_1 ATMs_{it} + \alpha_2 CBB_{it} + \alpha_3 DCB_{it} + \alpha_4 EPE_{it} + \alpha_5 GEE_{it} + e_{it} \tag{3}$$

4.2. Estimation Techniques

4.2.1. Fixed Effect Model

Given a linear regression model of the form:

$$Y_{it} = \beta_1 X_{it1} + \beta_2 X_{it2} + \mu_{it} \qquad \text{for } i = 1, 2, \ldots, N \text{ and } t = 1, 2, \ldots, T$$

Where:

Y_{it} is the value of Y for both the individual (*ith)* unit and time (*tth)* period; for the set of independent variables, X_{it1} denotes value of X_1 for both individual unit and time period and X_{it2} analogously denotes the same for the value of X_2..

Hence, the fixed effects regression model can take the form:

$$Y_{it} = \beta_1 X_{it1} + \beta_2 X_{it2} + \nu_i + \varepsilon_{it}$$

Given that; $\mu_{it} = \nu_i + \varepsilon_{it}$ for all disturbance terms, that diverge transversely within the units but are fixed over time and concurrently across units and time.

Going by the assumption of fixed effect of *ith* on Y for a given parameter α_i, an extension of the fixed effects model can be specified as

$$Y_{it} = \beta_1 X_{it1} + \beta_2 X_{it2} + \alpha_1 + \alpha_2 + \ldots + \alpha_N + \varepsilon_{it}$$

This model can be estimated by incorporating a dummy variable for each of the *N* units in the sample defined as:

$$D_{kit} = \begin{cases} 1 & \text{if } k = i \\ 0 & \text{if } k \neq i \end{cases}$$

This can be estimated given a regression equation (without an intercept) of the form:

$$Y_{it} = \alpha_1 D_{1it} + \alpha_2 D_{2it} + \ldots + \alpha_n D_{Nit} + \beta_1 X_{it1} + \beta_2 X_{it2} + \varepsilon_{it}$$

or given a regression equation (with an intercept) of the form

$$Y_{it} = \alpha_1 + \alpha_2 D_{2it} + \ldots + \alpha_n D_{Nit} + \beta_1 X_{it1} + \beta_2 X_{it2} + \varepsilon_{it}$$

4.2.2. Random Effects Model

Building a random effect model from the linear regression model, it can be infer that v_i (conversely to the fixed effect model) is given by

$$v_i = \alpha_0 + \omega_i \qquad \text{for } i = 1, 2, \ldots, N$$

where the v_i denotes a set of a deterministic component α_0 and a random component v_i. Once again, each of the N units has its own intercept. Additionally, the N intercepts in this model denote random variables as opposed to the fixed parameters (of fixed effect model).

Extensively, the error term ω_i satisfies the conditions of:

$$E(\omega_i) = 0 \qquad Var(\omega_i) = \sigma_\omega^2 \qquad Cov(\omega_i,\omega_s) = 0 \qquad Cov(\omega_i,X_{stk}) = 0$$

Hence, the random effects model can be equally modified as

$$Y_{it} = \alpha_0 + \beta_1 X_{it1} + \beta_2 X_{it2} + \mu_{it}$$

where $\mu_{it} = \omega_i + \varepsilon_i$ given that μ_{it} is uncorrelated with any of the independent variables and given

$$Corr(\mu_{it}, \mu_{is}) = \sigma^2_\omega / (\sigma^2_\omega + \sigma^2_\varepsilon)$$

As the correlation coefficient for the error term for the *ith* unit at any given two time periods *t* and s. Where σ^2_ω denotes the variance of ω_i, while corresponding variance of ε_{it} is denoted by σ^2_ε.

4.2.3. The Hausman-Test

To decide which of the two models to adopt, we employ the Hausman-test which orthogonally tests for random effects given that:

$$y_{it} = c + \mathbf{x}_{it}\beta + z_{it}\gamma + \alpha_i + \varepsilon_{it}$$

Where For a formal association between the α_i and $(\bar{x}_{i.}, z_i)$ stated as:

$$\alpha_i = a + \bar{x}_{i.}\lambda + z_i\eta + w_i$$

For the null and alternative hypotheses:

$$H_0 : \lambda = \eta = 0$$
$$H_A : \lambda \neq 0 \text{ and } \eta \neq 0$$

4.2.4. Generalised Method Moment Panel Approach

For adequate estimation, the presence of heteroscedasticity was accounted for by estimating with generalized method of moments (GMM) estimators developed for dynamic models of panel data which was proposed by Holtz-Eakin *et al.,* (1990), Arellano & Bond (1991) and Arellano & Bover (1995). However, this estimator is associated with certain statistical shortcomings, however, Alonso-Borrego & Arellano (1996) and Blundell & Bond (1998) propose that the lagged levels of the independent variables tend to be weak instruments for the regression equation in differences when these variables are insistent over time. To moderate the latent biases related with the difference estimator, this study adopts Difference GMM estimates which uses lagged differences of dependent variable as instruments for the equation in levels in addition to lagged levels of dependent variable as instruments for equations in first differences is adopted. This extended

GMM estimator according to Blundell & Bond (1998) presupposes efficient outcome where the first-difference.

4.3. Data Used

The scope of this paper covers 55 African countries with data overlapping a time of 2004-2015. The scope and coverage are constraint by data availability consideration. The dataset is from the World Development Indicators (WDI, 2016)

5. Empirical Results

The descriptive statistics for the designated variables are indicated in table 1 the mean values for all variables exhibited positive trend on average except for the aggregated financial inclusion index. Of the disaggregated variables of financial inclusion, the depositors with commercial, which are predominantly high compared to the other variables, are indicative of the wide outreach of banks branches grassroots in Africa. For example, a commission based system is common in Africa where a set of personnel are hired to take registration to the doorsteps people at homes, offices, market places, schools, occasions etc. this method has yielded an unprecedented success in terms of volume of deposit to the banks. The wide range of disparity between the human capital components is suggestive of inability of government expenditure on education to commensurate with school enrolment rates. A point of reference can be made to the inability of most African countries meet up with 26% budgetary on education.

Table 1. *Descriptive Statistics*

	Details	Unit of measurement	Mean	Std. Dev.	Min	Max
GDPPC	Gross domestic product per capita	current US$	1725.124	2028.140	210.4742	10062.91
ATMs	Automated teller machines (ATMs)	per 100,000 adults	8.563865	13.05436	0.030552	54.41506
CBB	Commercial bank branches	per 100,000 adults	9.810374	27.89203	0.395034	253.1915
B	Depositors with commercial banks	per 1,000 adults	269.2155	365.6546	1.146184	1713.740
EPE	Enrolment in primary education,	both sexes (number)	3117080.	3281456.	67745.00	14532477
GEE	Government expenditure on education	Total (% of GDP)	5.017638	2.367809	1.099720	14.79096
FININDEX	Financial inclusion index	per 1,000 adults	-0.03037	1.694343	-1.13181	8.672883
HCINDEX	Human capital index	Total (% of GDP)	0.074426	1.249322	-3.14324	4.055280

Note: GDPPC is used proxy for economic growth. ATMs, CBB and DCB are components used to proxy financial inclusion. EPE and GEE are components used to proxy human capital. FININDEX denotes single index for financial inclusion exhibiting a joint of effects of ATMs, CBB and DCB. HCINDEX denotes single index for human capital unveiling a combined effect of EPE and GEE. Indexes are calculated using the principal component analysis (PCA) proposed by Karl (1901).

Table 2a. *Financial Inclusion*

Principal component	Eigen values	Proportion (%)	Cumulative (%)
1	2.125859	0.7086	0.7086
2	0.623635	0.2079	0.9165
3	0.250507	0.0835	1.0000

Table 2b. *Human Capital*

Principal component	Eigen values	Proportion (%)n	Proportion
1	1.041804	0.5209	0.5209
2	0.958196	0.4791	1.0000

Table 2a presents results of Principal Component Analysis (PCA). Based on the result of the 'aggregate' index for financial inclusion, it could be concluded that the first two principal components explain about 91 per cent of the total variation in the original dataset. The first index explains about 70 per cent of the total variation in

the model. Similarly, the first variable in table 2b explains about 52 per cent of the total in the original dataset.

Table 3. *Correlations Matrix*

	GDPPC	ATM	CBB	DCB	EPE	GEE	FININDEX	HCINDEX
GDPPC	1.							
ATM	0.882658	1.						
CBB	0.549906	0.540909	1					
DCB	0.681894	0.845660	0.583660	1				
EPE	-0.229496	-0.243050	-0.000110	-0.206912	1.			
GEE	0.250935	0.229624	0.020302	0.243745	-0.228448	1.		
FININDEX	0.801412	0.906064	0.803243	0.925089	-0.171814	0.188796	1.	
HCINDEX	0.306677	0.301418	0.013201	0.287819	-0.776823	0.790531	0.230198	1.

Table 3 shows the correlation matrix. The relationship between economic growth and all other variables is positive except for EPE. Similar trend of positive association is observable among ATMs, CBB and DBB with other corresponding variables excluding EPE. A generic pattern of behavior here is pointing to the fact that Enrolment in primary education is more of deterrent to financial inclusion and human capital. This is may be sound right going by the high rate of disparity between enrolment in the primary level and other levels of education. A percentage of students who enrolled for primary do not seem to progress beyond the level while there equally cases of dropouts.

Table 4a. *Financial Inclusion-Economic Growth Model*

Independent Variables	FE	RE	GMM
C	2420.10***	2317.67***	
ATM	39.84***	41.30***	29.73368***
CBB	3.84	3.99	13.27753***
DCB	-0.17	-0.16	-2.425565***
GDPPC(-1)			0.445187***
Hausman	4.27		
R2	1.49		

Note: ***, **, * indicate the level of statistical significant at 1%, 5% and 10%, in that order. (#) Null hypothesis: No significant relationship

Table 4b. *Financial Inclusion-Economic Growth Model (aggregated)*

Independent Variables	FE	RE	GMM
C	2688.67***	2688.67***	
FININDEX	281.53***	297.25***	52.58***
GDPPC(-1)			0.45***
Hausman	4.12*		
R2	1.29		

Note: ***, **, * indicate the level of statistical significant at 1%, 5% and 10%, in that order. (#) Null hypothesis: No significant relationship

In elucidating the empirical interlock between our variables of interest, we estimated a static model and generalized method of moment to probe the level and direction of impacts of the independent variables on economic. Empirical fallouts from the financial inclusion-economic growth model in table 4a suggest that fixed effect is suitable for explaining the panel of relationship in the model as supported by the value of Hausman test at the bottom of the table. While random effect supports a positive and significant relationship between ATMs and economic growth leaving an insignificant impact with CBB and DCB, the GMM model supports a statistically significant and positive influence of the variables (except for DCB with negative sign) on economic growth. Table 4b which presents an aggregated version of the model did not only support the appropriateness of fixed effect model but also joint reveal that both fixed effect and GMM results support the existence of statistically significant relationship between financial inclusion and economic. Additionally, the GMM results from both tables 4a&b are reveal that the lag of GDPPC has significant and positive impacts on economic growth of the African continents. Our result corroborates the findings of Demigic-Kunt, Klapper & Singer (2017), Lenka, & Bairwa (2016) on the direction and level of impacts

between economic growth and financial inclusion. This therefore implies that financial inclusion is not only a germane to the African economies during the boom or bust periods, but also inexorable for sustained growth in the continent.

Table 5a. *Human Capital-Economic Growth Model*

Independent Variables	FE	RE	GMM
C	1974.62***	1860.16***	
EPE	2.36	9.54	-0.00***
GEE	23.13	28.64	-29.58***
GDPPC(-1)	-	-	0.88***
Hausman	1.16		
R2	-1.70		

Note: ***, **, * indicate the level of statistical significant at 1%, 5% and 10%, in that order. (#) Null hypothesis: No significant relationship

Table 5b. *Human Capital-Economic Growth Model (aggregated)*

Independent Variables	FE	RE	GMM
C	2148***	2025.11***	
HCINDEX	57.32	73.28	-73.10***
GDPPC(-1)			0.87***
Hausman	0.68		
R2	-1.73*		

Note: ***, **, * indicate the level of statistical significant at 1%, 5% and 10%, in that order. (#) Null hypothesis: No significant relationship

Tables 5a and b support the adoption of fixed effect and random effect respectively giving the significance level of the Hausman test. Results emanating from both tables of the static model (fixed or random) suggest that human capital insignificantly influences economic growth. Conversely, the GMM model suggests a significant but negative relationship between human capital and economic growth in Africa. However, the lag of GDPPC that is both significant and positive in both cases further support similar results reported in the financial inclusion-economic growth model in table 4a&b. We therefore infer from our results that the level of human capital achievements in Africa is not sufficient to drive the economy both during the expansionary and contractionary periods as suggested by the boom-bust concept. And the negative relationship suggested by the GMM model implies that human capital is on the deficit in Africa since huge amount and long years of investment in the citizen have not yielded to increased growth in the continent. A point of reference can be made to the high level of disparity between the periods of enrolment and education attainment at each of education. It is observable that many of the students who enrolled for school hardly graduate and the few who graduated rarely step further to higher levels.

Table 6. *Robustness Check Static Model: Financial Inclusion-Human Capital*

Independent Variables	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	ŁE
C	2621.79***	2379.22***	2620.21***	2369.21***	2420.10***	2317.67***	1938.07***	2482.63***	1379.31***	1535.6***	2773.48***	2688.67***	1735.3***	930.56***
ATM	43.12***	44.66**	41.29***	42.76***	39.84***	41.30***	27.38***	28.52***	19.88***	24.12***				
CBB			3.67*	3.72*	3.84	3.99	3.74**	3.72**	3.80***	3.64***				
DCB					0.17	0.16	0.10	0.14	0.24	0.40***				
EPE							1.45	-2.63	3.08	-9.32				
GEE									4.61	11.50				
FININDEX											281.53***	297.26***	229.1577*	245.8203** *
HCINDEX													-42.5020	-19.72463
Hausman	6.32””		6.19**		4.27		10.57**		195.69***		4.12**			

Note: ***, **, * indicate the level of statistical significant at 1%, 5% and 10%, in that order. (#) Null hypothesis: No significant relationship

For robustness purpose, we estimate an all-inclusive model encapsulating wider variables of both financial inclusion and human capital. this is necessary to help us determine whether interactions between the two regressors will impact divergently on the dependent variable from their disjoint impacts. The results emanating from the table are highly policy sensitive for decision making on the economies of

Africa. While the results mostly support the appropriateness of random effect except for model 3 suggesting otherwise, it was evident that ATMs and CBB exert both significant and positive impacts on economic growth. This result did not substantiate the fallouts from the previous tables, but also reflect the situational trend in operation across African countries. Consequently, ATMs and CBB are perceived as enhancing medium of accelerating the wide reach of including the unbanked population in Africa. We can infer from this trend of relationship that financial development through expansion of the banking industry and technology advancement witnessed with increased points of ATMs in Africa has not only enhanced inclusiveness in the region but has resulted to an unprecedented growth in the region's economic growth. This assertion is in consonant with World Bank (2013, 2014), Levine (2000), Ditus & Klein (2011), Jansen (2010).

Table 7. *Robustness Check GMM Model: Financial Inclusion-Human Capital*

Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
GDPPC(-1	0.54***	0.54***	0.45***	GDPPC(-1)	0.64***	0.45***	0.60***
ATM	5.42***	1.89***	29.73***	ATM	1.239***		
CBB		3.70***	13.28***	CBB	1.80***		
DCB			-2.43***	DCB	-0.13***		
EPE				EPE	7.32***		
GEE					2.39		
FININDEX						52.58***	60.92***
HCINDEX							1.13
Wald	1.90***	2.92***	144***	722159.5***	28559.32***	2.99***	671798.0***
R2	-0.87	-0.87	1.49	-0.99	-1.06	1.29	-1.17

Note: ***, **, * indicate the level of statistical significant at 1%, 5% and 10%, in that order. (#) Null hypothesis: No significant relationship

Considering the limitation of OLS to control for the issue of endogeneity, we result to estimating a system GMM equation for robustness purpose in table 7. It is imperative to accentuate that the results obtained portray a divergent result (to the static model) going by the significant level of the entire variable except for GEE. This implies that, given a stable and far-reaching financial inclusion and well-thought human capital plan and capacity building, the growth prospects of the African continent will be fully and sustainably exploited. The insignificant influence of GEE support results from the static model and further stresses the facts that government and policy makers must take a decisive action on the level of human capital investment in the continent through its annual budget allocation to the education sector.

With reference to post estimation tests, the reported values on table 7 for the Arellano-Bond test of second order serial correlation are the second order autocorrelated disturbances p-values in the first-differenced equation. As reported in the Table, there is no evidence for significant second order autocorrelation, which draws the empirical conclusion that the models are properly specified and sufficient to account for the level of variation between the regressed and the regressors.

In addition, the combined significance of our empirical variables in the model as revealed by the Wald test underpins our assertion about the validity, correctness of our obtained results. More importantly, the overall results from the system GMM evidence that financial inclusion anchored on the role of human capital is significant in achieving long term economically sustained growth in Africa continent.

Table 8. *Pairwise Granger Causality Tests*

Null Hypothesis:	Obs	F-Statistic	Prob.
FININDEX does not Granger Cause GDPPC	249	1.14210	0.3208
GDPPC does not Granger Cause FININDEX		0.18273	0.8331
HCINDEX does not Granger Cause GDPPC	120	0.30451	0.7381
GDPPC does not Granger Cause HCINDEX		2.31429	0.1034
HCINDEX does not Granger Cause FININDEX	44	3.21454	0.0510*
FININDEX does not Granger Cause HCINDEX		0.45149	0.6400

Note: ***, **, * indicate the level of statistical significant at 1%, 5% and 10%, in that order. (#) Null hypothesis: No causal relationship.

Empirical evidence emanating from pairwise granger causality in table 8 reveals a very microscopic direction of causality among the variables. Of all the variations in the direction of causality, a unidirectional causality running from human capital to financial inclusion was evident in from the table. Hence, it can be inferred that the level of education is a major determinant of how financially inclusive or exclusive the people of a given country will be.

6. Conclusion and Recommendations

In the past few years, substantial number of attention have been dedicated to study the implication of financial inclusion in different dimensions. While, the intellectual cases are compelling, and evidences are persuasive. This paper contributes to existing literature by explaining the dynamic of financial inclusion and human capital on long term economic growth for 55 African countries between 2004 and 2015. Fixed Effect, Generalised Method of Moment Panel Model and the Panel Pairwise Granger Causality Tests were employed as estimation techniques. the results show that ATMs and CBB exert both significant and positive impacts on economic growth. Suggesting that financial development through expansion of the banking industry and technology advancement witnessed with increased points of ATMs in Africa has not only enhanced inclusiveness in the region but has resulted to an unprecedented growth in the region's economic growth. This assertion is in consonant with World Bank (2013, 2014), Levine (2000), Ditus & Klein (2011), & Jansen (2010). While, the insignificant influence of Government Expenditure on education (GEE) support results from the static model and further stresses the facts that government and policy makers must take a decisive action on the level of human capital investment in the continent through its annual budget allocation to the education sector. Two major recommendation can be inferred from this study: First, the study recommends that there is urgent need for the CBs in Africa to intensify more effort to bank the unbanked population to have a sound, stable, and inclusive financial system through strategic financial innovation and bank proximity. Second, there need for African government to dedicate more budget allocation on education in other to improve the level of human capital development in Africa.

Appendix

Table 1. *Regional Distribution of Financial Inclusion Indicators*

Commercial bank branches (per 100,000 adults)					
	2005-2006	2007-2008	2009-2010	2011-2012	2013-2014
East Asia & Pacific	24.07	21.09	20.44	21.65	20.28
Europe & Central Asia	51.45	53.72	51.34	48.75	49.15
Latin America & Caribbean	25.50	26.29	26.97	26.6	28.08
Middle East & North Africa	22.85	26.00	27.31	25.57	27.93
Sub-Saharan Africa	3.13	5.31	6.40	7.95	10.20
Automated teller machines (ATMs) (per 100,000 adults)					
	2005-2006	2007-2008	2009-2010	2011-2012	2013-2014
East Asia & Pacific	56.63	52.95	41.84	68.66	98.42
Europe & Central Asia	78.06	103.43	116.71	119.64	119.35
Latin America & Caribbean	46.8	52.23	62.56	70.30	80.70
Middle East & North Africa	19.40	30.42	38.90	44.63	58.10
Sub-Saharan Africa	3.13	5.31	6.40	7.95	10.20

Table 2. *Regional Distribution of Human Capital Indicators*

Health expenditure per capita, PPP (constant 2011 international $)					
	2005-2006	2007-2008	2009-2010	2011-2012	2013-2014
Europe & Central Asia	35.60	41.43	46.17	48.62	50.97
European Union	51.90	58.67	64.41	67.41	69.61
Latin America & Caribbean	14.81	17.15	19.07	20.10	21.90
Middle East & North Africa	11.56	12.80	16.32	17.00	18.69
Sub-Saharan Africa	3.16	3.65	3.74	3.706	3.97
Enrolment in primary education, both sexes (thousand)					
	2005-2006	2007-2008	2009-2010	2011-2012	2013-2014
East Asia & Pacific	391	382	373	370	365
European Union	573	565	558	557	570
Latin America & Caribbean	138	137	135	133	131
Middle East & North Africa	851	856	858	884	948
Sub-Saharan Africa	238	260	276	293	312

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