Financial inclusion and economic growth: the role of commercial banks in West Africa

Jiang Hong Li[a], Prince Asare Vitenu-Sackey

Jiangsu University, E-mail address: pavsackey@gmail.com

Abstract

The economic growth of a country depends on how the units of the economy are financially included to be economically active and viable. This paper examines the role commercial banks play in financial inclusion on economic growth by using panel data on 10 West African countries from 2004 to 2015. Four econometric models are used to statistically infer on the outcome of the study and to find out the long run relationship between financial inclusion and economic growth. The empirical results infer that there is a long run impact of financial inclusion on economic growth and also have a strong positive relationship or impact on economic growth with an effective role played by the commercial banks. The study recommends that commercial banks should be innovative and also reach out to the unbanked populace with enticing products and services. Moreover, governments should create an enabling environment for high financial literacy in education and awareness creation.

1. Introduction

West Africa is a continent in the Sub-Saharan African continent with 16 countries and a population of 362,261,579 million (est. 2016). It has an area of approximately 6.1 million square kilometers and population density of 49.2 per kilometer square (127.5 per square meters). The 16 countries that constitute West Africa, with their high population densities, their various trading and monetary union blocs, their natural resources, including oil, and the sheer dynamism of their businesses, form one of the most attractive groupings in the continent. But the development of the industry has been uneven in the region, with some countries left out of the circle of new technology and connectivity while others have developed state of the art systems (Firend Alan Rasch, 2018). Perhaps, the region is becoming gradually integrated with local- and foreign-owned multinational banks greatly easing the flow of trade and investment in the sub-region (African Business Magazine, 2011).

In order to reduce income disparities and poverty which is among the top global problems; it is imperative for governments to ensure financial inclusion in their respective countries. Perhaps, in the avoidance of inclusive financial systems, poverty threat can emerge and jeopardize economic development since access to financial tools allows people to invest in their education, finance projects and become entrepreneurs as well as economically independent (Demirgüc̦-Kunt and Klapper, 2012b). Being a man, richer, more educated and older contribute positive to financial inclusion with a higher influence of education and income; mobile banking is driven by the same determinants than traditional banking (Alexandra and Laurent, 2016; Firend Al R., & Araghi, 2015). Alexandra and Laurent (2016) observed that the determinants of informal finance differ from those of formal finance; from the observation of their study it could be established that the poor is left in financial inclusion in Africa, which is a dire problem to solving or bridging the gap between the poor and the rich (Firend Al. R., & Wang Q., 2018). The motivation of this study is derived from the urgency of financial inclusion as a key global priority and governments, international development agencies, academics, and the private sector, have all brought financial inclusion to the top of the agenda. The World Bank has culminated universal financial access by 2020 as one of its pertinent goals, and expressed that more than 50 countries are strongly and seriously developing financial inclusion plans and policies (Firend Al R., 2015). The emergency surrounding financial inclusion is not amazed, given that 50% of the global adult population remained unbanked (Financial Access Initiative, 2010). Governments and businesses can be more efficient, and unbanked populations will find a better quality of life if financial products are extended to them (MasterCard Analysis, 2012).

Apparently, this motivates the study to ascertain how financial inclusion impact economic growth and how commercial banks have played their roles to ensure no one is left behind in the economic emancipation and financial liberalization efforts to bridge the gap between the rich and the poor.

The contribution of this study is to add up to the already existing literatures on financial inclusion (Alexandra and Laurent, 2016; Firend Al R. 2015; Demirgüç-Kunt and Klapper, 2012b; Fungácová and Weill, 2015, Kim et al. 2018) for policy direction and academic perusal. To contribute immensely to the literatures on financial inclusion, this study adopts robustness analysis to make statistical inference. This study intends to examine the role and impact that the commercials banks in West Africa play in financial inclusion that propel economic growth in the long run. The objectives of this study are to; examine the long run and robust impact of commercial banks in financial inclusion on economic growth in West Africa, find the correlation among the role of commercial banks, financial inclusion and economic growth and to ascertain the impact of financial inclusion on economic growth in the high gdp per capita and low gdp per capita countries. The study adopts panel data methodologies thus robust least squares regression and generalized linear models to confirm the robustness of the study to make statistical inference.

2. Review of Literatures

Financial inclusion has been considered and caught the attention of policy makers and researchers since the 1990s (Kim et al. 2017; Leyshon and Thrift, 1993, 1994, 1995; Collard, 2010; Kempson and Whyley, 1999; Treasury HM, 2004b and Allen et al., 2012). Financial Inclusion is intended to connect people to banks (financial services) with consequential benefits and ensuring that the financial system plays its due role in promoting inclusive growth is one of the biggest challenges facing the emerging economies. Access to safe, easy and affordable groups, disadvantaged areas and lagging sectors is recognized as a precondition for accelerating growth, reducing income disparities and poverty (Firend Al R., & Hashim, 2015). Access to a well-functioning financial system, by creating equal opportunities, enables economically and socially excluded people to integrate better into the economy and actively contribute to development and protects themselves against economic shocks (Vighueswara, 2014). Financial inclusion is a system through which a developing country like India can attain inclusive growth by connecting the contribution of weaker or rural population of the country with the main stream (Sewata and Rahul, 2017). Financial inclusion is the key promoter of development hence governments have made it their top most priority (Thankom and Rajalaxmi, 2015). Financial inclusion is a government policy used by developing and emerging countries to grow their economies. According to Massomeh et al. (2017), financial inclusion is said to be effective by gathering resources previously unaccounted for and repurposing them as resources for investment. The mechanisms to achieve this include the use of mobile or otherwise accessible banking, availability of affordable financial services, wider credit availability, and having reliable savings tools (Mehrotra & Yetman, 2015).

Some studies find that the impact of financial inclusion on growth depends on firms' access to credit rather than households; most notably by reducing the ''financing gap" faced by small- and medium sized firms and industries (GPFI, 2011; Beck, Bu¨yu¨kkarabacak, Rioja, & Valev, 2012). Lisa and Luc (2017) found out that there is a positive impact of financial inclusion on firms' growth and performance. Financial inclusion reduces liquidity constraints and encourages investment. The distribution of credit across firms at the sectoral level therefore has important effects on the industrial structure, competition, or the degree of informality in the sector, particularly in low income countries (Beck, Demirguc-Kunt, & Maksimovic, 2005). Franklin et al. (2016) examined the foundations of financial inclusion: understanding ownership and use of formal accounts; they found out that the closeness of financial services and the cost of owing account have a greater impact on financial inclusion. Badar and Shaista, (2017) assessed the role of banks in financial inclusion in India and they found a positive and significant impact of financial inclusion on economic growth. Antonia et al. (2018) opined that an improved financial inclusion has welfare effects that go beyond the benefits in the financial sector to economic benefits (Firend Al R., 2016).

Kim et al. (2018) studied the impact of financial inclusion on economic growth in the OIC countries, they employed dynamic panel estimation methodologies thus GMM for 57 countries and their conclusion is that financial inclusion has a positive effect or impact on economic growth and also have a mutual causality. Steel et al. (1997) shared information about informal finance in four African countries (Ghana, Malawi, Nigeria and Tanzania) with data covering 1992 and 1993. They elaborated on African economies and made a pronouncement that African economies constitute

dualistic financial systems in the form of formal banks and informal financial agents. They explain the informal financial sector by two main reasons; firstly, financial repression and secondly, the systems inefficiency of the formal banks to contribute to low access to credit. They conclude that, in the medium term, informal financial agents have a positive impact by deepening the access to financial services for the broader population. In spite of this, this study would like to focus on the role the formal banks play in financial inclusion to propel economic growth and financial liberation.

Upon review of the above literatures, financial inclusion has caught the attention of policy makers and researchers, but there are a few studies into the area. This study has leveled on the gap to assess the impact financial inclusion has on economic growth in the West African region with the emphasis on the role that commercial banks play.

3. Methodology and Data

3.1 Methodology

The study applies a panel regression models by using panel unit root tests, correlation matrix, Pedroni and Kao cointegration test, Censored or Truncated data (Including Tobit), Robust least squares and homogeneous causality test methods in this paper to study the role commercial banks play in financial inclusion to economic growth in 10 West African countries. By using these models, it can examine the driven factors of financial inclusion in West African countries in the long run estimations. Testing for cointegration implies testing for the existence of such a long-run relationship between economic variables.

Equation **1**

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Where, gdppc represents gross domestic product per capita, no_banks represent the total number of commercial banks, banks_branches represent the total number of branches per 1000 km square, Atm represent the number of Automated teller machines in the whole country, deposits_gdp represent total deposits with commercial banks as percentage of gdp and loans_gdp represent total loans granted by commercial banks as percentage of gdp. However, the data used in logarithmic and the econometric model is written in the following model.

Equation **2**

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Where β_0 is the intercept, i=1 …. I represent the cross section of the countries, t =1……t represents the time period and μ_{it} represents error term (disturbances and other factors that were not considered). The study commences with the analysis by testing the panel data, and in order to avoid spurious regression, a group unit root test is conducted. However, for using robust least square and censored or truncated data methodologies, the study ensures possibility of the long-run equilibrium among the variables examined. Firstly, the unit root tests are computed in order to check for stationarity among the variables. Therefore, the following methods are adopted; Levin-Lin Chu (LLC) Levin et al. (2002), Im-Pesaran Shim (IPS) Im et al. (2003), Fisher Augmented Dickey-Fuller (ADF) and Fisher Philips-Perron (PP) tests (Maddala and Wu, 1999). The study restricts itself to these three panel unit root test because Levin et al. (2002) test statistic for the homogeneity, Im et al. (2003), Fisher ADF and Fisher PP (Maddala and Wu, 1999) test statistic for heterogeneity. However, the specification proposed by Im et al. (2003) is as follows:

Equation **3**

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In the equation, x_{it} represents the combination of all the explanatory variables; ρ_i represents the autoregressive elasticities, ε_{it} denotes the residual term whilst $_i$ and $_t$ represents the time period. Im et al. (2003) make way for different order of serial correlation (Apergis and Payne, 2010) and subsequent the normal averaging of augmented dickey Fuller (Inglesi-Lotz, 2016) given as: the equation is adopted from (Maji and Sulaiman, 2019).

Equation **4**

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Substituting Eq. (3) into Eq. (4) yield the following:

Equation **5**

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In the resulting eqn. (5), ρi denotes the number of lags in the ADF regression. The null hypothesis of the panel unit root tests is that each variable has a unit root and the alternate hypothesis reports that at least one of the variables in the panel is stationary in series.

Secondly, after the estimation of the unit root test and all the variables prove stationary then it allows for the cointegration test. The regression of time series panel data requires either stationarity or cointegration. Cointegration tests investigate the residuals of spurious regressions of non-stationary variables. In Eqn. (6) below, the dependent variable y is regressed on x to obtain the residual e_{it}. The parameter σi is the individual effect and θi is the deterministic trend. To ascertain the Null hypothesis, H_o of no cointegration, the variables are not cointegrated and the residuals will be an I(1) process. To conclude, if the variables are cointegrated then the

residuals in the alternative hypothesis H_1 is an I(0) process. Kao (1999) test and approach allows more than one exogeneous variable, the long run estimation or model can be derived as (Maji and Sulaiman, 2019): Equation (6) Model 1 - 5……:

Error! Objects cannot be created from editing field codes.………………………………Model 1

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In the equation (6) (Model 1 – 5), $i = 1,…N$ represents the cross sectional observation, $t = 1,……,T$ represents the time period. gdppc refers to gross domestic product per capita, no_banks represents number of commercial banks, ATM is termed from the total of number of ATMs countrywide, Deposits_gdp refers to total deposits with commercial banks, banks_branches termed as number of branches of commercial banks and loans_gdp connotes loans granted by commercial banks, inf refers to inflation, Sep stands for school enrolment in primary, ume refers to unemployment rate, Pop means population growth and trade stands for trade openness. The symbol π represents the elasticities that will be estimated, y_{it} and ∂_{it} enable the specific effects and deterministic trend effects for each country. The error term is expected to be normally and identically distributed with zero mean and constant variance, therefore, the symbol μ_{it} represents the error term.

After the cointegration test has been done and evidenced that the variables are cointegrated; the next step is to run the long run equilibrium model in Eqn. (6) Model 1 to 5, to estimate the dynamics among the variables. At this stage, the main models for the study thus Robust least squares and Censored or Truncated data (including Tobit) models are used for the robustness of the study to make statistical inference. Robust least square regression is used to overcome the parametric and non-parametric methods.

3.2 Data

The study variables consist of panel data of gross domestic product per capita, number of commercial banks, number of commercial banks branches, number of ATMs, total deposits with commercial banks and total loans granted by

commercial banks in 10 West African countries. The 10 countries sample was drawn from 16 countries based on availability of data. The countries for the study come in three categories; all 10 countries, high GDP per capita countries and low gdp per capita countries. The study's data was gathered from IMF financial access survey and World Bank development indicators from 2004 – 2015. Table 1 depicts the specification and description of the variables used in the study. Financial inclusion is measured by proxies of number of automated teller machines countrywide, commercial bank branches per 1000 km2, number of commercial banks, total loans granted by commercial banks in a year and total deposits mobilized by commercial banks in a year. As financial inclusion harnesses economic growth, GDP per capita is considered as proxy to measure economic growth and also as the dependent variable. To control economic growth variable in the study the following variables are considered to measure the impact of financial inclusion on economic growth with an emphasis on the role commercial banks play, they are; inflation (annual %) for consumer prices, population growth rate, unemployment rate, school enrolment for primary education and trade openness (% of GDP), in line with literatures of Bjork (1999), Mankiw (2012), Firend Al R., (2015) and Kim et al., (2018).

Table 1 Variables and descriptions

variables	variable description	source
LnLoans_gdp	Use of Financial Services: Outstanding loans from commercial banks (% of GDP), Percent	IMF Financial access survey
No_Banks	Geographical Outreach, Number of Commercial banks,	IMF Financial access survey
Banks_Branches	Geographical Outreach: Number of commercial bank branches per 1000 km2, Number	IMF Financial access survey
LnDeposits_gdp	Use of Financial Services: Outstanding deposits with commercial banks (% of GDP), Percent	IMF Financial access survey
LnAtm	Geographical Outreach, Number of Automated Teller Machines (ATMs), Country wide,	IMF Financial access survey
Inf	Inflation, consumer prices (annual %)	World Development Indicators
Pop	Population growth (annual %)	World Development Indicators
LnSep	School enrollment, primary, male (% gross)	World Development Indicators
LnTrade	Trade (% of GDP)	World Development Indicators
Ume	Unemployment, total (% of total labor force) (modeled ILO estimate)	World Development Indicators
LnGdppc	GDP per capita ppp constant 2011	World Development Indicators

Note: Loans % of GDP, Deposit % of GDP, Automated teller machines, School enrolment in primary education, Trade openness and Gross domestic product per capita are transformed in natural logarithms in order to help minimize the fluctuation in data series. Source: Prepared by Author

Table 2 List of countries and their categories

Categories	High GDP per capita		Low GDP per capita
1	Nigeria	6	Benin
2	Ghana	7	Guinea

3		Ivory Coast		8		Mali
4		Senegal		9		Burkina Faso
5		The Gambia		10		Niger

Source: Prepared by Author

Table 3 Summary Statistics

	No_ Banks	Banks_ Branches	Lnatm	Loans _Gdp	Deposit _Gdp	Inf	Lnsep	Lntrade	Pop	Ume	Lngdppc
Mean	16.142	2.052	3.574	17.649	24.908	5.962	4.321	4.084	2.825	5.412	7.604
Median	13	0.981	4.102	17.720	23.814	4.070	4.432	4.113	2.808	5.041	7.507
Maximum	89	9.585	9.705	37.064	47.470	34.695	4.886	4.602	3.843	11.710	8.646
Minimum	6	0.021	0.000	1.217	5.642	-3.100	0.000	3.066	1.785	0.299	6.630
Std. Dev.	8.909	2.409	3.040	7.434	9.641	6.642	0.722	0.289	0.470	2.985	0.484
Skewness	4.705	1.484	0.133	0.046	0.282	1.602	-5.397	-0.585	0.246	0.128	0.056
Kurtosis	38.291	4.313	1.807	3.406	2.784	6.312	32.634	3.436	2.902	2.085	2.755
Jarque-Bera	6669.787	52.688	7.469	0.869	1.820	106.159	4973.394	7.804	1.260	4.512	0.363

Source: Prepared by Author

Table 3 summarizes the statistics of the variables adopted for the study. According to the table, the mean and median of the variables are very close and the standard deviations of all the variables are homogeneously related. Moreover, the statistical results posit that the variables are in normal distribution.

4. Results and Discussion

4.1 Correlation Matrix

Table 4 shows the correlation matrix among the variables; from the table it can be ascertained that there is no multicollinearity in the variables. The rule of thumb states that the correlation coefficient among the independent variables should not be more than -/+ 0.70 for two independent variables to be considered free from multicollinearity. The highest value in the table is 0.628 and the second highest is 0.609. Perhaps, there is no multicollinearity in the independent variables; no two independent variables have strong correlation with the dependent variable. No_banks, banks_branches, lnatm, loans_gdp, deposit_gdp, inf, ume and lnsep have positive correlation with the dependent variable whiles pop and lntrade have negative correlation with the dependent variable.

Table 4 Correlation matrix

	LNGDPPC	NO_BANKS	BANKS_BRANCHES	LNATM	LOANS_GDP	DEPOSIT_GDP	INF	LNSEP	LNTRADE	POP	UME
LNGDPPC	1										
NO_BANKS	0.628	1									
BANKS_BRANCHES	0.442	0.279	1								

LNATM	0.507	0.264	0.442	1						
LOANS_GDP	0.311	0.208	0.110	0.242	1					
DEPOSIT_GDP	0.220	0.068	0.542	0.262	0.766	1				
INF	0.241	0.192	0.189	0.134	-0.476	-0.368	1			
LNSEP	0.100	0.085	0.188	0.201	0.127	0.197	0.096	1		
LNTRADE	-0.064	-0.080	-0.169	-0.126	-0.108	-0.007	0.077	-0.154	1	
POP	-0.609	-0.317	-0.042	-0.150	0.123	0.131	-0.441	0.153	-0.300	1
UME	0.237	0.030	0.310	-0.056	0.256	0.470	-0.081	0.017	0.210	-0.071	1

Source: Prepared by Author

4. 2 Panel unit roots test

This study applied IPS test, Fisher tests (including Fisher-ADF test and Fisher-PP test) and Levin, lin & chu test to conduct the panel unit root tests, and the results are shown in Table 5. It indicates lngdppc and banks_branches are stationary with Levin test and, lnATM and No_Banks are stationary with Fisher PP test, inf, sep, pop and trade are all stationary at level with all the tests but the other tests of the other variables with the tests adopted are non-stationary. Thus, it can be concluded that all the variables became stationary after taking first differences. These results lay the foundation for the panel data regression analysis.

Table 5 Panel Unit root test

Variable	Form	Method	T-stat	P-value	sig.	conclusion
lngdppc	Level	Levin	-1.596	0.055	**	stationary
		IPS	2.194	0.986		non-stationary
		ADF-Fisher	9.574	0.975		non-stationary
		PP-Fisher	16.353	0.695		non-stationary
	First difference	Levin	-6.118	0.000	***	stationary
		IPS	-2.421	0.008	**	stationary
		ADF-Fisher	41.037	0.004	**	stationary
		PP-Fisher	61.358	0.000	***	stationary
no_banks	Level	Levin	2.064	0.981		non-stationary
		IPS	1.493	0.932		non-stationary
		ADF-Fisher	14.142	0.823		non-stationary
		PP-Fisher	50.704	0.000	***	stationary
	First difference	Levin	-45.486	0.000	***	stationary
		IPS	-18.102	0.000	***	stationary
		ADF-Fisher	91.666	0.000	***	stationary
		PP-Fisher	114.559	0.000	***	stationary
Banks_branches	Level	Levin	-3.767	0.000	***	stationary
		IPS	2.174	0.985		non-stationary
		ADF-Fisher	19.902	0.464		non-stationary
		PP-Fisher	16.259	0.701		non-stationary

	First difference	Levin	-5.785	0.000	***	stationary
		IPS	-4.338	0.000	***	stationary
		ADF-Fisher	51.152	0.000	***	stationary
		PP-Fisher	52.535	0.000	***	stationary
lnatm	Level	Levin	-1.247	0.106		non-stationary
		IPS	0.422	0.663		non-stationary
		ADF-Fisher	18.910	0.528		non-stationary
		PP-Fisher	32.803	0.036	**	stationary
	First difference	Levin	-16.623	0.000	***	stationary
		IPS	-9.084	0.000	***	stationary
		ADF-Fisher	65.312	0.000	***	stationary
		PP-Fisher	83.797	0.000	***	stationary
loans_gdp	Level	Levin	0.944	0.828		non-stationary
		IPS	3.949	1.000		non-stationary
		ADF-Fisher	10.901	0.949		non-stationary
		PP-Fisher	13.203	0.869		non-stationary
	First difference	Levin	-5.260	0.000	***	stationary
		IPS	-2.855	0.002	**	stationary
		ADF-Fisher	42.148	0.003	**	stationary
		PP-Fisher	44.189	0.001	***	stationary
deposit_gdp	Level	Levin	0.387	0.650		non-stationary
		IPS	3.865	1.000		non-stationary
		ADF-Fisher	10.826	0.951		non-stationary
		PP-Fisher	8.014	0.992		non-stationary
	First difference	Levin	-8.708	0.000	***	stationary
		IPS	4.985	0.000	***	stationary
		ADF-Fisher	59.347	0.000	***	stationary
		PP-Fisher	78.579	0.000	***	stationary
inf	Level	Levin	-7.802	0.000	***	stationary
		IPS	6.156	0.000	***	stationary
		ADF-Fisher	71.885	0.000	***	stationary
		PP-Fisher	78.444	0.000	***	stationary
	First difference	Levin	-13.885	0.000	***	stationary
		IPS	-10.048	0.000	***	stationary
		ADF-Fisher	109.687	0.000	***	stationary
		PP-Fisher	181.185	0.000	***	stationary
ume	Level	Levin	0.544	0.707		non-stationary
		IPS	1.446	0.926		non-stationary

		ADF-Fisher	11.004	0.946		non-stationary
		PP-Fisher	10.948	0.948		non-stationary
	First difference	Levin	-8.094	0.000	***	stationary
		IPS	-3.722	0.000	***	stationary
		ADF-Fisher	48.648	0.000	***	stationary
		PP-Fisher	34.169	0.025	**	stationary
sep	Level	Levin	-13.841	0.000	***	stationary
		IPS	-12.841	0.000	***	stationary
		ADF-Fisher	45.812	0.001	***	stationary
		PP-Fisher	66.713	0.000	***	stationary
	First difference	Levin	4.663	0.000	***	stationary
		IPS	-1.790	0.037	**	stationary
		ADF-Fisher	33.415	0.030	**	stationary
		PP-Fisher	34.463	0.023	**	stationary
pop	Level	Levin	-5.283	0.000	***	stationary
		IPS	-2.424	0.008	**	stationary
		ADF-Fisher	45.427	0.001	***	stationary
		PP-Fisher	42.565	0.002	**	stationary
	First difference	Levin	-7.367	0.000	***	stationary
		IPS	-4.196	0.000	***	stationary
		ADF-Fisher	76.843	0.000	***	stationary
		PP-Fisher	7.013	0.997		non-stationary
Trade	Level	Levin	-3.780	0.000	***	stationary
		IPS	-1.679	0.047	**	stationary
		ADF-Fisher	32.741	0.036	**	stationary
		PP-Fisher	29.005	0.088	*	stationary
	First difference	Levin	-8.966	0.000	***	stationary
		IPS	-5.909	0.000	***	stationary
		ADF-Fisher	66.886	0.000	***	stationary
		PP-Fisher	78.503	0.000	***	stationary

Notes: "***" indicates statistical significance at the 1% level. "**" indicates statistical significance at 5% level, "*" indicates statistical significance of 10% level. Source: Prepared by Author

4.3 Cointegration tests

In table 6, Pedroni (1999, 2004) and Kao and Chiang (2000) conitegration tests were used for the three groups that the study considered thus all 10 countries, high gdp per capita countries and low gdp per capita countries; the result confirms the existence of cointegration between the dependent and independent variables. Therefore, the null hypothesis that there is no cointegration between the variables is rejected. The results from seven tests performed four out of the seven were statistically significant at 1%, 5% and 10% respectively.

Table 6 Pedroni and Kao Cointegration tests

	All 10 countries			High GDP per capita countries			Low GDP per capita countries		
	statistics	p-value	sig.	statistics	p-value	sig.	statistics	p-value	sig.
V-stat	-0.849	0.802		-0.702	0.759		-0.490	0.688	
Rho-stat	2.445	0.993		1.631	0.949		1.834	0.967	
PP-stat	-3.149	0.001	***	-2.362	0.009	**	-2.080	0.019	**
ADF-stat	-2.856	0.002	**	-2.146	0.016	**	-1.886	0.030	**
Group rho-stat	3.608	1.000		2.503	0.994		2.599	0.995	
Group PP-stat	-7.058	0.000	***	4.471	0.000	***	-5.510	0.000	***
Group ADF-stat	-5.326	0.000	***	-2.920	0.002	**	-4.612	0.000	***
Kao	-2.936	0.002	**	-1.396	0.081	*	-3.267	0.001	***

Notes: "***" indicates statistical significance at the 1% level. "**" indicates statistical significance at 5% level, "*" indicates statistical significance of 10% level. Source: Prepared by Author

4.4 The Impact of financial inclusion on economic growth: Robust least square method (All 10 countries)

Table 7 depicts the results of the impact of financial inclusion on economic growth in all the 10 West African countries for all the 5 models adopted; all the financial inclusion variables thus No_banks, Banks_branches, lnatm, Loans_gdp, and deposit_gdp have positive and statistical significant impact on economic growth with coefficient of 0.050, 0.216, 0.055, 0.029 and 0.011 respectively; a percentage change in the financial inclusion variables will change economic growth by 0.050%, 0.0216%, 0.055% and 0.011% precisely. Moreover, inf and lnsep showed statistically insignificant impact on economic growth. Ume consistently showed positive and statistical significance with economic growth confirming its strong impact on economic growth in all models. Lntrade and pop showed negative and significant impact on economic growth.

Table 7 The impact of financial inclusion on economic growth: Robust least square method (All 10 countries)

Variables	All 10 countries				
	model 1	model 2	model 3	model 4	model 5
Inf	-0.004	-0.011	-0.006	0.005	0.001
	(-1.204)	(-4.553)***	(-1.135)	(1.471)	(0.197)
Ume	0.033	0.048	0.039	0.027	0.025
	(5.601)***	(9.149)***	(3.970)***	(4.795)***	(2.062)**
Lnsep	0.039	0.016	0.069	0.042	0.076
	(1.577)	(0.790)	(1.632)	(1.809)*	(1.637)
Pop	-0.444	-0.420	-0.741	-0.483	-0.748
	(-9.803)***	(-11.780)***	(-10.060)***	(-11.881)***	(-9.538)***
Lntrade	-0.428	0.010	-0.442	0.347	-0.440
	(-6.676)***	(0.183)	(-4.103)***	(5.808)***	(-3.807)***
No_banks	0.050	-	-	-	-

	(24.116)***	-	-	-	-
Banks_branches	-	0.216	-	-	-
	-	(32.588)***	-	-	-
LnAtm	-	-	0.055	-	-
	-	-	(5.570)***	-	-
Loans_gdp	-	-	-	0.029	-
	-	-	-	(11.260)***	-
Deposit_gdp	-	-	-	-	0.011
	-	-	-	-	(2.572)**
Cons.	9.496	0.216	10.847	6.561	10.779
	(27.278)***	(32.588)***	(19.099)***	(20.472)***	(17.711)***

Notes: "***" indicates statistical significance at the 1% level. "**" indicates statistical significance at 5% level, "*" indicates statistical significance of 10% level. Z-statistics are in parentheses. High GDP per capita countries are Nigeria, Ghana, Ivory Coast, Senegal and The Gambia. Low GDP per capita countries are Benin, Guinea, Mali, Burkina Faso and Niger. Source: Prepared by Author

4.5 Impact of financial inclusion on economic growth: High GDP per capita countries (Robust least square method)

Table 8 portrays the results of the impact of financial inclusion in the high gdp per capita countries; it can be evidenced that no_banks and inf have insignificant impact on economic growth whiles banks_branches, deposit_gdp, ume, pop and lntrade have negative and statistically significant impact on economic growth. Furthermore, loans_gdp and lnsep have consistent and strong positive impact on economic growth statistically significant. The number of banks and their branches do not positively increase economic growth in the high gdp per capita countries but more ATMs and loans tremendously increase economic growth. Therefore, financial inclusion increases economic growth in the high gdp per countries by the adoption of innovative banking products like the ATMs.

Table 8 Results from High GDP per capita countries: Robust least square

	High GDP per capita countries				
Variables	model 1	model 2	model 3	model 4	model 5
Inf	-0.000	0.004	0.000	0.004	-0.001
	(-0.069)	(0.763)	(0.041)	(0.878)	(-0.239)
Ume	-0.042	-0.044	-0.024	-0.037	-0.041
	(-2.564)**	(-2.770)**	(-1.639)	(-2.612)**	(-2.443)**
Lnsep	0.103	0.084	0.072	0.085	0.101
	(2.734)**	(2.311)**	(2.350)**	(2.610)**	(2.752)**
Pop	-0.651	-0.495	-0.656	-0.643	-0.616

	(-5.364)***	(-3.857)***	(-6.787)***	(-6.317)***	(-4.788)***
Lntrade	-0.636	-0.715	-0.528	-0.581	-0.629
	(-7.083)***	(-8.075)***	(-6.978)***	(-7.529)***	(-7.190)**
No_banks	-0.001	-	-	-	-
	(-0.305)	-	-	-	-
Banks_branches	-	-0.035	-	-	-
	-	(-2.636)**	-	-	-
LnAtm	-	-	0.032	-	-
	-	-	(4.003)***	-	-
Loans_gdp	-	-	-	0.012	-
	-	-	-	(3.343)***	-
Deposit_gdp	-	-	-	-	-0.002
	-	-	-	-	(-0.466)
Cons.	12.176	12.250	11.587	11.667	12.099
	(22.634)***	(25.419)***	(27.558)***	(26.053)***	(24.424)***

Notes: "***" indicates statistical significance at the 1% level. "**" indicates statistical significance at 5% level, "*" indicates statistical significance of 10% level. Z-statistics are in parentheses. High GDP per capita countries are Nigeria, Ghana, Ivory Coast, Senegal and The Gambia. Low GDP per capita countries are Benin, Guinea, Mali, Burkina Faso and Niger. Source: Prepared by Author

4.6 Impact of financial inclusion on economic growth: Low GDP per capita countries (Robust least square)

In the table 9, it can be ascertained that lnatm does not contribute to the increase in economic growth in the low gdp per capita countries. The financial inclusion variables showed positive and significant results or impact on economic growth except lnatm which exhibited negative and significant impact on economic growth in model 3. Inf has insignificant impact on economic growth, even though it showed negative and significant in model 3; it is only one out of the five model which the study can't reliably infer on that. In addition, pop and lntrade showed negative and significant impact on economic growth. Ume has positive and statistical significant impact on economic growth in all model whiles lnsep has statistical significant impact on economic growth in model 1&3 but insignificant in the other models.

Table 9 Results from low GDP per capita countries: Robust least square

	Low GDP per capita countries				
Variables	model 1	model 2	model 3	model 4	model 5
Inf	-0.002	-0.002	-0.002	-0.003	0.001
	(-0.811)	(-0.770)	(-1.656)*	(-0.112)	(0.493)
Ume	0.032	0.064	0.043	0.039	0.042

Variables	model 1	model 2	model 3	model 4	model 5
	(4.835)***	(12.230)***	(19.223)***	(7.081)***	(9.250)***
Lnsep	0.101	0.019	0.954	0.036	0.031
	(3.391)***	(0.795)	(89.877)***	(1.370)	(1.415)
Pop	-0.387	-0.220	-0.160	-0.403	-0.318
	(-8.601)***	(-5.314)***	(-9.864)***	(-10.581)***	(-9.539)***
Lntrade	-0.010	0.215	-0.083	0.288	0.217
	(-0.103)	(2.894)**	(-2.056)**	(3.563)***	(3.227)**
No_banks	0.073	-	-	-	-
	(6.470)***	-	-	-	-
Banks_branches	-	0.326	-	-	-
	-	(8.367)***	-	-	-
LnAtm	-	-	-0.019	-	-
	-	-	(5.697)***	-	-
Loans_gdp	-	-	-	0.022	-
	-	-	-	(8.089)***	-
Deposit_gdp	-	-	-	-	0.019
	-	-	-	-	(9.960)***
Cons.	7.065	6.536	3.758	6.633	6.607
	(16.041)***	(18.638)***	(21.895)***	(17.284)***	(20.745)***

Notes: "***" indicates statistical significance at the 1% level. "**" indicates statistical significance at 5% level, "*" indicates statistical significance of 10% level. Z-statistics are in parentheses. High GDP per capita countries are Nigeria, Ghana, Ivory Coast, Senegal and The Gambia. Low GDP per capita countries are Benin, Guinea, Mali, Burkina Faso and Niger. Source: Prepared by Author

4.7 Robust check: Generalized linear model (GLM)

To statistically infer on the findings of the study, the generalized linear model was adopted for robust check to confirm the outcome of the main methodology considered for the study. Table 10 reports that the financial inclusion variables have positive and statistical significant impact on economic growth in all models. Inf showed inconsistent results in model 2, it depicted negative and significant impact but positive and significant in model 4; in this case the study consider it to be insignificant which is in line with the results from table 7. Ume portrayed positive and significant impact on economic growth in all models. Pop and lntrade showed strong negative and statistically significant impact on economic growth. Lnsep on the other hand, exhibited positive and statistical significance in model 1, 2 and 5 but insignificant in model 3&4.

Table 10 Results from Generalized linear model: (Robust check)

Variables	All 10 countries				
	model 1	model 2	model 3	model 4	model 5

Inf	-0.005	-0.009	-0.005	0.011	0.003
	(-0.254)	(-1.905)**	(-1.029)	(2.023)**	(0.655)
Ume	0.036	0.018	0.042	0.025	0.022
	(4.052)***	(1.734)*	(4.536)***	(2.506)**	(1.853)*
Lnsep	0.081	0.083	0.058	0.065	0.075
	(2.160)**	(2.035)**	(1.476)	(1.590)	(1.676)*
Pop	-0.592	-0.750	-0.667	-0.688	-0.741
	(-8.588)***	(-10.496)***	(-9.734)***	(-9.617)***	(-9.694)***
Lntrade	-0.377	-0.366	-0.410	-0.420	-0.488
	(-3.853)***	(-3.368)***	(-4.097)***	(-4.005)***	(-4.333)***
No_banks	0.023	-	-	-	-
	(7.342)***	-	-	-	-
Banks_branches	-	0.068	-	-	-
	-	(5.137)***	-	-	-
LnAtm	-	-	0.061	-	-
	-	-	(6.636)***	-	-
Loans_gdp	-	-	-	0.025	-
	-	-	-	(5.500)***	-
Deposit_gdp	-	-	-	-	0.012
	-	-	-	-	(3.007)**
Cons.	9.929	10.675	10.450	10.336	10.932
	(18.724)***	(19.105)***	(19.872)***	(18.351)***	(18.425)***

Notes: "***" indicates statistical significance at the 1% level. "**" indicates statistical significance at 5% level, "*" indicates statistical significance of 10% level. Z-statistics are in parentheses. High GDP per capita countries are Nigeria, Ghana, Ivory Coast, Senegal and The Gambia. Low GDP per capita countries are Benin, Guinea, Mali, Burkina Faso and Niger. Source: Prepared by Author

4.8 Homogeneous causality test

The null hypothesis that independent variables do not homogeneously cause the dependent variable is rejected in this section because the results from table 13 postulate that there is homogeneous causality relationship between the dependent variable and the independent variables. Form the table, in the all 10 countries group, banks_branches homogeneously cause lngdppc, lnatm also causes lngdppc whiles lngdppc causes loans_gdp. These relationships signal unidirectional linkage from the first to the latter. Bank_branches homogeneously causes No_banks and loans_gdp confirming a unidirectional linkage from Bank_branches to No_banks and loans_gdp respectively. Lnatm has a bidirectional linkage with bank_branches or homogeneously causes each other; in other words, a change in one variable affects the other variable. Report from the high gdp per capita countries depicts that bank_branches homogeneously causes lngdppc, no_banks and loans_gdp confirming a unidirectional linkage from bank_branches to lngdppc, no_banks and loans_gdp concurrently; lngdppc causes loans_gdp. Lnatm and bank_branches have bidirectional linkage with each other and homogeneously cause each other. In the low gdp per capita countries, lnatm homogeneously causes lngdppc and bank_branches causes deposit_gdp confirming a unidirectional linkage from the first to the latter.

Table 11 Homogeneous causality test

Null Hypothesis:	All 10 countries			High GDP per capita countries			Low GDP per capita countries		
	W-Stat.	Zbar-Stat.	sig.	W-Stat.	Zbar-Stat.	sig.	W-Stat.	Zbar-Stat.	sig.
BANKS_BRANCHES does not homogeneously cause LNGDPPC	9.93	2.80	**	12.06	2.62	**	7.80	1.34	
LNGDPPC does not homogeneously cause BANKS_BRANCHES	2.51	-0.35		1.916	-0.43		3.09	-0.07	
LNATM does not homogeneously cause LNGDPPC	63.77	25.64	***	116.80	34.04	***	10.74	2.22	**
LNGDPPC does not homogeneously cause LOANS_GDP	7.61	1.81	*	12.01	2.60	**	2.39	-0.28	
BANKS_BRANCHES does not homogeneously cause NO_BANKS	7.52	1.78	*	9.51	1.85	*	5.54	0.66	
LNATM does not homogeneously cause BANKS_BRANCHES	8.00	1.98	**	13.76	3.13	**	2.25	-0.33	
BANKS_BRANCHES does not homogeneously cause LNATM	8.20	2.07	**	13.26	2.98	**	3.14	-0.06	
LOANS_GDP does not homogeneously cause BANKS_BRANCHES	1.69	-0.70		1.317	-0.61		7.00	1.10	
BANKS_BRANCHES does not homogeneously cause LOANS_GDP	16.0	5.40	***	18.77	4.63	***	6.03	0.81	
BANKS_BRANCHES does not homogeneously cause DEPOSIT_GDP	5.02	0.72		4.00	0.20		13.34	3.00	**

Notes: "***" indicates statistical significance at the 1% level. "**" indicates statistical significance at 5% level, "*" indicates statistical significance of 10% level. Z-statistics are in parentheses. High GDP per capita countries are Nigeria, Ghana, Ivory Coast, Senegal and The Gambia. Low GDP per capita countries are Benin, Guinea, Mali, Burkina Faso and Niger. Source: Prepared by Author

5. Conclusion and Recommendation

This study examined the impact of financial inclusion on economic growth considering the role of commercial banks for a panel of 10 West African countries from 2004–2015. The study's empirical analysis utilized panel data methodologies for robustness of the study such as unit root tests, correlation matrix, cointegration test, Robust least squares, generalized linear model and homogeneous causality test.

The outcome of the results evidenced that all the variables are cointegrated. The long run estimates and findings from the study confirm that there is a direct or positive impact of number of commercial banks, the number of commercial banks branches per 1000 km2, Number of Automated teller machines and total loans granted by commercial banks on economic growth and total deposits with commercial bank. Furthermore, in the high GDP per capita countries, the number of commercial banks have statistically insignificant impact on economic growth but the number of ATMs and the total amount of loans granted by commercial banks have a strong and direct impact on economic growth; unlike the amount of deposits with commercial banks and commercial banks branches which do not have a direct impact on economic growth. In the low GDP per capita countries, the role of commercial banks in financial inclusion have positive and significant impact on economic growth except the number of ATMs which showed negative and significant impact on economic growth. In conclusion, the study thereby infers that financial inclusion has a positive and statistical significant impact on economic growth.

From the outcome of the study, some policy recommendations are proposed, the policy recommendation comes in two forms:

Policy recommendation for industry: Commercial Banks should be widened their scope of operation and increase their reach to attract the rural-urban population as well as the unbanked population. They should design microcredit, micro-enterprise and safe savings products to attract the unbanked population to inculcate the habit of savings and credit access to ensure economic growth. They should employ strategies to retain and acquire customers with traditionally acquired knowledge systems on positive social cultural norms within their reach with ultimate aim of reaching out to the poor and vulnerable. Innovative ways of doing business should also be employed to ensure high productivity on the part of the commercial banks and their customers.

Policy recommendation for governments: There should be an effective financial literacy education and awareness by the governments to ensure the design of family-based and community-based education and awareness creation to build the knowledge of investment and wealth creation among the population.

The study recommends more researches into the areas of financial inclusion because the study has some limitations. As the study showed that the number of commercial banks and the number of branches in high GDP per capita countries do not have impact on economic growth and in the low GDP per capita countries, number of ATMs do not also have positive impact on economic growth; the study recommends for further study to unravel the true impact in these economies.

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