

# Financial Inclusion and Banks Performance: An Empirical Study of 10 West African Countries Using Panel Cointegration FMOLS Regression Methodology

Prince Asare Vitenu-Sackey\*

School of Finance and Economics, Jiangsu University  
No 301 Xuefu Road, Zhenjiang, Jiangsu Province, P.R. China

Jiang Hong Li

School of Finance and Economics, Jiangsu University  
No 301 Xuefu Road, Zhenjiang, Jiangsu Province, P.R. China

## Abstract

The paper assesses the effect of financial inclusion on banks performance in West African countries. To be able to assess the long run effect of financial inclusion on banks performance, the study employed panel cointegration methodology thus fully modified ordinary least square model to estimate the long run impact on banks performance. The study concluded that financial inclusion has positive effect on banks performance with an enticing results showing that financial inclusion increases banks performance in low gdp per capita countries which signals that banks should increase their presence and provide services to those countries. The study recommends the utilization of multi-factors of financial inclusion measure to ensure precise and appropriate way to measure multilateral financial inclusion level.

**Keywords:** Financial inclusion, Banks performance, Fully modified ordinary least square, West Africa

**DOI:** 10.7176/EJBM/11-21-05

**Publication date:** July 31<sup>st</sup> 2019

## 1. Introduction

In the quest to alleviate poverty, financial inclusion has become the vital instrument to champion this course. The banking sector plays a major role in the urge to make the world financially inclusive. Economic growth that propels economic development is doable when all the sectors of the economy are viable with the support of the financial sectors under the services industrial sector contribute financially to the other sectors to ensure production of goods and services. Policymakers and governments have identified financial exclusion as a barrier to financial services hence proposed the extension of banking services as a priority and intervention to the people (Demirgüç-Kunt et al., 2015). In recent times, the consolidation of banks around the world and the increased scrutiny of banking regulation in the era of the financial crisis have intensified the policy arguments on the influence of concentration and competition in the banking industry on real sector results (Beck et al., 2014). The world economic players in the field of financial inclusion such as the IMF, Alliance for financial inclusion (AFI), G20 and the central banks in emerging and developing countries have formed a consortium to enhance financial inclusion to reduce poverty and income inequality, enhance new firms establishment, increase employment opportunities, and improve the social psychological wellbeing of the people to ensure proper decision making to access finance; credit and savings (Allen et al., 2016; Aportela, 1999; Beck et al., 2007a; Aportela, 1999; Burgess and Pande, 2005; Angelucci et al., 2013; Bruhn and Love, 2014; Prasad, 2010; Karlan and Zinman, 2010; Klapper et al., 2006; Guiso et al., 2004; Mani et al., 2013; Banerjee et al., 2013; Flug et al., 1998).

The motivation of this study stems from the literatures of (Ahamed and Mallick, 2019; Ann and Javier, 2018) the importance of financial inclusion for banks stability, competition and banking concentration. They found that higher level of financial inclusion contributes to higher level of bank stability and pave way for ease access to credit and deposit accounts, also makes the banks competitive. In as much as there are some literatures on financial inclusion, bank concentration and bank performance; there is limited study in the West African countries in particular. Therefore, this study finds this gap to examine the impact of financial inclusion on commercial banks in West Africa to ascertain the actual impact.

In contribution to existing literatures on financial inclusion and bank performance, this study employs fully modified ordinary least squares and granger causality test to apply on West African data on find the dynamic linkage and long run impact on financial inclusion on commercial banks performance. To find an accurate and robust relationship between financial inclusion and banks performance, the countries are categorized into three groups to establish the true impact thus 10 countries, high gdp per capita countries and low gdp per capita countries.

The study is organized as followed; part 1 is the introduction of the study; part 2 contains the literatures review; part 3 comprises of the methodology, data collection and description; part 4 consists of the empirical results and discussion and lastly part 5 which reports the conclusion and recommendation.

## 2. Literature Review

Commercial banks play a major and central role in the financial sector and the economy. Banks perform the function as financial intermediaries that convert savings into investments, and manage loans in an efficient and effective way where stronger and bigger banks provide greater confidence (Rumler et al., 2010). There are valid arguments that economic growth is highly dependent on the banking industry performance and stability (Berger & Humphrey, 1997; Dobbs & Hamilton, 2006; Abu -Alkheil, Burghof & Khan, 2012).

For a panel of 83 countries, Ann and Javier (2018) studied the banking concentration, competition and financial inclusion; they found out that greater banking concentration results in higher financial inclusion hence the access of credit and savings accounts and effective market competition. Meanwhile, Bobby et al. (2016) posit that technology advancement improves banking performance and ensures productivity. Using instrumental variable analysis for robust study with 2635 banks in 86 countries, Ahamed and Mallick (2016) found that the higher level of financial inclusion results in stronger and higher level of bank stability. Kim et al. (2018) studied the impact of financial inclusion on economic growth by using GMM for panel of 57 OIC countries; they established that financial inclusion has a positive effect on economic growth.

Some existing studies found that financial inclusion has positive impact on the social-economic wellbeing the people and the firms in a country with an effective function of the financial sector (Lisa and Luc, 2017; Beck, Demircuc-Kunt, & Maksimovic, 2005; Beck, Bu`yu`kkarabacak, Rioja, & Valev, 2012; Franklin et al., 2016; Badar and Shaista, 2017; Antonia et al., 2018). This study intends to establish whether the findings of these researches are valid. Moreover, there are a few researches in the area of financial inclusion and banks performance. Current literatures adopted an individual proxy variable for financial inclusion to measure the depth of financial inclusion. This study deems it an opportunity to explore the area with different proxy variables for financial inclusion and also intend to combine five proxy variables together with macroeconomic variables to control banks performance to ascertain its effects.

## 3. Data and Methodology

### 3.1 Data

The study uses panel data of 10 West African countries from the period 2004 to 2015. The data are sourced from World Bank development indicators database, IMF financial assess survey and World Bank Global financial development database. Financial inclusion is measured by the proxies of the use of financial services and availability of financial service (World Bank, 2013; Demircuc-Kunt and Klapper, 2012). Therefore, the study uses the proxies in the database of IMF financial assess survey thus geographical outreach and use of financial services to measure financial inclusion. Five variables are considered under financial inclusion table 1 shows the variables and their descriptions. Banks performance is measured by proxies of return on assets and return on equity due to limitation on using return on assets hence return on equity has been considered as well. Furthermore, some macroeconomic variables are utilized to control banks performance. The description of the variables considered as control variables thus the macroeconomic variables can be found in table 1.

**Table 1 Variables and their 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 km <sup>2</sup> , 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
Roa	Return on Assets	Global financial development database
Lnroe	Return on Equity	Global financial development database

### 3.2 Methodology

The aim of the paper is to assess the impact of financial inclusion on banks performance and explore the linkage that exists between them. The econometric model adopted for the study was used by (Zhang and Gao, 2016; Dogan and Aslan, 2017 and Zhang and Liu, 2019) can be written as:

$$Banks\_performance_{it} = f(Financial\_Inclusion_{it}, inf_{it}, sep_{it}, ume_{it}, pop_{it}, trade_{it}) \quad (1)$$

After, taking transforming the variable in natural logarithmic form of Eqn. (1) is formulated as:

$$\ln Banks\_performance_{it} = f(\ln Financial\_Inclusion_{it}, \ln inf_{it}, \ln sep_{it}, \ln ume_{it}, \ln pop_{it}, \ln trade_{it}) \quad (2)$$

The first step that study considered is panel unit root test in order to check for integration and stationarity in diverse level and first difference. The following approaches were used to check for unit root thus 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 used 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. Perhaps, the specification proposed by Im et al. (2003) is as follows:

$$y_{it} = \rho_i y_{i,t-1} + \sigma_i x_{it} + \varepsilon_{it} \quad (3)$$

From the equation (3),  $x_{it}$  is the combination of all the independent variables;  $\rho_i$  is the autoregressive elasticities,  $\varepsilon_{it}$  represents the residual term whilst  $i$  and  $t$  stands for the time period. Im et al. (2003) pave way for different order of serial correlation (Apergis and Payne, 2010) and follow the normal averaging of augmented dickey Fuller (Inglesi-Lotz, 2016) given as: the equation is adopted from (Maji and Sulaiman, 2019).

$$\varepsilon_{it} = \sum_{j=1}^{n-1} \theta_{ij} \varepsilon_{i,t-1} + \varepsilon_{it} \quad (4)$$

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

$$y_{it} = \rho_i y_{i,t-1} + \sigma_i x_{it} + \varepsilon_{it} + \sum_{j=1}^{n-1} \theta_{ij} \varepsilon_{i,t-1} + \varepsilon_{it} \quad (5)$$

In the resulting eqn. (5),  $\rho_i$  represents 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.

Subsequently, if it estimated that all the variables prove stationary then it requires for the procedure of cointegration test. The regression of time series panel data assumes that the data should either be stationary or cointegrated. 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  $\sigma_i$  is the individual effect and  $\theta_i$  is the deterministic trend. To ascertain the Null hypothesis,  $H_0$  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. Pedroni (1999, 2004) and Kao (1999) test and approach allow more than one exogeneous variable, the long run estimation or model can be derived as (Maji and Sulaiman, 2019): Equation (6).....;

$$\ln(Banks\_performance)_{it} = \gamma_{it} + \delta_{it} + \pi_{1i}(Financial\_inclusion)_{it} + \pi_{2i}(inf)_{it} + \pi_{3i}(sep)_{it} + \pi_{4i}(ume)_{it} + \pi_{5i}(pop)_{it} + \pi_{6i}(trade)_{it} + \mu_{it} \quad (6)$$

In the equation (6),  $i = 1, \dots, N$  represents the cross sectional observation,  $t = 1, \dots, T$  represents the time period. Banks\_performance have the proxies; return on assets and return on equity, Financial inclusion has the proxies; No\_banks, Banks\_branches, Lnatm, Lndeposit\_gdp and Lnloans\_gdp, inf refers to inflation, lnSep stands for school enrolment in primary, ume refers to unemployment rate, Pop means population growth and trade stands for trade openness. The symbol  $\pi$  represents the elasticities that will be estimated,  $\gamma_{it}$  and  $\delta_{it}$  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  $\mu_{it}$  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), to estimate the dynamics among the variables. Using individual proxy dimension for financial inclusion provide incomprehensive outlook of the overall rate of inclusive of a country (Ahamed and Mallick, 2019) hence, the study considered six models for its findings; model 1 to 5 use individual proxies and model 6 uses all financial inclusion proxies adopted for the study for robust and comprehensive analysis. The study utilized fully modified ordinary least square (FMOLS) methodology which has the advantage of rectifying both serial correlation and simultaneous bias as the long run cointegration linkage can be interpreted as long run elasticity (Shun and Liu, 2019). Lastly, Granger causality test is performed to establish

linkage between financial inclusion variables and banks performance variables.

#### 4. Results and discussion

##### 4.1 Descriptive statistics

Table 2 shows the descriptive statistics of the variables used for the study, the mean and the median are very close in nature, also related and the standard deviations are homogeneous in recognition. From the table, it can be ascertained that the data are in normal distribution.

**Table 2 Descriptive statistics**

	ROA	LNROE	NO_BANKS	BANKS_BRANCHES	LNATM	LNLOANS_GDP	LNDEPOSIT_GDP	INF	LNSEP	UME	POP	LNTRADE
Mean	1.931	2.726	16.142	2.052	3.574	17.649	24.908	5.962	4.321	5.412	2.825	4.084
Median	1.745	2.824	13.000	0.981	4.102	17.720	23.814	4.070	4.432	5.041	2.808	4.113
Maximum	7.880	4.322	89.000	9.585	9.705	37.064	47.470	34.695	4.886	11.710	3.843	4.602
Minimum	-1.323	0.000	6.000	0.021	0.000	1.217	5.642	-3.100	0.000	0.299	1.785	3.066
Std. Dev.	1.378	0.778	8.909	2.409	3.040	7.434	9.641	6.642	0.722	2.985	0.470	0.289
Skewness	1.426	-1.630	4.705	1.484	0.133	0.046	0.282	1.602	-5.397	0.128	0.246	-0.585
Kurtosis	6.844	6.926	38.291	4.313	1.807	3.406	2.784	6.312	32.634	2.085	2.902	3.436
Jarque-Bera	114.566	130.191	6669.787	52.688	7.469	0.869	1.820	106.159	4973.394	4.512	1.260	7.804

**Table 3 List of countries and their categories**

Categories	Hign 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

##### 4.2 Panel unit root test

The study performed panel unit root tests; IPS test, Fisher tests (Fisher ADF and Fisher PP) and Levin, Lin & chu test to ascertain whether the null hypothesis that there is unit root in the variables hence they are not stationary. Table 4 reports the results, all the variables were non-stationary at level except No\_banks which showed stationary with Fisher PP test. After taking first difference, all the variables become stationary with exception of Pop in only one test thus Fisher PP test. Moreover, the results are good to confirm stationarity among them hence the null hypothesis is rejected.

**Table 4 Panel unit root tests**

Variable	Form	LLC	IPS	ADF-FISHER	PP-FISHER
Inroe	level	-9.624***	-2.834**	45.921***	41.859**
	first difference	-4.819***	-3.651***	51.753***	126.233***
roa	level	-3.987***	-1.980**	37.274**	50.910***
	first difference	-1.916**	-2.674**	40.443**	110.964***
no_banks	level	2.064	1.493	14.142	50.704***
	first difference	-45.486***	-18.102***	91.666***	114.559***
banks_branches	level	-0.496	3.771	11.628	16.259
	first difference	-5.785***	-4.338***	51.152***	52.535***
lnatm	level	-1.247	0.422	18.910	32.803
	first difference	-16.624***	-9.084***	65.312***	83.797***
Indeposit_gdp	level	0.387	3.865	10.826	8.014
	first difference	-8.708***	-4.985***	59.347***	78.579***
Inloans_gdp	level	0.944	3.949	10.901	13.203
	first difference	-5.260***	-2.855**	42.148**	44.189**
inf	level	-7.802***	-6.156***	71.885***	78.444***
	first difference	-13.885***	-10.048***	109.687***	181.185***
Insep	level	-13.841***	-12.841***	45.812***	66.713***
	first difference	-4.663***	-1.790**	33.415**	34.463**
ume	level	0.544	1.446	11.004	10.948
	first difference	-8.094***	-3.722***	48.648***	34.169**
pop	level	-5.283***	-2.424**	45.427***	42.565**
	first difference	-7.367***	-4.196***	76.843***	7.013
Intrade	level	-3.780***	-1.679**	32.741**	29.005*
	first difference	-8.966***	-5.909***	66.886***	78.503***

Note: \*\*\* denotes 1% significance, \*\* denotes 5% significance, \* denotes 10% significance

### 4.3 Panel Cointegration tests

To estimate the long run coefficients of the variables, it is imperative to test for the existence of cointegration among the variables. Therefore, Pedroni (1999, 2004) and Kao and Chang (2000) cointegration tests were used to establish whether there is cointegration or not. The tests were executed by applying the test formula to the three groups considered for the study. Table 5 displays the results and from the results four out of the seven tests showed statistical significance. Furthermore, the null hypothesis that there is no cointegration is rejected.

**Table 5 Pedroni and Kao Cointegration test**

	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	-3.148	0.999		-2.297	0.989		-2.066	0.981	
Rho-stat	3.659	0.999		3.576	1.000		2.570	0.995	
PP-stat	-6.206	0.000	***	-7.537	0.000	***	-9.481	0.000	***
ADF-stat	-3.095	0.001	***	-1.304	0.096	*	-3.101	0.001	***
Group rho-stat	5.143	1.000		4.113	1.000		3.732	1.000	
Group PP-stat	-13.281	0.000	***	-12.869	0.000	***	-11.504	0.000	***
Group ADF-stat	-3.231	0.001	***	-3.242	0.001	***	-2.201	0.014	**
Kao	-6.116	0.000	***	-3.808	0.000	***	-5.597	0.000	***

Note: \*\*\* denotes 1% significance, \*\* denotes 5% significance, \* denotes 10% significance. 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.

### 4.4 The impact of financial inclusion on banks performance (All 10 countries)

Table 6 shows the results of the impact of financial inclusion on banks performance in all 10 countries adopted for the study. Five financial inclusion variables were chosen as proxies to measure financial inclusion and each individual variable was used in a model together with the macroeconomic variables as control variables and the two dependent variables separately as well as the all variables put together in a model to ascertain a comprehensive

outlook of financial inclusion as a whole. Therefore, table 6 reports that No\_banks, Banks\_branches, lnAtm, pop and lnsep have negative and statistical significant effect on banks performance with Return on assets (ROA) as the dependent variable. Moreover, lndeposit\_gdp, loans\_gdp, inf, ume and lntrade have positive and statistical significant effect on banks performance (ROA). Using lnroe (Return of equity) as the dependent variable, No\_banks, Banks\_branches, lnAtm and pop have negative and statistical significant effect on banks performance. On the other hand, lntrade and ume have positive impact on banks performance at statistical significance level. In contrast, inf which showed positive effect on banks performance with ROA as dependent depicts insignificance but was significant in the model 6 which combines all the financial inclusion variables. Furthermore, lnsep showed positive and statistical significant effect on banks performance but was negative with ROA as dependent variable.

**Table 6 impact of financial inclusion on banks performance (All 10 countries)**

Variables	All 10 countries		Dependent Variable - ROA				Variables	All 10 countries		Dependent Variable - LNROE			
	model 1	model 2	model 3	model 4	model 5	model 6		model 1	model 2	model 3	model 4	model 5	model 6
Inf	0.022 (3.035)***	0.024 (3.582)***	0.037 (6.618)***	0.021 (2.586)**	0.022 (3.439)***	0.043 (72.307)***	Inf	0.004 (0.665)	0.009 (1.787)*	0.011 (2.850)**	0.005 (1.145)	0.006 (1.433)	0.018 (44.179)***
Ume	0.259 (6.827)***	0.291 (8.171)***	0.306 (10.312)***	0.279 (7.186)***	0.278 (8.135)***	0.303 (96.987)***	Ume	0.171 (5.797)***	0.178 (6.772)***	0.185 (9.004)***	0.173 (7.074)***	0.172 (8.238)***	0.171 (78.244)***
lnsep	-0.103 (-2.263)**	-0.086 (-2.008)**	-0.092 (-2.597)**	-0.083 (-1.777)*	-0.099 (-2.400)**	-0.104 (-27.837)***	lnsep	0.014 (0.409)	0.017 (0.555)	0.021 (0.845)	0.021 (0.716)	0.013 (0.520)	0.016 (78.389)***
Pop	-5.331 (-8.632)***	-5.594 (-9.502)***	-5.234 (-10.852)***	-5.653 (-8.957)***	-5.856 (-10.528)***	-4.352 (-83.087)***	Pop	-1.156 (-2.404)**	-1.038 (-2.294)**	-1.097 (-3.293)**	-1.186 (-2.989)**	-1.298 (-3.826)***	-0.019 (-51.318)***
lntrade	0.678 (3.586)***	0.951 (5.138)***	1.142 (7.561)***	0.845 (4.347)***	0.735 (4.289)***	1.244 (71.561)***	lntrade	0.169 (-1.15)	0.333 (2.447)**	0.352 (3.369)**	0.278 (2.280)**	0.186 (1.782)*	0.607 (49.752)***
No_banks	-0.265 (-9.864)***					-0.249 (-10.346)***	No_banks	-0.079 (-3.797)***					-0.029 (-17.328)***
Banks_branches		-0.289 (-4.102)***				-0.341 (-44.158)***	Banks_branches		-0.201 (-3.867)***				-0.428 (-79.054)***
lnAtm			-0.118 (-7.508)***			-0.091 (-54.821)***	lnAtm			-0.223 (-2.109)**			-0.018 (-15.226)***
Loans_gdp				0.016 (2.052)**		0.001 (68.689)***	Loans_gdp				0.018 (3.719)***		0.023 (25.351)***
Deposit_gdp					0.014 (1.939)**	0.056 (38.892)***	Deposit_gdp					0.018 (3.907)***	0.025 (25.563)***

Note: \*\*\* denotes 1% significance, \*\* denotes 5% significance, \* denotes 10% significance. T-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.

**4.5 Impact of financial inclusion on banks performance: High GDP per capita countries**

Table 7 reports the results from the high gdp per capita countries by using ROA as dependent variable, No\_banks, lnatm, pop and inf have negative and statistical significant effect on banks performance; lnsep has positive and consistent impact on banks performance at statistical significance level. Meanwhile, No\_banks, lndeposit\_gdp and Banks\_branches have insignificant effect on banks performance. Ume showed positive effect on banks performance but was insignificant in model 1. lntrade has negative effect on banks performance but was significant in model 1&6. By using lnroe as the dependent variable, No\_banks, lnatm and lntrade showed negative and statistical significant effect on banks performance; lnloans\_gdp, lndeposit\_gdp and lnsep have positive and statistical significant effect on banks performance. Pop reports contradictory results which show negative and positive statistical significant effect in model 2&5 and 6 respectively. Ume showed positive and statistical significant effect from model 2 to 5 but was insignificant in model 1. Inf showed negative effect on banks performance but statistical significant in model 3&6.



**Table 7 Impact of financial inclusion on banks performance: High GDP per capita countries**

High GDP per capita -Dependent variable- ROA							High GDP per capita countries -Dependent Variable LNROE						
Variables	model 1	model 2	model 3	model 4	model 5	model 6	Variables	model 1	model 2	model 3	model 4	model 5	model 6
Inf	-0.028 (-1.885)*	-0.020 (-1.526)	-0.019 (-1.663)	-0.037 (-1.908)*	-0.026 (-2.158)**	-0.024 (-1.760)***	Inf	-0.014 (-1.360)	-0.006 (-0.613)	-0.010 (-1.739)*	-0.012 (-1.028)	-0.009 (-1.325)	0.001 (1.170)***
Ume	0.099 (1.638)	0.263 (4.901)***	0.254 (5.521)***	0.297 (3.772)***	0.216 (4.442)***	0.248 (4.370)***	Ume	0.053 (0.226)	0.132 (3.618)***	0.128 (5.771)***	0.159 (3.512)***	0.110 (4.092)***	0.088 (3.210)***
Lnsep	0.267 (3.229)**	0.378 (5.085)***	0.211 (3.135)**	0.217 (1.887)*	0.343 (5.071)***	0.270 (3.440)***	Lnsep	0.140 (2.373)**	0.184 (3.631)***	0.117 (3.593)***	0.118 (1.778)*	0.185 (4.942)***	0.078 (2.050)
Pop	-6.973 (-5.277)***	-10.634 (-8.568)***	-6.037 (-5.139)***	-5.815 (-2.934)**	-9.258 (-8.697)***	-8.328 (-5.170)***	Pop	-0.989 (-1.051)	-2.657 (-3.631)**	-0.859 (-1.522)	-1.355 (-1.188)	-2.034 (-3.457)**	0.838 (1.080)***
Lntrade	-0.529 (-1.821)*	-0.255 (0.933)	-0.004 (-0.018)	-0.237 (-4.591)	-0.297 (-1.241)	-0.710 (-2.270)***	Lntrade	-1.117 (-5.396)***	-0.964 (-5.187)***	-0.830 (-7.625)***	-0.100 (-3.362)**	-0.997 (-7.526)***	-1.071 (-7.090)***
No_banks	-0.365 (-10.044)***					-0.392 (-1.040)***	No_banks	-0.126 (-4.878)***					-0.076 (-4.190)***
Banks_branches		0.024 (0.270)				0.370 (3.070)***	Banks_branches		-0.005 (-0.076)				-0.075 (-1.290)***
LnAtm			-0.212 (-7.019)***			-0.113 (-2.940)***	LnAtm			-0.080 (-5.468)***			-0.097 (-5.220)***
Loans_gdp				0.010 (0.755)		-0.037 (-1.460)***	Loans_gdp				0.014 (1.765)*		-0.036 (-2.950)***
Deposit_gdp					0.007 (0.870)	0.069 (2.490)***	Deposit_gdp					0.013 (2.744)**	0.067 (5.060)***

Note: \*\*\* denotes 1% significance, \*\* denotes 5% significance, \* denotes 10% significance. T-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.

#### 4.6 Impact of financial inclusion on banks performance: Low GDP per capita countries

Table 8 reports the results in the low gdp per capita countries; according to the table, No\_banks, Banks\_branches, lnatm, lndeposit\_gdp, lnloans\_gdp, inf, ume and lntrade have positive and statistical significant effect on banks performance. Lnsep and pop showed negative and statistical significant effect on banks performance all with ROA (return on assets) as the dependent variable. Using lnroe (return on equity) as the dependent variable, No\_banks, Banks\_branches, lnatm, loans\_gdp, lndeposit\_gdp, inf, ume and lntrade have positive and statistical significant effect on banks performance. Lnsep has negative and statistical significant effect on banks performance. Moreover, pop showed an insignificant effect on banks performance from model 1 to 5 but showed a positive and statistical significant effect in model 6.

**Table 8 Impact of financial inclusion on banks performance: Low GDP per capita countries**

Dependent Variable - ROA - Low GDP per capita countries							Dependent variable - LNROE - Low GDP per capita countries						
Variables	model 1	model 2	model 3	model 4	model 5	model 6	Variables	model 1	model 2	model 3	model 4	model 5	model 6
Inf	0.040 (6.407)***	0.038 (5.393)***	0.068 (18.458)***	0.043 (6.555)***	0.043 (5.648)***	0.071 (69.133)***	Inf	0.005 (0.802)	0.006 (1.059)	0.019 (3.746)***	0.008 (2.124)**	0.008 (1.469)	0.026 (36.229)***
Ume	0.342 (7.667)***	0.369 (7.561)***	0.366 (14.344)***	0.314 (6.619)***	0.347 (6.436)***	0.282 (37.330)***	Ume	0.253 (6.131)***	0.254 (6.261)***	0.267 (7.589)***	0.194 (6.699)***	0.229 (6.365)***	0.216 (40.694)***
Lnsep	-0.466 (-10.583)***	-0.436 (-8.615)***	-0.416 (-16.149)***	-0.375 (-7.624)***	-0.412 (-7.388)***	-0.304 (-39.038)***	Lnsep	-0.168 (-4.116)***	-0.137 (-3.257)**	-0.137 (-3.853)***	-0.072 (-2.380)**	-0.105 (-2.832)**	-0.021 (38.925)***
Pop	-4.477 (-8.235)***	-3.864 (-0.632)***	-2.550 (-7.828)***	-2.954 (-4.837)***	-3.639 (-5.353)***	-1.017 (-10.169)***	Pop	-0.974 (-1.934)*	-0.344 (-0.655)	0.218 (0.485)	0.527 (1.412)	-0.194 (-0.428)	1.988 (28.333)***
Lntrade	3.035 (13.521)***	2.977 (11.939)***	2.898 (21.576)***	3.138 (13.383)***	3.089 (11.268)***	3.012 (80.712)***	Lntrade	2.535 (12.184)***	2.519 (12.147)***	2.377 (12.860)***	2.678 (18.684)***	2.605 (14.261)***	2.465 (94.163)***
No_banks	0.193 (4.211)***					0.181 (20.247)***	No_banks	0.089 (2.100)**					0.054 (85.521)***
Banks_branches		0.946 (1.898)*				0.400 (43.946)***	Banks_branches		0.878 (2.117)**				-0.228 (-35.718)***
LnAtm			0.098 (7.667)***			0.127 (35.382)***	LnAtm			0.082 (4.657)***			0.113 (44.735)***
Loans_gdp				0.082 (5.163)***		0.062 (20.010)***	Loans_gdp				0.083 (8.557)***		0.055 (25.502)***
Deposit_gdp					0.102 (4.818)***	0.037 (94.724)***	Deposit_gdp					0.010 (7.407)***	0.070 (25.264)***

Note: \*\*\* denotes 1% significance, \*\* denotes 5% significance, \* denotes 10% significance. T-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.

#### 4.7 Granger causality test (Financial inclusion variables and banks performance variables)

Granger causality test was performed to ascertain the direction or linkage causality that the financial inclusion variables and banks performance variables have; Table 10 reports the linkage of return on equity's (Lnroe) causality with the financial inclusion variables and the results confirm no causality in the all 10 countries group. Meanwhile, *Indeposit\_gdp* and *loans\_gdp* have unidirectional linkage with or causality on *No\_banks* and *Banks\_branches* has unidirectional linkage with *Indeposit\_gdp* and *lnloans\_gdp*. In the high *gdp* per capita countries, *lnloans\_gdp* causes *lnroe* or has unidirectional linkage. *Banks\_branches*, *lnatm*, *Indeposit\_gdp* and *lnloans\_gdp* causes or have unidirectional linkage with *No\_banks*. *No\_banks* and *lnatm* causes or has unidirectional linkage with *lnroe* in the low *gdp* per capita countries and *No\_banks* has unidirectional linkage with *lnatm* while *lnatm* has a unidirectional linkage with *Indeposits\_gdp*. According to table 9, *ROA* causes *Banks\_branches* with a unidirectional linkage, *Banks\_branches*, *Indeposit\_gdp* and *lnloans\_gdp* have unidirectional linkage with *No\_banks* and *Banks\_branches* has unidirectional linkage with *Indeposit\_gdp* and *lnloans\_gdp* in the all 10 countries group. In the high *gdp* per capita countries, *ROA* causes *Banks\_branches* confirming a unidirectional linkage, *lnloans\_gdp* causes *ROA* while *Banks\_branches*, *lnatm*, *Indeposit\_gdp* and *lnloans\_gdp* causes *No\_banks* respectively with a unidirectional linkage. Lastly, *Banks\_branches* causes *lnloans\_gdp* with a unidirectional linkage. In the low *gdp* per capita countries, *No\_banks* granger cause *lnatm* and *Banks\_branches* granger cause *lnloans*, all confirming a unidirectional linkage. In conclusion, the null hypothesis that none of the independent variables granger cause the dependent variable is rejected because table 9&10 evidence that there is granger causality.

**Table 9 Granger causality test: Return on Equity**

Dependent Variable - Return on equity (LNROE)	All 10 countries		High GDP per capita		Low GDP per capita	
	F-Stat.	Prob.	F-Stat.	Prob.	F-Stat.	Prob.
NO_BANKS does not Granger Cause LNROE	0.092	0.913	0.210	0.812	2.443	0.098*
LNATM does not Granger Cause LNROE	0.084	0.920	1.056	0.357	2.681	0.079*
LNLOANS_GDP does not Granger Cause LNROE	3.759	0.027	6.824	0.003**	0.436	0.649
BANKS_BRANCHES does not Granger Cause NO_BANKS	3.604	0.031**	5.081	0.010**	0.840	0.438
LNATM does not Granger Cause NO_BANKS	1.511	0.226	2.567	0.088*	1.156	0.324
NO_BANKS does not Granger Cause LNATM	2.351	0.101	1.627	0.208	2.648	0.082*
LNDEPOSIT_GDP does not Granger Cause NO_BANKS	5.490	0.006**	5.294	0.009**	0.016	0.985
LNLOANS_GDP does not Granger Cause NO_BANKS	5.908	0.004**	5.363	0.008**	0.803	0.454
BANKS_BRANCHES does not Granger Cause LNDEPOSIT_GDP	4.240	0.017**	2.267	0.115	1.243	0.298
BANKS_BRANCHES does not Granger Cause LNLOANS_GDP	2.594	0.080*	2.571	0.088*	0.542	0.585
LNATM does not Granger Cause LNDEPOSIT_GDP	0.158	0.854	0.281	0.756	2.522	0.092*

Note: \*\*\* denotes 1% significance, \*\* denotes 5% significance, \* denotes 10% significance. T-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.

**Table 10 Granger causality test: Return on Assets**

Dependent Variable - Return on Assets (ROA)	ALL Countries		High GDP per capita		Low GDP per capita	
	F-Stat.	Prob.	F-Stat.	Prob.	F-Stat.	Prob.
ROA does not Granger Cause BANKS_BRANCHES	2.859	0.062*	2.546	0.090*	0.115	0.892
LNLOANS_GDP does not Granger Cause ROA	1.650	0.198	2.667	0.080*	0.516	0.600
BANKS_BRANCHES does not Granger Cause NO_BANKS	3.604	0.031**	5.081	0.010**	0.840	0.438
LNATM does not Granger Cause NO_BANKS	1.511	0.226	2.567	0.088*	1.156	0.324
NO_BANKS does not Granger Cause LNATM	2.351	0.101	1.627	0.208	2.648	0.082*
LNDEPOSIT_GDP does not Granger Cause NO_BANKS	5.490	0.006**	5.294	0.009**	0.016	0.985
LNLOANS_GDP does not Granger Cause NO_BANKS	5.908	0.004**	5.363	0.008**	0.803	0.454
BANKS_BRANCHES does not Granger Cause LNDEPOSIT_GDP	4.240	0.017**	2.267	0.115	1.243	0.298
BANKS_BRANCHES does not Granger Cause LNLOANS_GDP	2.594	0.080*	2.571	0.088*	0.542	0.585
LNATM does not Granger Cause LNDEPOSIT_GDP	0.159	0.854	0.2813	0.756	2.522	0.092*

Note: \*\*\* denotes 1% significance, \*\* denotes 5% significance, \* denotes 10% significance. T-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.



## 5. Conclusion and recommendation

Financial inclusion has become a central play policy in emerging and developing countries as it is the tool to ensure poverty alleviation and bridging the gap between income inequities. As a matter of importance, there have been some studies in the area to ascertain the efficacy of financial inclusion in diverse ways but there have not been a particular study on West African region alone. Therefore, this study capitalized on this gap to assess the impact of financial inclusion on banks performance in West Africa's region. The study employed panel data methodologies on 10 West African countries by using panel cointegration regression methodology thus panel unit root test, panel cointegration test, panel fully modified ordinary least square model and panel granger causality test to make statistical inference.

From the results, the paper reports of positive effect of financial inclusion on banks performance in the West African region. As there is positive impact of financial inclusion on banks performance, there is vast difference in reports from the individual financial inclusion proxies as was applied in the study. In the breakdown as the study did, all the 10 countries group reported that number of commercial banks, commercial banks branches per 1000 kms and number of ATMs do not have positive effect on commercial banks performance in West Africa but deposits mobilization and Loans acquisition have strong positive effect on commercial banks in the long run. In high gdp per capita countries, the number of commercial banks and number of ATMs do not have positive impact on banks performance as compared to loans which showed strong and positive effect on banks performance. Unlike deposit mobilization, it showed a weak positive impact on banks performance as a measure of financial inclusion as well as commercial banks branches showed insignificant impact on banks performance. The low gdp per capita countries reported interesting results; from the results, all the financial inclusion variables adopted for the study showed strong and positive effect on commercial banks performance. This concludes that financial inclusion plays a major role in banks performance in developing countries. Taking into consideration the macroeconomic variables used in the study, unemployment rate has positive effect on banks performance while population growth has negative effect on banks performance. Inflation and trade showed positive effect in the all 10 countries group and low gdp per capita countries but negative in high gdp per capita countries. Meanwhile, school enrolment for primary education showed positive effect on banks performance in the high gdp per capita countries but negative in the all 10 countries as well as low gdp per capita countries.

The study recommends that financial inclusion should be measured by using multiple variables which could give more precise and exact means of measuring multilateral financial inclusion level in support with (Kim et al., 2018). Moreover, commercial banks should assess the need to extend banking services to deprived and isolated areas instead of populating in already choked urban areas. The accessibility and affordability of banking services will propel patronage and growth in the banking sector. Effective policies and implementation should be ensured by the central banks to promote financial inclusion which is beneficial to the banking sector and the economy at large.

## References

- Abu-Alkheil, A. M., Burghof, H. P., & Khan, W. A. (2012). Islamic commercial banking in Europe: A cross-country and inter-bank analysis of efficiency performance. *International Business & Economics Research Journal*, 11(6), 647-676.
- Ahamed, M.M., Mallick, S.K. (2019). Is financial Inclusion good for bank stability? International evidence. *Journal of Economic behaviour & Organisation* 157, 403 – 427.
- Allen, F., Demircuc-Kunt, A., Klapper, L., Peria, M.S.M. (2016). The foundations of financial inclusion: understanding ownership and use of formal accounts. *Journal of Financial Intermediation* 27, 1–30.
- Ann L.O., Javier, M.P. (2018). Banking concentration, competition and financial inclusion. *Review of development finance* 8, 1 – 17.
- Angelucci, M., Karlan, D., Zinman, J. (2013). Win Some Lose Some? Evidence from a Randomized Microcredit Program Placement Experiment by Compartamos Banco. National Bureau of Economic Research.
- Apergis, N., Payne, J.E. (2009b). Energy consumption and economic growth: evidence from the common wealth of independent states. *Energy Economics* 31 (5), 641 – 647.
- Aportela, F., 1999. Effect of Financial Access on Savings by Low-Income People.
- Banerjee, A.V., Duflo, E., Glennerster, R., Kinnan, C. (2013). The Miracle of Microfinance? Evidence from a Randomized Evaluation. MIT Bureau for Research and Economic Analysis of Development Working Paper.
- Beck, T., Demircuc, -Kunt, A., Levine, R. (2007a). Finance, inequality and the poor. *Journal of Ecoomics Growth* 12, 27–49.
- Berger, A. N., & Humphrey, D. B. (1997). Efficiency of financial institutions: International survey and directions for future research. *European Journal of Operational Research*, 98 (2), 175-212.
- Bobby, B.C., Pek, S.T., Thian S.G. (2016). Banking Services that Influence the Bank Performance. *Procedia - Social and Behavioral Sciences*, 224 401 – 407.
- Bruhn, M., Love, I. (2014). The real impact of improved access to finance: Evidence from Mexico. *Journal of*

- Finance* 69, 1347–1376.
- Burgess, R., Pande, R. (2005). Do rural banks matter? Evidence from the Indian social banking experiment. *Am. Econ. Rev.* 95, 780–795.
- Demirgüç-Kunt, A., Klapper, L., Singer, D., Van Oudheusden, P. (2015). The Global Findex Database 2014: Measuring Financial Inclusion Around the World. *World Bank Policy Research Working Paper* 7255.
- Demirgüç-Kunt, A., Klapper, L. (2012). Measuring Financial Inclusion: the Global Findex database. *World Bank Policy Res. Work. Pap. Ser* (6025).
- Dobbs, M., & Hamilton, R. T. (2006). Small business growth: Recent evidence and new directions. *International Journal of Entrepreneurial Behaviour and Research*, 13 (5), 296-322.
- Doghan, E., Aslan, A. (2017). Exploring the relationship among CO2 emissions, real GDP, energy consumption and tourism in the EU and candidate countries evidence from panel models robust to heterogeneity and cross-sectional dependence. *Renewable Sustainability Energy Revision* 77, 239 – 245.
- Flug, K., Spilimbergo, A., Wachtenheim, E. (1998). Investment in education: do economic volatility and credit constraints matter? *Journal of Development Economics* 55, 465–481.
- Guiso, L., Sapienza, P., Zingales, L. (2004). Does local financial development matter? *Quartely Journal of Economics* 119, 929–969.
- Im, K.S., Pesaran, M.H., Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Economics* 115, 53 – 57.
- Inglese-Lotz, R. (2016). The impact of renewable energy consumption to economic growth: A panel application. *Energy Economics* 53, 58 – 63.
- Kao, C. (1999). Spurious regression and residual-based tests for cointegration panel data. *Journal of Economics* 90 (1), 1 – 44.
- Karlan, D., Zinman, J. (2010). Expanding credit access: using randomized supply decisions to estimate the impacts. *Revised Financial Studies*. 23, 433–464.
- Klapper, L., Laeven, L., Rajan, R. (2006). Entry regulation as a barrier to entrepreneurship. *Journal of Financial Economics* 82, 591–629.
- Levin, A., Lin, C.F., Chu, C. (2002). Unit root tests in panel data: asymptotic and finite sample properties. *Journal of Economics* 108, 1 – 24.
- Maddala, G.S., Wu, S. (1999). A comparative study of unit root tests with panel data and a new simple test. *Oxford Bulletin of Economics and Statistics* 61, 631 – 652.
- Maji, I. K., Sulaiman, C. (2019). Renewable energy consumption and economic growth nexus: A fresh evidence from West Africa. *Energy Report* 5, 384 – 392.
- Mani, A., Mullainathan, S., Shafir, E., Zhao, J. (2013). Poverty impedes cognitive function. *Science* 341, 976–980.
- Prasad, E.S. (2010). Financial Sector Regulation and Reforms in Emerging Markets: An Overview. National Bureau of Economic Research.
- Rumler, F., & Waschiczek, W. (2010). The impact of economic factors on bank profits. *Monetary Policy & the Economy*, 4, 49-67.
- World Bank, (2013). Global financial Development Report 2014: Financial Inclusion. World Bank Publications.
- Zhang, L., Gao, J. (2016). Exploring the effects of international tourism on China’s economic growth, energy consumption and environmental pollution: evidence from a regional panel analysis. *Renew. Sustain. Energy Rev.* 36, 180 – 187.
- Zhang, S., Liu, X. (2019). The roles of international tourism and renewable energy in environment: New evidence from Asian countries. *Renewable Energy* 139, 385 – 394.