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FINANCIAL INCLUSION AND POVERTY ALLEVIATION: THE CONTRIBUTION OF COMMERCIAL BANKS IN WEST AFRICA

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ABSTRACT

The study delves into financial inclusion and poverty alleviation with emphasis on the contribution of the commercial banks in West Africa from the period of 2004 to 2015. To achieve the objective of the study. In a panel of 10 West African countries, the study aimed at assessing the dynamic relationship that exists between financial inclusion and poverty alleviation. In order to achieve this objective, the study utilized some panel data methodologies such as unit root tests and cointegration tests to unravel the characteristics of the variables whether they statistically fit for further regression. The study employed dynamic panel data methodology to analyze the data to make statistical inference. The study found out that financial inclusion has positive impact on poverty alleviation but taking into consideration the number of commercial banks, it was evidenced that it has negative impact on poverty alleviation whiles number of ATMs and total amount of loans granted are insignificant in poverty alleviation. Government effectiveness as in the quality of policy formulation, implementation and the credibility of the government's commitment to such policies has positive impact on poverty alleviation but regulatory quality which is the ability of the government to formulate and implement sound policies and regulations for private sector development has negative impact on poverty alleviation. The study recommends that commercial banks should widen their scope of operation to reach out to the poverty-prone areas. Moreover, governments should create the enabling environment and formulate and also implement sound policies which can boost poverty alleviation.

Contribution/Originality: This study contributes in the existing literature on financial inclusion but presents a dynamic methodology by assessing the dynamic relationship that exists between financial inclusion and poverty alleviation in the region of West Africa.

1. INTRODUCTION

Poverty is generally accepted as a complex occurrence susceptible to many definitions and conceptualizations. Poverty can be defined as people's inability to provide sufficient income to meet their basic needs like food, shelter, clothing, transportation and education (Edozien, 1975; Mabogunje, 1975; Olayide & Essang, 1975). Moreover, poverty can be described as a situation of low income or inadequate income to meet the basic needs of life (Ogwumike, 1991; World Bank, 2001). Many studies have established direct and positive relationship between financial development thus access to finance and poverty alleviation (Beck, Demirgüç-Kunt, & Levine, 2007; Honohan, 2004; Jeanneney & Kpador, 2008; Julilian & Kirkpatrick, 2005; Odhiambo, 2009; Odhiambo., 2010). Financial inclusion has been established theoretically and empirically proven that it has the potential and possibility

to reduce poverty and that it promotes pro-poor growth and addresses the Millenium Development Goals (Chibba, 2008a, 2008b, 2008c, 2008d; IFPRI, 2007). As a result, it has highlighted the credibility of the World Bank (2012) report between 2008 and 2010, which posits that the percentage of adults that are formally banked rose from 21% to 30%, while those that were totally excluded from financial inclusion reduced from 53% to 46% (Aina & Onafowokan, 2014).

Commercial banks play the role of financial intermediation and the theory of financial intermediation stipulates that the process of intermediation seeks to enable the surplus units lend to the deficit units. It is through this process that financial inclusion comes into play. Financial inclusion can be defined as the timely delivery of financial services to the less privileged and disadvantaged sections of the society (Ramji, 2009) whiles financial exclusion is explained as a process whereby people confront struggles accessing and/or using financial services and products in the conventional market that are appropriate to their needs and enable them to lead an ordinary social life in the society in which they belong (Anderloni & Carluccio, 2006; European Union, 2008; Kempson, 2006; Sinclair, 2001).

Financial inclusion has been widely affirmed that it has positive significant impact on poverty alleviation. Some studies posit that financial inclusion has the tendency to alleviate poverty in developing countries as well as urban poor and rural poor communities (Burges & Pande, 2005; Harley, Adetoso, & Adegboba, 2017; Honoham, 2007). Poverty alleviation is one of the sustainable development goals which the whole world sees it as a threat to the world's peace. Moreover, it has attracted the attention of policymakers and government to find lasting solutions to the canker. As a result of this, the study is motivated to examine the impact of financial inclusion on poverty alleviation in the West Africa which is a developing region hence many of its indigenes are living in poverty. The study intends to find out how population growth in the national level, urban level and rural level affect poverty alleviation. Some literatures posit that rapid increase in population affect per capita gain to subsistence needs and also cripple governments with the inability to provide essential basic needs such employment, housing, electricity, water, sanitation, etc. which mostly help in human development (Buhaug & Urdal, 2013; Homer-Dixon & Blitt, 1998; Homer-Dixon., 1999).

The study intends to contribute to existing literatures which are not enough on such a pertinent topic to provide direction for policymakers and academic perusal.

The study is divided into section 1 which contains the introduction of the study; section 2 consists of data and methodology of the study, section 3 presents the results of the data analysis and the discussion of the results. Lastly, section 4 which conclude the study and propose recommendations.

2. DATA AND METHODOLOGY

2.1. Data

The study uses panel data of 10 West African countries from 2004 to 2015 and adopted 13 variables. The description of the variables could be found below. The independent variable financial inclusion is measured by proxy of geographical outreach of financial services and use of financial services thus number of commercial banks, number of commercial banks per 1000 kilometer square, number of Automated teller machines countrywide, total amount of loans granted by commercial banks and total amount of deposits with commercial banks. The dependent variable poverty alleviation is measured by proxy of human development index which is the statistic composite index of life expectancy, education, and per capita income indicators. Furthermore, some control variables were chosen to control poverty alleviation with the role of financial inclusion such as government effectiveness, regulation quality, population growth (urban and rural), gross domestic product per capita and employment in the agricultural sector. Below describe the variables in detail:

1. Total loans granted by commercial banks (LnLoansgdp) use of Financial Services: Outstanding loans from commercial banks (% of GDP). Source: IMF Financial access survey.
2. Number of Commercial banks (lnNoBanks) Geographical Outreach. Source: IMF Financial access survey.

3. Number of commercial bank branches (lnBBran) Geographical Outreach: Number of commercial bank branches per 1000 km2. Source: IMF Financial access survey.

4. Total amount of deposits with commercial banks (LnDepgdp) Use of Financial Services: Outstanding deposits with commercial banks (% of GDP). Source: IMF Financial access survey.

5. Number of Automated Teller Machines (ATMs), Country wide (LnAtm)   Geographical   Outreach. Source: IMF Financial access survey.

6. Government effectiveness (goveff) reflects perceptions of the qualities, the quality of policy formulation and implementation and the credibility of the government's commitment to such policies. Source: Worldwide Governance Indicators.

7. Regulatory quality (regqty) reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Worldwide Governance Indicators.

8. Human development index (hdi) is statistic composite index of life expectancy, education, and per capita income indicators. Source: United Nations Development Programmes (UNDP).

9. Population growth (annual %) (popg). Source: World Development Indicators.

10. Employment in agriculture (% of total employment) (modeled ILO estimate) (eia). Source: World Development Indicators.

11. Rural population growth (annual %) (rpopg). Source: World Development Indicators.

12. Urban population growth (annual %) (upopg). Source: World Development Indicators.

13. Gross domestic product per capita (lnGdppc) GDP per capita ppp constant 2011. Source: World Development Indicators.

Table-1. Human development index ranking as at 2017.

No.	Country	HDI Rank (2017)
1	Ghana	140
2	Nigeria	157
3	Côte d'Ivoire	170
4	Benin	163
5	Burkina Faso	183
6	Senegal	164
7	Gambia	174
8	Guinea	175
9	Mali	182
10	Niger	189

Source: UNDP.

The variables were transformed into natural logarithm to help minimize the fluctuations in data series except human development index (hdi), government effectiveness (goveff) and regulation quality (regqty).

The econometric model for the study thus Arellano-Bond dynamic panel data model (Arellano & Bond, 1991; Kim, Yu, & Hassan, 2018) can be written as;

$$hdi_{it} = \sum_{j=1}^{p} a_j\, hdi_{i,t-j} + \beta_1 financial\ inclusion_{it} + \beta_2 lngdppc_{it} + \beta_3 lneia_{it} + \beta_4 goveff_{it}$$

$$+ \beta_5 regqty_{it} + \beta_6 lpopg_{it} + v_i + \varepsilon_{it} \qquad i = 1, \ldots \ldots, N\ t = 1, \ldots \ldots T_i \tag{1}$$

$$hdi_{it} = \sum_{j=1}^{p} a_j \, hdi_{i,t-j} + \beta_1 financial\ inclusion_{it} + \beta_2 lngdppc_{it} + \beta_3 lneia_{it} + \beta_4 goveff_{it}$$
$$+ \beta_5 regqty_{it} + \beta_6 lupopg_{it} + v_i + \varepsilon_{it} \quad i = 1, \dots \dots, N \; t = 1, \dots . T_i \tag{2}$$

$$hdi_{it} = \sum_{j=1}^{p} a_j \, hdi_{i,t-j} + \beta_1 financial\ inclusion_{it} + \beta_2 lngdppc_{it} + \beta_3 lneia_{it} + \beta_4 goveff_{it}$$
$$+ \beta_5 regqty_{it} + \beta_6 lrpopg_{it} + v_i + \varepsilon_{it} \quad i = 1, \dots \dots, N \; t = 1, \dots . T_i \tag{3}$$

In the Equation 1 - 3, i represent the 10 cross sectional countries in West Africa, t represents the period of time from 2004 to 2015, v represents the panel level effect, and ε_{it} represents the independent and identically distributed (i.i.d.) over the whole data sample with variance σ_ε^2, j represents the time lag that will be determined by Arellano-Bond test for the serial correlation. Equation 1 takes into consideration of population growth in national level and Equation 2 takes into consideration urban population growth whiles Equation 3 takes into consideration rural population growth with the objective of examining the impact they have on poverty alleviation.

2.2. Methodology

The study employs panel data methodologies such as panel unit root tests, panel cointegration tests, dynamic panel data estimation method (Arellano-Bond) two-step generalized method of moment and homogenous causality test. All these methods were employed in order to confirm the outcome of study and make statistical inference. The first step of the study is to test for unit root in the variables and Levin, Lin, and Chu (2002); Im, Pesaran, and Shin (2003) Fisher Augmented Dickey-Fuller (ADF) and Fisher Philips-Perron (PP) tests (Maddala & Wu, 1999) approaches are used. 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 & Wu, 1999) test statistic for heterogeneity. However, the specification proposed by Im et al. (2003) is as follows:

$$y_{it} = \rho_i \, y_{i,t-1} + \sigma_i x_{it} + \varepsilon_{tt} \tag{4}$$

In the Equation 4, 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 & 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).

$$\varepsilon_{it} = \sum_{j=1}^{n=1} \theta_{ij} \varepsilon_{i,t-1} + \varepsilon_{it} \tag{5}$$

By substituting Equation 4 into Equation 5 yield the following:

$$y_{it} = \rho_i \, y_{i,t-1} + \sigma_i x_{it} + \varepsilon_{it} + \sum_{j=1}^{n=1} \theta_{ij} \varepsilon_{i,t-1} + \varepsilon_{it} \tag{6}$$

In Equation 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.

The second step after the testing of the unit root 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 Equation 5 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 Pedroni (1999); Pedroni (2004) and Kao and Chiang (2000) test approach allows more than one exogenous variable to test for unit root.

The next step is to analyze the data with Arellano-Bond dynamic panel data generalized method of moment two-step method to estimate the coefficients of the variables. The study used two-step GMM method for its estimations due to the effect of less propensity of an influence by heteroskedasticity than the one-step method. Furthermore, Sargan test is performed to examine the validity of instruments used in the process. Again, AR (1) and AR (2) tests are also performed to check for autocorrelation of the residuals; the value of AR (2) depicts that the hypothesis of zero second order serial correlation existing among the variables cannot be rejected (Lingyun & Xiaolu, 2018).

Lastly, the test for bivariate panel causality among the variables is performed to ascertain the direction in which each variable causes the other. Dumitrescu and Hurlin (2012) came out with a simple method to assess the hypothetical homogenous non-causality against the alternative of heterogeneous non-causality. The linear heterogeneous model can be written as:

$$y_{i,t} = \alpha_i + \sum_{k=0}^{k} Yi^{(k)} y_{i,t-k} + \sum_{k=1}^{k} \beta i^{(k)} x_{i,t-k} + \varepsilon_{i,t}$$

(7)

In Equation 7, k represents the lag length, x and y stands for the variables used for i individuals in t periods in the model, α_i stands for constant term for i individual effects. However, $Yi^{(k)}$ and $\beta i^{(k)}$ represent lag parameter and coefficient slope based on k lag and i individual effect respectively.

The null hypothesis (H_O) and the alternative hypothesis (H_1) can be expressed as follows:

$$H_O : \beta_i = 0 \; \forall i = 1, \dots., N \; with \; \beta_i = (\beta_I^1, \beta_I^2 \dots. \beta_I^K)$$

(8)

$$H_1 : \beta_I = 0 \; \forall i = 1, \dots., N_1$$

$$\beta_I \neq 0 \; \forall i = N_1 + 1, N_1 + 2, \dots., N$$

In this situation, N_1 is in line with condition $0 \leq N_1 \leq N$. The null hypothesis states that no causal relationship exist in all the units of the panel (H_O) and the alternative hypothesis (HENC,H_1) can be categorized into two sections. The first section states that x to y is observed and the second section suggests that there is no causality from x to y. Therefore, heterogeneous panel data model is employed which assumes fixed estimates of the group for the empirical analysis. However, the average statistics $W_{N,T}^{HNC}$ is recommended and it is related to the HNC hypothesis. It can be found as follows in Equation 9:

$$W_{N,T}^{HNC} = \frac{1}{N} \sum_{i=1}^{N} Wi, \tau$$

(9)

In Equation 9 Wi, τ represents the individual Wald statistics for the ith cross section units. From the null hypothesis of non-causality, each individual Wald statistics meets a Chi-squared distribution with k degrees of freedom for T $\rightarrow \infty$. The normal distribution under the homogeneous non-causality hypothesis meets the standardized test statistic and model derived can be written as:

$$Z_{N,T}^{HNC} = \sqrt{\frac{N}{2K}} \left(W_{N,T}^{HNC} - K \right) \rightarrow N(0,1)$$

(10)

In the Equation 10, T, N$\rightarrow \infty$ represents the fact that T $\rightarrow \infty$ at first and N $\rightarrow \infty$.

3. RESULTS AND DISCUSSION

3.1. Summary Statistics

Table 2 shows the summary statistics of the variables for the study; from the table, the mean and median of the variables are closely related. The standard deviation of the variables are homogeneous in nature and it measures how concentrated the variables are around the mean values. However, Skewness test is the measure of the asymmetric distribution of the variables and from the table it can be evidenced that the variables are both negatively and positively skewed but the positive skewed variables are more than the negative ones. Therefore, the Skewness test confirms that mass of the distribution are concentrated on the right. The right or positively skewed tends to affirm that there is higher mean value than the median value. Kurtosis tests shows positive values which means that the distribution is leptokurtic thus too tall. The Jarque-Bera test affirms that the all variables are not in normal distribution.

Table-2. Summary statistics of variables.

	Dependent and Independent variables						
	lnnobanks	lnbbran	lnatm	lndepgdp	lnloansgdp	hdi	
Mean	2.688	-0.114	3.574	3.126	2.721	0.432	
Median	2.565	-0.019	4.102	3.170	2.875	0.436	
Maximum	4.489	2.260	9.705	3.860	3.613	0.585	
Minimum	1.792	-3.848	0.000	1.730	0.197	0.274	
Std. Dev.	0.409	1.480	3.040	0.454	0.677	0.068	
Skewness	0.688	-0.406	0.133	-1.034	-2.228	-0.084	
Kurtosis	4.724	2.479	1.807	4.381	8.266	2.791	
Jarque-Bera	24.334	4.653	7.469	30.923	237.922	0.359	
Probability	0.000***	0.098*	0.024**	0.000***	0.000***	0.836	
		Control variables					
	lneia	lngdppc	goveff	regqty	lnpopg	lnrpopg	lnupopg
Mean	3.896	7.604	-0.708	-0.507	1.025	0.570	1.410
Median	3.838	7.507	-0.680	-0.456	1.032	0.585	1.386
Maximum	4.358	8.646	0.160	0.128	1.346	1.348	1.897
Minimum	3.399	6.630	-1.323	-1.352	0.579	-0.184	1.001
Std. Dev.	0.291	0.484	0.342	0.327	0.168	0.353	0.203
Skewness	0.028	0.056	0.263	-0.345	-0.220	0.417	0.150
Kurtosis	1.898	2.755	2.675	2.641	2.933	3.151	2.550
Jarque-Bera	6.083	0.363	1.917	3.028	0.991	3.584	1.462
Probability	0.048**	0.834	0.383	0.220	0.609	0.167	0.481

Note: *** indicates 1% significance, ** indicates 5% significance, * indicates 10% significance.

3.2. Panel Unit Root Tests

At this section, the panel unit root tests were computed and Table 3 displays the results. At level form, lnnobanks, lnbbranc and lnpopg were stationary; regqty and lnupopg were also stationary with LLC, ADF-Fisher and PP-Fisher. Lnatm was stationary with PP-Fisher test; lndepgdp and lngdppc were stationary with LLC as well as lnloansgdp. On the other hand, lnrpopg was stationary with LLC and ADF-Fisher tests, goveff was stationary with IPS, ADF-Fisher and PP-Fisher; hdi was also stationary with LLC and PP-Fisher tests but lneia was not stationary meaning it has unit root at level form. Subsequently, all tests were performed at first difference and the results confirm that, at first difference all the variables are stationary except lnpopg with PP-Fisher test, lnrpopg with IPS and PP-Fisher tests and lnupopg with PP-Fisher test. In contrast, the study can confidently reject the null hypothesis that there is unit root in the variables because at first difference all the variables are stationary.

Table-3. Panel unit root tests.

	Dependent and independent variables					
	lnnobanks	**lnbbran**	**lnatm**	**lndepgdp**	**lnloansgdp**	**hdi**
level						
LLC	–7.150***	–13.156***	–1.247	–2.318**	–2.128**	–4.126***
IPS	–6.196***	–4.047***	0.422	2.177	1.688	1.030
ADF-Fisher	68.226***	39.705**	18.910	15.976	20.005	17.375
PP-Fisher	70.605***	44.757***	32.803**	23.466	23.413	53.109***
First difference						
LLC	–19.707***	–6.009***	–16.623***	–9.324***	–5.587***	–8.626***
IPS	–11.078***	–5.160***	–9.084***	–5.880***	–2.986***	–5.053***
ADF-Fisher	90.891***	60.258***	65.312***	68.341***	43.890**	60.462***
PP-Fisher	127.103***	69.084***	–83.797***	88.506***	50.109***	45.352***

Note: *** indicates 1% significance, ** indicates 5% significance, * indicates 10% significance.

Unit root test Cont.		Control variables					
	lngdppc	**lneia**	**goveff**	**regqty**	**lnpopg**	**lnrpopg**	**lnupopg**
level							
LLC	-2.795**	5.623	-0.247	-2.115**	-5.118***	-3.312***	-2.707**
IPS	1.642	7.698	-1.531*	-0.776	-2.312**	-0.208	0.969
ADF-Fisher	15.252	4.011	38.169**	33.080**	44.629***	34.474**	46.390***
PP-Fisher	16.353	1.464	40.349**	39.187**	46.231***	24.908	34.226**
First difference							
LLC	-9.666***	-4.587***	-15.843***	-13.117***	-7.263***	-3.888***	-6.542***
IPS	-5.652***	-2.471**	-10.988***	-8.196***	-3.993***	-0.522	-2.095**
ADF-Fisher	66.131***	44.985**	91.365***	85.829***	75.033***	34.457**	44.460***
PP-Fisher	61.358***	41.141**	104.718***	80.220***	6.817	9.444	8.657

Note: *** indicates 1% significance, ** indicates 5% significance, * indicates 10% significance.

3.3. Pedroni and Kao Co-Integration Tests

In Table 4 exhibits the results of co-integration tests performed by using the approaches of Pedroni (2004) and Kao and Chiang (2000). From the table, it can be established that the null hypothesis which states that the variables are not co-integrated is invalid hence the study rejects the null hypothesis. Four out of the seven tests that are performed by using Pedroni approach showed 1% significance and Kao test also showed 1% significance hence the rejection of the null hypothesis.

Table-4. Pedroni and Kao cointegration tests.

	Pedroni Residual Co-integration			
Alternative hypothesis: common AR coefs. (within-dimension)				
			Weighted	
	Statistic	**Prob.**	**Statistic**	**Prob.**
Panel v-Statistic	–0.944	0.828	–1.661	0.952
Panel rho-Statistic	2.556	0.995	2.783	0.997
Panel PP-Statistic	–4.000	0.000***	–6.177	0.000***
Panel ADF-Statistic	–3.329	0.000***	–3.729	0.000***
Alternative hypothesis: individual AR coefs. (between-dimension)				
	Statistic	Prob.		
Group rho-Statistic	4.167	1.000		
Group PP-Statistic	–11.755	0.000***		
Group ADF-Statistic	–3.740	0.000***		
	Kao Residual co-integration test			
	t-Statistic	Prob.		
ADF	–8.885	0.000***		

Note: *** indicates 1% significance

3.4. Financial Inclusion and Poverty Alleviation with Emphasis on National Population Growth Rate

By assessing the impact of financial inclusion on poverty alleviation with the contribution of commercial banks in West Africa, Arellano and Bond dynamic panel data generalized method of moment (two-step) method was used to estimate the coefficient at which financial inclusion affects poverty alleviation. Table 5 reports the results and from the results it can be established that economic growth plays a vital role in poverty alleviation hence an increase in economic growth automatically increases in the reduction of poverty. It can be evidenced that lngdppc showed positive and statistical significant impact on poverty alleviation (hdi) in all the models with each financial inclusion variable considered. By taking into consideration the effectiveness of governments in the resolve to combat poverty, the variable goveff showed that governments' effectiveness in policy formulations and implementation helps a lot in poverty alleviation hence goveff showed positive and significant impact on hdi thus human development index. Agriculture seems to be the engine of Africa's growth, therefore, the study concentrated on employment in the agricultural sector to find out whether it has positive impact on poverty alleviation. The result is negative; employment in the agricultural sector in West Africa seems to rather negatively affect poverty alleviation. From Table 4 it can be evidenced that lneia showed consistent negative impact on hdi in all the models with the financial inclusion variables employed for the study per the contributions of commercial banks. Regulation quality is one factor which enables the private sector to have the enabling business environment and climate to operate and flourish to propel economic growth. The study employed regulation quality as control variable to measure the contribution of commercial banks in poverty alleviation and from the result it can be evidenced that the regulation quality in West Africa is not top-notch which do not support the commercial banks to contribute in poverty alleviation. Perhaps, regqty showed consistent negative impact on poverty alleviation (hdi). The population growth in West Africa has negative impact on poverty alleviation as well as the number of commercial banks. The increase in population has not been able to translate into economic gains hence the negative impact of lnpopg on hdi. The number of commercial banks has negative impact on poverty alleviation whiles the number of bank branches has positive impact on poverty alleviation. It can be evidenced that the number of commercial banks do not matter in poverty alleviation but the larger the number of commercial bank branches per 1000 km square (lnbbranc) has positive impact on poverty alleviation as well as the total amount of deposits with commercial banks (lndepgdp). The number of loans that are granted by commercial banks (lnloansgdp) in West Africa and number of ATMs are insignificant in poverty alleviation (lnatm).

Table-5. Financial inclusion and Poverty alleviation: Emphasis on national population growth rate.

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
hdi	-0.042	-0.136	-0.062	-0.033	-0.650
L1	(-1.21)	(-4.66)***	(-1.59)	(-0.85)	(-1.62)
lngdppc	0.090	0.058	0.070	0.053	0.068
	(18.87)***	(21.92)***	(35.50)***	(14.17)***	(20.95)***
lneia	-0.068	-0.019	-0.076	-0.052	-0.077
	(-13.96)***	(-2.77)**	(-31.51)***	(-5.83)***	(-18.21)***
goveff	0.069	0.054	0.061	0.052	0.059
	(8.34)***	(6.42)***	(7.37)***	(7.52)***	(8.15)***
regqty	-0.069	-0.052	-0.064	-0.091	-0.068
	(-11.34)***	(-9.06)***	(-10.06)***	(-14.58)***	(-12.36)***
lnpopg	-0.017	-0.038	-0.029	-0.035	-0.029
	(-2.10)**	(-5.65)***	(-4.70)***	(-5.28)***	(-5.19)***
lnnobanks	-0.028				
	(-4.82)***				
lnbbran		0.016			
		(8.33)***			
lnatm			0.000		
			(0.03)		
lndepgdp				0.035	
				(5.84)***	
lnloansgdp					0.002
					(1.03)
constant	0.125	0.170	0.255	0.089	0.263
	(3.22)***	(9.11)***	(15.89)***	(1.24)	(6.39)***
sargan test	11.625	11.869	11.802	11.503	11.794
prob.	1.000	1.000	1.000	(1.000)	(1.000)
AR(1)	-3.024**	-3.215**	-3.178**	-3.158**	-3.185**
AR(2)	-0.153	-0.371	0.368	0.576	0.520

Note: *** indicates 1% significance, ** indicates 5% significance, * indicates 10% significance.

3.5. Financial Inclusion and Poverty Alleviation: Emphasis on Urban Population Growth

By taking into account the urban population growth rate as a focal measure to assess the impact of financial inclusion on poverty alleviation with the contribution of commercial banks in West Africa; Table 6 exhibits the results and it can be evidenced that urban population growth rate showed inconsistent impact on poverty alleviation, out of the five models only two showed negative and statistical significant impact on poverty alleviation. The results are in line with the results in Table 5 with the emphasis on national population growth rate except urban population growth. For instance, lngdppc, goveff, lnbbran and lndepgdp showed positive and statistical significant impact on poverty alleviation (hdi). On the other hand, lneia and regqty and lnnobanks showed negative and statistical significant impact on poverty alleviation (hdi) whiles lnatm and lnloansgdp showed insignificant impact on poverty alleviation.

Table-6. Financial inclusion and poverty alleviation: Emphasis on urban population growth rate.

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
hdi	-0.043	-0.104	-0.071	-0.033	-0.090
L1	(-0.80)	(-2.69)**	(-2.01)**	(-1.00)	(-3.30)***
lngdppc	0.093	0.063	0.074	0.067	0.073
	(17.12)***	(22.14)***	(18.37)***	(20.86)***	(-6.13)***
lneia	-0.068	-0.013	-0.081	-0.054	-0.080
	(-12.66)***	(-0.69)	(-18.37)***	(-18.80)***	(-26.56)***
goveff	0.067	0.047	0.055	0.056	0.056
	(8.29)***	(6.89)***	(7.34)***	(6.52)***	(6.23)***
regqty	-0.073	-0.046	-0.074	-0.094	-0.077
	(-7.83)***	(-3.44)***	(-9.07)***	(-10.75)***	(-6.13)***
lnupopg	-0.004	-0.022	0.002	-0.012	0.002
	(-0.55)	(-2.41)**	(0.40)	(-2.82)**	(0.44)
lnnobanks	-0.029				
	(-4.24)***				
lnbbran		0.017			
		(5.72)***			
lnatm			-0.001		
			(-1.03)		
lndepgdp				0.034	
				(8.42)***	
lnloansgdp					0.001
					(0.30)
constant	0.092	0.083	-0.207	0.040	0.218
	(2.55)**	(1.02)	(6.34)***	(1.82)*	(11.82)***
sargan test	11.637	11.863	11.689	11.593	11.632
prob.	1.000	1.000	1.000	1.000	1.000
AR(1)	-2.916**	-3.208**	-3.079**	-3.016**	-2.986**
AR(2)	-0.489	-1.563	0.025	0.094	-0.595

Note: *** indicates 1% significance, ** indicates 5% significance, * indicates 10% significance.

3.6. Financial Inclusion and Poverty Alleviation: Emphasis on Rural Population Growth

The result from the assessment of the impact of financial inclusion on poverty alleviation with an emphasis on rural population growth tends to replicate the results with emphasis on national population growth rate. Table 7 reports the results and it is evidenced that lngdppc, goveff, lnbbran and lndepgdp have positive and statistical significant impact on poverty alleviation (hdi). Moreover, lneia, regqty and lnnobanks have negative and statistical significant impact on poverty alleviation (hdi). However, lnatm and lnloansgdp have insignificant impact on poverty alleviation by the contribution of commercial banks in West Africa.

3.7. Dumetriscu and Hurlin Causality Test

In order to ascertain the direction of causality of the variables, the study employed (Dumitrescu & Hurlin, 2012) homogeneous causality test and Table 8 displays the results. From the table, it can be found that there are bidirectional linkages between some variables as well as unidirectional linkages. The bidirectional linkage can be found from lngdppc↔hdi, lneia↔hdi, lnatm↔lnbbran, lnpopg↔lnbbranc, lnpopg↔lngdppc, lnpopg↔lneia and lnpopg↔regqty. The bidirectional linkage between the variables affirms that a change or variation in one variable will cause a change in the other variable concurrently. The evidence of unidirectional linkage can be found from hdi→lndepgdp, hdi→lnpopg, lnbbranc→lnnobanks, lneia→lnnobanks, goveff→lnnobanks, lnnobanks→lnpopg, lnbbranc→lndepgdp, lnbbranc→regqty, lnatm→lngdppc, lnatm→lnpopg, regqty→lnloansgdp, lnpopg→lnloansgdp, lnloansgdp→lnpopg, lngdppc→lmdepgdp, lneia→lndepgdp, regqty→lndepgdp, lnpopg→lndepgdp, lndepgdp→lnpopg, lngdppc→lneia, lneia→goveff and goveff→lnpopg. In brief, the unidirectional linkage affirms that the first variable homogeneously causes the latter.

Table-7. Financial inclusion and poverty alleviation: emphasis on rural population growth rate.

Model 1	Model 2	Model 3	Model 4	Model 5
-0.113	-0.156	-0.136	-0.033	-0.065
(-3.03)**	(-10.48)***	(-4.52)***	(-0.85)	(-1.62)
0.072	0.056	0.058	0.063	0.068
(10.51)***	(18.77)***	(16.16)***	(7.52)***	(20.95)***
-0.052	-0.033	-0.056	-0.052	-0.077
(-10.98)***	(-3.79)***	(-7.83)***	(-5.83)***	(-18.21)***
0.088	0.074	0.085	0.062	0.059
(11.57)***	(5.94)***	(10.14)***	(7.52)***	(8.15)***
-0.075	-0.069	-0.073	-0.091	-0.068
(-10.49)***	(-9.14)***	(-8.70)***	(-14.68)***	(-12.36)***
-0.049	-0.042	-0.058	-0.035	-0.029
(-5.89)***	(-3.85)***	(-10.67)***	(-5.28)***	(-5.19)***
-0.018				
(-2.85)**				
	0.008			
	(2.62)**			
		0.003		
		-0.57		
			0.035	
			(5.84)***	
				0.002
				-0.301
0.233	0.244	0.337	0.089	0.263
(5.13)***	(5.42)***	(9.91)***	-1.24	(6.39)***
11.587	11.629	11.65	11.603	11.794
1	1	1	1	-1
-3.053**	-3.216**	-3.133**	-3.168**	-3.185**
0.499	-0.12	0.589	0.499	0.52

Note: *** indicates 1% significance, ** indicates 5% significance, * indicates 10% significance.

4. CONCLUSION AND RECOMMENDATION

The study conducted an empirical research into the impact of financial inclusion on poverty alleviation with panel data of 10 West African countries from the period 2004 to 2015. The study used panel data methodologies such as panel unit root tests, panel co-integration tests, dynamic panel data estimation method (Arellano and Bond generalized method of moment two-step) and homogeneous causality to make robust and statistical inference. The study used 13 variables; 5 independent variables, 1 dependent variable and 7 control variables. The variables are gross domestic product per capita, employment in agricultural sector, government effectiveness, regulation quality, population growth (national, urban and rural), number of commercial banks, commercial banks branches, number of ATMs, total amount of deposits with commercial banks and total amount of loans granted by commercial banks.

The study found out that financial inclusion has positive impact on poverty alleviation but taking into consideration the number of commercial banks, it was evidenced that it has negative impact on poverty alleviation whiles number of ATMs and total amount of loans granted are insignificant in poverty alleviation. Government effectiveness as in the quality of policy formulation, implementation and the credibility of the government's commitment to such policies has positive impact on poverty alleviation but regulatory quality which is the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development has negative impact on poverty alleviation. Population growth and employment in the agricultural seems to negatively affect poverty alleviation. Astronomical increase in population tends to overburden governments' expenditure and ability to provide basic public services such as employment, housing, electricity, water, sanitation etc. hence these problems seem to be disadvantaged to poverty alleviation or human development index.

The study recommends that government should create an enabling environment for the commercial banks to operate and perform soundly to facilitate in poverty alleviation by providing credit or loans to the poverty-prone areas. The promotion and campaign of financial inclusion should be imperative to policy makers. Commercial banks should widen their scope of operation to reach out to the poor in the quest to alleviate poverty. Commercial banks should carve innovative products and services to reach out to the poor in the urban and rural communities. In pursuit of financial inclusion, it is assumed that no one should be left out. The study recommends further studies into the area of financial inclusion in developing countries.

Table-8. Homogeneous causality test.

Null Hypothesis:	W–Stat.	Zbar–Stat.	Prob.	Sig.
hdi does not homogeneously cause lndepgdp	15.661	5.230	0.000	***
lngdppc does not homogeneously cause hdi	12.176	3.752	0.000	***
hdi does not homogeneously cause lngdppc	8.312	2.112	0.035	**
lneia does not homogeneously cause hdi	8.589	2.230	0.026	**
hdi does not homogeneously cause lneia	8.756	2.301	0.021	**
hdi does not homogeneously cause lnpopg	58.390	23.359	0.000	***
lnbbran does not homogeneously cause lnnobanks	9.328	2.543	0.011	**
lneia does not homogeneously cause lnnobanks	12.171	3.749	0.000	***
goveff does not homogeneously cause lnnobanks	7.493	1.765	0.078	*
lnnobanks does not homogeneously cause lnpopg	28.414	10.641	0.000	***
lnatm does not homogeneously cause lnbbran	10.730	3.138	0.002	**
lnbbran does not homogeneously cause lnatm	16.557	5.611	0.000	***
lnbbran does not homogeneously cause lndepgdp	18.962	6.631	0.000	***
lnbbran does not homogeneously cause regqty	8.477	2.182	0.029	**
lnpopg does not homogeneously cause lnbbran	12.164	3.746	0.000	***
lnbbran does not homogeneously cause lnpopg	49.447	19.565	0.000	***
lnatm does not homogeneously cause lngdppc	63.771	25.642	0.000	***
lnatm does not homogeneously cause lnpopg	38.341	14.853	0.000	***
regqty does not homogeneously cause lnloansgdp	7.586	1.804	0.071	*
lnpopg does not homogeneously cause lnloansgdp	8.514	2.198	0.028	**
lnloansgdp does not homogeneously cause lnpopg	28.696	10.761	0.000	***
lngdppc does not homogeneously cause lndepgdp	7.283	1.676	0.094	*
lneia does not homogeneously cause lndepgdp	9.025	2.415	0.016	**
regqty does not homogeneously cause lndepgdp	8.131	2.036	0.042	**
lnpopg does not homogeneously cause lndepgdp	10.554	3.063	0.002	**
lndepgdp does not homogeneously cause lnpopg	19.133	6.703	0.000	***
lngdppc does not homogeneously cause lneia	13.877	4.473	0.000	***
lnpopg does not homogeneously cause lngdppc	8.104	2.024	0.043	**
lngdppc does not homogeneously cause lnpopg	14.485	4.731	0.000	***
lneia does not homogeneously cause goveff	9.080	2.438	0.015	**
lnpopg does not homogeneously cause lneia	13.208	4.189	0.000	***
lneia does not homogeneously cause lnpopg	16.217	5.466	0.000	***
goveff does not homogeneously cause lnpopg	18.957	6.628	0.000	***
lnpopg does not homogeneously cause regqty	13.466	4.299	0.000	***
regqty does not homogeneously cause lnpopg	9.987	2.823	0.005	**

Note: *** indicates 1% significance, ** indicates 5% significance, * indicates 10% significance.

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