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FINANCIAL INCLUSION: A CAUSAL DRIVER OF EARNINGS CAPACITY IN WEST AFRICA

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ABSTRACT

Financial inclusion analyses in sub-Saharan Africa have traditionally focused on single-country studies. However, the current study seeks to undertake theoretical and empirical discussions on financial inclusion as a causal driver of earnings capacity in a panel of 15 West African countries covering the period 2011-2018. In the light of data constraints, we investigate whether bank loans, deposit accounts, mobile money transactions,s and bank branches foster per capita income; while population size is a control variable. We utilized cultural factors to investigate cross-country differences. Data were extracted from World Development Indicators and United Nations Development Programme. The study employs spectra of estimation techniques, namely: Pooled Least Square, Random Effects, and Fixed Effects. However, the Hausman model identification test indicates the data to be plausibly described by Fixed Effect. From the regression, specific findings are established: First, a bank loan is apparently positive and significant. Second, whereas population size is overwhelmingly negative and significant; bank branches, deposit accounts, and mobile money are positive and insignificant across models. Third, on cultural effects from interaction with regressors, Portuguese-speaking countries completely record adverse cultural effects than their Anglo-Francophone counterparts, although apparent within-entity differences are present. Fourth, there is consistent evidence of extensive margin theory and regional financial market integration. Collectively, findings show evidence of a positive relationship between financial inclusion and per capita income. In conclusion financial inclusion causally drives per capita income in the sub-region.

KEYWORDS

Financial Inclusion, Per Capita Income, ECOWAS, Fixed Effect.

JEL Classification: **G00, D31, F53, C23**

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Introduction

Financial inclusion is an innovative strategy of delivering financial services at an affordable cost as a means of alleviating or ultimately ending poverty of low- income groups. Without financial inclusion poor people have to rely on their own limited savings to invest in their education or become entrepreneurs. In other words, small scale enterprises must rely on their limited earnings to pursue promising growth opportunities (Demirgüç-Kunt & Klapper, 2012). Financial services as He and Wang (2020) noted has larger impact on farmers' vulnerability than that provided by traditional banks. Already several Micro, Small, and Medium Enterprises (MSMEs) and rural farmers suffer insufficient access to credits and in many occasions rely on informal markets for finance, at high costs. Lack of access to formal finance leaves poor households more vulnerable to adverse shocks and poverty traps (IMF, 2018).

As an ultra-modern concept, financial inclusion for decade is universally pervasive. Growing body of research concludes that financial inclusion has potential for delivering positive development benefits (Mlachila *et al* 2016) especially in its poverty relieving ability (Allen *et al.* 2016; Steffi & Balkees, 2020). Yet, to be financially included starts with when poor households own accounts, borrow from financial institutions and use digital financial services or other novel financial technology applications to make and receive payments (fintech). Although, while evidence is not straightforward with some level of theoretical doubts, studies that are yet skeptical about the use of common account ownership, bank branch and convenient payment system from a bank mobile application in solving long-lasting income inequality; still express optimism in achieving better future prospect by using financial access and usage for distributing wealth. Not surprising, in sub-Saharan Africa (SSA), financial services have created opportunities for women. Recent studies found that when women-headed households in Kenya, adopted mobile money accounts, poverty dropped, savings increased, and 185,000 women left agricultural jobs for better positions in business or retail (Klapper *et al.* 2019), marking an occupational shift from previous economic engagements. As it is well known chronic involuntary exclusion from access to financial services increase income vulnerability, thus declines economic potentials of low- income groups (Demirgüç-Kunt & Levine, 2009).

Notwithstanding the capacity of financial inclusion to initiate a turnaround in the economic misfortunes, a great deal of skepticism is still prevalent on how ordinary account ownership, expanded bank branch network and branchless banking services, such as using a convenient mobile phone network could translate into declining poverty in low-income countries. Conversely, experience in Scandinavian countries evidently lends support to positive economic effects of being highly financially included. For example, Denmark and Sweden with very low levels of income inequality have high levels of financial inclusion (Gebrehiwot & Makina, 2015). Growing body of research reports income enhancing potentials from the use of digital services of mobile money, payment cards and several other financial technologies. Lead studies in Honohan, (2004) indicates a strong positive link between access to banking services and economic development.

Asongu and Nwachukwu (2016) make assessment of synergy effect between governance of mobile phone penetration and inclusive development supports a positive correlation of mobile phone and development. Seminal work by Sarma and Pais (2008) suggest that inclusive financial sector fosters efficient resource allocation and potentially diminishes capital cost. Neaime and Gaysset (2017) assert that empirical evidence establishes a rise in income distribution of economies with higher amount of bank branches with numerous deposits.

1.2 Statement of the Problem

Evidence of perennial income inequality in West Africa is widely known. The region has around 50 per cent of its population living on less than US$2/day (World Bank, 2018). Cross-country specific poverty rate in West Africa shows that per capita income in Niger is as low as $912 (UNDP, 2019), indicating that poverty could be more severe in the sub-region. However, most recent survey claims that 1.2 billion people who gained access to an account for the first time in the last eight years live in developing countries and emerging markets, resultantly decreasing extreme poverty in every region of the world (World Bank, 2015).

Following the World Bank's assertion, empirical analyses provide substantial body of evidence suggesting that unrestricted access and usage of financial products and services act as accelerator for creation of new firms and ultimately reduce poverty (Poutineau & Vermandel, 2015). Currently empirical investigations have been carried out in single country studies with positive conclusion for which evidence is largely available (Mathew & Kurian, 2016; Musau, Muathe & Mwangi, 2018). Similar finding is reported in multi-country research in East Africa (Andrianaivo & Kpodar, 2012); the same is obtainable in world-wide studies in the past (Cull, Erhbeck & Holle, 2014), and currently in Demirgüç-Kunt *et al.* (2017).

Conversely, rival evidences suggest that actual income induced by finance does not always hold. For instance, a study of 121 sample countries concludes that all finance variables increase income inequality (De Haan & Sturm, 2017). Denk and Cournède (2015) conclude that more finance is associated with greater income inequality observed in a sample of 33 OECD countries. Others conclude that free access can degenerate into a rent-seeking activity, and even a powerful force for initiating future financial crises (Schularick & Taylor, 2012; Mian & Sufi, 2014; Zingales, 2015), with adverse implication for long-term growth and for social welfare.

We find the contrasting views to be material in examining the logical soundness of the World Bank conjecture by placing West African economic bloc community into perspective. Surprisingly, West African states are yet to confirm by empirical means, the plausibility of tackling poor income earnings with financial inclusion. The current links greater earnings capacity in a regional market territory to financial access and usage. In addition, few authors highlight the use of Gini coefficient as proxy for income inequality to capture financial development (Honohan, 2007; Bae, Han & Sohn, 2012). However, our study does not adopt gini coefficient to proxy income inequality, we rather employ per capita income as measure of earnings capacity while controlling for population and cultural factors that account for unobserved heterogeneity in the sub-region. In addition, we employ financial inclusion measures of: deposit account, bank loans, mobile money and bank branch.

From the foregoing, these opposing views about the impact of financial inclusion on income suggests that there is controversy that needs to be resolved. This is the motivation for this study.

1.3 Research Hypotheses

As it is well known, generally accepted empirical evidences on the relationship between financial inclusion and earning capacity is still scarce in the sub-region, thus we create the following hypotheses:

1. HO_1: The contribution of deposit accounts to per capita income is not statistically different from zero in ECOWAS countries.

2. HO_2: The relationship between bank branches and per capita income in ECOWAS countries is statistically insignificant.
3. HO_3: There is no evidence of statistical difference of per capita income from mobile money agent transactions in ECOWAS countries.
4. HO_4: Bank loans do not have significant effects on per capita income in ECOWAS countries.
5. HO_5: Large adults' population does not adversely influence per capita income in ECOWAS countries.

The rest of this paper is structured according to sections. The section 2 is the review of literature. Section 3 is data issues and methods. In section 4 is result and discussions. It ends in section 5 as conclusion and recommendations.

2 Review of Literature

2.1 Conceptual Framework of Financial Inclusion and Earnings Capacity

Much less has been known on systematic measures of financial inclusion until Alliance for Financial Inclusion (AFI) presented fundamental measuring scale different from the dichotomous division of firms and individuals as either included or excluded (AfDB, 2013). Contemporary view is that financial inclusion is multi-dimensional. We conceptualize financial inclusion from the perspective of Access, usage and quality. Serrao, Sequeira and Hans (2012) included welfare which is less known but it is still a suggested parameter. The welfare component measures role of financial services in changing lives of users. It captures improvement in the wellbeing of households resulting from changes in consumption, women empowerment and increase in household expenditure.

Access implies making financial services available and affordable to users. According to Claessens (2006) access suggests the availability of reasonable quality of financial services with reasonable costs. Access or outreach factor is characterized by the elimination of barriers in the use of financial services, by measuring how many people use financial services. To improve access requires minimizing normal barriers associated with cost of opening and using a bank account and physical proximity of bank branches or any other form of outlet such as nearest ATM access points. Proportion of population of households holding an account is a good proxy measuring access. Whether partial or complete achievement of access depends on such factors as scope, quantity, institutional structure, quality gender, age, price etc. Simply expanding access points is not sufficient in understanding financial inclusion.

Usage is a demand-side related measure. Actual usage of financial services and products covers: regularity, frequency and duration of time used. Studies have separated these measures distinctively. Chauvet and Jacolin (2015) describes financial inclusion to imply effective use of formal financial service. Proxy indicator for usage is number of deposit accounts per 10,000 adults. In addition, AFI (2011) developed core usage indicator to number of loan accounts per 10, 000 adults by measuring active accounts of households. Enterprise based usage indicator is available in World Bank Enterprise surveys.

The quality aspect in the conceptual framework of financial inclusion is the last tier of available measure. It puts into focus life-style needs of customers. Opinion of the customer is well cherished. It encompasses experience of the consumer, attitudes and opinion towards certain available financial products; and if products are meeting their needs. Thus, quality implies tailoring products to client needs through appropriate segmentation to develop products for all income levels (AfDB, 2013). World Bank (2017) defines financial inclusion as the "means that individuals and businesses have access to useful and affordable financial products and services that meet their needs, such as

transactions, payments, savings, credit and insurance – delivered in a responsible and sustainable way". According to Central Bank of Nigeria "financial inclusion is achieved when adult Nigerians have easy access to a broad range of formal financial services that meet their needs at affordable costs".

Moreover, earnings capacity is conceptualized from vocational and monetary perspectives. In the former, earnings capacity is the ability for house-hold or individual persons to make money or earn a particular amount of money through paid employment or capacity of business entity to accrue income. In the latter, it is the ability to earn money. In this study earnings capacity is what a person is able to earn which is a stream of periodic monetary values (Horner & Slesnick, 1999). Thus, it is defined as income per capita of household population in a country.

2.2.1 Intensive and Extensive Margin Theoretical Perspectives

Emerging intensive and extensive margin views are front-line theories defending the course of adopting financial approach as a solution to living in perpetual poverty seen to be generally unacceptable.

The propositions can be profoundly relied upon to discuss how finance can shape the gap between the rich and the poor; and the degree to which that gap persists across integrated market like ECOWAS. According to Demirguc-Kunt and Levine (2009) finance can operate on the intensive margin. By intensive margin finance enhances the financial services of those already who already gained full access into the financial system. Tchamyou, Erreygers and Cassimon (2018) present detailed discussion of *Intensive margin theory* and assert that under this view finance affects inequality through an indirect channel as well as a direct mechanism; via the improvement of financial services of economic agents which already have access to the formal financial system, notably: well-established enterprises and wealthy individuals.

Conversely and for the sake of integrating agents involuntarily found outside the reach of formal financial institutions, the *extensive margin theory* is relevant in determining relationship between financial inclusion and income gap among agents.*Extensive margin theory* proposes that finance can operate on extensive margin. Through increasing the availability and use of financial services by individuals who had not been employing those services because of price or other impediments. In other words, finance can operate on extensive margin by expanding economic opportunities for the less privileged groups vital for reducing intergenerational persistence in relative income (Orji, Aguegboh & Anthoney- Orji, 2015; Tchamyou *et al* 2018). We anchor the current study on extensive and intensive margin theories.

2.2.2 Nexus Between Indicators of Financial Inclusion and Earnings Capacity

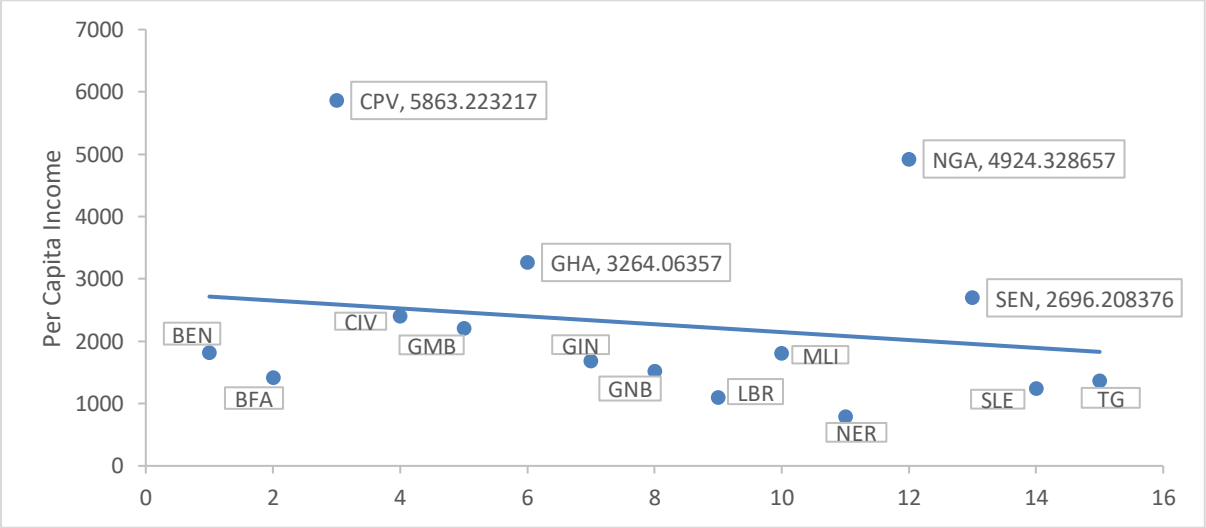
Financial inclusion can add positively to the economy, especially in the area of income per capita. Supporting theories established that expanded access to financial services favor the poor. As expressed in *liquidity constraint theory*, liquidity problem is an impediment obstructing poor agent's capacity in taking advantage of business opportunities that resultantly widens income inequality (Black & Lynch, 1996). However, financial inclusion might in this regard represent a solution to liquidity constraint. In practice holding account does not directly improve economic status, however it is a necessary requirement but not sufficient condition to access bank loans for small scale investment. Owning an account is a universal step to handling money wisely. Bank account ownership lays necessary ground work for developmental progress because savings are forms of self-insurance in difficult times.

In addition, *supply-leading* or alternatively *finance-led growth hypothesis* shows that finance can have causal impact on growth and development in the economy. The economy displays supply-leading quality when financial institutions mobilize and accumulate savings and transform them into investments. In the view of Goldsmith (1969), finance is observed to influence economic growth via an increase of effectiveness and build-up of the aggregate volume of investments. The build-ups are essential for the development of critical sectors of the economy. Even though this hypothesis is challenged by competing demand- following hypothesis (DFH) which has almost equal prominence with the former, it has attracted deeper concern and acceptance when studying finance-growth nexus (Marwa & Zhanje, 2015).

2.2.3 Economic Landscape of West African States

West African countries rely on primary produce to generate national income. the agricultural sector and extractive industry are key in the community of states. From Benin to Togo all ECOWAS states have varieties of naturally occurring resources. However, some are more fortunate than others in resource distribution. Small-sized Guinea holds about 40 percent of the world's bauxite reserves and the world's largest iron ore deposits. Investment in mining sector is robust in Guinea and supply of this mineral had been uninterrupted. Without Nigeria, Côte d'Ivoire and Guinea-Bissau, all ECOWAS countries import more goods than they export. West Africa have less to offer to the world except primary raw materials, but imports more from high producing economies such as China.

Trades also go on slowly in landlocked countries. Lack of access to sea corridor for Mali, Niger and Burkina Faso is a major barrier to export promotion policies. Consequently, growths are expected not to be normally distributed. Some of the countries have experienced high and declining growth. Exogenous challenge from the outbreak of Ebola virus caused severe disruption in economies of Liberia and Sierra Leone. These states are below the line of best fit. From economic contraction both countries returned to growth reaching 2.5 percent in 2017 and an estimated 3.2 percent in 2018. Good agricultural sector performance explains growth in Niger. Agriculture accounted for more than 40 per cent of GDP in Guinea-Bissau, Liberia, Mali, and Sierra Leone. It an important sector that employs majority of the workforce in Gambia (ECA, 2016).



Source: Author

Figure 1: Per capita Income in West Africa States in 2011

Other regional neighbors are not as fortunate as Nigeria's natural resources endowment. Crude oil deposit is in commercial quantity in Nigeria making it the richest supplier of hydrocarbons. Ironically, Nigeria imports petroleum products at higher cost than value of exported crude oil.
From the figure 1 above the size of per capita income varies markedly in the sub-region. Countries of Cape Verde, Nigeria, Ghana and Senegal are above the regression line. Cape Verde is the highest as can be observed (UNDP, 2019).

2.3 Empirical Review

As early as 2006, the UN has stated that building inclusive financial sectors improves peoples' lives, especially the urban poor in difficult times and rural subsistent farmers coping with troubles of crop failures, illness and death. In developing countries micro credits, a savings account or an insurance policy can make a great difference to a low-income family. However, research on this issue has produced different perspectives to the relevance of financial inclusion in ending poverty within shortest possible time. Clearly missing were empirical research studies of financial inclusion in regional economic community in West Africa. In addition, studies report different impacts of financial inclusion, especially cross-country evidences on densely populated economies and small countries in extreme poverty bracket. AFI (2011) challenges academics to demonstrate to the public some persuasive evidence of their studies on financial inclusion and cross-country discourses. Many studies have been written linking outreach to multidimensional measures of income per capita, poverty and inequality. Amongst the numerous studies from the outset include:
Honohan (2007) presents estimate of cross-country variation in household access to financial services. The author constructed composite data for over 160 countries analyzed with method of log-linear regression and correlation. Findings confirm access percentages are correlated with poverty rates and national per capita income, but not very closely. Also, when per capita income or a sub-Saharan Africa dummy (or both) are included, access is no longer significant. The study concludes that the new access percentages are inversely correlated across countries with poverty Headcount rates, whether at the $1 a day or $2 a day threshold.

Sarma and Pais (2008) present cross-country empirical investigation to analyze whether the levels of human development and financial inclusion in a country move closely with each other. The authors extracted data from construction of index multiple dimensions of financial inclusion (IFI) and Human Development Index (HDI) in 2008 for 49 countries, and subsequently apply classical ordinary least square (OLS) regression technique. In the result it is evident that level of human development and financial inclusion is strongly positively correlated. Though the result differs across countries, for instance, Albania, Armenia, Peru and Mexico are with relatively higher levels of human development as compared to their levels of financial inclusion. But country like India performs relatively better than its South Asian neighbors. Findings further reveals that the coefficient of GDP per capita is positive and highly significant which almost singlehandedly explains financial inclusion. After removing GDP per capita in the regression, Gini coefficient is found to be negatively and significantly associated with financial inclusion. In conclusion, among socio-economic factors, as expected, income is positively associated with the level of financial inclusion.

Bae *et al.* (2012) empirically investigate relationship between access to finance and poverty and income inequality. Using state-level micro panel datasets which are analyzed in a panel data regression of fixed effect model. Result estimates reveal that while access to finance relating to the degree of demographic financial institution penetration neither increased nor decreased income inequality, rather it is seen to effectively reduced poverty ratio, which is in conformity to initial

assertion in previous research, that access to finance and poverty level are negatively correlated. The authors conclude that access to finance apparently has positive effect by virtue of the fact that it declines both income degree of inequality and poverty level.

Martínez *et al.* (2013) investigate demand factors that influence financial inclusion in Mexico. The authors employ a probit model to analyze data from (Encuesta Nacional de Inclusión Financiera, ENIF). Findings reveal that insufficiency or income differentials and self-exclusion are the most important barriers in the Mexican market. Further evidence shows that factors of geographical location and individual vulnerability variables such as level of income, gender, education and occupation influence preferences for informal financial market and capacity to save. According to their conclusion, the insufficiency or variability of income and self-exclusion are the most important barriers in the Mexican market influenced by such variables as: income level, gender, Education and occupation; geographical indicators with respect to community size inhibited individual.

Sile (2013) use survey design to study financial inclusion in Organization for Co-operation and Development (OECD) listed 45 countries considered to be fragile. The study concludes that access and usage of financial services in most African fragile states are lower than in other African economies. It further concludes that enterprises in African fragile states face more constraints than their African peers to access funds irrespective of their size group. Turégano and Herrero (2018) after controlling for economic development and fiscal policy, assess empirically, whether financial inclusion contributes to falling income inequality. Using panel or pooled OLS to analyze GINI index and financial inclusion measures whose data are collated from multiple sources such as Penn world table, IMF, World Bank and others. The study firmly argues from its systematic evidence that significant positive relation exists between income equality and financial inclusion, whereas the opposite is true for the size of the financial sector. In conclusion financial size does not truly contribute to a more equal income distribution, measured by the GINI coefficient.

Wang and He (2020) examine effects of digital financial inclusion on farmers' vulnerability to poverty in China, using survey data on 1900 rural households. With reliance on the China Rural Financial Inclusion Survey Data 2018, conducted by the China Agricultural University collected through a stratified random sample survey of 1979 rural families from face-to-face interviews in July 2018. The authors apply Asset-Based Vulnerability Approach which establish a functional relationship between assets and welfare indicators, as in consumption which combines with ordinary least square technique. The authors evidently conclude that farmers' use of digital financial services have positive effects on their vulnerability reduction, and that greater impact of digital services are linked to ICT companies rather the banks.

Steffi and Balkees (2020) discuss overview of financial inclusion on poverty alleviation in India. After mobilizing data on composite indices of financial inclusion and human development, the method of varimax turn procedure and relapse technique for individual turn segment score were applied. Finding shows that the normal number of store account is 65, although the normal number of credit account is just 9 for each hundred populace matured seven years or more, while in the overall 47 percent of net state local pay has been secured by institutional credits.

For sustainable development in India, Shyamaladevi (2020) discusses the essence of money in day - to- day life, the forms of financial exclusion and the importance of financial inclusion measures noted for development. The author concludes that financial exclusion became the yardstick determining the limits of current prosperity.

In addition, other authors link financial inclusion to women empowerment. For instance, Gomathi and Gyathri (2020) analyze financial inclusion and women empowerment using descriptive statistics. The study reports inter alia that gender gap in account ownership remains fixed at 9 percentage points in developing countries, hindering women from being able to effectively control their financial lives.

In Tanzania, Olukorede and Koppensteiner (2020) use the rapidly expanding mobile money agent network between 2010 and 2012 to investigate financial inclusion, shocks and poverty as a relationship to mobile money expansion. The panel econometric model which integrates rains shock finds the coefficient for the direct effect of mobile money on poverty to exert negative but not significant effects at conventional levels of significance.

From the reviews there is strong evidence to infer that financial inclusion has been well researched providing numerous information about its effects within the local businesses, individual economic agents, the general economy and above all economic adjustment of the poor in different countries and regions. In a contrary view, IMF (2019) argues that financial inclusion in Africa is too narrow and constraining to stimulate sustained growth, employment and poverty reduction. In Africa single country research studies are prevalent. Thus, conclusions reached so far in the literatures are not straightforward. However, to the best of our knowledge multi-country analysis remains non-existent in the economic community of West African states as a homogeneous economic union. Against this backdrop, our study takes the first step in using panel regressions to investigate financial inclusion as a causal driver of earning capacity. In the process we examine the consistency of margin theories. This requires adopting extended country units by covering all West African states. Thus, we also differ from existing studies by controlling for population with culture as unobserved variable.

3 Data Issues and Methods

The current research examines causal influence of financial inclusion on per capita income in West Africa. The traditional source of all the data on financial inclusion is in World Bank Global Findex Database (GPFI). However, income per capita is publicly available in United Nations Development Programme. As regard to subjects, the 15 member countries under ECOWAS treaty constitute the sample; hence we proceed to replicate them. Based on time, the study period spans year 2011-2018.

3.1 Model Building and Specification

On the basis of extensive and intensive margins theories and empirical findings (Demirguc-Kunt & Klapper, 2012;Gebrehiwot & Makina 2015; Tita & Aziakpono, 2017), the functional relationship between financial inclusion indicators and per capita income is simply expressed based on the guidelines of standard statistical assumption that the dependent variable, say PCI, conditional on certain variables, say X, are random outcomes from a probability distribution that is characterized by a fixed dimensional parameter vector represented in a functional equation model below:

$$PCI = f(BLOAN, DAC, BBR, MMA, POPSIZE) \quad (3.1)$$

Where notation: PCI implies per capita income; $BLOAN$ Represents outstanding loans per one thousand adults; DAC Means deposit accounts per one thousand adults; BBR Implies banks branches per hundred thousand adults; $POPSIZE$ implies population size; MMA Is for mobile money agent Transaction.

However, based on financial inclusion measures and per capita income as proxy on earnings capacity, for notational convenience the estimated equation for pooled regression is re-stated as follows:

$$LnPCI_{it} = \alpha + Ln\beta_1 BLOAN_{it} + Ln\beta_2 DAC_{it} + Ln\beta_3 BBR_{it} + Ln\beta_4 POPSIZE_{it} + Ln\beta_5 MMA_{it} + \mu_{it} \quad (3.3)$$

i =1,2,3…15 (entities); t = 1,2,3…9 years. We would by *a priori* expect $\beta_1, \beta_2, \beta_3, \beta_5$ to have a positive effect on per capita income according to postulations of extensive and intensive margin theories and systematic findings ofTurégano and Herrero (2018). Han and Melecky (2014) employ population as a vector of control variable. β_4 is to be negative based on empirical findings of Tita and Aziakpono (2017).

Selection of appropriate model is based on Hausman test. If Hausman test accepts *H0:* or *p-value* > 5% hence the null hypothesis is that the preferred model is Random Effect (RE). Alternatively, *H1*: if Hausman test of cross-section random hypothesis receives *p*-value < 5%, then Fixed Effect (FE) is conclusively the most preferred model.

4 Results and Discussion

Our cross-country regression considers whether financial inclusion essentially has strong contributions to changes income in West Africa. After employing series of analytical econometric approaches devoted to the issue, statistical tests yield varying insights.

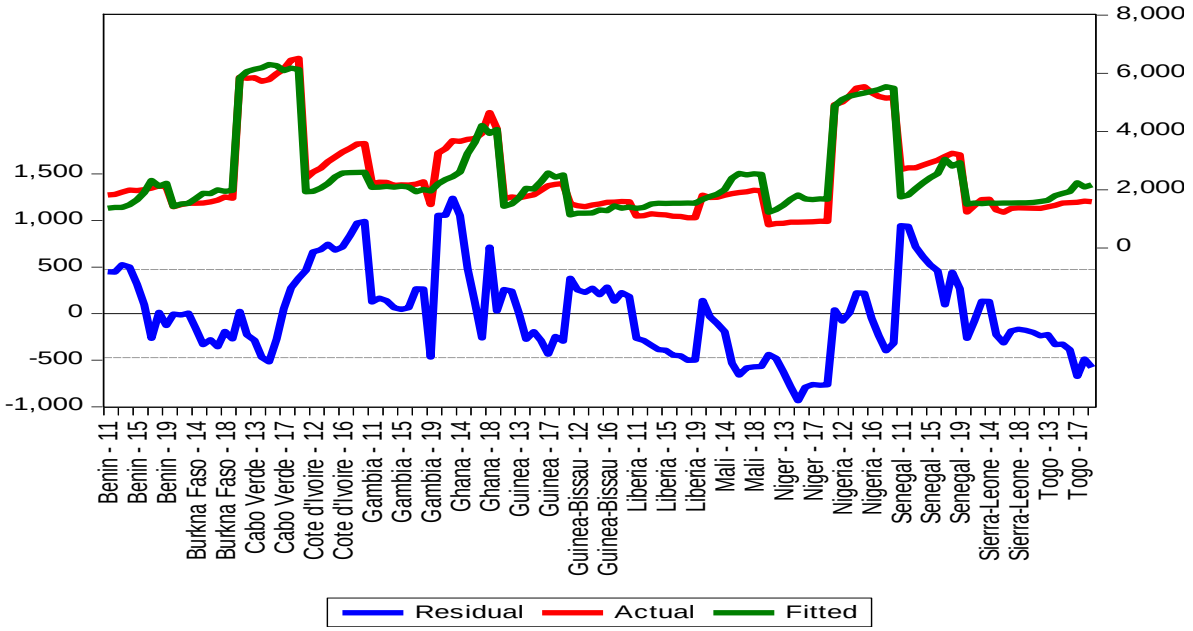


Figure 2: Graphical Illustration of Actual and Fitted Trendline

In figure 2 the fitted graph explicitly mimics the actual line plot. It is quite identical that it closely follows the trend with minimum deviation. This is an indicator that the sample data frequency is almost a perfect representative of the entire population of the study such that a generalized inference is possible.

Table 1: Cross-Section Random and Fixed Effects Comparison

Test summary	Chi-sq statistic	Chi-sq df	*p*-value
Cross-section random	31.025149	6	0.0000
Period random	0.000000	6	1.0000
Cross-section and period random	28.533817	6	0.0001

In the test above we have specifically selected cross-section random estimate. Hausman test clearly identifies the consistence of FE result. Given a *p*-value of cross-section random Chi-square statistic of 0.0000 < 5%, a conclusive inference is that FE is at least appropriate and retained results. Having *p*-value below conventional significance level supports acceptance of alternative hypothesis.

Table 2: Fixed Effects Estimates

Variable	Coefficient	Std. Error	t-statistics	*p*-value
Intercept	12.87851	5.181327	2.485562	0.0147
PCI(-1)	0.531545	0.102869	5.167213	0.0000
BLOAN	0.083952	0.042940	1.955084	0.0536
DAC	0.034211	0.043304	0.789999	0.4316
BBR	0.099253	0.082365	1.205029	0.2313
MMA	0.013513	0.009723	1.389729	0.1680
POPSIZE	-0.622271	0.321243	-1.937075	0.0558

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.992967	Mean dependent var	7.667596
Adj R-squared	0.990903	S.D. dependent var	0.538067
S.E. of regression	0.051320	Akaike info criterion	-2.900515
Sum squared resid	0.242303	Schwarz criterion	-2.250101
Log likelihood	202.0309	Hannan-Quinn criteria	-2.636379
F-statistic	481.0838	Durbin-Watson stat	1.665736
Prob(F-statistic)	0.000000		

The above result presentation is an FE model result. Using the slope parameters' estimates the new equation becomes:

$$LnPCI_{it} = \alpha + 0.0904BLOAN_{it} + 0.0278DAC_{it} + 0.0785BBR_{it} - 0.3301POPSIZE_{it}$$
$$+0.0148MMA_{it} + \mu_{it} \qquad (4.1)$$

The rigorous analyses produce interesting evidence underlining moderate beneficial effects of financial inclusion, *ceteris paribus*. When we added lag of per capita income in the specification, past values of per capita income did not lose its perfect significance (*p*-value 0.0000), even though its coefficient is marginally positive at 0.5315%. The robust evidence means that financial inclusion is largely driven by household income in the sub-region. Unlike the result of Honohan (2008), but in adherence to finding of Park and Mercado (2015), we record strong evidence supporting important influence of past income to future earnings. This justifies Demirgüç-Kunt *et al.* (2017) survey showing that having too little money is the sole reason people are not financially included. Our finding is ceteris paribus valid in ECOWAS.

The coefficient of bank loans has a positive and significant relation with per capita income. Loan is a key supply-side variable which conforms to presumed expectation. Coefficient of

0.09% is a sizeable magnitude. This is in line with supply-leading theoretical evidence which finds support in Turégano and Herrero (2018); and in extensive margin theory. One feasible explanation could be the case that with bank loans people can start, operate or expand a business. Survey has shown that others are keen at buying land or owning a home.

Bank branch per 100,000 adults approximately increases income by 0.078% which contradicts negative relation reported in Neaime and Gaysset (2017). The coefficient is insignificant which could be the case of concentration of branch network in major city centers observed in Togo, Benin republic and Guinea. Bank branches are also known to be limited outside Monrovia, Liberia. Conclusively many are prohibitively cut-off from accessing banking services by location circumstances.

When we put deposit account in perspective, approximately 0.03421% coefficient is below statistical expectation. The empirical result points to a positive and insignificant relationship between deposit account per 1000 adult and per capita income. The same can be said of mobile money at 0.0135%. The former is insignificant which could be that people are yet to be convinced on the need to own account. Those without account rarely save income. Saving is a form of self-insurance, but having an account is a prerequisite for saving. Financial inclusion via account ownership increases or helps households save for future use. Or deposit account is insignificant because people save less.

Turning to the control variable, estimate indicates that as shown in hitherto existing studies, population size is profoundly negative which lends support to Tita and Aziakpono (2017). But based on significance, similar finding is documented in Neaime and Gaysset (2017) MENA studies. High adult population does not appear to support income. This contradicts Park and Mercado (2015) theoretical reasoning that a larger population should increase financial access as it indicates a larger market size. This could be the case that West African banking system is not substantially sophisticated to widen outreach, especially in rural geographies where population size outpaces capacities of available banking outlets. Or that dense population renders financial inclusion and higher income even more difficult objective to achieve.

Table 3 Cross-sectional Dependence Estimates

Test	Stat	df	*p*-value
Breusch-Pagan LM	185.7400	105	0.0000
Pesaran scaled LM	4.536489		0.0000
Pesaran CD	0.632678		0.5269

Table 3 displays residual cross-section dependence test result for the subjects (countries). We rely on the result of Pesaran CD statistics whose *p*-value is 52.69% > 5%, hence the null hypothesis is accepted. Evidently there is absence of cross-sectional dependence in the residuals even though it is clear that ECOWAS countries share some similarities considering market integration and cultural factors.

5 Conclusion and Recommendations

The objective of financial inclusion is to empower and transform life of the poor in developing countries. Conclusively bank loans per 1,000 adults are positive and significant in influencing per capita income. Bank loans per 1,000 adults substantially contribute to per capita income. With the exception of inverse and significant relationship of population size on per capita income, other constructs: DAC, BBR and MMA are positive and hypothetically insignificant. In fact, these access measures involving bank branch per 100,000 adults and deposit account per 1000 adults weakly supports per capita income. Mobile money does not seem to be valuable input in supporting per capita income.

Similarly, extensive and intensive margin theories are valid in explaining relevance of financial inclusion in the region. In line with theories, some previous studies arrive at beneficial consequence of financial inclusion. Therefore, as regard to ECOWAS, we conclude that the World Bank's claim is an empirical fact that income of many underserved adults in developing countries grew because of enhanced financial services availability, accessibility and affordability. The present study supports this theoretical conclusion and makes policy suggestions as follows.

1. There is a need to strengthen the access segment of financial inclusion, especially bank branch. Knowing that geographical location is a factor in this regard, the practice of branch concentration in Ouagadougou metropolis neglecting unfamiliar Montserrado in Liberia can only lead to market share scrambles for vital few customers. Such situation is avoidable. Banking industry giants like First Bank Nigeria, Caixa Económica de Cabo Verde and La Banque Internationale pour le Commerce et l'Industrie de la Guinée (Vista Bank in English) should take the initiative to establish business presence in the rural regions or cross-river terrains. Government can help reduce operational risk arising from insecurity as an assurance for safety.

2. Community governments should commit to matching rising regional population with capacity building. It is true that population is a source of vital human resources but not where current resources cannot sustain it. We can still take advantage of inflated manpower through progressive creation of jointly owned industrial establishments based on resource diversities of members states. To this end, there could be ECOWAS Refinery & Petrochemicals in Nigeria; ECOWAS Food Beverage & Cocoa Processing company in Ghana and ECOWAS agro-food and Cashew nuts factory in Guinea-Bissau etc. The Economic and Social Council may in accordance with CHAPTER III Article 14 advice the supreme authority on this need. The Authority of Heads of State and Government may in turn partner with Committee of West African Central banks to float ECOWAS bond couple with direct negotiation with community industrialists to raise capital for the project.

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