European Journal of Economic and Financial Research
ISSN: 2501-9430
ISSN-L: 2501-9430
Available on-line at: http://www.oapub.org/soc

DOI: 10.46827/ejefr.v4i3.872 Volume 4 | Issue 3 | 2020

MODELLING FINANCIAL INCLUSION USING A PANEL MACROECONOMIC APPROACH: EVIDENCE FROM AFRICAN COUNTRIES

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Abstract:
The focus of this paper is to identify so as to analyze the determinants of financial inclusion and to explore the barriers that limit access to financial services, especially ownership of bank accounts across African Countries. To do this, this study used the latest available dataset which was retrieved from the Global Findex and World bank databases. The extracted dataset included information about underdeveloped African economies. Specifically, the survey contained 10 socioeconomic and demographic indicators of a sample of 48 countries. The results of econometric analysis based on retrieved data clearly demonstrated that being financially included is strongly correlated with Gross Domestic Product per capita, the number of credits granted to private firms, access to the internet and education. These findings are in line with the previous empirical studies in particular (Lucas, R, 1988; Neaime, S & I Gaysset, 2017; Olaniyi Evans, Akoka, & Babatunde Adeoye., 2016) research works. Our attempt to provide a macroeconomic overview on factors of financial inclusion in African economies showed that the main challenges for underdeveloped economies are to increase the use of accounts to reach the excluded population.

JEL: G29, G21

Keywords: financial inclusion, financial services, African countries, banking, determinants

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1. Introduction

The focus of the present study is to take stock of the current state of financial services across the third world. Specifically, this research paper seeks to identify the major macroeconomic factors influencing access to banking services across African Nations. Indeed, in the last decade, many countries over the world have made a hard effort in order to expand the financial services over the unbanked persons. in particular for poor and rural households since financial inclusion plays a great role in fighting against poverty, vulnerability, inequality and enhancing sustainable economic growth (Demetriades & Hussein, 1996).

Thereby, this research aims to explore the major key factors affecting access to financial services across underdeveloped economies and to suggest solutions for better financial inclusion of the considered countries in order to join them to the ranks of the developed countries. In other words, the present study will provide an economic overview of the situation of financial services around underdeveloped countries.

In order to achieve our main objective, in the remainder of this study, we will proceed as follows. In the next section, we present the literature review. in the second one, we will expose the data sources, the methodology and the econometric model implied by this research paper. Subsequently, we will check, identify and measure the determinants of financial inclusion across our sample. In the last one, we conclude with summary conclusions and implications of our study.

1. Theoretical Framework: Determinants of Demand for Financial Services

1.1 Literature Review

The concept of financial inclusion can be referred as access and use of financial services and products that meet the individuals and business needs such as loans, saving, health insurance, credits, payment means, etc. (Claessens, S., 2005). A still more recent definition, financial services can be returned to access to microcredit institutions, agricultural credit for small farmers, bank health insurance product and payment technologies (Nirvikar Singh, 2017).

It is commonly admitted that financial inclusion could help not only poor households to lift themselves out of poverty by investing in education for their children, but also businesses and enterprises to exploit growth opportunities by allowing them to access financial products in particular credits (Demetriades & Hussein, 1996). In other words, access to formal financial institutions allows people especially the poor ones to save and to borrow in order to meet their immediate needs., there are many factors influencing access to banking services such as credit facility, bank charges, and interest rate (Beck T. et al., 2011).

Access to financial services in rural areas can promote economic growth, as it allows to this category of the population to improve their livelihoods. determinants are

related to the geographic area that may block or at least limit bank penetration and individual accessibility (Allen, F., et al, 2012; Carbo S. et al., 2007).

On the other hand, current evidence shows that unbanked individuals cannot get access easily to financial institutions especially banks due to a lack of means and tools of guarantee. Therefore, financial exclusion has been correlated with various societal problems like poverty, unemployment and inequality (Kempson, E., 2009; Lucas, R, 1988). Indeed, the empirical studies conducted in that field showed that being financially included can ameliorate standards of life of the families especially the poor ones.

Furthermore, another factor that seems important and that can influence financial inclusion is the country's computer and digital development. In fact, the financial inclusion of the population depends on the level of technology of the country. Indeed, in a world that is becoming more and more digital, access and use of mobile devices has become an important tool for promoting financial development as well as overcoming geographical and socio-economic barriers especially accessibility of banks and distance to financial institution (Allen, F., et al, 2012; Kanobe, F. et al., 2017).

Moreover, many essays on individual's access to funding sources approve that it still associated not only to objective individual factors but also to subjective ones, for instance, perception, religion, beliefs and culture. Although this is remaining a big challenge for financial institutions as well as to underdeveloped economies. Even in 2019, with all the technological and technical development, it starts to change but at a very slow pace (Adeola, O., & Evans, O., 2017).

Numerous studies have explored to identify the shaping factors of financial inclusion across developed nations but a few of them have looked to underdeveloped ones and especially to the African Continent.

Despite the development in many areas, the majority of empirical studies have shown that women's access to financial products remain low compared to men. Hence, women's financial exclusion is a global phenomenon and not a specific one of the underdeveloped countries which limits their ability to increase their own wealth and participate actively in working life.

Gutierrez E. et al. (2013) examined the determinants of financial inclusion on a panel of countries. Using a baseline regression model, they revealed that the level of financial inclusion is statistically dependent on mobile banking usage and services.

In another study conducted on Asian developed countries, Park and Mercado (2015) have tried to check the influence of poverty and individual characteristics of financial inclusion. Using a panel data model, they indicated that the financial development is deeply linked to poverty reduction, income distribution and demographic characteristics of Asian people. Hence, financial access is seen as an efficient tool for fighting against poverty and inequity (Caskey J., 2002).

In a more recent study, Neaime and Gaysset (2017) applying a longitudinal approach on the Middle East and North African region approved that the degree of financial inclusion is negatively correlated with income inequality and poverty rate but positively related to financial stability for the entire sample.

By treating three samples from rural households in three different countries, namely Uganda, Malawi and Chile, Pascaline Dupas et al. (2018) found that widening access to basic bank accounts did not have a significant effect on savings or individual well-being because of the inability to predict how treated households would use their savings. Moreover, their empirical results suggested that broadening financial access to current financial institutions such as the case in many countries in Africa will not yield the expected results especially with respect to poverty and vulnerability alleviation.

1.2 Theoretical Assumptions

In short, the existing literature review on determinants of financial inclusion revealed that there are many variables that affected the financial individual decisions such as beliefs, literacy rate, income level, bank charges, etc. Table 1 below reveals and draws the various (microeconomic and macroeconomic) determinants of financial inclusion with a focus on underdeveloped countries.

Table 1: Factors of financial inclusion and indicators of measurement

Factors	Indicators of Measurement	Authors
Economic factors	✓ Individual's income level ✓ Poverty ✓ Inequality rate ✓ GINI index ✓ Employment	(Demetriades & Hussein, 1996), (Kempson, E., 2009), (Park, C. & Mercado, J, 2015), (Neaime, S & I Gaysset, 2017) and (Okoroafor O. K. et al., 2018)
Social factors	✓ Gender ✓ Literacy rate ✓ Educational status ✓ Age	(Park, C. & Mercado, J, 2015)
Geographic factors	✓ Distance to financial institution ✓ Accessibility ✓ Area of residence	(Carbo S. et al., 2007), (Allen, F., et al, 2012) and (Pascaline Dupas et al, 2018)
Geographic & Demographic ATM penetration	✓ ATMs per 1.000 km2 ✓ ATMs per 100.000 adults	(Conrad, A., et al, 2008)
Mobile account & number of E-Mobile transactions	✓ Number of banked adults ✓ Account ownership ✓ Total of mobile money accounts per 1.000 adults ✓ Number of mobile money transactions per 1,000 ✓ Access to means of payment ✓ Number of internet user	(Gutierrez, E et al., 2013), (Rentala. S et al, 2016) and (Pascaline Dupas et al, 2018)
Law, regulation and confidence	✓ Law and countries regulation ✓ Rules ✓ Regulatory authority ✓ Documentation of eligibility	(Quaye, W., 2008) and (Olaniyi Evans, Akoka, & Babatunde Adeoye., 2016)

	✓ Trust for formal financial institutions	
Bank's loan	✓ Interest rate ✓ Bank charges ✓ Bank facilities ✓ Percentage of individuals with at least a credit in a formal institution	(Beck T. et al., 2011) and (Olaniyi Evans, Akoka, & Babatunde Adeoye., 2016)
Country-specific contextual factors	✓ Perceptions ✓ Financial Attitudes ✓ Religion and beliefs ✓ Number of Islamic banking	(World Bank, 2015), (Olaniyi Evans, Akoka, & Babatunde Adeoye., 2016) and (Adeola, O., & Evans, O., 2017)
Macroeconomic contrast	✓ Inflation ✓ Inequality ✓ Gross Domestic Product per capita ✓ Stability	(Lucas, R, 1988), (Olaniyi Evans, Akoka, & Babatunde Adeoye., 2016) and (Neaime, S & I Gaysset, 2017)

Source: Author's summary from reviewed literature.

As previously reported, we assume that financial inclusions can be explained by the factors mentioned in Table 1 above. In our case, we were interested only in the macroeconomic determinants.

2. Data and Methodology

2.1 Data Source

In order to verify or to disprove the assumptions formulated above, an econometric analysis is carried out. To do this, this research paper uses the data provided by the Global Findex and World Bank databases. This data source provides open access to financial inclusion information about each country in the word and covers 20 years times period (the period of 1999-2018).

2.2 Software

With regards to technical, statistical, analytical and econometric manipulations, they were done using R studio software, version 3.6.1.

2.3 Econometric Analysis

The extracted dataset includes information about 48 underdeveloped African economies. Specifically, the survey contained 10 socioeconomic and demographic indicators of these 48 countries.

Financial inclusion in the underdeveloped economies has achieved remarkable progress over the last decade. Indeed, it reached almost 43% against only 23% in 2014[ii].

[ii] https://globalfindex.worldbank.org/

This significant development can be explained mainly by the progress of digital financial services.

Table 2: Summary Statistics Indicators of Financial Inclusion in Africa

Variable	Min	1st quartile	Median	Mean	3rd quartile	Max
FI	0.4731	61.25	140.90	285.59	366.98	2153.14
Gini	27.60	38.58	42.40	43.32	46.70	64.80
Gdpc	191.6	562.0	1211.9	2417.7	3005.7	20512.9
M2	-99.86	7.715	14.04	17.95	22.36	528.19
Credit	0.40	8.96	14.47	20.81	25.55	106.26
Infl	-29.69	1.91	5.84	13.12	11.35	2630.12
Inter	0.001	0.84	3.69	9.43	12.96	64.80
Liter	14.38	50.61	68.38	64.17	79.94	95.00
Pop	139959	2081044	10910759	20242248	25216237	195874740
I	0.18	3.75	6.79	7.33	9.04	48.69
Poverty	0.00	5.12	12.60	15.24	23.70	63.60
Log_gdpc	5.25	6.33	7.10	7.21	8.00	9.92
Log_pop	11.85	14.55	16.21	15.91	17.04	19.09

Source: Author's compilation

To meet our overall objective, we propose conducting an econometric analysis based on the existing data. To do this, we conduct a panel macroeconomic analysis. Hence, it is commonly accepted that the endogenous factor in our research is the state of financial inclusion. Hence, let FI_{it} denotes access to financial products and services which is equal to the individual number of depositors with commercial banks per 1,000[iii] among adult people, i = {1,..,P}, at time, t ={1, .., T}. The econometric modelling was based on the model of (Olaniyi Evans, Akoka, & Babatunde Adeoye., 2016). Mathematically, and in a compact form, we can write:

FI = f (Ineq, gdpc, M2, Cred, Inf, Liter, Pop, I, Eth) (1)

$$FI_{it} = \alpha_0 + \alpha_1 Ineq_{it} + \alpha_2 gdpc_{it} + \alpha_3 M2_{it} + \alpha_4 Cred_{it} + \alpha_5 Inf_{it} + \alpha_6 Liter_{it} + \alpha_7 Pop_{it} + \alpha_8 I_{it} + \delta_{it} \quad (2)$$

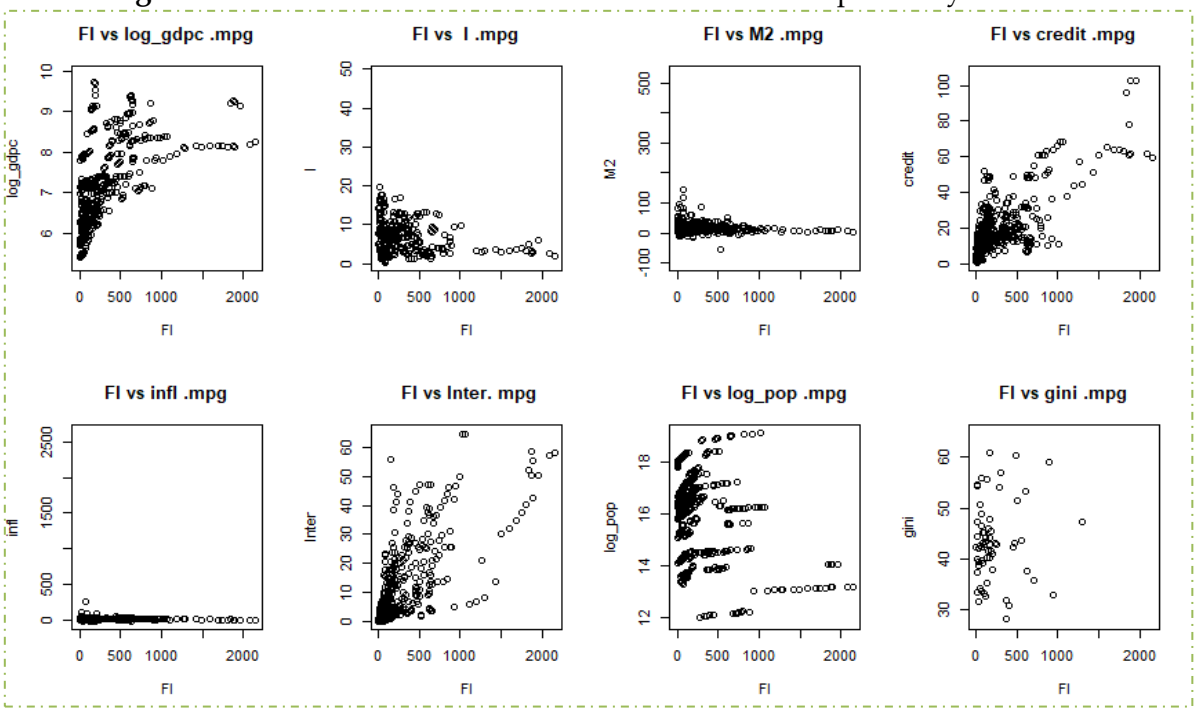
Whereas:
Ineq is the inequality rate measures by GINI index;
gdpc refers to GDP per capita;
M2 is money supply (% of GDP);
Cred indicates the domestic credit to the private sector (% of GDP);
Inf is headline inflation;
Inter is the number of internet users
Liter is adult literacy rate (% of people ages 15 and above);
Pop is the total population;

[iii] The same econometric approach could be implied with borrowers from commercial banks per 1,000 adults as an endogenous factor.

I refers to the deposit interest rate;
$\alpha = (\alpha_0, \ldots, \alpha_8)$ a vector of unknown parameters to be estimated;
δ is the error term.

The independent factors considered in this project are related to the macroeconomic determinants of financial inclusion in Africa. The detailed list of the used variables is shown in the appendix 1.

Figure 1: Cross between financial inclusion and other explanatory variables



Source: Author's compilation on R software.

Table 3 below presents the results of ordinary least squares (OLS), fixed effect (FE) and random effect (RE) regression findings. Implying Husman's test, we found that the random effect is the most appropriate model in our case. Indeed, the associated P value was equal to 0.000 (chi squared = 115.55) which is less than the level of 5%. Which means we have to adopt the RE is spit of other specifications.

Table 3: Summary of regression coefficients

Variables	OLS	FE	RE
log_gdpc	38.66	-190.0	47.74*
	(39.64)	(290.0)	(25.83)
log_pop	-21.43	139.2	-43.03*
	(17.33)	(244.0)	(25.55)
M2	0.650	-0.589	-0.466
	(1.821)	(0.951)	(1.152)
Credit	19.05***	1.908	11.42***
	(2.009)	(2.417)	(1.923)
Infl	4.210	1.580	0.336

	(3.994)	(3.090)	(3.023)
Internet	0.577	2.624	2.560*
	(3.170)	(1.933)	(1.865)
Literacy	2.825*	7.617**	3.495*
	(1.430)	(2.985)	(1.881)
I	-7.831	4.837	2.891
	(8.806)	(6.979)	(7.374)
C	-185.7	-1,124	156.8
	(438.8)	-3,129	(610.5)

Note: Standard errors in parentheses: *Denotes p<0.05; ** Denotes p<0.01; ***Denotes p<0.001.
Source: Author's compilation using Global Findex and World Bank databases.

4. Main Findings

First of all, it should be noted that the following two variables, namely GINI index and poverty rate have been eliminated from the model since they have many missing values which will negatively affect the model performance.

In terms of the overall model validation, the adopted regression is significant since the P value associated with the overall significance test is well below the 5% threshold. As regards the coefficient related to the Gross Domestic Product per capita, it is positive and significant at the level of 5%. This means that countries with high GDP per capita have also high levels of financial inclusion. This finding is in line with the empirical studies conducted previously, in particular (Lucas, R, 1988; Neaime, S & I Gaysset, 2017; Olaniyi Evans, Akoka, & Babatunde Adeoye., 2016) works.

Moreover, the results established that education-formation is a key factor in explaining financial inclusion in African Countries. In fact, as the country's level of education increases, the level of financial inclusion increases, but not necessarily with the same proportion.

Furthermore, and based on the data analysis, among the determinants of financial inclusion in Africa, we found the number of credits granted to private firms. Indeed, it positively impacts the level of countries' financial inclusion. This result is significant at the critical threshold of 1%.

Moreover, another variable that affects financial inclusion is the number of Internet users in the country. In our case, the coefficient associated to this variable is positive and significant at the 5% threshold. which proves that the internet on a large scale has an impact on financial inclusion.

5. Conclusions and Policy Implications

5.1. Conclusion

In this paper, we have tried to understand and to explore the most important factors that determine access to financial services in the third world especially ownership of bank accounts across African Countries.

To do this, we have tried, in the first section of this this research, to present the literature review of the demand of financial services. In the second one, we have checked, empirically, the major determinants of financial inclusion. Thereby, we have used the latest available dataset which is provided by The Global Findex and World bank database. The extracted dataset included information about underdeveloped African economies. Specifically, the survey contained a sample of 48 countries and a chosen10 socioeconomic and demographic indicators.

Regarding technical and statistical manipulations, it should be mentioned that they were achieved using R studio software.

To summarize our quantitative analysis, we can fairly say that using a panel macroeconomic approach, we found that access to the internet, education, Gross Domestic Product per capita, the number of credits granted to private firms are the major factors which impact the level of financial inclusion among African countries.

5.2. Policy implications

Through this research, an attempt has been made in order to provide a macroeconomic overview of factors of financial inclusion in underdeveloped African economies for policy-makers as well as for future research.

It seems from the realized analysis that the main challenges for underdeveloped economies are to increase the use of accounts to reach the excluded population.

It should be mentioned finally that in the present article, we have not been able to quantify some qualitative variables because of lack of data such as financial regulation, beliefs, and financial stability of countries. Taking into account these factors in future research would be timely as it allows for measuring their actual effect on the level of financial inclusion of countries.

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Appendix and acronyms

Appendix 1: Labels and types of the variables

Variable	Label	Type
Ide	variable identifier	Quantitative
Paysname	Country Name	Character
Time	Time	Quantitative
Gini	Gini index	Quantitative
Ineq	the inequality rate	Quantitative
Gdpc	GDP per Capita	Quantitative
Log_Gdpc	Logarithm of GDP per capita	Quantitative
I	the deposit interest rate.	Quantitative
Infl	Inflation	Quantitative
Inter	Individuals using the internet	Quantitative
Liter	Literacy rate (% of people ages 15 and above)	Quantitative
Pop	Total population size	Quantitative
Log_Pop	logarithm of the total population size	Quantitative
M2	money supply (% of GDP)	Quantitative
Cred	the domestic credit to the private sector (% of GDP)	Quantitative

Source: Author's compilation.

Appendix 2: Correlation matrix

	FI	gini	gdpc	M2	credit	infl	Inter	Liter	Pop	I	Poverty	log_gdpc
FI	1											
gini	0.09	1										
gdpc	0.47	0.36	1									
M2	-0.17	0.12	-0.05	1								
credit	0.74	0.14	0.31	-0.15	1							
infl	-0.07	0.09	-0.03	0.79	-0.08	1						
Inter	0.71	-0.04	0.33	-0.15	0.58	-0.06	1					
Liter	0.55	0.45	0.61	-0.19	0.46	0.03	0.48	1				
Pop	0.02	-0.25	-0.13	0.05	0.02	0.04	0.11	0.03	1			
I	-0.22	0.02	-0.27	0.46	-0.11	0.47	-0.22	-0.08	0.12	1		
Poverty	-0.49	0.17	-0.51	0.14	-0.56	0	-0.46	-0.25	-0.05	0.21	1	
log_gdpc	0.58	0.35	0.87	-0.04	0.45	-0.06	0.46	0.65	-0.08	-0.27	-0.65	1
log_pop	-0.32	-0.21	-0.3	0.1	-0.07	0.06	0.01	-0.16	0.74	0.17	0.14	-0.27

Source: Author's compilation on R software.

List of acronyms

ATMs: Automatic Teller Machines
FE: Fixed Effect
ICT: Information and Communication Technology
GDP: Gross Domestic Products
GDPC: refers to GDP per capita;
OLS: Ordinary Least Squares
RE: Random Effect