What drives financial inclusion in Central Africa?

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Abstract

Despite financial inclusion gaining interestwithinpolicy-making spheres, Central Africa still lags below the global and Sub-Sahara Africa average in the penetration of financial services provision. This study sought to investigate the barriers and determinants of financial inclusion in Central Africa by using the 2014 Global Findex database. Using binary probit models, we found that financial inclusion is determined by age, gender, income and education levels. We also established that account ownership differs across gender. Key barriers to financial inclusion include distance, cost of opening an account and documentation.
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1. Introduction

Financial inclusion has gained interest among several global stakeholders and policy-makers (World Bank, 2014) where the World Bank Group seeking to ensure universal financial access by the year 2020 (World Bank, 2017). Though access to financial access is multifacted and often defined in many respects, we adopt the Consultative Group to Assist the Poor's (CGAP) definition of financial inclusion as a situation that permits effective access to credit, savings, payments and insurance from formal financial services providers to all the working-age adults (CGAP,2011).

There are many benefits associated with financial inclusion for both households/individuals and firms. Beck, Demirgüç-Kunt and Levine (2007), Beck and Demirgüç-Kunt (2008) and World Bank (2008) for instance show that financial inclusion plays a critical role in reducing poverty levels and income inequalities. Further, it is an incentive to entrepreneurship, enhancesproductive investment and economic growth. Access to and use of financial services improve households' welfare through increased consumption, increase productive investments and entrepreneurship among women and reduce gender income inequality (Dupas and Robinson, 2013).

Substantial heterogeneity in financial inclusion across Sub Sahara Africa (SSA) countries exist. Demirguc-Kunt, Klapper, Singer and Oudheusden(2015) shows that the high level of financial inclusion in Southern Africa region is mainly driven by South Africa's experience while that in Eastern Africa is mainly due to extensive mobile money system adoption in Kenya. In the Central African region, the extent of financial inclusion at least as taken from an account penetration perspective is still relatively lower compared to the neighbouring regions as indicated in Figure 1.Equally, only 11% of adults in the Central African region according to Demirguc-Kunt and Klapper (2012) possessed an account at a financial institution which is less than the SSA average of 27%.

Figure 1: Deposit accounts with commercial banks per 1,000 adults
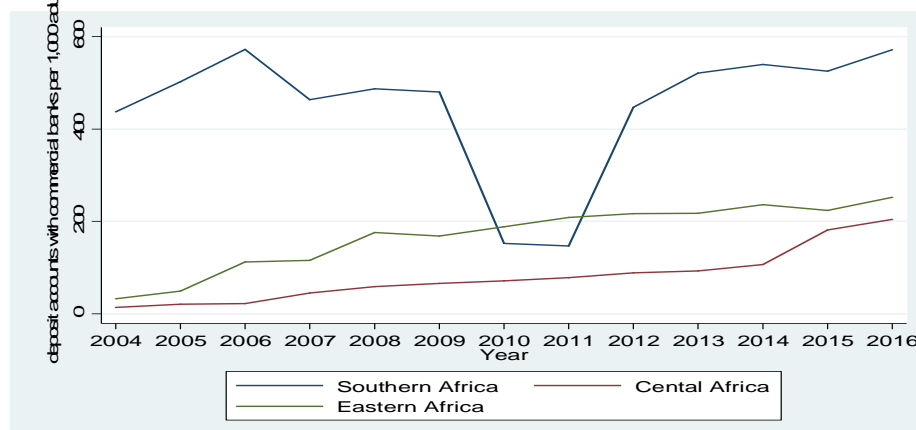
Source: Authors' computation from FAS, IMF 2016.

This paper is related to the growing literature on financial inclusion and is closely related to the works of and Demirguc-Kunt and Klapper (2012) who provide an overview of financial inclusion in Africa. Nonetheless, the paper does not tell much about the underpinning factors of financial inclusion in Central Africa and therefore this paper by focussing on a jurisdiction where evidence is less documented will provide hindsight on what drives financial inclusion in the region.

Soumaré, TchanaTchana and Kengne, (2016) investigated factors that explain financial inclusion in Central and West Africa. Nevertheless, these two regions differ in so many aspects. Thus, their empirical findings cannot be translated into instruments for policy reform and decision making in Central Africa. Most of existing studies have focused either at the SSA level (Demirgüç-KuntandKlapper, 2012; Zins and Weill, 2016; and Evans, 2016) or at the country level (Aduda and Kalunda, 2012 and Akudugu, 2013). This study takes a preliminary step in this research quest. We therefore sought to address the following research questions: what are the determinants of financial inclusion in the Central Africa? What barriers prevent individuals from being financially included in Central Africa?

The main objective of this paper is to investigate the drivers of financial inclusion in Central Africa and extends the existing literature on financial inclusion four-fold. First, it is timely, in view of the current emphasis on the role of finance in economic growth, which remains a top priority on reform agendas of African countries. Second, most of the cross-country studies on financial inclusion focus on financial depth, using measures such as total outstanding deposits or credits. This study broadens the dimension beyond the traditional banking sector development indicators. Rigorous analysis for Africa is often impeded by the lack of appropriate data; the data compilations used in this study offer a unique opportunity to explore financial inclusion. Third, at the policy level, examining factors that influence financial inclusion in Central Africa will help the policymakers gain better insights into the state of financial inclusion which is crucial for the development of appropriate policy tools and institutional frameworks that can foster the sustainable provision of formal financial services. Lastly, to the best of our knowledge, there are no cross-country studies in Central Africa that analyze the financial exclusion problem.

The remainder of this paper is structured as follows. Section 2 presents a brief literature review. Section 3 explains the empirical model, econometric methodology, and data employed. Section 4 reports the estimated results and interprets the findings. The final section concludes the discussion.

2.   Previous evidence

Existing literature has identified various factors that affects financial inclusion. These includes individuals' level of education, employment status, income, demographic characteristics low competition among the suppliers of financial services which may cause prohibitive costs of using financial services and insufficient number of branches of commercial banks and ATMs which may lower access by individuals and firms (Rojas-Suarez 2010). Along the same vein and using the Global Findex database of the year 2014 on 37 African countries, Zins and Weill (2016) estimated binary probit models and established that income and education are the most significant factors in explaining financial inclusion in Africa. Their estimated model, however, excludes other variables that may explain differences in financial inclusion across regions such as the type and place of residence. Their results are however consistent with Ulwodi and Muriu (2017) who apply a multilevel analysis.

For the case of Ghana, Akudugu (2013) found that alongside education and income, other socio-economic factors also affect financial inclusion. These includes distance to financial services provider, social capital and lack of trust. A similarity between Zins and Weill (2016) and Akudugu(2013) is that they both found age of individual as significant. Specifically, they show that older people are likely to be financially included. The studies, however, differ on the effect of gender. While Akudugu (2013) found no gender effect, Zins and Weill (2016) found that being a woman has a negative correlation with formal account ownership and making savings but has no effect on credit. Ouma, Odongo and Were (2017) however found that women have a high likelihood to save than men even though the amounts they save are generally lower than that of men. The inconclusive effect of gender in these studies may be related to the fact they used data that does not have much information about women and financial services usage.

Institutional factors also influence access and use of financial services. For instance, Allen, Demirguc-Kunt, Klapper & Peria (2016) shows that legal rights and political stability influences the level of account penetration. Using 10,000 firms in the World Bank Enterprise Survey data, Beck, Demirgüç-Kunt and Maksimovic (2004), found that access to finance by firms is significantly dependent on institutional framework in which firms operate. However, there might be an endogenous relationship between financial inclusion and political stability. Indeed, countries that are politically stable seem to have higher levels of financial inclusion (Demirguc-Kunt and Levine, 2007). Since, this may adversely affect estimation results, various studies often employ the Instrumental Variable (IV) approach where neighbouring countries' policies are instrumented for policies in own country. They assume that countries are likely to copy policies that have had beneficial effects in their neighbourhood and therefore the IV approach may not be reliable.

Demirguc-Kunt, Klapper and Singer (2013), analyzed differences in financial inclusion along gender dimensions in developing countries where they established that women are more financially excluded and that this is mainly explained by differences in educational attainment, income and employment levels which is consistent with findings of Aterido, Beck & Iacovone, (2013).

Branch penetration also influences access to finance. Allen, Cull, Carletti and Senbet (2017), investigated the effect of branch penetration using a case study of the Equity Bank in Kenya using an instrumental variable (IV) approach to circumvent reverse causality between branch expansion and access and use of financial services. Their estimation results reveal that the presence of Equity bank is strongly and positively correlated with an increase in the number of account ownership and loans.

Some studies have in addition found population density to significantly influence financial inclusion. Using state level data of India for the period of 1995-2008, Kumar (2013), found a negative relationship between population density and deposit bank account penetration. This is a sharp contrast to Allen et al. (2014) who found a strong and positive effect on overall financial inclusion indicators in Africa.

An important aspect of financial inclusion in African countries is on the use of mobile banking services. Using FinAccess and FinScope data, Ordinary Least Squares (OLS) and logit models for four African countries namely Kenya, Uganda, Zambia and Malawi, Ouma, Odongo and Were (2017) shows that usage of mobile banking services increase savings and that it is positively and strongly correlated with income and education through financial literacy. But the extent to which practices which appear to enhance inclusion in one country may be transferred to other country remains a contested issue (Hulme, 2005). Despite the fact that M-PESA has been having huge positive effects on the usage of financial services in Kenya, mobile banking has not had comparable results in neighbouring in the rest of the East Africa nations.

The benefits of mobile banking have also documented by Jack and Suri (2014) who examine risk-sharing and transaction costs in Kenya between users and nonusers of M-PESA services. Using the difference-in-difference approach, the study found that in case of external shocks, the per capita consumption of non-users falls by 7% points compared to users of M-PESA.

Several other studies have examined the barriers to financial inclusion. Allen et al. (2016) estimated a probit model while controlling for country specific effects and found that distance to formal financial institutions and lack of money were the main barriers to financial inclusion. For instance, their results indicate that distance can bar the poor, less educated and individuals living in rural areas from accessing and using financial services. Ulwodi and Muriu (2017) while applying a multilevel model found similar results for SSA countries. Fungáčová and Weill (2015) also found that lack of money was the major reason explaining why poor do not use formal financial services. They also found that poor persons have less chances than non-poor to have an account in the case a family member already has one.

These initial findings suggest that education, income levels, age, place of residence, distance, trust and institutional quality significantly influence the variations in financial inclusion. Lack of money, documentation, distance and the cost of opening an account are also considered to be barriers to financial inclusion.

3. Data and methodology

3.1 Theoretical framework

The Random Utility Model (RUM) developed by Marschak (1959) and Debreu (1960) and later modified by Walker and Akiva (2002) forms the basis of this paper's theoretical framework. This theory assumes that consumers seek to maximize their utility given their budget constraint and other alternatives they face. Consumers will choose the alternative from which the highest utility is derived since they are assumed to act rationally. Therefore, consumers will adopt to use formal financial services and products if and only if the utility associated with this usage is greater than not using those services offered by formal financial providers.

Utility, however, is a latent variable and can only be observed through revealed preferences of the consumers. Following Walker and Ben-Akiva (2002) the utility maximization behaviour that is derived from access and use of formal financial services can be formalized as follows;

$$U_{ij} = u(X_{ij}; Z_{ij}) \quad \text{…………………………………………………………...…….. (1)}$$

Where, U_{ij} is the direct conditional utility that individual i [i=1, 2...N] expects to derive from being financially included and j [j=0,1] is the alternative of choosing either to be financially included which is 1 or otherwise. U_{ij} has two components: X_{ij} and Z_{ij}. X_{ij} is the set of individual's observable characteristics that determine financial inclusion and Z_{ij} a set of unobservable characteristics of individual i that affect the alternative j. The utility maximization behaviour is subject to the budget constraint. Therefore, an individual may adopt to use formal financial services given his or her budget constraint.

$$I_i \geq XP_{ij} \quad \text{………………………………………………….……………………… (2)}$$

Where, I_i is the individual income, P_{ij} the price incurred while choosing an alternative j and X is the quantity associated with that price. For ease of computation, the price of other commodities that enter the utility function is normalized to 1.

Therefore, the consumer's utility maximization problem is simplified as follows;

$$Max\ U_{ij}(I_i, P_{ij},\ X_{ij}) \quad \text{…………………………………….………………………………… (3)}$$

Where, I_i and P_{ij} are described as in previous equations. X_{ij} is the set of individual attributes that may equally affect the decision to access and make use of formal financial services.

3.2. Empirical model

Empirically, however, conditional direct utility is not observed. What individuals express is the indirect conditional utility based on observed behaviour through preferences ordering. Thus, preferences indicate the utility that consumers derive from alternative j. If for instance we set j=1 if individual I is financially included and j=0 if otherwise, $U_{j1} > U_{j0}$ for individuals whose choice of being financially included enjoy higher utility than if they were not financially included. Hence, the indirect utility function will be given by:

$$V_{ij} = v(I_i, P_{ij}, x_{ij}) \quad \text{……………………………………….…………………………. (4)}$$

Where, V_{ij} is the indirect conditional utility of being financially included.

However, the consumer behaviour is characterized by some level of uncertainty. Thus, equation (5) becomes:

$$V_{ij} = V^*_{ij} + \varepsilon_{ij} \quad \text{……………………………………………………………………… (5)}$$

Where, V^*_{ij} is the deterministic component of utility and ε_{ij} is the error term.

Since equation 5 is a demand model based on utility function, we can assert the empirical model for the choice of being financially included as follows:

$$FI_{ij} = f(I_i, P_{ij}, x_{ij}) \quad \text{………………………….……………….………………………... (6)}$$

Where, FI_{ij} is the dependent variable which stands for financial inclusion for individual i and j the choice of being or not being financially included given the factors on the right-hand side. The linear estimable model thus becomes:

$$y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \cdots \ldots \ldots + \beta_k X_k + \varepsilon_i \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ \ldots\ldots (7)$$

$$FI_i = \beta_0 + \beta_1 Income_i + \beta_2 Education_i + \beta_3 Age_i + \beta_4 Agesquared_i + \beta_5 Sex_i + \varepsilon_i \ldots\ldots\ldots.. (8)$$

Where FI denotes financial inclusion, the subscript i stands for individuals while independent variables.

3.3 Measurement of variables

3.3.1 Financial inclusion

Financial inclusion has been measured differently in the literature. Some studies use account ownership at a financial institution (Akudugu, 2013); others define it as ownership of mobile banking account and account at a financial institution (Zins and Weill, 2016). Others have constructed indices that capture broad services offered by the financial services in a single indicator (Sarma, 2008; Pena, Hoyo & Tuesta, 2014; Massara & Mialou, 2014 and Deléchat,Newiak, Xu, Yang & Aslan, 2018). In this study financial inclusion is measured in three ways:

a) *Account ownership*: This is a dummy variable that takes the value 1 if an individual possesses personally or collectively an account in any financial institution and zero otherwise.
b) *Savings*: It is a dummy variable that takes the value 1 if an individual made a saving personally or collectively with someone else in the last 12 months.
c) *Borrowings*: It is a dummy variable taking the value of 1 if the individual borrowed personally or together with someone else in the last 12 months and 0 otherwise.

3.3.2. Determinants of financial inclusion

These are individuals' characteristics that may not only affect the decision of owning an account but also how financial services are used in terms of savings and credits. Table 1 shows the definition and measurement of variables.

Table 5: Definition and measurement of variables: determinants of financial inclusion

Variable name	Definition	Measurement	Expected sign
Income level	The individual's income	Income is divided into 3 levels: low income level, middle income level and high income level. Poor income level serves as the benchmark category	Positive
Sex	Individual's sex	It is a dummy variable where 1 stands for male	Undetermined
Age	Age of the respondent	It is measured in years	Positive
Age Squared	The square of age of the respondent		Negative
Education level	Highest level of education attained by the respondent	It is a categorical variable that takes: 0 "primary or less", 1 "secondary", 2" tertiary". 0 is used as the comparison category	Positive

3.3.3 Barriers to financial inclusion

Barriers to financial inclusion are set of variables that proxies the reasons why individuals do not have an account at any formal financial institution. Table 2 shows the definition and measurement of variables

Table 6: Definition and measurement: Barriers to financial inclusion

Variable name	Definition	Measurement	Expected sign
Too expensive	Cost of opening an account	Dummy variable which equals to 1 if the respondent finds it too expensive	Negative
Distance	The distance to the financial institution location	Dummy that takes the value of 1 if it is far away	Negative
Documentation	Necessary documents required to open an account	Dummy variable that takes the value of 1 if the individual lacks required documents	Negative
Trust	Level of trust that an individual put in the financial institutions	Dummy variable which is 1 if an individual lacks trust in financial institutions.	Negative
Family	If family members' account ownership affects own ownership	Dummy variable where 1 stands for individuals who do not have an account because a family member already has one	Undetermined

3.4 Econometric approach

Given the nature of the dependent variable, the Ordinary Least Squares (OLS) estimation also known as the Linear Probability Model (LPM) is unreliable as it produces biased estimates (Maddala, 1983) and thus the need to use discrete choice modelling approaches such as the Logit or probit models whose estimates are efficient and consistent. The choice between the logit and the probit model solely relies on the assumptions about the distribution of the disturbance term. In the event a logistic distribution is assumed, then a logit model is estimated. If, instead, a normal distribution is assumed, then probit model is preferred.

$$y_i = \beta_0 + B_1 x_i + \varepsilon_i \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots..(9)$$

Where y_i is financial inclusion, β's are the parameters and X [X=1, 2,…k] are the explanatory variables.

Following Cameron and Trivedi (2005), the choice of being financially included or not for an individual I is observed conditional on the explanatory variables X. The observable outcome is y=1 if individual I is financially included and y=0 otherwise for j the choice of access to and use of formal financial services.

$$y = \begin{cases} 1 \ if \ i \ is \ financially \ included \\ 0 \ otherwise \end{cases} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \ (10)$$

We seek to estimate the probability (P_i) that individuals are indeed financially included given the regressors using the probit model which assumes that the disturbance term follows a normal distribution with mean zero and variance equal to 1. Following Cameron and Trivedi (2005), we can rewrite

$$P_i = \Pr[y_i = 1|x_i] = \Phi(\beta_0 + \beta_1 x_i) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots..\dots\dots\dots \ (11)$$

Where Φ (.) is the standard normal cumulative distribution function. y_i denotes financial inclusion, x_i are the regressors as defined in the empirical model. The associated log-likelihood function which is estimated is:

$$lnL = \sum_{y_i=0} \ln[1 - \Phi(\beta_0 + \beta_1 x_i)] + \sum_{y_i=1} \ln[\Phi(\beta_0 + \beta_1 x_i)]\dots\dots\ \dots\dots..\dots\dots\dots \ (12)$$

We estimate the log-likelihood function using the maximum likelihood estimation (MLE) technique.

3.5 Data

We used the Global Findex 2014 data set which is a micro-survey that captures the demand-side measures of financial inclusion at an individual level. The data captures information relating to incomes, education among other individual characteristics influences utilization of financial services. The data in addition, captures the constraints that prevent people from accessing and using financial services and products. Even though the data covers around 140 countries, we limit ourselves to the Central African countries which are Democratic Republic of Congo (DRC), the Republic of Congo, Gabon and Cameroon. In each of these countries, we obtain data for 1000 individuals therefore a total of 4000 individuals.

4. Empirical findings and discussions

Table 3 provides the summary statistics which shows that only 23.27% have an account at a financial institution. 64.47% made a saving in the last 12 months while 49.58% had borrowed for the same period. When the statistics are broken down by gender, we observe that 53.29% are males. 35.6% have attained some primary level of education, 57.3% secondary while only 7.09% have attained tertiary level of education. The average age is 32 years. There were 5 quintiles for income level, the two first quintiles that were poorest and poor were combined to form income level made of poor individuals, the third quintile remained for middle income while the fourth and the fifth mainly the rich and richest were equally combined to form the high-income level. This combination was made because the income level differences among these income quintiles were very close despite being separately coded.

Table 7: Summary statistics

Variables	Obs.	Mean	Std. Dev.	Min	Max
Account ownership	3,991	0.2327	0.4226	0	1
Saved	3,991	0.6447	0.4786	0	1
Borrowed	3,991	0.4958	0.5000	0	1
Sex	3,991	0.5329	0.4989	0	1
Primary Education	3,991	0.3560	0.4788	0	1
Secondary Education	3,991	0.5730	0.4946	0	1
Tertiary or higher	3,991	0.0709	0.2567	0	1
Low income level	3,991	0.3304	0.4704	0	1
Middle income level	3,991	0.1801	0.3843	0	1
High income level	3,991	0.4893	0.4999	0	1
Distance	3,061	0.2551	0.4360	0	1
Too expensive	2,934	0.3292	0.4700	0	1
Documentation	3,062	0.2237	0.4167	0	1
Trust	3,027	0.2173	0.4125	0	1
Family	3,046	0.0686	0.2528	0	1
Age	3,810	32.4598	12.4743	15	65

On the financial inclusion indicators, 25.51% do not have an account because they find that financial institutions are too far away. 32.92% report that it is too expensive to have an account while 22.37% indicated that they lack necessary documents to open an account. Further 21.73% indicated that they lack trust in financial institutions.6.86% reported not having an account because a family member already has one.

When we break down the summary statistics by country, we observe some interesting statistics (see Table A4 in the appendix). Account ownership is lower in Cameroon and in the DRC where only 14.3% and 17.5% respectively reported to have a formal account. 22.6% reported to have a formal account in the Republic of Congo while Gabon has the highest proportion in reporting account ownership with 38.6%. It can be observed

that in all the four countries, more people reported to have saved in the last 12 months compared with borrowings.

Table 4 shows very low correlations among the variables. Thus, multicollinearity is not a problem. High correlation is between age and age squared is obvious, but which is meant to capture the non-linear effect of age and therefore enters the estimation equation separately.

Table 8: Pairwise correlation matrix

	Income	Education	Sex	Age	Age Square	Distance	Too expensive	Documentation	Trust	Family
Income	1.0000									
Education	0.2315	1.0000								
Sex	0.0374	0.0635	1.0000							
Age	-0.0729	-0.1675	0.0499	1.0000						
Age square	-0.0845	-0.1844	0.0471	0.9830	1.0000					
Distance	-0.0818	-0.0387	0.0365	0.0658	0.0627	1.0000				
Too expensive	-0.0743	-0.0638	0.0110	0.0191	0.0213	0.3389	1.0000			
Documentation	-0.0679	-0.0458	-0.0179	-0.1492	-0.1224	0.1498	0.1979	1.0000		
Trust	-0.0189	-0.0292	0.0187	0.0288	0.0214	0.1570	0.2894	0.1001	1.0000	
Family	0.0308	0.0181	-0.0276	-0.0379	-0.0312	0.0375	0.0258	0.0601	0.0547	1.0000

The estimates of the probit model for which account ownership is the dependent variable is presented in the Appendix (see table A1) while the marginal effects are reported in Table 5. The Likelihood ratio test has a value of 697.84which is associated with a χ^2 whose probability is significant at 1% levelimplies that the variables in the model jointly explain account ownership in Central Africa. It also has a pseudo R^2which is equal to 0.1682.

From the results, high income individuals are 18.29% more likely to have an own account at a financial institution compared to 8.25% of middle-income individuals which are both statistically significant at 1%. This finding is in line with existing literature (see for example Akudugu 2013;Fungáčová and Weill (2015). One possible channel for this finding is that high- and middle-income individuals own accounts for receiving wages from employment or income from other investments they undertake unlike the low-income individuals whose income streams are often irregular and volatile and thus account ownership may not lower due to costs associated with maintaining it which dries up their incomes.

The level of education has a positive effect on account ownership. The probability of having a formal account for an individual who has attained secondary education is 18.49% more than of an individual with only primary education and 43.22% higher for those with higher education compared to primarye ducation. This result is specifically important because education improves awareness of benefits of owning a formal account. This result is consistent with Pena, Hoya and Tuesta (2014) who showed that the level of education is a key determinant of account ownership in Mexico. Therefore, financial inclusion can be enhanced by boosting education levels through policies that increases enrolment and retention in education systems such as the introduction of free or subsidized education policies that would eventually stimulate enrolment.

We establish that account ownership is positively and significantly correlated with age. An increase of 1 year of age is expected to increase the probability of formal account ownership by 2.68%. However, this probability reduces at older ages since the coefficient of age squared has a negative sign as expected. This finding corroborates Allen et al. (2016) and Tuesta, Sorensen, Haring & Camara(2015). We also establish that heterogeneity along the gender dimension exists on account ownership with men being more likely to own an account at a formal financial institution. Account ownership by men is 3.33%higher than that of women. Empirical evidence, however, remains mixed. For example, Allen et al. (2016); Tuesta et al. (2015) and Bruhn (2009) do not find any gender difference in terms of account ownership. Similarly, Aterido, Beck and Iacovone (2013), show that gender gap turns insignificant once they control for other characteristics for several Sub-Saharan African countries. On the contrary Zins and Weill (2016) find significant male-female differences for Africa. Indeed, Taylor and Boubakri (2013), show that women do not own property/land titles and earn lower wages than men which renders them unattractive to the formal financial institutions. Demirguc-Kunt et al. (2013) also establish significant gender gaps in ownership of accounts and usage of savings and credit products though with significant variation across countries. They attribute this to differences in legal discrimination against women and gender norms.

Having borrowed or made a saving in the last 12 months indicates how individuals make use of formal financial services. A probit model is estimated where borrowed is the dependent variable. The marginal effects are presented in Table 5 column 2 and the probit model is presented in the Appendix (see Table A2). The value of the likelihood ratio test is 82.33which is associated with a Chi^2 whose probability is significant at 1% level. Therefore, the variables explain individuals' borrowings decision in Central Africa.

We find that only age explains the decision to borrow. An increase of one year of age is positively correlated with borrowings while older people are less likely to have borrowed in the last 12 months. Income and education are not significant. This result is a sharp contrast to Kumar (2013) and Olaniyi and Babatunde (2016). This is explained by the fact that borrowing from a formal financial provider does not depend on the individual choice to borrow only but also on the profitability of the lenders and other factors such as risk. Therefore, willingness to borrow does not necessarily result into obtaining a loan.

Table 5: Determinants of financial inclusion

	Account ownership	Borrowed	Saved
Middle income	0.0825***	0.0081	0.0523**
	(0.0242)	(0.0239)	(0.0216)
High income	0. 1829***	-0.0066	0.1034***
	(0.0161)	(0.0191)	(0.0180)
Secondary education	0.1849***	0.0158	0.0985***
	(0.0142)	(0.0184)	(0.0177)
Higher education	0.4322***	0.0382	0.1458***
	(0.0354)	(0.0344)	(0.0282)
Sex	0.0298***	0.0220	-0.0019
	(0.0132)	(0.0164)	(0.0158)
Age	0.0268***	0.0231***	0.0360***
	(0.0031)	(0.0036)	(0.0034)
Age squared	-0.0002***	-0.0002***	-0.0003***
	(0.00004)	(0.00005)	(0.00005)

Standard errors are in parentheses. Asterisks denote significance at the ***1 percent, **5 percent and *10 percent level.

The probit estimation that explains savings indicates that income, education and age are positively correlated with the decision to save (see Table A3 in the appendix). The estimated model has a LR test which is significant at 1% level. However, we interpret marginal effects. Income level and education level have a positive effect on the decision to save. A middle-income individual and high-income individual probability to save compared to a low-income individual is 5.23% and 10.34% higher respectively. The probability of a person who has attained secondary level of education or tertiary level of education is more likely than a person who attained primary level of education to save is 9.85% and 14.58% respectively. This result is similar to that of Allen et al. (2016). Unlike them, however, we find that individuals increase their savings as their age advances but reduce (tendency to dissave) as they grow old. This is consistent with theory (Modigliani, 1966). However, we find no differences between males and females' probability to save as shown by the coefficient on sex which is not significant.

For robustness, we also estimate probit models for the determinants of financial inclusion controlling for country dummies so that possible differences between countries are captured. After controlling for country dummies, we see that there is either a slight decline or increase in the magnitude of the marginal effects compared to the results in table 5 even though the levels of significance are still the same for all the variables except for borrowing on the variable sex which indicates that men are more likely to have borrowed in the last 12 months compared to women. The probability that a male individual borrowed is 2.69% higher than that of a female individual. In terms of account ownership, Gabon and the Republic of Congo perform better than the DRC and Cameroon while the reverse is observed for borrowings and savings.

Table 6: Determinants of financial inclusion when controlling for country dummies

Variables	Account ownership	Borrowed	Saved
Middle income	0.0780***	0.0092	0.0527**
	(0.0242)	(0.0242)	(0.0217)
High income	0.1776***	-0.0019	0.1053***
	(0.0160)	(0.0194)	(0.0181)
Secondary education	0.1895***	0.0165	0.1019***
	(0.0141)	(0.0191)	(0.0182)
Tertiary education	0.4904***	-0.0054	0.1274***
	(0.0372)	(0.0365)	(0.0305)
Sex	0.0318**	0.0269*	0.0017
	(0.0031)	(0.0166)	(0.0158)
Age	0.0245***	0.0269***	0.0379***
	(0.0122)	(0.00005)	(0.0035)
Age square	-0.0002***	-0.0002***	-0.0004***
	(0.00004)	(0.00005)	(0.00005)
DRC	-0.0380*	0.0314	0.0062
	(0.0195)	(0.0242)	(0.0233)
Congo, Republic	0.0603***	-0.1613***	-0.1076***
	(0.0215)	(0.0228)	(0.0235)
Gabon	0.2205***	-0.1739***	-0.0887***
	(0.0238)	(0.0226)	(0.0234)

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

One of the ways to check for country specific effects is the use of multilevel analysis (Bryan and Jenkins, 2015). The rule of thumb, however, stipulates that if the intraclass correlation (ICC) is less than 10%, there is no need to control for clusters (in our case country) specific effects.

Table 7: ICC test of Conditional intraclass correlation

Level	ICC	Std. Err.	[95% Conf.	Interval]
Country	0.0480	0.0338	0.0117	0.1769

Table 7 shows that the correlation that allows estimation of multilevel analysis is 4.8%. Hence, we do not use the multilevel analysis because in our case the rule of thumb is violated as the ICC coefficient is of 4.8%. This suggests that resorting to the simple binary probit model would not yield biased results due to country specific effects. Bryan and Jenkins (2015) controlled for country specific effects, through Monte Carlo simulations in multilevel models and found that if countries are less than 30, estimates from the logit model will not be biased.

Barriers to financial inclusion are set of variables that capture reasons for not having an account at a bank or another type of formal financial institution. We estimated several probit regression models and the estimation results of the marginal effects are presented in Table 8. Financial inclusion in equation (8) is replaced by the barriers to financial inclusion. This allows us to infer how these barriers prevent financial inclusion across income groups, education levels, sex and age. This is a common approach in the literature (Fungáčová and Weill, 2015 and Allen et al., 2016).

Our estimation results reveal that all these barriers are important in explaining low level of financial inclusion in Central Africa. Specifically, we find that distance to a formal financial institution has a negative effect on financial inclusion especially for poor income individuals. The coefficient on high income level indicates that high income person's probability of not having an account if the financial institutions are "too far away" is 5.41% lesser than that of low-income individual. This has also been established in the literature (See for example Allen et al., 2016 and Ulwodi and Muriu, 2017).

Table 8: Barriers to financial inclusion

	Distance	Too expensive	Documentation	Trust	Family
Middle income	-0.0287	-0.0367	-0.0023	0.0026	-0.0224
	(0.0212)	(0.0241)	(0.021)	(0.0214)	(0.0118)
High income	-0.0541***	-0.0510**	-0.0541**	-0.0138	0.0151
	(0.0179)	(0.0201)	(0.0172)	(0.0176)	(0.0106)
Secondary education	-0.0240	-0.0553**	-0.0342**	-0.0292*	0.0077
	(0.0176)	(0.0194)	(0.0167)	(0.0168)	(0.0099)
Tertiary education	0.0216	-0.0519	-0.0705**	-0.0266	-0.0233
	(0.0429)	(0.0432)	(0.0362)	(0.0374)	(0.0206)
Sex	0.0259	0.0141	-0.0108	0.0175	-0.01564*
	(0.0162)	(0.0178)	(0.0154)	(0.0154)	(0.0092)
Age	0.0067*	0.0003	-0.0248***	0.0074**	-0.0030
	(0.0035)	(0.0039)	(0.0033)	(0.0034)	(0.0020)
Age squared	-0.00006**	-5.19e-06	0. .0002***	-0.00009**	0.00003
	(0.00005)	(0.00005)	(0.00005)	(0.00005)	(0.00003)

Standard errors are in parentheses. Asterisks denote significance at the ***1 percent, **5 percent and *10 percent level.

We also established that high income individuals and those who have attained secondary level of education are more likely to have an account because they do not find it too expensive. This means that financial institutions charges are costlier to low income and less educated individuals. Reduction of the cost of opening an account, therefore, is likely to increase the number of individuals using formal financial services. Documentation also has a negative effect on account ownership. The coefficient on middle and high-income individuals indicate that lack of documents as a reason of not having an account is more likely to be a barrier to the poor and to the less educated individuals. For example, the probability of not having an account because of lack of documents for an

individual who attained tertiary level of education is 7.05% lesser than of an individual with primary level of education. If the documents required to open an account are estimated to entail a heavy process, less educated and low income individuals will not be willing to undergo such process. This will, therefore, reduce the likelihood of opening an account even if those individuals may not be prevented from account ownership by other factors. The effect of age on documentation shows that documentation is less likely to be a barrier as age increases but it is a barrier for old people. Therefore, in order to increase financial inclusion level in Central Africa, documents required to open a formal account should be lessened. This finding is consistent with Zins and Weill (2016). However, lack of documentation is not perceived as a barrier at the global level for individuals with high income (Allen et al., 2016).

Trust in financial institutions is only perceived as a barrier to account ownership through age. Trust can be built through quality of services provided by financial institutions which guarantee individuals on the safety of their money and permanent quality delivery. Finally, the probability that an individual lacks an account because a family member already has one is significant for middle income individuals and sex. Females are less likely to have an account because a family member already has one by a probability of 1.56%. However, this coefficient is not strong enough since it is only significant at 10% level of significance while the probability that a poor individual lacks an account because a family member already has one is 2.18% higher than that of an individual in the middle-income group.

5. Conclusion

This study examined the drives of financial inclusion in Central using the Global Findex database collected in the year 2014.Binary probit models were estimated. We established that the main determinants of financial inclusion in Central Africa are income, education, sex and age. We also find that account ownership differs across gender groups and that distance and documentation are the main barriers to financial inclusion.

Policies aiming at increasing individuals' income such as cash transfers may help improve the inclusion of the poor in the formal financial sector. On the other hand, low level of financial inclusion of individuals with low level of education is due to little awareness about formal financial market therefore increase in financial literacy through mobilizations and advertisements will have a big effect on the inclusion of the targeted individuals.

Given that long distances to financial services providers reduce the likelihood of being financially included, financial outreach policies should be implemented. Additionally, in order to increase financial inclusion, the process of getting necessary documents that allow individuals to open accounts with formal financial institutions should be less rigid.

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APPENDIX

Table A1: Account ownership

Account ownership	Coef.	Std. Err.	z	P>z
Middle income	0.2836	0.0783	3.62	0.000
High income	0.6779	0.0611	11.09	0.000
Secondary education	0.7307	0.0619	11.80	0.000
Tertiary education	1.2192	0.0948	12.85	0.000
Sex	0.1110	0.0494	2.25	0.025
Age	0.0996	0.0117	8.46	0.000
Agesquare	-0.00098	0.00015	-6.40	0.000
Constant	-3.8877	0.2187	-17.77	0.000
	Number of obs = 3,810 LR chi2(7) = 697.84 Prob > chi2= 0.0000 Pseudo R2 = 0.1682			

Table A2: Borrowed

Borrowed	Coef.	Std. Err.	z	P>z
Middleincome	0.0204	0.0601	0.34	0.734
High income	-0.0166	0.0480	-0.35	0.729
Secondary education	0.0396	0.0463	0.86	0.392
Tertiary education	0.0960	0.0867	1.11	0.268
Sex	0.0552	0.0412	1.34	0.181
Age	0.0581	0.0091	6.33	0.000
Age square	-0.00063	0.00012	-5.17	0.000
Constant	-1.1676	0.1581	-7.38	0.000
	Number of obs = 3,810 LR chi2(7) = 82.33 Prob > chi2 = 0.0000 Pseudo R2 = 0.0156			

Table A3: Saved

Saved	Coef.	Std. Err.	z	P>z
Middle income	0.1461	0.0619	2.36	0.018
High income	0.2841	0.0498	5.70	0.000
Secondary education	0.2675	0.0479	5.58	0.000
Tertiary education	0.4418	0.0977	4.52	0.000
Sex	-0.0053	0.0432	-0.12	0.902
Age	0.0985	0.0094	10.38	0.000
Age square	-0.0010	0.00012	-8.51	0.000
Constant	-1.8153	0.1624	-11.17	0.000
	Number of obs = 3,810 LR chi2(7) = 303.41Prob > chi2 = 0.0000 Pseudo R2 = 0.0617			

Table A4: Financial inclusion indicators per country

Country	Variables	Obs	Mean	Std. Dev	Min	Max
Cameroon	Account ownership	1,000	0.143	0.3502	0	1
	saved	1,000	0.67	0.4704	0	1
	borrowed	1,000	0.565	0.4960	0	1
DRC	Account ownership	994	0.1750	0.3802	0	1
	saved	994	0.7052	0.4561	0	1
	borrowed	994	0.5925	0.4916	0	1
Congo, Rep.	Account ownership	993	0.2255	0.4181	0	1
	Saved	993	0.5941	0.4913	0	1
	Borrowed	993	0.4259	0.4947	0	1
Gabon	Account ownership	1,004	0.3864	0.4871	0	1
	Saved	1,004	0.6095	0.4880	0	1
	Borrowed	1,004	0.4003	0.4902	0	1