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Evans, Olaniyi

Pan Atlantic University, Lagos, Nigeria

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## **DETERMINANTS OF FINANCIAL INCLUSION IN AFRICA: A DYNAMIC PANEL DATA APPROACH**

*Olaniyi Evans*

*Department of Economics, University of Lagos, Akoka Lagos, Nigeria*

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*\*Babatunde Adeoye, Ph.D*

*Department of Economics, University of Lagos, Akoka Lagos, Nigeria*

*Email: badeoye2010@yahoo.com*

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### **Abstract**

*This study documents the determinants of financial inclusion in Africa for the period 2005 to 2014, using the dynamic panel data approach. The study finds that per capita income, broad money (% of GDP), literacy, internet access and Islamic banking presence and activity are significant factors explaining the level of financial inclusion in Africa. Domestic credit provided by financial sector (% of GDP), deposit interest rates, inflation and population have insignificant impacts on financial inclusion. The findings of this study are of utmost value to African central banks, policymakers and commercial bankers as they advance innovative approaches to enhance the involvement of excluded poor people in formal finance in Africa.*

**Keywords:** Financial inclusion, finance, dynamic panel data, Africa

**JEL Classification:** C23, E62, F30, D14, G21

## **Introduction**

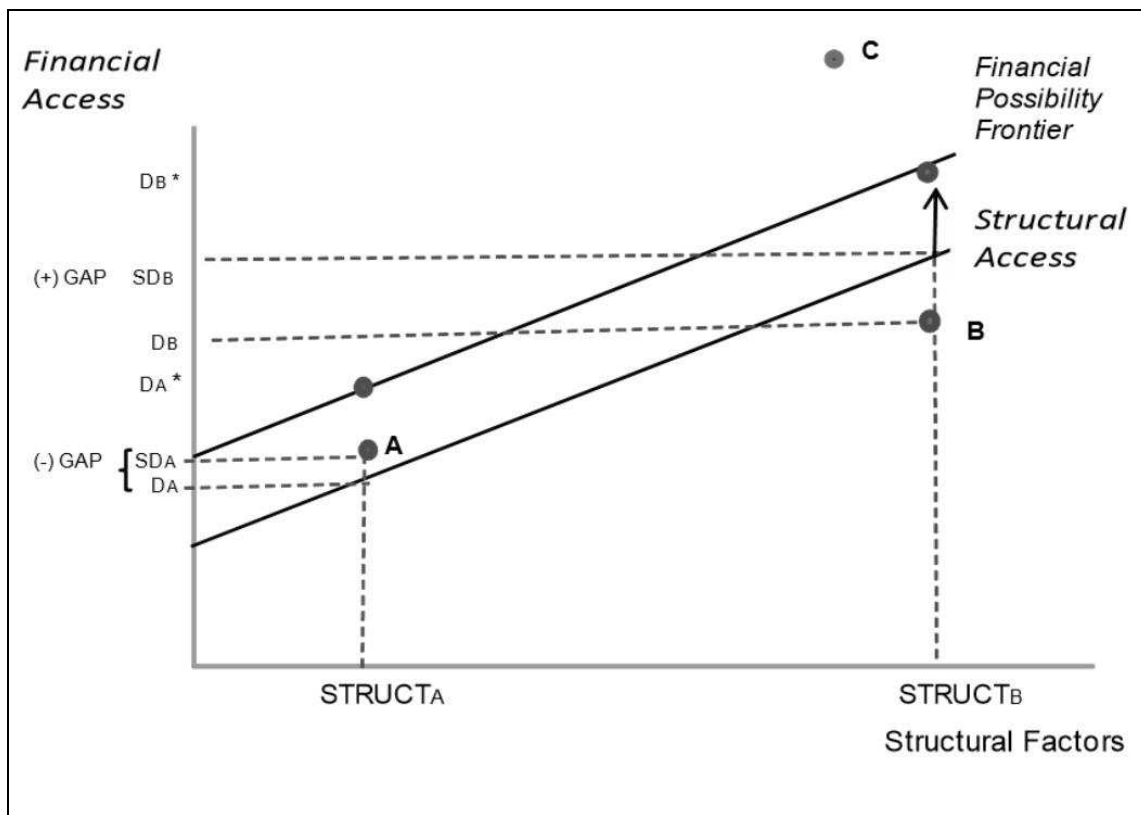
What are the determinants of financial inclusion in Africa? Recently, there has been a rapid thrust for financial inclusion, more so in emerging economies, such as in Africa. However, financial inclusion continues to pose increasing concerns for a vast number of economies. The concerns have led more than 50 countries to set formal targets of universal financial access by 2020 (i.e. Lesotho, Nigeria, Rwanda) and many more countries tasking their regulatory and supervisory agencies with encouraging financial inclusion. These increasing concerns are necessary considering the possible “cost in foregone economic growth when the volume of financial services in a country does not reach a sufficiently large share of the population” (Barajas, Chami & Yousefi, 2013 as cited in Naceur et al, 2015, p.4).

The share of unbanked adults can be as high as 90%, in many emerging and developing economies. Among the emerging and developing economies, account ownership is lowest in Africa (Mehrotra & Yetman, 2015). However, the level of financial inclusion varies widely by country and income level. For example, the adult population having a bank account is highest in Mauritius (80%) and South Africa (54%), followed by Angola, Mozambique, Kenya, Zimbabwe, and Morocco (all around 40%). With its mobile banking leading the way, Kenya has a successful financial inclusion policy. In addition, 14 African countries have less than 10% of the adult population having a bank account with a formal financial service (i.e. Egypt, Guinea, Niger, and Congo). For instance, in the Central African Republic, Kinshasa, Guinea and Congo, less than 5% of the adult population have access to formal financial services. In Niger, only 2% of the population has a bank account (Demirgüç-Kunt & Klapper, 2012).

Considering the character of finance, two types of factors constitute financial inclusion constraints in Africa. One type is time-invariant (structural characteristics) and the second type is policy factors (Naceur et al, 2015). The structural characteristics are population size and density, income per capita, and the level of economic informality, which all jointly decide the financial market size. The policy factors are the degree of macroeconomic stability and the institutional frameworks which determine the costs and risks of financial services provision. Thus, financial inclusion can be seen as a function of both structural and policy factors.

Naceur et al (2015) used an innovative graphical example to illustrate how financial inclusion can be seen as a function of both structural and policy factors. Let's consider the financial inclusion proxy introduced in this study: depositors with commercial banks.<sup>1</sup> The higher the level of the economy, its population and density, the more cost-effective is loan provision to the broader population. Therefore, as in Figure 1, a positive relationship is expected between this access (on the vertical axis) and the structural characteristics (on the horizontal axis). As shown by the structural access line, Country A, a small low-income country with a highly dispersed population (depicted as  $STRUCT_A$ ) would be expected to have a lesser level of inclusion than Country B, a large high-income country with concentrated urban population (depicted as  $STRUCT_B$ ).

Figure1. Financial Possibility Frontier



Source: Naceur et. al (2015, p. 18)

<sup>1</sup> A similar analysis could be carried out on the other financial inclusion variable: broad money per capital.

However, pro-finance policies and better enabling environment can push Country A to break through its structural constraints to register  $D_A$  level of inclusion ( $D_A > SD_A$ ). On the contrary, country B, though with a higher level of access than country A may underperform compared to countries with comparable structural characteristics ( $D_B < STRUCT_B$ ). Therefore, well-thought-out pro-finance policies and better enabling environment can drive access upward for African countries with diverse structural characteristics, to eventually reach a maximum sustainable level, termed by Naceur et al (2015) as the Financial Possibility Frontier (FPF) for inclusion.

In spite of the different conceptualizations of the factors that influence financial inclusion, little effort has been made to empirically determine these determinants of financial inclusion or factors that foster inclusion, especially in Africa. Existing studies have been devoted to the measurement and promotion of financial inclusion, to the detriment of the empirical evaluation of its determinants and impacts. This study is therefore a novel effort: it contributes to our understanding of the determinants of financial inclusion in Africa, on which there is little empirical research to date. This study therefore fills the gap by evaluating the determinants of financial inclusion in Africa, using dynamic panel data approach for 15 countries over the 2005-2014 period.

Regarding the motivation for this study, we selected Africa for quite a few reasons. Firstly, there is a shortage of research on the determinants of financial inclusion in Africa. Secondly, among the emerging and developing economies, account ownership is lowest in Africa (Mehrotra & Yetman, 2015). The determinants of financial inclusion may therefore be more significant and easily evident in Africa than in other parts of the world. Thirdly, many researchers consider that financial inclusion has had significant benefits for economic development worldwide. Fourthly, Africa has 34 of the current 48 Less Developed Countries worldwide, meaning the continent is a splendid context for the evaluation of the determinants of financial inclusion.

The rest of the article is organized as follows. Section 2 briefly provides the literature review. Section 3 is an exposition of data and methodology. Section 4 describes the results of the dynamic panel analysis. Section 5 concludes with overall summary and policy suggestions.

## **Literature Review**

The development of the financial sector, together with financial liberalization and international financial integration, came to the epicenter of academics as well as policy-makers discussions during the last four decades (Mirdala, 2011), due to its potential effects on the general economic performance of an economy. As a matter of fact, in the early neoclassical growth literature, the financial sector only served as a conduit of household savings to investors. However, studies such as Goldsmith (1969) and Mickinnon (1973) had a contrary view, proposing a more robust character for financial services. Ever since, a considerable volume of empirical and theoretical literature has looked at the role of an efficient financial system as the foundation for sustaining an open, vibrant economic system (i.e. Demetriades & Andrianova, 2004; Godhart, 2004; Abu-Bader & Abu-Qarn, 2008; Mirdala, 2011; Adeoye and Saibu, 2014; Adeoye & Sangosanya, 2015 and Adeoye, 2015 ).

The success of the financial system in contemporary times is attributed to financial sector reforms such as market-based procedures, the promotion of competition, and the relaxation of restrictions. The goal of these reforms is to initiate a more efficient and stable system, which will provide a foundation for effective stabilization and mobilization of capital, which leads to reduced poverty (Johnston & Sundararajan, 1999; Adeoye and Saibu, 2014; Adeoye & Sangosanya, 2015 and Adeoye, 2015). Emerging markets attach great importance to the development and deepening of the financial sector in the pursuit of their poverty-reduction objectives and, most recently, financial inclusion. Through mobilization of savings, facilitation of payments, and promotion of proficient allocation of resources, the financial sector plays a crucial role in the broadening of access to finance, stemming the tide of poverty (Zhuang, Gunatilake, Niimi, Khan, Jiang, Hasan, & Huang, 2009) and thus, leading to increased financial inclusion.

Of all the vast definitions of financial inclusion, the World Bank 2014 Global Financial Development Report's definition of financial inclusion as "the share of the population who use financial services" is the most "useful definition because it can be measured and incorporated easily into theoretical and empirical work" (Naceur, et al, 2015, p. 4). Thus, financial inclusion

describes a situation where the bulk of financial services in a country reach a sufficiently large share of the population.

As financial inclusion is becoming increasingly important for a vast number of countries worldwide, a growing literature has been evaluating its measurements, determinants, and effects. Bhattacharaya and Wolde (2010) found that inadequate access to credit has been undermining growth in MENA countries compared to the rest of the world. Studies such as Naceur, et al (2015) has identified a number of determinants of financial inclusion. First are structural factors. Structural factors determine the costs of financial services provision to the population. Second are policy-related factors. Policy-related factors can create enabling environments for financial inclusion. For example, Love and Martínez Pería (2012) found that countries with more competitive banking systems can enjoy greater financial inclusion as a higher number of firms will have access to a loans and overdrafts. Third are some non-policy characteristics of the country. For example, Aga and Martinez Pería (2014) show that inflows of international remittances to sub-Saharan Africa play a part as well since remittance recipients are more than likely to have a bank account.

A stream of research has shown the significant beneficial effects of financial inclusion for individuals, thus supporting the economic and political rationale for financial inclusion-promoting policies. For example, studies such as Banerjee and Newman (1993), Galor and Zeira (1993), Aghion and Bolton (1997) and Beck, Demirguc-Kunt and Levine (2007) have established an array of models to demonstrate how inadequate access to finance can lead to inequality and poverty traps. The literature, at the same time, has established that access to savings instruments increases consumption (Dupas & Robinson, 2009), savings (Aportela, 1999), productive investment (Dupas & Robinson, 2009) and female empowerment (Ashraf, Karlan and Yin, 2010). The literature further documents the significance of financial inclusion (see Sherraden & Grinstein-Weiss, 2015; Naceur, Barajas & Massara, 2015; Arya, 2015; Sarka, 2015; Adeoye & Sangosanya, 2015 and Adeoye, 2015), claimed to be associated to necessary economic outcomes beyond those linked to the more popular concept of financial depth.

The literature has established that while there is involuntary financial self-exclusion, there is, as well, voluntary financial exclusion (de Koker & Jentzsch 2011). The voluntarily self-excluded

decline to use financial services because they have no need of them or for cultural or religious reasons (Beck, Demirgüç-Kunt and Honohan, 2009). The voluntarily excluded lacks trust in the financial system (Dittus and Klein, 2011) or faces barriers such as affordability, inappropriate product design and inability to meet eligibility criteria (European Commission 2008).

Apart from the voluntarily self-excluded and the involuntary self-excluded are the self-withdrawn. The self-withdrawn are the bank customers who scaled access barriers but, then, withdraw from the financial system. For example, the FinScope (2004) found that, in South Africa, more than 3.5 million customers withdrew from the financial system. According to Ellison, Whyley and Forster (2010), this act of withdrawal may be as a result of lack of trust, costs, bad credit records, inappropriate product design and difficulties in managing spending. It is also noteworthy that there is a huge difference between financial access and usage. While the financially excluded can be encouraged to open an account, many of these accounts may become dormant. Financial access therefore does not necessarily translate into usage for day-to-day transactions (Platt et al. 2011).

In the literature there is no consensus on the determinants of financial inclusion. In a cross country analysis, Sarma & Pais (2011) showed that income, income inequality, telephone and internet usage and adult literacy are significant factors for financial inclusion in a country. They contend that countries with low GDP per capita have comparatively poorer connectivity and lower rates of literacy and seem to be more financially exclusive. In China, Fungáčová & Weill (2015) showed that better education and higher income are correlated with higher usage of formal accounts and formal credit. In Argentina, Tuesta, et al (2015) found that income and education are all significant factors for financial inclusion. In India, Chithra & Selvam (2013) found that income, population, literacy, deposit and credit penetration are significantly associated with financial inclusion. As well, Kumar (2013) found that the socio-economic and environmental structure is significant in shaping the banking habits of the masses in India. In Peru, Camara, Peña & Tuesta (2014) showed that income levels and education are significant variables for the level of financial inclusion. In Africa, Allen et al. (2014) showed that population density is highly more significant for financial inclusion than elsewhere. Besides, they found that mobile banking expands financial access.



Further recent work on financial inclusion has shown how Islamic bank impacts on financial inclusion in Muslim countries, in particular Naceur, Barajas, & Massara (2015) and Demirguc-Kunt, Klapper, and Randall (2013). Naceur, et al (2015) analyzed existing country-level data on the relationship between Islamic banking and financial inclusion in Muslim countries. Surprisingly they found that, though financial access has increased rapidly in these countries, financial usage has not increased as quickly. Their evidence shows a positive but weak link between financial inclusion and credit to households as well as to firms for financing investment. Demirguc-Kunt, Klapper, and Randall (2013), using micro-level data, find that the scale of the Islamic finance industry has no relation to differences in financial inclusion between non-Muslims and Muslims.

## **Materials & Methods**

### *Data*

This study uses annual data (2005 to 2014) on number of depositors with commercial banks (per 1,000 adults), GDP per capita, deposit interest rates, inflation, money supply (% of GDP), population, credit to the private sector (% of GDP), number of internet users, secure internet servers, and adult literacy rate. Inevitably, data availability limits the data span to 2005-2014 and the attention of the empirical analysis to 15 African economies, namely, Algeria, Botswana, Cameroon, Angola, Ghana, Namibia, Niger, South Africa, Morocco, Kenya, Mali, Libya, Malawi, Nigeria and Senegal.

Data for the analysis is collected from the World Development Indicators (WDI). The WDI is the most appropriate source of macro-economic data, considering the cost of collecting primary data for a large-scale panel study covering most of Africa. Also, WDI was chosen because it provides an extensive range of information on the variables, better than what is obtainable in the Global Financial index database on financial inclusion.

Consistent with the literature, the proxy for financial inclusion is the number of depositors with commercial banks (per 1,000 adults) (Varman, 2005; Čihák, Demirgüç-Kunt, Feyen & Levine, 2012; Naceur et al, 2015). As well, the selected determinants of financial inclusion, consistent with the literature, are broad money, deposit interest rate, domestic credit provided by financial

sector as a % of GDP, GDP per capita, inflation, population, adult literacy, internet users per 100 people, secure internet servers and a dummy variable for Islamic banking presence and activity (See Marshall, 2004; Sarma & Pais, 2011; Laha, Kuri & Kumar, 2011; Mohieldin, Iqbal, Rostom & Fu, 2011; Demirguc-Kunt, Klapper & Randall, 2014; Mehrotra & Yetman, 2015; Naceur et al, 2015).

### *Model*

The aim of this study is to determine the determinants of financial inclusion in Africa. In line with existing studies (i.e. Marshall, 2004; Sarma & Pais, 2011; Laha, Kuri & Kumar, 2011; Mohieldin, Iqbal, Rostom & Fu, 2011; Demirguc-Kunt, Klapper & Randall, 2014; Mehrotra & Yetman, 2015; Naceur et al, 2015), the econometric model for the study is given as:

$$FINC_{it} = \tau_0 + \tau_1 GDPC_{it} + \tau_2 M2GDP_{it} + \tau_3 CREDIT_{it} + \tau_4 INTEREST_{it} + \tau_5 INFLATION_{it} + \tau_6 LITERACY_{it} + \tau_7 USERS_{it} + \tau_8 SERVER_{it} + \tau_9 POPULATION_{it} + \tau_{10} ISLAMIC_{it} + \xi_{it} \quad (1)$$

Where FINC is financial inclusion (number of depositors with commercial banks per 1,000 adults); GDPC is GDP per capita; M2GDP is money supply (% of GDP) and CREDIT is the credit to the private sector (% of GDP). INFLATION is headline inflation, USERS is the number of internet users, SERVER is secure internet servers, LITERACY is adult literacy rate, and POPULATION is the total population. INTEREST is the deposit interest rate. ISLAMIC is a dummy variable which takes 1 if the country has Islamic banking presence and activity, and 0 otherwise.  $\xi$  are the residuals. The subscript  $i$  is the  $i$ -th country and the subscript  $t$  the  $t$ -th year.

### *Econometric Techniques*

This study first carries out a panel unit root test on the variables in order to ascertain their stationarity and preclude the possibility of spurious regression. Though the dynamic panel approach is effective irrespective of whether the regressors are exogenous or endogenous, and irrespective of whether the variables are I (0) or I (1) (Pesaran & Smith, 1995; Pesaran, Shin & Smith, 1999), it is necessary to ensure that none of the variables is I(2). The Im Pesaran & Shin (IPS, 2005) test for individual unit root process is the panel unit root test adopted for this study and is given as:

$$\Delta y_{it} = \rho_i y_{i,t-1} + \sum_{L=1}^{P_i} \phi_{iL} \Delta y_{i,t-L} + z'_{it} \gamma + u_{it}$$

(2)

The IPS test is appropriate for this study, considering the countries are heterogeneous. The IPS test assumes the unit root can differ across the cross sections in the model. In other words, the IPS test establishes a panel unit root test for the joint null hypothesis that individual series in the model is non-stationary.

In order to adequately capture the dynamic processes between financial inclusion and its determinants, this study uses the dynamic panel approach. According to Baltagi (2005, pp. 135), “Many economic relationships are dynamic in nature and one of the advantages of panel data is that they allow the researcher to better understand the dynamics of adjustment.” The benefit of using the dynamic panel data model in this study is to introduce dynamic effects into the usual panel data model (Baltagi, 1995); capture the dynamic effects of current or past shocks into the model (Hsiao, 1986); control for both unobserved and missing variables or relationships; and allow for identification of country-specific effects (Arellano-Bond, 1991; Pesaran, Smith, Im, Matyas & Sevestre, 1996). The dynamic panel specifications in this study permits a high degree of cross-country heterogeneity. This accounts for the fact that the determinants of financial inclusion could vary across countries, contingent on country-specific structural factors such as legal and institutional framework.

If  $y_{it}$  is the dependent variable in country  $i$ , and  $x_{it}$  is the vector of country-specific regressors (Hsiao, 2003), then a modest dynamic panel data model can be set up as follows:

$$y_{it} = \delta y_{i,t-1} + \beta x_{it} + \mu_{it} \quad [i=1,2,\dots,N; t=1,2,\dots,T] \quad (3)$$

$\delta$  is a scalar,  $\mu_i$  is the  $i$ th individual effect. The  $u_{it}$  is a one-way error component model explained by:

$$u_{it} = \mu_i + v_{it} \quad [\mu_i \sim \text{IID}(0, \sigma_\mu^2); v_{it} \sim \text{IID}(0, \sigma_v^2)] \quad (4)$$

$\mu_i$  and  $v_{it}$  are independent of each other and among themselves (Baltagi, 2005).

$\mu_i$  is a vector of unobserved common factors.

To allow for dynamics and cross-sectional dependence and slope heterogeneity in modelling the relationship between financial inclusion and the determinants in a panel context, the dynamic specification can be enhanced as follows:

$$y_{it} = \varphi_0 + \varphi_y y_{i,t-1} + \sum_{j=1}^p \varphi_x x_{jit} + \mu_{it} \quad (5)$$

However, as a result of the inclusion of the lagged dependent variable  $y_{i,t-1}$  in the model, “the dynamic panel data regression is characterized by two sources of persistence over time: autocorrelation due to the presence of a lagged dependent variable among the regressors and individual effects characterizing the heterogeneity among the individuals” (Baltagi, 2005, pp. 135). While it has been established in the literature that this problem could hinder the robust estimation of the model, a number of estimation techniques (i.e. Arellano & Bond (1991), Arellano & Bover (1995), and Blundell & Bond (1998) using the generalized method of moments (GMM estimator) has been developed to resolve the lagged dependent variable problem in the panel setting (Deaton, 1997).

The facility to remove the across-time heterogeneity from equation (3.6) by taking first differences is one of the greatest benefits of the GMM estimator in dynamic panel models estimation:

$$y_{it} - y_{i,t-1} = \sum_{l=1}^p \varphi_{il} (y_{i,t-1} - y_{i,t-2}) + \sum_{l=0}^p \beta'_{il} (x_{it} - x_{i,t-1}) + (\mu_{it} - \mu_{i,t-1}) \quad (6)$$

[Using the Arellano-Bond estimator, higher lagged values of the dependent variable and the exogenous regressors from all t periods can be used as instruments for the individual-specific effects,  $(y_{t-1} - y_{t-2})$ . On the contrary, Arellano & Bover (1995) showed that, to remove the unobserved heterogeneity, the lagged dependent variable and explanatory variables (without first differencing) and the lagged first differences can be used as instruments in the presence of time-varying regressors uncorrelated with the country-specific effects. That is, in model 6,  $\Delta y_{t-1}$  and  $x_{t-1}, x_{t-2}, \dots, x$  can be instruments for  $y_{t-1}$  and subsequently  $x$  can serve as instrument for  $y$ . The instruments ensure that the GMM estimator gives consistent estimates.

The consistency of dynamic panel approach demands sufficiently long lags, but longer lags than necessary lead to estimates with very poor small sample properties (Elhorst, 2014). In this study, the same lag order, 3, is used for all countries/variables, bearing in mind that a lag order of 3 should adequately account for the short-run dynamics. The likelihood of data mining is precluded by the use of the same lag across all countries/variables. Note that the aim of this study is to determine the determinants of financial inclusion in Africa rather than the country-specific dynamics relevant to individual countries.

In order to ensure robustness of the results of this study, the validity tests of the instruments used in the GMM estimation will be carried out (a scenario whereby the instruments are correlated with the error process makes the validity of the instruments questionable). One of such tests is Arellano & Bond's (1991) specification test for lack of second-order serial correlation in the first-difference residuals. The second specification test is the Sargan's test of over-identifying restrictions. To check the validity and the robustness of our results, therefore, the two tests are employed.

## Results & Discussion

### *Unit Root Test Result*

The results of the IPS unit root test, as shown in Table 1, indicate that the variables are a mix of  $I(0)$  and  $I(1)$  which is valid for the dynamic panel data approach. None of the variables is  $I(2)$ . Thus, we can safely begin the dynamic panel data estimation.

**Table 1. IPS Unit Root Test**

	<b>I(0)</b>	<b>I(1)</b>	<b>Decision</b>
FINC	3.864	-2.059*	I(1)
M2GDP	0.538	-1.920**	I(1)
INTEREST	-0.418	-2.349*	I(1)
GDPC	2.838	-2.696*	I(1)
INFLATION	-1.982**	-4.372*	I(0)

POPULATION	0.453	-2.389*	I(1)
CREDIT	0.524	-3.605*	I(1)
LITERACY	1.329	-2.648*	I(1)
INTERNET	-1.430	-1.953*	I(1)
SERVERS	-0.389	-3.491**	I(1)

*Source: Authors' calculation using STATA 11*

*Notes: By Schwarz criterion, the lag length was 1. (\*) and (\*\*) indicate stationarity at significance levels 1% and 5% respectively.*

Having established that the variables are a mix of  $I(0)$  and  $I(1)$ , it must be noted that the dynamic approach is valid irrespective of whether the variables are  $I(0)$  or  $I(1)$ , and irrespective of whether the regressors are exogenous or endogenous (Pesaran & Smith, 1995; Pesaran & Shin, 1999; Pesaran, 1997).

#### *Dynamic Panel Estimation*

Depositors with commercial banks per 1,000 adults as a measure of financial inclusion (FINC) is regressed on GDP per capita (GDPC), broad money (MONEY), deposit interest rate (INTEREST), and domestic credit provided by financial sector as a % of GDP (CREDIT), and internet users per 100 people (USERS), secure internet servers (SERVERS), inflation (INFLATION), total population (POPULATION), adult literacy rate (LITERACY), and the a dummy variable for Islamic banking presence and activity (ISLAMIC). This is necessary in order to examine the contemporaneous effect of these variables on financial inclusion (FINC).

The Least Squares estimates obtained are thus reported for two cases<sup>2</sup>:

- (a) Arellano-Bond dynamic panel-data and,
- (b) Arrelano-Bover/Bundell-Bond system dynamic panel-data.

Table 4.2 shows the results of the dynamic panel estimation using both Arrelano-Bond and Arrelano-Bover/Bundell-Bond methods. The coefficients on the lagged FINC are of special interest in the setting of these two dynamic models. The lagged FINC estimates which are statistically significant mean that lagged financial inclusion has significant impact on contemporaneous financial inclusion and would thus indicate a “catch-up effect.” A coefficient

<sup>2</sup> Individual country estimates are available on request, but take note they are likely to be independently undependable in view of the fact that the time dimension of the panel is small.

equal to zero would imply full catch-up, and a coefficient between zero and one would imply partial catch-up, which is the case in our Arrelano-Bond Dynamic Panel and the Arrelano-Bover/Blundell-Bond System dynamic panel models. The fact that the lagged financial inclusion estimates are between zero and one implies that countries with stunted financial inclusion tend to recover most of any financial inclusion deficit experienced in the past.

**Table 2. Dynamic Panel Estimates**

	<i>Arrelano-Bond</i>		<i>Arrelano-Bover/Blundell-Bond</i>	
	Coef.	P> z	Coef.	P> z
Lagged FINC	0.530*	0.000	0.743*	0.000
GDPG	0.335**	0.040	0.317**	0.047
MONEY	98.484*	0.001	6.907*	0.000
CREDIT	0.674	0.263	0.659***	0.088
INTEREST	5.117	0.178	5.106	0.175
INFLATION	-0.691	0.392	-0.605	0.318
LITERACY	10.090**	0.046	8.152***	0.073
POPULATION	17.814	0.492	15.378	0.411
USERS	3.960***	0.057	3.957***	0.050
SERVERS	0.046	0.149	0.049**	0.044
ISLAMIC	81.522*	0.000	79.003*	0.000
	N = 105 Wald $\chi^2 = 456.91^*$ Sargan test = 8.536 AB test = -0.025		N = 120 Wald $\chi^2 = 4308.880^*$ Sargan test = 5.071 AB test = -0.149	

Source: Authors' calculation using STATA 11.

Notes: The (\*) signifies variable significant at 1%; (\*\*) significance at 5%; (\*\*\*) significance at 10%. test is Arellano and Bond test for AR(2). The Sargan test reports that under the null the overidentified restrictions are valid.

GDPG is statistically significant and positive across both specifications. This means countries with high per capita income have highly inclusive financial systems. This finding is in line with Sarma & Pais (2011), Chithra & Selvam (2013), Camara et al. (2014), Tuesta, et al. (2015) and

Fungáčová & Weill (2015) who also found that income is a significant variable for financial inclusion in a country.

M2GDP is significant and positive across both specifications. Additionally, CREDIT is positive but insignificant. The insignificant impact is expected, considering the fact that credit is extremely low in Africa, due to a host of variables such as lack of collateral and credit information. Nonetheless, this finding is in contrast with Chithra & Selvam (2013) who showed that deposit and credit penetration have significant impacts on financial inclusion in India.

Population, though positive, is insignificant. This finding conflicts with Chithra & Selvam (2013) who showed that population has significant impact on financial inclusion in India and Allen et al. (2014) who also showed that population has significant impact on financial inclusion in Africa. The impact of population on financial inclusion may have been overstated by these studies. Inflation has a negative impact on the level of financial inclusion, though insignificant across both specifications.

The deposit interest rate has positive but insignificant impacts on financial inclusion. The low deposit interest rates in Africa are unlikely to significantly impact both existing and potential depositors. Since the official interest rates is often the gauge of other interest rates in the economy, broader access to financial services across Africa is likely to make the interest rates set by African central banks a more potent device for regulating economies. In other words, considering that the rewards for saving are influenced by interest rates, higher financial access bring a bigger share of economic activity under the control of interest rates, making them a more powerful tool for policymakers, but can as well worsen the risk of injurious financial crises.

Positive significant effects on financial inclusion are also seen, by way of literate rate. Literacy, especially financial literacy, has gradually become more important as financial markets become increasingly complex and the illiterate finds it difficult to make informed financial decisions. This evidence is consistent with Sarma & Pais (2011) who, in a cross-country analysis, showed that adult literacy is a significant factor in explaining the level of financial inclusion in a country and Chithra & Selvam (2013) who found that literacy is an important in explaining the level of



financial inclusion in India. Additionally, Camara et al (2014) and Tuesta et al (2015) showed that better education is a significant variable for financial inclusion.

Internet users per 100 people (USERS) and secure internet servers (SERVERS) have significant impacts on financial inclusion. This result is similar to Sarma & Pais (2011) and Allen et al. (2014) who showed that internet access is an essential factor in a fast-moving and digital economy. This is evidenced in the case of Kenya where M-Pesa has transformed a wide spectrum of financial services. The significant impacts of internet access have very important implications for financial inclusion. Without the intensive use of the internet in Africa, financial inclusion will be very infinitesimal. Covering all the millions of villages in the African continent with brick and mortar branches of financial institutions would be a very arduous task, in terms of the investment and cost effectiveness. The internet has drastically reduced the cost of transactions, via the mobile and the ATM. Further, internet has increased the potentials of credit delivery in remote areas of the African continent. It has made it possible to provide home banking services where the accounts are operated by illiterate customers using mobiles. The internet, therefore, has become a major financial inclusion enabler.

The Islamic dummy variable is significant and positive across both specifications. In other words, countries with Islamic banking presence and activity have higher financial inclusion. This means that Sharia-compliant finance is an important factor for explaining the level of financial inclusion. This result is consistent with Naceur et al (2015) who showed some evidence that Islamic banking presence and activity is linked to higher financial inclusion in Muslim countries-members of the Organization for Islamic Cooperation.

## **Conclusion**

In this study, we have combined the Arrelano-Bond and Arrelano-Bover/Bundell-Bond dynamic panel data approaches to assess the determinants of financial inclusion in 15 African countries. This study finds that GDP per capita, broad money as a % of GDP, adult literacy rate, internet access and Islamic banking presence and activity are significant factors explaining the level of financial inclusion in Africa. Domestic credit provided by financial sector as a % of GDP, deposit interest rates, inflation and population have insignificant impacts on financial inclusion

in Africa. This study has highlighted the major financial inclusion-inducing factors, which may help to improve future policy vis-à-vis financial inclusion.

However, while the findings of this study should be of help to African central banks' policymakers and commercial bankers as they advance innovative approaches to enhance the involvement of excluded poor people in formal finance, this study is far from an evaluation of the financial inclusion drive in individual countries. The diversity of the countries in Africa implies that the challenges encountered in one country may be quite different from the next.

There are a few critical areas for further research. Firstly, while the present study used the number of depositors with commercial banks per 1,000 adults as a measure of financial inclusion, it would be worthwhile to examine other alternative measures which could enhance access to formal finance for excluded individuals, such as the nature and frequency of transactions that take place in these accounts. Access is not synonymous with usage, and as such, opening bank accounts without accompanying consistent usage may simply cause additional costs for banks with no feasible advantage to poor African communities. Thus, future policy measures to increase financial inclusion in Africa must give incentives for usage.

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