Can Islamic Banking and Finance Spur Financial Inclusion? Evidence from Sub-Saharan Africa

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This study examined the effect of introduction of Islamic banking and finance on financial inclusion in Sub-Sahara Africa (SSA). To achieve this objective, the study applied Probit, Tobit and Juhn-Murphy-Pierce decomposition to estimate model of financial inclusion. The study used World Bank's Global Financial inclusion index (Global Findex) dataset of 2015. The findings revealed that the introduction of Islamic banking and finance system in some Organization of Islamic Cooperation (OIC) countries in SSA enhanced financial inclusion in the sub-region. The study also uncovers that households from OIC with Islamic banking and finance are more likely to be financially included than their counterparts in OIC countries without Islamic banking and finance. Further, there are other factors that play an important role in determining the probability of financial inclusion in the region. Inter alia, these factors include age, gender, income level and level of education. The policy implication of the findings is that introducing Islamic banking and finance is necessary for spurring financial inclusion in OIC of SSA.

Keywords: Financial inclusion; Islamic banking; Juhn-Murphy-pierce; OIC; Sub-Saharan Africa; Tobit.
JEL Classification: G10; G20; Z12; C14; O55; C35.

1.0 Introduction

Sub-Saharan Africa (SSA) is believed to be the region hosting larger proportion of poor people in the world. It has an estimated population of over 960 million people. Majority of the people in SSA are living in abject poverty with daily income of less USD2 per day. Financial exclusion is assumed to be one of the major factors contributing to poverty, unemployment and low level of growth and development in most SSA countries (World Bank, 2015a). Conventional financial institutions have failed in providing financial services and opportunities to the poor households and micro enterprises. These can be attributed to banks' bureaucratic processes and unending requirements, and sometimes the households and firms especially

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Muslims cannot patronize their services due to interest-led transactions, which is prohibited according to Islamic law (Ahmed, 2010; Arouri, Ameur, Jawadi, Jawadi and Louhichi, 2013; El Qorchi, 2005; Beck, Demirguc-Kunt and Merrouche, 2013). Besides that, the risk sharing feature of the Islamic banking and finance allows longer term loans and efficiency between parties which leads to more return on capital (Chong and Liu, 2009).

Islamic banks are money-making financial intermediaries much like conventional banks, but in order to meet the requirements of Islamic law (Shariah), they must adhere to four major principles. A prohibition on charging interest is the primary difference between Islamic banks and conventional banks, derived from the notion that charging interest is a form of exploitation and inherently inconsistent with Islamic values of fairness; Islamic banks are also prohibited from speculation, in the form of risky or uncertain business ventures, and from financing haram activities. Finally, Islamic banks are compelled to donate part of their profits to benefit society in the form of zakat (Imam and Kpodar, 2010). Islamic banking and finance has emerged in the recent years as an alternative, effective and viable tool for providing financial services and development worldwide, including non-Muslim countries. There are solid evidence that Islamic finance has become an integral part of the global financial system and that it has the potentials of solving the problem of poverty and low economic growth through financial inclusion especially in poor income countries (World Bank, 2015b). Financial inclusion through providing access to financial services will stimulate the independence and self-development of poor households and micro enterprises. Additionally, providing easy access to finance is considered as a giant step in connecting the poor section of the society to a larger and broader world (Imboden, 2005).

Available statistics by World Bank (2015c) suggests that there has been substantial progress in increasing financial inclusion in the world for about 62 percent of adults are financially included in 2014 as against 51 percent in 2011. Nonetheless, World Bank (2015c) reports that about 2 billion adults were financially excluded in 2014 and 17 percent of them were from Sub-Saharan Africa (SSA). Again, 5 percent of the financially excluded adults cited religious reasons or beliefs as their

justification for financial exclusion and majority of these adults are expected to be Muslims (World Bank, 2015c; Zaher and Hassan, 2001). The rate of financial exclusion due to religious reason is even higher in SSA for it stands at 6.8 percent as depicted in figure 2. In view of this scenario, Islamic system of Banking and finance could be very effective in enhancing financial inclusion, especially in Muslims dominated countries.

Although, there is proliferation of studies on the role of Islamic finance on financial inclusion in the recent years, such as Mohieldin, Iqbal, Rostom and Fu (2012); Demirguc-Kunt, Klapper and Randall (2013); Naceur, Barajas and Massara (2015); Leon and Weill (2016); and Zulkhibri (2016) among others but there are at best too scanty studies that specifically focused on SSA countries despite the importance of the region in the world and fast development and growing awareness of Islamic finance in the region. This prompted the need to unveil the impact of Islamic financial services in reducing financial exclusion in the region.

The objectives of this study are twofold: firstly, to explore empirically whether Islamic finance has contributed in enhancing the probability of financial inclusion in SSA countries, and secondly, the study sought to examine the gap that may exist between the OIC countries with Islamic banking and finance and those without in SSA in the probability of financial inclusion. These objectives were achieved by employing Probit, Tobit regression models and Juhn-Murphy-Pierce decomposition technique.

The paper is divided into five sections, following the introduction, section 2 presents stylised facts of financial inclusion in SSA and review of related literature is undertaken; section 3 focuses on methodology and sources of data; while section 4 presents the result and findings of the study. Section 5 concludes the study with recommendations for policy action.

1.1 Stylised Facts of Financial Inclusion in Sub-Saharan Africa

In Figure 1 there is the depiction of the distribution of financial inclusion in SSA using the core indicators of financial inclusion. The figure suggests that only 27.7

percent of the households surveyed have bank accounts at financial institutions in SSA which is higher than 20.93 percent in OIC member countries in SSA. This implies that religious (Islamic) belief, perhaps, serves as a constraint to financial inclusion in the OIC countries of the region.

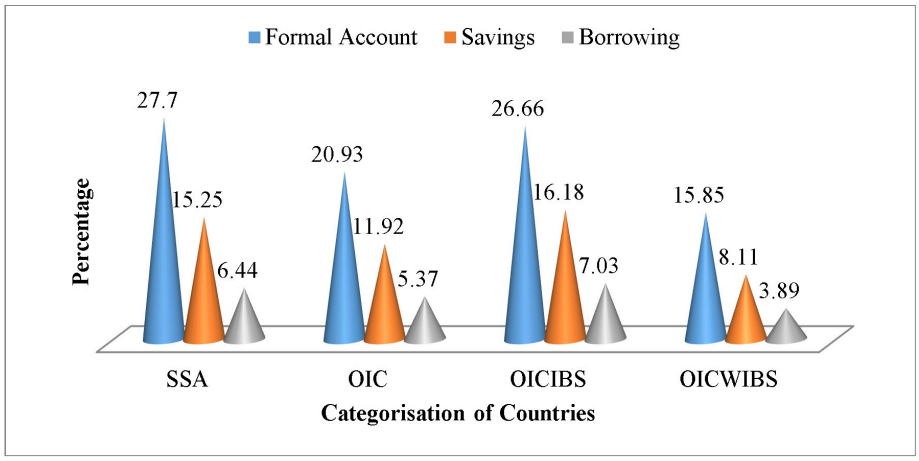

Figure 1: Distribution of Financial Inclusion

This is so, considering that among the OIC countries there are those without Islamic banking and finance. This could be subsequently confirmed when the OIC countries were separated into OICIBS and OICWIBS. The rate of financial inclusion in OIC countries with Islamic Banking and Financial System (OICBS) (26.66 percent) is higher than that of OIC without Islamic banking system (15.85 percent) in the region. It is becoming clearer that religious factor may be at work in determining the probability of financial inclusion in OIC countries in SSA. The same distribution is obtainable when other indicators (saving in financial institution and borrowing from financial institutions) are considered in Figure 1. It could be inferred that financial inclusion is generally low in SSA and lower in OIC countries of the region. However, OICIBS shows some level of progress.

Figure 2 reveals the distribution of households who are financially excluded due to religious reason. For instance, 6.8 percent of the households surveyed in SSA cited religious reason as their constraint to financial inclusion while 9.71 percent of the households among the households surveyed in OIC of the region also cited religious reason for their financial exclusion.

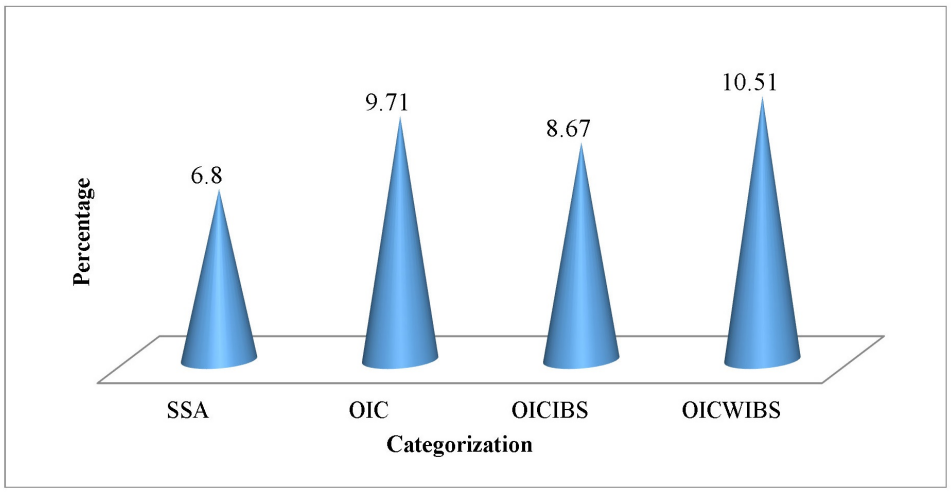

Figure 2: Distribution of Religious Reason for Financial Enclusion

Again, the rate of religious constraint is lower in OICIBS (8.67 percent) than in OICWIBS (10.51), though the gap is not very significant. It is indicated that even with the introduction of Islamic banking and finance system in some countries, certain households cited religious reason for the financial exclusion. This implies that there may be lack of awareness of the importance or existence of Islamic banks.

2.0 Literature Review

2.1 Theoretical Framework

Islamic banking and finance has become increasingly widespread over the past three decades, particularly in OIC countries. This has spawned volume of studies in the area by academics, researchers and interest groups.

The most cited theories of financial inclusion are free market model and theory of asymmetry of Information. Free market model is an offshoot of classical economic theory which proposes that the nature and structure of market is the main determinant of health condition of any economy. The model argues that a deregulated economy tends to be more 'Pareto optimal' than otherwise, and that any government intervention through policies distorts the market thereby taking the economy off the track that could to lead to Pareto optimum (Aboody and Baruch, 2000; Garmaise and Natividad, 2010). In connection, a deregulated financial system

tends to enhance financial inclusion as deregulated financial institutions actively engage in any legitimate transactions that could maximize shareholders' wealth (Boyce, 2000; Chavan, 2008 and Philip, 2014).

By so doing, they could offer any financial product or service (including Islamic banking and financial services) that customers demand so much for irrespective of tribal, religious and regional affiliations of the customers. However, a regulated financial system tends to cause financial exclusion as they are restricted by government policies and as such; they may not provide a variety of financial products. Also, the theory of asymmetry of information postulates that the imperfection of information about the characteristics of potential borrowers and lenders could be the major source of financial exclusion. Information is imperfect or asymmetric if one party to a transaction has more information than the other.

The persistence of this condition could deleteriously affect the economic transactions and may result in total denial of financial products to certain groups in the economy (Philip, 2014). In connection to this study, Islamic financial services could be available in the economy but due to imperfect information about the availability, accessibility and affordability people may not access and use such financial products. The theory of asymmetry of information serves as the theoretical framework of this study given that it is the micro-foundation of free market model. It is chosen as it addresses the major problem of Islamic financial system in SSA, which is ignorance or lack of awareness of the principles of Islamic banking and finance in the region. For instance, Al-Jarhi (2016) used the asymmetric model as a basis to develop an Islamic economic theory for financial regulation, specifically on Islamic debt instruments (which are one of the measures of financial inclusion). Kömling (2014) applied the model to explain profit-and-loss-sharing contract in Islamic finance.

2.2 Empirical Literature

The nexus between finance and economic activities has long been established in economic literature. Economic development of a country is driven by level of connectivity and performance of the financial system. Although Islamic banking and

financial system emerged and evolved over the last 40 years; there are scanty studies on the effect of Islamic banking and financial system on financial inclusion. Again, most of the available studies were carried out in the Middle-eastern region of the world. For instance, Zulkhibri (2016) studies the relationship between Islamic finance and financial inclusion using data obtained from financial industries in Muslim countries. The study found that despite the growth in Islamic finance in the recent past, there are still many individuals that are financially excluded. Contrarily, Usman and Tasmin (2016) using documented evidences reveal that Islamic finance has contributed immensely in enhancing financial inclusion through human empowerment, increased financial services and financial windows.

Furthermore, Ali (2015) examines the role of Islamic microfinance in enhancing access to finance in Muslim countries and the findings show that Islamic microfinance has gone long a way in making financial services available to people particularly those that are initially excluded. In another study by Naceur, Barajas and Massara (2015) on the relationship between the development of Islamic banking and finance and financial inclusion in OIC countries and their findings reveal that there is a significant nexus between Islamic finance and financial inclusion at both individual and firms level. Similarly, Mohieldin, Iqbal, Rostom and Fu (2012) investigate the impact of Islamic banking and finance on financial inclusion in OIC countries and found that Islamic finance plays a significant role in enhancing financial inclusion, redistribution of income and building a healthy economy in most OIC countries.

Using a panel data for developing and emerging economies, Leon and Weill (2016) examine the role of Islamic banks in promoting access to credit. The result indicates that Islamic banking and finance has not contributed significantly in promoting financial inclusion compared to conventional banks. On the other hand, where there is limited number of conventional banks, the contribution of Islamic banks is found to be positive. Similarly, Bhattacharaya and Wolde (2010) reveal that lack of access to credit is one factor driving down growth in Middle East and North Africa (MENA) countries relative to the rest of the world. It is also argued in the literature that availability of financial services may not necessarily induce financial inclusion, this is because some people may voluntarily exclude themselves

from the financial services due to religious or cultural reasons and, sometimes, due to ignorance (Beck, Demirguc-Kunt and Peria, 2008).

In another study by Bose, Bhattacharya and Islam (2016) on the financial inclusion disclosure among Bangladesh's banks using data spanning between 2008 and 2013. Their findings indicate that the level of financial inclusion has a positive relationship with the size of banks, growth opportunities, institutional investors and region based branches. On the other hand, the percentage of female directors and firms' age are negatively related with the level of financial inclusion disclosures.

Moreover, Morrissey (2012) investigates the effect of Islamic banking and finance on financial outcome in Gulf Cooperation Council (GCC) countries and found evidence that Islamic banking has a positive and significant impact on private savings of individuals. Demirguc-Kunt, Klapper and Randall (2013) investigate the role of Islamic finance on financial inclusion. The study reveals that adult Muslims are significantly less likely to own a formal account than non-Muslims. On the other hand, the study found no evidence that Muslims are less likely to report formal or informal borrowing. Additionally, they found that Muslims are most likely to report religion as a barrier than non-Muslims. Again, Sain, Rahman and Khanam (2016) examine financial exclusion among minority Muslims in Australia. They reported that financial exclusion remains a serious problem among Muslims due to little windows for Islamic finance and products in Australia.

There are some studies that indirectly assessed the role of Islamic banking and finance in improving financial inclusion. This is so because the studies investigate the effect of Islamic banking and finance on investment, portfolio diversification, susceptibility to financial crisis and degree of uncertainty in relation to conventional banking, which all are related to financial inclusion. For example, Arouri, Ameur, Jawadi, Jawadi and Louhichi (2013) using VAR model established that Islamic finance industry is less affected by financial crisis than conventional one; investment in Islamic products generates high returns, and portfolio that include Islamic products are less risky than conventional one. Thus, Islamic financial system could serve as an alternative to conventional financial system, and con-

sequently Islamic finance enhances financial inclusion. Likewise Beck, Demirguc-Kunt and Merrouche (2013), in their cross-country comparative study of Islamic versus conventional banking, indirectly confirmed that Islamic financial system can spur financial inclusion. The study specifically found out that although Islamic banks are less cost-effective than conventional ones, they have a higher intermediation ratio, higher asset quality and better capitalization. Again, Gheerart (2014), using Islamic Finance Recording and Sizing Tool (IFIRST) data, ascertained that the development of Islamic banking in Muslim countries bring about a higher banking sector development as measured by amount of private credit or bank deposits scaled to GDP.

There are other studies that generally analysed the major determinants of financial inclusion. The studies mostly observed that (on demand-side) age, income level, gender (male), educational level, distance to financial institutions, lack of documentation, etc. were the major determinants of financial inclusion (Abdu, Buba, Adamu and Muhammad, 2015; Akudugu, 2013; Tuesta, Sorensen, Haring and Camara, 2015; and Fungcova and Weill, 2012). On the supply-side, the studies suggested that branches, ATMs, market size, economic growth (Naceur, Barajas and Massara 2015 and Tuesta, Sorensen, Haring and Camara, 2015).

There are also studies that examine the influence of Islamic law on the operations of Islamic banking and finance. For example, Chong and Liu (2009) examine the operation of Islamic banking in Malaysia within the framework of Islamic law and the results show that their activities are not significantly different from the conventional bank. The study further reveals that only negligible portion of Islamic banks are strictly using profit and loss sharing paradigm and that most Islamic banks are not interest-free. Similarly, Dasuki and Abozaid (2007) show similar evidence that there is no significant difference in the operation of Islamic and conventional banks. In another study by Samad (2004) on the comparison between performance of Islamic banks and conventional banking system in Bahrain, the result reveals that there is no noticeable variation between Islamic and conventional banks with respect to profitability and liquidity. Ahmed, Rehmn and Humayoun (2011) investigate the role of Islamic law in the operations of Islamic banks in

Pakistan. The study shows that Islamic law strongly influence the activities of Islamic banks in Pakistan. Further, Khan (2010) posits that after three decades of the introduction of Islamic banking system, there remains a substantial divergence in application of islamic law in the operations of islamic banks as they are functionally indistinguishable with the conventional banks. The study indicates that although in some cases, the central banks guarantee the operation of Islamic banks in a manner that is not fully in compliance with Islamic law. In another study Chen and Masih (2017) reveals that Islamic finance and banking services is significantly difference from the conventional banking system more especially in the area of profit and loss between parties. Dasuki and Abdullah (2007) also found similar evidence that Islamic banks differs in their operations and are highly preferred in Malaysia because of religious belief, quality and efficient services and social responsibility programs.

It is noted from the literature reviewed above that there are few studies that examined empirically and theoretically the role of Islamic banking and finance in providing financial services. Despite the increasing awareness and expansion in their services but studies on this area seems to be rare. More importantly, there are too scanty studies (if any) on SSA.

This study was motivated by the works of the Mohieldin, Iqbal, Rostom and Fu (2012) and Naceur, Barajas and Massara (2015). Though this study appears similar to the latter study, it does differ from Naceur *et al.* (2015) in a number of aspects. First, this study focuses only on SSA so as to take care of socioeconomic, demographic and political peculiarities across the continents and continental subregions. Second, this study uses methodology that is entirely different from that of Naceur *et al.* (2015). For example, this study uses dependent variables like savings at and borrowings from formal financial institutions, and constructed a score of financial inclusion over and above just having bank account as used by Naceur *et al.* (2015). With regard to methodology, this study uses probit and tobit techniques to estimate the models. Specifically, the study applies the technique of Juhn-Murphy-Pierce decomposition to quantitatively compute the gap. Therefore, this study contributes to literature by covering the above lacuna identified in literature.

3.0 Methodology

3.1 Source of Data and Variables' Measurement

To realize its objectives, this study used the 2014 World Bank's Global Financial inclusion (Global Findex) dataset by World Bank (2015c). This dataset focuses on such financial inclusion issues as households' ownership of bank account at, savings at and borrowings from, financial institutions, across 142 countries of the world and 34 of them are from Sub-Saharan Africa. There are also 17 OIC countries in SSA and out of them 8 are OIC with Islamic banking and finance (see Table 2 in appendix). The dataset contained information like age, gender and income level of households surveyed. Using this source of data, four core indicators of financial inclusion have been constructed which include *dummies for formal bank account, formal savings and formal borrowing* as well as *overall index* of financial inclusion. The overall index is constructed by summing dummies for formal bank account, formal savings and formal borrowing, divided by three (number of variables). This is based on broad measure approach of technological capabilities index theoretically developed by Lall (1992), and modified by Mahendra, Zuhdi and Muyanto (2015) in their efforts to develop broad measure of innovation. Like Mahendra, Zuhdi and Muyanto (2015), this study did not normalise the index, instead it divided the sum of their dummies by their number.

3.2 Estimation Techniques

This study applied three techniques of analysis to realize its cardinal objectives. The techniques include binary probit regression model, tobit regression model and Juhn-Murphy-Pierce decomposition. Binary probit regression has been used in estimating the determinants of households' likelihoods to own formal bank account, make formal savings and borrowings. This model is so chosen since the dependent variables are all binary dummies. The binomial probit is an estimation technique for equations with dummy dependent variables that avoids the unboundedness problem of the linear probability model by using a variant of the standard normal cumulative distribution function (Studenmund, 2011). The binary probit model is specified in equation (1):

$$\Pr(i = 1/Y = y) = \Phi(\beta_0 + \beta_1 X_i + \beta_2 D_i + \varepsilon_i) \tag{1}$$

Where $Pr(i)$ is the propensity for the household i to own formal bank account, make formal savings and borrowings; and $\Phi(\cdot)$ is the standard normal cumulative distribution function (cdf). x_i is a vector of households' characteristics and income level of the households. Di is a dummy for OIC or OIC with Islamic banking and finance system.

Given that $\Phi(\cdot)$ is a standard normal cumulative distribution function, the probit distribution function takes the form of equation (2):

$$Prob\left(y_i = 1\right) = \Phi\left(X_i\beta\right) = \int_{-\infty}^{X_i\beta} \frac{1}{\sqrt{2\pi}} \exp\left(\frac{z^2}{2}\right) dz \tag{2}$$

The standard normal transformation $\Phi(\cdot)$ restricts the probability to fall between 0 and 1.

In order to estimate the determinants of overall index of financial inclusion; Tobit regression model would be used since the dependent is left-censored at 0 and right-censored at 1. As an extension of the probit model, Tobit model is applied to correct for the possible sample bias in the observation (Bhattarai, 2016). Thus, the model is specified as in equation (3) below:

$$fin_i^* = \beta_o + \beta_1 x_i + \beta_2 D_i' + \varepsilon_i \tag{3}$$

where $fin_i = 0$ if $fin_i^* \leq 0$ and $fin_i = fin_i^*$ if $fin_i^* > 0$.The definitions of the variables remain as in equation (1).

Juhn-Murphy-Pierce decomposition technique is adopted in order to estimate the actual gap in financial inclusion between OIC with Islamic banking and OIC without Islamic banking in SSA. Juhn, Murphy and Pierce (1993) first proposed this technique for estimating wage inequality, and thus, the econometric setting of the model is specified as in equation (4):

$$\overline{fin}_{IBS} - \overline{fin}_{WIBS} = (\overline{X}_{IBS} - \overline{X}_{WIBS})\beta_{IBS} - \overline{\theta}_{WIBS} = (\overline{X}_{IBS} - \overline{X}_{WIBS})\beta_{IBS}$$

$$-\overline{\theta}_{WIBS} * \sigma_{IBS} \tag{4}$$

The first term on the right-hand side of equation (4) corresponds to that part of the differential in financial inclusion attributable to the group differences in the observed characteristics (quantity or endowment effect), while the second and third terms correspond to the difference in coefficients (the prices effect) and differences in unobservable prices and quantities, i.e, the discriminatory or "unexplained" component of this decomposition respectively. Where θ is a standard residual with mean zero, unitary variance; β is a vector of parameters of explanatory variables (productive characteristics); and σ is a standardised residuals, i.e. the quantity of the not observed productive abilities multiplied by the yield of these abilities.

4.0 Results and Discussions

In the appendix, Table 1 reports the definitions of variables, which shows that all the variables are discrete ones with the exception of age. Table 2 presents the categories of countries in SSA: non-OIC, OICIBS and OICWIBS countries. Table 2 reveals that there are 17 non-OIC countries, 8 OIC countries with Islamic banking and finance, and 9 OIC countries without Islamic banking and finance in the dataset.

Table 3a reports the coefficients of determinants of probability of financial inclusion (own bank account, savings and borrowings). Model of formal bank in table 3a shows that age, level of education, gender, income and being an OIC, are the significant determinants of probability to own bank account at formal financial institution in SSA.

Table 3a: Probit Model on Financial inclusion in SSA

	Formal Bank Account	Savings	Borrowings
VARIABLES	Coefficient	Coefficient	Coefficient
Age	0.0660***	0.0666***	0.0757***
	(0.00288)	(0.00361)	(0.00480)
Age-squared	-0.000609***	-0.000657***	-0.000790***
	(3.43e-05)	(4.42e-05)	(5.86e-05)
Male	0.0891***	0.0774***	0.00674
	(0.0163)	(0.0186)	(0.0229)
Secondary	0.816***	0.678***	0.312***
	(0.0180)	(0.0209)	(0.0259)
Tertiary	1.397***	1.131***	0.652***
	(0.0365)	(0.0362)	(0.0420)
Income level	0.192***	0.201***	0.110***
	(0.00605)	(0.00724)	(0.00868)
OIC	-0.422***	-0.278***	-0.150***
	(0.0163)	(0.0186)	(0.0229)
Constant	-2.977***	-3.448***	-3.563***
	(0.0605)	(0.0751)	(0.0990)
Prob > chi^2	0.0000	0.0000	0.0000
Pseudo R^2	0.1801	0.1532	0.0750
Log pseudolikelihood	-15918.242	-11813.288	-7225.532
Observations	32,904	32,658	32,681

Robust standard errors in parentheses *** *indicate significances levels at 1%*

The introduction of age-squared in the models is to capture non-linear effect of age on financial inclusion. Model of savings in the table shows that level of education, especially tertiary education, is the major determinant of probability of making formal savings, followed by OIC, income level, male gender and age. Model of borrowings in the table finally reports that age, level of education, income and being an OIC, are the significant determinants of households' likelihood to borrow from financial institutions. The significant determinants are reported in all the models to be statistically significant at 1 percent level of significance.

Model 1 in Table 3b reveals that as the age of household increases the probability of owning formal bank account rises by 2.04 percentage point until certain age limit beyond which the probability reduces by 0.02 percentage point when the age increases. In other words, age-squared suggests that age (old age) has negative non-linear effect on probability of owning formal bank account because as the individuals get old they may not be productive enough to generate resources to own bank account. Again, as households move from an income level to the higher one

their likelihoods to own formal bank account increases by 5.95 percentage point. Households with secondary and tertiary education are more likely to own formal bank account by 26.1 and 51.3 percentage points than those with primary or less education respectively. Being male household improves the likelihood of owning formal bank account by 2.75 percentage point than otherwise.

Table 3b: Marginal Effects of Probit Model on Financial inclusion in SSA

	Formal Bank Account	Savings	Borrowings
VARIABLES	Coefficient	Coefficient	Coefficient
Age	0.0660***	0.0666***	0.0757***
	(0.00288)	(0.00361)	(0.00480)
Age-squared	-0.000609***	-0.000657***	-0.000790***
	(3.43e-05)	(4.42e-05)	(5.86e-05)
Male	0.0891***	0.0774***	0.00674
	(0.0163)	(0.0186)	(0.0229)
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	(0.0163)	(0.0186)	(0.0229)
Constant	-2.977***	-3.448***	-3.563***
	(0.0605)	(0.0751)	(0.0990)
Prob > chi^2	0.0000	0.0000	0.0000
Pseudo R^2	0.1801	0.1532	0.0750
Log pseudolikelihood	-15918.242	-11813.288	-7225.532
Observations	32,904	32,658	32,681

Robust standard errors in parentheses *** *indicate significances levels at 1%*

Finally, households from OIC countries in SSA are less likely to own formal bank account by 13.10 percentage point than otherwise. Model 2 in table 3b shows that as the age of household increases the likelihood to save at financial institutions rises by 1.29 percentage point. Age-squared (non-linear effect) implies that at an old age, the probability of making savings at financial institutions reduces by 0.01 percentage point. Again, as households move from an income level to the higher one their likelihoods to save at financial institution increases by 3.90 percentage point. Households with secondary and tertiary education are more likely to make savings at banks by 14.2 and 34.5 percentage points than those with primary or

less education respectively. Being male household improves the likelihood of making formal savings by 1.50 percentage point than otherwise. More importantly, the model reveals that households from OIC in SSA are less probable to save at financial institutions by 5.42 percentage point than otherwise.

Model 3 in Table 3b indicates that as the age of household increases the probability to borrow from financial institutions goes up by 0.80 percentage point. Age-squared (non-linear effect) again indicates that as the age of old people increases the chances of borrowing from financial institutions falls 0.01 percentage point. This may be due to the influence of retirement. Households with secondary and tertiary education are more likely to borrow from banks by 3.47 and 10.80 percentage points than those with primary or less education respectively. As income increases from one level to a higher level, the possibility to borrow from financial institutions improves by 1.16 percentage point while households from OIC in SSA are less probable to borrow from financial institutions by 1.59 percentage point than otherwise. The models are correctly specified as nonlinear given the significance of hat-square. The models have also strong prediction power as they accurately predicted the rates of financial inclusion in SSA.

Table 4a reports the impact of Islamic banking and finance on the probability of financial inclusion in OIC countries of SSA. The table indicates that level of education; OICIBS, income level, male gender, and age (both youthful and old) are the significant determinants of chances to be financially included. However, male gender is insignificant in a model of borrowings. Table 4b presents the marginal effects of variables in the models capturing the impacts of Islamic banking and finance on indicators of financial inclusion.

Table 4a: Probit Model on Impact of Islamic banking & Finance in OIC

	Formal Bank Account	Savings	Borrowings
VARIABLES	Coefficient	Coefficient	Coefficient
Age	0.0769***	0.0821***	0.0697***
	(0.00487)	(0.00616)	(0.00685)
Age-squared	-0.000744***	-0.000830***	-0.000725***
	(5.89e-05)	(7.61e-05)	(8.27e-05)
Male	0.161***	0.123***	0.0468
	(0.0245)	(0.0286)	(0.0341)
Secondary	0.811***	0.686***	0.289***
	(0.0274)	(0.0322)	(0.0388)
Tertiary	1.236***	0.978***	0.450***
	(0.0496)	(0.0522)	(0.0636)
Income level	0.197***	0.200***	0.0860***
	(0.00910)	(0.0110)	(0.0125)
OICIBS	0.221***	0.287***	0.222***
	(0.0243)	(0.0284)	(0.0344)
Constant	-3.748***	-4.198***	-3.620***
	(0.101)	(0.127)	(0.142)
Prob > chi^2	0.0000	0.0000	0.0000
Pseudo R^2	0.1817	0.1657	0.0645
Log pseudolikelihood	-7127.565	-5121.2483	-3289.4316
Observations	16,975	16,799	16,816

Robust standard errors in parentheses *** indicate significances levels at 1%

It is clear in the models of Table 4b that households from OIC with Islamic banking and financial system (OICIBS) have more chances of owning formal bank account, make formal savings and borrowings by 5.51, 4.36 and 2.07 percentage points than those from OIC without Islamic banking and finance system (OICWIBS), respectvely. The models in table 4b are correctly specified as nonlinear given the significance of hat-square. The models have also strong prediction power as they accurately predicted the rates of financial inclusion in SSA.

Table 4b: Marginal Effects of Probit Model on Impact of Islamic banking & Finance in OIC

VARIABLES	(1) Formal Account	(2) Savings	(3) Borrowing
Age	0.0191***	0.0123***	0.00641***
	(0.00117)	(0.000871)	(0.000590)
Age-squared	-0.000185***	-0.000124***	-6.68e-05***
	(1.43e-05)	(1.09e-05)	(7.23e-06)
Male	0.0396***	0.0183***	0.00430
	(0.00599)	(0.00420)	(0.00311)
Secondary	0.222***	0.119***	0.0286***
	(0.00776)	(0.00608)	(0.00407)
Tertiary	0.429***	0.245***	0.0580***
	(0.0189)	(0.0179)	(0.0108)
Income Level	0.0488***	0.0299***	0.00792***
	(0.00220)	(0.00158)	(0.00114)
OICIBS	0.0551***	0.0436***	0.0207***
	(0.00610)	(0.00440)	(0.00327)
_hat	.3267765***	.2083595***	.2164925***
	(.0114237)	(.0133532)	(.0307964)
_hatsq	.0490411***	.0240866***	.0382631***
	(.0062992)	(.0052167)	(.0093046)
Obs Predicted	.2093667	.1192333	.0536394
Predicted Pr(x-bar)	.1647108	.0806661	.0434012
Prob > chi2	0.0000	0.0000	0.0000
Pseudo R2	0.1817	0.1657	0.0645
Observations	16,975	16,975	16,975

Robust standard errors in parentheses *** indicate significances levels at 1%

Table 5 presents Tobit model results on the determinants of overall financial inclusion in SSA. Model 1 (or model 2) in Table 5 suggests that as the level of income goes up from one level to the higher one, the possibility of being financially included improves by 12.3 (or 13.3) percentage point than otherwise.

The models reveal that age (young and old), male gender, levels of education income level, religious beliefs, and introduction of Islamic banking and finance are the significant determinants of overall financial inclusion in the region. The variables are all significant at 1 percent level of significance. Model 1 and Model 2 in the table indicate that as age increases the probability of overall financial inclusion increases by 4.66 and 5.74 percentage points respectively. Also, age-squared (non-linear effect) suggest that at an old age, the probability of overall financial inclusion reduces by 0.044 and 0.056 percentages, respectively as the age increases. It can also be seen from models 1 and 2 that being a male make the probability of overall financial inclusion to rise by 4.57 and 9.00 percentage point

respectively, than otherwise. Households with secondary education are likely to be more financially included by 49.90 and 53.10 percentage points, respectively, while households with tertiary education are likely to be more financially included by 81.60 and 77.40 percentage points, respectively than those with lower levels of education respectively.

Model 1 in Table 5 signifies that households from OIC in SSA are less probable to be financially included by 24.4 percentage point than those from non-OIC countries in the region. This signals the influence of religion in the model. Finally, the introduction of Islamic banking and finance in OIC countries of SSA (OICIBS) makes the households in the countries to be more likely to be financially included by 17.60 percentage point than OIC without Islamic banking and finance in the region as shown in model 2 of Table 5.

Table 5: Tobit Model on Determinants of Financial inclusion in SSA

VARIABLES	(1) SSA	(2) OIC (SSA)
Age	0.0466*** (0.00183)	0.0574*** (0.00331)
Age-squared	-0.000443*** (2.18e-05)	-0.000564*** (4.01e-05)
Male	0.0457*** (0.00999)	0.0900*** (0.0166)
Tertiary	0.816*** (0.0192)	0.774*** (0.0299)
Secondary	0.499*** (0.0112)	0.531*** (0.0185)
Income Level	0.123*** (0.00380)	0.133*** (0.00620)
OIC	-0.244*** (0.0100)	
OICIBS		0.176*** (0.0165)
Constant	-1.905*** (0.0396)	-2.576*** (0.0706)
Sigma	0.689*** (0.00587)	0.751*** (0.00981)
_hat	1.062736*** (.0185388)	1.220212*** (.0378308)
_hatsq	.1257177*** (.0240115)	.247701*** (.0333219)
Prob > chi2 Pseudo R2 Observations	0.0000 0.1487 32,525	0.0000 0.1468 16,713

Robust standard errors in parentheses *** indicate significances levels at 1%

To establish the actual gap in financial inclusion between OICIBS and OICWIBS in SSA, Juhn-Murphy-Pierce Decomposition models have been estimated and presented in Table 6. In terms of formal account, there is 10.81 percentage point gap in financial inclusion between OICIBS and OICWIBS. This means OICIBS have 10.81 percentage point higher chances of owning bank accounts at financial institutions than OICWIBS in SSA.

Differences in observable factors (quantity effect) contributed 5.88 percentage point to the gap (55 percent of the total gap). This implies when explanatory variables of the model (observable factors) like age, gender, educational level and income level were equally distributed between OICIBS and OICWIBS in SSA, the gap would be reduced by 55 percent. Otherwise the gap continues to widen by same proportion. Again, variation in unobservable factors (price effect) contributed 4.82 percentage point to the gap (44 percent of the total gap). Price effect refers to changes in variables or factors not included in the model, and, in this case, they imply that should there be an equal distribution of the observable factors between the two groups, a gap of 4.82 percentage point would still exist between them. This could be as a result of discrimination of financial institutions on the basis religious affiliations (Islamic versus conventional financial institutions) in the region. Finally, the interaction between price and quantity effects contributed 0.11 percentage point to the gap. With respect to overall index of financial inclusion, there is 7.27 percentage point gap in financial inclusion between the groups. Difference in quantity effect contributed 3.45 percentage point to the gap (48 percent of the gap) while price or discrimination and interaction of price and quantity effects contributed 3.75 (51 percent of the gap) and 0.10 (1 percent of the gap) percentage points to the gap respectively.

Table 6: Juhn-Murphy-Pierce Decomposition of Financial inclusion inequality in OIC, SSA

	Formal Account	Savings	Borrowing	Overall Index
Total Difference (T)	.10813415	.08033823	.03144093	.07269332
Observable Factors (Quantity Effect)	.05880389	.03565695	.0093402	.03458653
Unobservable Factors (Price Effect)	.04824332	.04388021	.02159058	.03748162
Interaction between quantity and price Effects	.00108694	.00080108	.00051016	.00062517

With respect to formal savings and borrowing, Table 6 reveals that there exist 8.03 and 3.14 percentage point gaps between OICIBS and OICWIBS in SSA. Variation in observable factors contributed 3.57 (44 percent of the gap) and 0.93 (30 percent of the gap) to differences in formal savings and borrowings between OICIBS and OICWIBS in SSA respectively. Differences in unobservable factors contributed 4.39 (55 percent of the gap) and 2.16 (67 percent of the gap) percentage points to variations in formal savings and borrowings between OICIBS and OICWIBS in SSA respectively. Finally, the interaction between price and quantity contributed 0.08 (1 percent of the gap) and 0.05 (3 percent of the gaps) percentage point to the gaps in formal savings and borrowings between OICIBS and OICWIBS in SSA respectively.

Given that discrimination contributed largely to the differences in the measures of financial inclusion, it may be concluded that Islamic belief is the major unobservable factor responsible for the discrimination. This is further made clear by the fact that discrimination contributed the most to the inequalities in formal savings and borrowings between OICIBS and OICWIBS in SSA because interest is receivable on savings and it is payable on borrowings at conventional financial institutions. However, prohibiting paying or receiving interest is the major difference between Islamic and convention financial institutions.

It is quite obvious from the above analysis that so many factors play significant roles in determining or spurring financial inclusion in SSA. Among others, a religious belief especially Islamic one determines the probability of financial inclusion

negatively. This is so because Islam clearly prohibits interest-based and unethical transactions. However, the introduction of Islamic banking and finance system in some OIC countries in SSA improves financial inclusion. Nonetheless, the gap in financial inclusion or religious constraint between OICIBS and OICWIBS is still negligible meaning despite the introduction of Islamic banking and finance system; some households in OICIBS are still financially excluded due to religious constraint. This implies that introducing Islamic banking and finance system in OIC is necessary but not sufficient conditions; that there is need for mass awareness creation on bounties of the system given the positive significance of level of education in the models. Given the fact that quantity effect contributed largely to the gap; this means there is also need for institutional re-arrangement in the process of introducing Islamic banking and finance system in an OIC country, that is, such institutions should be strategically established in regions where their services are in much demand.

The findings of this study disagreed with those of Naceur, *et al.* (2015) that there is weak evidence that Islamic banking enhances financial inclusion. However, the findings of this study agreed with those of Mohieldin, et al (2012) though the latter study is supply-side oriented study using redistributive instruments such as Zakah, adaqat, Waqf, and Qar-al-asan. Thus, this study contributes to the existing literature by focusing particularly on SSA given socioeconomic, demographic and political peculiarities of the region and using entirely different theoretical and methodological frameworks.

5.0 Conclusion and Policy Implications

The primary goal of this study remains to empirically answer the question that: Can Islamic banking and finance spur financial inclusion in SSA? To scientifically realize the objective, the study used Probit and Tobit regression techniques and Juhn-Murphy-Pierce decomposition technique to analyse Global Financial inclusion (Findex) data collected by World Bank, (2015c). The study arrived at some stylized facts about financial inclusion in SSA. First, the study established that households from OIC member countries in SSA are less likely to be financially included than their non-OIC counterparts. This suggests that religion (Islamic doc-

trine) constrains households from being financially included in those OIC countries. Secondly, the study also uncovers that households from OIC with Islamic banking and finance are more likely to be financially included than their counterparts in OIC without Islamic banking and finance. This implies that the introduction of Islamic banking and finance system in some OIC countries in SSA spurs financial inclusion in the region. Lastly; other factors play important role in determining financial inclusion in the region. These factors include youthful and old age, male gender, income level and most importantly is the level of education, of households.

The policy implications of the study is that although introducing Islamic banking and finance system in OIC is necessary condition for enhancing financial inclusion in OIC of SSA but it is not sufficient condition. Policymakers and financial regulators have herculean task by way of engaging in mass awareness creation given the low level of education in SSA. There is also need for institutional re-arrangement in the process of introducing Islamic banking and finance system in OIC of SSA. By this, we mean such institutions should be strategically established in regions where their services are in much demand. This has been empirically backed given that endowment or price effect contributed largely to the gap in financial inclusion between OICIBS and OICWIBS in SSA. In same vein, enhancing financing inclusion would help SSA in realizing their foremost dream of reducing poverty in the region.

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Appendix

Table 1: Definitions of Variables in the Models

Explanatory Variables	Definition
Age	Age in years of the households
Agesqr	Age-squared of the Households
Male	Dummy taking the value of 1 for male household and 0 otherwise.
Income Level	Ordinal Dummy taking the value of 1 for the poorest households, 2 for the poor households, 3 for the middle-income households, 4 for the rich households and 5 for the richest households.
Primary/Less	Dummy taking the value of 1 for household with primary or less education and 0 otherwise.
Secondary	Dummy taking the value of 1 for household with secondary education and 0 otherwise.
Tertiary/more	Dummy taking the value of 1 for household with tertiary education or more and 0 otherwise.
SSA	Dummy taking the value of 1 for household from Sub-Saharan Africa and 0 otherwise.
OIC	Dummy taking the value of 1 for household from Organization for Islamic Cooperation countries in Sub-Saharan Africa and 0 otherwise.
OICIBS	Dummy taking the value of 1 for household from Organization for Islamic Cooperation countries with Islamic banking and finance in Sub-Saharan Africa and 0 otherwise
OICWIBS	Dummy taking the value of 1 for household from Organization for Islamic Cooperation countries without Islamic banking and finance in Sub-Saharan Africa and 0 otherwise

Source: Authors' construction

Table 2: Categories of Sub-Saharan African Countries in the Findex

Non-OIC SSA	OICIBS	OICWIBS
Angola,	Burkina Faso	Benin,
Botswana,	Cameroon,	Chad
Burundi,	Cote d'Ivoire	Gabon
Democratic Republic of Congo	Mauritania	Guinea,
Congo, Republic, Ethiopia	Nigeria,	Mali
Ghana, Kenya, Madagascar	Senegal	Niger
Malawi, Mauritius, Namibia,	Sudan	Sierra Leone
Rwanda, South Africa	Uganda	Somalia,
Tanzania, Zambia & Zimbabwe		Togo

Source: Authors' construction