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**Determinants of the choice of a savings option: “The case of African Households”.**

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### **Abstract:**

*Recent research shows that about 2.5 million people have no access to financial services worldwide. The research also shows that Africa, the home to 70 percent of the world's least developed countries, has 80 percent of its population unbanked. These statistics are particularly disturbing as they have direct implications for economic growth. This is because, financial inclusion, including savings, has been shown to have a positive impact on economic growth and development. However, recent empirical research is limited in explaining the determinants of the choice of the savings option in Africa. By using survey data obtained from the World-Global Financial Inclusion (Global Findex) Database, 2014, we investigate how household's characteristics affect their choice of a saving option. We use the multinomial probit model due to its ability to account for issues of independence of irrelevant alternatives (IIA). Our results indicate that there is a strong disconnect between female entrepreneurs and the formal banking sector.*

**Key Words:** Africa, financial inclusion, saving option, multinomial probit.

## **1.0. Introduction: savings and development**

The African continent is one of the richest continents in the world, in terms of the natural resource base and the degree of diversification of both fauna and flora. In addition, it is a much-diversified continent made up of thousands of tribes scattered across 54 countries. For instance, Ghana, a country of about 28 million people, has over 92 ethnic groups each possessing their own unique cultural traditions (Asante 2004). The rich and diversified natural resource endowments of Africa, and its unique climate and people has enabled it to provide to the world's economy essential raw agricultural commodities, numerous minerals, and oil, among others.

In spite of the above facts, Africa is home to the majority of poor and struggling economies of the world. This development paradox has resulted in many research activities, all aimed at solving this paradox and encouraging growth and development on the continent. There is a consensus among many research scientists that savings could propel developing economies, including Africa, into renewed economic growth development (Beck et al. 2014, McKinnon 2010, Shaw 1973). For instance, it has been documented that access to financial products and services (financial inclusion) could translate to better lives for the poor (Banerjee et al. 2015, Bruhn and Love, 2009). Households with access to financial services are able to receive credit and save, allowing them to invest and expand their businesses, and respond to economic shocks (Aket and Wilson, 2013).

Globally, over 2.5 billion people are unbanked (do not have access to a financial account) (Klapper et al. 2013). In Africa, only 23 percent of its adult populations are banked, which makes it the least banked continent in the world (Klapper et al. 2013). In addition, only 37 percent of women in Africa are banked compared to 46 percent for men (Klapper et al. 2013). With regards to the 23 percent that are banked, there is considerable heterogeneity in ownership of bank accounts across Africa. For instance, South Africa (Central Africa) has 51 percent (12 percent) of its population with bank accounts ((Klapper et al. 2013).

One of the greatest obstacles to the expansion of banking services in Africa has been poor and in most cases nonexistent infrastructure, such as roads, telecommunications and internet, and electricity, among others (Demirgüç-Kunt and Klapper, 2012). Currently, it is estimated that the infrastructural deficit in Africa stands at \$US 93 billion per year (Foster et al. 2010). Moreover, African economies are mostly operated by an informal sector dominated by a subsistence agricultural sector that relies on obsolete agricultural technologies (Stevenson and St-Onge, 2005, Beck et al. 2014). The informal sector in Sub-Saharan Africa employs about 77.4 percent of non-agricultural employment (Charmes 2012). Also, women's participation in the informal sector in Africa is about 60 percent (Charmes 2012). The result is that most parts of Africa (especially the rural areas) are dominated by small micro-enterprises which are usually operated by women. However, only 30 percent of micro and small-scale enterprises in Sub-Saharan Africa have access to accessible and affordable capital (World Bank, 2005). This is even worse for women entrepreneurs who, in most cases, do not control resources they can use as collateral for loans (Gichuki et al. 2014).

As discussed above, Africa is largely an informal economy which is largely dominated by women. In addition, the share of women in rural poverty in developing countries is growing faster than that for men (Mehra 1997). This means that to ensure the sustainable economic growth and development in Africa, the economic empowerment of women must not be neglected (Mehra 1997). One of the ways to promote the economic empowerment of women in Africa is through access to affordable credit or capital. For instance, lack of access to credit is seen as one of the major obstacles faced by small-holder women farmers in Ghana with regards to the expansion and adoption of improved agricultural technologies (Dolphyne 1991). Improving financial inclusion (access to financial services) to African women, in particular, could have a positive impact on the growth of the rural economy, through the generation of employment opportunities, low fertility rates, and a diversified rural economy not only dependent on agriculture.

To be able to improve financial inclusion of women, including women entrepreneurs, in Africa, there is a need to know how they save. That is which banking option (such as formal banking, mobile banking, and informal banking) are they most likely to choose and save with. Traditionally, many people in Africa use the informal banking sector (Beck et al. 2014). However, the rapid demographic changes on the continent, with regards to the transmission from a largely rural traditional economy to an urban modern economy, coupled with the revolution of mobile-telecommunication technology have changed the mode of access to financial services in Africa. Currently, about 3.3 billion people use mobile phones and related technologies globally, out of which about 1.7 billion are unbanked (CGAP 2014; Medhi, Ratan, and Toyama, 2009). This has caused the development of a branchless banking service (mobile banking) around the world, including Africa (CGAP, 2014). Therefore, many new ways of banking are currently emerging in Africa.

Therefore, this study seeks to answer the following fundamental question: How do Africans save? Subsequently, the primary objective of this study is to explain the choice of banking options among Sub-Saharan Africans. Specifically, it seeks to identify the magnitude of the effects of the factors that are important to individuals in Africa with regards to their choice of a banking option. More importantly, the focus is put on the choice behavior of female entrepreneurs on the continent.

This study is justified in several ways. First, information on a multinomial choice problem concerning banking alternatives is limited in Africa. This study contributes to the literature by modeling this problem. In addition, the results of the study could help policymakers, and other stakeholders interested in the financial inclusion and economic empowerment of women, to promote access to credits and other financial services to women.

## **1.1. Background**

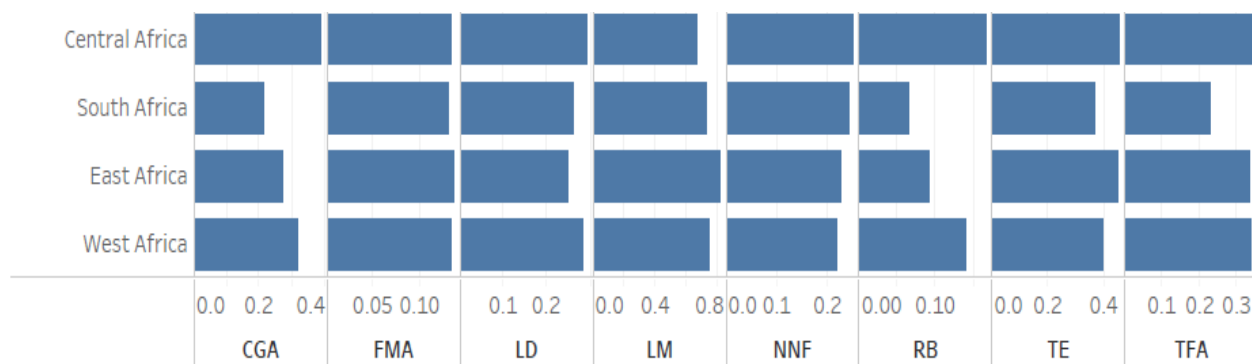
### *1.1.1. Formal Financial Sector*

The African financial industry has moved from a government controlled sector in the 1980s to a liberalized industry, leading to the establishment of private banks across the continent (Beck et al. 2014). This has contributed to a more developed financial sector, with increased competition among banks, innovative banking solutions (such as mobile banking), and improved financial services to customers (Derreumanx, 2013).

In spite of the improvement of the financial sector over the last two decades in Africa, the sector still faces many problems. Among others, the major problems are the high political and economic instability, the informal nature of many African economies, and small-scale nature of banks (Beck et al. 2014). These problems, in particular, the informal nature of African economies and the poor infrastructure in Africa have precluded many people in rural Africa from accessing formal financial services.

At the individual level, there is heterogeneity with regards to the obstacles people in Africa face in their pursuits to own a formal bank account (Figure 1). Compared to other regions, more people in Central Africa self-report that they do not have a need for a bank and their religious beliefs prevent them from opening a bank account (Figure 1). In addition, more people in Central Africa self-report that banks are too far from them, that it is too expensive to operate an account, and lack the documentation to open an account. These reasons might be why more people in this region do not have a formal bank account, compared to other African regions (Figure 2). On the contrary, the above statements about Central Africans are opposite for South Africans (Figure 1).

**Figure 1. Self-reported obstacle to the use of formal bank accounts**

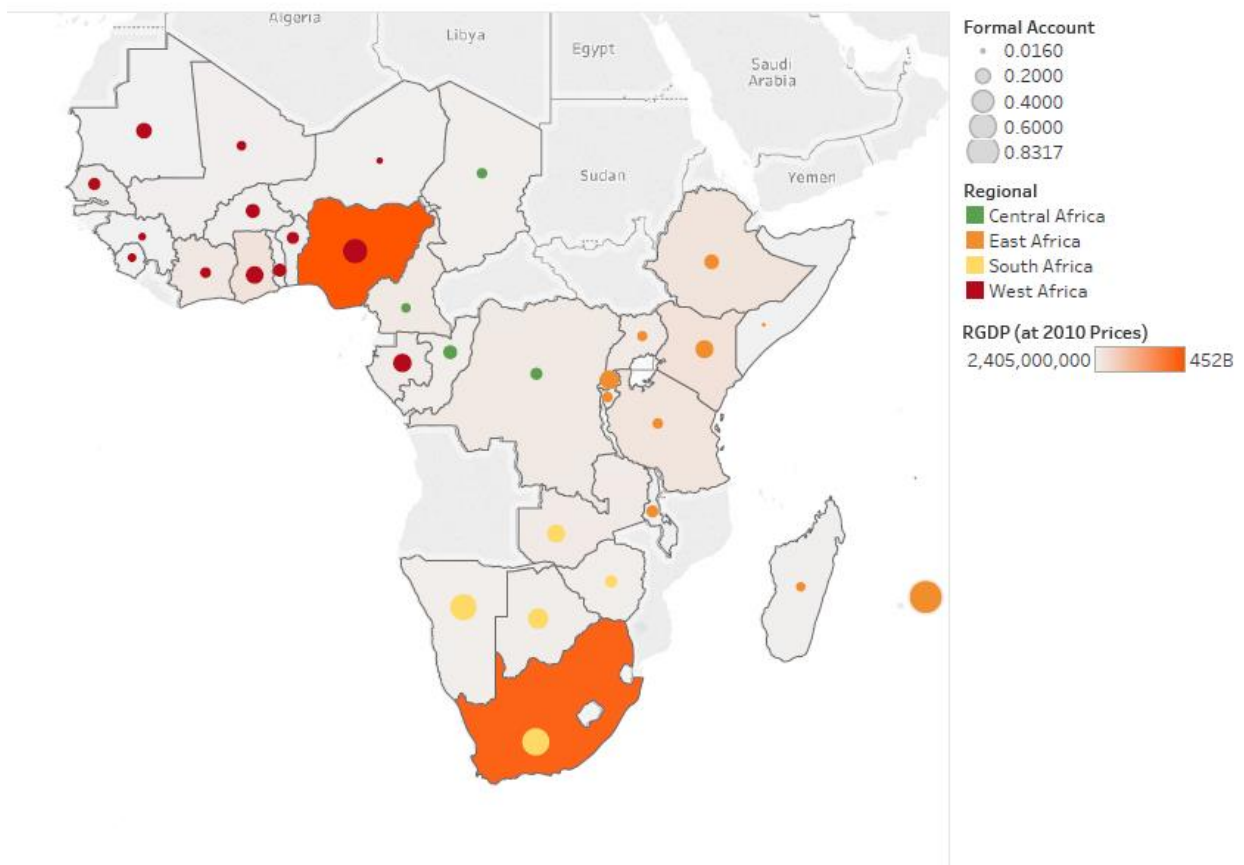


**Source: Author (with data from 2014 Global Findex Database)**

where CGA denotes cannot get an account; FMA denotes family member has an account; LD denotes lack documents to open an account; LM denotes lack money; NNF no need for financial services; RB denotes religious beliefs; TE denotes too expensive to have an account; and TFA denotes too far away to a bank.

Lack of access to the formal financial industry by the majority of Africans could derail the development agenda of countries across the continent. This is because savings is an important precursor to economic development and growth. Figure 2 shows the relationship between real GDP in 2010 US\$ prices and ownership of formal accounts across Sub-Saharan Africa. This shows that countries with higher real GDP tend to have more people with formal bank accounts. This is expected.

**Figure 1. Relationship between Real GDP in US\$ (2010 prices) and ownership of formal banking accounts across Sub-Saharan Africa**

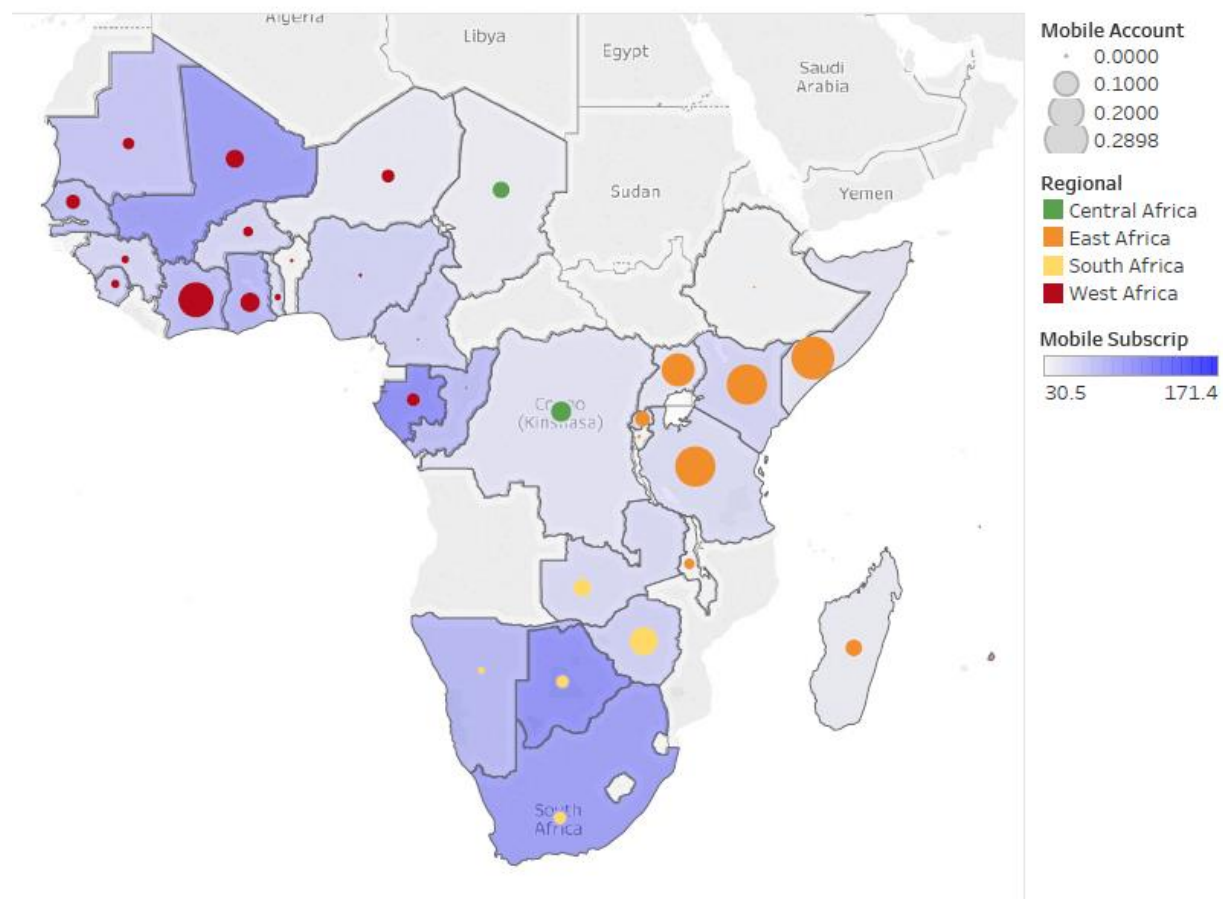


**Source: Author (with data from 2014 Global Findex Database)**

### 1.1.2. Mobile Banking Sector

Currently, about 3.3 billion people use mobile phones globally, out of which about 1.7 billion are unbanked. Also, about 90 percent of the world's poor receive mobile signals (Kendall and Voorhies, 2014). From the foregoing, mobile banking holds great potential in bringing financial services to poor unbanked residents of the world, which could contribute to reducing poverty in the world (Dunn, 2015). Figure 3 below shows the relationship between mobile subscriptions and mobile banking usage across Sub-Saharan African countries. East Africans have more people with mobile banking accounts compared to other African regions. This is not surprising since one of the most successful mobile banking platforms, M-PESA, was first introduced in Kenya, East Africa. However, from figure 1 South Africa and West Africa have more people with mobile subscriptions. This means that there is great potential for mobile banking in these regions too. Central Africans have fewer people with mobile subscriptions and mobile accounts compared to other regions in Africa.

**Figure 3. Relationship between Mobile Subscriptions and Mobile Banking Usage across Sub-Saharan Africa**



Source: Author (with data from 2014 Global Findex Database)

Mobile banking is a branchless banking services operated on a mobile telecommunication technology platform to offer financial services to people (Tobin 2012). It can allow customers to access essential financial services, such as saving money, making and receiving payments, and making money transfers to other people (Aker and Wilson, 2013). It can also be called mobile money, mobile payment, m-money or m-banking (Dunn, 2015). By its nature, this innovation could help banks eliminate the cost associated with establishing and operating brick-and-mortar banks across rural Africa (Kendall and Voorhies, 2014, Beck et al. 2011, Osei-Assibey, 2009). It charges very low financial transaction fees (variable cost) which could motivate low-income groups in Africa to access financial services (Kendall and Voorhies, 2014; Aker and Wilson, 2013). According to CGAP (2014), the transaction charges for branchless banks are about 19 percent lower than for traditional brick-and-mortar banks.

In most cases, mobile platforms serve as intermediaries between clients and traditional banks (Kendall and Voorhies, 2014). Kenya was the first to introduce a platform called M-Pesa, to send and make payments using the mobile phone. It has been tagged as one of the most successful mobile financial service platforms in the world (Dunn 2015). In Kenya, about 62 percent of adults have active mobile accounts; in Uganda, 26 percent of adults are users; and over 47 percent of adults are users in Tanzania (Kendall and Voorhies, 2014). This platform has been able to provide access to financial services to the unbanked in Africa, especially rural Africa (Dunn 2015). Like most mobile banking platforms, it is simple and easy to use, even for non-educated populations (Tobbin 2012). Studies have shown that most people in some parts of rural Ghana and Kenya trust mobile banking more than traditional banking (Dupas et al. 2012; Tobbin 2012).

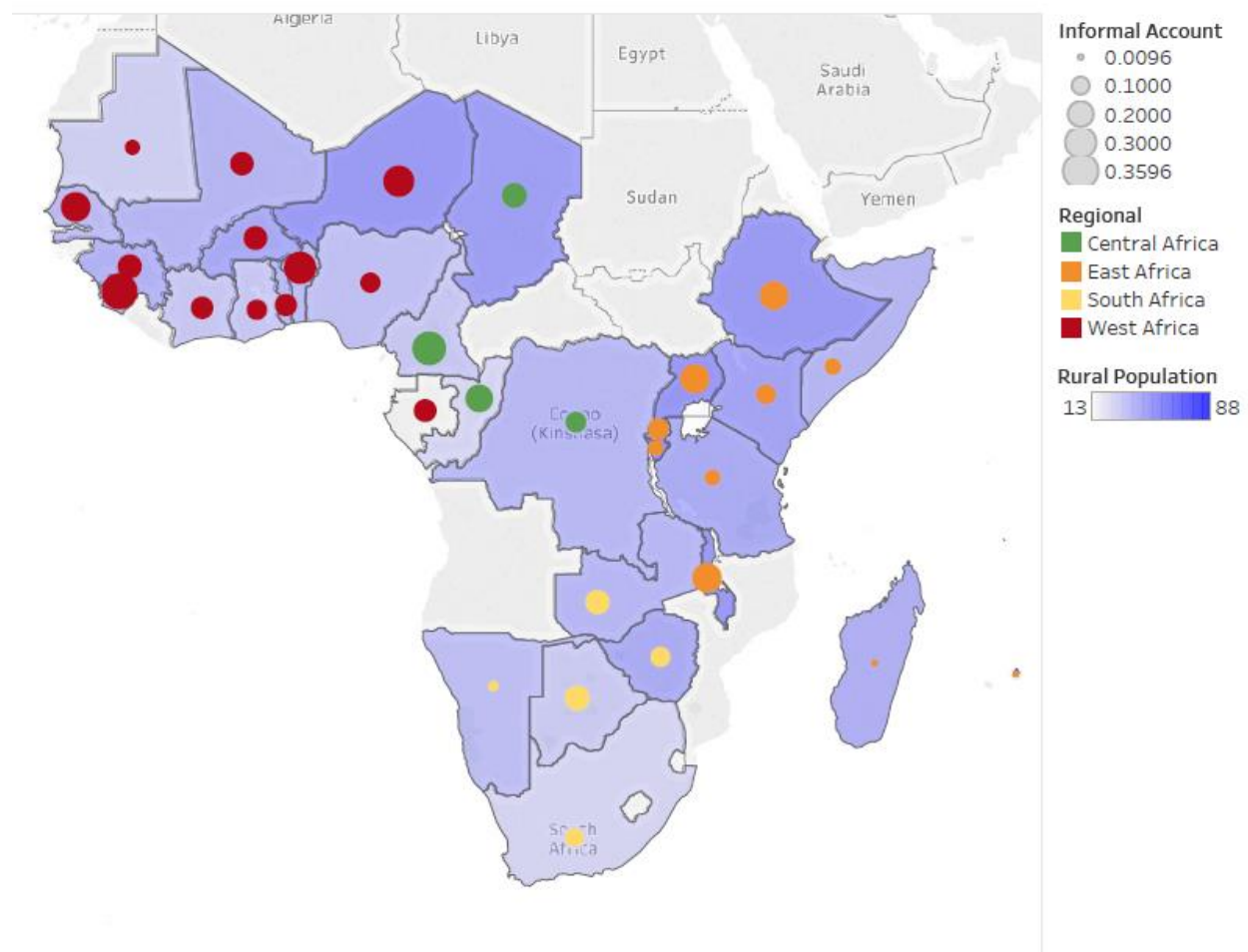
In Ghana, about 4.1 million people (16.4 percent) out of the 25 million people using mobile telecommunication use some form of mobile financial services in Ghana (Osei-Assibey, 2009). For those in this group, they access mobile financial services to make payments, send money, and as a store of monetary value (Osei-Assibey, 2009). In a study conducted in Northern Ghana, it was revealed that m-money usage increased to 26 percent of households, three months after the study (Aker and Wilson, 2013).

### *1.1.3. Informal Banking Sector*

African economies are mostly characterized by an under-developed financial system with an inefficient credit system and a high cost of accessing credit (Sacerdoti, 2005). As a result, most people and firms do not have access to financial services. The informal sector has always played a significant role to promote financial inclusion in Africa (Collins et al. 2010).

However, the informal banking sector, rotating savings and credit associations, moneylenders, “susu” operators, provide credit (usually small amounts) to people and firms at high interests. Although, the informal financial service providers have always been important in the promotion of financial inclusion to the unbanked in Africa, its scale of credit delivery is not enough to provide micro and small-scale enterprises with the adequate and appropriate forms of credits for their expansion and growth. The informal banking sector includes providers such as rotating savings and credit associations, friends and family (Collins et al. 2010). Figure 4 shows the distribution of people that do have informal banking accounts, in relation to the percentage of rural population, across African economies. It reveals that countries that have more rural populations as a percentage of the country’s entire population tend to have more people banking with the informal sector. This is expected.

**Figure 4. The relationship between Informal Banking Account Ownership and Rural Population across Africa.**



**Source: Author (with data from 2014 Global Findex Database)**

## 2.0. Methodology

### 2.1. Conceptual Framework

This study seeks to explain the behavior of individuals in Sub-Saharan Africa, and in particular, female entrepreneurs, concerning their choice of a banking alternative. Following Fishbein (2008), a behavior is defined as an action directed at a target, performed in a given context, at a given point in time. Here, the action is to choose; the target is a banking alternative; context is to access a financial service; and time is over the entire year, 2014. The banking alternatives available to the individual are a formal banking option, a mobile banking option, an informal banking option and a no banking option or unbanked. A banking option is a platform that provides financial services to an individual, through savings, access to credits and a means to pay for goods and services.

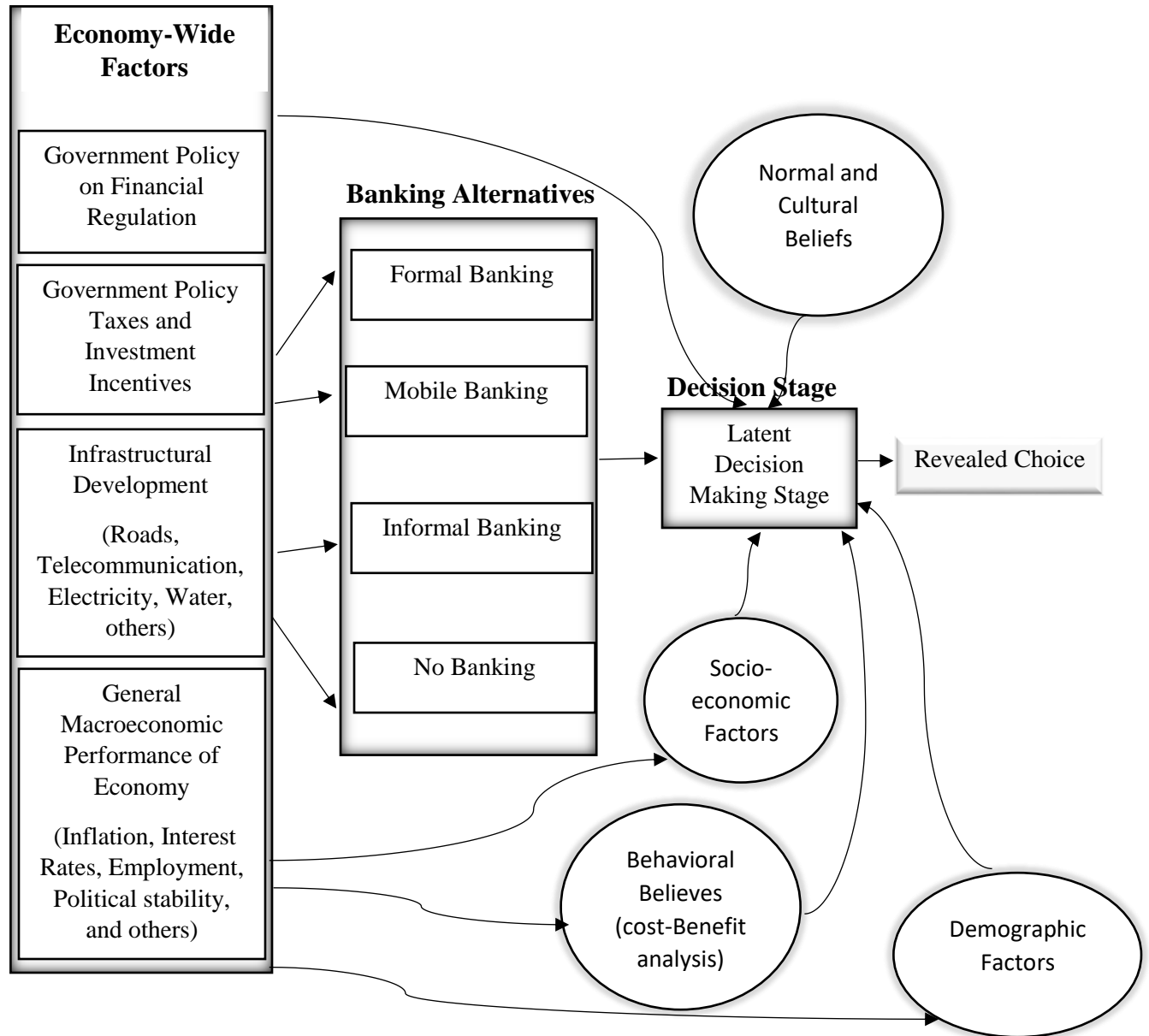
It is assumed that individuals' behavior with regards to their choice of a banking option is rational. These rational behaviors are largely influenced by the emotions, impulses and other noncognitive factors of individual behavior (Fishbein 2008). For this reason, the Integrated Model of Behavioral Prediction and the Random Utility Model are used to explain the behavior of individuals concerning their choice of a banking option (Fishbein 2008; Cameron and Trivedi, 2005).

The integrated model of behavioral prediction helps this study to isolate variables that could influence the choice of a banking alternative. According to this model, the significant variables are intentional factors, attitudinal factors, perceived norms, perceived behavioral controls, behavioral beliefs (cost and benefit analysis), normative beliefs, and control beliefs (Fishbein 2008). This study groups normative beliefs, control beliefs and behavioral controls under norms and cultural beliefs. Also, attitudinal factors are grouped under demographic factors. The intentional factors and behavioral beliefs are grouped under socioeconomic factors.

The random utility model is used to explain the reasoning behind an individual choosing a given banking alternative. It is assumed that an individual will receive a benefit by accessing a banking alternative. Among others, some of the benefits are the ability to save, which gives the individual the opportunity to respond to economic shocks and emergencies (medical and otherwise). Another benefit is the ability for the individual to smoothen the consumption of goods and services over time, with the savings and credits from a financial institution. For a business owner, doing business with a financial institution builds trust and creditworthiness, which can be used to access credit for business expansions and other activities. On the other hand, there is a cost associated with savings and accessing credits from a financial institution. At the fundamental level is the opportunity cost of forgoing consumption today for consumption tomorrow, through savings. Other costs are the inconvenience of travelling to a bank, which is mostly in urban towns, to save or get credit; the high cost of credit from mostly informal banker; the risk an informal banker leaving town with your savings; the risk of scammers and fraudsters stealing your savings from a mobile banking platform; and many others.

Therefore, an individual chooses a banking option which gives the highest latent utility. Latent utility from a banking option is the expected utility that could be derived from the benefits of choosing a banking option minus the disutility associated with the costs of that banking option. The latent utility is an internal decision-making process that is perceived only by the individual but not the researcher. In addition to the cost and benefits associated with a banking alternative (behavioral beliefs), the latent utility decision-making process is also influenced by the other variables from the integrated model of behavioral prediction, and economy-wide macroeconomic indicators and policies. Figure 5, shows a general depiction of the framework discussed in this section together.

**Figure 5. Decision-Making Process underlying the choice of a banking option**



## 2.2. Econometric Model

This section describes the procedure that is used to explain the likelihood that an individual chooses a banking alternative. The individual compares the latent utility that he/she derives from each alternative, and chooses the alternative with the highest latent utility. Therefore, the alternative with the highest latent utility will be the revealed choice of a banking option.

Let the latent utility of banking alternative  $j$  be expressed as:

$$(1) U_{ij} = x'_{ij}\beta + \varepsilon_{ij}, \quad \varepsilon = (\varepsilon_{i1}, \varepsilon_{i2}, \varepsilon_{i3}, \varepsilon_{i4}); \quad i = 1, \dots, N; \quad j = 1, \dots, 4$$

where  $U_{ij}$  is latent utility for individual  $i$  which is derived from choosing alternative  $j$ ;  $x_{ij}$  is a vector of alternative-variant or alternative-specific regressors;  $\varepsilon_{ij}$  is the stochastic error term for individual  $i$  and alternative  $j$ ;  $N$  is sample size.

Alternative  $j$  is chosen if its latent utility is greater than that of the other alternatives. This is expressed as:

$$(2) U_{ij} > U_{ik}, \text{ for all } k \text{ \& } j \neq k$$

From equation 2, the probability that alternative  $j$  is chosen is expressed as:

$$(3) p_{ij} = P(y_i = j) = \Pr \left\{ (\varepsilon_{ik} - \varepsilon_{ij} \leq) (x_{ij} - x_{ik})' \right\} = F(x_i, \beta), \quad \text{for all } k \text{ \& } j \neq k$$

Different assumptions about the probability density function depicted by  $F(\cdot)$  leads to different multinomial probability models. For this study, it is assumed that the errors are independently and identically distributed with a Gumbel extreme value distribution (Cameron and Trivedi, 2005). Therefore, a multinomial logit model is used to estimate equation 3. This model makes the assumption of independence of irrelevant alternatives (IIA). Meaning that the odds of choosing an alternative  $j$  compared to alternative  $k$ , is not affected by adding or deleting other alternatives.

The assumption of IIA is tested in this study by using the Hausman test and Small and Hsiao test (Cameron and Trivedi, 2005). The Small and Hsiao test is used as a robustness check for the Hausman test. The null hypothesis of the test is IIA holds, against the alternative hypothesis that null is not true. The test is implemented in STATA 14 by using “mlogtest”.

Given that the null hypothesis is rejected, that is IIA do not hold, the multinomial probit model is used to estimate equation 3. This model assumes the errors in equation 3 are multivariate normally distributed. The multinomial probit model relaxes the IIA assumption, allowing for correlation in individual choices across alternatives. Also, it does not impose the independently and identically distributed errors. The “mlogit” and “mprobit” routines in STATA 14 are used to estimate the multinomial logit and multinomial probit models, respectively. Table 1, provides information on the variables used to estimate the above models, including their hypothesized effects on the choice of a banking alternative.

**Table 1. Variable Definitions and Hypothesized Effects of Explanatory Variables on Choice of Banking Alternative.**

<b>Variable</b>	<b>Definition</b>	<b>Hypo<sup>1</sup></b>	<b>Hypo<sup>3</sup></b>	<b>Hypo<sup>3</sup></b>
<b>Informal Account</b>	Dummy Variable, equals 1 if individual has a formal account and 0 otherwise			
<b>Mobile Account</b>	Dummy Variable, equals 1 if individual has a mobile account and 0 otherwise			
<b>Informal Account</b>	Dummy Variable, equals 1 if individual has an informal account and 0 otherwise			
<b>No Account</b>	Dummy Variable, equals 1 if individual has no account and 0 otherwise			
<b>Age</b>	Continuous variable, Age of Individual	+	-	-
<b>Income Quintile</b>	Discrete variable, ranges from 1 (poorest 20%) to 5(richest 20%)	+	+	-
<b>Female Entrepreneur</b>	Dummy Variable, equals 1 if individual is female and owns a business/farm	+	+	+
<b>At least Secondary Education</b>	Dummy Variable, equals 1 if individual has obtained at least a secondary school education and 0 otherwise	+	+	-
<b>Online Transaction</b>	Dummy Variable, equals 1 if individual transacts online business and 0 otherwise	+	+	-
<b>Regular Cash Transaction</b>	Dummy Variable, equals 1 if individual transacts business regularly in cash and 0 otherwise	+	+	-
<b>Public Servant</b>	Dummy Variable, equals 1 if individual is employed in the public service and 0 otherwise	+	+	+
<b>Bank Too Far Away</b>	Dummy Variable, equals 1 if individual thinks he owns no formal bank account because bank is too far and 0 otherwise	-	+	+
<b>No Need Financial Services</b>	Dummy Variable, equals 1 if individual thinks he owns no formal bank account because he has no need for financial services and 0 otherwise	-	-	+
<b>Too Expensive to Own Account</b>	Dummy Variable, equals 1 if individual thinks he owns no formal bank account because it is too expensive to own a formal account and 0 otherwise	-	+	+
<b>Lack Documentation to Open Account</b>	Dummy Variable, equals 1 if individual thinks he owns no formal bank account because he lacks the documentation to open a formal account and 0 otherwise	-	+	+
<b>Religious Belief Obstacle</b>	Dummy Variable, equals 1 if individual thinks he owns no formal bank account because his/her religious belief is an obstacle and 0 otherwise	-	+	+
<b>Cannot Open Account</b>	Dummy Variable, equals 1 if individual thinks he owns no formal bank account because he/she cannot own one and 0 otherwise	-	+	+
<b>Lack Money to Open Account</b>	Dummy Variable, equals 1 if individual thinks he owns no formal bank account because he lacks money and 0 otherwise	-	-	+
<b>Family Has Account</b>	Dummy Variable, equals 1 if individual thinks he owns no formal bank account because family member already has one and 0 otherwise	+	+	-

### *2.3. Data Source and Variable Description*

The data for this study is obtained from the 2014 Global Findex Database. The data was collected in conjunction with the annual Gallup World Poll Survey, with funding from the Belinda and Gates Foundation. The survey data was obtained by interviewing more than 150,000 nationally representative and randomly selected persons 15 years and above in 148 economies. For each country, at least 1000 people were interviewed. The data contains information on individual savings, borrows, obstacles to savings, socio-economic variables, and others. It also contains information on the socioeconomic and demographic characteristics of respondents. Specific questions that were asked concerning ownership of a banking account are

- a) Do you have an account at a financial institution?
- b) Do you have a mobile money account?
- c) Have you saved using an informal savings club?

Answers to these questions are used to construct the dependent variable, account (banking) alternatives. The no banking alternative captures a situation where individual answers no to all the questions above. Table one contains the variables that are used to explain the choice of a banking alternative.

## **3.0. Model Results**

### *3.1. Descriptive Results*

The descriptive results (Table 2) show that fewer people in Central Africa choose formal and mobile accounts compared to other regions of Africa. In addition, that region have more people who think banks are too far from them to open an account, think they have no need for financial services, think it is too expensive to open an account, think they lack documentation to open an account, their religious beliefs prevent them from opening a formal account, and think they cannot open an account (Table 2). More people in East Africa, compared to other regions of Africa, think they lack money to open an account and has a family member with a formal account (and that is an obstacle to them opening their own formal accounts).

However, compared to other regions in Africa, Central Africans have informal accounts and no banking accounts. More people in West Africa have formal accounts, compared to other regions in Africa. People in East Africa tend to have more mobile accounts, compared to other regions in Africa. Africa has the highest youth demographic group in the world. It is, therefore, not surprising that most people across the regions in Africa are in their thirties (Table 2). Also, a greater proportion of females are entrepreneurs in Central Africa, compared with other regions in the Africa. Most of the respondents in this study are in the third 20% richest quintile. South Africa (East Africa) has the highest (lowest) percentage of people with at least a secondary school education, compared to other regions in Africa.

**Table 2. Variable Definitions and Summary Statistics**

	Central Region (N=3,660)	East Africa (N=8,061)	South Africa (N=3,717)	West Africa (N=11,621)
Variable	Mean (Standard Error)	Mean (Standard Error)	Mean (Standard Error)	Mean (Standard Error)
<b>Formal Account</b>	0.1068 (0.3089)	0.2047 (0.4035)	0.3640 (0.4812)	0.1550 (0.3619)
<b>Mobile Account</b>	0.0262 (0.1598)	0.0903 (0.2866)	0.0452 (0.2078)	0.0328 (0.1781)
<b>Informal Account</b>	0.2019 (0.4015)	0.1099 (0.3128)	0.1063 (0.3082)	0.1829 (0.3866)
<b>No Account</b>	0.6650 (0.4720)	0.5951 (0.4909)	0.4845 (0.4998)	0.6294 (0.4830)
<b>Age</b>	33.0025 (14.5180)	35.9017 (16.1147)	36.0685 (16.8175)	33.9954 (15.4219)
<b>Income Quintile</b>	3.1719 (1.4266)	3.0768 (1.4307)	3.0393 (1.4097)	3.1948 (1.4304)
<b>Female Entrepreneur</b>	0.1505 (0.3577)	0.1094 (0.3122)	0.0850 (0.2789)	0.1313 (0.3378)
<b>At least Secondary Education</b>	0.5372 (0.4987)	0.3012 (0.4588)	0.6182 (0.4859)	0.3848 (0.4866)
<b>Online Transaction</b>	0.0169 (0.1291)	0.0133 (0.1145)	0.0199 (0.1397)	0.0170 (0.1291)
<b>Regular Cash Transaction</b>	0.7377 (0.4399)	0.6918 (0.4618)	0.7024 (0.4572)	0.6702 (0.4702)
<b>Public Servant</b>	0.0508 (0.2197)	0.0411 (0.1984)	0.0635 (0.2439)	0.0502 (0.2183)
<b>Bank Too Far Away</b>	0.3403 (0.5835)	0.3330 (0.6125)	0.2263 (0.4649)	0.3357 (0.5936)
<b>No Need Financial Services</b>	0.2498 (0.5357)	0.2261 (0.5394)	0.2428 (0.4868)	0.2183 (0.5321)
<b>Too Expensive to Own Account</b>	0.4567 (0.7961)	0.4539 (0.7813)	0.3686 (0.6145)	0.3978 (0.6956)
<b>Lack Documentation to Open Account</b>	0.2923 (0.5601)	0.2477 (0.5673)	0.2592 (0.5096)	0.2841 (0.5690)
<b>Religious Belief Obstacle</b>	0.1653 (0.4893)	0.0902 (0.4654)	0.0651 (0.3781)	0.1391 (0.4825)
<b>Cannot Open Account</b>	0.3894 (0.5917)	0.2735 (0.5748)	0.2130 (0.5117)	0.3190 (0.6256)
<b>Lack Money to Open Account</b>	0.6694 (0.5454)	0.8184 (0.4846)	0.7267 (0.5089)	0.7548 (0.5217)
<b>Family Has Account</b>	0.1351 (0.5204)	0.1377 (0.5275)	0.1326 (0.4302)	0.1348 (0.5204)

### 3.2. Multinomial Probit Results

The independence of irrelevant alternatives assumption (IIA) of the estimated multinomial logit model is rejected by both the Hausman test and the Small-Hsiao test (Table 3). For this reason, the results of the estimated multinomial probit model (Table 4) are reported in this section. Overall, the multinomial probit model is significant at 1 percent, with a Wald Chi-square value of 2441. However, the multinomial logit model results are used as a robustness check on the direction of effect of the covariates in the estimated multinomial probit model.

**Table 3. Test of IIA Assumption**

	Null Hypothesis: IIA Holds		Alternative Hypothesis: Not Null	
	Hausman Test of IIA Assumption		Small-Hsiao Test of IIA Assumption	
Alternative	Chi-Square	Conclusion on Test	Chi-Square	Conclusion on Test
Formal	69.15**	Reject null	37.76	Do not reject null
Mobile	121.33***	Reject null	57.1	Do not reject null
Informal	113.14***	Reject null	63.56**	Reject null
None	106.81***	Reject null	65.0**	Reject null

\*\*\*, \*\*, \* denotes significance at 1, 5 and 10 percent, respectively.

The model results (both multinomial probit and multinomial logit) are reported in Table 4. The marginal effects results of the multinomial probit model are reported in Table 5. The results (multinomial probit) show that individuals moving from a lower income quintile to a higher income quintile are about 0.7 percent and 0.8 percent more likely to choose a mobile banking and informal banking, respectively. Also, they are 1.5 percent less likely to be unbanked (no banking account). An individual with at least secondary education is more likely to choose a formal banking account and a mobile banking account by 0.7 percent and 2.9 percent, respectively. They are 2.6 percent less likely to choose an informal banking account.

A female entrepreneur is more likely to choose a mobile account and an informal account by 3.7 percent and 10.6 percent, respectively. They are 14.7 percent less likely to be unbanked. A person who transacts business online regularly is more likely to choose a formal banking account and a mobile banking account by 2.8 percent and 6.5 percent, respectively. They are 9.4 percent less likely to choose an informal banking account. Moreover, an individual who transacts business regularly with cash is more likely to choose a formal banking account, a mobile banking account, and an informal banking account by 0.3 percent, 3.4 percent, and 14.8 percent, respectively. They are 18.5 percent less likely to be unbanked. A person who is employed in the public sector is more likely to choose a formal banking account, a mobile banking account, and an informal banking account by percent, 1.7 percent, and 4.8 percent, respectively. They are 8.7 percent less likely to be unbanked.

A person who has no need for financial services is more likely to choose a mobile banking account and an informal banking account by 0.7 percent and 1.1 percent, respectively. That person will be 1.6 percent less likely to be unbanked. Also, a person who cannot open a formal banking account is also less likely to choose a mobile banking account by 1.1 percent. However, such persons are 2 percent more likely to be unbanked. A person who thinks it is too expensive to own a formal banking account is more likely to choose a mobile banking account by 0.9 percent. Similarly, a person who thinks they lack documentation to open an account is more likely to choose a mobile banking account by 0.8 percent. A person whose religious belief is against him/her owning a banking account is 0.3 percent (0.7 percent) more (less) likely to

choose a formal account (a mobile account). A person whose family member already has a formal banking account is more likely to choose such a banking platform by 0.3 percent. They are also more likely to choose a mobile banking account by 1.3 percent.

Geography matters with regards to the choice of a banking option. Compared to people in West Africa, people in East Africa are more(less) likely to choose a mobile banking platform (informal banking platform) by 5.9 percent (7.6 percent). They are also 1.7 percent more likely to be unbanked, compared to West Africans. South Africans are more likely to choose a formal banking account and a mobile banking account by 2 percent and 2.4 percent, respectively, compared to West Africans. They are also less likely to choose an informal banking account by 3.4 percent, compared to West Africans. Central Africans are less (more) likely to choose a formal banking account (not to choose a banking platform) by 2.4 percent (2.1 percent), compared to West Africans.

**Table 4. Multinomial Probit Model Results**

Variable	Formal Account Ownership		Mobile Account Ownership		Informal Account Ownership	
	Multinomial Logit Coefficient (Z-test)	Multinomial Probit Coefficient (Z-test)	Multinomial Logit Coefficient (Z-test)	Multinomial Probit Coefficient (Z-test)	Multinomial Logit Coefficient (Z-test)	Multinomial Probit Coefficient (Z-test)
<b>Age</b>	0.011** -3.09	0.005* (-2.49)	0.010*** (-4.44)	-0.006*** (-4.64)	-0.001 (-1.09)	-0.001 (-0.93)
<b>Income Quintile</b>	0.038 -0.93	0.034 (-1.59)	0.164*** -7.6	0.106*** (-7.66)	0.064*** -4.92	0.054*** (-5.31)
<b>Female Entrepreneur</b>	0.449** -2.6	0.379*** (-4.21)	0.910*** -11.76	0.658*** (-12.31)	0.758*** -14.96	0.633*** (-15.27)
<b>At least Secondary Education</b>	0.573*** -4.52	0.296*** (-4.5)	0.570*** -8.83	0.355*** (-8.43)	-0.129** (-3.12)	-0.085** (-2.66)
<b>Online Transaction</b>	2.107*** -8.58	1.294*** (-8.1)	1.313*** -6.97	0.914*** (-6.53)	0.106 -0.57	0.149 (-1.08)
<b>Regular Cash Transaction</b>	0.515*** -3.92	0.432*** (-6.39)	0.935*** -12.71	0.679*** (-15.01)	1.111*** -24.21	0.851*** (-25.66)
<b>Public Servant</b>	1.693*** -8.51	1.031*** (-8.32)	0.344* -2	0.340** (-2.98)	0.374** -3.28	0.321*** (-3.53)
<b>Bank Too Far Away</b>	-0.127 (-1.04)	-0.063 (-1.00)	0.055 -0.96	0.031 (-0.81)	0.062 -1.74	0.046 (-1.64)
<b>No Need Financial Services</b>	-0.127 (-1.00)	-0.072 (-1.06)	0.152* -2.51	0.099* (-2.47)	0.084* -2.19	0.068* (-2.25)
<b>Too Expensive to Own Account</b>	-0.032 (-0.33)	0.003 (-0.06)	0.180*** -4.23	0.116*** (-4.06)	0.002 -0.06	0.002 (-0.08)
<b>Lack Documentation to Open Account</b>	0.117 -1.06	0.054 (-0.92)	-0.148* (-2.32)	-0.101* (-2.48)	0.001 -0.02	0.001 (-0.03)

\*\*\*, \*\*, \* denotes significance at 1, 5, and 10 percent, respectively

Variable	Formal Account Ownership		Mobile Account Ownership		Informal Account Ownership	
	Multinomial Logit	Multinomial Probit	Multinomial Logit	Multinomial Probit	Multinomial Logit	Multinomial Probit
	Coefficient (Z-test)	Coefficient (Z-test)	Coefficient (Z-test)	Coefficient (Z-test)	Coefficient (Z-test)	Coefficient (Z-test)
<b>Religious Belief Obstacle</b>	0.250*	0.145*	-0.151	-0.075	0.065	0.047
	-2.32	(-2.43)	(-1.92)	(-1.57)	-1.59	(-1.44)
<b>Cannot Open Account</b>	0.005	-0.028	-0.246***	-0.158***	-0.077*	-0.068*
	-0.05	(-0.49)	(-3.88)	(-4.01)	(-2.23)	(-2.50)
<b>Lack Money to Open Account</b>	-0.281*	-0.141*	-0.038	-0.015	0.044	0.04
	(-2.57)	(-2.44)		(-0.37)		(-1.39)
			(-0.62)		-1.19	
<b>Family Has Account</b>	0.265*	0.153**	0.267***	0.172***	-0.036	-0.02
	-2.55	(-2.66)	-4.79	(-4.53)	(-0.88)	(-0.63)
<b>East Africa Region</b>	-0.044	0.004	1.120***	0.663***	-0.473***	-0.322***
	(-0.27)	(-0.05)	-16.46	(-15.24)	(-10.39)	(-9.33)
<b>Central Africa Region</b>	0	-0.026	-0.516***	-0.308***	-0.031	-0.021
	0	(-0.28)	(-4.34)	(-4.51)	(-0.60)	(-0.51)
<b>South Africa Region</b>	1.486***	0.824***	0.513***	0.303***	-0.195**	-0.118*
	-10.47	(-10.63)	-5.12	(-4.77)	(-3.06)	(-2.44)
<b>Constant</b>	-5.344***	-3.490***	-4.227***	-2.980***	-2.307***	-1.891***
	(-21.01)	(-26.77)	(-30.49)	(-34.59)	(-29.08)	(-30.96)
Number of Observations	22,184					
Multinomial Logit : Likelihood Ratio Chi-Square=	2637***					
Log-likelihood	-15869					
	Multinomial Probit: Wald Chi-Square = 2441***					

\*\*\*, \*\*, \* denotes significance at 1, 5, and 10 percent, respectively

**Table 5. Multinomial Probit Model Marginal Effect Results**

	Formal Account Coefficient (T-statistics)	Mobile Account Coefficient (T-statistics)	Informal Account Coefficient (T-statistics)	No Account Coefficient (T-statistics)
<b>Age</b>	0.000** (-3.04)	-0.000*** (-4.74)	0 (-0.37)	0.000* (-2.14)
<b>Income Quintile</b>	0 (-0.39)	0.007*** (-6.79)	0.008*** (-4.22)	-0.015*** (-7.25)
<b>Female Entrepreneur</b>	0.003 (-1.6)	0.037*** (-9.34)	0.106*** (-13.88)	-0.147*** (-16.80)
<b>At least Secondary Education</b>	0.007*** (-4.38)	0.029*** (-9.14)	-0.026*** (-4.33)	-0.01 (-1.47)
<b>Online Transaction</b>	0.028*** (-7.37)	0.065*** (-6.33)	0.001 (-0.06)	-0.094*** (-3.43)
<b>Regular Cash Transaction</b>	0.003* (-2.03)	0.034*** (-10.14)	0.148*** (-24.23)	-0.185*** (-27.81)
<b>Public Servant</b>	0.022*** (-7.44)	0.017* (-2.03)	0.048** (-2.89)	-0.087*** (-4.64)
<b>Bank Too Far Away</b>	-0.002 (-1.27)	0.002 (-0.56)	0.009 (-1.66)	-0.008 (-1.44)
<b>No Need Financial Services</b>	-0.002 (-1.51)	0.007* (-2.16)	0.011* (-2.04)	-0.016* (-2.49)
<b>Too Expensive to Own Account</b>	0 (-0.22)	0.009*** (-4.21)	-0.002 (-0.51)	-0.007 (-1.44)
<b>Lack Documentation to Open Account</b>	0.002 (-1.13)	-0.008** (-2.62)	0.002 (-0.36)	0.005 (-0.75)
<b>Religious Belief Obstacle</b>	0.003* (-2.43)	-0.007* (-2.01)	0.01 (-1.61)	-0.006 (-0.87)
<b>Cannot Open Account</b>	0 (-0.14)	-0.011*** (-3.65)	-0.01 (-1.90)	0.020*** (-3.59)
<b>Lack Money to Open Account</b>	-0.004** (-2.65)	-0.002 (-0.55)	0.009 (-1.66)	-0.004 (-0.63)
<b>Family Has Account</b>	0.003* (-2.48)	0.013*** (-4.74)	-0.008 (-1.43)	-0.008 (-1.31)
<b>East Africa Region</b>	0 (-0.19)	0.059*** (-18.06)	-0.076*** (-11.86)	0.017* (-2.43)
<b>Central Africa Region</b>	0 (-0.15)	-0.024*** (-4.56)	0.003 (-0.35)	0.021* (-2.34)
<b>South Africa Region</b>	0.020*** (-10.6)	0.024*** (-5.04)	-0.034*** (-3.81)	-0.009 (-0.93)

\*\*\*, \*\*, \* denote significance at 1, 5 and 10 percent, respectively.

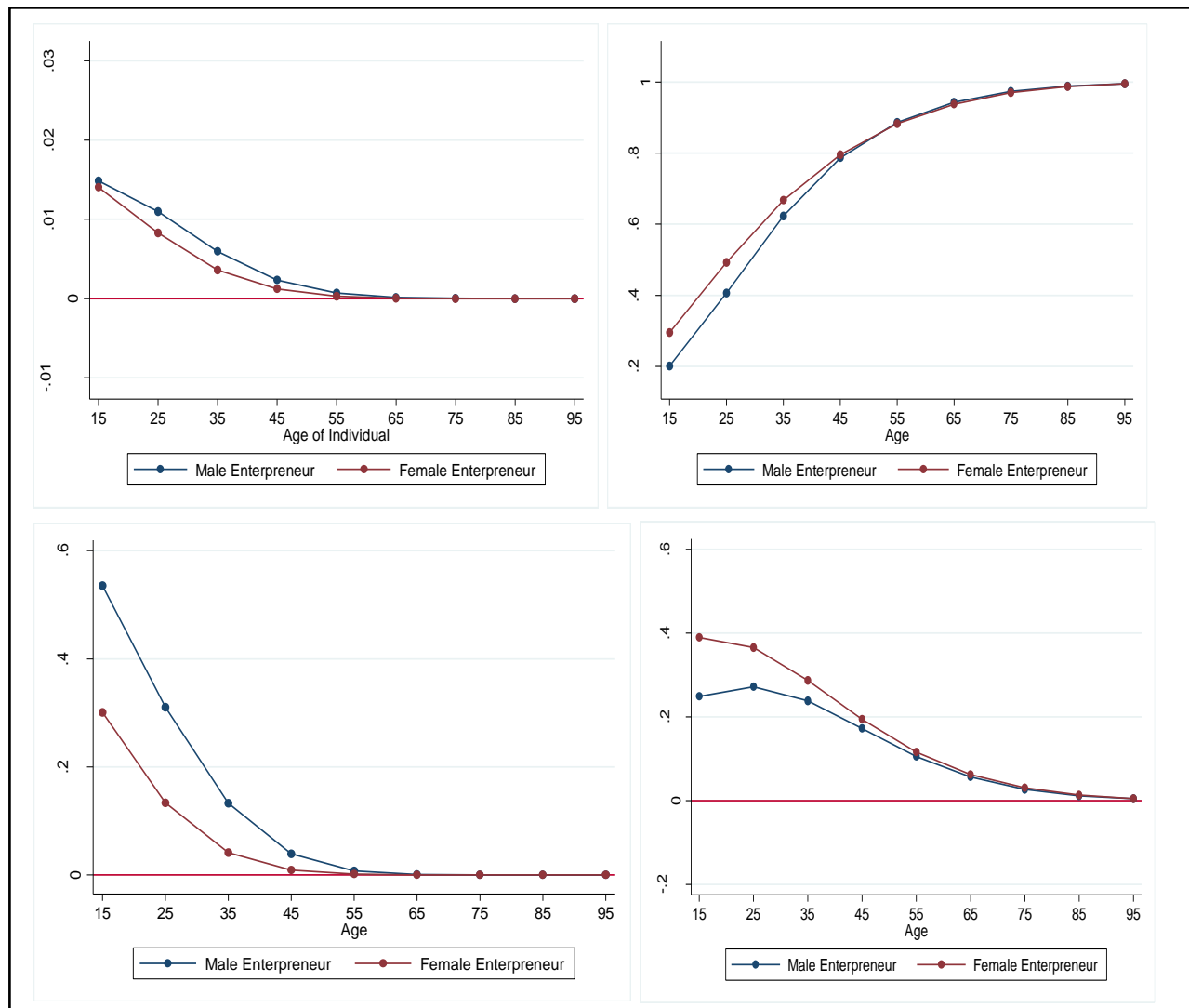
### 3.3. Discussion

The focus of this study is about understanding female entrepreneurs in Africa, with regards to how they might choose a banking alternative. It has been documented that access to credits by small-scale business owners, including small-scale farmers, in Africa is very low, compared to other regions of the world. This is unfortunate because lack of access to credits to resource-poor entrepreneurs in a largely under-developed informal is an important obstacle to the growth and development of the African economies. Unfortunately, women on the continent are disproportionately affected by rural poverty.

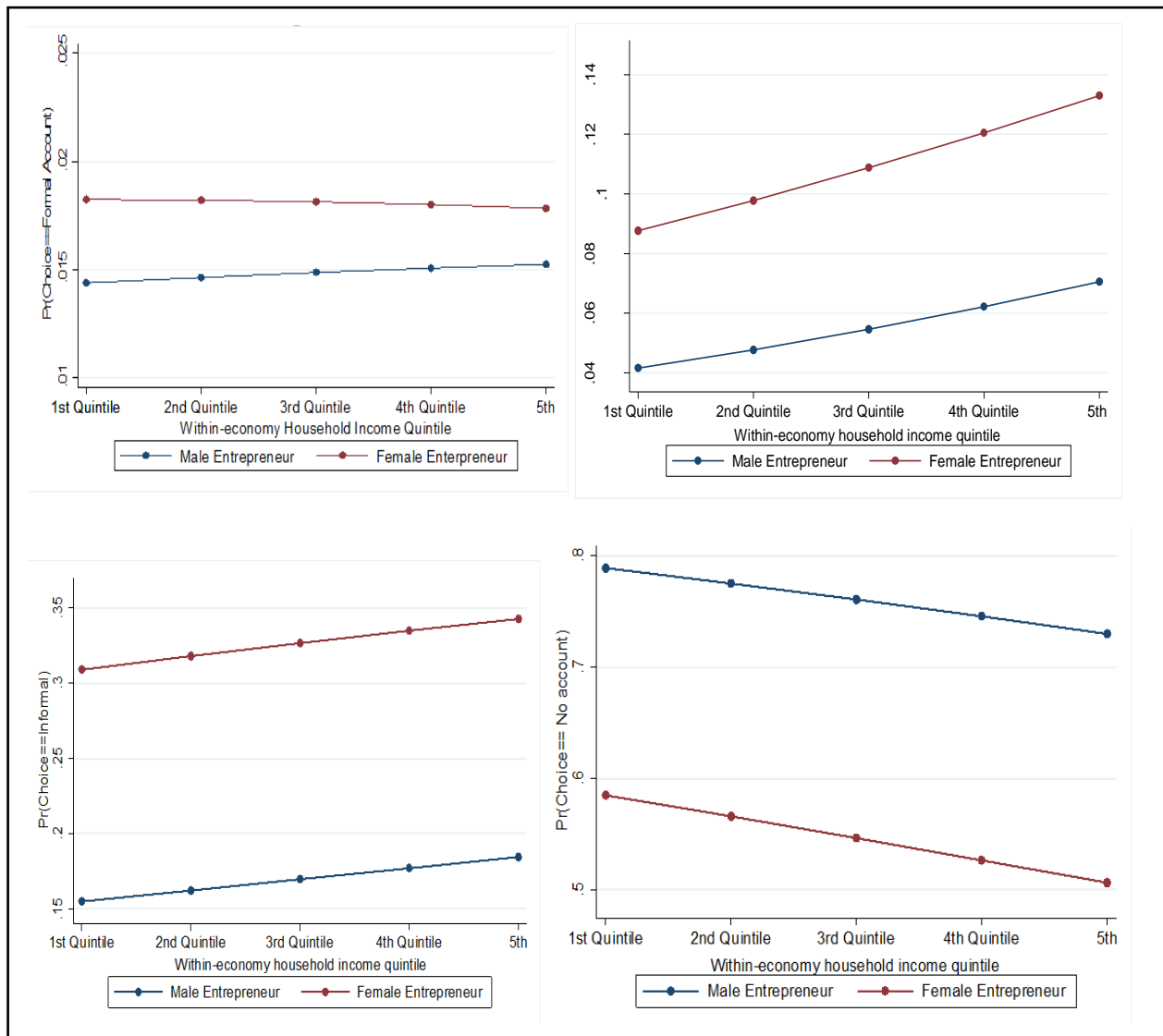
This study found out that, compared to their male counterparts, female entrepreneurs are more likely to choose a mobile banking account by 3.7 percent, and an informal banking account by 10.6 percent. They are also about 14.7 percent less likely to be unbanked. Further, the probability that a female entrepreneur chooses a mobile banking account increases, although at a decreasing rate, as she ages or her firm ages (Figure 6). Also, the probability that a female entrepreneur chooses a mobile banking platform increases at an increasing rate as her income increases (Figure 7). This shows that mobile banking holds great potential in improving access to financial services to female entrepreneurs, especially those in areas where the formal banking sector is largely nonexistent. These results are expected because women largely dominate the informal sector in Africa. According to CGAP (2014) mobile banks (branchless banks) charge fewer transaction costs than traditional banks. In addition, mobile banks are able to provide access to financial services to rural areas, which are in most cases inaccessible to traditional banks due to poor infrastructure. Mobile subscriptions across Africa is at an all-time high. In Ghana, about 16.4 percent of the population has access to mobile telecommunications (Osei-Assibey, 2009). These factors are making mobile banking a favorable option to rural Africa (Dunn 2015, Osei-Assibey, 2009).

Moreover, the probability that a female entrepreneur chooses an informal banking account decreases from 57 percent at 15 years to about 0 percent at 65 years (Figure 6). However, as income increases this probability increases but is under 20 percent even at the 5<sup>th</sup> income quintile. Similarly, the probability that female entrepreneurs choose no banking option decreases with age, and income (Figure 6 & 7). In Figure 6, the probability that a female entrepreneur chooses a formal banking account reduces from about 1.5 percent at age 15 to about 0 percent at age 65. This shows a strong disconnect between female entrepreneurs and the formal banking sector.

**Figure 6. Relationship between female entrepreneurs, their age, and choice of banking alternative**



**Figure 7. Relationship between female entrepreneurs, income quintile and choice of banking alternative**



#### 4. Conclusion

This study has shown that female entrepreneurs are more likely to choose mobile banking accounts than other alternatives, such as informal, formal and no banking. That is the mobile banking platform is the preferred option for female entrepreneurs in Africa. The next best alternative is informal banking accounts. It is believed that the reason for these results is that the poor infrastructure and a largely informal African economy have prevented traditional banks from providing financial services to the unbanked in Africa. The current mobile telecommunication revolution in Africa, which has allowed many on the continent to have access to mobile subscriptions, could provide a platform for traditional banks to innovate and introduce branchless banking platforms. The success story of M-Pesa, one of the most successful mobile banking platforms in the world, provides hope for improving financial inclusion in Africa.

Moreover, this study identified regular cash transactions, employment in the public sector, online transactions, income quintile, at least secondary education as important variables that could influence the choice of a banking account alternative. Other significant variables include no need for financial services, too expensive to own a formal account, lack of documentation to open a formal account, religious beliefs, a family member has a formal account, cannot open an account. These variables are obstacles to opening a formal account in Africa from the individual's perspective. Sub-regions, such as East Africa and South Africa, are significant in explaining the choice of banking alternatives, compared to West Africa.

The results of this study could help policymakers and other stakeholders interested in financial inclusion in Africa to design the right policies to help this cause. For instance, this study has shown that access to mobile banking accounts are quite important to female entrepreneurs in Africa. Educationally related policies directed towards female entrepreneurs in rural Africa regarding this technology could encourage more adoption of the technology. Once this is done, banks can innovate and use the mobile banking technology to access the largely unbanked rural population in Africa. This has the potential of improving financial inclusion in Africa which undoubtedly could have a positive effect on economic growth and development.

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