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An analysis of the factors affecting the financial inclusion in Côte d'Ivoire

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Abstract

The purpose of this study is to examine the drivers of the ownership and use of mobile accounts as compared to those of financial institution accounts in Côte d'Ivoire. In this perspective, individual level data from the Global Findex 2017 database were used to carry out simple probit and Heckman probit estimations. The results revealed that the ownership of mobile accounts is associated with determinants related to individuals in the least vulnerable strata of society (wealthier and more educated individuals and individuals in the labour force), while their use is associated with determinants related to individuals in the most vulnerable strata of society (women and individuals out of the labour force). On the other hand, the ownership and use of financial institution accounts are associated with the determinants related to individuals in the least vulnerable strata of society. Therefore, the delay between the financial institution accounts' penetration rate and that of mobile accounts in Côte d'Ivoire may be explained by the greater use of mobile accounts by individuals in the most vulnerable strata of society, which represent the large share of the unbanked.

Keywords: Financial inclusion; Mobile money; Formal banking services; Heckman probit; Côte d'Ivoire

JEL Classifications: C25; D14; D91; G21; G41; G51

Introduction

Since the seminal paper of Leyson and Thrift (1993), the access to finance has gained a paramount place in development programmes of many economies worldwide. In this dynamic, to raise account penetration rates, governments have developed various policies. Among these policies, we can cite the implementation of M-Pesa* in Kenya in 2007, which has boosted the big proliferation of mobile money services, particularly, in developing countries. Since then, mobile money represents an important means of development for governments in developing countries; unlike formal banking services, it allows a great number of the poor to have access to finance.

Within the West African Economic and Monetary Union (WAEMU), the state of Côte d'Ivoire registered in terms of mobile money accounts' penetration, the rates of almost 29% and 41% in 2014 and 2017, respectively. They correspond to an increase of 12 percentage points over this period 2014-2017. However, the formal bank account penetration rate over this period remained constant with an average rate of almost 20% (Global Findex, 2014 and 2017). These statistics unveil a large gap between mobile money account owners and financial institution account owners and that is in favour of mobile money account owners. Moreover, as mobile money is supposed to integrate a large share of the individuals without bank accounts in the financial system, one may want to know the profile of the users of the mobile money in Côte d'Ivoire. Do these mobile money users have a different profile compared to the users of financial institution accounts? Insofar as individuals who are voluntarily or automatically excluded from formal financial services may turn to less demanding financial services such as mobile money services, it is expected that potential users of mobile money accounts in Côte d'Ivoire will have different profile from those who use financial institution accounts. Thus, the following question arises: which social categories use mobile money in Côte d'Ivoire compared to the users of formal banking services?

This study aims to examine the factors that determine the holders and the users of mobile payment accounts as well as financial institution accounts in Côte d'Ivoire. In this, the following assumptions are tested:

H1: The large share of the holders and the users of mobile accounts belong to the most vulnerable strata of society;

H2: The large share of the holders and the users of financial institution accounts belong to the least vulnerable strata of society.

In order to verify the above assumptions, the Global Findex 2017 micro-level data were used to carry out simple probit and Heckman probit estimations. The results revealed that the penetration of mobile accounts is higher among individuals with higher levels of education, wealthier people and individuals in the labour force, while their use is higher among women and individuals out of the labour force. But, the greater ownership and use of the financial institution accounts are associated with the characteristics related to the least vulnerable strata of society (i.e, men, older, individuals with high levels of education and wealthier people).

Recently, numerous studies have addressed the issue of the determinants of financial inclusion through mobile money or formal banking services. One of these studies that compared the determinants of financial inclusion through mobile money and traditional banking services is that of Zins and Weill (2016). These authors considered a variable relating to the ownership of mobile accounts as financial inclusion indicator for the use of mobile money. Their study was applied to a sample of 37 African countries. However, this study carries out a comparative analysis of the factors determining the financial inclusion in terms of access to the mobile money and formal banking services considering the use of mobile money as financial inclusion indicator beside the ownership of mobile money accounts. Moreover, no such study has been carried out in the context of one country, namely Côte d'Ivoire.

The rest of the study is organized as follows: Literature review on financial institution and mobile financial services drivers; Research and Methodology; Results and discussion on ownership and use of accounts; and Conclusion.

* Mobile payment system where M stands for "mobile" and Pesa means "money" in Swahili (see Aron, 2017).

Literature Review

Drivers of financial institution services

Using different approaches, many authors have focused their research on identifying the factors that motivate the use of financial services. Based on the National Financial Access Survey of Kenya which reported in 2009 an exclusion of 60.4% of Kenyans from financial services, Mwangi and Sichei (2009) chose to identify the determinants of access to credit. To do this, the authors used multinomial probit models to conduct a comparative analysis using data from the 2006 and 2009 National Financial Access surveys. Their findings indicated that: increase in age, education and income tended to improve the probability of accessing credit, but that probability decreased as individuals drew close to retirement age. Likewise, as credit financial access has been argued to be the engine of sustainable rural development and a factor necessary for household food security and poverty reduction, Kiplimo et al. (2015) investigated the drivers of the smallholder farmers' access to credit financial services in Kenya. Using a logistic regression, they found that, the marginal effects of education level, occupation and access to extension services positively influence on access to credit financial services. However, total annual household income and the distance to the credit source negatively influence on access to credit financial services. In a similar way, Prabhakar et al. (2016) examined determinants of financial inclusion in considering the impact of bank account ownership and banking services' use in India. Using primary data from Union Territory of Pondicherry and the binary logistic regression model, they considered the ownership of bank account as dependent variable and income level, age, gender dimension, employment status and education level as independent variables. The results of their research revealed that income level and education have a significant impact on financial inclusion.

Furthermore, Asuming et al. (2019), in conducting a comparative analysis of financial inclusion in 31 Sub-Saharan African countries using data from the global Findex database, found that age, education, gender and wealth were significant factors affecting financial inclusion. Likewise, Rashdan and Eissa (2020), in examining the determinants of financial inclusion in Egypt, considered formal account, formal savings and formal credit as financial inclusion measures and used data from the Global Findex 2017 to perform a logistic regression. They found that being among richer, more educated and older individuals significantly influence the level of financial inclusion in Egypt. In the same vein, using the Tanzania FinScope survey of 2017 comprising a sample of 9,459 adults, Ndanshau and Njau (2021) investigated the demand side determinants of financial inclusion in Tanzania. Employing a probit model and using formal financial services as financial inclusion indicator, their study revealed that being a male, middle aged, living in urban areas, being formally employed, having more income and being more educated to a certain extent foster financial inclusion in Tanzania, with a higher influence of formal employment, income and education.

As many countries attach great importance to the promotion of an inclusive financial system in policy making, Njanike K (2019) sought to explore, in the context of Zimbabwe, the factors determining the openness of an account with a bank. The author used the 2014 Finscope Survey data to estimate probit models. The findings showed that individual characteristics such as location, age, gender, marital status, proof of residence, employment history and level of education influenced individuals' decision to open a bank account. Equally, taking into account the global interest devoted to financial inclusion due to the negative effect of financial exclusion in tackling the socio-economic problems like poverty, Mhlanga and Denhere (2020) examined the drivers of financial inclusion in South Africa. Considering bank account ownership as the proxy variable of financial inclusion, they used data from the South Africa 2018 General Household Survey (GHS) dataset to perform logit estimations. The study showed that the main determinants of financial inclusion are age, education, income, race, and marital status. However, a female is less likely to be financially included in South Africa. Similarly, Abel et al. (2018) evaluated the determinants of financial inclusion in Zimbabwe. Considering the ownership or usage of formal financial services as financial inclusion indicator, the authors used the logit model to investigate the determinants of financial inclusion. The study established that age, education, financial literacy, income, and internet connectivity are positively related to financial inclusion. On the other hand, the documentation required to open bank accounts and the distance to the nearest access point are negatively related to financial inclusion.

Drivers of mobile financial services

Nowadays, the mobile telephone is recognised as an instrument that simplify financial services and allow a large number of unbanked to access them. Therefore, to understand the factors that motivate the use of the mobile finance a growing number of authors studied the determinants of financial inclusion for the use of

mobile money. In this dynamic, based on the important role played by mobile payments in mobile business, Lin et al. (2020) used the theoretical frameworks of the Extend Unified Theory of Acceptance and Use of Technology and Diffusion of Innovation to discuss in which manner consumers' behavioural intention can be further influenced in Taiwan. Using Partial Least Squares to implement the data analysis, they found that factors such as social influence, facilitating conditions, hedonic motivation, compatibility, innovation, relative advantage, and observability had positive influence on the intention of consumers to use mobile payment.

In the same vein, as few studies addressed individuals' continuance to use mobile payment, especially as part of in an African country, Franque et al. (2021) investigated the continuous intention to use mobile finance. In this, they used the theoretical model of the DeLone and McLean Information System and that of the Expectation-Confirmation evaluated and validated through partial least squares and structural equation modelling to estimate data collected from 338 questionnaire items through an online survey. Their findings revealed that the main factors affecting the continuous intention to use mobile payment were the individual performance, the use, and the satisfaction. Likewise, in examining the factors affecting the continuous usage of mobile money services in Tanzania, Koloseni and Mandari (2017) used Structural Equation Modeling to analyse data from a total of 309 valid and reliable responses collected using questionnaires. Their findings depicted that perceived trust, attitude and perceived behavioural control had significant influence on continuance behavioural intention while perceived trust, satisfaction and continuance behavioural intention had significant influence on continuance usage behaviour. Also, in considering the fact that mobile payment is a new approach to carry out financial transactions easily using digital platforms, Nur and Panggabean (2021) analyzed the factors that affect the adoption of mobile payments as a procedure of payment that the generation interacting the most with internet uses. Based on the model of Extended Unified Theory of Acceptance and Use of Technology, 100 respondents of this generation from Jakarta and surrounding areas were sampled. The results provided by the Partial Least Square-Structural Equation Model showed that factors like performance expectancy, social influences, facilitating condition, perceived enjoyment, and trust significantly influenced the behavioural intention to use mobile payments to carry out transactions using internet. Moreover, based on the fact that mobile finance had continuously transformed the daily lives of people by making available to them interesting and advantageous services, Ismail et al. (2017) examined, in the context of the rural parts of Uganda, the factors determining the adoption of mobile money transfer services. To do so, using a cross sectional survey methodology, they collect data from 300 respondents from the rural parts of Kampala District. Their findings revealed that, with the exception of transaction costs, customer expectancy and social factors significantly influenced the behavioural intention to use mobile money transfer service.

Regarding the proliferation of the mobile payment services in Bangladesh in accordance with the development of information and communication technology and internet access, Rasheduzzaman et al. (2021) investigated the factors influencing electronic-commerce transactions through mobile finance. The authors gathered data from 240 users of mobile payment services from Mymensingh and Sylhet Districts to estimate multiple linear regression models. They found that age, education, income and residential area significantly influenced monthly electronic-commerce transaction over mobile finance. Furthermore, young people were more likely than older people to use mobile finance. More educated people transacted less money over mobile finance. Richer people and urbans transacted more money over mobile finance. Likewise, Akinyemi and Mushunje (2020) investigated the determinants of mobile money adoption in rural areas of Africa. On the basis of a two-part model analysis that involved in its first part the adoption of mobile finance and in its second part the amount of money sent or received using mobile finance, they used the Research ICT Africa dataset to perform their research estimations. The findings revealed that factors like age, education level in terms of years, unemployment, and bank account ownership significantly influence the adoption of mobile finance and the amount of money sent. On the other hand, age, bank account ownership, and net income per month significantly influence the adoption of mobile finance and the amount of money received.

Research and Methodology

Data

The study uses micro-level data relating to financial inclusion (the ownership and use of accounts) and individual characteristics such as gender, age, income, education, labour force, identity card ownership and mobile phone ownership.

The data are drawn from the 2017 Global Findex survey database. This database is created on the basis of interviews carried out over the year 2017 including close to 150,000 people in randomly selected 144 economies. In each of these economies, the survey included approximately 1,000 people. All samples were randomly selected, nationally representative and targeting the entire civilian, non-institutionalized population aged 15 and above.

Variables

As the study focuses on the understanding of the profile of the users of mobile money services compared to that of the users of formal banking services, five measures of financial inclusion relating to the adoption and use of these financial services were used.

The adoption is captured through the ownership of accounts: “Own a mobile account” is a dummy equal to 1 if respondent reported having a mobile account in the past 12 months and 0 otherwise, “Own a financial institution account” is a dummy equal to 1 if respondent reported having an account at a formal financial institution and 0 otherwise.

The use is captured by the services offered through each financial service. Concerning the mobile money services, the services selected are: “Sending remittances”, “Receiving remittances” and “Paying utility bills”. Concerning formal banking services, we have the services: “Savings” and “Borrowing”.

“Sending remittances” is a dummy equal to 1 if respondent sent money in the past 12 months using a mobile account and 0 otherwise. “Receiving remittances” is a dummy equal to 1 if respondent received money in the past 12 months via a mobile account and 0 otherwise. “Paying utility bills” is a dummy equal to 1 if respondent made regular payments for water, electricity, or trash collection in the past 12 months using a mobile account and 0 otherwise.

“Savings” refers to the respondents reported to have saved or put money aside in the past 12 months using an account at a financial institution. “Borrowing” refers to the respondents reported to have borrowed money in the past 12 months using an account at a financial institution.

Table 1 below shows that in Côte d'Ivoire, almost 41% of adults hold a mobile account, but only almost 20% of them hold a financial institution account. On average, close to 10% of the holders of financial institution accounts have saved money in the past 12 months using their account, while around 3% have got access to a loan. For the holders of mobile accounts, on average, close to 77% send money using their accounts and almost 74% receive money; while 45% pay utility bills. The varied statistics make it clear that in Côte d'Ivoire, a greater proportion of the holders of mobile accounts use their accounts unlike the holders of financial institution accounts.

Table 1: Descriptive statistics of financial inclusion measures

Variables	Observation	Mean	Standard dev.	Minimum	Maximum
Own a financial institution account	1,000	0.1960	0.3972	0	1
Own a mobile account	1,000	0.4090	0.4919	0	1
Savings	989	0.0950	0.2934	0	1
Borrowing	992	0.0323	0.1768	0	1
Sending remittances	393	0.7659	0.4240	0	1
Receiving remittances	414	0.7367	0.4409	0	1
Paying utility bills	278	0.4496	0.4984	0	1

Source: Author's calculations

The independent variables include the following individual characteristics: *Gender*, *Age*, *Age²*, *Income*, *Education*, *Labour force*, *Identity card* and *Mobile phone*. The variable *Gender* is a dummy variable that is equal to 1 if the respondent is a woman and zero if otherwise. The variable *Age* is the respondents' age in years. The variable *Age²* is the respondents' age in years, squared. This variable is used to control for a possible nonlinear relationship between age and dependent variables (see Zins and Weill, 2016).

Concerning the variable *Income*, four dummy variables are used (*second 20%*, *middle 20%*, *fourth 20%* and *richest 20%*). Each of them is equal to 1 if income is in the first income quintile and 0 if otherwise. The poorest quintile (*poorest 20%*) is considered as the omitted dummy variable. As part of the variable *Education*, one dummy variable is used (*Primary education*), and two dummy variables are considered as omitted (*Secondary education* and *Tertiary education*). *Primary education* is a dummy that is equal to 1 if the respondents have completed elementary education or less (up to 8 years of education) and 0 if otherwise. *Secondary education* is a dummy that is equal to 1 if the respondents have completed secondary education and beyond secondary education (9-15 years of education) and 0 if otherwise. *Tertiary education* is a dummy that is equal to 1 if the respondents have completed four years of education beyond high school and/or received a 4-year college degree and 0 if not.

Regarding the variable *Labour force*, one dummy variable was used as part of labour force variable (*In workforce*) and one dummy variable is considered as omitted variable (*Out of workforce*). *In workforce* is a dummy that is equal to 1 if the respondent is in the workforce and 0 if otherwise, while *Out of workforce* is a dummy that is equal to 1 if the respondent is out of the workforce and 0 if otherwise.

The variable *Identity card* is a dummy variable that is equal to 1 if the individual holds a national identity card and zero if otherwise. The variable *Mobile phone* is a dummy variable that is equal to 1 if the individual holds a mobile phone and zero if otherwise.

Summary statistics of independent variables are presented in Table 2 below. The average age of 45% of the respondents in the sample of Côte d'Ivoire is around 33. Among these respondents, on average, almost 58%, 41% and 1% have attained primary, secondary and tertiary education, respectively. The income quintile indicates that, on average, close to 27%, 20%, 19%, 18% and 16% of the respondents are in the richest 20%, fourth 20%, middle 20%, second 20% and the poorest 20% income quintiles, respectively. The labour force variable shows that 68% of the respondents are in the workforce, while 32% of them are out of the workforce. Furthermore, on average, close to 73% of the respondents own a national identity card and around 83% of them own a mobile phone.

Table 2: The summary statistics of the explanatory variables

Variable	Observation	Mean	Standard deviation	Minimum	Maximum
Female	1,000	0.3150	0.4647	0	1
Age	994	33.4427	13.2279	15	83
(Age) ²	994	1,293.2130	1,069.3890	225	6,889
Education (primary)	998	0.5822	0.4935	0	1
Education (secondary)	998	0.4068	0.4915	0	1
Education (tertiary)	998	0.0110	0.1045	0	1
Income (richest 20%)	1,000	0.2710	0.4447	0	1
Income (fourth 20%)	1,000	0.2040	0.4032	0	1
Income (middle 20%)	1,000	0.1880	0.3909	0	1
Income(second 20%)	1,000	0.1760	0.3810	0	1
Income(poorest 20%)	1,000	0.1610	0.3677	0	1
In workforce	1,000	0.6820	0.4659	0	1
Out of workforce	1,000	0.3180	0.4659	0	1
Identity card	997	0.7272	0.4456	0	1
Mobile phone	998	0.8327	0.3735	0	1

Source: Author's calculations.

Table 3 below provides the statistics on accounts' penetration rates by individual characteristics. It is observed for the respondents reported having a mobile account a proportion of almost 74% for men versus a proportion of almost 26% for women; while these proportions were around 78% versus 22% for the respondents reported having a financial institution account. These statistics reveal that the greater proportions of the account holders (mobile money accounts or financial institution accounts) are men. However, the proportion of men owning a financial institution account is greater than that of men holding a mobile account; while the proportion of women owning a mobile account is greater than that of women having a financial institution account.

Among both the holders of mobile accounts and the holders of financial institution accounts, those recording at least secondary and higher education levels are almost 58%, while those recording at least a primary education level are almost 42%. Then, considering either formal banking or mobile money, the greater proportions of the account holders are among the more educated people rather than among the less educated people.

Among the holders of mobile accounts, when considering the highest income quintiles, that is to say, the richest 20% and the fourth 20%, the account holders are almost 57%, but this proportion is almost 43% within the lowest income quintiles, that is to say, the middle 20%, the second 20% and the poorest 20%. These proportions are almost 64% versus 36% among the holders of financial institution accounts. Thus, as part of account ownership in the two contexts (mobile money banking and formal banking), the greater proportions of account holders are in the highest income quintiles. Following that, the proportion of people in the highest income quintiles and holding financial institution accounts is greater than that of people in the highest income quintiles and holding mobile accounts. By analogy, the proportion of individuals in the lowest income quintiles and having mobile accounts is greater than that of individuals in these income quintiles and having financial institution accounts.

Among mobile account holders, the respondents aged between 25 and 64 are almost 75% and those aged between 15 and 24 are almost 23%; while these proportions are almost 86% and almost 11% among financial institution account holders. Therefore, the proportion of the working-age group individuals (respondents aged between 25 and 64) that subscribe to financial institution accounts is greater than the proportion of the working-age group individuals that subscribe to mobile accounts. Consequently, the proportion of younger people (respondents aged between 15 and 24) that subscribes to mobile money accounts is greater than that of younger people that subscribe to financial institution accounts.

The proportion of individuals with mobile accounts and being in the workforce is almost 79% and that of those out of the workforce is almost 21%; while among the holders of financial institution accounts, this proportion is around 76% for those in the workforce and almost 24% for those out of the workforce. Thus, the proportion of individuals in the workforce and subscribing to mobile money accounts is greater than the proportion of individuals in the workforce and who subscribe to financial institution accounts. By analogy, the proportion of individuals out of the workforce and who subscribe to financial institution accounts is greater than that of the individuals who are out of the workforce and who subscribe to mobile money accounts.

Table 3: Descriptive statistics of the penetration rates of accounts by individual characteristics

		Own a mobile account	Own a financial institution account
The penetration rates of the accounts	Yes	40.9000%	19.6000%
	No	59.1000%	80.4000%
Gender	Male	74.3300%	78.0600%
	Female	25.6700%	21.9400%
Education levels	Education (primary)	42.0500%	42.3500%
	Education (secondary)	55.9900%	54.5900%
	Education (tertiary)	1.9600%	3.0600%
Income quintiles	Richest 20%	35.9400%	41.3300%
	Fourth 20%	20.7800%	22.9600%
	Middle 20%	18.0900%	15.8200%
	Second 20%	14.1800%	10.2000%
	Poorest 20%	11.0000%	9.6900%
Age	15-24 years	22.5500%	11.2200%
	25-64 years	75.2500%	86.2200%
	65-85 years	2.2100%	2.5500%
Labour force	In workforce	78.9700%	76.0200%
	Out of workforce	21.0300%	23.9800%
Identity card	Yes	81.3300%	88.7800%
	No	18.6700%	11.2200%
Mobile phone	Yes	95.5900%	
	No	4.4100%	

Source: Author's calculations

Econometric model

Due to the fact that deciding to hold an account is in line with a binary choice, a simple probit model was employed to identify the drivers of account ownership. The econometric model considered is:

$$y_j = \alpha_1 Gender_j + \alpha_2 Age_j + \alpha_3 Age_j^2 + \alpha_4 Education_j + \alpha_5 Income_j + \alpha_6 Inworkforce_j + \alpha_7 Identitycard_j + \alpha_8 Mobilephone_j + v_j, \quad (1)$$

In the above equation each financial inclusion measure is represented by y_j for an individual j (own a mobile account or own a financial institution account). The parameters to be estimates are $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7$, and α_8 and v_j is the error term. This term is normally distributed with zero mean and a variance equal to 1.

Since an individual uses a mobile money service or a formal banking service only if he/she holds a mobile money account or a financial institution account, the model considered to analyse the state of the use of accounts is based on the Heckman probit model with sample selection redesigned by Van de Ven and Van Pragg (1981). This Heckman probit model allows estimation of probit models with tests and controls for sample selection bias (Pastore, 2012).

The theoretical specification of the Heckman probit model provided by Van de Ven and Van Pragg (1981) is as follows:

$$\text{The selection equation} \quad \begin{cases} z_j^* = (w_j \alpha + \mu_j > 0) \\ z_j = 0 \text{ if } z_j^* \leq 0 \\ z_j = 1 \text{ if } z_j^* > 0 \\ \mu \sim N(0,1) \end{cases}, \quad (2)$$

$$\text{The probit equation} \quad \begin{cases} y_j^* = (x_j \alpha + \varepsilon_j > 0) \\ y_j = y_j^* \text{ if } z_j = 1 \\ y_j \text{ not observed if } z_j = 0 \\ \varepsilon \sim N(0,1) \end{cases}, \quad (3)$$

Where $\text{corr}(\mu_1, \mu_2) = \rho$; when $\rho \neq 0$, this means that the error terms are correlated, therefore the probit model will produce biased results.

The empirical specification of the model is:

Outcome equation:

$$y_j = \alpha_1 \text{Gender}_j + \alpha_2 \text{Age}_j + \alpha_3 \text{Age}_j^2 + \alpha_4 \text{Education}_j + \alpha_5 \text{Income}_j + \alpha_6 \text{Inworkforce}_j + \varepsilon_j, \quad (4)$$

Selection equation:

$$z_j = \alpha_1 \text{Gender}_j + \alpha_2 \text{Age}_j + \alpha_3 \text{Age}_j^2 + \alpha_4 \text{Education}_j + \alpha_5 \text{Income}_j + \alpha_6 \text{Inworkforce}_j + \alpha_7 \text{Identitycard}_j + \alpha_8 \text{Mobilephone}_j + \mu_j, \quad (5)$$

In the above equations, ε_j and μ_j represent the error terms. Each of these terms is normally distributed with zero mean and a variance that is equal to 1. The financial inclusion measures (dependent variables) are represented by y_j and z_j . z_j represents the ownership of accounts (own a mobile account and own a financial institution account) and y_j represents the different usages of accounts (send money, receive money, pay bills, savings and borrowing). $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7$, and α_8 are parameters to be estimated.

For more robust identification the variables “Identity card” and “Mobile phone” are included as exclusion restrictions in the selection equation to the extent that these variables influence more the ownership of accounts than the usages of the services they offer.

Results and Discussion

The ownership of accounts

Table 4 presents the probit estimations results of the characteristics determining the ownership of accounts in Côte d'Ivoire. The probability of having a mobile money account and that of having a financial institution account are registered in this table. The table shows in each cell of each column the coefficients of the estimations, the standard robust errors and the marginal effects. The significant estimated Wald chi-square of 154.75 and 76.20 in column 1 and column 2, respectively confirms that our model is statistically significant, that is, it fits significantly better than a model with no predictors.

Table 4: Determinants of the ownership of mobile money and financial institution accounts

Dependent variables	Own a mobile account	Own a financial institution account
Explanatory variables	(1)	(2)
Female	-0.0473 (0.0974) <i>-0.0157</i>	-0.2403** (0.1112) <i>-0.0597</i>
Age	0.0038 (0.0185) <i>0.0013</i>	0.0844* (0.0227) <i>0.0210</i>
Age squared	-0.0000 (0.0002) <i>-0.0000</i>	-0.0009* (0.0003) <i>-0.0002</i>
Education (primary)	-0.5373* (0.0941) <i>-0.1787</i>	-0.4153* (0.1053) <i>-0.1031</i>
Income (richest 20%)	0.4550* (0.1418) <i>0.1513</i>	0.4623* (0.1664) <i>0.1148</i>
Income (fourth 20%)	0.2633*** (0.1498) <i>0.0876</i>	0.2866 (0.1745) <i>0.0712</i>
Income (middle 20%)	0.2142 (0.1514) <i>0.0712</i>	0.1025 (0.1839) <i>0.0254</i>
Income (second 20%)	0.1445 (0.1549) <i>0.0481</i>	-0.0864 (0.1919) <i>-0.0214</i>
In workforce	0.3835* (0.0986) <i>0.1275</i>	0.1184 (0.1085) <i>0.0294</i>
Identity Card	0.3665* (0.1131) <i>0.1219</i>	0.4041* (0.1361) <i>0.1003</i>
Mobile phone	0.8742* (0.1473) <i>0.2907</i>	
Constant	-1.5764* (0.3566)	-2.9020* (0.4646)
Observations	987	989
Log pseudo-likelihood	-576.5280	-436.9774
Pseudo R ²	0.1372	0.1125
Wald Chi2	154.75*	76.20*

Note: *, ** and *** denote statistical significance threshold at the 10%, 5%, and 1%, respectively. (1) and (2) represent column numbers. The estimation results of the regression of the ownership of the mobile money account and that of the financial institution account on the set of individual characteristics are presented in columns (1) and (2), respectively. In each cell are presented the coefficient of the estimation, the robust standard errors in parentheses, and the marginal effects in italics.

Regarding gender, it was observed a negative non-significant association between the female variable and the ownership of a mobile money account (column 1), but a negative significant association is observed between this variable and the ownership of a financial institution account (column 2). Thus, the gender influences the ownership of financial institution accounts, but not the ownership of mobile money accounts. In this perspective, women are less likely than men to own financial institution accounts. According to the results, the probability of owning a financial institution account is almost 6 percentage points lower for women than for men.

In column (1) a non-significant association is shown between the age variable and the ownership of a mobile account, but in column (2) it presented a positive significant association with the ownership of a financial

institution account. Therefore, the likelihood of holding a financial institution account increases with age, while owning of a mobile account is not influenced by age.

The education variable showed significant association with the likelihood of owning a mobile account (column 1) and that of owning a financial institution account (column 2). But this association is negative. Thus, less educated people in Côte d'Ivoire are less likely to own an account, either financial institution account or mobile money account. It is observed that the probability that someone hold a mobile money account was almost 18 percentage points lower for less educated people than for the more educated ones, while that of holding a financial institution account was 10 percentage points lower.

In columns (1) and (2) a significantly positive association is noted for the probability of holding a mobile account and that of holding a financial institution account, respectively, as part of the richest income quintiles compared to the lowest income quintiles. These findings reveal that richer people are more likely to own accounts in Côte d'Ivoire, either financial institution accounts or mobile money accounts. According to the results, the probability of having a mobile account was almost 15 percentage points higher for wealthier individuals than for poorer people (column 1), while the probability of holding a financial institution account was almost 11 percentage points higher for wealthier individuals than for poorer people (column 2).

Considering the labour force, a significantly positive association was noted with the probability of owning a mobile account (column 1), but a non-significant association was noted with the probability of owning a financial institution account (column 2). Thus, owning a mobile account significantly increases for individuals in workforce than for individuals out of workforce in Côte d'Ivoire. The results confirmed that the probability of holding a mobile account was around 13 percentage points higher for individuals in the workforce than for those out of the workforce (column 1).

Regarding the national identity card variable, it was observed that the probability of owning a mobile account (column 1) and the one of owning a financial institution account (column 2) increase with the possession of a national identity card. Therefore, individuals with a national identity card are more likely to subscribe to an account than individuals without national identity card. This is because to be secured from cyber criminality, the government of Côte d'Ivoire imposed the delivery of mobile phone smart cards only on presentation of a national identity card. For similar reason of security, traditional commercial banks require the information on national identity cards as a pre-condition before the opening of accounts.

In column (1), a significantly positive association is noted between the mobile phone variable and the ownership of a mobile account. This is obvious, even if an individual may use the mobile phone of someone else (i.e, a relative, a friend, etc.), most of the subscribers to mobile money accounts use their own mobile phones.

To sum it up, in Côte d'Ivoire, the probability of holding a mobile account is higher for wealthier and more educated individuals and individuals in the workforce, while the probability of holding a financial institution account is higher for wealthier, older and more educated individuals.

The use of accounts

Tables 5 and 6 present the Heckman probit estimations of the link between the measures of financial inclusion (account use) and the explanatory variables (individual characteristics). The table reports coefficients of estimations and marginal effects.

The Wald chi-square tests are statistically significant in Tables 5 and 6. Thus, they indicate that the null hypothesis stating that all variables can be jointly excluded can be rejected and confirm that the models are statistically significant, that is, they fit significantly better than a model with no predictors.

The Wald tests of independence between equations are not significant in all the regressions in Table 6 and in the regression with the financial inclusion measure "paying utility bills" in Table 5. These outcomes of the Wald test confirm that the null hypothesis of no correlation between the error terms of the outcome equations and the selection equations is rejected. But in Table 5, the Wald tests of independence between the equations are significant in the regressions with "sending remittances" and "receiving remittances" as financial inclusion measures. This confirms the presence of a selection bias in observations. The use of the Heckman probit model in this study is justified and it contributes to the correction of this selection bias.

Table 5: Main factors determining the use of mobile accounts

Dependent variables	Sending remittances			Receiving remittances			Paying utility bills		
Explanatory variables	Coef errors)	(Std	Marginal effect	Coef errors)	(Std	Marginal effect	Coef errors)	(Std	Marginal effect
<i>Outcome equation</i>	(1)	(2)	(3)	(4)	(5)	(6)			
Female	(0.2276 (0.2396)	0.0161	0.2495 (0.2609)	0.0150	0.5876** (0.2408)	0.0940			
Age	-0.0657*** (0.0392)	-0.0047	-0.0030 (0.0371)	-0.0002	-0.0137 (0.0374)	-0.0022			
Age squared	0.0008*** (0.0005)	0.0001	-0.0002 (0.0004)	0.0000	0.0000 (0.0005)	0.0000			
Education (primary)	0.2651 (0.1989)	0.0188	0.2077 (0.2497)	0.0125	0.1251 (0.2768)	0.0200			
Income (richest 20%)	0.3737 (0.3063)	0.0265	-0.2588 (0.3066)	-0.0156	-0.3923 (0.3909)	-0.0628			
Income (fourth 20%)	0.3819 (0.3253)	0.0270	-0.1861 (0.3062)	-0.0112	-0.3988 (0.3536)	-0.0638			
Income (middle 20%)	0.2106 (0.3152)	0.0149	0.4203 (0.4410)	0.0253	-0.3310 (0.3923)	-0.0530			
Income (second 20%)	0.0205 (0.3246)	0.0014	-0.3195 (0.3678)	-0.0192	-0.0560 (0.4143)	-0.0090			
In workforce	-0.4419*** (0.2453)	-0.0313	0.0390 (0.2188)	0.0023	-0.2244 (0.2058)	-0.0359			
Constant	2.9357* (0.7346)		2.1894* (0.7384)		1.9958** (0.8065)				
<i>Selection equation</i>									
Female	-0.1373 (0.1161)	-0.0382	0.0302 (0.1099)	0.0088	-0.3804* (0.1442)	-0.0851			
Age	0.0285 (0.0235)	0.0079	-0.0258 (0.0210)	-0.0076	0.0304 (0.0258)	0.0068			
Age squared	-0.0003 (0.0003)	-0.0001	0.0003 (0.0003)	0.0001	-0.0003 (0.0003)	-0.0001			
Education (primary)	-0.6629* (0.1088)	-0.1843	-0.5814* (0.1069)	-0.1704	-0.6522* (0.1267)	-0.1458			
Income (richest 20%)	0.6442* (0.1745)	0.1791	0.4310* (0.1621)	0.1264	0.7465* (0.2000)	0.1669			
Income (fourth 20%)	0.4919* (0.1854)	0.1367	0.2986*** (0.1696)	0.0876	0.2261 (0.2178)	0.0506			
Income (middle 20%)	0.3212*** (0.1938)	0.0893	0.2168 (0.1712)	0.0636	0.4254** (0.2151)	0.0951			
Income (second 20%)	0.2327 (0.1948)	0.0647	0.0339 (0.1835)	0.0099	0.0290 (0.2388)	0.0065			
In workforce	0.5235* (0.1212)	0.1455	0.2969* (0.1117)	0.0871	0.3224** (0.1404)	0.0721			
Identity card	0.4175* (0.1306)	0.1161	0.4322* (0.1293)	0.1267	0.4994** (0.2052)	0.1117			
Mobile phone	0.8233* (0.1749)	0.2289	0.9603* (0.1801)	0.2815	1.1743* (0.2515)	0.2626			
Constant	-2.5531* (0.4630)		-1.4119* (0.4085)		-3.0506* (0.4908)	-0.0851			
Observations	822		821		735				
Censored	582		582		582				
Uncensored	240		239		153				
Wald chi2	17.95**		14.78***		16.77***				
Wald test (rho = 0):	5.78**		3.11***		1.95				
Log pseudo-likelihood	-479.4348		-488.0657		-385.0281				

Note: ***, **, * denote 1%, 5% and 10% levels of significance respectively. (1), (2), (3), (4), (5) and (6) represent column numbers. In parentheses, we have the robust standard errors. The numbered columns (1), (3) and (5) provide the estimation results of the financial inclusion indicators of on the set of explanatory variables, while the columns (2), (4)

and (6) present the marginal effects. The financial inclusion indicators are: *Sending remittances* that refers to respondents who sent money in the past 12 months using a mobile money account, *Receiving remittances* that refers to respondents who reported having received money in the past 12 months via a mobile money account, *Paying utility bills* that refers to respondents who reported having made regular payments for water, electricity, or trash collection in the past 12 months using a mobile money account. The variables "*National identity card*" and "*Mobile phone*" are included as exclusion restrictions in the selection equation to the extent that these variables influence more the ownership of accounts than the usages of the services they offer.

Table 6: Main factors determining the use of financial institution accounts

Dependent variables	Savings		Borrowing	
Explanatory variables	Coef (Std errors)	Marginal effect	Coef (Std errors)	Marginal effect
<i>Outcome equation</i>	(1)	(2)	(3)	(4)
Female	-0.4394*** (0.2412)	-0.1186	-0.0912 (0.3024)	-0.0278
Age	0.0354 (0.0677)	0.0095	-0.1384* (0.0386)	-0.0423
Age squared	-0.0004 (0.0007)	-0.0001	0.0017* (0.0005)	0.0005
Education (primary)	-0.4372 (0.2851)	-0.1180	0.0384 (0.3040)	0.0117
Income (richest 20%)	1.2482* (0.4059)	0.3369	-0.1541 (0.2948)	-0.0470
Income (fourth 20%)	1.1679* (0.4166)	0.3153	0.0145 (0.3009)	0.0044
Income (middle 20%)	0.9273** (0.4450)	0.2503	0.0054 (0.3301)	0.0016
Income (second 20%)	0.5818 (0.4865)	0.1571	-5.4425** (2.4337)	-1.6611
In workforce	-0.2950 (0.2506)	-0.0796	-0.1200 (0.2126)	-0.0366
Constant	-1.8333 (2.2074)		2.7521** (1.0922)	
<i>Selection equation</i>				
Female	-0.2498** (0.1118)	-0.0618	-0.2571** (0.1114)	-0.0636
Age	0.0831* (0.0226)	0.0206	0.0864* (0.0229)	0.0214
Age squared	-0.0009* (0.0003)	-0.0002	-0.0009* (0.0003)	-0.0002
Education (primary)	-0.4010* (0.1053)	-0.0992	-0.4164* (0.1055)	-0.1030
Income (richest 20%)	0.4610* (0.1662)	0.1141	0.4546* (0.1658)	0.1125
Income (fourth 20%)	0.2888*** (0.1741)	0.0715	0.2806 (0.1740)	0.0694
Income (middle 20%)	0.0870 (0.1844)	0.0215	0.0785 (0.1846)	0.0194
Income (second 20%)	-0.0852 (0.1916)	-0.0211	-0.0894 (0.1918)	-0.0221
In workforce	0.1267 (0.1089)	0.0314	0.1115 (0.1083)	0.0276
Identity card	0.4005* (0.1378)	0.0991	0.4085* (0.1319)	0.1011
Constant	-2.8848* (0.4626)		-2.9156* (0.4680)	
Observations	987		988	
Censored	793		793	
Uncensored	194		195	
Wald chi2	23.58*		36.73*	
Wald test (rho = 0):	0.12		1.98	
Log pseudo-likelihood	-554.7154		-501.7880	

Note: ***, **, * denote 1%, 5% and 10% levels of significance respectively. (1), (2), (3) and (4) represent column numbers. In parentheses we have the robust standard errors. The numbered columns (1) and (3) provide the estimation results of the financial inclusion indicators on the set of explanatory variables, while the columns (2) and (4) present the marginal effects. The financial inclusion indicators are: *Savings* that refers to the respondents reported to have saved or put money aside in the past 12 months using an account at a financial institution, *Borrowing* that refers to the respondents reported to have borrowed money in the past 12 months using an account at a financial institution. The variable "*National identity card*" is included as exclusion restriction in the selection equation to the extent that this variable influences more the ownership of financial institution accounts than the usages of the services they offer.

Table 5 provides the estimations for the probability of sending money, receiving money and paying utility bills using a mobile account in columns (1), (3) and (5), respectively. Table 6 provides the estimations for the probability of saving and borrowing through a financial institution account in columns (1) and (2), respectively.

In Table 5, a positive association is noted between the financial inclusion variables and the female variable. But in Table 6, a negative association is observed between this variable and the financial inclusion variables (savings and borrowing). In Table 5, only the coefficient of the link between the female variable and the financial inclusion variable "paying bills" is statistically significant (column 5). This indicates that the likelihood of using mobile accounts increases for women as compared to men. The marginal effect indicates that the probability of paying utility bills using a mobile account is almost 9 percentage points higher for women than for men. This result may be explained by the fact that the main payments made through the mobile money concern household activities such as payment of electricity, water, goods etc. In Table 6, only the coefficient of the link between the female variable and the financial inclusion variable "savings" is statistically significant (column 1). Therefore, the likelihood of using a financial institution account decreases for women as compared to men. Mhlanga and Denhere (2020) found a similar result in South Africa which showed that being female reduces the chances of people being financially included. The marginal effect shows that the likelihood of saving through an account at a financial institution is almost 12 percentage points higher for men than for women. This result may be explained by the fact that in Côte d'Ivoire like in many sub-Saharan African countries men represent the great share of individuals that are employed in formal sector where employers recommend the subscriptions to formal bank accounts as a norm.

In Table 5 a negative significant association is observed between the age variable and the financial inclusion variable "sending remittances" (column 1). Similarly, in Table 6 a negative significant association is noted between the age variable and the financial inclusion variable "borrowing" (column 3). Thus, both the likelihood of using a mobile money and the likelihood of using financial institution accounts decrease with age.

In Table 5 a negative significant association is noted between the labour force variable and the financial inclusion variable "sending remittances" in column (1). This revealed that the likelihood of using mobile money to send remittances decreases among the people in workforce as compared to their counterparts out of workforce. The marginal effect indicates that the likelihood of sending remittances using a mobile account is almost 3 percentage points lower for the individuals in the labour force than for those out of the labour force. This outcome could be explained by the provision of mobile banking accounts[†] by commercial banks. Indeed, as a great share of individuals in the workforce may possess financial institution accounts and as mobile banking accounts are already linked to their accounts, automatically their usage of mobile money reduces.

In Table 6 (column 1), there is a positive significant association between the income quintile variable and the financial inclusion indicator "savings". Therefore, the likelihood of using financial institution accounts increases among richer people. The marginal effect indicates that the likelihood of saving through an account at a financial institution is almost 34 percentage points higher for wealthier individuals than for poorer people. Indeed, as richer people are part of the least vulnerable segments of the population a great share of this population is able to save after their monthly expenditures for various reasons as their income increases. On the other hand, as poorer people belong to the most vulnerable segments of the population only a small number of them can save a part of their income after their monthly expenditures.

[†] Unlike mobile money, mobile banking is a mobile financial service provided by banks to their clients to access their bank account and to carry out transactions such as money transfer, balance verification, payment of bills, and make specific requests (see Aron, 2017).

In conclusion, the finding revealed that the ownership of mobile accounts is higher among wealthier and more educated individuals and individuals in the workforce, while their use is higher among women and individuals out of the workforce. On the other hand, owning financial institution accounts is higher among men, older, wealthier and more educated people, while their use is higher among men and wealthier people.

The determinants of being financially included through formal financial services, except gender, are in line with the finding of Rashdan and Eissa (2020) in Egypt. The determinants of owning mobile accounts relating to richer and more educated people are in line with the finding of Rasheduzzaman et al. (2021) in Bangladesh and those of Akinyemi and Mushunje (2020) in rural Africa. When considering the ownership of accounts, the results of this study are in line with the findings of Zins and Weill (2016). Indeed, in their research, they considered the ownership of mobile money account as a financial inclusion indicator through mobile money banking. But, they did not consider the use of the mobile money account. Therefore, when considering the use of the mobile money account, the results of our study partly contradict their conclusion stating that the same factors determine mobile money and traditional banking in Africa.

Conclusions

Among the member countries of the West African Economic and Monetary Union (WAEMU), Côte d'Ivoire has been, according to the Global Findex 2014 and 2017 databases, the one with the highest mobile accounts' penetration rates over the period 2014-2017. Nevertheless, the financial institution account penetration rate in this country remained constant over this period. This study attempted to understand whether the users of mobile money accounts are different from the users of financial institution accounts in Côte d'Ivoire. In this perspective, probit and Heckman probit estimations are carried out with data from the Global Findex 2017 database. The results showed that the penetration of mobile accounts is higher among more educated and wealthier individuals and individuals in the workforce, while their use is higher among women and individuals out of the workforce. However, the penetration of financial institution accounts is higher among men, older, more educated and wealthier individuals and their use is higher among men and wealthier individuals. Thus, although the penetration of the accounts and the use of the financial institution accounts are higher among the least vulnerable strata of society, the use of mobile accounts is higher among the most vulnerable strata of society. Therefore, the greater use of mobile accounts by the most vulnerable strata of society that represent the large share of the unbanked may be the reason why the mobile accounts' penetration rate is higher than that of financial institution accounts in Côte d'Ivoire. The results imply that there is need to intensify the awareness programmes towards the use of financial institution services.

To favour a greater financial inclusion in Côte d'Ivoire, actions aiming at raising within-income levels should be put in place by the government. This could be done through tax incentives to corporates employing large shares of the unbanked on conditions that they operate wages increases. The active persons should be taught about the advantages of formal finance through financial literacy campaigns proposed by commercial banks. The achievement of higher levels of education should be encouraged through tax reductions or provision of subsidies to private high schools and private higher education schools on conditions that they operate reductions in school fees. Mobile money providers should intensify near the most vulnerable segments of the population, especially women, stay-at-home moms, retirees, and students, mobile money awareness programmes incorporating mobile payment products that incite them to integrate the financial sector.

Since the results in this study revealed that the use of accounts depends on the social categories, a limitation is that these results do not inform us if this situation may change or not with the per capita income level of a country. In this perspective, further study could carry out a similar comparative analysis using cross-sectional data including countries selected according to the income level classification.

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