



# Who uses mobile money, and what factors affect its adoption process? Evidence from smallholder households in Cote d'Ivoire

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## Abstract

Who uses mobile money, and what factors affect its adoption process? This study analyzes mobile money adoption process among smallholder households in Côte d'Ivoire using the Consultative Group to Assist the Poor (CGAP) Smallholder Household Survey 2016. Based on the hypothesis that mobile money adoption process goes through five steps, a sequential logit model is estimated to identify factors affecting each step of the process. Overall, the findings show that mobile money users are in majority male, in urban area, more educated, belong to social network, and have bank or microfinance account. Adoption process is affected by demographic factors such as age, sex and marital status; social interaction variables including membership in agricultural cooperative, belonging to saving and credit group, and institutional variables such as the level of education and being clients of banks or microfinance. In all the steps, educated and those having bank account are more likely to go far in the adoption process. Women are disadvantaged, however once adopted, they are more likely to trust the mobile money services more than men. Policies that promote adoption of mobile money services in rural area, encourage women adoption, and participation in social interactions networks are key to improve access to financial services among smallholder households in Côte d'Ivoire.

**Keywords** Adoption · Mobile money · Sequential logit model · Smallholder households · Côte d'Ivoire

**JEL Classification** D1 · C25 · O12

## Introduction

Financial inclusion remains a big challenge for low income population, especially in Sub-Saharan African countries where only 43% and 33% of individual over 15 years old have bank and financial institution accounts, respectively (Global Findex, 2017). This low level of financial inclusion and the proliferation of mobile phone and internet users have led to the development of several innovative channels (online banking, m-banking, mobile money, among others) in order to improve access to financial services among

low income populations (Shankar and Jebarajakirthy, 2019; Shankar et al., 2020, 2021; Jebarajakirthy and Shankar, 2021). These channels are developed to meet consumers' expectations and maintain a competitive advantage (Shankar et al., 2020). Among all these new services, mobile money has emerged as the most efficient channel reaching all people even in remote area. Mobile money services include withdrawal, saving, remittance delivery, and payment of bills. Mobile money adopters are not just technology users; they are also a part of social network consisting of friends and family members (Rakhi and Mala, 2013; Riquelme and Rios, 2010; Okello et al., 2018); they trust the telecom companies (Tobbin and Kuwornu, 2011; Malaquias and Hwang, 2016; Okello and Ntayi, 2019) and they have cultural norms (Singh et al. 2010; Okello and Munene, 2019). All these variables have a positive effect on the relationship between mobile money and financial inclusion (Okello et al., 2018; Okello and Munene, 2019; Okello and Ntayi, 2019).

The launch of digital technology such as Mobile Money Services in several Sub-Saharan African countries has

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boosted access to financial services among low-income earners (Mbiti and Weil, 2011; Okello et al., 2018; Okello and Ntayi, 2020). Beyond improving access to financial services, other studies (Jack and Suri, 2014; Kikulwe et al., 2014; Aker et al., 2016; Murendo and Wollni, 2016; Sekabira and Qaim, 2017; Afawubo et al., 2019) have indicated that the use of mobile money contributes to enhance the populations living conditions. In a study by Kikulwe et al. (2014), they found that remittances received from relatives and friends are an important pathway through which mobile money contributes to improve living standards in Kenya. Such remittances help to reduce risk and liquidity constraints and contribute to income directly. Among smallholders' farmers in Kenya, Kikulwe et al. (2014) found that mobile money users applied more purchased farm inputs, marketed a greater proportion of their output, and realized higher profits than non-users. In Niger, Aker et al. (2016) have shown that food diversity was higher among households receiving mobile transfers. A study by Afawubo et al. (2019) in Togo concluded that mobile money users are less vulnerable to economic shocks such as drought, irregular rain, soil degradation, erosion and fertility reduction and to high prices of agricultural inputs. In Uganda, adoption of new mobile technologies has the potential to increase agricultural productivity and reduce food insecurity (Murendo and Wollni, 2016). Also, Sekabira and Qaim (2017) found that the adoption of mobile money technology has contributed to higher household incomes and consumption levels through increasing off-farm income in Uganda.

Côte d'Ivoire is among the West African's fastest growing economies. After several years of political instability, key political and economic reforms have improved security and boosted the country's economic resilience. Côte d'Ivoire has maintained a strong economy and a high GDP growth rate since 2012, and this resulted in the reduction in poverty levels from 51% in 2011 to 46% in 2015 (World Bank, 2020). Despite this, few proportion of the population has access to financial services. According to the Global Findex (2017), in Cote d'Ivoire, 41% of adults (people over 15 years) have bank accounts. With limited number of bank branches in the country, the financial services offered by the leaders of the mobile telephony are gaining in popularity. Almost all adults using financial services from banks or microfinance institutions also use mobile money. About 2% of the financially included are not using mobile money (Global Findex, 2017). Mobile money is the main driver of financial inclusion in Cote d'Ivoire. It is used to transfer money to a relative, to pay bills for services such as water, electricity, telephone, television subscription, among others. Mobile money is also used in supermarkets, and restaurants. Facing this, the banks have started to compete with mobile network operators by developing mobile banking apps, mobile wallets, and

online-only banking systems. However, one of the main barriers to the growing adoption of mobile money in Cote d'Ivoire is a lack of digital skills and financial literacy which are strongly related to education. Indeed, the adult literacy rate (47.17%) remains low in the country. In this line, Mbiti and Weil (2011) and Senou et al. (2019) argue that the ability to read and write are key in the mobile money adoption process.

Three operators (Orange, MTN and Moov) are offering mobile money services in Côte d'Ivoire. Mobile financial services were introduced in 2008, and major financial services like Orange Money and MTN Mobile Money dominate the market. As of 31 December 2019, Orange has 50% of the market share against 40% for MTN and 10% for Moov. Since its introduction in Côte d'Ivoire, adoption of mobile money has increased rapidly, boosted by government and private sector partnerships for implementing e-payment systems. The number of mobile money accounts has increased from 24% in 2014 to 34% in 2017 (Global Findex, 2017). Despite this, a large percentage of people over 15 years does not have a mobile money account. This is worst for disadvantaged groups including women, less educated, the poor and people in rural areas. For instance, the Global Findex (2017) reported that 30% of women have a mobile money account compare to 38% of male. While, smallholder farmers are the lifeblood of Côte d'Ivoire, they appear largely neglected by formal financial institutions. Figures from Consultative Group to Assist the Poor (CGAP, 2016) survey show that less than 10% of smallholders in Côte d'Ivoire have an account at a formal financial institution (bank or Microfinance), while 36% have mobile money account with 59% in urban area and 34% in rural area. There is a 16-point gap between male and female smallholders when it comes to mobile money usage, with 42% of men and 26% of women.

In this regard, the study contributes to the growing knowledge by providing answers to the following empirical research questions: (1) What are the socioeconomics characteristics of mobile money users? (2) What are the factors that inform the mobile money adoption process? Do disadvantaged groups (women, less educated, and rural people) are more likely to adopt mobile money? Therefore, the general objective of this study is to analyze drivers of mobile money adoption process among smallholder households in Côte d'Ivoire. It adds knowledge on mobile money adoption by providing evidences on how policy interventions could help improving access to financial services through large adoption of mobile money in Côte d'Ivoire. From previous studies it can be seen that the factors that affect adoption of mobile money services differ across countries. This may be because of variability in political conditions, and socio-economic and demographic factors as well as institutional variables. Thus, there is a need for specific investigation to support financial inclusion policy in Côte d'Ivoire.



Also, few papers have analyzed adoption of mobile money as a sequential process. In contrast to studies that have considered adoption as a single decision process (Mbiti and Weil, 2011; Tobbin and Kuwornu, 2011; Sayid et al., 2012; Chogo and Sedoyeka, 2015; Lema, 2017; Abdinoor and Mbamba, 2017; Bidiassé and Mvogo, 2019), our study analyzed the mobile money adoption as a dynamic process including several steps. This is based on Rogers (1962, 1995, 2003) theory of technology adoption and diffusion which postulates that adoption and diffusion of innovation is a procedural sequence in which an innovation is going through certain channels between members of a social system. In the case of Senegal, Fall et al. (2015) have proposed 3 steps including (1) knowledge of the product and its uses, (2) possession of an account, and (3) adoption of the service. However, this contribution by Fall et al. (2015) excludes two important steps in the mobile money adoption process (Afawubo et al., 2019). These important steps are “having a cell phone” and “confidence in the service.” Afawubo et al. (2019) in the case of Togo have used the 5-step mobile money adoption process. This study is built on the 5-step process of mobile money adoption proposed by Afawubo et al. (2019). These steps include (1) have a mobile phone, (2) have heard of the mobile money, (3) use the mobile money once, (4) have a mobile money account, and (5) have confidence in mobile money services.

The rest of the paper is organized as follows. Section 2 presents the literature review followed by the research method in Sect. 3, while data and descriptive statistics are presented in Sect. 4. Results and discussion are reported in Sect. 5, and finally a concluding remark is given in Sect. 6.

## Literature review

Several definitions of mobile money are found in the literature. According to Donovan (2012) mobile money is a cell phone services including account information, transfer of funds, credit, insurance, and saving. Upadhyay and Jahanyan (2015) have defined mobile money as a mobile-based money transfer service that uses information and communication technology (ICT) tools and non-banking channels to offer and extend financial services to subscribers who are not profitable to be reached by formal and traditional financial services providers like banks. For the Consultative Group to Assist the Poor (CGAP, 2017), mobile money service is referred to as a service in which the mobile phone is used to access financial services. Nan et al. (2020) consider mobile money as a convergent digital innovation that brings together telecommunications infrastructure (mobile) and microfinance (money).

Successful adoption of mobile money depends essentially on its cost, usefulness, usability, convenience, security and

privacy (Herzberg, 2003; Terrade et al., 2009; Shankar and Datta, 2018; Kaur et al., 2020; Loh et al., 2021; Shankar and Behl, 2021). These factors constitute the basis for theories that explain adoption behavior. For example, in a Technology Acceptance Model (TAM) developed by Davis (1989), perceived usefulness and perceived ease of use are the primary drivers of new technology acceptance. Davis (1989) defined perceived usefulness as the degree to which a person believes that using a particular system would enhance his or her performance, while perceived ease refers to the degree to which a person believes that using a particular system would be free of effort. In 2000, Venkatesh and Davis (2000) and Venkatesh (2000) developed TAM II, which is a new version of TAM. The TAM II include some external variables such as subjective norms, job relevance, image, quality, and result demonstrability. Furthermore, in 2003, Venkatesh et al. (2003) developed a unified theory of acceptance and use of technology (UTAUT) based on studies of eight important models on Technology acceptance (see Venkatesh et al. 2003). The UTAUT include four core factors of intentions and usage such as performance expectancy, effort expectancy, social influence, and facilitating conditions, with four mediators of key relationships: gender, age, experience, and voluntariness of use. Later, Venkatesh and Xu (2012) developed UTAUT2 by integrating hedonic motivation, price value and habits into UTAUT.

Another commonly used theory is Rogers's (1962, 1995, 2003) theory of technology adoption and diffusion. It postulates that adoption and diffusion of innovation is a procedural sequence in which an innovation is going through certain channels between members of a social system. The rate of diffusion is determined by the rate of adoption, which refers to the relative speed of use by members of the social system (Rogers, 2003). In turn, the rate of adoption is affected by several attributes of the innovation. Five major attributes including relative advantage, complexity, compatibility (CO), trialability (TRI) and observability of the innovation have been identified by Rogers (2003). Thus, potential adopter of a technology makes the adoption decision based on the ideas or beliefs about the technology. In line with this, the consumer's choice theory postulates that adopters will choose between different innovations in order to maximize their utility.

Empirically, studies have shown that socioeconomic and demographic characteristics are keys in the adoption process. Education has been identified as key determinant of mobile money adoption. Indeed, previous studies (Merritt, 2011; Kiconco et al., 2018; Sathye et al., 2018; Senou et al., 2019; Akinyemi and Mushunje, 2020) highlighted the potential role of education in the process of adoption of mobile money. These authors argue that mobile money adopter must be literate as the mobile money services are Short Message Service (SMS) based services and people have to know



reading and writing to use mobile money. The ability to read and write is key in the mobile money adoption process (Senou et al., 2019). In addition to education, other socioeconomic and demographic variables are playing important role in the adoption of mobile money. For instance, in rural area of Africa, Akinyemi and Mushunje (2020) have shown that age, unemployment, and ownership of bank accounts explain both the adoption and the amount of money sent using mobile money, while age, bank account ownership, and net monthly income determine both the adoption of mobile money and the amount of money received. In the West African Economic and Monetary Union (WAEMU), Senou et al. (2019) found that being young, man, relatively richer and even banked increases the likelihood of adopting mobile money among individual in WAEMU. A study by Abdinoor and Mbamba (2017) found that gender, age and income level are among the factors that influence the adoption of mobile financial services in Tanzania. Mbiti and Weil (2011) found that age, level of education, and living conditions are the key factors which significantly affect the decision to adopt the M-Pesa, a mobile money transfer service in Kenya.

Other studies have analyzed adoption as a sequential process. In this regard, Fall et al. (2015) considered adoption of mobile banking in a three step process including (1) knowledge of the product and its uses, (2) possession of an account, and (3) adoption of the service. In the first stage of adoption, age was the only influential factor. In the second stage, education, literacy, membership in rotating credit and savings scheme (ROSCA) were variables that determined the adoption of M-banking. The variables education, wages and ownership of business were the factors affecting the final stage of adoption of mobile-banking. Afawubo et al. (2019) extended this 3 step in the case of Togo. The authors modeled the adoption of mobile money using a 5-step process including, (1) having a mobile phone, (2) having heard of the

service, (3) use the product once, (4) have an account, and (5) have confidence in the product. Afawubo et al. (2019) found that literate people and clients of microfinance or banking institutions were more likely to go far in the adoption process. Being client of banks or microfinance institutions act as powerful channels from one step to another in the process however, only freelancers and merchants were more likely to have confidence in the mobile money service (last step).

Beyond these socioeconomic and demographic characteristics, other studies show that adoption of mobile money services also can be analyzed from the supply side. In this vein, Senou et al. (2019) found that country characteristic including mobile infrastructure and banking infrastructure in terms of numbers of Automated teller machines (ATM) per 100,000 people are the main determinants of mobile money adoption. Chogo and Sedoyeka (2015) have concluded that the main factors affecting the adoption of mobile money services are poor agent network, poor user support, insufficient service awareness, high transaction cost, fear for money safety, unfriendly interface design and lack of procedure training. In Ghana, Tobbin and Kuwornu (2011) found the relative advantage, ease of use, usefulness, ability to test, and confidence in the product, as main determinants of mobile financial services adoption.

## Empirical approach

The study considered five steps in the adoption process of mobile money services as proposed by Afawubo et al. (2019). Based on this, a conceptual model of the mobile money adoption process is presented in Fig. 1. Successful adoption of mobile money requires that customers have a mobile phone with a phone number (first step). The users must be aware of the service and its utilization (second

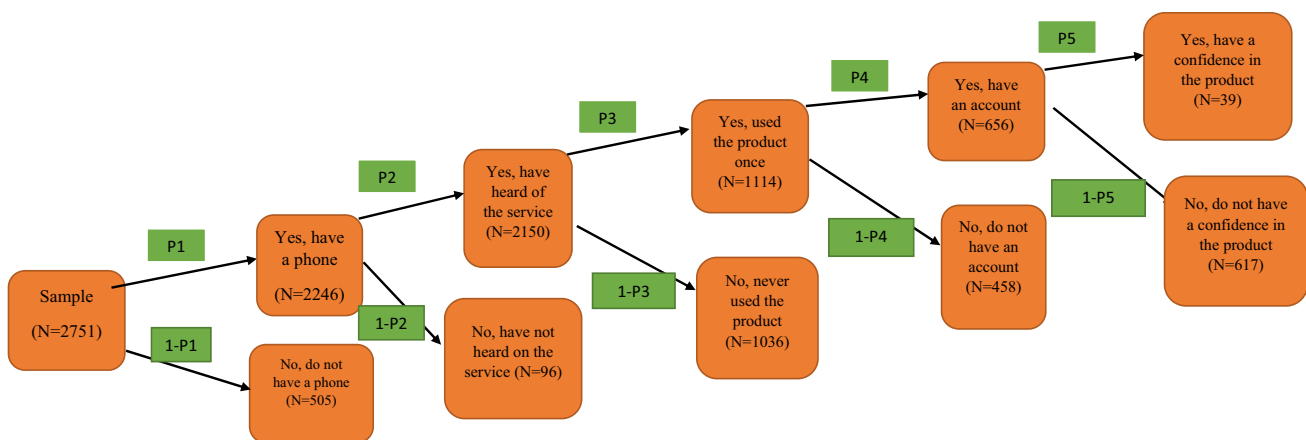


Fig. 1 Process of mobile money adoption. Source: Adapted from Afawubo et al. (2019)



step). This step entails the ability to operate the phone which requires a minimum knowledge (basic reading and writing) in French, the official language in Côte d'Ivoire. In the third step adopters could use the services frequently before. Majority of the mobile money users used it for the first time just by curiosity or to test its simplicity. This occasional use does not need having a mobile money account as people can go to mobile money agent point and use mobile money services. However in the case of frequent use of the mobile money an individual must need to open an account. Frequent users may be motivated to open a mobile money account (fourth step) which entails registration. Opening an account also requires users to perceive the ease of use and usefulness of the product. Finally, for continuous use, mobile money users must have confidence in the services (fifth step). This is very crucial for a complete adoption of mobile money. Some cases of fraud and scams have usually been reported by mobile money users. Besides, a mobile money user could send the money to another user account by mistake. In this case, there is a possibility for a mobile money user to call and inform the operator which may rectify the mistake.

We analyzed the decision to adopt mobile money within a random utility framework. Let  $U_{ij}$  be the utility obtained by an individual  $i$  in step  $j$ . An individual will choose to move from one step to another one only if the utility associated to the next step is higher than the former. Mathematically, this is:  $U_{i(j+1)} > U_{ij}$ . In practice, these utilities are not observed, what we observe is the state of adoption in each step. In order to explore the factors that influence the transition from one step to another of the adoption process, a sequential Logit model (see Maddala, 1983 and Tutz, 1991) is employed. This model has been used in several other studies including Fall et al. (2015) and Afawubo et al. (2019). The probability of transitioning from one step to another is expressed by Eq. (1) as follows:

$$p_{ji} = \frac{\exp(\alpha_j + \beta_j X_{ji})}{1 + \exp(\alpha_j + \beta_j X_{ji})} \quad (1)$$

$X_{ji}$  represents the characteristics of individual  $i$  for step  $j$ .

Equation (1) indicates that the probability of transitioning from one step to another is affected by the socioeconomics and demographic characteristics of the individual as well as the institutional variables. Based on the literature (Mbiti and Weil, 2011; Tobbin and Kuwornu, 2011; Sayid et al., 2012; Jack and Suri, 2014; Kikulwe et al., 2014; Fall et al., 2015; Aker et al., 2016; Afawubo et al., 2019), the variables used in the sequential Logit model include age, gender, marital status, education, agricultural cooperative, being in saving and credit groups, being clients of bank and microfinance, and rural zone.

## Data and descriptive statistics

Smallholder Household Survey 2016 database is used in this study. This nationally-representative survey was carried out in 2016 by the Consultative Group to Assist the Poor (CGAP) in coordination with the Côte d'Ivoire National Institute of Statistics. CGAP has surveyed thousands of smallholders in six countries including Bangladesh, Cote d'Ivoire, Mozambique, Nigeria, Tanzania, and Uganda, with the aim to help fill the knowledge gap in smallholder finance. The smallholder household survey in Côte d'Ivoire is a nationally-representative survey with a target sample size of 3,000 smallholder households. The sample was designed to provide reliable survey estimates at the national level, urban/rural and for 3 zones including East Forest, West Forest and Savanna.

In 2015, the Côte d'Ivoire National Institute of Statistics has identified 18,321 enumeration areas (EAs) that contain agricultural households. The sampling frame for the CGAP smallholder survey is the list of these EAs containing agricultural households. A stratified multistage sampling methodology was applied. Stratification was achieved by separating each zone into urban and rural areas. Therefore, six (6) strata were created and the sample was selected independently in each stratum. The CGAP smallholder survey contains three different questionnaires: the household questionnaire, the multiple respondent questionnaire and the individual respondent questionnaire. In each selected household, the household questionnaire was administered to the head of the household, or the spouse or any knowledgeable adult household member to collect information about household characteristics. The multiple respondent questionnaire was administered to all adult members in each selected household. In addition, in each selected household only one household member was selected using the Kish grid, and was administered the single respondent questionnaire to collect information on their agricultural activities, financial behaviors and mobile money usage. The minimum age of eligible respondents is 15 years.

For the purpose of this study, the single respondent database is used because it provides more information on mobile money usage. The data involve 2949 respondents both in urban and rural areas. However, for the estimation, the sample size was relatively reduced because it was restricted to observations for which all the variables exist. For instance, the social groups variables (member of agricultural association and member of saving and credit group) are particular missed some observations. Finally the sample comprises 2751 individuals' respondents.

Table 1 presents the summary statistics of the variables included in the analysis. It is observed that 87% of



**Table 1** Descriptive statistics of the variables

Variables	Obs	Mean	Min	Max
Mobile money adoption process				
1. Have a mobile phone (yes = 1)	2 564	0.87	0	1
2. Have heard about mobile money (yes = 1)	2 189	0.98	0	1
3. Have used mobile money (yes = 1)	2 174	0.51	0	1
4. Have a mobile money account (yes = 1)	1 114	0.58	0	1
5. Have confidence in mobile money (yes = 1)	656	0.04	0	1
Socioeconomic variables				
1. Male (yes = 1)	2 751	0.63	0	1
2. Education (yes = 1)	2 751	0.40	0	1
3. Married (yes = 1)	2 751	0.68	0	1
4. Member of saving and credit groups (yes = 1)	2 751	0.03	0	1
5. Agricultural association (yes = 1)	2 751	0.13	0	1
6. Bank account (yes = 1)	2 751	0.06	0	1
7. Microfinance account (yes = 1)	2 751	0.04	0	1
8. Rural zone (yes = 1)	2 751	0.87	0	1
9. Age (in year)	2 751	41.63	15	92
		(14.14)	-	-

Value in the parenthesis is standard deviation

surveyed respondents have a mobile phone. Among them 98% have heard about mobile money services of which 51% have used mobile money services. Among those using mobile money services 58% have a mobile money account, however only 4% trusted the mobile money services. In term of socioeconomic characteristics, 63% of the surveyed respondents are male; 40% are educated and the average age is 42 years. A large proportion (87%) of respondents' lives in rural area and 13% belong to an agricultural association. A very low proportion has a bank account (6%) or microfinance account (4%).

As reported in Table 2, the main reason limiting the use of mobile money services in Côte d'Ivoire was the

lack of knowledge on the procedure as 24.97% of mobile money non-users reported that they do not know how to register or to open an account. This is followed by 21.50% that reported never have enough money for the transaction. About 12.20% of mobile money non-users reported that they do not need that. There are ranked third, following by those (11.76%) who reported lack of close services points. Other reasons, which is ranked fifth, include poor network, expensive transaction fees, spouse already use it, having issues with the sim card, among others.

**Table 2** Main reasons why people never used mobile money services

Reasons	Frequency	Percentage	Ranking
Do not know what is mobile money	64	6.01	6
Do not have mobile phone	40	3.75	9
Do not know how to register or open account	266	24.97	1
Do not have identity card or other requirement documents	50	4.69	7
Lack of close services points	125	11.73	4
Do not need	130	12.20	3
Using mobile money is difficult	49	4.60	8
Never have money for transaction	229	21.50	2
Do not trust	14	1.31	10
Do not have permission from spouse	15	1.40	10
Do not know	15	1.40	10
Other reasons	68	6.38	5
Total	1065	100	-



## Results and discussion

### Profile of mobile money users

Table 3 reports the socioeconomics characteristics of mobile money users. A difference test was performed to analyze any significant difference between mobile money users and non-users. A *t*-test was used when the variable is continuous while a chi-square test was performed for categorical variables. To do this, the mobile money usage is considered as a binary variable with value 1 if an individual use mobile money once and 0 otherwise. This refers to step 3 in the adoption process presented above. The results indicated a significant gender difference between adopters and non-adopters. A higher proportion of male used the mobile money service compared to women. Being educated is also likely to improve the use of mobile money service. Indeed, compared to non-adopters a higher proportion of educated has used the mobile money. A significantly higher proportion of agricultural association member (17%) compared to non-adopters (11%). Also, having bank or microfinance account is likely to improve the use of mobile money as a significantly higher number of bank or microfinance account holders used mobile money services. Considering the geographical location, the results also indicated a significant difference with a significantly higher number of non-adopters in rural area. This suggests that the use of mobile money service in rural area remains limited probably because people in rural area are less educated and poor.

### Determinants of the mobile money adoption process

Estimates of the sequential logit model are reported in Table 4. Overall, the model has a good fit with the explanatory variables as indicated by the significance of the Wald

test (Prob = 0.000). The results indicated that age, male, education, members of Agricultural cooperative, clients of bank and microfinance are more likely to reach the first step of the adoption process, that of having a mobile phone. On the contrary, being in rural area decrease the likelihood of having a mobile phone. Age has a positive effect on the probability of having a mobile phone, suggesting that as age increase, smallholders are more likely to use mobile money services. This is consistent with previous findings by Mbiti and Weil (2011) and Abdinoor and Mbamba (2017). In line with studies by Ouadregago (1998) and Afawubo et al. (2019), being male increases the probability of having a mobile phone. Education also has a positive effect on the probability of having a mobile phone, suggesting that more educated people are more likely to reach the first step of the mobile money adoption process. Indeed, the use of mobile money requires a minimum knowledge (basic reading and writing) in French which is the official language in Côte d'Ivoire. Being member of social groups has a positive effect on the probability of having a mobile phone. This is consistent with Fall et al. (2015) who argue that mobile phone is a very useful channel particularly for coordination between group's members and managing activities. Being client of bank or microfinance appears as a significant determinant of having a mobile phone. Actually, bank or microfinance clients have a higher likelihood of having a mobile phone. This is probably due to the fact that cell phone is a means of communication between financial institutions and their clients (Afawubo et al., 2019). Also, many banking transaction can be done on cell phone.

From the second step (have heard of mobile money) of the adoption process, age, education and being client of the bank appeared as main determinants of the transition to this step. These determinants have been significant in the first step. Age has a positive effect on the probability to hear of mobile money, however as age increases this probability decreases. The variable education positively influences the

**Table 3** Socioeconomics characteristics of the respondents

Variables	Mobile money users	Mobile money non-users	Difference test (t-test/ $\chi^2$ value)
1. Male (yes = 1)	0.71	0.60	30.22***
2. Education (yes = 1)	0.59	0.35	127.20***
3. Married (yes = 1)	67.77	69.24	0.54
4. Member of saving and credit groups (yes = 1)	0.04	0.03	01.63
5. Agricultural association (yes = 1)	0.17	0.11	15.11***
6. Bank account (yes = 1)	0.14	0.02	103.57***
7. Microfinance account (yes = 1)	0.08	0.02	41.51***
8. Rural zone (yes = 1)	0.76	0.89	66.46***
9. Age (in year)	41.25	41.10	- 0.25
	(13.07)	(13.91)	-

\*\*\*Significant at 1%; Values in parentheses are standard deviation



**Table 4** Estimates of the sequential logit model

Variables	Have a mobile phone (first step)	Have heard of mobile money (second step)	Use mobile money (third step)	Have a mobile money account (fourth step)	Have confidence in mobile money (fifth step)
Age (in years)	0.067*** (0.017)	0.075*** (0.022)	- 0.012 (0.023)	0.031 (0.030)	- 0.222*** (0.065)
Age squared	- 0.00084*** (0.00018)	- 0.00094*** (0.00024)	8.79e-05 (0.00026)	- 0.00029 (0.00033)	0.0023*** (0.00069)
Male (yes = 1)	0.888*** (0.097)	0.198 (0.125)	0.358*** (0.115)	0.055 (0.162)	- 0.835** (0.406)
Marital status (married = 1)	0.105 (0.103)	0.012 (0.127)	- 0.057 (0.115)	0.170 (0.152)	0.833* (0.467)
Education (yes = 1)	0.606*** (0.109)	0.815*** (0.130)	0.734*** (0.107)	0.725*** (0.145)	0.0152 (0.429)
Member of Agricultural cooperative (yes = 1)	0.574*** (0.171)	- 0.116 (0.165)	0.279* (0.149)	0.309 (0.194)	- 0.183 (0.553)
Member of saving and credit group (yes = 1)	- 0.056 (0.279)	0.560 (0.363)	0.090 (0.276)	0.073 (0.347)	- 0.137 (1.110)
Bank account (yes = 1)	2.213*** (0.556)	0.797*** (0.302)	1.438*** (0.257)	1.126*** (0.256)	0.157 (0.556)
Microfinance account (yes = 1)	1.886*** (0.723)	0.511 (0.363)	0.599** (0.292)	0.479 (0.311)	0.023 (0.747)
Rural area (yes = 1)	- 1.402*** (0.223)	- 0.222 (0.178)	- 0.670*** (0.154)	- 0.445** (0.186)	0.262 (0.489)
Constant	0.366 (0.429)	- 0.174 (0.515)	0.493 (0.512)	- 0.705 (0.661)	1.436 (1.540)
Observations	2751	2246	2150	1114	656
Log pseudo likelihood	- 4062.55	Wald chi2(10)=246.04		Prob=0.000	

\*\*\*Significant at 1%, \*\*Significant at 5% and \*Significant at 10%. Values in parentheses are standard robust errors

probability of transitioning to the second step. Banks clients are more likely to hear about the mobile services compared to non-members.

Men, educated, members of agricultural cooperative, members of saving and credit group, and clients of bank or microfinance are more susceptible to use the mobile money (third step). Inversely, being in rural area appeared to negatively influence the use of mobile money services. These factors were significant determinants either in the first or second step. In its Technology Acceptance Model, Davis (1989) indicated perceived usefulness and perceived ease of use as the basic points for technology usage. Among those who did not used mobile money in Cote d'Ivoire, only 4.6% reported that using mobile money is difficult (see Table 2 above).

From the fourth step (have a mobile money account) of the adoption process, three factors (education, clients of bank and being in rural area) of which two (education and clients of bank) have been significant since the first step, appeared as main determinants of the transition to this step.

Being in rural area has been significant in the first and third step. Education and being clients of bank have positively influenced the probability of having a mobile money account while this decreases for those in rural area.

Age and being male reduce the probability of passing through the final step (Have confidence in mobile money). These results suggest that the older the individuals are the less likely they have confidence in the mobile money. Compared to women, men have less trusted the mobile money services in Cote d'Ivoire. This may be due to the fact that the mobile money does not provide loan possibilities to finance economic activities, something that many users desire. Customers want to have a loan through their mobile account. According to them, adding credit and finding reimbursement solutions from the phone is the future prospect they expect from mobile operators (CGAP, 2016). Married people have strong confidence in the mobile money services. Marital status which was not significant in the previous steps appeared as the sole determinant which positively influence the probability of having confidence in the mobile money services.



This is probably an indication of the fact that mobile money service fit with married people needs of money security, transactions and may be an important alternative to avoid wasting time by going to formal financial institutions (bank or microfinance).

Overall, the findings show that mobile money adoption process is affected by: (1) demographic factors such as age, sex and marital status; (2) social interaction variables including members of agricultural cooperative, and saving and credit group; and (3) institutional variables such as education and being clients of banks and microfinance. These findings are consistent with those found in previous studies (Ouangregago, 1998; Mbiti and Weil, 2011; Sayid et al., 2012; Jack and Suri, 2014; Kikulwe et al., 2014; Fall et al., 2015; Abdinoor and Mbamba, 2017; Afawubo et al., 2019). Women are disadvantaged; however, once adopted, they are more likely to trust the mobile money than men. Interestingly, in all the steps of the adoption process, the study found that more educated are more likely to move through the mobile money adoption process in Cote d'Ivoire. This is in line with previous studies (Merritt, 2011; Kiconco et al., 2018; Sathye et al., 2018; Senou et al., 2019; Akinyemi and Mushunje, 2020) that show the potential role of education in the process of adoption of mobile money. Indeed, to use mobile money, individual need certain abilities and skills since mobile money services are operating on mobile phone, and in the French language. Therefore, before one can efficiently use mobile money services, one has to possess at least basic technical mobile phone skills and French abilities.

## Concluding remarks

The study analyzed the determinants of the adoption process of mobile money in Côte d'Ivoire. It used the Consultative Group to Assist the Poor (CGAP) Smallholder Household Survey 2016. A descriptive statistics and a sequential logit model were employed as methods of data analysis. The results show that mobile money users are in majority male, in urban area, more educated, belong to social network, and have bank or microfinance account. Educated and those having bank account are more likely to move through the process. Only women, married, and old people are more likely to pass the last step (having confidence in the mobile money service) of the adoption process. The study also found that disadvantaged groups are less likely to adopt mobile money services as educated are more likely to move through the adoption process. Women are disadvantaged in the first four steps of the process; however, women are more likely to trust the mobile money than men.

Overall, in view of the findings we suggest that mobile money operators may target and encourage smallholder households in rural area and the women for the adoption

of mobile money services. There is also a need to facilitate smallholder households' participation in social interactions networks as this favors adoption of mobile money services. The findings of the study are subject to some limitations; which future researchers may resolve. The study relies on one round of the Finscope, which does not enable detecting cause and effect relationships between variables. When possible, future researchers may consider other cycles of the Finscope and use panel data models. This would be particularly useful as it would capture changes in people's perceptions and behaviors. In future, studies could explore the use of mobile money in local language. The analysis of the profile of mobile money users could also be deepened by including other socioeconomic and institutional factors (e.g., religious group, employment status, income, among others) that were not taken into account in this analysis. Finally, future studies can also explore the possibility for loan through mobile money account.

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