

# Willingness to pay for insurance against mobile money fraud: evidence from Ghana

Evidence from  
Ghana

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## Abstract

**Purpose** – The rapid growth of the mobile money industry has been matched by a rise in mobile money fraud. The technology required to apprehend perpetrators of such fraud is nonexistent in most developing countries. Hence, the need for individuals to be willing to pay for insurance against such frauds is crucial. This paper aims to examine individuals' willingness to pay for insurance against mobile money fraud in Ghana.

**Design/methodology/approach** – The paper uses nationally representative data collected from 4,266 adults (persons 18 years and above) in Ghana. Individuals' willingness to pay premiums for protection against mobile money fraud was elicited by a single-bound dichotomous choice and open-ended contingent valuation designs.

**Findings** – On average, 24.34% of Ghanaians are willing to pay premiums for insurance against mobile money frauds, with more men (26.37%) being willing than women (22.56%). Similarly, the average monthly premium that men are willing to pay for protection against mobile money fraud is GH¢32.16 (US\$8.16), while that of women is GH¢22.5 (US\$5.62). Furthermore, the results show that years of schooling, income, previous fraud experience, and using the accounts for saving are all positively associated with willingness to pay. However, using other networks apart from MTN has a negative association with willingness to pay.

**Originality/value** – To the best of our knowledge, this is the first study that examines willingness to pay for insurance against mobile money fraud. Thus, this is the first that estimate quantitatively how much mobile account holders will pay as premiums for insurance against mobile money fraud.

**Keywords** Mobile money, Willingness to pay, Fraud, Insurance, Ghana

**Paper type** Research paper

## 1. Introduction

In most developing countries, where there are disproportionately high numbers of people who do not have bank accounts, the most practical and user-friendly alternative for conducting financial transactions is mobile money (Cook and McKay, 2015; Espinosa-Vega *et al.*, 2020). Mobile money, which initially started as a means of transferring money among peers, has evolved to include other new and enhanced services such as payment of bills, savings, borrowing, and microcredit. The emergence of the COVID-19 pandemic “leapfrogged” the expansion of mobile money as it facilitated financial transactions with

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little or minimal physical contact (Bazarbash *et al.*, 2020). Globally, the total number of registered mobile money accounts increased by 12.7% just for the year 2020 (GSMA, 2021).

The rapid growth of mobile money usage may be attributed to several factors, including its less expensive transaction costs, the convenience it brings, as well as the avenue it provides in terms of transferring and storing money (Dupas *et al.*, 2018; Jack and Suri, 2014). Also, there is growing evidence of the positive effects of the usage of mobile money on consumption smoothing through the receipt of remittance (Munyegera and Matsumoto, 2016; Suri and Jack, 2016); response to health and income shocks (Jack and Suri, 2014); employment creations (Wieser *et al.*, 2019); and poverty reduction (Munyegera and Matsumoto, 2016; Suri and Jack, 2016; Jack and Suri, 2014).

The success of the mobile money industry has, however, been matched by a rise in fraudulent activities as dishonest people continue to use this service to swindle other people, particularly in Sub-Saharan Africa (Chatain *et al.*, 2011). Mobile money fraud incidents in 2015 accounted for 53% of all mobile money transactions in Uganda, 42% of transactions in Tanzania, 12% of all mobile money transactions in Kenya, and 23% of mobile money transactions in Ghana (Busuulwa, 2016; Laryea, 2016; Ali *et al.*, 2020). These fraudulent activities put the future of mobile money products in jeopardy as they have the potential to discourage people from using these products. The technology required to apprehend mobile money fraud perpetrators is mostly non-existent in most African countries including Ghana, where these fraudulent activities are relatively high. There is, therefore, the need for individual consumers to contribute money to serve as insurance against mobile money fraud. The purchase of an insurance policy against mobile money fraud will provide protection against any future loss. This study seeks to examine individuals' willingness to pay for insurance against losses from mobile money fraud in Ghana.

A sizeable portion of Ghanaians do not participate in the nation's official financial system. The unbanked population of Ghana can access traditional banking institutions through mobile money operations (Akomea-Frimpong *et al.*, 2019). Ghana is one of the countries in Sub-Saharan Africa with the fastest mobile money growth. With the introduction of mobile money services in 2009 by MTN, the number of mobile money users has increased tremendously. Currently, mobile money services are offered by all the mobile service operators, which are MTN, Airtel/Tigo, and Vodafone. According to the Bank of Ghana, the value of mobile money transactions was GHC11bn, with 2.3 million active users in 2014. Both the value of mobile money transactions and the number of registered accounts increased from GHC37.07bn with 17.2 million users in 2016 (Akomea-Frimpong *et al.*, 2019); to GHC56bn with 34.5 million users in 2020 [1]; and GHC978.32bn with 48.3 million users in 2021 (Bank of Ghana, 2022).

Similar to most sub-Saharan African countries, the issue of mobile money fraud is on the ascendency in Ghana. According to the Bank of Ghana, 12,350 cases of mobile money fraud were reported in 2021. These cases amounted to a loss of GHC12.8m. Out of this total value, 90.14% (GH¢12.8m) was lost and only about 10% of the total value was recovered (Bank of Ghana, 2021).

These fraud cases came from mainly wrong transfers and wrong cash reversals. Wrong transfers occur where victims transfer money meant for a particular recipient to a wrong recipient and the wrong recipient cashed the money out before it could be reversed. Wrong cash reversal, on the other hand, occurs when a fraudster sends a fake message of receipt of transfer to a victim's phone and calls the victim to request a reversal of the transaction since it was a mistake. The victim reverses the supposed wrong transfer to the fraudster only to realise that the fraudster did not transfer any money to his/her account in the first place.

At the individual level, it has been found that victims of mobile money fraud in Ghana lost monies ranging from GHC200 (\$45) to GHC3,500 (\$800) [2] per transaction (Akomea-

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[Frimpong \*et al.\*, 2019](#)). Despite the quantum of losses associated with mobile money fraud, there are few studies on this. A thorough search of the literature reveals few or no studies on mobile money fraud. Though few studies on mobile money operations have mentioned the threat posed to the sector by fraudsters ([Osei-Assibey, 2015](#); [Mas and Radcliffe, 2011](#)), no study has examined ways to address this menace ([Akomea-Frimpong \*et al.\*, 2019](#)). To better understand how mobile money users can protect themselves against fraud, we estimate their willingness to pay for insurance against such losses. Consumers have been found to prefer the option of making regular payments to a solidarity association that provides protection against unforeseen losses rather than paying huge sums out of their pockets when there is a loss ([Arhinful, 2003](#)).

Most studies on mobile money services focused on the benefits such services offered to individuals and households. In terms of the welfare effects of mobile money services, [Munyegera and Matsumoto \(2016\)](#) find that mobile money access increases households' per capita consumption through its positive effect on receipts of remittances. Similarly, [Jack and Suri \(2014\)](#) find a positive effect of mobile money on food, non-food, and total consumption in Kenya. However, [Suri and Jack \(2016\)](#) find that mobile money has a negative effect on the consumption growth of male-headed households but a positive impact on the consumption of female-headed households in Kenya. In addition, using a randomised control trial, [Aker \*et al.\* \(2016\)](#) find improvements in household welfare for recipients of cash transfers through mobile money accounts in Niger. However, [Blumenstock \*et al.\* \(2015\)](#) did not find any significant effect of mobile money on welfare indicators such as consumption and self-reported satisfaction. [Mbiti and Weil \(2015\)](#) find that adopting M-Pesa reduces both the use of informal savings groups and the need to hide cash in secret places. A thorough review of the empirical literature on the impacts of mobile money is found in [Aron \(2018\)](#).

This study is related to a few studies on mobile money fraud. Recognition of the threat posed to the mobile money sub-sector by the activities of fraudsters has been made by some studies ([Akomea-Frimpong \*et al.\*, 2019](#); [Mudiri \*et al.\*, 2013](#)). Other studies have analysed the security features of mobile money services and proposed ways by which fraud in the mobile money sector could be detected ([Rieke \*et al.\*, 2013](#); [Adedoyin \*et al.\*, 2017](#); [Ali \*et al.\*, 2020](#)). However, there is a dearth of studies on consumers' willingness to pay premiums to insure themselves against mobile money fraud. To the best of our knowledge, this is the first study examining willingness to pay for insurance against mobile money fraud. This study extends the literature on mobile money by examining what mobile money users can do against mobile money fraud, the maximum amount they are willing to pay, and the factors affecting their willingness to pay.

The study is structured in four sections. This introduction section is followed by the methodology section which looks at data, the model specification and the estimation technique in Section 2. Section 3 discusses the estimation results. Section 4 concludes the study and makes policy recommendations.

## 2. Methodology

### 2.1 Data

The data for this study comes from the third [3] wave of the nationally representative socioeconomic panel survey conducted in 2017–2018 by the Institute of Statistical, Social and Economic Research of the University of Ghana, the economic growth centre at Yale University, and the North-Western University. A two-stage stratified sample method was used. In the first stage, 334 enumeration areas (EAs) or clusters were randomly sampled from a list of EAs used for the 2000 Ghana Population and Housing Census. Fifteen households were randomly chosen from each selected EA bringing the total number of

households selected to 5,010. Out of the 5,010 households selected, 5,009 households containing 18,889 individuals were completely interviewed. However, the questions on mobile money were administered only to adults (persons 18 years and above) and 4,266 persons were completely interviewed.

Individuals' willingness to pay premiums for protection against mobile money fraud was elicited by a single-bound dichotomous choice and open-ended contingent valuation designs. In the first place, mobile money account owners were asked, "Are you willing to pay a premium as insurance for your mobile money deposits against fraud/theft/robbery?". The responses were yes and no. Respondents who answered yes to the first question were then asked, "What is the highest amount (greater than zero) you are willing to pay?". Thus, the highest willingness to pay (WTP) amount was not censored. In addition, as stated above, respondents were mobile money holders, so they knew about the benefits of the product/service, and this imprinted realism into this hypothetical market for insurance against mobile money frauds.

2.2 Descriptive statistics

Table 1 shows some demographic characteristics of the respondents. Out of the 4,266 individuals interviewed, 1,962 (46) of them are men. The average age of respondents is 35 years and only 18% are in paid employment. In terms of education, the average years of schooling is seven years which is equivalent to the completion of primary school. In addition, 35% of respondents are into farming. Income is one of the most important factors likely to affect an individual's willingness to pay. A good proxy for income is expenditure. The average per capita expenditure is GH¢1,321. Furthermore, 62.3% of respondents were either married or in consensual unions.

In addition, we examine the employment status of respondents in detail. Table 2 shows the employment status of respondents. From the table, a majority of respondents are found in farming as 35.26% of them are farm owners. This proportion is likely to increase if all those involved in farming but are not owners are added to it. In addition, the sub-sector with the second highest percentage of workers is business owners or self-employment and this is followed by 18% of respondents in paid employment. Also, about 6% (5.75%) of respondents were unemployed.

2.2.1 Mobile money awareness and usage. Mobile money products and services have moved from the traditional services of sending and receiving funds to include other services such as the provision of an avenue for contribution to pensions, savings, and insurance; purchases of securities, transfer of funds to and from banks among others. Table 3 shows the percentage of respondents who are aware of mobile money products/services available on the platform, as well as the proportions that have used these products/services. From Table 3, the top five mobile money services known in Ghana are transfer in and out of cash

**Table 1.**  
Demographic characteristics of respondents

Variable	Mean	SD	Min.	Max.
Age	35.25	17.48	18	111
Male	0.46	0.47	0	1
Paid employment	0.18	0.1	0	1
Average expenditure	1,321	8,134	273	4,002
Married	0.623	0.21	0	1
Farming	0.35	0.21	0	1
Education (years)	7.2	3.2	3	9

Source: Authors' calculation

from mobile money accounts; savings; purchase of airtime and data; offering of loans, and payment of interest on loans. However, few Ghanaians are aware of other services such as the purchase of securities and hospital support plans; automated teller machine (ATM) cash out, and mobile money interoperability offered by mobile money operators.

In terms of usage of these products/services, the proportions of respondents who have benefited are relatively smaller than those who are aware of the existence of such services. For instance, while 56.6% of respondents are aware that transfers in and out of cash from mobile money accounts could be made, only 39.5% have used such a service. A similar pattern is observed in terms of the top five mobile money products/services used by respondents and these are transfer in and out of cash from mobile money accounts; savings; purchase of airtime and data; offering of loans, and payment of interest on loans.

*2.2.2 Mobile money accounts and fraud.* Among the four mobile service operators, MTN is the most preferred network in Ghana. Out of the 4,266 respondents, 3,902 of them were mobile money account holders in the survey. Thus, about 91% of respondents have mobile money accounts. Of the 3,902 mobile money account holders, 3,562 of them, representing 91.29%, were users of MTN as indicated in Table 4. Mobile money account holders who used Tigo as their network provider were 187 in number, corresponding to 4.79%. Furthermore, 30 of the account holders corresponding to 0.77% were users of Airtel. The number of respondents who used the Vodafone network was 123, corresponding to 3.15%.

Status	No.	%
Paid employment	780	18.02
Business owner (self-employed)	1,224	28.26
Farmer	1,527	35.26
Full-time student	271	6.26
Retired	279	6.45
Unemployed	249	5.75

**Table 2.**  
Employment status  
of respondents

**Source:** Authors' calculation

Product/service	Aware (%)	Usage (%)
Pensions	8.0	0.9
Insurance	6.0	1.5
Savings	29.7	15.3
Loans	9.9	2.6
Payment of interest on loans	9.7	4.3
Purchases of securities	2.6	0.8
Hospital support plan	3.8	1.4
Transfer to and from banks	7.1	2.1
ATM cash out	3.0	1.0
Payment of bills	9.3	2.3
Transfer in and out of cash	56.6	39.5
Purchase of airtime and data	25.8	14.2
Safety	9.2	6.4
Mobile money interoperability	5.4	2.4

**Table 3.**  
Mobile money  
products/services  
awareness and usage

**Source:** Authors' calculation

*2.2.3 Experience of mobile money fraud or theft.* As stated earlier, fraud is a serious problem in the mobile money industry in Ghana. It is evident from [Table 5](#) that 22.44% of mobile money account holders (1,204 individuals) have ever experienced or know someone who has experienced mobile money fraud or theft. Out of this, 5.29% are self-experienced, while the remaining 17.24% are experiences from others. In addition, over 90% (92 %) of victims of mobile money fraud were on the MTN network. The average amount involved in these fraud or theft cases is GH¢1,010.66 with a range of GH¢3 and GH¢12,000. Considering the level of income in the country with an extreme poverty line of GH¢792.05, the average fraud loss is substantial. Furthermore, among mobile money account holders who have ever experienced fraud, 48.3% informed the customer care office of their network operators; 9.4% lodged cases with the police, while the remaining 2.3% did nothing. Only 11% of victims who lost money through mobile money fraud got their money back.

Mobile money fraud can make account holders feel unsafe and this was expressed by respondents. From [Table 5](#), about 17% of account holders said they do not feel safe using their mobile money accounts. In addition, about 5% closed or thought of closing their mobile money accounts; while about 8% reduced the amount of money

**Table 4.**  
Number of mobile money account holders by service providers

Mobile provider (network)	No. of users	%	Cum.
MTN	3,562	91.29	91.29
Tigo	187	4.79	96.08
Airtel	30	0.77	96.85
Vodafone	123	3.15	100.00
Total	3,902	100.00	

**Source:** Authors' calculation

**Table 5.**  
Experience of mobile money fraud and safety

Variable	Mean/(%)
Ever experienced fraud yourself or know relatives or others	22.44
Self	5.29
Relatives and others	17.24
Average fraud amount (in GH¢)	1,067.66
<i>Network experienced fraud on:</i>	
MTN	1,108 (92%)
Vodafone	36 (3%)
Airtel/Tigo	60 (5%)
<i>Efforts to retrieve the money</i>	
Called customer care of the network or operator	48.3
Reported to police	9.4
Did nothing	42.3
Fraud amount was retrieved	11
Do not feel safe using mobile money	17.03
Closed or thought of closing account due to fraud or fear of fraud	4.97
Reduce the amount in the account due to fraud or fear of fraud	7.72

**Source:** Authors' calculation

in their mobile money accounts as a safety measure against fraud and theft in the industry. Evidence from  
Ghana

### 2.3 Empirical model and estimation strategy

We assume individuals are risk averse and they will always prefer sure outcomes relative to uncertain outcomes. For risk-averse individuals, the expected utility from buying an insurance policy is greater than the expected utility obtained in the absence of insurance. The probability that an individual will be willing to pay for mobile money insurance premium against fraud would be given by:

$$WTP = \Phi X + \varepsilon \quad (1)$$

where WTP is the outcome variable. The  $X$  is a vector of independent factors that might affect an individual's WTP for insurance, and  $\varepsilon$  is the error term. From theory, an individual's WTP is likely to be influenced by his/her demographic characteristics as well as the attributes of the product or service in question. We, therefore, include the sex, age, occupation, years of schooling, marital status, the mobile network used, theft/fraud experience, average expenditure (in logs) and whether the account is used for savings or not. The residential location of respondents is also included to control for differences in development in the country.

The decision to pay a premium to an insurance company for protection against mobile money fraud involves two stages. In the first stage, the individual decides whether to contribute or not and then in the second stage he/she decides on the amount of money to contribute. Thus, the empirical equations to be estimated are given by:

$$WTP = \beta_0 + \beta_1 \text{Male} + \beta_2 \text{Age} + \beta_3 \text{Empt} + \beta_4 \text{Mar} + \beta_5 \text{YrsSch} + \beta_6 \text{Network} \\ + \beta_7 \text{HHsize} + \beta_8 \text{FraudE} + \beta_9 \text{Saving} + \beta_{10} \text{Expenditure} + \beta_{11} \text{Region} + \varepsilon_1 \quad (2)$$

$$WTP_{\text{Amount}} = \beta_0 + \beta_1 \text{Male} + \beta_2 \text{Age} + \beta_3 \text{Empt} + \beta_4 \text{Mar} + \beta_5 \text{YrsSch} + \beta_6 \text{Network} \\ + \beta_7 \text{HHsize} + \beta_8 \text{FraudE} + \beta_9 \text{Saving} + \beta_{10} \text{Expenditure} + \beta_{11} \text{Region} \\ + \varepsilon_1 \quad (3)$$

Where WTP is a binary variable which is 1 if a mobile money account holder is willing to pay a premium against fraud and 0 otherwise. WTP amount is the highest amount an individual is willing to pay as a premium. The individual characteristics considered are sex, age, employment status, marital status, and education. Male is the sex or gender of an individual which is 1 if male and 0 if female. Age is the age of a respondent in years. Marital status (Mar) is a dummy variable which is 1 if married and 0 otherwise. Education (YrsSch) is measured by the years of schooling completed. In terms of the attributes of the product or service, we included the network operator that an individual uses and these include MTN, Tigo, Airtel and Vodafone. Also, the use of the mobile money account (savings or sending of money) and experience with fraud (FraudE) are included. Finally, the log of the average annual per capita expenditure of an individual's household and the residential location of an individual is included in the estimations, where residence in the Greater Accra region is

coded 1 and 0 for other regions. Detailed descriptions of these variables are in [Table A1](#) in the [Appendix](#).

[Equation \(2\)](#) is estimated as a probit model since the outcome variable is binary in nature. However, [equation \(3\)](#) is estimated as a Tobit model since the outcome variable is censored at zero. Thus, for individuals who are not willing to pay premiums for protection against mobile money fraud, their WTP amount will be zero. The marginal effects of these estimations are discussed in the next section.

### 3. Estimation results and discussions

#### 3.1 Willingness to pay and amount willing to pay

[Table 6](#) shows the proportions of males, females, and the overall sample that are willing to pay a premium against mobile money fraud. Overall, 24.34% of respondents are willing to pay a premium to be protected against mobile money fraud. The outcome gets interesting when we disaggregate the sample by gender. From [Table 6](#), whereas, about 26.4% of males are willing to pay a premium for protection against mobile money fraud only 22.6% of females will do that. This result is surprising since women have been found to be more risk averse ([Charness and Gneezy, 2012](#)), it was expected that more women relative to men would be willing to pay premiums against mobile money fraud.

Similarly, men are willing to pay higher amounts as premiums for protection against mobile money fraud in comparison to women as depicted in [Table 7](#). Overall, a Ghanaian is willing to pay GH¢27.37 (US\$6.84) [\[4\]](#) as a monthly premium for a policy that will protect him/her against mobile money fraud with a minimum and maximum premium of GH¢1.25 and GH¢500, respectively. However, on average, a man is willing to pay a monthly premium of GH¢32.66 (US\$8.16) while a woman will pay GH¢22.50 (US\$5.62). In addition, the minimum and maximum WTP amounts for men are higher than that for women.

#### 3.2 Regression results [\[5\]](#)

3.2.1 Willingness to pay. [Table 8](#) shows the marginal effects of the probit model estimation of the factors affecting an individual’s willingness to pay premiums against mobile money

**Table 6.**  
Percentage of persons willing to pay a premium against mobile money fraud

Status	All (%)	Male (%)	Female (%)
Willing to pay	24.34	26.37	22.56
Not willing to pay	75.66	73.45	77.44

**Source:** Authors’ calculation

**Table 7.**  
Willing to pay amount in Ghana cedis (GH¢)

Status	Average	Minimum	Maximum
Male	32.66	1.25	500
Female	22.50	1	300
All	27.39	1.25	500

**Source:** Authors’ calculation

Variables	All	Men	Women
Female	-0.0228 (0.0159)	-	-
Age	-0.000583 (0.000628)	-0.00224** (0.000881)	0.00147 (0.000898)
Years of schooling	0.0380*** (0.0054)	0.016*** (0.0087)	0.027*** (0.0069)
HHsize	0.00987*** (0.00319)	0.00776* (0.00436)	0.0133*** (0.00465)
Married	0.0687** (0.0308)	0.0409*** (0.0041)	0.0993** (0.0474)
<i>Network operator</i>			
Tigo	-0.0532* (0.0300)	-0.0998*** (0.0373)	0.0114*** (0.0049)
Airtel	-0.0973*** (0.0062)	-0.0104*** (0.0086)	-0.0896*** (0.0084)
Vodafone	0.0575 (0.0421)	0.0298 (0.0580)	0.102 (0.0634)
Fraud experience	0.120*** (0.0164)	0.135*** (0.0227)	0.103*** (0.0236)
Saving	0.0855*** (0.0147)	0.0794*** (0.0208)	0.0935*** (0.0204)
Other regions (not capital)	-0.157*** (0.0382)	-0.140** (0.0545)	-0.179*** (0.0540)
Per capita expenditure (log)	0.00198*** (0.00014)	0.00708*** (0.00261)	0.00815** (0.00392)
<i>Employment</i>			
Self-employed	-0.0122 (0.0164)	-0.0160 (0.0248)	-0.0112 (0.0217)
Farmer	0.0692*** (0.0177)	0.0728*** (0.0242)	0.0653** (0.0271)
Student	0.0782** (0.0321)	0.0848* (0.0452)	0.0832* (0.0457)
Retired	-0.0958*** (0.0340)	-0.116** (0.0563)	-0.0947** (0.0428)
Observations	3,887	2,086	1,801
R squared	0.620	0.701	0.590

**Notes:** Robust standard errors clustered at the household level in parentheses; \*\*\* $p < 0.01$ ; \*\* $p < 0.05$  and \* $p < 0.1$ . The reference categories for the network operator and employment status are MTN and paid employment, respectively

**Source:** Authors' calculation

**Table 8.**  
Factors associated  
with willingness to  
pay

fraud. Column 2 shows the result for the overall sample while Columns 3 and 4 show the result for men and women sub-samples.

From Table 8, both the age and gender of respondents have no association with their WTP premium for protection against mobile money fraud in both the overall sample and women. However, there is a negative association between the age of a man and his willingness to pay a premium against mobile money fraud. An additional age is associated with a 0.2% decrease in the probability of willingness to pay. This is surprising since older adults are more risk averse and hence, they are expected to be willing to pay premiums to avoid the risk associated with mobile money fraud (Albert and Duffy, 2012). Confirming our expectations, marital status, and years of schooling all have positive influences on an individual's WTP against mobile money (MoMo) fraud. Specifically, an additional year of schooling increases the likelihood of being willing to pay a premium against MoMo fraud by 3.8%, 1.6%, and 2.7% in the overall, men and women subsamples, respectively. Similarly, being a married man or woman is associated with a 4.1% and 9.9% increase in the probability of WTP premium against MoMo fraud for men and women, respectively. These findings are in line with studies (Asenso-Okyere *et al.*, 1997; Danso-Abbeam *et al.*, 2014; Falola *et al.*, 2013; Kuwawenaruwa *et al.*, 2011; Gideon, 2019) that seem to suggest that the more responsibility an individual has in terms of caring for others, the higher the likelihood that he/she will be willing to pay a premium for insurance.

Furthermore, there is a positive association between WTP and income (measured by per capita expenditure). In terms of employment, the results from Table 9 show that farmers are more likely to pay premiums against MoMo fraud in relation to individuals in paid employment. Thus, working as a farmer is associated with a 6.9%, 7.3%, and 6.5% increase

in WTP against MoMo fraud for the overall sample, men and women subsamples, respectively. Also, students are more likely to pay premiums against MoMo fraud, whereas retirees are less likely to pay any amount against MoMo fraud. This result may be partly due to the fact that a majority of mobile money account holders are students. Furthermore, living in other regions apart from the Greater Accra region is associated with less probability of being willing to pay any amount against MoMo fraud. This is not surprising since a majority of mobile money fraud victims are found in the Greater Accra region.

In terms of attributes of the product and experience of mobile money fraud, the results show that the type of mobile network operator, experience with MoMo fraud, and the use of MoMo account for savings, all influence an individual's willingness to pay any amount against MoMo fraud. Specifically, individuals using Tigo and Airtel networks have 5.3% and 9.7% lesser probabilities of being willing to pay any amount against MoMo fraud in comparison to individuals using MTN. Thus, MTN subscribers are more willing to pay premiums for policies that will protect them against MoMo fraud. This is not surprising since most mobile money fraud victims are users of the MTN network (Akomea-Frimpong *et al.*, 2019). In addition, Ghanaians who have experienced MoMo fraud before have a 12% higher probability of being willing to pay premiums against MoMo fraud than those who have no MoMo fraud experience. The likelihood of being willing to pay a premium against MoMo fraud due to previous experience with fraud is 13.5% for men but 10.3% for women. Finally, for the overall sample, men and women, the probability of being willing to pay any amount against MoMo fraud is 8.5%, 7.9% and 9.3% higher if they use their MoMo account for savings in comparison with those who do not save on their MoMo accounts.

Variables	All	Men	Women
Female	-2.745 (2.034)	-	-
Age	3.144** (1.0011)	-3.0208*** (1.0082)	3.0155*** (1.0091)
HHsize	1.876*** (0.0458)	1.0698*** (0.00402)	1.0126*** (0.00454)
Years of schooling	-1.042*** (0.105)	-1.0161*** (0.0891)	1.062*** (0.769)
Married	6.258*** (2.380)	2.033*** (1.0357)	3.099*** (1.0440)
<i>Network provider</i>			
Tigo	-6.704*** (3.288)	-5.0979*** (2.0393)	-4.013*** (1.0479)
Airtel	-10.960*** (10.11)	-1.104*** (0.0954)	-1.100*** (0.106)
Vodafone	4.556 (4.430)	0.0226 (0.0512)	0.0892 (0.0550)
Fraud experience	15.15*** (4.062)	6.122*** (2.0197)	5.102*** (2.0224)
Security	0.284 (2.431)	0.0361 (0.0243)	-0.0322 (0.0261)
Savings	11.13*** (5.098)	3.0726*** (1.0193)	2.921*** (1.0024)
Other region	-5.13*** (3.108)	-4.117*** (1.0479)	-5.150*** (2.0488)
Per capita expenditure (log)	0.0995*** (0.00341)	0.0122*** (0.00387)	0.0208*** (0.00582)
<i>Employment</i>			
Self-employed	-1.613 (2.158)	-0.0150 (0.0229)	-0.00975 (0.0216)
Farmer	7.009*** (1.798)	1.0678*** (0.0223)	1.0631** (0.0265)
Student	10.97*** (2.737)	2.0802*** (1.0016)	1.0851*** (0.4059)
Retired	-12.91*** (3.203)	-3.115** (1.0560)	-2.0997** (0.0438)
Pseudo R square	0.281	0.232	0.348
Observations	3,860	2,086	1,801

**Table 9.** Factors associated with willingness to pay amount – marginal effect of Tobit model

**Notes:** Robust standard errors clustered at the household level in parentheses; \*\*\* $p < 0.01$ ; \*\* $p < 0.05$  and \* $p < 0.1$ . The reference categories for network operators and employment status are MTN and paid employment, respectively

**Source:** Authors' calculation

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*3.2.2 Willingness to pay amount.* Table 9 shows the results of the marginal effects of the Tobit estimations. Column 2 shows the results for the entire sample, while Columns 3 and 4 show the results for men and women, respectively. Overall, the factors that are associated with the maximum WTP amount are similar to those influencing willingness to pay probability with few exceptions.

From Table 9, there is a positive relationship between age and the maximum amount individuals are willing to pay against MoMo fraud for the overall sample and all subsamples. In particular, an additional year increases the WTP amount by GH¢3.14, GH¢3.02, and GH¢3.01 for the overall sample, men, and women, respectively. Similarly, an additional member to a household increases the adult members' maximum WTP amount by GH¢1.88. An additional household member is associated with GH¢1.07 and GH¢1.01 increase in the WTP amount of male and female sub-samples, respectively. In the same way, married persons are willing to pay higher premiums for insurance against MoMo fraud than non-married individuals. Marriage is associated with GH¢6.26, GH¢2.03, and GH¢3.10 increase in premiums for all Ghanaians, men, and women, respectively.

Surprisingly, education has a negative influence on the WTP amount for the overall sample and men but it has a positive association with women's WTP amount. One more year of schooling reduces men's WTP amount by GH¢1.02, but it increases women's WTP amount by GH¢1.06. Furthermore, individuals living outside Ghana's capital region have lower WTP amounts than those living in the Greater Accra region. An individual residing outside the Greater Accra region is willing to pay GH¢5.13 less as monthly premiums against MoMo fraud, however, the amount will be GH¢4.12 less if he is a man and GH¢5.15 less for a woman. Also, farmers and students have higher WTP amounts than individuals in paid employment. However, individuals who are on retirement have a lower WTP amount than those in paid employment. Similar to the likelihood of being willing to pay a premium, income has a positive association with the amount an individual is willing to pay.

Furthermore, the results show that individuals who have personally experienced MoMo fraud or know family members or others who have had such experiences are willing to pay GH¢15.15 more as monthly premiums for protection against fraud than individuals with no experience. Similarly, there is a positive association between using a mobile money account for saving and WTP amount. In particular, using the account for savings increases the willingness to pay amount by GH¢11.13, GH¢3.07, and GH¢2.92 for the overall sample, men and women, respectively.

#### **4. Conclusion and policy recommendations**

Most adult populations in developing countries, including Ghana do not have bank accounts with traditional financial institutions. The emergence of mobile phones, notably mobile money account holding has led to a rapid rise in financial inclusion in Africa, particularly among people who were formerly excluded from the traditional financial sector. Mobile money account holders can make savings, access credit and make payments for bills on their mobile phones. Thus, mobile money presents a quick, easy and cost-effective banking method for individuals on the go. In Ghana, mobile money accounts were introduced by MTN in 2009 and since then all four mobile service operators – MTN, Vodafone, TIGO and Airtel – are offering these services to customers. Since 2009, the volume and value of mobile money transactions have increased tremendously with Ghana being described as one of the countries in Africa with the highest mobile money usage. For instance, in 2021, the volume and value of mobile money transactions increased by 47% and 71%, respectively from 2020 values.

The rapid expansion of mobile money accounts has led to an increasing number of fraudulent activities in most countries, including Ghana. In 2021 alone, 12,350 mobile money fraud cases or incidents were recorded by the Bank of Ghana. These fraud incidents amounted to a total value of GH¢14.2m with 90.14% of this value lost. This study seeks to find mobile money account holders' willingness to pay premiums for insurance against fraud and the maximum amount they are willing to pay, as well as factors affecting their willingness to pay. We use a nationally representative data set collected in 2018.

The results show that, on average 24.34% of respondents are willing to pay monthly premiums to insure themselves against mobile money fraud. However, about 4% more men (26.37%) are willing to pay positive amounts for mobile money fraud insurance than women (22.56). Similarly, the average monthly premium that men are willing to pay for protection against mobile money fraud is GH¢32.16 (US\$8.16), while the average monthly premiums for women and the overall sample are GH¢22.5 (US\$5.62) and GH¢27.39 (US\$6.84), respectively. In terms of factors associated with willingness to pay, years of schooling, household size, being married, income (expenditure), fraud experience, using mobile money accounts for saving and being a farmer, are all positively associated with willingness to pay. On the other hand, using other networks apart from MTN, residing outside Greater Accra and being a retiree, all have negative associations or influences on willingness to pay. Concerning the maximum monthly premium, increase in age, large household size, being married, having experienced fraud before, increase in income, and using a mobile money account for saving, all have positive associations with the maximum premiums mobile money account holders are willing to pay for insurance against fraud in the sub-sector.

These results suggest that there is a demand for insurance policies against mobile money fraud in Ghana. Hence, network operators, insurance companies, and other private or public companies can provide this service to mobile money account holders for protection against mobile money fraud. However, the provision of such insurance policies should consider the education, employment status, and gender of account holders.

## Notes

1. Bank of Ghana report retrieved from [www.bog.gov.gh/wp-content/uploads/2021/09/Summary-of-Economic-Financial-Data-September-2021-1.pdf](http://www.bog.gov.gh/wp-content/uploads/2021/09/Summary-of-Economic-Financial-Data-September-2021-1.pdf)
2. Using the Bank of Ghana's interbank exchange rate of \$1 to GH¢4.374 as of 11th May 2017.
3. The first two waves do not contain data on willingness to pay for mobile money fraud, hence we could not use these waves.
4. Using the interbank exchange rate of GH¢4.2 to US\$1 as of December, 2017
5. These results show the factors that correlate with individuals' willingness to pay, hence we do not attribute causal inference in this study.

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Variables	Definitions and measurements
WTP	Willing to pay a positive amount for protection; 1 if yes and 0 otherwise
WTP amount	Maximum WTP amount for policy against fraud
Age	Age of respondents
Female	Gender of a respondent: 1 if male and 0 otherwise
Education	Years of schooling completed by respondents
Employment	Employment status of respondent (paid employment, self-employed, farmer, student, retired)
Network	Categorical variable for network used by a respondent (MTN, Tigo, Vodafone, Airtel)
Marital status	Marital status of a respondent: 1 if married and 0 otherwise
Household size	Number of persons in a respondent's household
Expenditure	Annual per capita expenditure per adult
Other regions	The region where a respondent resides: 1 if he/she is in Greater Accra and 0 otherwise
Fraud experience	A dummy variable which is 1 if one has been defrauded and 0 otherwise
Saving	A dummy variable which is 1 if one uses an account for saving and 0 otherwise

**Source:** Authors' calculation

**Table A1.**  
Definitions and  
measurements of  
variables

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