ESEPARC
ESWATINI ECONOMIC POLICY ANALYSIS AND RESEARCH CENTRE

Financial Inclusion in Eswatini:
What is Driving the Adoption of Mobile Money?

T. Magongo[1]

1Eswatini Economic Policy Analysis and Research Centre, Mbabane, Eswatini
*Correspondence: magongotanele@separc.co.sz

2019

ESEPARC WORKING PAPER 011/SZL

Financial Inclusion in Eswatini: What is Driving the Adoption of Mobile Money? – 2019 Eswatini Economic Conference[1]

T. Magongo[1]

[1]Eswatini Economic Policy Analysis and Research Centre

Abstract. Mobile money has gained increasing importance and prominence in many sub-Saharan African countries and as a result, it is seen as a possible key to fast-tracking financial inclusion in developing countries including Eswatini. Although financial inclusion rates have improved considerably in Eswatini, the adoption of mobile money is still relatively low in the country compared to other countries in sub-Saharan Africa, yet a majority of the population knows about the technology. This study investigates the driving factors of mobile money adoption in Eswatini using a logit and probit analysis based on the 2014 FinScope Financial Access and Consumer Survey. Findings reveal that the likelihood of using mobile money increases with increasing levels of financial literacy, education, sending and receiving remittances using mobile money, usage of informal financial products, living in an urban area, and adjusting income during times of shock. Results suggest opportunities for financial inclusiveness such as designing and implementation of financial literacy education and money management programs, purposely targeting the underserved population (rural), as well as informal financial product usage formalization.

Key Words: Mobile Money, Financial Inclusion, Developing Economies, Eswatini

1. Introduction

Many developing countries experience low levels of financial inclusion and the situation is more rampant in Sub-Saharan Africa (SSA). The World Bank (2018) states that only 34% of adults in SSA have formal banking which is almost two times lower than the world average of 69%. Further compounding the issue is the fact that the financial systems in SSA are usually underdeveloped and the level of financial literacy amongst the population is often poor (Lapukeni, 2015). Consequently, these problems lead to a barrier in the socio-economic development of the region because they restrict the ability of the population to make savings and investments which could boost economic growth and in turn reduce the level of poverty in SSA (World Bank, 2012; Venkatesen & Gaurav, 2013).

Mobile money has provided a promising prospective developmental role, which could address financial exclusion in a number of SSA countries including Eswatini. It is a financial transaction offered by a telecommunication provider that does not require internet access (or a smart phone) and hence is simply conducted using a mobile phone and a mobile money agent (a vendor acting as an ATM or a bank). By harnessing this relatively simple technology, many SSA countries have

significantly improved their financial inclusion rates.

However, in Eswatini, despite the introduction of mobile money in 2011, statistics indicate that only 21% of adults use the system yet it is one of the key systems for improving the levels of financial inclusion in many developing economies (FinScope, 2014). It is further important to note that a majority of emaSwati (83%) is aware of mobile money yet the usage of the system among the population is still quite low (FinScope, 2014). The reasons behind this are unknown yet they could provide crucial information for the development of financial inclusion improvement policies with respect to mobile money in the country especially considering the recent development of the National Financial Inclusion Strategy in 2017. Therefore, although 64% of emaSwati are formally served (FinScope, 2014), in order to accelerate this to 100% in 2022 as envisaged by the strategy, there is need to understand the underpinnings behind this phenomenon and thus the paper attempts to answer the question on what determines the usage of mobile money in the country.

Against this background, the study aimed to identify the different factors that contribute to mobile money usage with the goal to unveil important policy implications for financial inclusion policy in Eswatini. Specifically, it identified areas which the Government in Eswatini needs to focus on in order to improve mobile money adoption and in turn increase the overall levels of financial inclusion in the country.

The subsequent sections cover the following subjects: Part two provides a brief review of literature. The data and methods used are presented in part three while part four presents the empirical results of the research. The conclusion and policy implications/recommendations are presented in part five.

2. Literature review

Empirical literature determining the possible determinants of mobile money adoption in sub-Saharan Africa is limited. Most research work has tended to focus on determinants of adoption (or access to) of digital financial services such as mobile and/or online banking applications. However, mobile money is a different system altogether which is more widely used in SSA compared to digital financial services.

The few studies that have been done on this area have tended to identify the determinants of

mobile money usage based on specific study groups such as micro women entrepreneurs (Gichuki & Mulu-Mutuku, 2018), farmers (Kikulwe et al., 2014; Kirui et al.,2013), and rural areas (Munyegera & Matsumoto, 2016) but no study has been done on a nationally representative sample of the population.

Moreover, many studies focus on socio-economic variables as possible determinants. For example, the studies by Munyegera & Matsumoto (2016), Kikulwe et al., (2014), and Kirui et al., (2012) look at age, gender, income, education, farm size, and employment of the household head as possible factors in Uganda and Kenya respectively. These papers found that the education level of the household head has a positive impact on mobile money usage. Specifically, the authors noted that as the level of education increases for a household head, the more likely that he/she will use mobile money. This is partly due to the literacy effect of educated household heads who could be more able to operate mobile handsets. Alternatively, it could also be due to the fact that educated household heads are more able to send their children to school who, upon graduation, find jobs in towns and extend financial assistance in form of remittances through mobile money platforms (Munyegera & Matsumoto, 2016). Kirui, Okello, & Nyikal (2014) further suggest that there are differences between users and non-users of mobile money. Specifically; they indicate that non-users of mobile money services are usually less educated and are more experienced in farming.

On the other hand, Kikulwe, Fischer, & Qaim (2014) provide evidence that the household size also plays a significant role because households with more members are more likely to use mobile money in Kenya. Munyegera & Matsumoto (2016) also indicate that households with a family member who is a migrant worker are more likely to use mobile money compared to those who do not have a migrant worker in Uganda. This is more likely the case because the migrant workers will want to send remittances back home to their family using mobile money.

There is also evidence that mobile money usage is associated with income and/or wealth of the household head. Kikulwe, Fischer, & Qaim (2014) find that wealth which was proxied by farm size (since their paper is focused on banana farmers), is another factor which may influence whether a household head will use mobile money or not.

While these studies have formed a good foundation for identifying the socioeconomic factors associated with mobile money usage, there is limited to no mention on financial literacy and/or

money management factors. Ample evidence (for example Honohan & King (2012)) has noted that financial literacy and money management behavior play a huge role in whether individuals or household heads will use a certain financial service or technology. These papers also do not consider locational influences (urban or rural) as another factor to further identify if there is any urban-rural divide in mobile money usage. As such, it is key that such factors are taken to account when examining determining factors for mobile money adoption. Therefore, this research bridged this gap by including these variables in the mobile money adoption model.

This paper therefore departs from the other empirical literature by first using a nationally representative dataset from the last FinScope Consumer Survey conducted in Eswatini in 2014 and, by also exploring financial literacy and money management variables (which are available in the survey data) that have not been included in previous studies. Most importantly, despite the fact that some empirical studies in other countries have illustrated possible different factors which influence mobile money usage, such a study has not yet been conducted in Eswatini, yet this is a crucial step to undertake before developing policies which are necessary to increase the level of financial inclusion in the country.

3. Description of data and methods

The research uses data from the 2014 FinScope Consumer Survey conducted by the Central Statistics Office under the Ministry of Economic Planning and Development in Eswatini. A total of 3440 face-to-face household interviews, representative on national, urban/rural and regional levels, were conducted. The survey data includes several characteristics such as socioeconomic, infrastructure, financial literacy, and money management variables. Financial literacy is an index of responses to various questions which determine financial literacy where a score between 1-4 is "illiterate" between 5-8 is "sort of literate" and between 9-12 is "literate." Money management variables include various questions on aspects such as use of informal saving products, remittances, savings, adjusting income in times of shock etc.

Factors influencing the usage of mobile money services were analyzed using binary logit and probit[1] regression models (since the dependent variable is categorical) in the form:

$$MobileMoney_i = \propto + \beta X_i + \varepsilon_i \qquad (1)$$

[1] The paper first estimates logit models. However due to the presence of endogeneity, the paper then estimates probit models with instrumental variables. Instrumental variables can only be added on probit models.

where $MobileMoney_i$ is a dummy variable which takes one if the household head i uses mobile money or zero otherwise, X_i is a vector of the possible different factors/characteristics that may influence mobile money usage based on reviewed literature including the financial literacy and

money management variables (see Table 3.1 below) and ε_i is the error term.

Table 3.1 Description of explanatory variables

Variables	Description	Classification
Location	Ample literature notes that people living in urban areas are more likely to be banked than those living in rural areas. Fanta et al., (2016) find that urbanites use mobile money more than people living in rural areas. Therefore it is expected that people living in urban areas are more likely to use mobile money.	Dummy (0 = Rural, 1 = Urban).
Education	Household heads who have a higher level of education are expected to be more likely to use mobile money. As Munyegera & Matsumoto (2016), Kikulwe et al., (2014), and Kirui et al., (2012) note, it may be due to the literacy effect of educated household heads who could be more able to operate mobile handsets.	Categorical (1= No formal education, 2=Primary education, 3= Secondary Education, 4= High school education, 5= College education, 6= University education)
Income	Household heads who earn a higher income and/or have more wealth may be more likely to use mobile money. Kikulwe, Fischer, & Qaim (2014) note that they may have the resources which may influence them to register for mobile money in order to transact.	Continuous
Savings	In line with income/wealth, household heads with higher savings (which inherently is wealth) may want to use mobile money as a tool for keeping their funds as noted by Kikulwe, Fischer, & Qaim (2014)	Continuous
Age	A look at the other variables shows that an increase in age increases the incidence of bank account ownership, as does an increase in personal monthly income.	Continuous
Gender	A positive coefficient for gender suggests that bank account ownership is skewed towards males, with females more likely to be excluded.	Dummy (0 = Male, 1 = Female).
Has bank account	Studies (for example Mbiti (2011) suggest that using mobile money increases the chance of a user having a bank account (Mbiti, 2011).	Dummy (0 = No, 1 = Yes).

Receiving remittances through mobile money	According to Munyegera & Matsumoto (2016) households who have a family member who is a migrant worker are more likely to use mobile money as they receive remittances from the family member.	Dummy (0 = No, 1 = Yes).
Sending remittances through mobile money	In line with receiving remittances (as noted above), household heads who are migrant workers are more likely to use mobile money as they send remittances to the family members back home.	Dummy (0 = No, 1 = Yes).
Ease of access to money	Household heads with ease of access to money at any time indicate their level of wealth to a certain extent. As such, such households may want to use mobile money as a tool for keeping their funds as noted by Kikulwe, Fischer, & Qaim (2014)	Categorical (1= Agree, 2= Sometimes, 3= Disagree)
Financial literacy score	As Morgan & Trinh (2019) notes, it is also possible that more financially educated individuals are also more skilled thus are more likely to use a financial instrument	Continuous
Ability for household to adjust income in times of shock	Ability for the household to adjust in times of shock also depicts its level of income/wealth thus households who are able to do that are more likely to use mobile money.	Categorical (1= Agree, 2= Sometimes, 3= Disagree)
Uses informal financial products	Mbiti (2011) notes that an individual that uses mobile money is more likely not to use informal financial products	Dummy (0 = No, 1 = Yes).

Source: Author's Own from Literature Review

The paper corrected for clustering at the regional level which incorporates *Tinkhundla* (constituencies) with similar characteristics in terms of educational levels and socioeconomic living standards. The paper also uses an instrumental variable (IV) approach to account for possible endogeneity resulting from reverse causality in the estimation[2]. After estimating the model, the paper tested for the endogeneity of the financial literacy score using the Wald test of exogeneity, which in the case of a single endogenous variable reduces to testing the null hypothesis of no correlation (rho) between the error terms of the first and second equations estimated in the probit model (Anselmi, Lagarde, & Hanson, 2015). The paper also tested the instrumental variables to find out whether they are weak or not using the F-statistic as indicated by Staiger & Stock (1997). The analysis was carried out using Stata 14.

4 Results and discussions

4.1 Descriptive statistics: comparison between non-users and users of mobile money

Table 4.1 provides descriptive statistics of non-users of mobile money whilst Table 4.2 provides descriptive statistics of users of mobile money based on the Finscope Consumer Survey sample. About 78% of the respondents do not use mobile financial transactions. The mean financial literacy score for users of mobile money is slightly higher than mobile money users (8.2 versus 7.8). Moreover, the average income and savings of mobile money users is higher than mobile money non-users (for income: E3509.67 versus E2107.82, and for savings: E11,163.96 versus E7402.26). The descriptive statistics also show that more mobile money users have higher education levels, live in an urban area, are younger (in terms of age), send remittances using mobile money, and also have a bank account as seen between the comparisons in Table 4.1 and 4.2 below.

Table 4.1 Descriptive statistics for non-mobile money users

	Mean	Std. Dev	Min	Max
Location (Urban/Rural)	0.266322	0.442116	0	1
Education	1.708595	1.226971	0	5
Income	2107.816	5045.884	0	100000
Savings	7402.262	37449.42	0	800000
Age	52.59963	15.60264	21	94

[2] The paper uses two instrumental variables which are highest education level and saving ability because there could be unobserved effects that may lead to one being financial literate.

Gender	0.328082	0.469732	0	1
Has bank account	0.402803	0.490552	0	1
Send remittances ~ mobile money	0.989303	0.102891	0	1
Receive remittances ~ mobile money	0.005902	0.076611	0	1
Ease of access to money	0.314607	0.464446	0	1
Financial literacy score	7.835116	1.927017	0	12
Ability to adjust income ~ shock	1.341571	0.609187	1	3
Uses informal financial products	0.178532	0.383031	0	1

Source: Author's Estimation

Table 4.2 Descriptive statistics for mobile money users

	Mean	Std. Dev	Min	Max
Location	0.412894	0.492692	0	1
Education	2.491084	1.244875	0	5
Income	3509.666	5475.294	0	80000
Savings	11163.96	28644.1	0	300000
Age	50.35689	15.27095	21	93
Gender	0.312057	0.464157	0	1
Has bank account	0.695473	0.460523	0	1
Send remittances ~ mobile money	0.677641	0.467701	0	1
Receive remittances ~ mobile money	0.305899	0.461103	0	1
Ease of access to money	0.416667	0.493349	0	1
Financial literacy score	8.234568	1.898123	1	12
Ability to adjust income ~ shock	1.260631	0.565103	1	3
Uses informal financial products	0.315501	0.465034	0	1

Source: Author's Estimation

4.2 Estimation results: factors associated with mobile money adoption

Table 4.3 presents the results of the logit, probit, and IV probit models estimated on the sample. The logit models in column one and two indicate that having a higher education level (specifically high school, college, and university education) is associated with having mobile money adoption. This is consistent with the studies by Munyegera & Matsumoto (2016), Kikulwe, Fischer, & Qaim (2014) and Kirui, Okello, & Nyikal (2012). Moreover, people who use informal financial products (such as rotating savings and credit associations, ROSCAs or *stokvels* as they are known in Southern Africa), send and receive remittances, and have ease of access to money are more likely to use mobile money compared to those who do not. Interestingly in these logit models, the financial literacy score does not appear to be associated with mobile money usage since it is not significant in model 1 but when clustering is factored in in model 2, it becomes significant at 90% significance level.

Table 4.3 Estimation results: logit and probit models

Variables	Model (1) Logit	Model (2) Logit ~ cluster	Model (3) Probit- IV instruments	Model (4) Probit – IV instruments & cluster	
				2nd Stage	1st stage
Lives in urban area	-0.133	-0.133	-1.318	0.309**	0.458**
	(0.343)	(0.445)	(0.919)	(0.154)	(0.199)
Age	-0.008	-0.008	0.008	0.002	-0.004
	(0.010)	(0.006)	(0.017)	(0.003)	(0.004)
Female	0.035	0.035	0.463	0.108	-0.166
	(0.345)	(0.319)	(0.534)	(0.109)	(0.163)
Primary education	0.113	0.113			
	(0.902)	(0.744)			
Secondary education	0.868	0.868			
	(0.810)	(0.651)			
High school education	1.411*	1.411**			
	(0.793)	(0.685)			
College education	2.358***	2.358***			
	(0.836)	(0.640)			
University education	2.858***	2.858			
	(1.057)	(2.401)			
Financial literacy score	-0.033	0.033*	2.740*	0.642***	
	(0.095)	(0.018)	(1.610)	(0.035)	
Ability to save	0.953	0.953			
	(2.513)	(0.794)			
Lnsavings	-0.070	-0.070	0.080	0.019	-0.034
	(0.121)	(0.185)	(0.186)	(0.032)	(0.049)
Lnincome	0.034	0.034	-0.091	-0.021	0.051
	(0.186)	(0.138)	(0.280)	(0.118)	(0.170)
Send remittances by MM	2.508***	2.508**	-1.061	0.248*	-0.083
	(0.548)	(1.212)	(0.830)	(0.145)	(0.280)
Receive remittances by MM	4.811***	4.811***	2.611***	0.611*	0.021
	(0.778)	(1.063)	(0.812)	(0.365)	(0.220)
Has bank account	0.579	0.579	0.187	0.044	0.042
	(0.399)	(0.521)	(0.564)	(0.091)	(0.043)
Uses informal products	0.794**	0.794**	0.552	0.129*	-0.041
	(0.314)	(0.316)	(0.481)	(0.069)	(0.097)
Adjust income (disagree)	0.838	0.838	9.475*	-2.220***	-3.278***
	(0.518)	(0.565)	(5.316)	(0.069)	(0.150)
Adjust income (sometimes)	-1.192*	-1.192**	5.876	1.377***	-2.369***
	(0.684)	(0.538)	(3.861)	(0.199)	(0.115)
Ease of access to money	0.588*	0.588**	-0.389	-0.091	0.262*
	(0.324)	(0.263)	(0.633)	(0.124)	(0.153)
Constant	-1.471	-1.471	-24.447*	-5.727***	8.341***
	(3.039)	(2.597)	(14.073)	(0.993)	(1.213)
Pseudo R2	0.409	0.409	-	-	
Wald chi2	-	-	29.53	40.95	
Prob > chi2	0.000	0.000	0.005	0.000	
Wald test of exogeneity	-	-	18.32	-	38.89 (p value=0.00)
Rho	-	-	-	-	-0.972
F-test	-	-	-	-	15.987

Source: Author's Estimation
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

However, the logit regression estimates could be biased due to endogeneity problems. For example, Morgan & Trinh (2019) indicate that those with savings could improve their financial literacy. It is also possible that more financially educated individuals are also more skilled (unobservable effect) thus more likely to use mobile money. Moreover, there could also be measurement errors in the financial literacy score.

Therefore, to correct for these endogeneity and measurement error problems, the paper uses two instrumental variables which are the highest education level and saving ability. This is in line with other research on the area of financial literacy. For example, Cole, Sampson, & Bilal (2011) have evidently shown how education influences the way individuals behave when it comes to financial management. Models 3 and 4 are the results from the IV probit models. The paper estimated this using the IV probit commands because there is currently no way for including IV using logit models on Stata.

The analysis of the results will focus on model 4 since it also includes clustering whilst model 3 does not. The F-statistic test for weak instrumental variables is 15.987 as shown in Table 4.3 which is larger than the rule of thumb of 10 proposed by Staiger & Stock (1997)[3]. Therefore, this confirms that it is not a weak instrument. The Wald test of exogeneity ($p = 0.000$) result suggests that financial literacy and mobile money is endogenous since the p-value is significant and according to Anselmi, Lagarde, & Hanson (2015) this means that the IV probit estimates are more efficient and should be preferred to the rest of the other estimates in models 1, 2, and 3.

In general, the results indicate that adoption of mobile money is positively and statistically influenced by residing in an urban area, a higher financial literacy score, sending and receiving remittances using mobile money, usage of informal financial products, and adjusting income during times of shock (those who responded that 'sometimes' they do). Moreover, there is a negative and statistical significance between mobile money adoption and those who indicated that they do not adjust their incomes in terms of shock.

Specifically, the results show that individuals with a higher financial literacy score are 64% more likely to use mobile money than those who have a lower financial literacy score. This is line with

[3] Other diagnostic tests (*fitstat* tests for model 4) are attached in the appendix.

several studies which have studied the impact of financial literacy on mobile financial services such as Honohan & King (2012). Additionally, people who send and receive remittances using mobile money are 25% and 61% respectively more likely to use mobile money than those who do not send and receive remittances. This makes sense considering the fact that sending remittances using mobile money is more efficient and quicker especially for those who live in rural areas who may not have access to ATM banks or any sophisticated financial services. These results are also consistent with the findings by Munyegera & Matsumoto (2016) in Uganda.

The results also show that those who use informal financial products (*stokvels*) are 13% more likely to use mobile money than those who do not. Due to the nature of *stokvels*, this is not surprising, because sending money to each group member who is expected to receive money either weekly/monthly is more efficient and cheaper through mobile money than travelling to give the person money in person. It must be noted that *stokvels* tend to be undertaken by people working in the informal sector thus the usage of mobile money to send and/or receive money by these groups is highly likely since they (people in informal sector) also act as the vendors/"ATMs" for mobile money

There is also a presence of the rural-urban divide since people who reside in urban areas are 31% more likely to use mobile money compared to than those who do not. Lastly, those who do not adjust their income accordingly when they experience shocks are 222% not likely to use mobile money than those who adjust their income accordingly.

While Kikulwe, Fischer, & Qaim (2014) find that wealth is associated with mobile money usage in Kenya as indicated in the literature review, this paper finds that total income and savings do not have an effect on whether people will use mobile money since these results are not statistically significant. As such, the results of the study highlight the fact that policy attention will need to focus on financial literacy education, education, money management, and locational areas as these will be part of the key areas in driving financial inclusion in Eswatini.

5. Conclusion and policy recommendations

This paper has identified the various factors that are associated with mobile money adoption in Eswatini using a logit and probit analysis. The analysis reveals that adoption of mobile money is positively and statistically influenced by residing in an urban area (31%), a higher financial

literacy score (64%), sending and receiving remittances using mobile money (25% and 61% respectively), usage of informal financial products (13%), and adjusting income during times of shock (222%) (those who responded that 'sometimes' they do). Moreover, there is a negative and statistical significance between mobile money adoption and those who indicated that they do not adjust their incomes in terms of shock. The study also shows that a higher education level is associated with mobile money usage (although this result is based on the logit models which were corrected for instrumental variables).

From the results, it is therefore clear that financial literacy and some money management variables clearly influence whether people use mobile money or not. Essentially, awareness of mobile money is not equal to increased usage of mobile money as purported by the Government of Eswatini. Therefore, just because that individual knows about mobile money does not necessarily mean that that person will use it. As a result, such considerations need to be key in designing strategies to increase usage of financial mobile services, in particular mobile money in this context.

Based on results, therefore, in order to increase usage of mobile money in Eswatini and in turn achieve the Governments' vision of 100% financial inclusion in 2022, the study recommends the Government of Eswatini to do the following:

- Develop and implement financial literacy education and empowerment programs to empower the population to have increased information in terms of financial education since the research finds that higher financial literacy is associated with mobile money usage
- In addition to the financial literacy education and empowerment programs, the Government should increase outreach of mobile money services in rural areas since it is clear there is also a rural-urban divide in the usage of mobile money as highlighted by the research.
- The findings also point out to existing opportunities in the population using informal financial products yet these informal *stokvels* are not still yet recognized formally by the Government. Therefore, there is need to examine how these informal financial products

can be merged (formalized) with mobile money to ensure increased and efficient utilization between users, agents, and service providers.

Further research on this area could expand this current analysis by conducting randomized field experiments at local levels on the impact of financial literacy and money management programs on usage of mobile money. This will not only help identify the impacts but also help identify and shape the financial literacy and money management programs that the Government will implement (as suggested in the policy recommendations) in terms of the psychological and cultural contextual needs of the people of Eswatini in order to increase more usage of financial mobile services such as mobile money in the country.

References:

Anselmi, L., Lagarde, M., & Hanson, K. (2015). Health service availability and health seeking behaviour in resource poor settings: evidence from Mozambique. *Health Economics Review*, 5(26), 1-13.

Cole, S., Sampson, T., & Bilal, Z. (2011). Prices or Knowledge? What Drives Demand for Financial Services in Emerging Markets? *The Journal of Finance*, 66(6), 1933-1967.

FinScope. (2014). *FinScope Consumer Survey Swaziland*. Retrieved October 6, 2015, from Finmark: http://www.finmark.org.za/wp-content/uploads/pubs/Brich_FsSwaziland_2014.pdf

Gichuki, C. G., & Mulu-Mutuku, M. (2018). Determinants of awareness and adoption of mobile money technologies: Evidence from women micro entrepreneurs in Kenya. *Women's Studies International Forum*, 67(1), 18-22.

Honohan, P., & King, M. (2012). Cause and effect of financial access: cross country evidence from the finscope surveys. In R. Cull, A. Demirguc-Kunt, & J. Morduch, *Banking the World: Empirical Foundations of Financial Inclusion* (pp. 45-62). London: The MIT Press.

Kikulwe, E. M., Fischer, E., & Qaim, M. (2014). Mobile Money, Smallholder Farmers, and Household Welfare in Kenya. *PLoS ONE*, 9(10), 1-13.

Kirui, O. K., Okello, J. J., Nyikal, R. A., & Njiraini, G. W. (2013). Impact of Mobile Phone-Based Money Transfer Services in Agriculture: Evidence from Kenya. *Quarterly Journal of International Agriculture*, 52(2), 141-162.

Lapukeni, A. F. (2015). *Financial Inclusion, ICT and Intra Regional Trade in COMESA*.

Morgan, P., & Trinh, L. (2019). Determinants and Impacts of Financial Literacy in Cambodia and Viet Nam. *Journal of Risk and Financial Management*, 12(1), 1-24.

Munyegera, G. K., & Matsumoto, T. (2016). Mobile Money, Remittances, and Household Welfare: Panel Evidence from Rural Uganda. *World Development*, 79(1), 127-137.

Riley, E. (2018). Mobile money and risk sharing against village shocks. *Journal of Development Economics*, 135(1), 43-58.

Staiger, D., & Stock, J. (1997). Instrumental Variables Regression with Weak Instruments. *Econometrica*, 65(3), 557-586.

USAID. (2013). *Mobile Money Defined.* Retrieved from https://www.hfgproject.org/wp-content/uploads/2013/09/HFG-Mobile-Money-Defined.pdf

Vheronycka, H. (2017). *MTN Mobile Money Fraud – An Inside Job?* Retrieved from https://www.adomonline.com/ghana-news/mtn-mobile-money-fraud-inside-job/

World Bank. (2012). *Measuring Financial Inclusion: the Global Findex Database*. Retrieved October 3, 2015, from http://go.worldbank.org/J3T8AZ4KX0

World Bank. (2018). *Financial Inclusion on the Rise, But Gaps Remain, Global Findex Database Shows*. Retrieved from World Bank: https://www.worldbank.org/en/news/press-release/2018/04/19/financial-

inclusion-on-the-rise-but-gaps-remain-global-findex-database-shows

Appendix

Table 5.1 Model 4 diagnostic tests

Probit	
Log-likelihood	
Model	-157.908
Intercept-only	-267.009
Chi-square	
Deviance (df=467)	315.816
R2	
McFadden	0.409
McFadden (adjusted)	0.397
McKelvey & Zavoina	0.609
Cox-Snell/ML	0.371
Cragg-Uhler/Nagelkerke	0.547
Efron	0.462
Tjur's D	0.459
Count	0.864
Count (adjusted)	0.467
IC	
AIC	321.816
AIC divided by N	0.685
BIC (df=3)	334.274
Variance of	
e	1
y-star	2.555

Source: Author’s Estimation