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George Okello Candiya Bongomin[a], Joseph M Ntayi[b], John C. Munene[a] and Charles Akol Malinga[c]

[a]FGSR, Makerere University Business School, Kampala, Uganda; [b]Procurement and Logistics, Makerere University Business School, Kampala, Uganda; [c]Finance, Makerere University Business School & Currency, Bank of Uganda, Kampala, Uganda

ABSTRACT

The purpose of this article is to test the moderating effect of social networks in the relationship between mobile money usage and financial inclusion in rural Uganda. The results revealed that there is a significant and positive moderating effect of social networks in the relationship between mobile money usage and financial inclusion in rural Uganda. Besides, mobile money usage and social networks have direct and significant effects on financial inclusion in rural Uganda. Thus, the findings suggest that existence of social networks of strong and weak ties among mobile money users promote financial inclusion in rural Uganda. Previous studies have concentrated only on investigating the impact of mobile money in promoting financial inclusion in developing economies, especially in Sub-Saharan Africa. However, this particular study introduces the moderating effect of social networks in the relationship between mobile money usage and financial inclusion in rural Uganda, which seems to be sparse and lacking in literature.

Background

Rangarajan Committee (2008) defines "financial inclusion as a process of ensuring access to financial services and timely and adequate credit where needed by vulnerable groups at an affordable cost." Contextually, Bank of Uganda (2014) refers to it as "usage of financial services provided by regulated, other formal, and informal financial institutions."

Scholars such as Ardic, Heimann, and Mylenko (2011) and Beck, Levine, and Levkov (2010) reveal that price and non-price barriers like high cost associated with fees and minimum balances, lack of physical access, long loan processing time, and strict documentation and collateral requirements have led to voluntary exclusion of the population worldwide. Conversely, financial inclusion promoters such as the World Bank and UNCDF have argued that use of digital financing through mobile money can lead to increased access to affordable, safe, accessible, adaptable, and usable financial services, especially among the rural communities in developing countries (Kikulwe, Fischer, & Qaim, 2013; UNCDF, 2015).

A large body of existing empirical evidence suggests that mobile phones can potentially serve as a tool for economic development in Africa, especially in promoting financial inclusion (see for e.g. Aker & Mbiti, 2010; Ggombe, 2015). Indeed, Gosavi (2017) attests that mobile money, which is a mobile-phone-based financial tool can transfer money safely and quickly across a wide geographical area. However, evidence on the moderating effect of social networks in the relationship between mobile money usage and financial inclusion is lacking in this region, especially among the poor in rural Uganda.

Accordingly, Duncombe (2009) observes that mobile phones have considerable potential in providing a new and rapidly developing technological means to facilitate monetary payments and transfers in under-banked and unbanked communities. In addition, UNCDF (2015) also reveals that innovations such as use of digital financing through mobile money, has led to increased access to affordable, safe, accessible, adaptable, and usable financial services by the poor. Moreover, CGAP (2009) argues that mobile phones offer the possibility of revolutionalizing the traditional labor intensive banking model into a more agile, robust, and cost-effective mechanism capable of delivering small transactions that the low-income groups usually deal with.

Additionally, Rangarajan Committee (2008) contends that use of appropriate technology such as mobile money with low-operational cost can promote outreach of financial services in remote areas. This is supported by Kochhar (2009) who observes that leveraging technology create channels beyond branch networks that helps in extending banking services to the unbanked similar to those dispersed by branches. Conclusively, the World Bank (2014) elucidates that high rates of mobile phone network penetration and adoption, lack of affordable alternatives, especially among rural communities, and lower service fees relative to conventional bank accounts have resulted into rapid use of mobile money, especially in developing economies (see also Mas & Radcliffe, 2010; World Economic Forum Report, 2011). Indeed, use of digital financing reduces cost associated with financial services delivery incurred by banks.

Riquelme and Rios (2010) suggest that the extent to which consumers use mobile technology as a medium of transaction is affected by the opinions of their families, relatives, and friends. Thus, mobile phone users such as the poor, rely on their closed networks of families, existing open networks of friends, and peers to get and share useful information and knowledge about use of mobile money technology. Unfortunately, this seems to be sparse in literature and theory of financial inclusion.

Indeed, the World Bank (2002) contends that in under developed markets, especially in Sub-Saharan Africa where the poor live, they rely most on existing informal networks in their social settings to enable trade. Similarly, scholars like Munene, Schwartz, and Kibanja (2005) indicate that most poor households in rural Uganda rely on their existing local networks of strong and weak ties (e.g. community associations, religious groups, burial groups, ROSCA) to gain access to new ideas and information to operate in the market (see also Heikkilä, Kalmi, & Ruuskanen, 2009). Correspondingly, Slade, Dwivedi, Piercy, and Williams (2015) postulate that social networks act as a great source of information and motivator for people trying out any new technology or information system (see also Yang, Lu, Gupta, Cao, & Zhang, 2012). The exchange and sharing of valuable information among members in social networks provide higher credibility in use of mobile telephone services. This is supported by Granovetter (1973) who argues that

nodes and ties, which are part of a network among economic actors, enables them to have better access to information and ideas about existing opportunities and resources.

Prior studies like Kikulwe, Fischer, and Qaim (2014), Jack and Suri (2014), Mbiti and Weil (2011), Aker, Boumnijel, McClelland, and Tierney (2011), Maurer (2008), Jonathan & Camilo (2008), Merritt (2010), Thacker and Wright (2012), Johnson and Nino-Zarazua (2011) reveal that mobile money usage can promote access to and use of financial services, especially among the rural population. Contextually, studies by Ggombe (2015), Ssonko (2010), Ndiwalana, Morawczynski, and Popov (2010) indicate that mobile money usage has potential to enhance financial inclusion, especially among poor households in rural Uganda.

However, these studies fail to consider the moderating effect of social networks in the relationship between mobile money usage and financial inclusion, especially among the poor in rural Uganda. Thus, the purpose of this article is to test the moderating effect of social networks in the relationship between mobile money usage and financial inclusion in rural Uganda.

The current article is organized into 6 sections. The first section contains the review of the necessary literature and hypotheses setting. The second section discusses the methodology used in the study, while section three indicates the results and discussions of the findings. Section four focuses on conclusion drawn from the study, and section five concentrates on possible policy recommendations. Last, section six identifies the limitations to the study and areas for future studies.

Review of literature and hypotheses setting

Mobile money usage and financial inclusion

According to Upadhyay and Jahanyan (2015), "mobile money" is basically a mobile-based money transfer service that uses information and communication technology 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. Indeed, mobile money provides basic financial services such as deposit, withdrawal, remittance delivery, and payment of bills. Thus, the launch of Mobile Money Services by telecom companies in several countries, especially in Sub-Saharan Africa has boosted provision of financial services among low-income earners.

Jonathan & Camilo (2008) observe that many lives, especially of the rural poor households have been transformed by the mobile phone revolution, which has provided not only communication but also access to basic financial services through phone-based money transfer and storage (see also Demombynes & Thegeya, 2012). Medhi and Ratan (2009) contend that the total number of mobile phone users is more than the total number of people with bank accounts across the world.

According to the World Bank (2014), high rate of mobile phones network penetration and adoption, lack of affordable alternatives, and lower service fees relative to conventional bank account fees have resulted into rapid use of mobile money, especially among rural communities in developing economies (Mas & Radcliffe, 2010; World Economic Forum and Boston Consulting Group, 2011).

Additionally, USAID (2012) also argues that mobile money is relatively cost-effective and efficient compared to cash-based payment channels. Thus, Kumar, Martin, and O'Neill (2011) contend that mobile money, which enables person-to-person and person-to-merchant payments using mobile phones without the need to have bank accounts and costly equipments, is convenient and key in promoting financial inclusion among the poor.

Scholars like Must and Ludewig (2010), Pope et al. (2011), Aker and Mbiti (2010) have observed that as large numbers of poor people in developing countries migrate from rural to urban areas to earn livelihood, they have the great need to send money back to their families on regular basis. However, money transfer services can be very difficult and expensive. Thus, in such circumstances, mobile money becomes the most suitable medium for transferring the money.

A study by Mobile Money Global Event (2015) in Kenya revealed that use of mobile money as a tool for financial inclusion resulted into over 90 million mobile money transactions valued at about $2.16 billion (KSh227.9 billion) in the year 2015 with more than 129,357 registered mobile money agents. Similarly, in Uganda, about $10.8 billion (Sh32.5 trillion) was transacted through the mobile money payments platform in the year 2014 with a customer base of 21.1 million registered mobile money users (Abuka, 2016). This conforms to the argument that mobile money as a tool for economic development has a high potential to foster financial inclusion in Sub-Saharan Africa as stipulated by Donovan (2012) and Kasekende (2013). Thus, mobile money equally contributes to banking the unbanked. Therefore, here we hypothesize that:

H1: Mobile money usage is significantly and positively related to financial inclusion in rural Uganda.

Social networks and financial inclusion

Wasserman and Faust (1994) defines social network as "a social structure made up of a set of social actors (such as individuals or organizations), sets of dyadic ties, and other social interactions between actors." While Granovetter (1973) refers to "strength of a tie as a combination of amount of time, the emotional intensity, the intimacy and the reciprocal service that characterize the tie." Strong ties refer to larger time commitments between individuals who are closely tied (family and relatives), whereas weak ties refer to individuals who are not closely tied to a group such as people who move frequently or live in isolated areas (friends and acquaintances).

Indeed, strength of a tie enhances resource flow and sharing between individuals in dyadic relationships. Thus, proponents of networks theory like Granovetter (1973); Burt (1992) have advocated for the importance of personal connections in seeking information for economic benefits.

Scholars such as Mishkin (1998) and Stiglitz (1990) argue that financial market imperfections such as transaction cost and information asymmetry are likely to limit access to credit by the poor, especially for those without physical collateral (see also Akerlof, 1970). This is translated by the conventional understanding that lending to poor household will fail as the cost of doing so is too high and the risks are great with saving tendency too low. Thus, under such situation, social connections through existing

informal networks of strong and weak ties can be the only asset available to the poor that they can utilize to overcome barriers in accessing credit. This also acts as an essential tool for screening loan applicants and for ensuring that contracts can be enforced.

Indeed, van Bastelaer (2000a) states that social network increases the capacity of the poor to access market information and creates linkage and tie among members in groups (see also Yokoyama & Ali, 2006). Ahlin and Townsend (2007) observe that social ties among non-relatives reduce repayment rates through social sanction. Against this backdrop, Floro and Yotopolous (1991) suggest that social ties and the resulting potential for sanction among the poor helps to mitigate adverse selection and moral hazard problems in joint liability lending contracts.

Conclusively, Biggs, Raturi, and Srivastava (2002) argue that in accessing financial services, social network helps the poor by supplying information and it acts as a mechanism for enforcement (see also Narayan & Prittchet, 1997). Karlan (2007) using a randomized experiment on 2,000 individuals participating in FINCA-Peru found that individuals who live closer to one another and are more culturally similar to others in the group are more likely to repay their loans and save more. The findings showed that members are better able to monitor each other and to enforce each others' repayment. Thus, here we hypothesize that:

H2: Social network is significantly and positively related to financial inclusion in rural Uganda.

Mobile money usage and financial inclusion: the role of networks theory

The networks theory posits that node centrality, density, robustness, and transitivity that enhances the strength and level of interaction between actors affect the degree of information flow and sharing (see e.g. Granovetter, 2004; Katz, Lazer, Arrow, & Contractor, 2005; van Bastelaer, 2000b). The World Bank (2002) stipulates that in under developed markets where the poor transact, they rely most on existing social networks to enable trade. Indeed, strong ties associated with dense networks provide access to redundant information and resources (Granovetter, 1985). This corroborates with the works of Ajani and Tijani (2009) and Okten and Osili (2004) who argue that social tie improves access to credit among the poor.

Sun and Barnett (1994) suggest that global telephone networks play a paradoxical role in promoting economic and social development. Therefore, existence of social networks among individuals can promote adoption and use of mobile telephone for socio-economic benefits. Correspondingly, Riquelme and Rios (2010) argue that the extent to which consumers perceive and believe they should use a particular technology is affected by the opinions of their families, relatives, and friends. Indeed, the exchange and sharing of valuable information among members in social networks provide higher credibility in the use of mobile telephone services. This is supported by Granovetter (1973) who connotes that nodes and ties, which are part of a network among economic actors, enable better access to information and ideas about existing opportunities and resources. Social networks act as a great source of information and motivator for people trying out any new technology or information system (Yang et al., 2012; Slade et al., 2015).

Accordingly, mobile phone users like the poor, rely on their closed networks of families, existing open networks of friends, and peer groups to get and share useful information and knowledge about mobile phone use for saving, transferring, and sending money.

Consistently, CGAP (2013); the World Bank (2014) argue that existence of social networks among mobile telephone users promotes its use for saving, transferring, and sending money, especially among the poor who have no access to formal financial services.

Therefore, in Sub-Saharan Africa where most poor individuals live, they rely more on their existing social networks to achieve economic benefits such as use of mobile phones for accessing financial services. A study by Rakhi and Mala (2013) found that social influence is a significant determinant of customers' intention to use mobile money in India. Henceforth, we hypothesize that:

H3: Social networks moderate the relationship between mobile money usage and financial inclusion in rural Uganda.

Methodology

Design, population, and sample

The study employs cross-sectional research design to investigate the hypotheses generated in this study. This is because it observes all the population or a representative subset at one specific point in time. Besides, it allows large amount of data to be collected over a short-time period. Furthermore, since it observes all the population or a representative subset at one specific point in time, problems arising from recurrent mistakes in data collection instruments are also minimized as it does not suffer from unavailability of sample used in previous observation like in longitudinal study. This study was both descriptive and analytical in nature.

A total population of 1.2 million poor households living in rural Uganda were used for this study as sourced from UBOS (2012a) statistical abstract on poverty level projection. Thus, from the foregoing, the sample for the study was selected from a total population of 1.2 million poor households located in rural Uganda.

Simple random sampling using a list from UBOS (2012a) statistical abstract on poverty level projection in rural Uganda was used to select poor households who participated in the study. The study targeted the poor households' heads residing in rural Uganda. This resulted into a sample of 400 respondents. As the unit of analysis comprised of poor households' heads, the data were analyzed based on individual responses. The total sample for this study was selected using the formula derived from Yamane (1973). Thus, a total sample of 400 poor households was used for this study in line with Yamane (1973).

The poor households selected for the study were assigned unique numbers for purpose of proper identification until the required number of 400 was attained. The unit of analysis for the study were poor households, while the unit of inquiry were poor households' heads.

Data collection tool and procedures

The study used a semi-structured questionnaire to elicit responses from the poor households selected for this study. Prior to the main study, the questionnaire was first subjected to a pilot study before embarking on the final study. After pre-testing the questionnaire, all the ambiguous, negatively worded, and difficult questions were deleted in order to have a

refined questionnaire for the final field study. The measurement items used in the questionnaires were adopted from earlier studies referenced in international Journals. The survey questionnaire is indicated in Appendix 1.

Measures of study variables

Mobile money usage was measured using the items of intention to use and user satisfaction as stipulated by Venkatesh, Morris, Davis, and Davis (2002). These items were used as standard measures under the UTAUT model for study of mobile technologies in promoting access to financial services (see also Ggombe, 2015; Ssonko, 2010; Ndiwalana et al., 2010; Mas & Morawczynski, 2009). All items used in the questionnaire were anchored onto a 5-point likert scale of strongly agree (5), agree (4), not sure (3), disagree (2), and strongly disagree (1).

Social network as a moderating variable was measured using the constructs of interaction, interdependence, and ties. These constructs were adopted from previous scholarly works by Katz et al. (2005); Granovetter (2004); Heikkilä et al. (2009); Okten and Osili (2004); Ahlin and Townsend (2007); Godquin and Quisumbing (2005), who used them in previous studies and were found to be reliable and valid. The items generated under each construct in the questionnaire were anchored onto a 5-point likert scale of strongly agree (5), agree (4), not sure (3), disagree (2), and strongly disagree (1).

The concept of financial inclusion was measured using the dimensions of access, quality, usage, and welfare, which were adopted from previous scholars such Čihák, Demirgüç-Kunt, Erik, and Levine (2012); Claessens (2006); Kempson (2006); Beck, Demirguc-Kunt., and Martinez Peria (2008); ACCION (2011); AFI (2011). These constructs were found to be reliable and valid in measuring financial inclusion, especially in developing countries. The items generated under each construct were anchored onto a 5-point likert scale of strongly agree (5), agree (4), not sure (3), disagree (2), and strongly disagree (1).

Reliability and validity of measurement items

Reliability is an assessment of the degree of consistency between multiple measurements of a variable. The internal consistency of the instruments is measured using Cronbach's alpha coefficient (Cronbach, 1951). Validity is concern with the instrument giving actual results of what it claimed to measure (Babbie & Monton, 2002; Gregory, 1992).

Thus, test to determine reliability (internal consistency) of the instrument was carried out. The results showed that all variables under study had reliability with alpha coefficients above 0.70 as recommended by Nunnally and Bernstein (1994). Mobile money usage had alpha coefficient of 0.840 with 8 items retained, social networks had alpha coefficient of 0.862 with 9 items retained, and finally financial inclusion had alpha coefficient of 0.850 with 10 items retained. In addition, all the variables under study had content validity figure greater than 0.90 with mobile money usage yielding (0.95), social networks (0.94), and financial inclusion (0.92).

Common method bias

Podsakoff, MacKenzie, Paine, and Bachrach (2000) argue that common method bias, which is the main source of errors in research, should be considered if valid conclusion is to be drawn from any study. Thus, common method bias is considered in order to avoid inflation or deflation of observed relationships between constructs so as to eliminate type I and type II errors in our study (see also Nunnally, 1978). Based on recommendations by Podsakoff, MacKenzie, Lee, and Podsakoff (2003), ambiguous terms, vocabularies, jargons, and vague words were re-defined before the main study. Therefore, items in the questionnaire used in this study were kept simple, specific, and concise, and double barreled questions were eliminated. Indeed, all items that were included in the instrument for the final study were re-worded for purpose of simplicity and interpretation. However, the 5-point likert-scale anchors used at the pre-test stage was retained to avoid alteration in the meaning of the items in the questionnaire. This was done in order to eliminate common method biases.

Data management and analysis

Prior to data analysis, final data collected from the field were verified for careless scoring, inaccurate responses, and missing instruments before capturing them into Statistical Package for Social Sciences (SPSS) that was used to analyze the data. Data captured were checked for data entry errors, outliers, missing values, and normality as stipulated by Field (2005) and Hair, Anderson, Tatham, and Black (2010). Box plots were used to check whether values with outliers existed in the data, and missing values were checked by running frequencies for all the items included in the final questionnaire. In addition, test for normality was also performed on the final data from the field. The histogram, normal p-p plots, scatter plots, multicollinearity, and homogeneity of variance were used to establish whether the data were normally distributed as recommended by Field (2005).

The results indicated that there were no outliers in the final data. However, missing values existed in the data. As the values were missing at completely random (MCAR), linear interpolation method of data replacement was adopted and all the missing values were replaced. Further, the test for normality in the data was achieved since the histogram was bell-shaped and the normal p-p plots had most observed values falling along the straight line. In addition, the scatter plots had all the values falling closer and within the vicinity of each other, thus indicating that the data were normal. Finally, the multicollinearity test using the variance inflation factor (VIF) and tolerance levels revealed that it was not a problem in the data as indicated by variance inflation factor value of 1.064 and tolerance level of 0.940. Thus, this indicated that there was no violation of the rule of thumb (VIF <4 and tolerance>0.2) in testing for multicollinearity as stipulated by Field (2005). Besides, the result of the Levene's test to determine homogeneity of variance revealed that all variables were non-significant at P > .05 and the variances were stable at all level.

Test to establish existence of moderation effect

Jose (2008) graphical method and conditions set by Baron and Kenny (1986) were adopted to test for the interaction effect and, thus, explain whether social networks moderate the relationship between mobile money usage and financial inclusion. Jose (2008) recommends that interaction effect can be confirmed by graphing the mean and the standard deviation with unstandardized coefficients of main effect, moderator, and the interaction term. Jose argues that the complementary effect of the variable can be appropriately proved and interpreted based on the slopes of graphs generated by ModGraph. Thus, as long as the magnitude of an effect is greater at one level of a variable than at another, it justify that a significant interaction has occurred (see also Aiken & West, 1991). Therefore, this means that the graph should not be parallel but must have different gradients or slopes for interaction to be significant.

In addition, Jose (2008) further argues that in testing interaction, the independent variables must be centered (i.e. subtracting the mean from the global independent variable to get marginal mean score) to get the product of the centered variable to generate the interaction term that is used to test for interaction effect through hierarchical regression of independent variable and interaction term on dependent variable. Thus, hierarchical regression was adopted in order to determine the predictive power of independent variable on the dependent variable.

Additionally, Baron and Kenny (1986) also recommends that for an interaction to exist, the effect of independent variable on the dependent variable varies as a function of change in the moderator variable. Further, four conditions must also be satisfied. These include: 1) a significant relationship must exist between the independent and dependent variables; 2) a significant relationship must exist between independent and moderator variables; 3) a significant relationship must exist between dependent and moderator variables; and 4) a significant relationship must exist between the independent, moderator, and dependent variables.

Findings and discussion

The study targeted 400 poor households who were randomly sampled to provide responses. Thus, from the study, the results revealed that 100 percent response rate was achieved. This was possible because data collection was carried out through the help of community leaders such as the local council chairpersons and civic leaders. Besides, the research assistants used in the study were recruited from the particular regions and districts where the study was carried out in order to solve the problem of non-responses due to language barrier. Similarly, a list of poor households with their contacts was obtained from UBOS (2012b) statistical abstract on poverty level projection in rural Uganda. This helped the data collection team to easily follow-up on none responses at the end of the study. The demographic characteristics of the sample and various categories of financial services transacted through mobile money are indicated in Tables 1 and 2 below.

The main purpose of this article is to test the moderating effect of social networks in the relationship between mobile money usage and financial inclusion in rural Uganda. Besides, Baron and Kenny (1986) assert that 4 conditions, which test for existence of

Table 1. Demographic characteristics of the respondents

	Frequency	%	Cumulative %
Gender			
Male	254	63.5	63.5
Female	146	36.5	100
Total	400	100	
Age			
18-25 years	38	9.5	9.5
26-33 years	147	36.8	46.3
34-41 years	102	25.5	71.8
42-49 years	92	23.0	94.8
50+ years	21	5.3	100
Total	400	100	
Household location			
Rural	151	37.8	37.8
Peri-urban	155	38.8	76.5
Urban	94	23.5	100
Total	400	100	
Primary source of water			
Piped water	129	32.3	32.3
Private well	26	6.5	38.8
Public well	107	26.8	65.5
Borehole	113	28.3	93.8
River/stream	23	5.8	99.5
Spring	2	0.5	100
Total	400	100	
Toilet facility			
Community pit latrine	155	38.8	38.8
Individual pit latrine	242	60.5	99.3
Bush	1	0.3	99.5
Others	2	0.5	100
Total	400	100	
Type of lighting source			
Paraffin lantern	187	46.8	46.8
Small kerosene lamp	108	27.0	73.8
Firewood	3	0.8	74.5
Others (solar)	102	25.5	100
Total	400	100	
Cooking fuel			
Firewood	216	54.0	54.0
Charcoal	181	45.3	99.3
Paraffin	1	0.3	99.5
Others (biogas)	2	0.5	100
Total	400	100	
Are you able to read & write?			
Yes	241	60.3	60.3
No	159	39.7	100
Total	400	100	

n = 400

Table 2. Categories of financial services transacted through mobile money

	Ranking	Frequency	Percentage (%)	Cumulative %
Savings	2	105	26.25	26.25
Loans	3	75	18.75	45
Payments	4	53	13.25	58.25
Remittances	5	14	3.5	61.75
Withdrawals	1	153	38.25	100
Total		400	100	

n = 400

Table 3. Correlation analysis between the variables

	Mean	Std. dev	1	2	3
Mobile money usage (1)	2.02	.845	1.000		
Social networks (2)	3.91	.152	.245**	1.000	
Financial inclusion (3)	4.20	.656	.234**	.290**	1.000

n = 400; ** Correlation is significant at 0.01 level (2-tailed).

relationships between the independent, moderator, and dependent variables must be achieved before test for interaction effect is carried out. Drawing from this, Pearson correlation analysis was performed to establish the relationships between the variables under this study. The results are indicated in Table 3 below. Furthermore, inter item correlations were also generated for the variables under study and the results are indicated in Appendix 2.

The Pearson correlation results showed that there is a significant and positive correlation (r = .234, p < 0.01) between mobile money usage and financial inclusion. This implies that mobile money usage has a positive relationship with financial inclusion of the poor in rural Uganda. This finding is in line with Jonathan & Camilo (2008) who observe that many lives, especially of the rural poor households have been transformed by the mobile revolution, which is providing not only communication but also access to basic financial services through phone-based money transfer and storage services. This confirms hypothesis (H1) set under this study.

Further, the Pearson correlation analysis also indicated that social networks and financial inclusion are significantly and positively correlated (r = .290, p < 0.01), thus, satisfying hypothesis (H2) of the study. This implies that there is a positive relationship between social networks and financial inclusion of the poor in rural Uganda. Indeed, social networks of closed and open ties affect financial inclusion, especially in rural communities. Ahlin and Townsend (2007) observe that social ties among non-relatives reduce repayment rates through social sanction. Indeed, Floro and Yotopolous (1991) suggest that social ties and the resulting potential for sanction among the poor helps to mitigate adverse selection and moral hazard problems in joint liability lending contracts.

Besides, the correlation results also revealed that there is a significant and positive (r = .245, p < 0.01) relationship between mobile money usage and social networks. Therefore, meaning that there is a positive relationship between social networks and mobile money usage among the poor in rural Uganda. The World Bank (2002) stipulates that in under developed markets where the poor transact, they rely most on existing social networks to enable trade. Indeed, CGAP (2013); the World Bank (2014) argue that existence of social networks among mobile telephone users promotes its use for saving, transferring, and sending money, especially among the poor who have no access to formal financial services.

Upon carrying out Pearson correlation analysis, hierarchical regression analysis was used to test for existence of interaction effect between mobile money usage and social networks to cause a change in financial inclusion. The regression analysis results are shown in Table 4 below.

The hierarchical regression results in Table 4 showed that there is a significant and positive effect of mobile money usage on financial inclusion (β = .182, p < .05),

Table 4. Testing for Interaction Effects of Mobile Money Usage and Social Networks on Financial Inclusion

|	Dependent variable: financial inclusion			
	Model 1	Model 2	Model 3	VIF
Constant	4.570	2.447	3.242	
Age	.025	.039	.045	
Gender	−.050	.064	-.055	
Location	.068	.048	.010	
Literacy level	-.144	.079	-.131	
Mobile money usage (Main effect)	.182*	.135*	.174*	1.000
Social networks (Moderator)		.131*	.248*	1.064
Interaction term			.234*	1.064
R^2	.055	.113	.190	
ΔR^2		.058	.077	
ΔF	7.389	8.202*	9.221*	
Durbin Watson	1.849			

**$P < .001$; $n = 400$.

therefore, supporting hypothesis (H1) of the study which, states that mobile money usage is significantly and positively related to financial inclusion in rural Uganda. This finding is supported by scholars like Must and Ludewig (2010), Pope et al. (2011), Aker and Mbiti (2010) who observed that as large numbers of poor people in developing countries migrate from rural to urban areas to earn livelihood, they have the great need to send money back to their families on regular basis. However, money transfer services can be very difficult and expensive. Thus, in such circumstances, mobile money becomes the most suitable medium for transferring the money. Empirical evidence by Mobile Money Global Event (2015) in Kenya revealed that use of mobile money as a tool for financial inclusion resulted into over 90 million mobile money transactions valued at about $2.16 billion (KSh227.9 billion) in the year 2015 with more than 129,357 registered mobile money agents. Similarly, in Uganda, about $10.8 billion (Sh32.5 trillion) was transacted through the mobile money payments platform in the year 2014 with a customer base of 21.1 million registered mobile money users (Abuka, 2016). This conforms to the argument that mobile money as a tool for economic development has a high potential to foster financial inclusion in Sub-Saharan Africa as stipulated by Donovan (2012) and Kasekende (2013). Thus, mobile money equally contributes to banking the unbanked.

In addition, the results from the hierarchical regression also indicated that social networks significantly and positively affects financial inclusion (β = .131, $p < .05$). This lends support to hypothesis (H2) of the study. This finding is in line with the statement that social networks between group members are also an essential tool for screening loan applications and for ensuring that contracts can be enforced (see for e.g. Karlan, 2007). Ahlin and Townsend (2007) observe that social ties among non-relatives reduce repayment rates through social sanction. Indeed, Floro and Yotopolous (1991) suggest that social ties and the resulting potential for sanction among the poor helps to mitigate adverse selection and moral hazard problems in joint liability lending contracts. Conclusively, Biggs et al. (2002) argue that in accessing financial services, social network helps the poor by supplying information and it acts as a mechanism for enforcement (see also Narayan & Pritchett, 1997).

More so, the hierarchical regression results revealed a significant and positive moderating role of social networks in the relationship between mobile money usage and financial inclusion (β = .234, p < .05). The results indicated that the moderating role of social networks boost the main effect of mobile money usage in explaining financial inclusion by 7.7 percent (ΔR^2 = 0.077). Indeed, when the interaction term between mobile money usage and social networks is included in the model, the predictive power of mobile money usage on financial inclusion increases by 7.7 percent from 11.3 percent to 19.0 percent. Thus, the results imply that the interaction term boost the main effect to explain variation in financial inclusion of poor households. This provides support for hypothesis (H3) of the study, which states that social networks moderate the relationship between mobile money usage and financial inclusion in rural Uganda.

Conclusively, it can be deduced that inclusion of social networks in the relationship between mobile money usage and financial inclusion explains 7.7 percent variation in financial inclusion of poor households in rural Uganda. Indeed, the World Bank (2002) observes that in under developed markets where the poor transact, they rely most on existing social networks to enable trade. Thus, mobile phone users such as the poor rely on their closed networks of families, existing open networks of friends, and peers to get and share useful information and knowledge about mobile money technology and usage.

Finally, Jose (2008) recommends that the interaction effect of the moderator can be plotted on a ModGraph to show its impact on the dependent variable. Thus, the results in Table 4 above can be plotted to confirm the interaction effect of social networks in the relationship between mobile money usage and financial inclusion. This can be done by plotting the mean and standard deviation with unstandardized coefficients of main effects (mobile money usage), moderator (social networks), and the interaction term on the ModGraph.
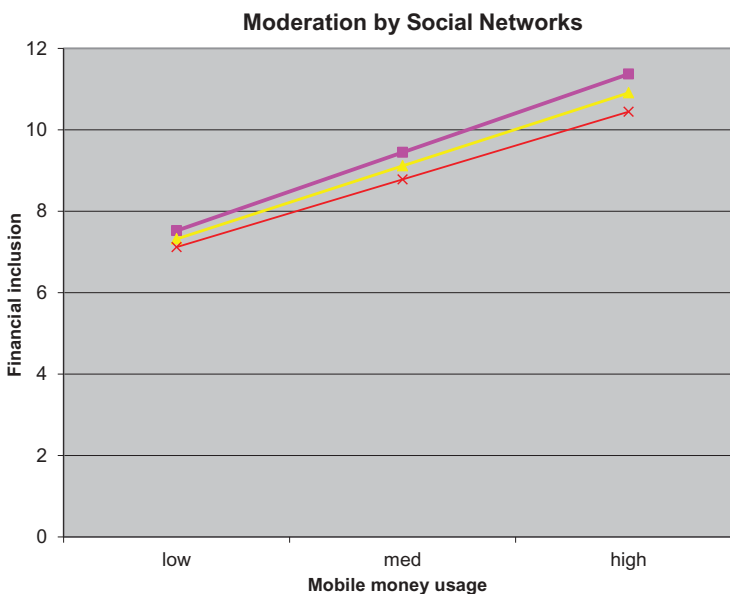
Figure 1. ModGraph Showing the Interaction Effect.

Therefore, as a rule of thumb, Jose stipulates that the graphs should not be parallel but must have different gradients or slopes for interaction to be significant. Thus, after plotting the mean and standard deviation with unstandardized coefficients of main effects as indicated in Figure 1, the results indicated that there is an interaction effect between mobile money usage and social networks on financial inclusion since the lines are not parallel.

This means that a change in social networks significantly affect variations in mobile money usage in an attempt to influence financial inclusion of the poor. The result lends support to hypothesis (H3) of the study. Further, the ModGraph results can be interpreted based on low, medium, and high levels based on the main effects and the moderator (Jose, 2008). Thus, the results showed that the rule for conditional effect is not violated since all the lines are not parallel to each other, thus, showing interactions between mobile money usage, social networks, and financial inclusion.

Conclusion drawn from the study findings

Drawing from the hypotheses developed under this study, the following are the conclusion.

The findings from the study revealed that there is a significant and positive relationship between mobile money usage and financial inclusion. This implies that mobile money usage has an impact on financial inclusion of the poor in rural Uganda. This means that a change in mobile money usage results into a change in financial inclusion. This is in line with hypothesis (H1) set under this study.

Furthermore, the findings also indicated that social network has a significant and positive effect on financial inclusion. This lends support to our hypothesis (H2) of the study. This implies that existence of social networks result into financial inclusion among the poor.

Besides, the findings showed that social networks significantly and positively moderate the relationship between mobile money usage and financial inclusion. The results indicated that the interaction effect boost the main effect of mobile money usage in explaining financial inclusion by 7.7 percent ($\Delta R^2 = 0.077$). Conclusively, it can be deduced that including social networks in the relationship between mobile money usage and financial inclusion explains 7.7 percent variation in financial inclusion of poor households in rural Uganda. Thus, confirming hypothesis (H3) of the study.

Recommendations based on the study findings

Mobile telephone companies should consider developing mobile money services that promotes social networking among the users of mobile money services. They should also ensure that there is mobile phone network efficiency in order to promote use of mobile money services in rural areas. Besides, they should protect the mobile money users from sim-card swaps, which are used for fraudulent mobile money transactions.

The government should ensure that there is effective law to protect mobile money users and operators, especially in circumstances where wrong transactions have been remitted. The law should enable mobile money users to recover their monies sent erroneously to wrong recipients. In addition, the government should embark on awareness creation about the importance of mobile money, which is affordable,

convenient, and accessible platform for carrying out financial transactions as opposed to banks, which are expensive with limited outreach in rural areas.

The government through its communication regulatory authority-Uganda Communication Commission (UCC) should ensure that affordable transaction fees are set by mobile money operators and agents in order to attract more financially excluded poor households to use mobile money as a tool for access to and use of basic financial services.

Financial institutions, especially the microfinance institutions and commercial banks should develop financial products and services that can easily be transacted through the mobile money platform. In addition, they should use existing social networks in rural areas to attract more poor households to use financial products and services like savings accounts using mobile wallet product in order to minimize the problem of dormant accounts rampant among microfinance institutions and commercial banks.

Mobile money operators and agents should use social networks to promote use of mobile money in order to achieve financial inclusion of the poor. Specifically, mobile money operators should use existing social networks to spread information on varieties of financial services offered on the mobile money platform in order to promote its increased usage.

Finally, the mobile money users such as the poor should use their existing social networks to share and learn new knowledge and information about improvement on mobile money apps in order to increase access to and use of financial services. This can be achieved through sharing experiences on credibility and reliability of the mobile money platform.

Limitations and areas for further study

The study relies solely on quantitative data and the findings are based specifically on cross-sectional research design, thus, ignoring qualitative data and longitudinal survey design. Future research may adopt use of qualitative data and data collected through longitudinal study design. In addition, other financially excluded population such as the disabled persons and refugees may be used as samples in future studies.

Disclosure statement

No potential conflict of interest was reported by the authors.

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APPENDIX

Appendix 1. Survey Questionnaire

Section 1: Background information

Please kindly tick appropriately

1. Gender 1) Male_____ 2) Female _____

2. Age Group

1) 18 – 25 _____ 2) 26 – 33 _____ 3) 34 – 41 _____

4) 42 – 49 _____ 5) 50+ _____

3. Number of people in your household

(1) 5 or less _____ 2) 6 – 10 _____ 3) More than 10 _____

4. Type of dwelling unit for this household

1) Temporary Building Materials _____ 2) Semi-permanent Building Materials _____

3) Permanent Building Materials _____

5. Number of years lived in this community

(1) 5 years or less _____ (2) 6 – 10 years _____ (3) 11 – 15 years _____

(4) More than 15 years_____

6. What is the primary source of water for this household?

(1) Piped water system _____ (2) Private well _____ (3) Public well _____

(4) Borehole _____ (5) River or stream _____

(6) Other (specify) _____

7. What type of toilet facility does this household use?

(1) Community pit latrine _____ (2) Individual pit latrine _____ (3) Bush _____

(4) Other (specify) _____

8. What type of lighting does this household use?

(1) Paraffin lantern _____ (2) Small kerosene lamp _____ (3) Firewood _____

(4) Other (specify) _____

9. What type of cooking fuel does this household use?

(1) Firewood _____ (2) Charcoal _____ (3) Paraffin _____

(4) Other (specify) _____

10. Are you able to read and write?

(1) Yes _____ (2) No _____

Section 2: Mobile money usage

Please circle the most appropriate option for each of the questions below;

Strongly agree (5), agree (4), not sure (3), disagree (2) strongly disagree (1)

Intention to use

IN1   I expect to use mobile money services in the next few weeks

IN2   I intend to use mobile services in the coming months

IN3   I intend to use mobile money for services beyond money transfer

IN4   I intend to continue using mobile money services in the next coming years

IN5   I have strong positive perception toward use of mobile money services

IN6   My attitude toward use of mobile money services is always positive

User satisfaction

US1   I enjoy using mobile money services for my transactions
US2   My mobile money system meets my financial needs well
US3   My mobile money system meets my expectations regarding financial services
US4   I usually have no complaints about my mobile financial service provider
US5   I am content with the costs incurred in using mobile money financial system
US6   I do not find mobile money costly in terms of interest
US7   Mobile money services is always reliable to me

Section 3: Social network

Please circle the most appropriate option for each of the questions below;

Strongly agree (5), agree (4), not sure (3), disagree (2) strongly disagree (1)

Ties

T1   In this household, some members are leaders in social groups to which they belong
T2   In this household, we belong to social groups where most members are neighbors
T3   In this household, we belong to social groups with members from diverse occupations
T4   In this household, we belong to social groups with members from diverse religion
T5   Members of this household belongs to social groups with members from diverse ethnicity
T6   Members of this household belongs to social groups with members from diverse age groups
T7   Most of the members in this household are friends to friends who know each other

Interaction

INT1   In this household, we belong to social groups which frequently interact with other groups outside this community
INT2   In this household, some members are friends to prominent people in this community
INT3   In this household, members always get together with friends to play games and recreational activities
INT4   My household members have many friends with whom we are very close within and outside this community
INT5   In this household, most members participate in social organizations in this community
INT6   In this household, most members participate in activities of diverse social organizations
INT7   In this household, most members are highly involved in activities of social organization to which they belong
INT8   Members of this household always get together with others regularly to do an activity

Interdependence

IND1   In this household, members have many people beyond this household that we can turn to in case we needed help
IND2   In this household, we have many stable friendships and we support and trust each other
IND3   In this household, members have people they feel at ease with
IND4   In this household, we have people we can talk to about our private matters
IND5   In this household, we have people we can call upon for help
IND6   Members of this household closely talk to many households in this community when they have problems
IND7   Members within this household can easily approach other households within this community when they have problems
IND8   In this household, we always go outside this community to visit
IND9   In this household, we are always visited by friends when we get problems

IND10   In this household, we always ask neighbors to take care of our children when we are away

Section 4: Financial inclusion

Please circle the most appropriate option for each of the questions below;

Strongly agree (5), agree (4), not sure (3), disagree (2) strongly disagree (1)

Access

ACC1   There are many financial services delivery channels nearby this household

ACC2   There are many financial institution branches nearby this household

ACC3   The initial account opening fees charged by the financial institution is affordable

ACC4   The account maintenance fees charged by the financial institution is affordable

ACC5   The minimum balance on savings account required by the financial institution is affordable

ACC6   The loan fees charged by the financial institution is affordable

ACC7   The minimum loan amount offered by the financial institution is satisfactory

ACC8   The numbers of documents required by the financial institution to open an account are few

ACC9   The number of days taken by the financial institution to process loan applications is favorable

ACC10   In this household, we are not discriminated by the financial institution in its service provision

ACC11   The location to submit loan application required by the financial institution is favorable

ACC12   The fees charged on payment services offered by the financial institution is affordable

Quality/relevance

QTY1   The savings product provided by the financial institution suits our needs

QTY2   The loan product provided by the financial institution suits our needs

QTY3   The payment services provided by the financial institution suits our needs

QTY4   The savings product provided by the financial institution is safe for us

QTY5   The loan product provided the financial institution is safe for us

QTY6   The payment services provided by the financial institution is safe for us

QTY7   The saving product provided by the financial institution satisfies us

QTY8   The loan product provided by the financial institution satisfies us

QTY9   The payment services provided by the financial institution satisfies us

QTY10   The saving product provided by the financial institution is useful to us

QTY11   The loan products provided by the financial institution is useful to us

QTY12   The payment services provided by the financial institution is useful to us

Usage

USG1   The cost of making a trip to the financial institution is low

USG2   The paper work requirements by the financial institution is favorable

USG3   The fees charged by the financial institution on use of its services are favorable

USG4   The level of service provision by the financial institution is very good

USG5   The financial institution always provide its services on regular basis

USG6   The financial institution always provide its financial services at convenient hours

USG7   Members of this household trust financial products and services offered by the financial institution

USG8   The products and services provided by the financial institution are user friendly

USG9   The process of getting financial services from the financial institution is easy

USG10	It takes us less time to reach the financial institution to get the services
USG11	The interest on deposit services offered by the financial institution is attractive for us
USG12	The terms set by the financial institutions on use of its products and services are favorable to us
USG13	The financial institution used by this household member is conveniently located
USG14	The terms of repayment of loans provided by the financial institution is favorable to us

Welfare

WEL1	The products/services provided by the financial institution has improved our standard of living
WEL2	The products/services provided by the financial institution has increased our income
WEL3	The products/services provided by the financial institution has enabled us acquire more assets
WEL4	The products/services provided by the financial institution has led to improved literacy in this household
WEL5	The products/services provided by the financial institution has led to increased consumption in this household
WEL6	The products/services offered by the financial institution has provided self-employment to this household members
WEL7	The products/services provided by the financial institution has improved our access to health services
WEL8	The products/services provided by the financial institution has improved our housing condition
WEL9	The products/services provided by the financial institution has improved our access to amenities
WEL10	The products/services provided by the financial institution has improved our access to utilities

Appendix 2. Inter-items correlations

Mobile money usage constructs

	1	2	3
Intention to use (1)	1.000		
Satisfaction (2)	.412**	1.000	
Mobile money usage (3)	.742**	.927**	1.000

**. Correlation is significant at the 0.01 level (2-tailed)
n = 400

Social networks constructs

	1	2	3	4
Interactions (1)	1.000			
Ties (2)	.507**	1.000		
Interdependence (3)	.545**	.572**	1.000	
Networks (4)	.821**	.675**	.629**	1.000

**. Correlation is significant at the 0.01 level (2-tailed)
n = 400

Financial inclusion constructs

	1	2	3	4	5
Welfare (1)	1.000				
Quality (2)	.296**	1.000			
Usage (3)	.279**	.401**	1.000		
Access (4)	.341**	.125**	.144**	1.000	
Financial inclusion (5)	.614**	.632**	.689**	.725**	1.000

**. Correlation is significant at the 0.01 level (2-tailed)
n = 400