Does Financial Literacy Influence Use of Mobile Financial Services? Evidence from Malawi Household Survey Data

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Mobile financial services are gaining prominence and could be a possible solution to fast-track financial inclusion in developing countries including Malawi. However, adoption and usage of such services remains low among Malawi population. This study investigates the influence of financial literacy on financial behaviour of individuals in Malawi, specifically use of mobile phone based financial transactions. Descriptive and econometric analyses were conducted using cross-sectional data comprising 4, 999 individuals obtained from the Reserve Bank of Malawi. Findings reveal the likelihood of using mobile financial services increases with increasing levels of financial literacy, type of employment and peri-urban residence. Furthermore, men are more likely to transact on mobile phones than females and that although income levels matter in the use of mobile financial transactions, the magnitude of effect is negligible. Results suggest opportunities for expanding access to financial services and products such as differentiation in financial literacy education by characteristics of population including gender of users. Informal settings do not preclude expansion of digital payments hence financial product innovation and addressing rural residents' constraints to access of mobile financial services is crucial.

1. Introduction

The financial sector plays a crucial role in economic growth and development. Through financial mediation, an economy expands and diversifies access to financing and ensures risk sharing among financial players. Further, the day to day management of buying and selling of goods and services is made easier through an effective payment system. Ndulu *et al*., (2007) and Sarma and Pais (2011) concur that the merits offered by a vibrant and inclusive financial sector demonstrate the crucial role of financial sector for growth and development of African economies.

The financial industry in Africa is being revolutionized with the emergence of mobile financial services that provide a convenient platform for conducting financial transactions. The use of mobile phone based financial transactions is increasingly gaining ground especially in regions with low levels of financial inclusion. For instance, about 8.8 % of sub Saharan region's adult population had mobile

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money accounts compared to 1.4 % in Latin America (Nyantakyi and Sy, 2015). This penetration of mobile money is amid limited financial inclusion at only 165 individuals for every 1000 adults owning bank accounts in sub–Saharan Africa, compared to 747 people per 1000 adults in Latin America (Demirgüç-Kunt *et al*.,, 2015). The Global System for Mobile Communications Association (GSMA, 2017) reported that about two thirds of sub-Saharan African countries have in place enabling regulation for mobile money operations which has increased penetration. In Kenya, mobile phone network has been found to facilitate financial inclusion especially for the unbanked segment of the population who own or have access to a mobile phone (Ntwiga, 2016). Elsewhere mobile financial services are heralded for increasing circulation of money, making available capital when most needed, improving local farm employment and savings, and reducing time and distance to financial service provider (Chipeta and Kanyumbu, 2017; Ouma, *et al*., 2017; Demombyens and Thengeya, 2012). Mobile financial services can either be bank-led or non-bank led. Whereas the former uses an application of m-commerce which enables customers access bank accounts through mobile devices (Kim and Kang, 2012), the latter is operated by mobile network providers and does not require one to have a bank account.

In recognition of the role of mobile financial systems in increasing financial inclusion, the Malawi Government included expansion of digital payment systems as a key priority area in its National Financial Inclusion Strategy of 2015-2020. In Malawi, penetration of mobile phone technology has remarkably increased from as low as 1.8 % of the population in 2004 to over 42.5 % in 2016. However, despite the increased access to mobile phone technology, adoption and active use of mobile financial services remains low. Recent data by Reserve Bank of Malawi (RBM) indicates mobile money subscription stands at 3.7 million, representing 51.7 % of total mobile phone subscription in Malawi (RBM, 2017). However, active subscription remains low at 23.3 % over a 30-day period and 34 % over a 90-day period. Similarly, subscription for bank integrated mobile services is growing at a slow pace from an estimated 11 % of banked population in 2012 to about 18 % in 2016 (RBM, 2017). Such low access and usage of mobile financial services may be a result of both supply and demand side constraints. According to Zottel *et al*. (2013), the main reason behind poor access to financial services, besides not having enough resources, is lack of understanding and awareness of existing financial products. Financial education can therefore bridge the gap between product marketing and effective product use (Cohen *et al.*, 2008). This is particularly important in contexts with low literacy levels like Malawi where the national literacy rate is estimated at 65.8 % compared to the global rate of 86.3 %, with a bias towards males (UNESCO, 2015).

The main objective of the study is to investigate the influence of financial literacy on use of mobile phone based financial transactions in Malawi. Financial literacy is a component of financial capability defined as the combination of knowledge, understanding, skills, attitudes and especially behaviours which people need to make sound personal finance decisions suited to their social and financial circumstances (Zottel *et al*., 2013). The study further investigates the relationship between socioeconomic factors (sex, age, family income, type of employment, and area of residency among others) and use of mobile financial services. We hypothesise that financial literacy can stimulate demand for financial products and services including mobile financial transactions. Financial knowledge raises awareness of financial products offered through mobile services and increases one's confidence to transact. Such that unless an individual is familiar with concepts such as savings, interest, and insurance, they may not fully appreciate nor utilise the transaction platform available on their mobile phones. Financial transactions and planning is made easy once one knows financial concepts (Von Rooij, 2012). This is an interesting area of study for southern Africa because existing literature on mobile banking in African economies is biased towards East and West African economies

that have already made strides in mobile money technology (Demombyens & Thengeya, 2012; Ouma et al 2017; Shibia & Kieyah 2016). We analyse nationally representative data on financial literacy among Malawi populous, a country in Southern Africa which appears to be lagging in financial inclusion[1]. In Malawi, a study by Tsilizani (2015) revealed that while mobile money increased productivity, its usage was undermined by limited mobile network connection. Another study by Madise (2014) raises the importance of financial integrity, transparency, and accountability in the promotion of financial inclusion through usage of mobile money services. To the best of our knowledge, no study linking financial literacy and mobile financial services has been published on Malawi. Therefore, the findings will be relevant for policy and strategic direction towards promotion of both bank and non-bank mobile financial services.

The rest of the paper is organised as follows; Section 2 presents background information on mobile financial services operations in Malawi; Section 3 reviews relevant literature; Section 4 looks at methodology and data; Section 5 contains results and discussions, and Section 6 concludes by offering study implications.

2.   Mobile Financial Services Operations in Malawi; a preview

2.1   Growth of mobile financial services use in Malawi

Internet and mobile phone services in Malawi gained platform in late 1990s and subscription has steadily increased to date. However, a survey conducted by Malawi Communication Regulatory Authority (MACRA) (2014) revealed that access to mobile phones was skewed towards the urban population at 69 % compared to 29 % of the rural counterparts. Nevertheless, there were no significant disparities between the male and female population. According to the survey, affordability was the major limiting factor to owning a mobile phone.

Mobile money in Malawi was first introduced in 2012 and estimates as at 2014 showed only 8 % of individuals in Malawi used mobile money services, 27 % in urban and 5 % in rural areas (MACRA and National Statistics Office (NSO), 2014). Financial services that can be accessed include cash-in/cash-out, payment of bills, airtime purchase, insurance, salary payments and money transfers. Airtel and Telekom Networks Malawi are the two licenced telecommunication network operators providing mobile money services in Malawi. Other agent-based service providers like Mukuru and Zoona have also emerged on the market providing cashing in and out services. International organisations such as FHI 360, World Bank and USAID are implementing projects aimed at expanding the subscription base for mobile money in the country. For instance, as part of Joint Emergency Food Aid Programme, Concern World Wide piloted cash transfers using mobile money in Mchinji district in 2015.

Since inception in 2012, non-bank mobile money subscription has registered an annual average growth rate of 125 % from slightly above 33,000 subscribers (4 % of mobile phone subscription) to around 3.6 million subscribers (48 % of mobile phone subscription) in 2016. Annual volume of transactions has grown from about half a million to about 90 million between 2012 and 2016 (Figure

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[1] Finscope (2014) reports 40 % of adult Malawians had access to formal bank and non-bank services which compares to 53 % who had access to both formal and informal banking as reported by Chirwa and Mvula (2014). About 25 % of adult Malawians participated in rotational savings and credit associations (ROSCAs) and village banks.

1).   Usage of mobile money is largely limited to cash in/out transactions and purchasing of airtime. The underutilisation of the other services could be attributed to their complexity among other reasons.

Figure 1: Trends in Non-Bank Mobile Money
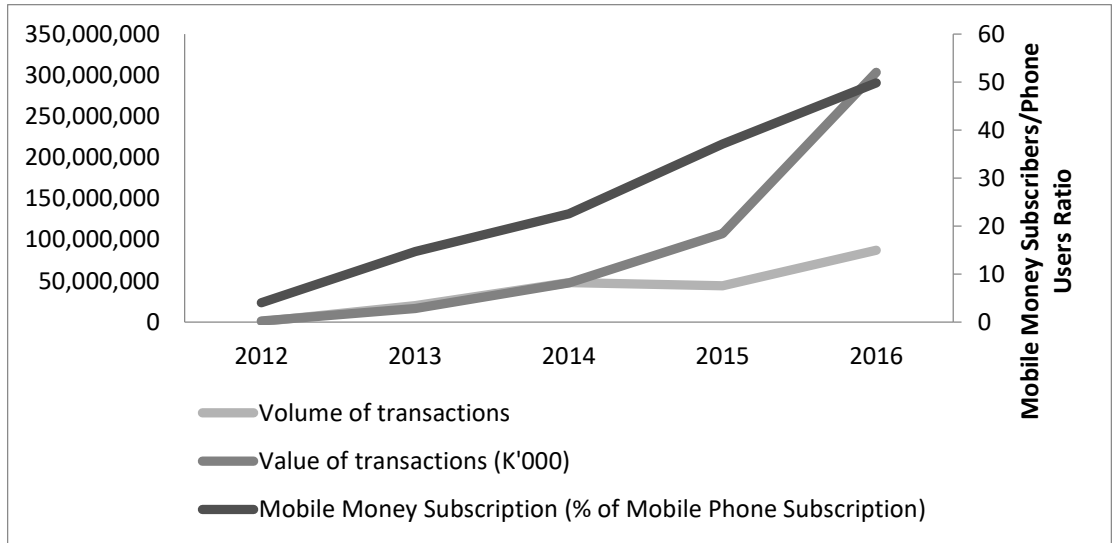
Source of data: Reserve Bank of Malawi and MACRA

Meanwhile, in 2017 only four out of the existing ten banks in Malawi provided integrated mobile services. The subscription base for bank-led mobile banking grew from 11% to 18 %. Meanwhile transaction values increased whereas volume of transactions remained steadily under 2 million (Figure 2).

Figure 2: Trends in Bank Integrated Mobile Services
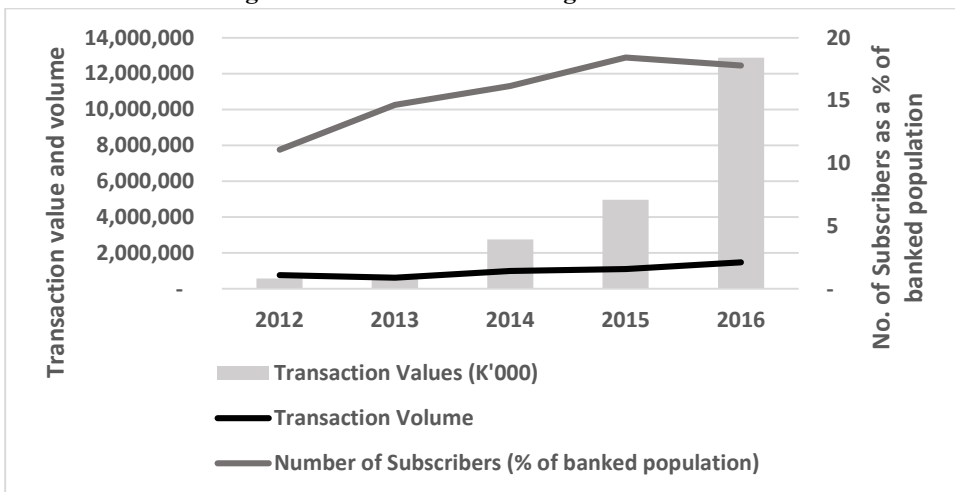
The trend in non-bank led mobile financial services indicates notable growth in subscription levels from as low as 4 % to 48 % of phone subscribers in a period of 6 years. However, the significant growth in subscription does not match utilisation levels of services except for buying and sharing of airtime. A quick look at the sampled data, shows that subscribers transacting in the underutilised services had relatively higher scores of financial literacy than those transacting in the highly patronised services. This suggests that financial literacy plays an important role in the use of mobile financial services. Besides, Malawi needs finanical consumers that can actively engage in innovative mobile financal services for them to be sustainable. However, such sufficient consumer demand is often missing in many contexts due to among other factors limited knowledge.

2.2   Policy and Regulatory Framework for Mobile Financial Services in Malawi

Malawi has several financial services Acts and regulations including the umbrella Financial Services Act, the Agency Banking Regulations, the Financial Cooperatives Act, the Credit Reference Bureau Act, the Pension Fund Act and the Microfinance Act among others. Since provision of electronic financial services cuts across financial and communication sectors, it requires a multi-sectoral regulation approach. This is crucial given literature alludes to policy and regulation as a significant constraint to adoption of mobile financial services (Duncombe and Boanteng, 2009). Until recently, the financial sector in Malawi operated without legislation to bind digital communication and financial transactions. This gap was addressed with the passing and enacting of the National Payments Systems Act (2016), and Financial Crimes Act (2017). These legislations provide regulatory framework for mobile financial services operations in Malawi. However, the sector still needs to address uncertainty of jurisdiction of authority over consumer protection. For instance, there are overlaps between Consumer Protection Act of 2003/Consumer Protection Council/Competition and Fair Trading Act of 1998/Competition and Fair Trading Commission; and the RBM over consumer protection and education responsibility under the different Acts. From the policy domain, the Malawi Financial Sector Development Strategy for 2015-2020 identified consumer protection and financial literacy as key areas for promoting financial inclusion. This was in response to the apparent high financial illiteracy levels. The Reserve Bank of Malawi with support from World Bank is implementing a programme that aims at enhancing financial education among the populous targeting existing users of financial services, the unbanked, and students in education establishments. As others have argued, the functioning of modern society requires financial literacy which affects financial behaviour (Lusardi *et al.,* 2010; Agarwalla *et al*., 2015). Again, the potential to increase market share for all types of financial institutions and enhance their contribution to economic development depends on recognising and addressing financial illiteracy problem (Shambare and Rugimbana, 2012).

3.   Literature Review

3.1   Theoretical Literature

Financial capability is increasingly being recognised as key to stability and functioning of financial markets that are inclusive in nature (Zottel *et al*., 2013) and key to achieving this is financial literacy among populations. Financial knowledge is considered as a form of investment in human capital (Agarwalla *et al*., 2015; Lusardi and Mitchell, 2013) required for planning and managing income between savings and consumption uses over one's lifetime as expressed in the life cycle hypothesis of maximising consumer utility (Modiglian and Brumberg, 1954) or the permanent income hypothesis on

ability to smoothen consumption over time (Friedman, 1957). In related consideration, Jappelli and Padula (2013) incorporates financial literacy into their model of intertemporal consumer's choice where individuals aim at maximising lifetime utility against intertemporal budget constraints. Their findings suggest that higher financial literacy levels are associated with higher savings hence contributing to economic growth through investment channel.

Since this paper is interested in use of mobile financial services as a distinct technology or innovation, we conceptually place the consumer decision making within the innovation and technology adoption framework. Rogers (1962) defines the adoption process as 'the mental process some individual passes from the first hearing about an innovation to final adoption' (p. 17). For purposes of empirical analysis, adoption is defined as the degree of use of a technology in the long-run equilibrium when the [individual] has full information about the technology and its potential (Feder *et al*., 1985). This definition of adoption refers to the degree of use of a technology as a quantitative measure of the extent of adoption. For technology like mobile financial services, the extent of adoption at the individual level in a given period is necessarily dichotomous (use/no use). Feder *et al.* (1985) argues that a complete analytical framework for investigating adoption decision should include a model of individual consumer decision making about the extent and intensity of use of technology throughout the adoption process. Such consumer decisions are assumed to be derived from maximisation of expected utility subject to a set of constraints. Attempts to analyse adoption of technologies have among a variety of approaches tended to focus on relationship of key variables to adoption behaviour.

Another relevant theory is the Technology Acceptance Model that advance perceived usefulness and perceived ease of use as relevant factors in predicting users' acceptance of information technology such as mobile financial services (Davis *et al*.,1989: Talukder, *et al*., 2014). In addition, the Theory of Reasoned Action is also widely used in analysing technology adoption behaviour specifically focusing on the role of attitudes and norms (Ajzen and Fishbein, 1980: Talukder, *et al*., 2014). A person will perform a given behaviour if the perceived outcome is positive and the opposite holds true. However, due to data limitations, it was not possible to explore these dimensions of mobile financial services use. Suffice to say that financial literacy plays a key role in people's formulation of financial perceptions regarding financial services (Lusardi, 2008; Lusardi and Mitchell, 2017).

3.2   Empirical Literature

There is a rich body of literature on the relationship between financial literacy and demand for financial services. As argued by Clark *et al.,* 2012; van Rooij *et al.,* 2011, 2012; Sevim *et al.,* 2012; Xu and Zia 2012; Lusardi and Mitchell 2009), financial knowledge affects a range of financial behaviours such as having a bank account, insurance take-up, business literacy, interest in financial education itself, retirement planning, borrowing behaviour and investment behaviour. In addition, sub-optimal financial outcomes are associated with low financial literacy in areas such as borrowing decision, stock market participation, indebtedness and responsible financial behaviour (Agarwalla *et al*., 2015). Similarly, Shibia and Kieyah (2016) shows that financial literacy is a strong predictor of financial access in Kenya for both formal and informal services but with a higher marginal effect for the formal sector. Cole *et al.* (2011) using field experiment in Indonesia and India finds financial literacy stimulates demand for bank account while van Rooij *et al.* (2012)concludes that less financially literate households are less likely to participate in formal financial systems while Agarwalla *et al.* (2015), explains that how individuals deal with money in their lives reflects their financial behaviour. While adoption could also be attributed to environmental factors such as government regulation on Information, Communication and Technology (ICT) and finance including safeguards for consumer

protection (Malady, 2016) or perceived risks (Kabir, 2013); literature suggests financial literacy increases awareness of financial choices and attitudes towards financial decision (Carpena, *et al.*, 2011) and thus potentially influences financial behaviour of adopting use of mobile financial services.

In addition, socio economic factors have been found to influence use of mobile financial services elsewhere. In Bangladesh study by Duncombe and Boateng (2009) revealed that only 4 % of mobile banking users were illiterate compared to a national illiteracy level of 60 % while Messy and Monticone (2012) found access to formal services tends to be low among those whose main source of income was farming and own business. Ivatury and Pickens (2006) documented that it is mostly low-income earners who were making the most use of mobile banking in South Africa and that users were mostly those with higher levels of education and technological sophistication calling for introduction of financial education in schools and vulnerable segments of the population to increase awareness, ability and confidence to use financial products. Technology attributes to do with ease of use, complexity, relative advantage, security assurance among others also tend to influence mobile financial services use (Kabir, 2013; Kim and Kang, 2012; Talukder *et al.,* 2014; Shi, 2011; Oliveira, *et al.,* 2016). Supply side factors such as network connectivity, ICT, service provider infrastructure and regulatory framework are also important to improve digital financial services and their use. Buckley et al (2015) revealed that the majority of Malawi mobile users had low education and financial literacy levels emphasizing the need for the regulator to have active powers to safeguard the end users. In addition, Reserve Bank of Malawi (2017) reported that biased agent distribution, at 21.4 % in rural areas was one of the bottlenecks to adoption and usage of mobile money. However, due to data limitations we are unable to account for the supply side factors.

Studies reviewed infer that financial literacy raises awareness of existing financial products or services and positively influences access to financial services and financial behaviour. It may as well be that low financial literacy levels are associated with low adoption of mobile financial services, however, there is no evidence of causality from econometric analysis. This study will therefore seek to test the hypothesis that financial literacy does not influence use of mobile financial services.

4. Methods and Data

4.1 Methods of Analysis

The study uses both descriptive statistical analysis and econometric evidence. A multivariate regression approach is used to analyse the influence of socio-economic attributes and financial literacy of individuals on use of mobile phone based financial innovations. The following model is estimated:

$$MFS_i = \beta_0 + \beta_1 FL_i + \beta_2 X_i + \varepsilon_i \qquad (1)$$

Where MFS is our dependent variable defined as a dummy variable equal to one if individual i used mobile phone for any financial transactions, zero otherwise. This relationship is estimated using Probit regression since our dependent variable is limited. The realised marginal effects indicate the effect of individual explanatory variable on the probability of the dependent variable i.e. conducting financial transactions on mobile phone. We control for various correlates including our key variable financial literacy. Financial literacy is a count of correct responses to various fundamental financial concepts such as inflation, division, simple interest calculation, compound interest calculation, absolute/% discount, risk, and risk diversion. It has a minimum value of zero (illiterate) if respondent got none of the questions correct, and a maximum value of 7 (highly literate) when a respondent gives

correct answers to all the 7 questions. Thus, the financial literacy takes only integer and non-negative values.

Our approach was to first include financial literacy as a continuous variable and secondly considered dummy variables reflecting various levels of financial literacy. Thirdly, predicted *FL* level that accounts for any possible endogeneity from reverse causality in the estimation is used. To get the predicted *FL* score, we regressed *FL* against a set of control variables including highest education level of respondent which acted as Instrumental Variable (IV). This is consistent with other studies on financial literacy such as van Rooij *et al.* (2012) who uses economics education as instrument for advanced financial literacy or Cole *et al.* (2012) that demonstrated the influence of education on financial behaviour and management. This estimation is done using Poisson regression since our dependent variable is count data taking non-negative values (Wooldridge, 2010) between zero and seven. Predicted *FL* is then used in equation (1) to investigate its influence on use of mobile financial transactions. We are not able to correct for standard errors as is normally the case, but we demonstrate our results are consistent, irrespective. Other control variables *X* include socio-economic factors (sex, age, family income, type of employment, and area of residency among others) as identified in literature. ε is the error term.

4.2   Data Type and Data Sources

The study used cross-sectional data collected in 2013 by Reserve Bank of Malawi to understand financial knowledge, management and services among the Malawi population. The baseline survey that generated the data randomly drew a representative national sample of 4,999 households guided by 2008 population census. Each district was stratified into enumeration areas that on average had 335 households. Using household list for each enumeration area, 20 households were randomly selected. In each household, an adult member was randomly selected and interviewed (Chirwa and Mvula, 2014). The households were further clustered into income groups by residential area namely urban-city areas, urban-district town areas, peri-urban areas and rural areas representing differences in wealth and access to financial services in Malawi. The data for variables age and income were both winsorised at 1 % level to remove outlier observations. Detailed description of variables is included in Appendix A.

5.   Results and Discussions

5.1   Descriptive Statistics

Table 1 provides characteristics of users of mobile financial transactions based on our sample. About 34 % of the respondents use mobile financial transactions. The proportion of users increases with increasing financial literacy and the differences in each category of financial literacy score are statistically significant. Majority of respondents in formal employment (75%) and those residing in urban cities (64%) use mobile financial transactions, reflecting possible differential access to financial markets by employment sector and residential area. About 23% of individuals that do not own a bank account use mobile financial transactions reflecting potential to include the unbanked through this service. About 61 % of individuals that own a bank account use mobile financial services possibly as either a complement or substitute to bank services. Further differentiation by income quantiles shows the proportion using mobile financial transaction increases from 15 % to 64 % as one moves from lowest to highest income quantile.

Table 1: Characteristics of Mobile Financial Transaction Users

Category	Proportion of respondents using mobile financial transactions (%)
	Yes
Financial Literacy Score Group	
0 (illiterate)	10.8
1-2 (low literacy)	21.3
3-4	32.8
5-6	48.0
7 (highly literate)	68.8
Employed – formal sector	75.6
Employed – informal sector	52.5
Self employed	30.8
Unemployed	30.8
Owns a bank account	61.4
Does not own a bank account	23.9
Urban-cities	64.2
Urban-district towns	47.1
Peri-urban	48.0
Rural	27.9
Income Quantile 1	15.1
Income Quantile 2	24.4
Income Quantile 3	37.5
Income Quantile 4	63.5

Source: Authors' computation

Table 2 shows that buying of airtime and sharing using M2U were the most commonly used financial transactions among the studied sample. This was reported by 35 % and 52 % of the respondents, respectively. This is consistent with MACRA and NSO (2014) finding that majority (65 %) of Malawians use their mobile phones for buying airtime. Other transactions like sending and receiving money and paying of bills were reported by less than 5 % of the sample. This is lower than proportion of 27 % receiving payments reported in the MACRA and NSO (2014) Report. A possible explanation could be that such transactions may be complex and require above average financial literacy. Individuals that engaged in mobile phone financial transactions had an average financial literacy level of 4, implying that they answered correctly 57 % of financial concept questions.

Table 2: Distribution of Financial Literacy Score by Type of Financial Transactions

Type of Financial Transaction	Proportion of respondents (%)	Financial literacy Score (mean)
Receive money	3.15	4.48
Send money	3.45	4.81
Pay bills	2.08	5.04
Buy airtime	35.38	4.05
M2U (sending airtime)	51.50	4.10
Other	0.61	4.26

Source: Authors' computation based on Reserve Bank of Malawi data.

Table 3 presents sample descriptive statistics for variables included in the regression models. Over half of respondents were female (61 %) and close to 77 % engage in self-employment activities. Roughly, 5 % of respondents are in either formal or informal employment. On average, respondents scored 3.5 on financial literacy which represents low financial literacy as categorised by Agarwalla *et al.,* (2015). Only 48 % of respondents could answer 3-4 financial concepts questions correctly or 50 % of financial literacy questions. Respondents' monthly income is estimated at an average of MK18, 861 with lowest average income of MK12, 579 in rural areas and highest average income in urban cities at MK48,264. The differences in monthly income between urban and rural households are statistically significant. We also find the level of income increases with increasing financial literacy levels and the differences in levels were statistically significant. Majority of respondents (96 %) reported their incomes varied by season. About 31 % reported better financial position compared to the previous year upon assessing themselves.

Table 3: Descriptive Statistics of Model Variables

Variable	*Mean*	*S.Dev*	*Min*	*Max*
Financial literacy score	3.53	1.50	0	7
Financial literacy score (instrumented)	3.57	0.62	2.4	6
Financial Literacy Score Group				
0 (illiterate)	0.03	0.16	0	1
1-2 (low literacy)	0.22	0.42	0	1
3-4	0.48	0.50	0	1
5-6	0.26	0.44	0	1
7 (highly literate)	0.01	0.10	0	1
Use phone for various financial transactions	0.34	0.47	0	1
Use phone to save & receive money, & pay bills	0.031	0.17	0	1
Own/has use of phone (0/1)*	0.54	0.50	0	1
Age of respondent (years)	37	21	21	63
No education (0/1)	0.19	0.40	0	1
Primary (Std 1-5) education (0/1)*	0.31	0.46	0	1
Primary (std 6-8) education (0/1)*	0.27	0.44	0	1
Secondary (form 1-2) education (0/1)	0.09	0.29	0	1
Secondary (form 3-4) education (0/1)	0.10	0.30	0	1
Tertiary education (0/1)*	0.03	0.18	0	1
Monthly income ('000)	18.86	30.39	0.50	200
Monthly income urban_cities ('000 Malawi	48.26	51.67	0.50	200
Kwacha)	33.69	43.26	0.10	200
Monthly income urban_ district towns ('000	39.53	46.11	0.50	200
Malawi Kwacha)	12.56	18.52	0.5	200
Monthly income peri_urban ('000 Malawi				
Kwacha)				
Monthly income rural ('000 Malawi Kwacha)				
Better-off financially than a year ago (0/1)*	0.31	0.46	0	1
Seasonal income (0/1)*	0.96	0.20	0	1
Male respondent (0/1)*	0.39	0.49	0	1
Employed – formal sector (0/1)*	0.05	0.21	0	1
Employed – informal sector (0/1)*	0.05	0.21	0	1
Self-employed (0/1)*	0.77	0.42	0	1
Urban_cities (0/1)*	0.13	0.34	0	1
Urban_district towns (0/1)*	0.03	0.16	0	1
Peri_urban (0/1)*	0.04	0.19	0	1
Number of observations		4999		

Notes: (0/1)* indicates dichotomous variables for the stated category equal to 1, otherwise equal to 0 for the base category.

5.2 Econometric Results

We report results of various regressions estimated in Table 4. We first checked pair-wise correlation among regressors and find none more than 0.8 rule of thumb suggested in Gujarati (2003). Model 1 and 2 presents Probit regression results where we are not considering problem of endogeneity for the variable financial literacy. Overall, Wald test statistic shows that we reject the null hypothesis that all

parameter estimates except the constant are zero at the 1 % significance level. We find statistically significant positive influence of financial literacy on use of mobile phone financial transactions. An additional score on the financial literacy questions results in a 1.7 % increase in probability that an individual will use their phone for financial transactions. This is true in Model 1 where financial literacy is a continuous variable. Further analysis in Model 2 where the financial literacy is categorised into various levels shows that probability of using ones' phones for financial transactions increases with increasing level of financial literacy. For instance, the probability that an individual will use their phone for financial transactions increases from 8.7 % for low financial literacy scores of 1-2 to 12 % for highly financially literate respondent with a score of 7 relative to base category of financially illiterate individual. However, the influence of financial literacy level is only statistically significant for scores 3-4 and 5-6 representing probability increases of 11 % and 14 %, respectively. This finding emphasizes the role of financial literacy in enhancing use of mobile - based financial innovations.

Model 3 presents first stage estimation of the IV model. The results show that financial literacy is positively and statistically influenced by at least upper primary level education, income, age, being male, residing in a city and district town. Further, education positively influences use of mobile financial transactions. In all models, estimated marginal effect of education on use of mobile financial services tends to increase with increasing education level. For instance, in model 3 the effect ranges from as low as 0.439 (upper primary) to 1.01 (tertiary education) additional correct response on financial literacy concept questions reflecting the importance of education in ensuring financial literacy consistent with other studies (Adelman and Nagarajan, 2009; Worthington, 2004; Lusardi and Mitchell, 2008; Guiso and Jappelli, 2008). Second stage results using instrumented independent financial literacy variable as one of regressors are presented in Model 4. The instrumented financial literacy scores range between 0.94 and 1.84 points with a mean score of 1.26. We find that an increase in financial literacy score significantly increase the probability of using mobile financial transactions by 1.59.

Table 4: Factors Influencing Use of Mobile Financial Services[2] (marginal effects reported)

Dependent Variable Independent Variables	Model 1		Model 2		Model 3 (IV)		Model 4	
	D=1 if used MFS				FLS		D=1 if use MFS	
	dF/dx	Z	dF/dx	Z	dF/dx	Z	dF/dx	Z
Financial literacy Score (FLS)	0.017	2.66*	-	-	-		1.593	13.79*
FLS Group (1-2)	-	-	0.094	1.38	-		-	-
FLS Group (3-4)	-	-	0.114	1.75***	-		-	-
FLS Group (5-6)	-	-	0.144	2.1**	-		-	-
FLS Group (7)	-	-	0.122	0.95	-		-	-
Monthly income ('000)	0.002	5.09*	0.002	515*	0.003	3.84*	0.001	2.09**
Seasonal income (0/1)*	-0.012	-0.22	-0.011	-0.2	0.011	0.08	-0.02	-0.30
Better-off financially than a year ago (0/1)*	0.065	3.31*	0.066	3.35*	0.182	3.53*	-0.01	-0.57
Age of respondent (years)	0.010	2.03**	0.010	2.04**	0.084	6.18*	-0.03	-4.76*
Age-squared of respondent (years)	-.0002	-2.83*	-.0001	-2.83*	-0.00	-6.34*	0.000	4.12*
Male respondent (0/1)*	0.116	5.93*	0.118	6.01*	0.321	6.34*	-0.02	-0.70
Primary (Std 1-5) education (0/1)*	0.136	4.3*	0.137	4.34*	0.122	1.51	-	-
Primary (std 6-8) education (0/1)*	0.253	7.62*	0.255	7.69*	0.439	5.44*	-	-
Secondary (1-2) education (0/1)	0.412	9.78*	0.416	9.9*	0.751	7.41*	-	-
Secondary (3-4_ education (0/1)	0.469	10.62*	0.476	10.89*	0.99	9.65*	-	-

[2] We also checked the influence of answering correctly financial literacy concepts on the probability of using mobile financial transactions. Results show positive and significant effect of correct answer on compound interest, insurance and division. While correct answers on inflation negative influence use of mobile financial transactions. Concepts related to share diversification, discount rate, are not statistically significant. Furthermore, persons that are responsible for household and personal expenses are less likely to use mobile financial transaction. Detailed results are presented in the appendix B.

Dependent Variable Independent Variables	Model 1		Model 2		Model 3 (IV)		Model 4	
	D=1 if used MFS				FLS		D=1 if use MFS	
	dF/dx	Z	dF/dx	Z	dF/dx	Z	dF/dx	Z
Tertiary education (0/1)*	0.520	6.11*	0.525	6.23*	1.01	6.69*	-	-
Employed – formal sector (0/1)	0.148	2.27**	0.1470	2.31**	0.159	1.32	0.076	1.22
Employed – informal sector (0/1)	0.134	2.56**	0.1251	2.40**	0.22	0.17	0.123	2.37**
Self-employed (0/1)	0.085	2.72*	0.0840	2.67**	0.085	1.09	0.052	1.63***
Urban-city (0/1)	0.163	5.01*	0.1787	5.37*	0.251	3.34*	0.049	1.44
Urban -district town (0/1)	0.014	0.24	0.0314	0.55	0.240	1.78***	-0.08	-1.52
Peri-urban (0/1)	0.054	1.24	0.0682	1.50	-0.12	-1.00	0.111	2.48**
Number of Observations		4655		4655		4655		4
F statistic		-				-		-
Prob >F		-				-		-
Wald Chi-Squared		588.67		602.05		672.35		6
Probability>Chi-squared		0.0000		0.0000		0.0000		0
Pseudo R-Squared		0.2118		0.2115		-		0

Note: For dummy variable dF/dx is for discrete change of dummy variable from 0 to 1. Superscripts *, **, *** represents statistically significant at 1%, 5% and 10% levels, respectively.

Inclusion of control variables allows accounting for differences among the respondents. Monthly income statistically increases probability of adoption in all models estimated though marginal effect is small. Despite the expectation that seasonality of income would call for various mechanisms to smooth household consumption among them financial instruments, (Diagne and Zeller, 2011) we find that seasonality of income does not significantly influence use of mobile financial services. The statistically significant positive effect of age (Models 1, 2) reflects that adoption of innovations increases with age as people become more knowledgeable. However, the significant negative influence of age squared confirms literature observation that as people get older, they are likely to fail to adapt to new innovations on the financial market due to natural cognitive deterioration (Agarwal *et al*., 2011). These results are reversed in model 4 where despite statistically significant more young people (40 %) using mobile financial transactions relative to 32 % of adults above 24 years, the probability of use tends to decline and pick up as they grow older possibly reflecting the limited economic activities of the youths.

Gender of respondent also influences use of mobile phone financial transactions. We find male individuals are (models 1, 2) more likely to use mobile phone for financial transactions relative to females. This resonates with literature that males are likely to engage more with financial services than their female counterparts (Mandell, 2008; Cole *et al.*., 2011; Worthington, 2004; Chen and Volpe, 1998; Lusardi and Mitchell, 2006 and 2008; Almenberg and Säve- Söderbergh, 2011; Monticone 2010; Volpe *et al.*, 1996; Danes and Hira, 1987). Goldsmith and Goldsmith (1997) attribute this tendency to a general lack of interest by women in topics related to personal finance, investment, technology and their low level of interaction with financial service providers. Of late though, increasingly more women are becoming interested in financial services especially through village savings and loans associations which are often informal (Meyer, 2015; Ouma, 2017; Karlan *et al*., 2017). This variable is however not significant in model 4. Individuals in self-employment and informal sector are 12.3 % and 5.2 %,respectively, more likely to use their mobile phone to access financial services compared to the unemployed. Thus, the unemployed are likely to have limited means and economic activities to use their mobile phone to access financial services. Residence in peri-urban areas increases the probability that an individual will use mobile phone for financial transactions by 4.9 % (model 4) relative to rural areas. Use and access to mobile phone for various purposes is more prevalent in urban than rural areas. This may well reflect the correlation between urbanisation and availability and usage of financial services infrastructure in general which is often better in urban than rural areas in most developing countries (Cole *et al.*., 2011).

6.   Conclusions and Policy Implications

Malawi has experienced an increase in mobile phone use and access over the years which presents an opportunity to expand financial services and promote financial inclusion. However, use of mobile phone for financial transactions remains low with airtime purchase and sharing as commonly used transactions. This is happening amid continued financial education programs to improve financial inclusion and capability among Malawians by Reserve Bank and other stakeholders. This paper set out to investigate whether financial literacy among the populous is constraining use of mobile based financial services. The Reserve Bank collected nationally representative cross-sectional data from 4, 999 randomly selected adults in 2013 on financial literacy and consumer protection that is analysed using statistical description and econometrics. On average 48 % of sampled individuals answered correctly 3-4 questions on financial literacy. The average financial literacy score was 3.53 out of 7.

About 34 % use mobile financial transactions, majority of which are city dwellers, people in formal employment and in higher income quintiles.

Econometric results obtained showed financial literacy positively influences use of mobile financial transactions. More importantly likelihood of use increased with increasing levels of financial literacy demonstrating relevance of financial literacy in scaling out use of mobile phones for financial services. Consistently, model with education variables also shows increasingly people with higher education are more likely to conduct financial transactions on mobile phones. Being male increased probability of using mobile financial transactions relative to females. We found employment significantly affects use of mobile financial transactions, the magnitude of effect varies with higher probability of use among those employed in informal (12%) and self- employment (5%) relative to unemployed persons. Income is also another key factor though magnitude of effect is negligible. Differences exist reflecting rural-urban divide, with peri-urban residence associated with higher probability of using mobile financial transaction.

The study results have important implications. Firstly, interventions must differentiate financial literacy education to adult segment of population by their characteristics and avoid a 'one size fits all' approach to financial education. Secondly, policy and strategies promoting mobile financial services should respond to constraints faced by rural residents to access mobile financial services. While rural population remains underserved relative to urban counterparts in Malawi, expanding use of digital payment system in rural settings offers opportunities for increasing access to financial products and services. This should expand to emergence of such agents supporting cashing in and out of funds such as Mukuru or Zoona. Thirdly, women should be encouraged to engage more with financial services hence, gender sensitive innovations capable of sustaining and developing a general positive interest in financial services among women are required. For instance, the proliferation of women village savings and loans association presents platform to integrate their activities with mobile financial services. Lastly, findings point to opportunities existing in informal sector to expand digital payments and yet many informal transactions have not embraced to a large extent use of mobile financial services. There is need to examine how to overcome informal setting barriers to use of mobile financial transactions to ensure effective intermediation between users, agents and service providers. Informal sector businesses, Small and Medium Enterprises, those engaged in petty trading must begin to use mobile financial transactions.

Further research could expand current analysis to determine whether factors identified in single country case can be generalised to other countries in SADC region. One can also investigate whether mobile financial transactions are a complement or substitute to existing bank services which is important for integrated financial product innovation.

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Appendix A: Description and definition of variables

Variable	Description
Financial literacy index	Ranges between 0 and 7. Reflects number of correct answers on financial concepts such as inflation, division, simple interest calculation, compound interest calculation, absolute/% discount, risk, and risk diversion.
Financial Literacy Index Group	Defined score groups 0 (illiterate) 1-2 (low literacy) 3-4 5-6 7 (highly literate)
Use phone for various financial transactions	D = 1 if used phone for financial transactions, zero otherwise
Age of respondent	Age of respondent in years
Education level of respondent No education	D=1 if respondent has not attended any education, zero otherwise
Primary (Std 1-5) education	D=1 if highest education level is primary (std 1-5), zero otherwise
Primary (std 6-8) education	D=1 if highest education level is primary (std 6-8), zero otherwise
Secondary (1-2) education	D=1 if highest education level is primary (form 1-2), zero otherwise
Secondary (3-4) education	D=1 if highest education level is primary (form 3-4), zero otherwise
Tertiary education	D=1 if highest education level is tertiary level, zero otherwise
Monthly income ('000)	Income in Malawi Kwacha
Better-off financially than a year ago	D=1 if one is better-off financially than a year ago, zero otherwise
Seasonal income	D=1 if one is individual income is seasonal, zero otherwise
Employed – formal sector	D=1 if one is employed in formal sector, zero otherwise
Employed – informal sector	D=1 if one is employed in informal sector, zero otherwise
Self-employed	D=1 if one is self-employed, zero otherwise
urban cities	D=1 if one resides in urban city, zero otherwise
Urban_district towns	D=1 if one resides in urban district towns, zero otherwise
Peri_urban	D=1 if one resides in peri urban, zero otherwise

Appendix B: Influence of various financial literacy concepts on use of mobile financial transactions

Variables	dF/dx	Z
Very confident in ability to manage finances (((0/1)*	0.025	1.36
Responsible for household and personal expenses (0/1)*	-0.420	-2.04**
Correct answer for division (0/1)*	0.091	3.62*
Correct answer for inflation (0/1)*	-0.032	-1.73***
Correct answer for simple interest (0/1)*	0.021	0.85
Correct answer for compound interest (0/1)*	0.048	2.61**
Correct answer for discount rate (0/1)*	-0.020	-1.06
Correct answer for insurance (0/1)*	0.069	3.54*
Correct answer for share diversification (0/1)*	-0.011	-0.6
Primary (Std 1-5) education (0/1)*	0.129	4.11*
Primary (std 6-8) education (0/1)*	0.234	7.07*
Secondary (1-2) education (0/1)	0.383	8.89*
Secondary (3-4_ education (0/1)	0.431	9.57*
Tertiary education (0/1)*	0.497	5.67*
Monthly income ('000)	0.002	5.06*
Seasonal income (0/1)*	-0.011	-0.2
Better-off financially than a year ago (0/1)*	0.060	3.08*
Age of respondent (years)	0.008	1.63***
Age-squared of respondent (years)	-0.000	-2.44**
Male respondent (0/1)*	0.101	5.12*
Employed – formal sector (0/1)	0.157	2.36**
Employed – informal sector (0/1)	0.144	2.76**
Self-employed (0/1)	0.088	2.81*
Urban-city (0/1)	0.153	4.8*
Urban -district town (0/1)	0.009	0.15
Peri-urban (0/1)	0.041	0.96
Number of Observations	4672	
Wald Chi-Squared	665.95	
Probability >Chi-Squared	0.000	
Pseudo R-Squared	0.2173	

Note: For dummy variable dF/dx is for discrete change of dummy variable from 0 to 1. Superscripts *, **, *** represents statistically significant at 1%, 5% and 10% levels, respectively.