

Does financial literacy influence use of mobile financial services in Malawi?

Research Report

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Submitted to the AERC (Thematic Research)

May 2018

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Abstract

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 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 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 financial inclusiveness such as differentiation in financial literacy education by characteristics of population including gender lens to financial product innovation, addressing rural resident's constraints to access mobile financial services and embrace informality to expand digital payments.

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 merits offered by a vibrant and inclusive financial sector demonstrate the crucial role of financial sector for growth and development of African economies.

Financial inclusion is considered as key in mitigating extreme poverty and driving inclusive economic growth in Africa (Triki and Faye, 2013). An inclusive financial sector is one that ensures ease of access, availability, and usage of formal financial system for all citizens in the economy (Sarma, 2008). In Sub-Saharan Africa, financial inclusion remains low with only 165 individuals for every 1000 adults having bank accounts compared to 747 people in Latin America and 638 at global level (Global Financial Index, 2015). Despite reforms that have increased the number of financial players and services in Malawi over the years, a large proportion of Malawians remain financially unserved. 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 had informal savings

accounts in rotational savings and credit associations (ROSCAs) and village banks. Such low access to financial services may be a result of both supply and demand side constraints. According to World Bank (2012), 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). UNESCO (2015) recorded Malawi's national literacy rate at 65.8 % compared to global rate of 86.3 %, with a bias towards males at 73 % against 58.6 % for women.

Today the financial industry in Africa is being revolutionized with the emergence of mobile financial services which 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 percent of sub Saharan region's adult population had mobile money accounts compared to 1.4 percent in Latin America and 2.3 percent in OECD (Nyantakyi and Sy, 2015). 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. Ntwiga (2016) observes that mobile phone network facilitates financial inclusion in Kenya especially for the unbanked segment of the population who own or have access to a mobile phone. Evidence elsewhere shows 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 *et al.*, 2009), 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. In Malawi, penetration of mobile phone technology has remarkably increased from as low as 1.8 percent of the population in 2004 to over 42.5 percent in 2016 (MACRA, 2016). However, despite the increased access to

mobile phone technology, adoption and active use of mobile financial services remains low. Recent data indicate mobile money subscription stands at 3.7 million, representing 51.7 percent of total mobile phone subscription in Malawi (RBM, 2017). However, active subscription remains low at 23.3 percent over a 30-day period and 34 percent over a 90-day period. Similarly, subscription for bank integrated mobile services is growing at a slow pace from an estimated 11 percent of banked population in 2012 to about 18 percent in 2016 (RBM, 2017).

This study therefore investigates the influence of financial literacy on use of mobile phone based financial transactions in Malawi. According to the OECD financial literacy is defined as ‘the combination of consumers’/investors’ understanding of financial products and concepts and their ability and confidence to appreciate financial risks and opportunities, to make informed choices, to know where to go for help, and to take other effective actions to improve their financial well-being. We hypothesise that financial literacy can stimulate demand for financial products and services including mobile financial transactions. Financial knowledge raises awareness of existence 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 paper raises an interesting question for sub Saharan 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. We analyse new data on financial literacy among Malawi populous a country in Southern Africa which appears to be lagging in financial inclusion. Besides no similar study has been published on Malawi before hence relevant for policy and strategic direction towards promotion of 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 and offers policy implications of the study.

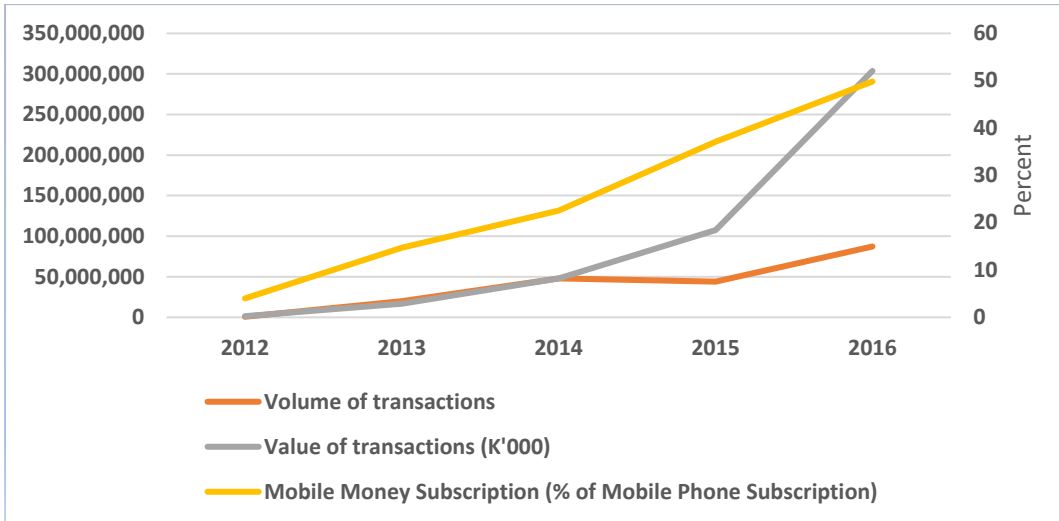
2. Mobile Financial Services Operations in Malawi; a preview

2.1 Prevalence of mobile financial services use in Malawi

Malawi has experienced an increase in mobile phone ownership over the years from as low as 1.8 percent of total population in 2004 to 42.5 percent in 2016 (MACRA, 2017). Such mobile phones may be used to access mobile financial services. Mobile money in Malawi was first introduced in 2012 and estimates show only 8 percent of individuals in Malawi use mobile money services, 27 percent in urban and 5 percent in rural areas (MACRA and 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 TNM are the two telecommunication network operators providing mobile money services in Malawi licenced under the Communications Act 1998. 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 percent from slightly above 33,000 (4 percent of mobile phone subscription) to around 3.6 million subscribers (48 percent of mobile phone subscription) in 2016. Annual traffic of transactions has grown from about half a million to about 90 million between 2012 and 2016 (Figure1). 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 complexity of the service among other reasons.

Figure 1: Trends in non-bank mobile money



Source of data: Reserve Bank of Malawi and MACRA

Meanwhile, only four out of the existing ten banks in Malawi provide integrated mobile services. On the other hand, subscription base for Bank-led mobile banking has grown from 11 percent of banked population in 2012 to 18 percent in 2016. Transaction values have also been on the increase while volume of transactions has remained steadily under 2 million (Figure 2).

Figure 2: Trends in bank integrated mobile services

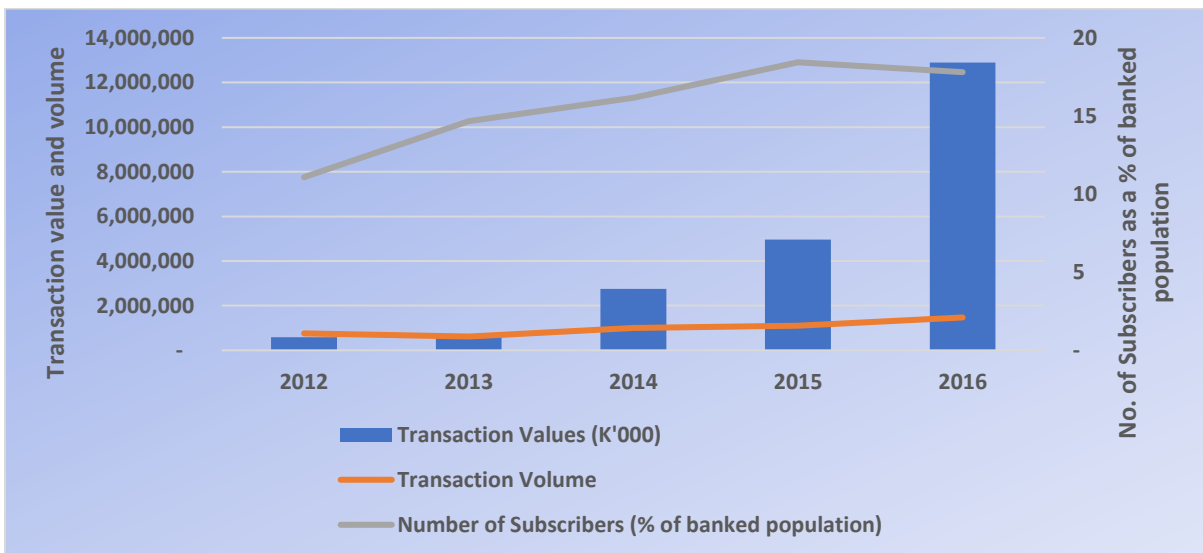


Figure 2

Source of data: Reserve Bank of Malawi

Table 1 shows that buying of airtime and sharing using M2U are the most commonly used financial transactions among our sample. This is reported by 35 percent and 52 percent of the respondents, respectively. This is consistent with MACRA and NSO (2014) finding that majority (65 percent) of Malawians use their mobile phones for buying airtime. Other transactions like sending and receiving money and paying of bills are reported by less than 5 percent of the sample. This is lower than proportion of 27 percent receiving payments reported in the MACRA and NSO (2014) Report. Internet and mobile phone services in Malawi gained platform in late 1990's. Mobile phone penetration has grown from 1.8 percent of total population in 2004 to 42.5 percent in 2016. Over the same period, internet subscription has increased from almost non-existent to about 19 percent of the total population (MACRA,2016). According to a survey conducted by MACRA (2014), access to mobile phones was skewed towards the urban population at 69 percent compared to 29 percent of the rural counterparts. However, 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. In relation to financial literacy, individuals that engage in mobile phone financial transactions have an average financial literacy of 4 implying that they answered correctly 57 percent of financial concept questions suggesting that such transactions demand above average financial literacy.

Table 1: Distribution of Financial Index by type of Financial Transactions

	<i>Proportion of respondents (%)</i>	<i>Financial literacy Index³ (mean)</i>
Used phone to ...		
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.

The trend in non-bank led mobile financial services indicates notable growth in subscription levels from as low as 4 percent to 48 percent 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

³ Financial literacy is an index of responses to various fundamental financial concepts such as inflation, division, simple interest calculation, compound interest calculation, absolute/percent discount, risk, and risk diversion. The values range from zero to seven.

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 requires financial consumers that can actively engage with innovative mobile financial services for them to be sustainable. But such sufficient consumer demand is often missing in many contexts including Malawi 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 (Dancombe 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 Review

Financial capability is increasingly being recognised as key to stability and functioning of financial markets that are inclusive in nature (World Bank, 2013). 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 (World Bank, 2013). 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 life time 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 (2011) 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 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 a 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 a

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 we were not able 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).

3.2 Empirical review

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 Alessie *et al.* (2007) 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 ICT and finance including

safeguards for consumer protection (Donavan, 2012) 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 percent while Messy and Monticone (2012) finds access to formal services tends to be low among those whose main source of income is farming and own business. Ivatury and Pickens (2008) documents that it is mostly low-income earners and not the poor 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) In addition, factors such as network connectivity, ICT, service provider infrastructure and regulatory framework are important to improve digital financial services and their use. However, due to data limitations we are unable to account for these 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. While it has been revealed that low literacy levels are associated with low adoption of mobile financial services, 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 Methodology 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. Our dependent variable is a dummy variable equal to one if individual used mobile phone for any financial transactions, zero otherwise. We then control for various correlates including our key variable financial literacy. Financial literacy is an index of responses to various fundamental financial concepts such as inflation, division, simple interest calculation, compound interest calculation, absolute/percent discount, risk, and risk diversion. The index 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 index as a continuous variable and secondly considered dummy variables reflecting various levels of financial literacy.

The investigation uses an Instrumental Variable (IV) approach to account for possible endogeneity resulting from reverse causality in the estimation. We use highest education level of respondent as our instrumental variable. This is consistent with other studies on financial literacy such as van Rooij *et al.* (2012) 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. In the first stage we regress financial literacy against a set of control variables including highest education level of respondent. The estimation is done using the Tobit model since our dependent variable is censored and can only take values zero to seven. In second stage, we investigate whether predicted financial literacy level influences 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. We include a set of socio-economic factors (sex, age, family income, type of employment, and area of residency among others) as control variables. 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.

4.3 Data 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 have 335 households. Using household list for each enumeration area, 20 households were randomly selected and in each an adult member randomly selected was 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 winsorized at 1% level to remove outlier observations.

5.0 Results and discussions

5.1 Descriptive Statistics

5.1.1 Characteristics of mobile financial transactions users

Table 2 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 respondent 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 percent 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 percent to 64 percent as one moves from lowest to highest income quantile.

Table 2: Characteristics of mobile financial transaction users

Category	Proportion of respondents using mobile financial transactions (%)
Yes	
Financial Literacy Index 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
Owens 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 3 presents sample descriptive statistics for variables included in the regression models. Over half of respondents were female (61 percent) and close to 77 percent engage in self-employment activities. Roughly, 5 percent 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 percent of respondents could answer 3-4 financial concepts questions correctly or 50 percent 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 percent) reported their incomes varied by season. About 31 percent 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 index	3.53	1.50	0	7
Financial literacy index (instrumented)	3.57	0.62	2.4	6
Financial Literacy Index 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	0.19	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 (1-2) education (0/1)	0.09	0.29	0	1
Secondary (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)	48.26	51.67	0.50	200
Monthly income urban_ district towns ('000)	33.69	43.26	0.10	200
Monthly income peri_urban ('000)	39.53	46.11	0.50	200
Monthly income rural ('000)	12.56	18.52	0.5	200
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	

Note: * indicates dummy variable

Source: Computed by authors.

2.3 Econometric Results

2.3.1 Factors influencing mobile phone financial services use

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 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 percent 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 percent increase in probability that an individual will use their phone for financial transactions. This is true in Model 1 where financial literacy index is a continuous variable. Further analysis in Model 2 where the financial literacy index 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 percent for low financial literacy index scores of 1-2 to 12 percent 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 a probability increases of 11 percent and 14 percent, 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 test for weak instruments looks at the F statistic for joint significance of instruments. The number is 35 from the model which is larger than the rule of thumb of 10 (Staiger and Stock, 1997). Therefore, the instrument is not weak. Results shows that financial literacy as measured by the index is positively and statistically influenced by at least higher 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 tend to increase with increasing education level. For instance, in model 3 the effect ranges from as low as 41% (upper primary) to 116% (tertiary education) increase in the probability reflecting the importance of education in ensuring financial inclusion consistent with other studies (Adelman and Nagarajan, 2009; Worthington, 2004; Lusardi and Mitchell, 2006, 2008; Guiso and Jappelli, 2008). However, financial literacy is not influenced by seasonality of income, employment sector and type of employment. 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 2.4 and 6 points with a mean score of 3.6. We lose observations for the categories with financial literacy scores of zero and seven. Using the instrumental variable, about 14%, 77% and only 2% of the sample shows a financial literacy score in categories (1-2), (3-4),

and (5-6) respectively. Individuals with financial literacy scores in the category (3-4) are more likely to use their phone for financial transactions relative to those in category (1-2), consistent with Model 2 results. The influence is statistically significant at 1% level.

Table 4: Factors influencing use of mobile financial services⁴

Variables	Model 1		Model 2		Model 3 (IV)		Model 4	
	dF/dx	Z	dF/d	Z	dF/d	Z	dF/d	Z
Financial literacy index (FLI)	0.017	2.66*	-	-	-	-	-	-
FLI Group (1-2)	-	-	0.09	1.38	-	-	-	-
FLI Group (3-4)	-	-	0.11	1.75***	-	-	0.120	2.99*
FLI Group (5-6)	-	-	0.14	2.1**	-	-	0.247	0.28
FLI Group (7)	-	-	0.12	0.95	-	-	-	-
Monthly income ('000)	0.002	5.09*	0.00	515*	0.004	3.86*	0.002	2.93**
Seasonal income (0/1)*	-0.012	-0.22	-	-0.2	0.017	0.11	-0.03	-0.61
Better-off financially than a year ago	0.065	3.31*	0.06	3.35*	0.187	3.37*	0.087	4.51*
Age of respondent (years)	0.010	2.03**	0.01	2.04**	0.084	6.23*	0.000	0.11
Age-squared of respondent (years)	-.0002	-2.83*	-	-2.83*	-	-6.61*	-	-1.71***
Male respondent (0/1)*	0.116	5.93*	0.11	6.01*	0.332	6.27*	0.159	8.28*
Primary (Std 1-5) education (0/1)*	0.136	4.3*	0.13	4.34*	0.098	1.32	-	-
Primary (std 6-8) education (0/1)*	0.253	7.62*	0.25	7.69*	0.407	5.3*	-	-
Secondary (1-2) education (0/1)	0.412	9.78*	0.41	9.9*	0.759	7.11*	-	-
Secondary (3-4_ education (0/1)	0.469	10.62*	0.47	10.89*	1.070	9.36*	-	-
Tertiary education (0/1)*	0.520	6.11*	0.52	6.23*	1.161	6.25*	-	-
Employed – formal sector (0/1)	0.148	2.27**	0.14	2.31**	0.202	1.41	0.291	5.02*
Employed – informal sector (0/1)	0.134	2.56**	0.12	2.40**	0.020	0.15	0.126	2.5**
Self-employed (0/1)	0.085	2.72*	0.08	2.67**	0.090	1.15	0.067	2.18**
Urban-city (0/1)	0.163	5.01*	0.17	5.37*	0.273	3.2*	0.254	7.83*
Urban -district town (0/1)	0.014	0.24	0.03	0.55	0.263	1.72**	0.106	1.82***
Peri-urban (0/1)	0.054	1.24	0.06	1.50	-	-1.2	0.124	2.56**
Number of Observations		4655		4655	4655		4655	
F statistic		-			35.05			
Prob >F		-			0.000			
Wald Chi-Squared		588.67		602.05	-		373.77	

⁴ 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.

Probability>Chi-squared	0.0000	0.0000	-	0.0000
Pseudo R-Squared	0.2118	0.2115	0.046	0.1626

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 various 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. This is consistent with studies of financial inclusion that often segments of society that are excluded are low income groups (Sarma and Pais, 2011). 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 influencing use of mobile financial services. The statistically significant positive effect of age (Models 1, 2 and 3) 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).

Gender of respondent also influences use of mobile phone financial transactions. We find male individuals are 16 percent (model 4) 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 2009; Volpe *et al.*, 1996; Danes and Hira, 1987). Goldsmith and Goldsmith (1997) attributes 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. Individuals in self-employment, formal and informal sector are 6.7 percent, 29percent and 13 percent 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 to use their mobile phone to access financial services. Residence in urban cities increases the probability that an individual will use mobile phone for financial transactions by 25 percent (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 developing countries (Cole *et al.*, 2011).

5. 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 ensure financial inclusion. However, use of mobile phone for financial transactions remains low with airtime purchase and sending as commonly used transactions. This is happening amid continued financial education programs to improve financial inclusion and capability among Malawians by Reserve Bank. This paper set out to investigate whether financial literacy among the populous is constraining use of mobile based financial services. The Reserve Bank collected 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. About 34% use mobile financial transactions, majority of which are city dwellers, people in formal employment and in higher income quantiles.

Econometric results obtained show financial literacy positively influence use of mobile financial transactions. More importantly likelihood of use increases 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 increases probability of using mobile financial transactions relative to females. While employment significantly affect use of mobile financial transactions the magnitude of effect varies with higher probability of use among those employed in formal (29%), informal (12%) and self-employment (6%), in that order relative to unemployed persons. Income is also another key factor though magnitude of effect is negligible. Differences exist reflecting rural-urban divide, with urban residence associated with higher probability of using mobile financial transaction followed by peri-urban then district town areas.

The study results have important implications for policy. 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 financial inclusiveness. 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. Lastly, findings point to opportunities existing in informal sector to expand digital payments and yet 'informality' has not been embraced to a large extent in promotion 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.

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. Summary of empirical Literature

Author	Research Findings	Methodology used
Agarwalla <i>et al</i> (2015)	Financial knowledge leads to responsible financial behaviour. However, negative relationship exists between financial attitude and financial behaviour	-Ordered logistic regression. -Accounted for socio-demographic characteristics -Used Spearman's rank correlation coefficient to explore nature of relationship
Van Rooj <i>et al</i> (2012)	Positive link between financial literacy and wealth either directly or indirectly through likelihood of investing in stock market or retirement planning	- Employed survey data and used multivariate regression on several control variables including income - OLS regression on total net worth on financial literacy
Alessie (2012)	Low levels of financial literacy associated with less likelihood to invest in stocks	- 2-stage linear regressions and generalise method of moments using survey data
Kabir (2013)	Adoption of mobile financial attributed to perceived factors – risk, trust, ease of use, relative advantages	-multiple regression
Clark (2012)	Many workers do not possess enough financial knowledge to confidently make optimal choices	OLS regression
Sevim <i>et al</i> (2012)	Reports differences in borrowing behavior of consumers with different levels of financial literacy	Factor analysis approach
Carpene <i>et al</i> (2011)	Financial literacy increases awareness of financial choices and attitude towards financial decision	Experimental study with randomised treatments
Talukder <i>et al</i> (2014)	Perceived usage, ease of use, perceived credibility, trust and intention had positive correlation with adoption of mobile banking in Australia	-Multiple regression analysis using Technology Acceptance Model. -Used survey data sampled from mobile phone users

	while system quality had no impact on use of mobile phones.	
Kim (2012)	Perceived ease of use, security, risk and trust have direct effect on intention to use smartphone banking	-Adopted Technology Acceptance Model with an extension of trust, security risk and self –efficacy. -Employed Structural Equation modelling technique.
Ivatry and Pickens (2006)	Most non-users of the mobile banking targeting low income individuals in South Africa lacked knowledge of the service and perceived it to be expensive and meant for individuals in formal type of employment	-Simple cross tabulations
Cole (2011)	Strong correlation between financial literacy and behaviour. Financial education programs have modest effects, increasing demand for bank accounts only for those with limited education but financial subsidies had large effects. Financial literacy stimulates demand for bank accounts in India	-Linear probability model using household survey data for India and Indonesia

B. 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/percent 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

C. Factors influencing use of mobile financial transactions (using continuous instrumented variable of financial literacy)

Variables	dF/dx	Z
Instrumented financial literacy index (Continuous)	0.407	13.55*
Monthly income ('000)	0.001	1.43
Seasonal income (0/1)*	-0.017	-0.31
Better-off financially than a year ago (0/1)*	-0.008	-0.39
Age of respondent (years)	-0.023	-4.26*
Age-squared of respondent (years)	0.000	3.56*
Male respondent (0/1)*	-0.008	-0.34
Employed – formal sector (0/1)	0.060	0.93
Employed – informal sector (0/1)	0.127	2.44**

Self-employed (0/1)	-0.058	1.84**
Urban-city (0/1)	0.050	1.46
Urban -district town (0/1)	-0.076	-1.35
Peri-urban (0/1)	0.120	2.64**
Number of Observations	4680	
Wald Chi-Squared	589.92	
Probability >Chi-Squared	0.000	
Psuedo R-Squared	0.2045	

D. 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	
Psuedo 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.