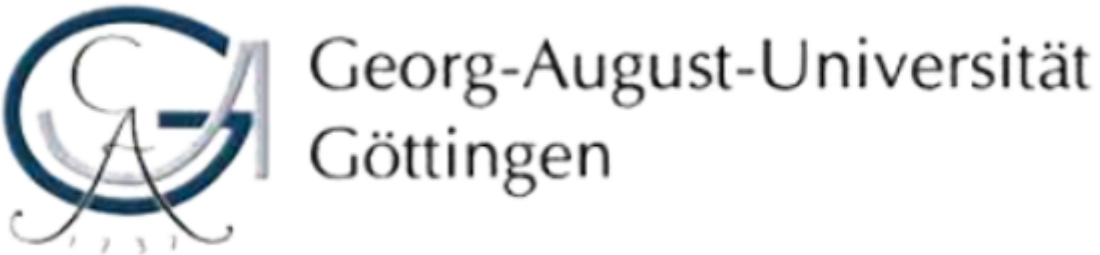
Does digital financial inclusion through mobile money accounts have an effect on savings in Zimbabwe?



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Abstract

Mobile money has become the main go to option for many poor people particularly in African countries as an alternative to traditional banking systems. Numerous benefits are attached to the use of mobile money such as safer, cheaper and more convenient ways to store money and thus save money as well. This paper assesses whether and to what extent having a mobile money account has an impact on savings in general, savings for old age and savings for business or farm related reasons. Data from the World Bank Findex data on approximately 1000 individuals from Zimbabwe is analyzed with descriptive statistics and Logistic regression using Python 3. Savings are important as they can go a long way in assisting the underbanked and financially disadvantaged more as they are more vulnerable to negative economic shocks. There exists previous studies that have researched this topic through various methodologies such as surveys and regression analysis but this paper looks at the impact of mobile money on three different saving options and not only the general term for savings.

The results in this paper show that having a mobile money account increases the odds that an individual saves for two out of the three saving categories. It is found that the odds of saving for business or farm reasons are approximately one and a half times higher and for savings in general the odds are roughly twice as high for individuals that have mobile money accounts compared to those without. It is also found that there is no effect of mobile money on saving for old age. Moreover, the findings suggest that overall, mobile money has increased levels of savings and with better financial education, better policies that encourage better governance and physical infrastructure as well as targeted policies by the government that target more of the unbanked and specifically those with a mobile phone already but not yet a mobile money account can go a long way in mitigating poverty and individuals being better prepared for negative economic shocks.

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Introduction

For a noteworthy amount of people, worrying about the safety of their money is not something that they would usually have to think twice about. Access to financial services, a bank account ensures that when you receive your salary or receive money from other sources such as family or businesses there is a safe place for you to store it, keep an eye on it or even grow it through interest overtime.

However for so many others, especially lower income families in developing countries, access to such a set-up is unfortunately not as common as it should be. This lack can lead to hindrance in terms of savings or no savings at all as people have to find alternative ways to save such as hiding money around the house, spending it in fear of having it stolen and overall not being able to budget properly or keep an eye on what they spend their money. Technology and having a mobile money account or bank account would make spending habits so much easier to understand, trace and control.

Although mobile money is a relatively new phenomenon, a significant amount of time has passed where it has been in use by quite a few developing countries. Despite this, not many papers have been written on the topic of mobile money and savings yet both concepts are of grave importance. It is important to conduct research on the relationship between the two concepts because savings can be linked to poverty, education, gender equality and so many other important factors.

The impact of the recent Corona virus has also shown us how vital savings may have been in assisting households and not only households but governments may also intuitively have had to spend less money on emergency funds if lower income households had access to more savings. Thus, the extent that digital technology through mobile money can assist with savings should be explored more in depth especially considering the explosion of the use and access to mobile phones and thus mobile money in many developing countries over the past few years.

Introduction to mobile money digital financial inclusion

Technological advances have over the past few years increased rapidly and although some individuals may not have access to bank branches, computers or laptops or know how to use them, mobile phones have come in and managed to bridge this gap. Now individuals can have

better access to financial instruments and a better way to manage their finances through mobile money options and or transacting using their mobile phone.

It is important to note that mobile money is not the same as mobile banking. Mobile banking is when customers access their bank accounts using their phones whereas mobile money is when customers only transact through mobile money operators and thus do not have to have a bank account with a financial institute (Aker and Mbiti, 2010).
Mobile money registration does not require any paperwork of minimum balances, usually only SIM card, national ID and a mobile phone is required for registration with a licensed agent which is usually free of charge. Customers only get charged for transactions that normally depend on the amount being transacted. The mobile money services are managed and run by large telecommunications companies that also provide SIM cards, airtime and sometimes cellphones to customers. Registered users may deposit and withdraw cash from agents whenever they would like to. The ease that accompanies registering for an account and the fact that you do not have to have a smartphone to utilize mobile money makes it quite popular and beneficial for low income earners.

African mobile money officially started in Kenya in 2007 more or less in order to find easier ways to send money, for example from one relative to another, of which one of them may be in a rural area where almost no access to banks are available. Mobile money service has thus increased substantially over the past few years and according to the 2019 GSMA report (GSMA, 2019), there are now more than one billion registered mobile money users.

Figure 1: Evolution of the global mobile money landscape, 2001 to 2019 (GSMA, 2019)

As can be seen in Figure 1 above, since 2007 mobile money has increased significantly and in 2019 there are 290 live services across 95 countries. Of which the largest share of these services and also the largest growth has been in Sub-Saharan Africa. Mobile money services exist in 96% of countries where more than two-thirds of the population do not have an account at a formal institution (GSMA, 2019). Many individuals that would never have been able to have access to a bank account can now find an easier way to have access to financial services just by owning a mobile phone. “Two-thirds of unbanked adults have a mobile phone” (World Bank, 2018). This provides a wide gap to tap into as financial services can be provided to these individuals through digital technology through the use of their mobile phones. This may help overcome certain barriers that these adults can say prevent them from accessing financial services such as branches that are too far away or too much paper work involved or minimum balance required to open some bank accounts. Another note to note is that data can be quite expensive to buy in developing economies but mobile money does not require the use of data which makes it more affordable for most people who do not have smart phones or access to the internet as only a registered phone number and a credit balance on your phone is required in order to make transactions.

According to the 2019 GSMA report empowerment comes from owning a mobile money account. Small-holder farmers get paid more quickly, more women have access to financial services and low-income households have access to vital utility services. An added benefit is the fact that not only is it now more affordable, faster and easier to send money on a national level but also on an international level where families can now better assist each other financially for example should an emergency arise and funds are required. All of this shows just how important the role mobile money is playing in assisting especially low-income families in many different ways all around the world.

Research rationale, questions, aims and objectives

The main objective of this paper is to analyze the effect that not only financial inclusion has had on individuals and their saving capabilities but the effect of financial inclusion on savings through the uprising of digital technology through mobile money.

The main questions for this research paper are whether or not mobile money accounts have an impact on general savings, saving for old age and saving for business or farm reasons. Most research papers on this topic analyze the effect that mobile money has on overall savings but it would be interesting to research the impact mobile money has on different saving reasons.

This may assist in better policy decisions being made to target specific saving benefits. It may also assist in ideas for mobile companies to build on in terms of making different saving pockets available to customers.

Overview of mobile money digital financial inclusion in Sub-Saharan Africa

In 2019, the global transaction value for mobile money was around USD690 billion, with around 66% of that value coming from Sub-Saharan Africa alone with USD 456.3 billion in value (GSMA, 2019).
Mobile money accounts were largely concentrated in East Africa in 2014 but by 2017 these accounts were now spreading. In West Africa approximately 1 in 3 adults owns a mobile money account and in East Africa particularly Kenya, almost 3 in 4 adults use mobile money (World Bank, 2019).

Amongst other things, some major benefits of mobile money are that digital payments allow for governments and employers to reduce costs through removing the time and resources required to allocate payments manually. For individuals, digital payments can be more secure and convenient and serve as an increased way to access formal financial services (World Bank, 2019). A concern with regards to mobile money has been that of over-indebtedness due to consumers being misinformed or uninformed when it comes to financial literacy (OECD, 2018). As mobile money providers enter the credit market this is something that needs to be monitored very closely such as not to have already low-income earners find their way even more into debt and perhaps even poverty.

Overview of mobile money digital financial inclusion in Zimbabwe

According to the IMF (2018), Zimbabwe has the second largest informal economy in the world. This intuitively implies that most employees, employers and entrepreneurs need an alternative way to make and receive funds which can be achieved through having a mobile money account. Although mobile money uptake is more common in the urban areas, it has also managed to make its way and be significantly beneficially to the rural areas of Zimbabwe. The major drawback being that there are not enough mobile money agents in rural areas (Chinakidzwa et al, 2015)
In general, cash is very hard to come by in Zimbabwe. The lack in access to cash because of the reason that the country adopted the US dollar and now did not have enough USD dollars

circulating in the economy and also could not print USD cash seems to have pushed the use of mobile money even higher. Long queues at the bank for hours in order to get cash has also pushed the use of mobile money amongst individuals in order to save them both time and money required to travel to traditional banks.

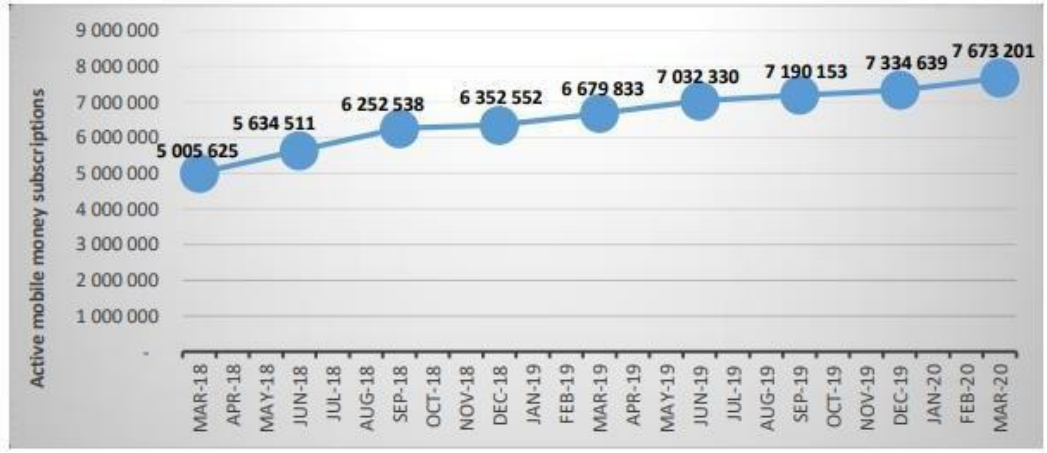

Figure 2: Zimbabwe growth in mobile money subscriptions (Potraz, 2020)

Figure 2 above shows that the growth in mobile money subscriptions from March 2018 to March 2020 has been largely significant and grown by more than 2 million subscribers in just two years, a growth rate of over 50%. The most used and prominent mobile money provider is the telecommunications company Econet that offers mobile money under Ecocash followed by One Money and then Telecash. Users can now pay utility bills amongst other things under Ecocash.

According to Potraz (2020), active mobile subscriptions grew from 13.2 million to 13.7 million (4%), thus mobile penetration also increased from 90.6% to 94.2% from fourth quarter 2019 to first quarter 2020. The increase in both these figures implies that there is still room for growth in mobile money account take up as more of the population gains access to a mobile phone.

In the first quarter of 2020, mobile money subscriptions had grown by 4.6% from 7 334 639 to 7 673 201 from fourth quarter 2019, this can also be seen in Table 1 below and this could be viewed as being in line with the growth in mobile subscriptions.

OPERATOR	4th Quarter 2019	1st Quarter 2020	Variance (%)
ECOCASH	6,812,368	7,065,382	3.7%
TELECASH	53,311	52,564	-1.4%
ONE MONEY	468,960	555,255	18.4%
TOTAL	**7,334,639**	**7,673,201**	**4.6%**

Table 1: Zimbabwe active mobile money subscriptions (Potraz, 2020)

Ecocash has the largest share of mobile money subscriptions in Zimbabwe, roughly 92% share of the market and most recently, the government of Zimbabwe recently banned the use of mobile money through all the above telecommunications companies (Mahomed, 2020). This act and sudden act thereof has had major negative implications on the nation as a whole as the nation was already suffering from cash shortages and thus digital payment methods had become the main source of transacting for the economy. Both poor and well off individuals make use of Ecocash on a daily basis quite frequently for all their everyday purchases and needs and thus no one is left unscathed by this policy decision.

As these introductory sections are concluded, a summary of the remaining chapters is organized as follows. The next section is the literature review which provides a background into past research on this topic. Following the literature review is the methodology section, which discusses the methods and data used for this paper in order to test our hypothesis of the impact mobile money has on different saving reasons. The findings and analysis section comes next and here the findings on the outcome of the empirical analysis conducted are presented and discussed. The last section provides a conclusion for this paper and policy recommendations as well as research limitations and further recommendations.

Literature review

This section will examine existing theories and empirical findings in regards to savings and mobile money accounts. It is important to note that it seems that not many empirical papers on the relationship between mobile money and savings exist in general and especially none for Zimbabwe to my knowledge.

"Mobile money has done more to extend the reach of financial services in the last decade than traditional "bricks and mortar" banking has in the last century" (GSMA, 2016).
Today, mobile money is said to contribute to achieving each one of the 17 UN Sustainable Development Goals (SDGs) in one way or another with regards to poverty, zero hunger, good health and well-being just to mention a few (GSMA, 2019). Access to mobile money and thus the opportunity to be able to save in this form can have an impact on mitigating the effects of poverty and other economic hardships.

Mobile Money Economics

The potential positive impact of mobile money spans across different platforms and thus why it has been described as being able to assist in achieving each of the UN SDGs. The impact it can have on an economy as a whole and not just on a specific singled out goal will go a long way in long term economic growth and prosperity for developing countries. The discussion below will attempt to point out some factors and ways in which mobile money helps to mitigate some areas of market failure.

Radcliffe and Voorhies (2012), discuss how cash anonymity may cause mistrust between market traders and new vendors. This market failure of information asymmetry is mitigated by the use of mobile money because hard cash for example that is usually kept under a bed is now turned into recorded cash in an electronic account. Thus a digital record of all transactions creates greater financial transparency that will assist in building greater trust between suppliers and buyers. This will also assist in the future with regards to requiring credit, savings or payment products as customers will now have a financial history that can be observed. These authors also discuss the effect on savings and enlighten that loss of savings is common in cash based households due to risk of theft, accumulation of assets such as livestock or jewelry. These forms of savings can be detrimental because when instances do

arise that require funds it is not so easy to sell these assets off in order to obtain the money that may be required. Thus mobile money offers alternative and safer ways to store money.

Lower income households tend to have less means in which to mitigate risks and/or obtain insurance yet due to their high informal rates of income they are usually more at risk of negative shocks such as floods and droughts as well as health or theft reasons. These households tend to rely more on family or social networks to assist them through such difficulties. Mobile money can assist in reducing such risks through risk- spreading (Jack and Suri, 2011). This can be achieved through the fact that the geographic reach of networks and thus more people that can assist each other financially has grown through mobile money. Nationwide or even internationally, those experiencing negative shocks can now more easily and faster receive funds from someone else and can even be assisted at a constant rate for example by periodically receiving small remittances each month.

Mobile money can also be beneficial with regards to business and occupations. In their 2016 paper, Jack and Suri (2016) discuss that better management and coordination with mobile money may improve business planning and efficiency. Through improved risk sharing, greater access to credit and reduced cost of long distance remittances better investment decisions can be made such as those related to labor decisions. The authors note that higher- risk but higher-return occupations or income earning strategies may be undertaken. Thus returns to investment may increase which could lead to larger savings.

Determinants of Mobile Money adoption

It is important to consider the factors that influence the uptake of mobile money usage and thus the factors that can assist in increasing the uptake of the accounts and thus pave a way for savings to be obtained through having access to a mobile money account. The following paragraphs will discuss different determinants that different authors have observed.

Education

Mahmoud (2017) analyzed the determinants of mobile money take up from a few developing countries in Africa. Specifically Zimbabwe, Kenya, Tanzania, Ghana, Egypt, Uganda and Rwanda. The author differentiated between registered and active subscribers and analyzed the factors that affect each of the two. Amongst other things, the author found that for registered subscribers there is a negative relationship with education, however it would have been safe to expect a positive impact as people with higher education would be more financially

educated and have education on technology too and this is the positive relationship the author found but for active subscribers. This is also the finding for Malinga and Maiga (2019) who found that education has a positive impact on active mobile money subscribers, specifically education on how to use the different services.

Service Prices and limits

Mobile money transactions are relatively lower than bank transaction costs, however as noted by Micheni et al (2013), money transfer companies costs are notably significant and hinder the uptake and use of mobile money. Mahmoud (2017) finds that there is a negative relationship between service prices and registered mobile money users and negative relationship between service limits and registered mobile money users but no effect on active users. This implies that mobile money service limits and prices could cause less registered users as low income and unbanked may not be able to afford higher fees and those that can afford higher fees may not want a limit on transactions or account balances.

Regulations

Strict regulation on transaction amounts had negative effect on mobile money usage (Malinga and Maiga, 2019). This may hinder people from taking up mobile money usage if they feel that they cannot have access to their money and as much as they require when they require it. However in terms of regulations such as consumer protection ones and anti-money laundering, these should be able to encourage better faith from customers in the mobile money regulatory financial system.

Crime

It would be safe to assume that crime would have a positive effect because the more crime that exists, the safer an option mobile money is than to keep cash on hand. Mahmoud (2017) found a positive effect with crime and active mobile money subscribers but no effect on crime for registered users. The effect on crime is so hard felt that consumers are on average prepared to pay up to 1.24% of a transaction value just to avoid carrying cash on them for an extra kilometer (Hamdan, 2019).

Number of mobile money agents

Access to a mobile money agent is 20 times more than for bank branches and 7 times more than ATMS with the number of mobile money agents having more than tripled the past five years (GSMA, 2020). The more the number of agents and the higher the network distribution of them, the higher the amount of registered subscribers because plenty more customers and

potential customers can be reached. Transport costs and physical infrastructure in terms of roads can affect access to mobile money agents and thus having more agent outlets distributed more uniformly would aid in this situation. Not only has there been a positive impact on customers but on agents as well as this creates new jobs and forms of income for them.

Number of service providers

The amount of service providers in a country can have a positive impact on the number of registered subscribers (Mahmoud, 2017). This makes intuitive sense because should a customer have a negative experience with one service provider, having a different one to go to would imply that they have different options and would probably not consider not using mobile money at all.

The paper by Mahmoud (2017) encourages the awareness for registered against active mobile money subscribers and sheds light on what policies or financial mobile money information should be addressed in order to encourage registered subscribers to become active ones and how to retain and encourage active subscribers. In addition, Malinga and Maiga (2019) advise that incentives by agents at mobile money registration and afterwards is key to customers going from only registered but dormant users to active users.

Theories on mobile money and savings

According to Dahlberg (2015), in order for a payment instrument to be desirable, it should embody the characteristics of universality, convenience, information, security, certainty and economy. Evaluating this definition, mobile money can be seen to incorporate all of these traits. To expand on a few, mobile money is secure in that it is money stored digitally and not physically for example hidden in a household, which can be unsafe and prone to being stolen. It is convenient in that an individual does not have to travel or take up much time in order to make a transaction. It is also universal as payments can be made across long distances.

Moving forward and examining classical and neo-classical theories of money. These theories consider that money is when methods and habits compete with each other for attention of parties that participate into an exchange transaction. A mobile device is a payment habit and thus under this theory payments made with a mobile device must decrease costs and/or increase productivity for all parties involved (Dahlberg, 2015). This too can be extending to mobile money as costs are decreased by not having to physically travel to a formal bank branch in order to make or receive payments of any form thus productivity is increased

through perhaps saving transport costs and freeing up travel time to engage in more productive activities.

An additional theory is one connected to the fact that mobile money can and is also used by individuals in order to send and receive money amongst their social network. This can make social relations amongst themselves stronger and thus can be connected to the social theory of money. This theory on money is based on the fact that money is regarded as a social construct that is continually re-negotiated and founded on social relations between monetary agents and other society's economic agencies (Fine and Lapavitsa, 2000).

One of the most important purposes of saving in developing economies is for consumption smoothing purposes (Deaton 1990). This theory concept is important because if spending and savings are balanced it helps to achieve a better standard of living and be prepared for any negative economic shocks that may transpire.

Theorized relationship between savings and gender, age, education and income

Prior literature has shown that gender, age, education, marital status and income are factors that influence savings behavior and thus this is also why these variables were considered for this papers empirical analysis. A theorized relationship between the response variables savings and the independent variables gender, age, education and income will be briefly discussed. Gender has a significant effect on savings performance and it tends to be the belief that women tend to save more than men do. This may be due to the fact that men tend to have a better position in labor market than women and thus have less need to save as much (Floro and Seguino, 2002). Age also influences savings as depicted in the life cycle hypothesis (Modigliani, 1966). People tend to save more the older they get and then less after a certain point once they reach retirement age thus age and age squared are both included in the model. Education influences savings and it is believed that the higher education an individual has the more that individual tends to save and that education increases the national savings rate in the long run (World bank, 1995). Household income influences savings as illustrated by the permanent income hypothesis. Individuals tend to assess and forecast their long-term average income and from that they can decide whether to save or not (Friedman, 1957). Household income levels can also intuitively influence savings for example because the more leftover income a household has the more money available that can be putting towards saving, this

however depends on other factors such as perhaps the number of individuals within the household.

Empirical findings of the impact of mobile money on savings

The extent to which mobile money can reach so many different sectors and opportunities for an economy are largely vast and thus the potential of the positive impact on poorer individuals can potentially be immense as well. According to GSMA (2019), mobile money supports economic growth at the macro level by facilitating savings and investments, creating employment, driving business activity and entrepreneurship. Mobile money can also assist in formalizing economies and providing stability during economic crises. This is also mentioned in the Global Findex Report (2017), which states that mobile phones can act as an entry point to the formal financial system. This report, also in line with what is mentioned by GSMA (2019), is that digital payments can be a more secure and convenient way for individuals to potentially help build up savings balances. This may be achieved through the fact that keeping money digitally is regarded as safer than keeping it hidden somewhere in the household. It is also easier and cheaper for individuals to receive or make payments digitally as compared to physically having to travel somewhere and build up transport costs and also time consumed with the travel that may be better used elsewhere.

A study undertaken by (Demombynes and Thegeya, 2012) in Kenya found that those who registered for mobile money through M-Pesa are 32% more likely to have some savings and that the savings are more likely for those who are male, married, higher levels of education, income and wealth and those living in rural areas.
Furthermore, research by (EPRC, 2016) also found that being a registered mobile money user increases the possibility of savings using mobile money. However in contrast to (Demombynes and Thegeya, 2012), they found that saving using mobile money is more common in urban and central regions than rural areas and this is due to poor infrastructure in rural areas such as lack of electricity and bad telecommunication networks and factors such as lower propensity to save among poor that don't have higher incomes and thus access to more money that can be spared and then saved. (EPRC, 2016) mentioned that savings through mobile money are still low and this may be increased through certain approaches such as interest payments on mobile money savings. This kind of research impact was discovered in (Batista and Vicente, 2019). This 2019 study on farmers in Mozambique also found that using mobile money increased mobile savings but only if interest was being paid on the mobile

savings balances. This is an interesting concept as it may be a good incentive to incentivize people to save more if they know that they can make a bit more from just having money in a savings account. The study also shows that tailoring mobile money products can be very effective as in this case it improved modern technology adoption by farmers (EPRC, 2016).

Looking at benefits from electronic transfer programs, there was a study by (Willis, 2016.) in North Zimbabwe in 2014/2015 that made cash transfers delivered through mobile money with the intent to cover a specific food basket. The study found that not only did participants make use of their mobile money products and services more but that one of the biggest increases in mobile money usage were related to savings that increased from 0% to 27%. Thus it may be possible to assume that in certain instances were getting actual cash may have made households spend the available cash immediately or have to spend some of it on transport to collect it or other extra costs by receiving it through mobile money the money already lands in a safe place and a place where it can also be accessed easily but also automatically saved.

(Ouma et al, 2017) is a study based on a select number of countries in Sub-Saharan Africa that examines the effect that mobile phones have on savings by providing access to financial services by the use of them. The study found that two forms of savings both mobile phone savings and bank incorporated mobile savings are increased by having access to and using mobile phones. Not only is there an effect on the likelihood of saving but also on the amounts saved. This is probably because of the ease, security, cost effective and convenience related to transacting using a phone and not in person or at a bank branch.

An interesting study on Burkina Faso (Ky et al, 2017), investigated the impact that mobile money has on not only savings in general but the impact mobile money has on different saving reasons that individuals may have. The authors investigated the effect on overall savings, saving for health emergencies and saving for predictable events such as saving to develop an activity. It was found that mobile money services increased the ability for individuals to save for health emergencies but that there was no impact on overall savings or saving for predictable events. Thus, this may imply that individuals place more importance on saving for unpredictable circumstances such as health scares and are less inclined to save for the sake of saving for positive reasons in the foreseeable future. The authors also found that disadvantaged groups such as rural, female and less educated individuals saved more for health emergencies. This may also be because these groups tend to not have health insurance as they may not be able to afford to pay the monthly premiums each month or deem it

necessary to pay an amount every month for a health emergency that may never happen or only happen once in a while.

The next section will discuss and elaborate on the research design and methodology used for this paper in order to answer the research questions.

Research Design and Methodology

This chapter will provide detailed information on the research design and strategies used in this dissertation. This chapter will also provide the data and techniques used in order to arrive at the answers to the research questions and objectives.

Research design and strategy

The hypothesis for this research paper is whether or not mobile money accounts have an impact on three different saving reasons, which are: general savings (no specified reason), saving for old age and saving for business or farm related reasons. More specifically, the hypothesis tested is:

H_0: Mobile money usage does not significantly increase savings (general, old age, farm/business)

H_1: Mobile money usage significantly increases savings (general, old age, farm/business)

If the beta coefficient (β_1) is not significantly different from zero, we fail to reject the null hypothesis H_0 and conclude that the effect is not statistically significant. Otherwise, we reject the null hypothesis.

The impact of mobile money accounts on different underlying saving reasons was analyzed in order to see if there is a difference that mobile money accounts make depending on the reasons individuals are saving. Some research papers have looked at the impact mobile money has on general savings but not many have looked at the impact on different saving reasons.

Both descriptive and empirical analysis was undertaken using Python 3 software and Microsoft Excel in order to test the hypothesis of the relationship between savings and mobile money accounts. Data on Zimbabwe from The World Bank Microdata 2017 Financial Inclusion Survey was used with a target response of individuals aged 15 years and older.

Data Description

For this dissertation, secondary data collection on Zimbabwe was utilized. Secondary data refers to data that was not gathered specifically for this research paper. The initial data taken from the World Bank website consisted of 1000 individuals with over 100 different digital and financially related variables. The survey was conducted in 2017 by Gallup Inc. as part of

the Gallup World Poll. Data was collected starting on 8 April 2017 until 8 May 2017 using computer assisted personal interviews (World Bank, 2018).

The data used in this research paper is based on approximately 950 individuals in Zimbabwe with 10 different variables looked at to determine the impact that some of these variables had on individuals different saving outcomes. These ten variables chosen were most relevant for this topic that looks specifically at the impact having a mobile money account has on different saving outcomes and also chosen after considering the literature and previous papers on the topic. Thus the variables listed below were used:

Dependent variables

- Saved in the past year
- Saved for old age in the past year
- Saved for business or farm related reasons in the past

year Independent variables

- Respondent is female
- Respondent age
- Respondent education level
- Within-economy household income quintile
- Respondent is in the workforce
- Owns a mobile phone
- Has a mobile money account

The initial data of 1000 respondents went down to 945 respondents after removing 55 respondents that had missing values that were just missing or respondents had refused to answer or had not had an answer.

Education level had three categories in the model (completed primary or less, secondary and completed tertiary or more). Income quintile had five categories (poorest 20%, second (poorest) 20%, middle 20%, fourth 20% and richest 20%.

Descriptive statistics

Table 2 below shows a quick overview of the summary statistics for the initial data.

	Sex		Saved - Overall	Saved - farm/business	Saved - old age	has mobile money account	owns mobile phone	is in workforce
Female	604	Yes	540	226	48	509	802	662
Male	385	No	449	763	941	480	187	327
Total	989		989	989	989	989	989	989

Age	N	mean	std	min	max
	989	36.61	16.54	15	88
HH income quintile	Poorest 20%	Second 20%	Middle 20%	Fourth 20%	Richest 20%
	174	180	174	210	251
Education	completed primary or less	secondary	completed tertiary or more		
	265	668	56		

Table 2: Summary statistics

The average age of the respondents is roughly 36 and a half years old which means that our analysis analyses quite the young population with around two-thirds of the respondents being in the workforce. The remaining summary statistics are better understood and explainable with the following illustrations.

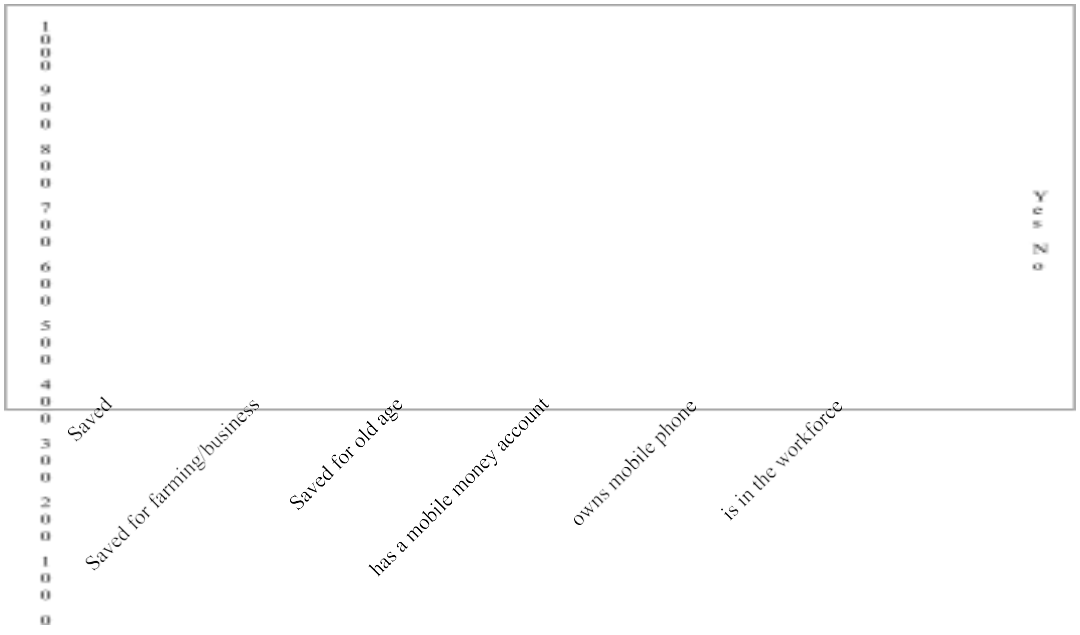

Figure 3: Summary statistics for saving, mobile money, mobile phone and workforce

As can be seen in Figure 3, the number of individuals that own a mobile phone (802) is much larger than those that do not (187). However, in contrast there is seems to be a more equal amount of individuals that have a mobile money account (509) and those that do not (480).

This implies that there is a huge gap that could be filled here where individuals that own mobile phones can get access to and register for mobile money accounts. Looking at the three different savings variables, respondents that save in general are a slightly higher number than those that do not. However, in contrast, the respondents that saved for old age or business or farming reasons are significantly low with majority of respondents showing that they did not save for these reasons. Only roughly 5% of respondents saved for old age, with around 95% not having saved for old age and approximately only 23% of respondents saying they saved for farming or business reasons and around 77% did not.

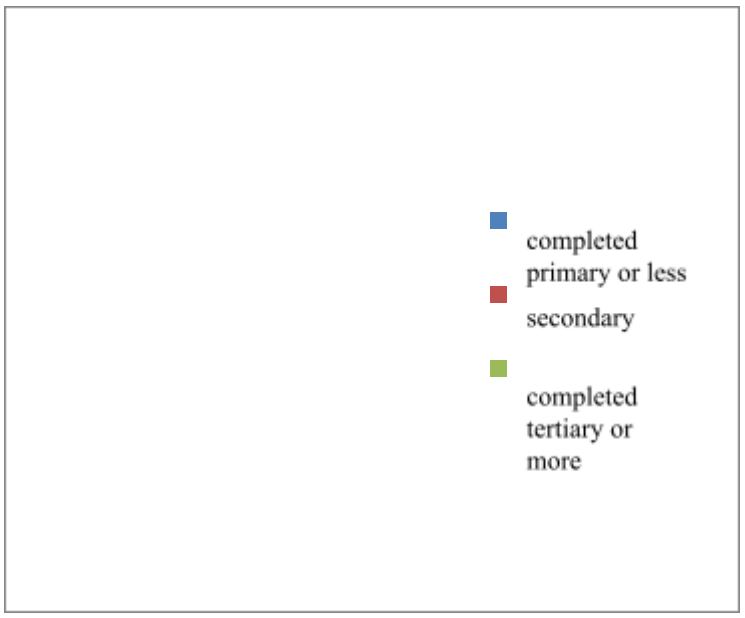

Figure 4, illustrates that majority of respondents have completed secondary education, followed by those with primary education or less and then respondents that completed tertiary or more are the smallest percentage of the sample.

Figure 4: Pie chart of respondents' education levels

As shown in Figure 5, majority of respondents are in the Richest 20% HH income quintile followed closely by those in the fourth richest 20% quintile. The remainder of the respondents are more or less spread between middle, second poorest and poorest HH income quintiles.

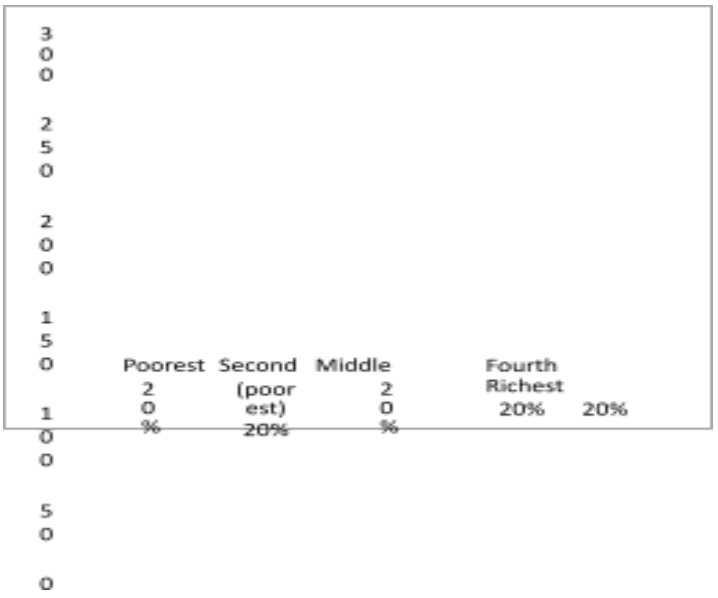

Figure 5: Percentage share of Respondents HH-income quintile

Logistic regression model specification

In order for the research hypothesis to be tested, logistic regression was carried out to examine the impact of mobile money on three different savings patterns. The effects on general saving, saving for old age and saving for business or farm reasons by mobile money users and non-users was compared. The use of logistic regression was implemented because the response variables are categorical variables that can only predict two possible outcomes (saved or did not save). The Logistic regressions were carried out and control variables such as age, gender, income and education were included.

The empirical model to be estimated in order to determine the correlation between savings and mobile money is:

$$logit[P(y=1)] = \alpha_i + \beta_1 MM_i + \beta_2 X_i + \varepsilon_i \quad (1)$$

where y represents the three response variables, general savings, saving for old age and saving for business and farm reasons that are used separately. These three variables are dummy variables, where if equal to 1, represent that a respondent saved and if equal to zero, represents otherwise.

α_i represents individual fixed effects.

MM*i*, is the variable of interest, mobile money account and is a dummy variable equal to one if respondent *i* has a mobile money account and equal to zero if otherwise.

X*i* is a vector for control variables, other sets of factors that can influence savings such as income, age and others discussed in previous chapters

εi is the statistical disturbance term.

The coefficient of β ought not to be significantly different from zero if respondents that have mobile money accounts and those that do not have mobile money accounts have the same ability to save in general, save for old age and save for business or farm reasons. However, if respondents that have mobile money accounts have better ability to save than those without mobile money accounts then β should be positive and statistically different from zero.

For logit models, the coefficients are interpreted in terms of relative changes in odds. The ratio of the probability that an individual saves divided by the probability that they do not. The odds ratio is calculated by exponentiation of the beta coefficient. For example if after

running the logistic regression, the coefficient of beta for female is 0.19. The odds ratio will be $e^{\beta} = e^{0.19} = 1.209$.

Since most of the variables for this data were categorical data, they had to be converted into dummy variables including gender, employment status, education level and household income quintile. For the education variable, primary or less is used as the reference group. For the household income quintile variable, fourth poorest (2nd richest) was used as the reference group. Thus these two do not appear in the regression output as they are the variables used as reference variables for the other groups in that category.

Methodological issues

In order to identify causal effect of mobile money account on the three different saving reasons from equation (1), it must be assumed that the variable mobile money account is exogenous or uncorrelated with other control variables and the error term. This assumption may be true under the following conditions. Firstly, having a mobile money account does not imply that respondents save and secondly if a respondent does save, it does not imply that they have a mobile money account.

However, mobile money account usage might have a different impact on saving if subsamples dependent on individual characteristics are considered. Thus, β can only be considered to show the overall universal effect mobile money accounts have on savings for all respondents in the sample.

Endogeneity seems to be the most crucial problem that exists. Heterogeneity and reverse causality can be present and some studies have tried to mitigate these issues using instrumental variables and/or fixed effects.

Findings, analysis and discussion

This chapter will display the results obtained from all the descriptive and statistical analyses done and also explain and analyze the findings and outcomes of the regression models in order to assist in answering the research questions.

The full Python data analysis document can be found with a downloadable link provided in the Appendix in this thesis.

Descriptive Analytics

Table 3 below, shows us that out of 989 respondents only 469(47%) that have a mobile phone also have a mobile money account and that 333(34%) that own a mobile phone do not have a mobile money account. They may be countless reasons behind this figure, but it is an important figure nevertheless because making room for these respondents to have access to the use of a mobile money account may aid them financially in ways they had not thought about or known to be possible.
Another interesting value is that 40 (4%) respondents had no mobile phone but had a mobile money account which implies that they may be making use of a family member or a friends mobile money account and would be interesting to do further research on this angle.

owns_mobile_phone	no	yes
mobile_money_account		
no	147	333
yes	40	469

Table 3: mobile money account vs owns mobile phone

Table 4 below, examines respondents with or without mobile money accounts and the different saving options.

mobile_money_account saved	no	yes
no	272	177
yes	208	332

mobile_money_account saved_farm_business	no	yes
no	396	367
yes	84	142

mobile_money_account saved_old_age	no	yes
no	466	475
yes	14	34

The hypothesis that having a mobile money account should ideally increase savings does not seem to be the case for all saving reasons as can be seen by looking at the outcomes in Table 4. For general savings, 332 respondents that have a mobile money account have saved and 177 have not. In contrast for savings reasons that are farm or business or old age related and the respondents have a mobile money account, the figures for those that did not save (367 and 475 respectively) are much higher than for those that did save (142 and 34 respectively) . Considering that the average age of the dataset is quite young, it would have been right to assume that more emphasis would go towards savings for old age or business related reasons.

Table 4: Mobile money account vs. saving options

In Table 5 below with regards to savings vs. Education levels, looking at general savings for respondents that have secondary education, 378 saved compared to respondents with primary education or less and those with tertiary education or more. In contrast, for respondents with secondary education, 636 respondents didn't save for old age and the overall figure for saving for old age is significantly tiny for all education levels. Secondary educated respondents that did not save in this case for farm or business related reasons are also a high figure of 513 respondents. All in all, this tells us that overall savings were done by mostly respondents that have secondary education and that saving for reasons such as business, farm or old age was not done by majority of respondents regardless of education levels. This may imply that despite the level of education an individual has, there may be other underlying reasons that are much stronger that may be negatively affecting the opportunity or interest to save for

business, farm or old age such as financial knowledge which is knowledge that is not really taught to a great extent and thus education in it is poor.

education saved	completed primary or less	completed tertiary or more	secondary
no	147	12	290
yes	118	44	378

education saved_old_age	completed primary or less	completed tertiary or more	secondary
no	258	47	636
yes	7	9	32

education saved_farm_business	completed primary or less	completed tertiary or more	secondary
no	216	34	513
yes	49	22	155

Table 5: Different saving reasons vs Education levels

Regarding the savings figures by household income quintile, table 6 below shows us that when it comes to saving for old age or farm or business related reasons regardless of household income levels, most respondents did not save for these reasons compared to those that did. However, amongst them, the richest 20% have the larger share of respondents that did not. This is rather interesting as it would be expected for the higher income level households to save more for old age or business/farm reasons but perhaps this would be better assessed over a time period of more than 12 months of saving habits.

hh_income_quintile saved	Fourth 20%	Middle 20%	Poorest 20%	Richest 20%	Second 20%
no	82	91	92	89	95
yes	128	83	82	162	85

hh_income_quintile saved_old_age	Fourth 20%	Middle 20%	Poorest 20%	Richest 20%	Second 20%
no	204	168	172	223	174
yes	6	6	2	28	6

hh_income_quintile saved_farm_business	Fourth 20%	Middle 20%	Poorest 20%	Richest 20%	Second 20%
no	158	136	137	189	143
yes	52	38	37	62	37

Table 6: Household income quintile vs. different saving reasons

The next section of this paper will analyze and discuss the results and findings from the logistic regressions.

Logistic Regression

This section presents the Logistic regression outputs. The regression outcomes advise whether any of the independent variables had an impact on the three dependent variables; saved, saved for farming or business purposes and saved for old age. A positive sign implies greater odds of saving and a negative sign implies the odds of respondents to save is lower when compared to their counterparts.

The empirical results for the Logit model are discussed below in four different sections. Three separate sections that discuss each of the outcome savings variables and a final discussion comparing the results of all the models together.

Saved in general dependent variable model

	saved
intercept	-0.57*
	(0.32)
mobile_money_account	0.74***
	(0.14)
female	0.19
	(0.14)
age	-0.00
	(0.01)
age_sqr	0.00
	(0.00)
in_workforce	0.49***
	(0.15)
completed tertiary or more	0.97**
	(0.38)
secondary	0.22
	(0.17)
Poorest 20%	-0.35
	(0.22)
Second 20%	-0.49**
	(0.21)
Middle 20%	-0.43**
	(0.21)
Richest 20%	-0.04
	(0.20)
N	989

Standard errors in parentheses.
* p<.1, ** p<.05, ***p<.01

Saved - Odds Ratios

intercept	0.565140
mobile_money_account	2.095682
female	1.207746
age	0.998464
age_sqr	1.000154
in_workforce	1.630516
completed tertiary or more	2.642489
secondary	1.243999
Poorest 20%	0.705162
Second 20%	0.611414
Middle 20%	0.649762
Richest 20%	0.961996

Figure 6: Logistic Regression and Odds table for general savings variable

The empirical results for the logit model 'saved' that regresses mobile money account against savings in general illustrated in Figure 6 above, show that the impact of having a mobile money account on savings is positive and highly significant at the 1 percent level with an odds ratio of 2.096. This odds ratio implies that the odds of general saving for respondents with mobile money accounts are approximately twice as high as the odds for those without mobile money accounts holding all else constant. This is also in line with empirical papers that were discussed earlier and intuitively makes sense especially because mobile money gives people safe, secure, cheaper and more convenient ways to transact and store their money.

It would have been expected for the age variable and also age squared variable to be significant as previously found in some research papers because people tend to save more the older they get and after a certain age have less savings due to perhaps retirement. However, the empirical results for this model show that the age and age squared variables are statistically insignificant in having an impact on general savings and have coefficients of zero. This may be impacted by the fact that the average age of our dataset is in their mid-30s and thus perhaps a dataset with an average of perhaps 45 would have given different outcomes. Being in the workforce has a positive and highly significant coefficient. This tells us that individuals that are in the workforce had roughly one and a half times the odds of having saved in general than those not in the workforce holding all else equal. This may also intuitively be because people that have a job and thus an income may have more disposable income available that they can save as compared to those that are not in the workforce and thus may not receive an income.

Compared to respondents in the fourth poorest (2nd richest) quintile, respondents in the second poorest and middle quintiles had approximately 0.6 and 0.65 times the odds of having saved in general respectively. This is shown by the statistically significant but negative coefficients, which means that the 2nd richest household quintile has higher odds of saving than the middle and second poorest quintiles which have lower odds of saving in comparison holding all else equal.

Interestingly enough, having a mobile money account seems to have no effect at all on the poorest respondents' general savings as the coefficient is statistically insignificant. This is important as the poorest household income quintile is the target audience that should hopefully be assisted the most to be able to save and thus mitigate their poverty. Education wise, the completed tertiary or more coefficient is positive and significant and with

an odds ratio of 2.64, tells us that respondents that had education of tertiary standards or more had the odds of having saved in general approximately two and a half times more than respondents with primary education or less. Previous literature on the relationship between education and savings have shown that the higher the education level, the higher the likelihood to save. This finding has different reasons behind it and may be due to the fact that tertiary education perhaps leading to better jobs and thus more money available to save or there being more financial knowledge the higher your education level is. The secondary education coefficient is statistically insignificant for general savings.

Saved for old age dependent variable model

	saved_old_age
intercept	-4.42***
	(0.86)
mobile_money_account	0.52
	(0.35)
female	-0.29
	(0.31)
age	0.02
	(0.01)
age_sqr	-0.00
	(0.00)
in_workforce	-0.18
	(0.35)
completed tertiary or more	0.91
	(0.64)
secondary	0.24
	(0.50)
Poorest 20%	-0.76
	(0.84)
Second 20%	0.22
	(0.60)
Middle 20%	0.30
	(0.59)
Richest 20%	1.29***
	(0.47)
N	989

Standard errors in parentheses.
* p<.1, ** p<.05, ***p<.01

Saved_old_age - Odds Ratios

intercept	0.012050
mobile_money_account	1.681080
female	0.746101
age	1.018294
age_sqr	0.999806
in_workforce	0.833762
completed tertiary or more	2.473097
secondary	1.275671
Poorest 20%	0.468132
Second 20%	1.245171
Middle 20%	1.343156
Richest 20%	3.641924

Figure 7: Logistic Regression and Odds table for saved for old age variable

The next model discussed, shown in Figure 7 above looked at the impact having a mobile money account has on the dependent variable saved for old age. This outcome variable is important to look at because with an economy that has such a large number of people in the informal sector, they are not able to save for retirement through formal employment financial services such as pensions and thus mobile money may be a good alternative for them. The empirical result for the logit model 'saved_old_age' has somewhat not surprising results. The effect that having a mobile money account has on saving for old age is statistically insignificant, telling us that having a mobile money account has no effect on saving for old age compared to those without a mobile money account. This makes intuitive sense as mobile money accounts seem to more often than not be for short term transacting and savings. Especially amongst the poor and those in informal employment, savings may usually be used to smooth consumption more short term and not to save for long-term investments like old age.

All other variables are also statistically insignificant except for the richest 20% quintile coefficient of 1.29 which is positive and highly significant. This tells us that respondents that lie in the 20% richest household quintile have approximately 3.6 times the odds of saving for old age than respondents in the 4th poorest (2nd richest) quintile holding all else equal. The household income quintile findings also show us that the poorest and majority of the respondents do not use mobile money accounts for saving for old age purposes but perhaps only for short or middle term needs. It would have been right to assume that the richest save for old age in more formal banks with poorer household income quintile respondents who are more or less in the informal sector to save for old age using mobile money, however these results show this is not the case here.

Saved for business or farming dependent variable model

	saved_farm_business
intercept	-2.35***
	(0.40)
mobile_money_account	0.47***
	(0.17)
female	-0.11
	(0.16)
age	0.01
	(0.01)
age_sqr	-0.00
	(0.00)
in_workforce	0.86***
	(0.20)
completed tertiary or more	0.90**
	(0.36)
secondary	0.20
	(0.21)
Poorest 20%	0.02
	(0.26)
Second 20%	-0.16
	(0.25)
Middle 20%	-0.06
	(0.25)
Richest 20%	-0.21
	(0.23)
N	989

Standard errors in parentheses.
* p<.1, ** p<.05, ***p<.01

Saved Farm/Business - Odds Ratios

intercept	0.094956
mobile_money_account	1.595219
female	0.895196
age	1.006236
age_sqr	0.999914
in_workforce	2.370668
completed tertiary or more	2.458996
secondary	1.226034
Poorest 20%	1.024777
Second 20%	0.849495
Middle 20%	0.945192
Richest 20%	0.807634

Figure 8: Logistic Regression and Odds table for saved for business/farm variable

The last model, Figure 8, looks at the impact having a mobile money account has on the dependent variable saved for something specific and in this case business or farming purposes. The empirical results for the logit model ‘saved_farm_business ‘ shows that the effect that having a mobile money account has on saving for farm or business purposes is positive and highly significant at the 1 percent level holding all else equal. The odds ratio of roughly 1.6 implies that respondents owning a mobile money account saved towards these two aspects approximately one and a half times more than respondents that do not have a mobile money account. This finding is especially important because agriculture and thus

farming is a huge and prosperous sector in Zimbabwe and thus access to savings for better technology or products to use on farms through mobile money may help in growing this sector, which can also ultimately benefit lower income people.

The different household income quintiles had no effect at all on saving for business or farm reasons but the in the workforce variable had a positive and highly statistically significant coefficient of 0.86, which gives an odds ratio of 2.37. This implies that the odds of saving for business or farm is 2.4 times higher for respondents that are in the workforce than for those that are not.

Taking education into consideration, the completed tertiary or more coefficient was positive and significant with an odds ratio of 2.5 telling us that respondents with tertiary education or higher saved for business and farm reasons more than twice as much than those with only primary education or less holding all else equal.

Comparing results of all three models

	saved	saved_old_age	saved_farm_business
intercept	-0.57*	-4.42***	-2.35***
	(0.32)	(0.86)	(0.40)
mobile_money_account	0.74***	0.52	0.47***
	(0.14)	(0.35)	(0.17)
female	0.19	-0.29	-0.11
	(0.14)	(0.31)	(0.16)
age	-0.00	0.02	0.01
	(0.01)	(0.01)	(0.01)
age_sqr	0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)
in_workforce	0.49***	-0.18	0.86***
	(0.15)	(0.35)	(0.20)
completed tertiary or more	0.97**	0.91	0.90**
	(0.38)	(0.64)	(0.36)
secondary	0.22	0.24	0.20
	(0.17)	(0.50)	(0.21)
Poorest 20%	-0.35	-0.76	0.02
	(0.22)	(0.84)	(0.26)
Second 20%	-0.49**	0.22	-0.16
	(0.21)	(0.60)	(0.25)
Middle 20%	-0.43**	0.30	-0.06
	(0.21)	(0.59)	(0.25)
Richest 20%	-0.04	1.29***	-0.21
	(0.20)	(0.47)	(0.23)
N	989	989	989

Standard errors in parentheses.
* p<.1, ** p<.05, ***p<.01

Figure 9: Logistic Regression table for all three saving variables

Odds Ratios			
	Saved	**Saved_old_age**	**Saved_business/farm**
intercept	0.565	0.012	0.095
mobile_money_account	2.096	1.681	1.595
female	1.208	0.746	0.895
age	0.998	1.018	1.006
age_sqr	1.000	1.000	1.000
in_workforce	1.631	0.834	2.371
completed tertiary or more	2.642	2.473	2.459
secondary	1.244	1.276	1.226
Poorest 20%	0.705	0.468	1.025
Second 20%	0.611	1.245	0.849
Middle 20%	0.650	1.343	0.945
Richest 20%	0.962	3.642	0.808

Figure 10: Odds table for all three saving variables

Comparing the results of all three models, displayed in Figure 9 and Figure 10 the most important take away from our models is that having a mobile money account has a positive and statistically significant effect on the odds of general savings and on saving for business or farm reasons compared to respondents without a mobile money account. However for saving for old age, having a mobile money account has no effect at all. This finding seems to support the idea that saving through mobile money is more popular for short term and not long term saving plans.

Income quintiles have no effect at all on savings for business or farm related reasons but when looking at saving for old age the richest 20% coefficient is the only positive and statistically significant value implying that the odds of saving for business or farm reasons are higher amongst the richest 20% as compared to the fourth richest holding all else equal. For savings in general, the middle and second 20% quintiles are negative and statistically significant at the 5% level and thus compared to the second richest income quintile, as is to be expected middle and second poorest income quintile have lower odds to save generally.

Having completed tertiary education or higher has a positive and significant effect on general savings and saving for farm or business related reasons but has no effect on saving for old age. What is surprising though is the fact that being a female is statistically insignificant. A significant amount of research has found that women tend to save more than men do, however this is not the case in our findings. This may be due to some of the methodological issues discussed earlier or perhaps a larger sample over a longer period of time may show different results.

To conclude, having a mobile money account and having completed tertiary education or more seem to have the highest and most positive effects on a respondents odds of savings in general and/or on a respondents' odds of saving for business or farm related reasons. Needless to say, our findings may reflect differences between those that do and those that do not save through having a mobile money account for reasons other than causal effect. This may be for example because respondents that understand financial transactions and have technical ability (higher education) would naturally be more expected to use mobile money and individuals that can afford a mobile phone (higher income) to begin with would also be more likely to have a mobile money account.

Although the R squared values (found in the python notebook in the link in the Appendix) for all the models are very low, some of the independent variables are still statistically significant and thus vital inferences can still be drawn on the relationships between those variables.

Conclusion

Mobile money accounts have managed to greatly re-invent ways in which individuals, particularly in developing countries can have better access to formal financial services. Consistent with our theoretical findings, this study has shown that access to mobile savings through mobile money has increased. The study revealed that the odds of saving in general increase twice as much for mobile money account users and for farm or business related saving reasons, more than one and a half times more as compared to respondents that do not have mobile money accounts. It was however found that mobile money has no effect on savings for old age. These findings demonstrate that there is a need to promote saving through mobile money not just for savings in general but for particular reasons such as business, farm, old age and other important reasons such as health and education as well as motivate long term savings.

Significant macroeconomic implications stem from these findings that may prove vital if applied at policy level. Popular saving techniques and methods in the past have focused either on more informal methods such as saving together amongst social groups and networks or through microfinance companies. Conversely, this study shows that mobile money can be used to encourage financial inclusion and thus better means to save that can be cheaper, safe and more convenient.

Such policies may not only positively impact the wellbeing of the financially excluded but also the economy as a whole. However, it should be noted that digital technology through mobile money accounts alone is not enough to increase financial inclusion. Many developing countries lack proper physical infrastructure, good payments system, good governance and regulations and a good payment system. In addition, consumer protection is also very important.

A good practice that would encourage the use of mobile savings long term would be for the government to focus on better policies that restore or encourage faith in the financial system and to focus on projects that improve physical infrastructure, good payments systems and regulations amongst other things mentioned before. These projects and policies should be focused on regions and groups that lag behind.

Another idea would be for governments to have incentives that encourage mobile phone users to register for mobile money or make it part of the package that when you purchase a simcard

to use on your phone you are automatically registered for mobile money usage. This may inertly encourage mobile money usage and in turn mobile savings.

Generally, the use of mobile money for savings is low. This may be due to lack of awareness or promotion for this from the government or also due to the Telecommunications companies not offering savings products or tailored savings products to customers and this may prove to be beneficial and impactful in the short or long run.

Study Limitations and Recommendations

This study only focuses on the impact of mobile savings on roughly 950 individuals over the past 12 months in Zimbabwe. It would however be interesting to conduct further research and replicate this study over a longer period of time and additionally using more data in terms of more respondents, marriage status, number of people in household as well as data on other countries and not only one country. Furthermore other data such as variables like distance to mobile agent could be used in order to be able to carry out instrumental variable regression analysis to be better able to attain causality.

The study can also be replicated in further research by examining rural and urban data as well as a sample with more diverse age range and larger share of lower income households thus more financially excluded groups.

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Appendix

The following google drive link leads to all the data used in this thesis as well as the data analysis undertaken using Python and excel:

https://drive.google.com/drive/folders/1Cu655j0jMukc9LJjYOZAvC8MCPvSYtiB?usp=sharing