Does Mobile Money have a Part to Play in Poverty Reduction Within South Africa?

A Dissertation

presented to

The **Development Finance Centre (DEFIC)**
Graduate School of Business
University of Cape Town

In partial fulfilment
of the requirements for the Degree of
Master of Commerce in Development Finance

by

Shuaib Mollagee

MLLSHU002

February 2024

Supervisor: Dr Thanti Mthanti

Declaration

I, Shuaib Mollagee hereby declare that the work on which this thesis is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university. I authorise the University to reproduce for the purpose of research either the whole or any portion of the contents in any manner whatsoever.

Signature:…….Signed by candidate…….

Date: 09 February 2024

Table of Contents

Acknowledgments

To my remarkable wife, Noorjan Allie, whose unwavering support, boundless love, and incredible patience made this journey not only possible but also enjoyable. Your ability to manage both the household and my occasional chaos with grace and humour deserves a standing ovation. Thank you for being my rock, my sounding board and for having the patience you did throughout this degree.

Big shoutout to my little munchkins Inaya Mollagee and Amaanah Mollagee for being the cutest distractions a thesis writer could ask for. Your endless energy and curiosity, and unending demands for attention kept me on my toes and reminded me of what truly matters in life.

I want to dedicate this work to my late father Nazmoedien Mollagee, who always held me in high regard and took immense pride in my accomplishments. Your unwavering belief in my abilities and your constant encouragement continued to push me, even in your absence. And to my mom Ghikma Marnitz, who always believed in me, even when I doubted myself. Your endless love and support have been my anchor throughout this rollercoaster of a journey. Thank you for all the check in's and continued prayers throughout. I promise to make it up with weekly calls.

Heartfelt thanks to the Allie family, my wonderful in-laws, for their continuous support, and encouragement. Your love and understanding have been a source of comfort and strength throughout this journey. Shout out to Nafisa Allie who kept me on my toes throughout.

Huge thanks to my supervisor, Dr Thanti Mthanti for putting up with my procrastination and therefore last-minute panic attacks. Your patience and guidance helped turn my ideas into something coherent.

Thank You!
Shuaib Mollagee

Abstract

There is a growing amount of research that points towards an additional factor capable of increasing inclusive growth and therefore successfully reducing poverty levels within a country, that is, the use of mobile money. With the rise of mobile phone penetration within African countries, its use has gone beyond communication, providing key financial access in the form of phone-based money transfers and storage. The mobile phone has assisted in providing the previously marginalized with more affordable and cost-effective financial services. The population living in poverty also generally lack information vital to the work they do. Whether its market prices, information on new income earning opportunities, or even as simple as up-to-date weather reports that could affect their existing job. The lack of up-to-date knowledge adds to their already vulnerable state. Mobile phones assist in providing this information to the poor in cost-effective ways.

This study tests whether mobile money has a part to play in poverty reduction, specifically within South Africa. It uses data obtained from FinMark Trust from the 2018 Finscope SA survey. To that end, the Alkire and Santos (2011) method was used to compute a multidimensional poverty index (MPI). Using the MPI, an instrument variable approach was used to treat the endogeneity bias seen by the two-way relationship between poverty and mobile money adoption.

Factors such as gender, age, location, race, and access to necessities such as electricity, clean water and sanitation were additional factors used to calculate the MPI. Results indicate that individuals who are non-white, female, and who live in rural areas contribute the most towards poverty in South Africa. In order to check for robustness, a propensity score matching method (PSM) was used.. Results show that mobile money has a negative contribution to multidimensional poverty, that is, individuals who adopt mobile money have reduced rates of multidimensional poverty. The robustness demonstrated that mobile money has a positive and statistically significant effect on multidimensional poverty reduction.

List of Tables

Chapter 3

Chapter 4

List of Figures

Chapter 1

Chapter 2

Chapter 4

List of Abbreviations

ATM	Automated Teller Machine
ATT	Average Treatment Effect on Treated
B-BBEE	Broad-Based Black Economic Empowerment
BMI	Mody Mass Index
CIA	Conditional Independence Assumption
DOC	Department of Communication
DOI	Diffusion of Information
G2P	Government to person
GDP	Gross Domestic Product
ICASA	Independent Communications Association of South Africa
ICT	Information and Communication Technologies
IG	Inclusive Growth
KYC	Know your Client
LSM	Linear Probability Model
MCA	Multiple Correspondence Analysis
MFS	Mobile Financial Services
MMPI	Moderate Multidimensional Poverty Index
MPI	Multidimensional Poverty Index
NN	Nearest Neighbour
P2B	Person to Business
P2P	Person to Person
PCA	Principle Component Analysis
PEOU	Perceived Ease of Use
PSLSD	Project for Statistics on Living Standards and Development
PSM	Propensity Score Matching
PU	Perceived Usefulness
QOL	Quality of Life
RICA	Regulation of Interception of Communications Act
SIM	Subscriber Identity Module
SMS	Short Message System
SVAR	Structural Vector Autoregressive
TAM	Technology Acceptance Model
UNDP	United Nations Development Programme
VEC	Vector Error Correction

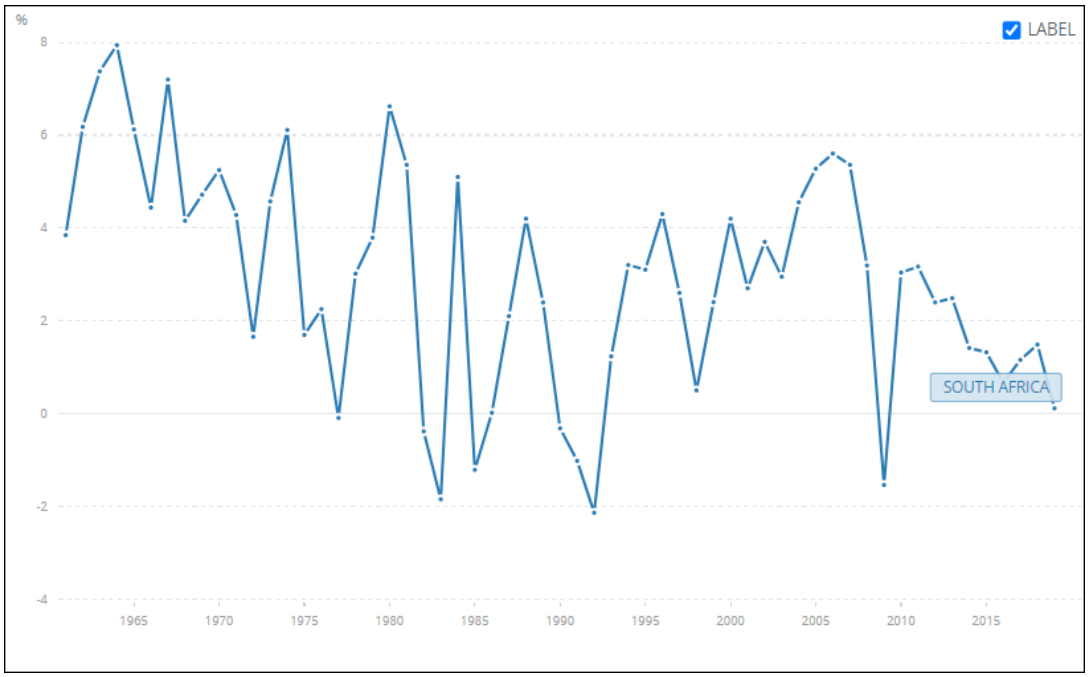
Chapter 1
Introduction

1.1 Background of the study

Between 1961 and 2019, South Africa had an impressive growth in terms of GDP, only recording negative numbers in 8 of the 59 years (figure 1). However, history has shown that growth in isolation does not necessarily relate to good social and economic outcomes. Despite this remarkable growth, there is still a concern that its nature needs to be more equal and inclusive. According to Ranieri and Ramos (2013), inclusive growth (IG) is the notion that in addition to a population having an equal share in the benefits of growth, all individuals should also have a say in the orientation of the growth process. IG involves poor, near-poor, and wealthy individuals and ensures the distribution of income improvements and developments relating to living conditions and empowerment. The presumed lack of inclusive growth within South Africa could explain the astronomically high levels of inequality shown by its Gini coefficient of 63%, which, according to Anyanwu's (2013) findings, is the second most significant determinant of poverty after inflation.

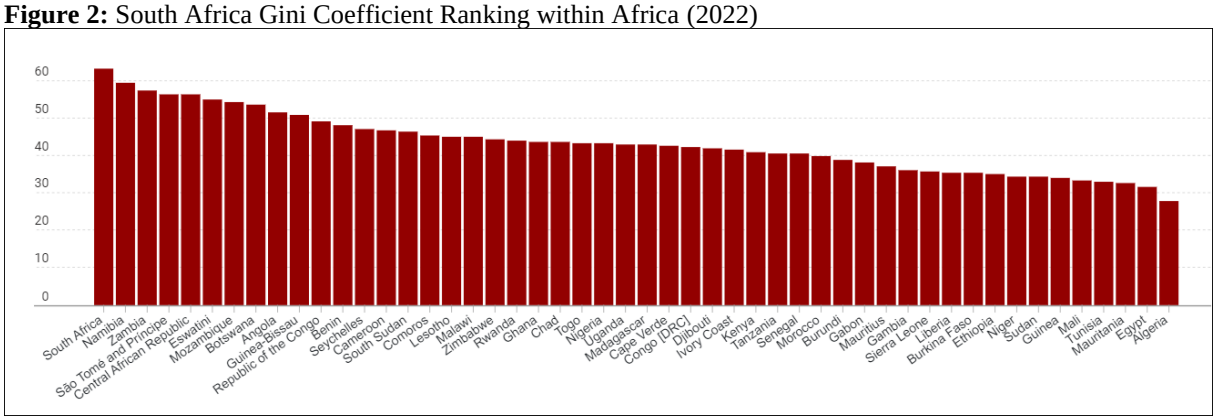
Despite being ranked 5th in GDP amongst all African countries, South Africa is ranked first in income inequality (figure 2). Furthermore, the number of individuals living below the international poverty line has increased over the last decade and remains exceptionally high. The lack of access to health, lack of opportunity and participation within the economy, as well as the staggeringly high unemployment rate (figure 3), are increasing, all play a role in the trend of the high poverty rate.

Figure 1: South Africa GDP Growth (1961-2019)



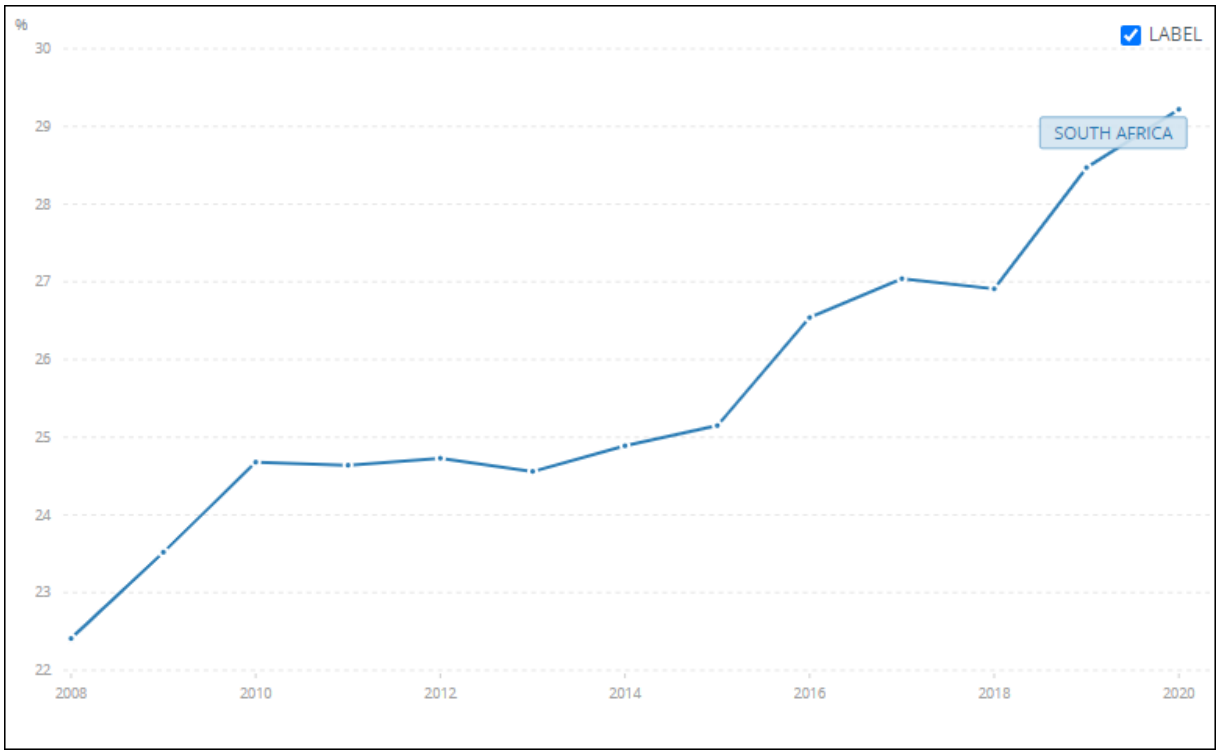
Source: Author using data from World Bank Databank

Figure 2: South Africa Gini Coefficient Ranking within Africa (2022)



Source: Author using data from World Bank Databank

Figure 3: South Africa Unemployment Rate (2008-2020)



Source: Author using data from World Bank Databank

Poverty is a diverse, multidimensional, and dynamic socioeconomic issue; even though there is no universal definition, it can be broadly explained by deprivations both in monetary and non-monetary terms. In monetary terms, poverty is linked to the lack of income required to fulfil basic needs and purchase essential items for survival. It is generally measured using the World Bank's $1 per day absolute poverty line. In non-monetary terms, poverty is related to the lack of access to private asset ownership, essential infrastructure such as basic services and public services, poor health, low education attainment, people unable to find jobs (unemployed), and those individuals marginalised and persecuted culturally, socially, and economically (Anyanwu, 1997; Chambers, 1988; World Bank, 2001). Recognising and understanding the negative consequences of the trend of poor social, economic, and political outcomes is imperative to pursue combating poverty reduction strategies.

A growing amount of research points towards an additional factor capable of increasing inclusive growth and, therefore, successfully reducing poverty levels within a country: mobile money. With the rise of mobile phone penetration within African countries, its use has gone beyond communication, providing critical financial access through phone-based money transfers and storage. Mobile phones have provided the previously marginalised with affordable and cost-effective financial services. The population living in poverty also generally lack information that may be vital to the work they do. Insufficient information, market prices, information on new income-earning opportunities, or even simple up-to-date weather reports could affect their existing job. The lack of up-to-date knowledge adds to their already vulnerable state. Mobile phones assist in providing this information to people experiencing poverty in cost-effective ways.

Kenya is one such country that used mobile phones to benefit the poor by increasing access to essential financial services. From 1990, Kenya went from less than three per cent of households having access to a mobile phone and 1 in 1000 adults having access to mobile services to close to 93 per cent at the close of 2011 (Demombynes & Thegeya, 2012). This exponential increase can largely be accredited to the M-PESA mobile system. M-PESA was launched to help facilitate underbanked and unbanked Kenyans with digital transactions, assisting in reducing the use of physical money. The system has evolved to allow for bank-integrated mobile savings products, further increasing financial inclusion within communities that adopted the system.

Within South Africa, mobile penetration has grown exponentially relative to other African countries. The International Telecommunications Union confirmed that an estimated 4000 mobile subscriptions were registered in 1989, with South Africa being the only country with access to mobile services at that time. However, at the end of 2012, South Africa's penetration rate of 123% was the highest rate recorded across all African countries (Deloitte & GSMA, 2012). Even though mobile penetration rates in South Africa are high, systems such as M-PESA did not replicate the same success in breaking into the South African market as with Kenya. Researchers suggest that mobile money thrives the more underdeveloped the financial services system is, which is in great contrast to what South Africa has. The country does, however, offer various solutions to low-income earners. As mentioned above, some of these solutions are M-PESA offered through Nedbank, MTN mobile money, FNB cell phone banking with the help of E-wallet, and Wizzit.

Research suggests that mobile telephony can decrease income inequality (Asongu & Nwachukwu, 2016), increase financial inclusion and lead to inclusive growth with positive income redistributive effects (Asongu, 2013). In theory, the decrease in income inequality and increase in inclusive growth should lead to a reduction in poverty; however, to the author's knowledge, this theory is yet to be tested, especially within a South African context. This paper, therefore, seeks to answer the question of whether mobile money has a role to play in poverty reduction within South Africa.

1.2 Research Problem and Questions

1.2.1 Defining poverty

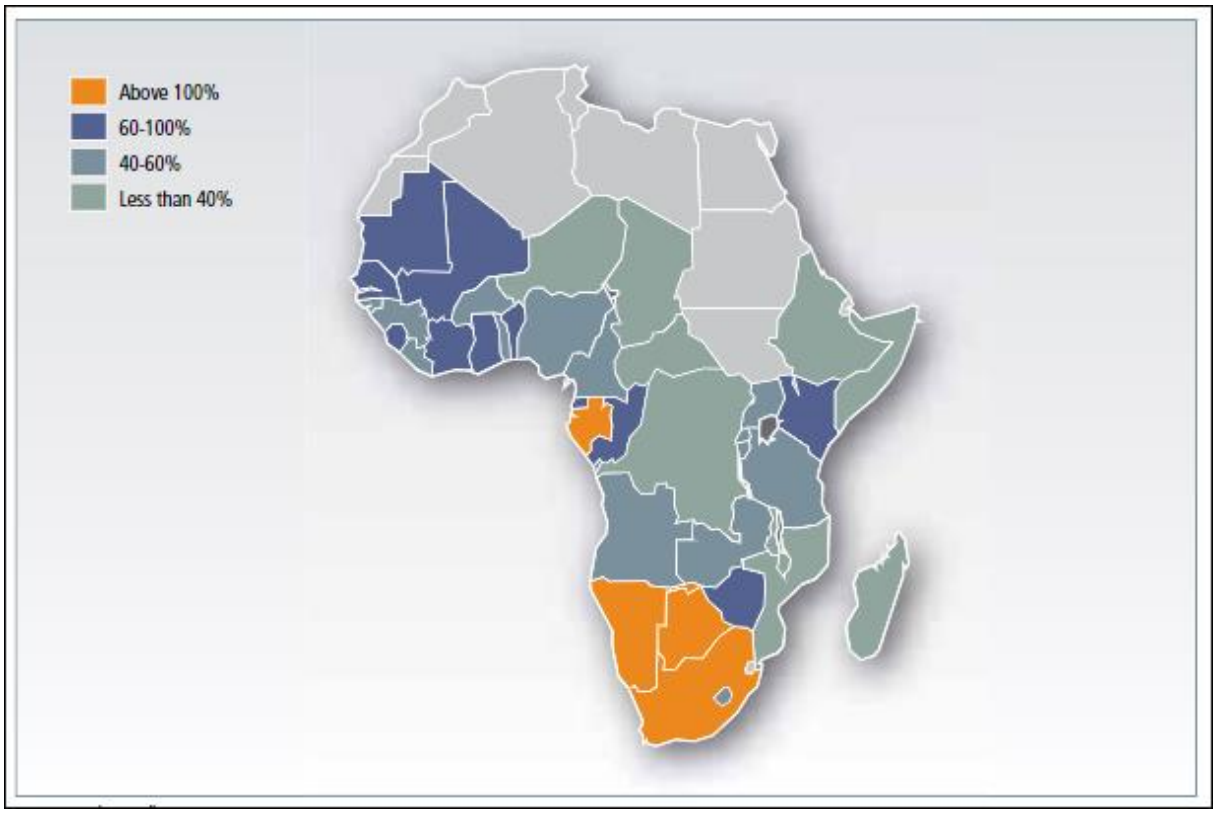
Poverty is a complex multidimensional phenomenon with no singular definition. In essence, defining poverty is more complicated than describing it. Addison et al. (1990) describe poverty as the inability of an individual to attain a basic standard of living. World Bank (2000) defines poverty as those deprived of necessities such as food, shelter, and clothing. This definition can

be further expanded to socially excluded individuals who lack the necessary access to basic education and health services. Poverty has a multifaceted definition attributable primarily to its diverse effects on individuals. It affects individuals morally, physically and psychologically, which is most likely why Agbu (1997) stated that poverty is more easily observed than defined.

1.2.2 Growth of mobile phones - providing context to mobile money and its potential use in poverty alleviation

Since the inception of mobile phones, their technology has evolved from low cost, with basic functionality such as short message system (SMS), to sophisticated smartphones with more technologically advanced features. These smartphones have touchscreen technology, specialised operating systems and applications which allow for a broader range of capabilities. These applications, combined with the smartphone's ability to access the internet, opened a wide range of cell phone possibilities. During the 2000 to 2008 period, Africa experienced a rapid increase in mobile penetration, with less than two out of every 100 individuals owning a mobile phone in 2000 and 33 out of every 100 individuals in 2008 (International Telecommunication Union, 2009). According to the International Telecommunication Union (2012), the growth trend continued from 2009 to 2010 and 2010 to 2011, growing at 18% and 13%, respectively. South Africa experienced astronomical levels of mobile penetration, with the highest recorded level of 123% in 2012 (Deloitte & GSMA, 2012). The mobile penetration within Africa displayed in Figure 4 below shows that only a few African countries could achieve growth similar to South Africa's in the same period.

Figure 4: Mobile Penetration within Africa (2012)

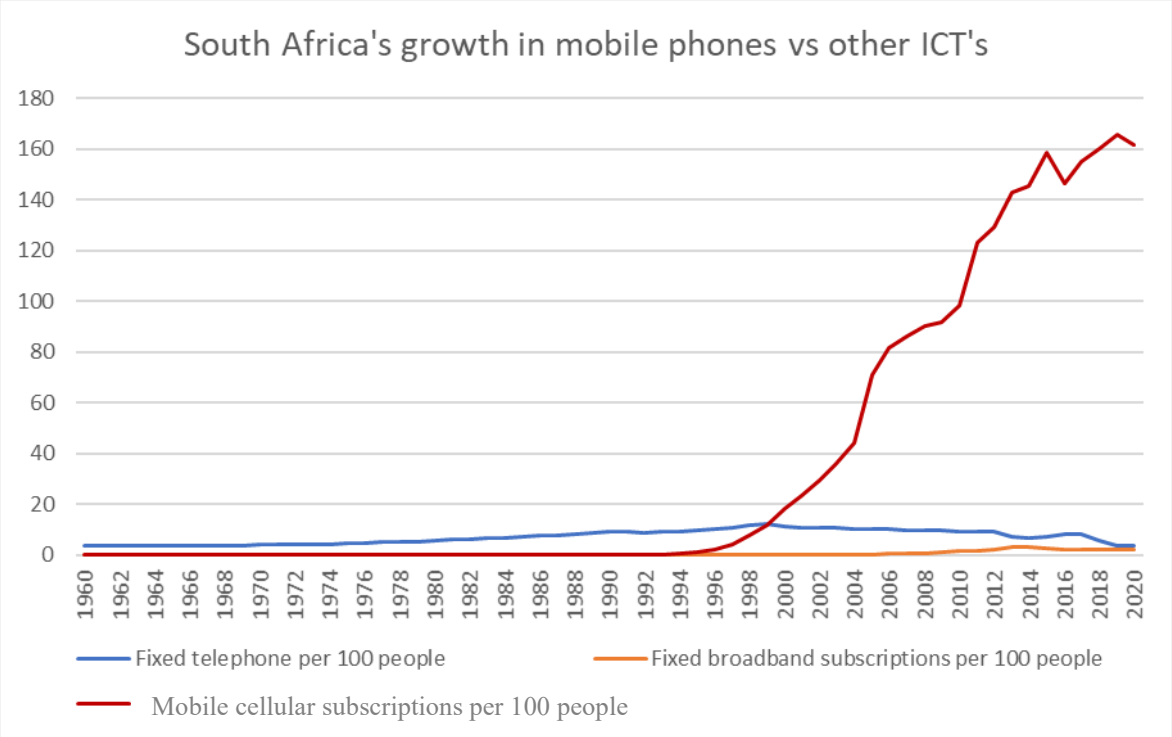


Source: **(Deloitte & GSMA, 2012)**

This growth is opposite to that seen in other information and communications technologies (ICT), such as fixed telephones and fixed broadband subscriptions, which have not seen the

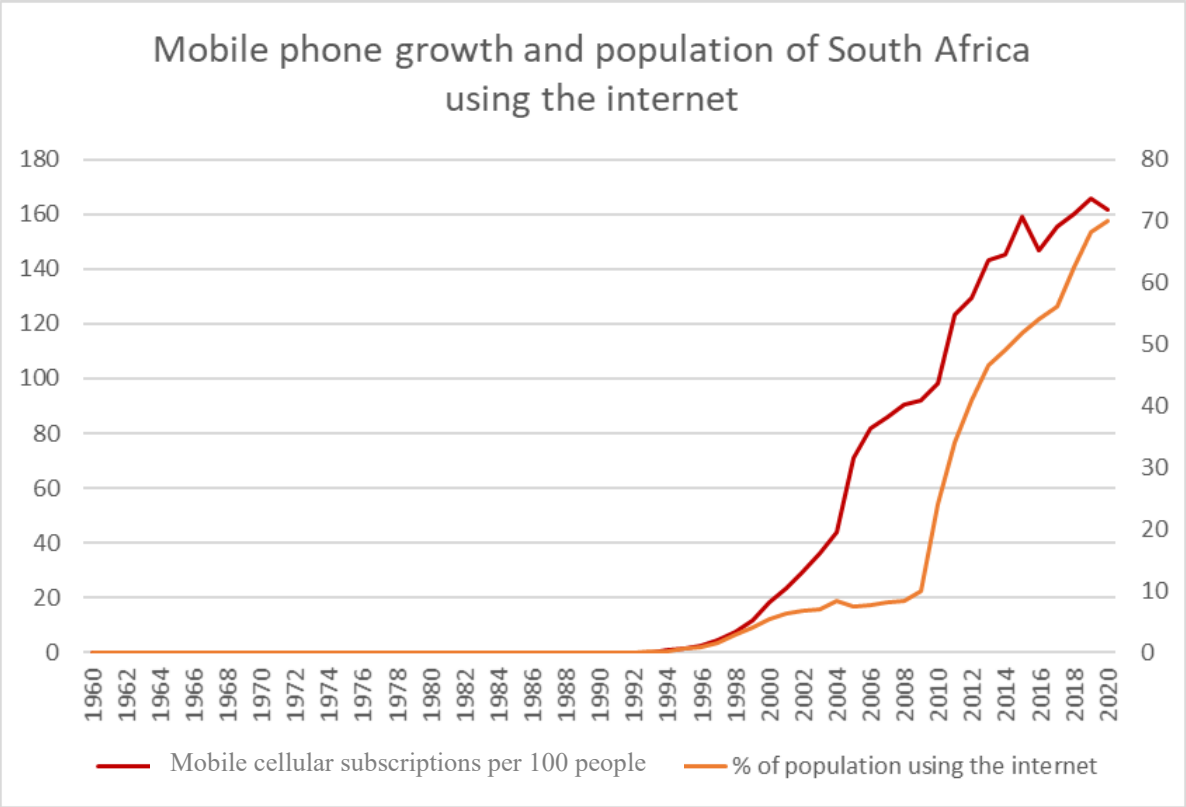
same penetration levels. Figure 5 displays this growth comparison and shows that the highest growth of fixed telephone and fixed broadband subscriptions took place in 1999, with 12 individuals out of every 100 owning a fixed telephone, and in 2014, with three individuals out of every 100 having a fixed broadband subscription, respectively. This pales in comparison to the growth of cellular subscriptions (and therefore mobile phone growth) displayed in figure 5. The fact that almost no other ICT has experienced the same growth as mobile phones is partly why there is a growing body of research on the effects and potential of mobile money. As some users access the internet through their mobile phones, the total percentage of the South African population accessing the internet has increased dramatically (figure 6), which unlocked a wide range of capabilities for humanity to deal with issues such as financial inclusion, inequality or poverty, to name but a few. Although Figure 5 and Figure 6 do not differentiate between the capabilities of these mobile phones (i.e., access to mobile money or mobile banking), they give us some insight into the level at which access to either technology is growing.

Figure 5: South Africa's growth in mobile phones vs other ICT's



Source: Author using data from World Bank Databank

Figure 6: Mobile phone growth and population of South Africa using the internet.



Source: Author, using data from World Bank Databank

These levels of growth and penetration expose the desire of individuals to be both informed and have the ability to communicate. Various research investigates the use of mobile phones and its diffusion amongst the poor in developing countries. Studies have shown that it is no longer only the privileged that have access to mobile phones but also the underprivileged. Research shows that regions where the poor reside have no impact on the accessibility of mobile phones for the poor (Donner & Tellez, 2008). Diga (2007) further added to this and found that individuals within poor communities are likely to substitute necessities such as groceries and sanitation products to be able to afford mobile-related expenses in hopes that ownership of a mobile phone will offer various economic and social opportunities. Infodev (2012) reported similar findings in analysing six districts in Kenya and the use of mobile phones. The findings were that individuals would forego a day's meal to have credit on their phones to stay connected. As mobile phones have become more cost-effective and accessible, with research pointing towards poor individuals giving up other household goods to own a mobile phone, this begs the question of whether mobile money can lead to a reduction in poverty levels within a country, specifically South Africa, which has had high levels of mobile phone penetration?

Shams (2009) noted that the quickest solution to poverty alleviation is to own at least one mobile phone. Despite the growing recognition that mobile phones and mobile money can be successfully used to reduce poverty levels, the exact way and extent to which mobile money influences poverty reduction is not fully documented, especially within South Africa. According to Anyanwu (2013), income inequality is the second largest negative contributor to poverty after inflation. This may suggest that reducing inequality levels in a country could significantly reduce poverty. Asongu and Nwachukwu (2016) measured the effect of mobile

penetration and mobile banking on income inequality across 52 African countries. The results show that mobile penetration and mobile banking both have income-equalising effects, with mobile banking having a more pronounced effect on income inequality. This may indirectly suggest that mobile penetration or mobile money and mobile banking may also play a part in poverty reduction. Macharia (2013) investigated the effect that the mobile money ecosystem has on poverty reduction through wealth creation. The results show that mobile money increased the wealth of the unbanked by more than 10%.

Sife et al. (2010) studied mobile phones' contribution to rural livelihoods and poverty reduction. The findings show that a mobile phone can reduce poverty in several ways, such as strengthening and expanding social networks, which leads to increased productivity, reducing travel costs through sending and receiving money and allowing traders to secure better markets and prices and promptly communicate business-related information. This study is aimed at Tanzania's rural areas, which may have differing results from South Africa's rural areas.

This research aims to answer the question: Does mobile money have a part to play in poverty reduction within South Africa? Existing research focuses on a few African countries or one African country at a time. None of the existing research focuses on South Africa in particular. Additionally, existing studies examine the influence that mobile money or mobile penetration has on some known variables affecting poverty, for example, financial inclusion, GDP, or income inequality. Other research finds evidence of how mobile phones could lead to poverty reduction, for example, through access to information or the fact that a mobile phone can be used as an efficient savings tool. However, these studies are outside a South African context. To the best of the author's knowledge (as far as I have reviewed), the studies discussed above are the only research directly related to this topic. This gap in existing knowledge is further evidence that this research could add significant value.

1.2.3 The contribution of mobile money to poverty.

Mobile money as a contributor to poverty reduction can be highlighted in a number of ways. There are many ways mobile money can reduce poverty. Three of the main points shown in empirical evidence will be discussed in this section. Firstly, even though not within the scope of this paper, mobile money facilitates greater financial inclusion, to a majority, as opposed to a minority of the population. Inadequate access to financial services restricts and at times prevents low-income households from enacting on fundamental financial decisions, often apparent to most, thus finding themselves in a poverty trap (Helms, 2006). The World Bank highlights financial inclusion as an important factor needing to be addressed, stating that the inability to adequately access their finances will inevitably result in inequality and poverty traps (World Bank, 2014).

Additionally, the UN postulates that unrestrained access to a well-run financial system , should lead to social and economic upliftment of people, with greater benefits on the impoverished, allowing for better integration within their country's economy and improved resistance to economic shocks (United Nations, 2006). Empirical evidence suggests that when the impoverished are provided access to a wide variety of financial products and services they previously did not have access to, it leads to financial inclusion and, ultimately, poverty reduction. (Mohammed et al., 2017; Churchill & Marisetty, 2020; Koomson et al., 2020; Omar & Inaba, 2020; Alvarez-Gamboa et al., 2021).

Secondly, as mobile money allows for cross-border transfers between individuals terms remittances. These remittances help mobile money reduce poverty levels. Akobeng (2016) analysed remittances from a macro perspective and found that remittances have positive effects on poverty reduction and income-equalising effects. Akobeng (2016) also found that a well-functioning financial sector improves the effect of remittances within Sub-Saharan Africa. Aker et al. (2016) showed similar evidence and found that mobile money cash transfer programs aided in reducing poverty within Niger. Munyegera and Matsumoto (2016), measured real per capita consumption and found a positive and statistically relative relationship between access to mobile money and domestic welfare.

Inoue (2018) studied the relationship between poverty, financial development, and remittances to the poor and found that financial development and remittances inflows help ameliorate poverty levels in developed countries. In support of these findings, Ekanayake and Moslares (2020) showed that remittances not only reduce poverty levels in Latin America but also have a positive and statistically significant effect on long-term economic growth as remittances have become one of the most significant contributors to foreign financing after foreign direct investment.

Thirdly, mobile money enables users to be more resistant to shocks. In measuring mobile money and its effect on an individual's propensity to save for emergencies, Ky et al. (2018) found that deprived groups such as those who are illiterate, rural dwellers, and those with low income or irregularities in their income had a higher propensity to save for emergencies when they had access to mobile money. Djahini-Afawubo et al. (2020) also measured mobile money and its effects on households' ability to cope with predictable and unpredictable life events. Djahini-Afawubo et al. (2020) found that due to its facilitation of quick access to financial resources, the use of mobile money positively affects households' ability to respond to negative shocks and lessens the effect of climatic shocks that affect agricultural processes, especially production and, ultimately, the well-being of a substantial percentage of the populace in Togo. The World Bank (2014) also highlighted that mobile money cash transfers are essential in building resistance to environmental shocks. Therefore, mobile money is a useful tool to aid farmers in overcoming agricultural shocks (Riley, 2018).

1.3 Research hypotheses

This work aims to answer the question: Does mobile money affect poverty reduction within South Africa? Based on the questions above, the research's key objective is to establish whether mobile money influences poverty reduction within South Africa. As the research is quantitative, the following hypothesis is proposed:

H_1: There is no relationship between mobile money adoption and poverty reduction.

H_0: There is a positive relationship between mobile money adoption and poverty reduction.

1.4 Justification of the Study

Previous studies that focused on the correlates of poverty have looked at poverty from two different aspects. The first is a monetary aspect, which looks at the income levels of either individuals or households to determine what affects the income of those living in poverty. The second is a non-monetary aspect, which looks at various factors such as the lack of access to private asset ownership, essential infrastructure such as basic services and public services, poor

health, low education attainment, people unable to find jobs (unemployed), and those individuals marginalised and persecuted culturally, socially, and economically (Anyanwu, 1997; Chambers, 1988; World Bank, 2001). None of the studies (to the best of my knowledge) looked at the effect that mobile money could have on poverty within South Africa.

Other studies examined the effects of mobile money on the factors that could potentially reduce poverty, such as financial inclusion, GDP, and income inequality measured by the Gini coefficient. These studies did not determine whether there is a direct relationship between mobile telephony and poverty reduction. These studies mainly focused on developing or African countries due to the generally high poverty levels, financial exclusion, or income inequality. Additionally, only some focused on these effects within a South African context. To the author's knowledge, studies have yet to examine whether mobile money influences poverty reduction within a South African context. This gap in research is what this topic aims to cover and is one of the main justifications for this study.

To further justify this research, poverty is one of the 17 sustainable development goals and is, therefore, a global, multidimensional issue which is often easier to observe than to define. Identifying all the correlates of poverty is a complex task. Additionally, the introduction of emerging technologies such as blockchain or development in AI has the potential to change the correlates of poverty significantly. This study attempts to determine whether mobile phones are one of the technologies affecting poverty reduction. Policymakers within South Africa will also benefit from the findings of this study. They will be able to establish a link between mobile money and poverty, using the research to determine the level of focus to place on the mobile ecosystem as a tool for poverty reduction.

Public corporations and entrepreneurs would also benefit from the findings as they offer various business opportunities. The results of this research are expected to facilitate policy design and creation within South Africa. It is also estimated that 25% of the population of South Africa still does not have access to banking facilities, which is a further reason that this research will benefit private corporations, entrepreneurs, and the government, who could utilise mobile money to capture those who are unbanked.

1.5 Organisation of the Study

After the study has been developed, it will consist of five chapters, briefly outlined below.

Chapter 1 introduces the research topic by discussing the background of the various theories involved. The problem statement, research question and objectives follow this. Furthermore, it explains the scope and justification of the study.

Chapter 2 contains the literature review and defines the key terms and concepts involved in the study. It also comprises all existing literature on the effects of mobile money on the correlates of poverty. This section also reviews existing literature on the relationship between mobile money and poverty reduction. This section will also provide evidence of gaps within existing literature.

Chapter 3 contains the methodology and explains the research approach and design. It shows how the chosen quantitative approach has been implemented. The justifications for using a qualitative approach and the benefits thereof are fully explained in this chapter. Additionally, information will be provided on the data used and where this data was sourced.

Chapter 4 presents the findings of the methodology and discusses these findings in detail. Additionally, robustness checks of the results are introduced and discussed.

Chapter 5 provides a conclusion to the study based on the findings. Recommendations are provided to potential research users and are expected to assist in policy design and add to the current body of research. Recommended areas for future studies will also be discussed within this chapter.

Chapter 2
Literature Review

2.1 Introduction

This chapter discusses the literature surrounding mobile money and whether it has the potential to decrease poverty. The chapter starts with a description of mobile money and poverty. It then presents an overview of the current landscape regarding mobile money in South Africa. The theories underpinning mobile money and poverty are then introduced, followed by an overview of the empirical evidence relating to mobile money and its effect on poverty.

2.2 Mobile Money Explained

In its simplest form, Donovan (2012) defines mobile money as delivering financial services to individuals using a mobile device. Mothobi and Grzybowski (2017) expand on this definition and explain that mobile money can be classified as using mobile phones or other devices to access financial services typically offered remotely over the counter. In the current age, these financial services can be conducted through various devices such as smartphones, tablets and even smartwatches. However, apart from physical cash, mobile phones are the primary method of money transactions. UNCAD (2012) further explains that mobile money is the storage of money on a subscriber identity module (SIM), used as the identifier replacement for an account number in conventional banking. The telephone number linked to the SIM usually serves as the unique identifier for the money stored on the SIM.

Mobile money, often offered through telecommunication companies (telcos), has allowed owners of mobile phones to perform various financial transactions without requiring physical cash or access to traditional bank accounts. What initially started as a service allowing transactions between two individuals (person-to-person or P2P) soon expanded to electronic money transfers between person-to-business (P2B), which can be used as a payment for goods, and government-to-person (G2P), which involved grants or other social disbursements (Shy, 2010). Mobile money has more advanced uses in markets with more complex financial systems, such as the payment and receipt of pensions, insurance, or loans. This service is offered using a "wallet", a digital way of storing credits or debits to allow mobile devices to be used for payments rather than bank cards or physical cash, usually at a lower cost. These services are usually not offered by telcos directly but rather through banks that partner with telcos.

The term "wallet" was introduced by Word Remits in 2018, according to Rillo and Levine (2018) explanation of mobile money, which is a service that allows for storage, payment, and receipt of money electronically using a mobile phone, otherwise known as an electronic wallet or "e-wallet" for short. E-wallet is the process of creating and operating an account of value which can be accessed remotely or through agency points using a mobile device. Mobile money wallets or E-wallets are often seen as more accessible than traditional bank accounts. Banks often have strict FICA and Know-Your-Client (KYC) requirements to gain access to bank accounts, whereas mobile money wallets have less stringent requirements to promote inclusion.

Even though the concept of mobile banking is sometimes used within the context of mobile money, and even though mobile money appears to be similar to mobile banking, the back end of the system and how it operates are significantly different from a conventional bank account. Money stored in a mobile money account (Electronic money or E-money) trades one for one

with cashless transaction costs involved. This means that when owners of a mobile money account deposit money into the account, they purchase the equivalent value in E-money from an agent. Similarly, when withdrawing money from a mobile money account, they are selling the E-money to an agent for the equivalent value in cash. This means that the principal role of mobile money agents is to manage the supply and flow of mobile money (Suri et al., 2021).

Mobile money has completely transformed the landscape of formal banking services regarding financial inclusion in emerging and developing countries. It also solves market failures that traditional brick-and-mortar banking services still need to address. Today, more than a third of lower LSM countries utilise mobile money in some shape or form. (Aron & Muelbauer, 2019). Mobile money's central function is to transfer or receive money. However, the service could become the primary lending platform for low-income households that lack the necessary collateral that traditional banks require. Karlan et al. (2016) proposed that the mobile money could record historical transactions of individuals in order to determine credit scores for many forms of collateral. According to Cho and Hinata (2019), technology companies in China have already developed the software within mobile money service which banks use to determine individuals' ability to pay off loans. Mobile money could change the financial services landscape considerably by solving many socioeconomic problems that traditional banks failed to solve.

Transaction costs are one of the main issues addressed by mobile money. Before the widespread adoption of M-PESA in Kenya, transaction costs were one of the most significant issues with traditional banking. Kenya is generally known to have a wide dispersion between families. This dispersion means remittances often travel far distances (Jack & Suri, 2014). Until recently, cash transfers were seen as less effective when compared to other poverty-reduction programs because of the unforeseen costs to program recipients. The research by Aker et al. (2016) suggests that mobile money may have increased the effectiveness of cash transfers as a poverty-reduction program. Aker et al. (2016) conducted a randomised controlled trial using data on 96 villages in Niger. They discovered that transfers of cash using mobile money reduced costs for the receivers and agencies involved in the transaction.

Mobile money has also been shown to aid in empowering women, especially when households are women-led. Mobile money services also have time-saving properties, allowing individuals to spend time on other activities. In a study of women-led households in Niger, Aker et al. (2016) showed that the time savings element of mobile money allowed women to improve household diet diversity. The authors found that households that incorporated mobile money services experienced a greater diet diversity (9-16% more diverse) and a higher number of daily meals for children.

Another benefit of mobile money is that it offers better savings mechanisms for individuals who do not use traditional bank accounts. Mobile money allows for reduced savings costs and an increased incentive to save. Gürbüz (2019) studies the impact that technological innovations have on household welfare. Gürbüz (2019) discovered that there is a 22% increase in the probability of rural Kenya saving when adopting M-PESA, which is more pronounced for households without an existing bank account. This significantly impacts the informal economy, who habitually keep cash "under the pillow". These individuals are gradually starting to inculcate mobile money in day-to-day business transactions, allowing business owners to keep a financial transaction history and better monitor the financial system.

Mobile money also facilitates risk and insurance. Jack and Suri (2014) provide evidence that individuals portray higher volumes of transactions during bad times, explained by an increase in the receipt of remittances by the poor. Jack and Suri (2014) observed that poor households showed more than a 10% increase in the likelihood of receiving remittances from friends or family members during bad times. Jack and Suri (2014) also discovered that households not using mobile money services experience a 7% decline in expenditure after major shocks.

Blumenstock et al. (2015) analysed whether an individual's cell phone usage could be utilised to infer their socioeconomic status. Blumenstock et al. (2015) found that shortly after the Lake Kivu earthquake of 2008, airtime transfers to affected individuals and areas increased exponentially and instantaneously. Shocks increase the velocity and volume of currencies, facilitating risk spreading between the poor and other LSM groups. Furthermore, sub-Saharan Africa is seeing an increase in mobile and micro insurance. Bird (2018) found that mobile money services enable farmers in Ghana and Kenya to obtain crop insurance via smartphones.

Aron and Muellbauer (2019) emphasised several other market failures that could be addressed by mobile money services, such as facilitating labour market opportunities, strengthening social networks, and facilitating local and cross-border trade, to name but a few. Encouragingly, the benefits of mobile money far outweigh the currently documented benefits. As innovations in mobile money services occur, so will the potential benefits. (Hasibul et al.,2022)

2.3 Theories Underpinning Mobile Money

Perhaps one of the most influential and commonly accepted theories relating to an individual's acceptance of ICTs is the Technology acceptance model. This model was introduced by Davis (1985) and was initially adapted from the model of Ajzen (1980) called the Theory of Reasoned Action. The Technology Acceptance Model explains that an individual's acceptance of an information system or technology is determined by the perceived usefulness (PU) or the perceived ease of use (PEOU) of the information system or technology. This model applies to the adoption of individuals to mobile phones. Even though this system is robust, Lee and Jun (2007) believe that the TAM is insufficient in capturing the reasons for the non-use of specific applications of mobile phones.

The Sustainable Livelihood Framework created by Robert Chambers and Gordon Conway in the mid-1980s was utilised by May (2012) to explain how multidimensional poverty indicators can be incorporated into the analysis of access to information and communications technologies. The notion of digital poverty by Barrantes (2007) was also utilised in this approach.

The diffusion of information (DOI) theory was initially developed by Rogers (1961) and is a theory that explains the rate of adoption of an innovation. The model generally measures how many individuals adopted an innovation over a specified period (usually over one year). The model further explains that five variables determine the adoption rate: the perceived attributes of innovation, the type of innovation decision, the communication channels used, the nature of the social system, and the extent of change agents' promotional efforts. This theory can be used to explain the rate at which innovation, such as mobile phones or mobile money, is adopted by individuals in a social system and is the primary theory underpinning this research. The five variables above are then broken down further into sub-variables.

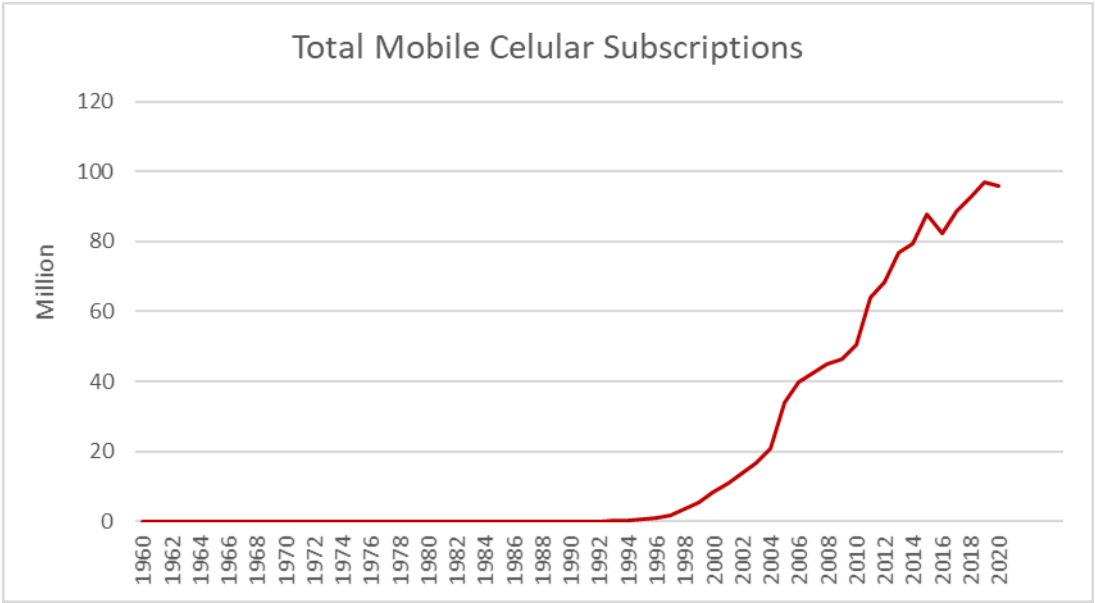
2.4 The State of Mobile Money in South Africa

For the first time in 1994, South Africa introduced a democratically elected government allowing equal opportunities for all individuals regardless of colour, age, or gender. Due to the nature of apartheid, South Africa at the time had the highest levels of income inequality in the world and the highest level of inequality within Africa. This is still the case to this day. Naturally, this inequality was prevalent in income and opportunities and access to public services such as education, health, and financial services.

Post 1994, South Africa made significant improvements to the number of unbanked individuals, especially among the black ethnic group. These improvements are partly due to the launch of the Financial Sector Charter in 2003 with a mandate of increasing banking access for the underprivileged (Ardington & Leibbrandt, 2004), as well as the initial success of the "Mzanzi" account initiated by the big four banks (ABSA, Nedbank, FNB, and Standard bank). This account allowed for no minimum balance and no transaction costs. The account became more inaccessible, and transaction costs increased dramatically, which contradicted the reason for its existence. Despite the government's commitment to ensure improved access to formal banking, most of the population remained unbanked (World Bank, 2014).

Between 1991 and 1994, Telkom was known to be the sole provider of fixed-line services and was considered a monopoly. Post-apartheid, the South African government acknowledged the need for increased access to ICT and with the release of the Telecommunications Act of 1996, South Africa allowed for the privatisation of the telecommunications industry. Neotel, registered in 2005, was South Africa's second fixed-line service provider and a direct competitor to Telkom. In 1993, the first mobile service provider, Vodacom, was licensed to offer mobile network services in South Africa. In the same year, MTN was launched as a mobile service provider, and in 2001, Cell C, the third largest service provider, was launched in South Africa. Figure 5 shows that the mobile landscape took a few years to gain traction; after that, South Africa experienced astronomically high growth rates in mobile penetration and mobile cellular subscriptions, with the highest recorded level of 123% in 2012 (Deloitte & GSMA, 2012).

Figure 1: Total Mobile Celular Subscriptions in South Africa (1960-2020)



Source: Author, using data from World Bank Databank

The Department of Communication (DOC) and the Independent Communications Association of South Africa (ICASA) are the regulatory bodies in South Africa responsible for ensuring ICT products and services are of high quality and affordable to maintain increased access. Additionally, their mandate is to protect the South African population against unfair business practices from private mobile service providers.

Despite the existence of these regulatory bodies, Esselaar et al. (2007) argues that the pricing model for mobile services has impacted the usage of and access to mobile services and is comparatively high within Africa. Other regulations, such as the Regulation of Interception of Communications Act (RICA), have further stifled the accessibility of mobile services in South Africa. The act required mobile service providers to register the identities of individuals who have purchased or will purchase SIM cards in future and could potentially impact the accessibility of mobile banking/mobile money for the poor who do not have access to identification documents.

The first position paper relating to mobile money or E-money was released by the South African Reserve Bank (SARB) in 1999, which then evolved in 2009. The South African Reserve Bank's mandate relates to ensuring the stability of the South African payment system and protecting consumers from financial loss resulting from malpractice and fraudulent activities. This paper sets out guidelines and regulations regarding the use of E-money within the industry. According to this paper, non-banking institutions partaking in mobile money services are legally only able to do so if partnered with a banking institution. This allowed various mobile money providers to tap into the South African Market. M-pesa, founded in Kenya in 2007, is one such provider to enter the market and was launched in South Africa in 2010.

M-pesa, partnered with Nedbank, is a mobile money product that allows the deposit, payment, and withdrawal of money without needing a conventional bank account. FNB's E-walled service is another product that offers mobile money transfers. The owner of the E-wallet requires a bank account. However, money can be transferred to any individual without a bank which can be withdrawn at any FNB ATM. Another typical mobile money service is MTN's Momo, which offers mobile money transfers without the need for a bank account. The service has no monthly fee and no fee for recharging, paying bills or in-shop purchases.

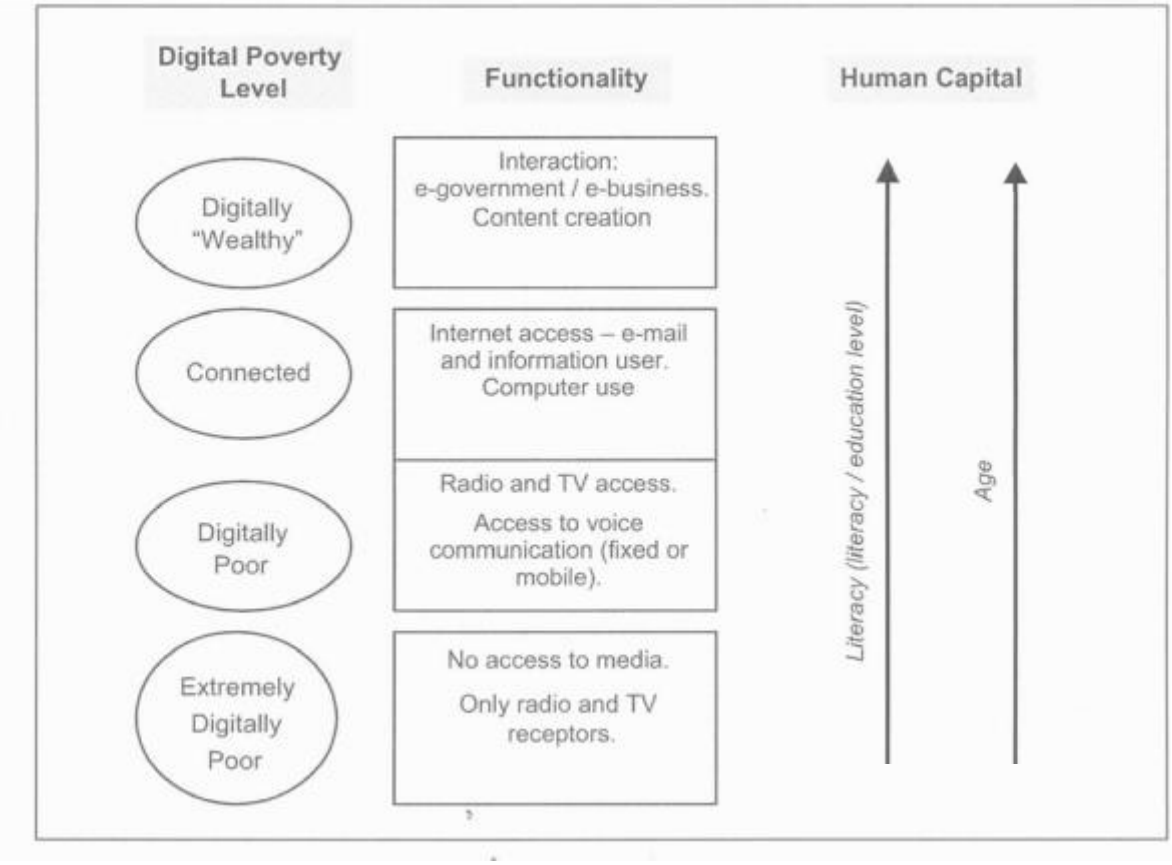
2.5 Poverty Defined

Nearly all cultures have endeavoured to explain poverty and formulate a moral approach to it (Iliffe, 1987). However, poverty is multifaceted and is often easier observed than defined (Agbu, 1997). The definition and measurement of poverty are everchanging and have evolved over the last few decades. Lipton and Ravallion (1995) explain that "poverty exists when one or more persons fall short of a level of economic welfare deemed to constitute a reasonable minimum, either in some absolute sense or by the standards of a specific society". This view is, however, limited to poverty from a monetary assessment. In a broader sense, poverty can be explained and measured in monetary and non-monetary terms. According to Jansen et al. (2015), non-monetary poverty can be defined as inadequate access to public services such as hospitals or schools, lack of private asset ownership, and increased vulnerability to crime. Jansen et al. (2015) further explain that poverty can also be measured subjectively, as individuals form opinions on their life satisfaction relative to income levels.

Poverty can also be explained from a subjective or objective point of view. The former allows individuals to assess whether they feel poor or not. This explanation of poverty does not judge individuals based on a single monetary component but rather that an individual's perception of his or her well-being is informed by the perceived well-being of others (Statistics South Africa, 2012). The latter explains poverty based on a single monetary component and is often described as the minimum income needed to survive. Within South Africa, for cross-country comparisons, Woolard and Leibbrandt (2006) absolute poverty lines are often used to determine the poverty status of individuals.

A growing field of research suggests that poverty can also be explained through the lack of access to ICT, called digital poverty. Barrantes (2007) explains that individuals can be classified as digitally poor when they lack access to information, communication, and media facilities. Barrantes (2007) suggests that there are four levels of digital poverty, which range from "extremely digitally poor" (explained as having no access to media, only radio and TV receptors) to "digitally wealthy" (explained as those individuals who have access to use ICT's frequently and the knowledge to use them effectively). Figure 2 below graphically depicts this concept.

Figure 2: Digital Poverty



Source: Barrantes (2007)

Poverty can be defined not only from an income and consumption perspective but also from a deprivation perspective, where an individual is considered materially deprived when he/she lacks access to minimum essential goods and services deemed reasonable within society

(Jackson & Yu, 2023). Poverty is also expanded to include an individual or household's vulnerability and exposure to crime, violence, and defencelessness (World Bank, 2000).

As shown above, poverty is multidimensional in nature, and therefore, non-monetary factors need to be considered when measuring poverty rather than only from a monetary perspective. Poverty has a multifaceted definition attributable primarily to its diverse effects on individuals. It affects individuals morally, physically and psychologically. This is likely why Agbu (1997) stated that poverty is more easily observed than defined. A growing body of research focuses on measuring poverty from a multidimensional perspective. Multidimensional poverty incorporates multiple non-monetary factors used to create a non-monetary welfare index. This index then determines if an individual or household is multidimensionally poor. Multidimensional poverty includes the analysis of poverty levels from an individual and household level, including gender as an additional explanatory variable.

A wide variety of models can be used to compute this index. According to Alkire et al. (2015), several models exist, such as Venn diagrams, the axiomatic approaches, the Fuzzy set poverty approach, statistical approaches such as factor analysis, Multiple Correspondence Analysis (MCA), Principle Component Analysis (PCA), the dominance approach, as well as the well-known Foster-Geer-Thorbecke (FGT) indices. Many of these methods have been used within a South African context.

The statistical approaches mentioned above are common in determining multidimensional poverty. Bhorat and Van der Westhuizen (2013) analysed the changes in non-monetary wellbeing in South Africa between 1993 and 2004. The authors used factor analysis to construct the index to measure non-monetary welfare on a household level. Using factor analysis, the authors found that headcount poverty rates decreased significantly during the measurement period, as well as asset inequality. In a follow-up study, Bhorat et al. (2014) examined poverty rates in South Africa between 1993 and 2010. The authors considered private asset ownership, household service variables (such as energy source for cooking and for lighting, and sanitation) and level of education as factors in deriving a non-monetary index. The authors used PCA in order to create an asset index and found that large decreases in poverty occurred during the measurement period. On the other hand, Ntsalaze and Ikhide (2018) applied an MCA to find statistically significant covariates used create a non-monetary index. The authors found that economic status and financial commitments are statistically significant in determining multidimensional poverty in addition to the health, standard of living, and education dimensions (Ntsalaze & Ikhide, 2018).

More recently, many studies have incorporated Akire and Foster's (2011) multidimensional poverty index (MPI) method to compute poverty in South Africa. Finn et al. (2013) incorporated three dimensions, namely education, health, and standard of living, with nine indicators to derive an MPI. Using the 1993 Project for Statistics on Living Standards and Development (PSLSD) and 2010 National Income Dynamic Study (NIDS) data, the authors found that water and sanitation were the factors that had the highest deprivation and multidimensional poverty decreased in the two years measured.

Similarly, Rogan (2016) measured the poverty gap between males and females in South Africa. Using data obtained from the 2008 NIDS study and the same three dimensions and nine factors mentioned above by Finn et al. (2013), Rogan (2016) found that poverty rates between genders when measured by the MPI, are slightly lower than that indicated by the poverty levels by the conventional monetary approach. Additionally, Rogan (2016) found that child mortality, low

education attainment levels, and lack of access to basic sanitation contributed the most to the MPI in female-led households. Furthermore, nutrition contributed the most towards the MPI for male-led households, followed by sanitation, water, and electricity.

Statistics South Africa (2014) created an MPI for South Africa with a specific focus on a provincial level. According to Alkire and Foster (2011), the ability to measure MPI on different levels (i.e. suburb, city, provincial, or country level) is one of the main advantages of the MPI). The authors used the Census 2001 and 2011 data and incorporated four dimensions with 11 indicators in total. The four dimensions were health, education, living standards, and economic activity. The authors found that close to 50% of the MPI was made up of a household's standard of living over both years of study. The factors with the next highest contribution was unemployment, years of schooling, and energy sources for heating. Additionally, multidimensional poverty decreased, with Eastern Cape, KwaZulu Natal and Limpopo having the highest MPI over the two years of study.

Fransman and Yu (2019) also analysed the MPI on a provincial level. The authors used data from the National Census of 2001, 2011, and 2007, and 2016 data from the Community Survey (CS). The study incorporated 12 factors among four dimensions, namely the health, education, standard of living, and economic activity dimensions. The empirical findings showed that years of education, individual disability status, and unemployment contributed the most towards the MPI. Additionally, the study considered gender differences and results showed that females living in non-urban areas experienced decreased poverty levels in Eastern Cape and KwaZulu Natal. As argued by Vijaya et al. (2014), equating individuals with households when explaining poverty is inaccurate as gender is an essential axis of differentiation, with males often privileged over females.

Several South African studies on multidimensional poverty also focused on poverty amongst population sub-groups. Frame et al. (2016) focused on measuring multidimensional poverty faced by the current youth in South Africa aged 15-24. Using the National Census 2011 data, the authors adapted the original MPI of Akire and Foster (2011) to reflect unique characteristics and experiences of children. The results of the study indicated a wide distribution of the MPI for youth between municipalities. The highest MPI scores were concentrated in homeland areas. Furthermore, education, followed by household adult employment status indicators, contributed the most towards youth MPI. 72% of the multidimensionally poor were deprived of education. Omotoso and Kock (2017) instead measured multidimensional poverty among the youth aged 0-17. Using the 2002 and 2014 General Household Survey (GHS) data and 18 indicators in the health, education, economic activity, and standard of living dimensions, the authors found that youth MPI decreased over the two years of study, with economic activity contributing the most towards youth MPI.

Mushongera et al. (2017) measured the MPI of Gauteng. The MPI incorporated nine indicators and four dimensions: education, standard of living, economic activity and food security. The authors used data from the 2011 and 2013 Quality of Life (QOL) survey, and results showed that the MPI for Gauteng was low but differed significantly across wards, municipalities, and different LSM groups. Empirical findings also showed that the MPI increased low economic areas close to Gauteng's outskirts.

On the other hand, Ebenezer and Abyssinia (2018) measured multidimensional poverty in the Eastern Cape. The study used 2014 GHS data, and the MPI consisted of 13 indicators across the same three dimensions mentioned above in the Finn et al. (2013) study. The empirical

findings showed that only 5.41% of households in the Eastern Cape had more than one source of income. Additionally, the households considered poor or severely poor, according to the MPI, have heads of households with low levels of education and are primarily located in rural areas within the Eastern Cape. Furthermore, the results showed that diversification of household livelihood is not significant in reducing multidimensional poverty in the province.

2.6 Theories Underpinning Poverty

Several theories that study poverty attempt to outline the determinants or sources of poverty. As this field of study is widespread and has been in research for decades, there are several theories developed. Poverty theories are largely categorized into two groups, namely structural and cultural theories. The cultural theories propose that attitudes and behaviours toward the poor can be used to explain poverty itself. The structural poverty theories assume that poverty can be explained by analysing the living conditions of the poor, like basic sanitation, access to health, and inadequacy of education levels, to name but a few (Elesh, 1973).

There is convincing evidence to view poverty as lacking essential capabilities rather than a deficiency in monetary income. This approach is often termed the capabilities approach to poverty and analyses an individual's welfare in terms of their functioning (defined by actual and potential activities) and capabilities (defined as an individual's wellbeing) (Kuklys & Robeyns, 2005). Sen (1985) defined functioning as an individual's success in what this person can accomplish through choice and wellbeing, measured by factors such as decent health, adequate levels of education, and sufficient shelter. This concept is intrinsically multidimensional as it represents an individual's choice of actions and choice to select different living conditions (Jackson & Yu, 2023).

Social isolation and vulnerability are often overlooked as a non-monetary measure of poverty. Samuel et al. (2018) defines social isolation from an external and internal point of view. External isolation refers to having fewer meaningful relationships with other people, while internal isolation refers to the divergence between ideal and perceived social relationships. Meanwhile, Bird et al. (2010) define isolation as an inadequate access basic service: travelling far distances to obtain adequate health care facilities, clean water, access to sanitation, or a place of work, to name but a few. According to Samuel et al. (2018), Sen (2000) draws on the work of Adam Smith, who observed that an individuals' who are unable to interact freely with society is a relational deficiency intrinsic to the significance of partaking in communal life. Relationship deprivation, Sen (2000) argues, is a factor that influences poverty as the inability to interact freely with others can result in other deprivations, such as being excluded from employment opportunities that may be necessary to lift an individual out of poverty.

According to Gallardo (2020), vulnerability can be described as the risk of being poor and incorporates both the future likelihood of an individual being poor as well as the severity thereof. Meanwhile, Chambers (1989) described vulnerability as difficulty coping with exposure to contingencies and stress. Chambers (1989) further explains that vulnerability can be explained from an internal and external perspective. Internal vulnerability refers to defencelessness of suffering irreversible loss of resources (monetarily deprived, socially dependent or psychologically damaged (Jackson & Yu, 2023)), while external vulnerability references risks, shocks and stress a household is exposed to (Chambers, 1989).

These theories can be further expanded upon to include, the 'theory of individual deficiencies', 'cultural belief systems that support subcultures of poverty', 'economic, political and social

distortions or discrimination', 'geographical disparities', and 'cyclical interdependencies'. (Abdulai et al., 2014; Blank, 2003; Bradshaw, 2006; Davis & Sanchez-Martinez, 2014; Downes, 2010; Jung & Smith, 2007; Rank, 2004; Nyikahadzoi et al., 2012; Turner & Lehning, 2007; Wolf, 2007). These theories are explained in further detail below.

2.6.1 The 'Theory of Individual Deficiencies' (Cultural Theory)

Some scholars believe that individuals are responsible for their own situation of poverty. Bradshaw (2006) classifies this as the theory of individual deficiencies. Both Gans (1995) and Nyikahadzoi et al. (2012) are of the opinion that welfare involvement, human capital and an individual's attitude towards their poverty status are statistically significant factors that affect poverty (Addae-Korankye, 2019). Bradshaw (2006), on the other hand, blames the poor for their poverty situation, arguing that better life choices coupled with hard work will solve their situation. He further postulated that poverty is due to lacking generic abilities such as intellect, which is not as easily solved.

The theory of individual deficiencies stems from the 'free-market system', which is grounded in attempts to provide an opportunity for as many participants as possible. Both Rank (2004) and Nyikahadzoi et al. (2012) believe that the theory of individual deficiencies emphasises individuals being responsible for attaining necessities like food, education, shelter, and healthcare. The theory also leans towards factors such as virtue, lack of talent and motivation being factors influencing poverty (Addae-Korankye, 2019).

2.6.2 The 'Theory of Cultural Belief Systems that Support Subcultures of Poverty' (Cultural Theory)

Bradshaw (2006) believes that another cause of poverty is the transmission of skills, beliefs and values over multiple generations and that these factors are socially produced but individually held. Lewis (1966), as cited by Nyikahadzoi et al. (2012), confirms that the 'theory of culture' is constructed on the belief that the wealthy and the poor have dissimilar behavioural norms, which stem from beliefs, values and skills.

This theory proposes that poor individuals are in the situation due to the physiological behaviours or behavioural norms learned from the previous generations of poor (Lewis, 1966). Lewis (1966), as cited by Nyikahadzoi et al. (2012), believes that the poor have little to no experience in doing well academically, and spending money wisely as these are not inherent traits that previous generations of poor had. The culture of poverty is a subdivision of poor who live within the same social network and share behaviours distinct from but rooted in the culture of the main society (Bradshaw, 2006).

This theory is heavily critiqued by Rank (2004), who argue that the theory incorrectly focuses on character defects rather than the leading causes of poverty and that human capital can significantly impact the probability of an individual being poor. According to Rank (2004), human capital positively affects earnings due to the increase in competitiveness within the labour market. Therefore, individuals lacking human capital are more likely to experience poverty. Blank (2003) argues that policy conclusions based on classical theories of poverty result from individuals' inappropriate activities being imitated. Blank (2003) further proposes that policies should focus on making positive shifts in individuals' mindsets and behaviours by generating support initiatives such as personal counselling or appropriate drug rehabilitation programs or by employing threats such as punishment or criminal sanctions.

2.6.3 The 'Theory of Economic, Political, and Social Distortions or Discrimination' (Structural Theory)

According to Bradshaw (2006), this theory is based on the premise that economic, political and social systems limit the opportunities for the underprivileged to achieve an appropriate level of income and well-being and, therefore, are causes of poverty. Bradshaw (2006) and Nyikahadzoi et al. (2012) propose that capitalism is the foundation to high poverty regardless of a person's mindset, behaviour, or work ethic. In other words, the literature suggests that the way capitalistic economic systems are structured causes a country's population to be poor and fall behind, irrespective of how competent that segment may be.

Davis and Moore (1985), as cited by Nyikahadzoi et al. (2012), state that high status positions in society require a unique skillset, and in order to convert an individual's talent into the required skills and knowledge requires the sacrifice of time, money and other resources. The authors suggest that individuals should be motivated according to the sacrifice of resources to attain higher wages and privileges within society.

Nyikahadzoi et al. (2012) confirm that labour market theories are rooted in the divergence of earnings for explaining the existence of poverty. The 'neoclassical labour-market theory' suggests that markets allow individuals to compete on the basis of individual skill, ability, effort, and training. (Addae-Korankye, 2019). According to Nyikahadzoi et al. (2012), the neoclassical labour-market theory suggests that an individual's skill, ability, effort, and training are important mechanisms in a productive free-market society and the more an individual utilises these qualities to contribute to the free market, the larger his reward should be.

Blau and Kahn (2000) identified factors that led to the divergence from the law of labour price determination. Two such factors influencing labour price are race and gender. Hurst (2004) studied the disparities in earnings and found that the variations were due to factors such as gender and race. Additionally, Rank (2004) also found that demographic factors such as race, gender, age, household size and structure, to name but a few, are important indicators of poverty. The author noted that poverty is generally higher amongst single-parent households, women lead households, and households with larger families.

Richardson and London (2007) analysed poverty in rural areas. The authors suggested that the correlation between rural poverty and structural inequalities is not "accidental or incidental but rather structural and causal" (Richardson & London, 2007). The authors suggested that policies should focus on race, class, and rural economies focused on reducing inequalities, in order to reduce rural poverty. Abdulai et al. (2014) argue that the reduction of structural poverty should focus on increasing the capabilities of individuals considered poor for the betterment of their livelihoods and, in the process, should not convert the poor into perpetual beneficiaries of assistance programs.

Abdulai et al. (2014) think that structural poverty theory is rooted in the Marxist doctrine, which argues that the presence of monetary poverty is for the existence of a capitalistic system or bourgeoisie, used as a tactic for societal domination. From an Islamic perspective, property ownership is permissible. However, it needs to be acquired honestly, which calls for government intervention to create equal and justifiable acquisition and distribution of wealth.

2.6.4 The 'Theory of Geographical Disparities' (Structural Theory)

As suggested by Abdulai et al. (2014), attempts to measure poverty according to geographical distinctions lead to the theory of geographical disparities. Bradshaw (2006) stated that

geographical poverty is a holistic representation of rural and ghetto poverty and third-world poverty. Geographical poverty is the idea that individuals, institutions and cultures within specific geographical regions lack the necessary resources to generate an appropriate level of wealth and well-being.

Abdulai et al. (2014) asserted that the study of spatial concentration is linked to the precondition of poor being concentrated in specific communities within countries. Factors within geographical poverty are largely linked with the proximity to and density of natural resources, and transmission of innovation (Addae-Korankye, 2019). According to Abdulai et al. (2014), scholars believe that wealthier areas are more likely to experience growth than poorer areas, even during economic prosperity.

Abdulai et al. (2014) suggest that to tackle geographical poverty successfully, the core reasons causing a falloff of resources in underprivileged areas should be prioritised. Abdulai et al. (2014) further suggested that the attraction of organisations away from other areas to particular areas may lead to 'other areas' being impoverished. An example of this is that low housing prices in underdeveloped areas may attract the poor and, therefore, to property disinvestment by building owners (Addae-Korankye, 2019).

According to Bradshaw (2006), there are three sub-theories within the theory of geographical disparities: the 'Economic Agglomerate Theory', the "Central Place Theory' and the 'Theory of Selective-Out Migration'. The 'Theory of Economic Agglomeration' assumes that a high density and concentration of similar firms attract the relevant supporting services and markets used to operate as efficiently as possible. The attraction of the relevant supporting services and markets leads to additional attraction of similar firms (Bradshaw, 2006). The 'Central Place Theory' assumes that wealthier locations are likely to grow at a faster rate when compared to poorer areas even during periods of economic upswings. This is due to the belief that the distribution of wealth and resources are multiplicative rather than equitable. (Bradshaw, 2006). According to Bradshaw (2006), individuals with high levels of education, unique skills, and the broadest worldview who live in disadvantaged areas were the ones more likely to migrate out of these locations to other places with better opportunities for income and wealth. According to Bradshaw (2006), these departing individuals were likely to be the community's most ideal role model. This concept speaks to the Theory of Selective-Out Migration'.

2.6.5 The 'Theory of Cumulative and Cyclical Interdependencies' (Structural Theory)

This theory is based on the notion that households unexpectedly become unable to cater for their needs due to unanticipated events. As asserted by Bradshaw (2006), this theory has three levels of cyclicality. The first level assumes that individual predicaments and community resources are mutually dependent on a declining economy. An example is individuals who lack the necessary means to positively contribute to an economy, making it harder for others to survive since fewer taxes are being paid. He added that insufficient employment opportunities lead to insufficient income distribution, instigating insufficient spending, consumption, and investment. These individuals would, therefore, lack the necessary resources needed to attain a decent education or to pursue entrepreneurship opportunities, causing little to no expansion, decline of markets and disinvestment by the community. This snowball effect ultimately leads to a lack of opportunities within communities (Addae-Korankye, 2019).

According to Bradshaw (2006), the second level of cyclicality relates to health challenges. The second level assumes that health issues arise due to an incapacity to: afford medicine when required, attain good health, and reasonable living conditions, which are some of the causes

for the poor lagging the wealthy. The second level also assumes that due to insufficient resources, the poor are unable to invest in the next generations' education, meaning children receive sub-par levels of education leading to less desirablility in the labour market. These children would repeat the cycle of illness and lack of access to appropriate medical care.

The third level of cyclicality assumes that poverty is due to insufficient jobs, leading to lower levels of confidence and motivation, and high levels of depression (Addae-Korankye, 2019). According to Bradshaw (2006), people's physiological issues are heightened by their association with others, leading to a culture of despair. The culture of despair phenomenon affects community leaders as well. This leads to a "sense of hopelessness and fatalism among community leaders" (Bradshaw, 2006)

2.7 Empirical Evidence – Mobile money and its effect on poverty

The role of mobile money in poverty reduction is a fairly new field of research. Although many studies attempt to explain and analyse the determinants of poverty, only a few have measured poverty reduction from a mobile money perspective. Most studies that include mobile money generally analyse it and it's effects on some of the determinants of poverty, such as GDP, income inequality, and financial inclusion, to mention a few. This section reviews some empirical studies that align with poverty reduction using mobile money.

In recent years, a growing amount of research has measured the effect mobile money has on consumption smoothing and, therefore, as a potential poverty-reducing variable. Jack and Suri (2014) surveyed 3000 individuals across Kenya and the effects of shocks on mobile money users' household consumption patterns. The results of the study show that households that have access to mobile money services (specifically M-pesa) are better able to smooth their consumption after an income shock event when compared to households with no access to mobile money services. Jack and Suri (2014) further found evidence that users of M-pesa smooth consumption after income shocks by reducing transaction costs, while households with no access to mobile money reduce total consumption by 7% to account for the same shock.

In a follow-up study, Suri and Jack (2016) measured whether transformative MFS can reduce poverty levels over more extended periods. The study involved household panel data from 2008 to 2014. The findings showed that M-PESA increased per capita consumption levels, with the effects being more pronounced for female-led households due to better-quality labour market conditions.

These findings are further supported by Abiona and Koppensteiner (2018), who used climate-related income shocks (more specifically, rainfall) rather than idiosyncratic shocks to measure the consumption smoothing effect of mobile money. The results aligned with Jack and Suri's (2014) findings. Batista and Vincente (2018) extended the previous studies and measured the economic impact of introducing mobile money to rural areas of Mozambique. When using a randomised control trial, results found improved consumption smoothing. The findings also discovered that the introduction of mobile money reduced total investments (particularly in agriculture) by individuals with access to mobile money.

In contrast to consumption smoothing for poverty reduction, Macharia (2013), using a mixed method research approach of a survey and regression model, measured the effect mobile money has on wealth creation of the unbanked in Kenya. Using a sample of 320 respondents, Macharia (2013) found that unbanked users of M-pesa have increased their wealth by an average of 10%.

Mizutani (2021) used a mixed-method approach to determine whether mobile money can prevent users from falling into short-term poverty. The findings show that short-term income shocks have an immediate effect on household consumption, which increases the number of households consuming below the international poverty line by 5.6%. This was not observed with users of mobile money. Mizutani (2021) theorises that this may be due to mobile money users' ability to instantly receive financial support from relatives across the country. Contrary to Mizutani's (2021) findings, Suri and Jack (2016) found in their study of the long-run poverty and gender impacts of mobile money that access to mobile money increased consumption per capita levels. This lifted 2% of Kenyan households out of poverty.

Research also points toward mobile phones having a positive effect on some of the correlates of poverty, which can indirectly affect poverty reduction. Asongu et al. (2016) measured the effect of mobile penetration and mobile banking on inclusive growth or income inequality. The study was conducted in 52 African countries using a quantitative approach; the authors determined that mobile penetration has an equalising income distribution effect, which is more pronounced with mobile banking. Asongu and Nwachukwu (2016) propose that the income redistribution effects of mobile penetration and banking are due to the absorption of income shocks and the empowerment of women and the "income disadvantaged".

Financial inclusion is another correlate of poverty that can be affected by increased mobile money adoption. This direct relationship between mobile money and financial inclusion has led many researchers to strive towards understanding the determinants of mobile money adoption. Researchers such as Donovan (2012), Okello Candiya Bongomin et al. (2018), and Ahmad et al. (2020), to name but a few, are all researchers who have contributed towards this concept. The effects on economic activity, a positive correlate to poverty, have also been shown to be affected by an increase in mobile money. Mawejj and Lakuma (2019) studied the effects of mobile money on aggregate economic activity and other macroeconomic variables within Uganda. Using vector error correction (VEC) techniques for long-run mobile money demand and Structural vector autoregressive (SVAR) techniques for short-run effects of mobile money, the authors found that an increase in the adoption of mobile money increases gross economic activity and reduces interest rates.

For mobile money to have any positive impact, it needs meaningful adoption rates within a country. Tobbin (2012) suggests that the mobile financial ecosystem comprises various role players who all have a part to play in ensuring high levels of mobile money adoption. Burns (2018) posits that the regulator of the mobile money industry is the most important stakeholder, as policies regulating the ease of access to mobile money are one of the most significant determinants of mobile money adoption. Burns (2018) compares the success of mobile adoption in Kenya with that of Nigeria, suggesting that the regulatory environment can explain the main difference between the two countries. The Kenyan government allowed for a more relaxed environment, while Nigeria had strict regulations, stunting the mobile money adoption rate. Della Peruta (2018) has an opposing view and suggests that the main determinants of mobile money adoption rates are a country's financial system, the general population's financial literacy level, and the awareness of mobile money offerings. Della Peruta (2018) further expands on this and states that maintaining a balance between mobile money demand and supply is crucial for successful mobile money adoption; that is, mobile money suppliers should be able to profit, and consumers should receive affordable prices.

Some studies support the idea that mobile money can be risky if not used correctly. As mobile money presents the convenience of remote transacting at a lower cost than traditional banks, it

influences users' spending behaviour. Cobla and Osei-Assibey (2018) studied the spending behaviour of students with access to mobile money services. Using survey data from 400 students, findings showed that students who had no access to mobile money or ATMs spent the least, students who had access to mobile money and ATMs spent 13 more Ghana Cedis than those with neither, and students who only had access to mobile money spent 20 Ghana Cedis more than those with no access to mobile money and an ATM. These findings suggest that the easier the access to money, the more likely an individual will have lousy spending patterns. These spending patterns may also reduce savings and increase the risk of users falling below the poverty line. The relaxation of access requirements for mobile money brings about other risk factors involved. In Whisker and Lokanan's (2019) study of threats introduced by mobile money, they cautioned against having weaknesses in the regulations surrounding mobile money as it offers opportunities for money laundering criminals to exploit. The authors suggest that the risks associated with money laundering can be mitigated if appropriate systems and controls are implemented.

Mobile money and its poverty reducing effects are not isolated to African countries. Must and Ludewig (2010) for example, postulates that mobile money can reduce poverty within developed countries as well through increasing saving rates within the population, as well as increasing access to financial products provided by microfinance institutions. The Authors suggest an expansion in policy framework that caters for the growth in demand for microfinance and mobile money.

2.8 Chapter Summary

This chapter defined the key terms and concepts involved in the study and the theoretical framework underpinning the research. The chapter also provided an empirical review of some of the research related to the topic. The existing research presents a few opportunities to justify the current knowledge gap. Firstly, the influence that mobile money has on poverty reduction is relatively under-researched. The existing literature on the effects of mobile money generally attempts to determine the effects on the correlates of poverty, such as income inequality, financial inclusion, or economic activity. Secondly, the studies explaining these effects often use cross-sectional data from more than one African country at a time. Using cross-sectional country data could introduce the risk of treating different countries and economies as homogenous entities. It is, therefore, inaccurate to make assumptions on a single country or economy based on an analysis of multiple countries. Lastly, the study of mobile money and poverty reduction within South Africa is under-researched. Most studies seek to explain this relationship in countries with more successful mobile money adoption rates, such as Kenya. This study is, therefore, one of the first to determine whether mobile money has a part to play in poverty reduction within South Africa.

Chapter 3
Methodology

3.1 Introduction

Chapter 3 explains the research approach and design and shows how the chosen quantitative approach has been implemented. The justifications for using a quantitative approach and the benefits thereof are fully explained in this chapter. This section will outline how multidimensional poverty will be measured and the method used to determine the effect of mobile money on poverty reduction within South Africa. This section will outline the variables used within the model and the justification thereof. Additionally, information will be provided on the study period, the data used and where this data was sourced.

3.2 Research Approach

The research approach used to determine the effect of mobile money on poverty reduction is quantitative. "Quantitative research is the numerical representation and manipulation of observations to describe and explain the phenomena that those observations reflect" (Sukamolson, 2007, p. 2). One of the main disadvantages of quantitative data is that it often requires complex statistical analysis to draw accurate conclusions when used in research. However, quantitative research is effective in analysing and determining the magnitude of relationships between variables, and the secondary data used is often easy to obtain and fairly inexpensive. A quantitative research approach is most applicable as this research aims to determine whether a relationship exists between mobile money and poverty reduction and quantify it.

3.3 Research Design

3.3.1 Sample size, data period, and data source

This study measures levels of poverty on an individual level. Secondary data is used instead of collecting data physically via surveys. Data for the analysis was obtained from FinMark Trust, who conducts annual surveys called the FinScope SA survey. This survey has been conducted since 2002. The survey collects various data on individuals and households, such as asset ownership, employment status, health status, income levels, and access to banking, to name but a few, with data updated yearly. As far as possible, the same individuals are surveyed yearly to measure how and why these factors change over time.

The objective of the survey is to measure the adult population's consumption of financial products and services. This is done by capturing several aspects, such as individuals' income and how it is generated, attitudes and behaviours regarding the perception of financial products and services, asset ownership, and access to financial products, to name a few. The survey scope is limited to individuals 15 years or older, with more than 4000 individuals surveyed yearly. Sharpe (2001) explains that a sample size of 30 is large enough to allow a sample distribution

to be close to a population distribution. The study period is 2018, using the FinScope SA data, and 4995 individuals were interviewed in 2018.

Descriptive statistics of this data is provided in Annexure A. Additionally, a linear probability model is adopted in order to analyse the data further and determine the relationship between mobile money and poverty within South Africa. These models are explained in further detail below.

3.4 Analytical Framework

Several frameworks are available for modelling the determinants of poverty, with the appropriateness of each dependent on the availability of data for each variable. The most common model available is the household consumption model. In order to compute the MPI, the Alkire and Santos (2011) method was adopted. This method was also adopted by Djahini-Afawoubo et al. (2023) for measuring mobile money's influence on poverty. Each of these methods is explained in further detail below.

3.5 Methods available to measure multidimensional poverty

There are various techniques used measure multidimensional poverty. Most major methods stem from the “basic needs approach”, the “capability approach”, or the “social inclusion approach", amongst others (Alkire et al.,2015). According to Alkire et al. (2015), several models exist, such as Venn diagrams, the axiomatic approaches, the Fuzzy set poverty approach, statistical approaches such as factor analysis, multiple correspondence analysis, principle component analysis, and the dominance approach. The Alkire and Santos (2011) method is used in this paper with frequent reference to Alkire and Foster (2011) as these methods differ only slightly.

The Alkire and Santos (2011) method is used for its simplicity and clarity, which are advantages over other methods of measuring poverty (Silber, 2011). This method can also be used across different LSM groups, which aids in the formation of policies targeting specific LSM groups. Additionally, most data for measuring multidimensional poverty combine cardinal and ordinal data. Income, for example, is generally relayed in a cardinal format, whereas basic sanitation is generally reported purely in an ordinal format. The Akire and Santos (2011) method allows the use of both cardinal and ordinal data. Furthermore, the Alkire and Santos (2011) method computes a single score known as the Multidimensional poverty index (MPI), which determines a level of hardship based off of multiple indicators an individual is deprived of.

One benefit to the MPI is that it allows for an adjustment of MPI due to changes in depriavtions suffered by each individual or household. An example of this is if an individual is deprivation of indicators move from 60% to 40% of the indicators, the MPI will adjust accordingly even if the individual’s poverty status has not changed Therefore, the Alkire and Santos (2011) method facilitates targeting the poorest LSM groups as the MPI index would decrease when the spectrum of deprivations suffered is eliminated. Multiple other scholars have incorporated the Alkire and Santos (2011) method for computing poverty (Alkire & Seth, 2015; Alkire et al., 2017; Djahini-Afawoubo & Couchoro, 2020; Djahini-Afawoubo et al., 2023). The Alkire and Santos (2011) method will be discussed further.

3.6 Decomposing Alkire and Foster (2011) MPI

The Alkire and Santos (2011) method of measuring multidimensional poverty uses two critical pieces of information, namely, (1) poverty/deprivation intensity and (2) poverty/deprivation incidence. Poverty intensity measures how widely deprived an individual or household must be when being classified as poor. Poverty incidence - sometimes known as the headcount ratio- measures the percentage of the population classified as poor. (Fransman and Yu, 2019). In order to obtain poverty intensity and poverty incidence, the entire sample is subjected to these conditions in order to calculate MPI for the sample.

3.6.1 Poverty Intensity

To measure poverty intensity, the Alkire and Santos (2011) method uses deprivation cut-offs for each indicator (z_i) and an *i*th individual is considered deprived in any indicator when the individual's achievement of that indicator x_i is less than the indicator cut-off. In other words, when $x_i < z_i$. The dimensions used are given equal weighting. Furthermore, dimensions can be made up of one or more indicators. Each indicator is also assigned an equal weighting, and therefore, $\sum_{i=1}^{d} \mathrm{W}i = 1$ where the indicator I is weighted as W_i.

Once indicators of each dimension are selected and weights assigned, each individual is assigned a deprivation score by taking the weighted sum of the number of deprivations. An individual's deprivation score increases the more an individual is deprived in each indicator. The maximum deprivation score is 1, and the minimum is 0; a person deprived in all indicators has a score of 1, and a person deprived in none of the indicators has a score of 0. Mathematically, this is written as follows:

$$C_i = W_1I_1 + W_2I_2 + \ldots + W_dI_d \qquad \textbf{(1)}$$

C_i is the deprivation score, I is the deprivation indicator, and W is the weight linked to $\sum_{i=1}^{d} \mathrm{W}i = 1$.

A poverty cut-off is noted with K and is the cut-off point for each deprivation score. K is the weighted deprivation an individual must experience to be identified as multidimensionally poor (K = 1/3). (Jackson & Yu, 2023). This notion differs from the initial Alkire and Foster (2011) method, where K represents the number of deprivations an individual must suffer to be considered multidimensionally poor (Alkire & Santos, 2011). An individual is, therefore, considered poor if $C_i \geq K$; in other words, to be considered multidimensionally poor, an individual deprivation score needs to be no less than one-third of the weighted indicators (Alkire & Santos, 2011). For $C_i < K$ individuals, in other words, individuals not considered multidimensionally poor, the score is replaced with a "0". This is termed censoring in the poverty measurement and noted as $C_i(k)$ to differentiate it from the original deprivation score. Thus, when $C_i \geq k$, $C_i(k) = C_i$,and when $C_i < K$, $C_i(k) = 0$ (Alkire and Santos, 2011).

Poverty intensity is noted as A, which can be derived using the censored deprivation score. It is the average deprivation score of multidimensionally poor individuals and can be written as follows:

$$A = \frac{\sum_{i=1}^{n} Ci\ (k)}{q} \qquad \textbf{(2)}$$

$C_i(k)$ is the censored deprivation of individual *I*, and q is the number of individuals considered multidimensionally poor according to the chosen indicators (Alkire & Santos, 2011).

3.6.1 Poverty Incidence

As previously mentioned, the MPI combines two factors, namely (1) deprivation intensity and (2) deprivation incidence. Deprivation incidence measures the number of individuals within a population that experience multiple deprivations. Formally, this component is called the multidimensional headcount ratio. The headcount ratio is written as follows:

$$H = \frac{q}{n} \quad \textbf{(3)}$$

Where H is the multidimensional headcount ratio, q is the count of multidimensionally poor individuals within a given population, and n is the total population (Alkire & Santos, 2011).

According to Alkire and Santos's (2011) method, the MPI can then be found by computing the product of the multidimensional headcount ratio (H) and poverty intensity (A) and can be expressed as follows:

$$\text{MPI} = \text{H} \times \text{A} \quad \textbf{(4)}$$

3.6.3 Choice of dimensions

In order to calculate multidimensional poverty using the Alkire and Santos (2011) method, this paper incorporates six dimension variables, namely, (1) education, (2) employment, (3) health, (4) services – facilities, (5) Dwelling type, and (6) Standard of living – asset ownership. Even though the availability of relevant data may see the methodology shift from equal weights across dimensions to general weights, with each deprivation across the spectrum, equal weighting is used as there is no compelling reason to consider one deprivation more important than the next.

Several factors have influenced the choice of dimensions used: The objectives of the Sustainable Development Goals (SDG), standard indicators used in recent studies (Frame et al., 2016; Fransman & Yu, 2019; Djahini-Afawoubo et al.,2023; Jackson & Yu, 2023), the global MPI, as well as the appropriateness of available data. Below is a complete description of the dimensions as well as dimension cut-offs. Table 1 shows a summary of each dimension and dimension weights.

Education

The education dimension consists of one indicator: the highest level of education obtained. This indicator is mostly unchanged from the initial MPI method. However, Alkire and Foster (2011) used six years of schooling attendance as this is the duration of primary school in India. This is an imperfect indicator for primary school completion as it does not factor in those who have repeated a grade. The Finscope SA questionnaire incorporates the question, "What is your highest level of education?" allowing more accurate responses. There are eight categories for this question, with an individual considered poor if they have no schooling or primary school. This is consistent with Yu and Roos (2018), who stated that illiteracy relates to any individual who has yet to complete seven years of schooling or Grade 7 (the number of years to complete

primary school within a South African context). Additionally, most responses to "other" referred to education obtained that is higher than the primary school level.

Table 1: Dimensions, indicators, and weightings used for each indicator.

Dimension	Indicators	Deprivation cut-off	Weighting
Education	(1) Level of Education	Primary school	*1/6*
Employment	(2) Unemployed	Unmployed looking for work. Unemployed not looking for work	*1/6*
Health	(3) Food Security, Medical security	Often or sometimes gone without enough food to eat , gone without medicine or medical treatment that was needed	*1/12*
	(4) Medical Insurance	No access to at least one of the following: Life insyrance or life cover, medical aid, medical scheme or hospital plan, hospital cash back plan which pays you cash if you are hospitalised	*1/12*
Services - Fac	(5) Access to clean water	No access to clean water, shared communal tap inside or outside dwelling or yard	*1/18*
	(6) Access to electricity	No electricity in household	*1/18*
	(7) Sanitation	No toilet facilities or community toilet	*1/18*
Dwelling Typ	(8) Dwelling type	Lives in either a RDP house, an extended/renovated RDP house, informal dwellings - shack or hut	*1/6*
Standard of li	(9) Ownership of ICT's	Does not own at least one of the following: cell phone, computer, laptop, or fixed telephone	*1/12*
	(10) Ownership of financial assets	Lack of ownership of at least one of the following financial assets: unit trusts, education policy or plan, investment or savings policy, endowment policy, stokvel account at a bank, tax-free savings, structured deposits/products (e.g. structured investment plan), deposit or call account	*1/12*

Source: Adapted from Alkire and Santos (2011)

Employment

The original MPI method did not consider unemployment. However, unemployment remains one of the most critical socioeconomic challenges faced in South Africa, reaching 33.5% in

2022. It is, therefore, essential to include this as a dimension. South African studies like Frame et al. (2016), Omotoso and Koch (2017), Fransman and Yu (2019), and Jackson and Yu (2023), have included an employment dimension. The Finscope SA questionnaire incorporates the question, "Which of these, if any, best describes your personal working status?". There are ten categories, with individuals considered poor if they are unemployed and looking for a job or unemployed and not looking for a job.

Health

Prior to COVID-19, albeit at varying speeds, many countries made vast progress towards improving health outcomes, especially towards child and maternal mortality rates (United Nations Development Programme, 2019). The global MPI measures child mortality and malnutrition for the health dimension, both of which represent severe forms of health deprivation. Even though these conditions remain an issue, many countries have made significant progress to decrease or eliminate these issues (Alkire et al., 2020). The initial MPI of Alkire and Foster (2011) uses Body Mass Index (BMI) as an indicator for the health dimension. According to the BMI measure, individuals are considered malnourished and therefore deprived of a health perspective if their BMI is less than 18.5 for adults and an underweight child.

The Finscope SA survey collects no data on BMI or child mortality and nutrition. Hence, other health indicators are used. Two indicators are used for the health dimension: food and medical security and health insurance. For food and medical security, the Finscope SA survey incorporates the question "In the last 12 months, how often have you or your household…?" with answers ranked as: (1) often, (2) sometimes, (3) rarely, (4) never. The options to answer are as follows:

1. Gone without enough food to eat because you did not have enough money to buy food.
2. Gone without medicine or medical treatment that was needed.
3. Gone without energy to heat your home or cook food except for blackouts or load-shedding.
4. Felt unsafe in your home because of crime.
5. Gone without clean water to drink or cook with

Individuals who have ‘gone without enough food to eat’ (referring to food security) or individuals who have ‘gone without medicine or medical treatment’ that was needed (referring to medical security) or both and ranked either "often" or "sometimes" are considered deprived. Individuals who have often ‘gone without enough food to eat’ and ‘gone without medicine or medical treatment that was needed’ are considered the most deprived. The food security indicator was influenced by Omotoso and Koch (2017), who also included food hunger as a health indicator in their study and focused on the frequency with which an adult or child experiences food hunger.

For health insurance, the Finscope SA survey incorporates a question asking the respondents about ownership of insurance products. For health insurance, those individuals who do not own at least one of the following health covers are considered deprived: Life insurance or life cover, medical aid or medical scheme or hospital plan, hospital cash back plan which pays you cash if you are hospitalised. The motivation for using health insurance is derived from SDG target 3.8, which refers to universal health coverage. Alkire et al. (2020) also used health insurance as an indicator, albeit for a moderate multidimensional poverty index (MMPI).

Services – Facilities
Measuring service facility deprivation involves using three indicators: access to clean water, sanitation, and electricity. Regarding access to clean water indicators, The Finscope SA questionnaire incorporates the question, "How does your household get the water that you use in your home?" An individual is considered deprived if they use a shared communal tap inside or outside the dwelling or yard or have no access to water. An individual who does not have access to any water is considered more deprived.

Regarding sanitation, The Finscope questionnaire incorporates the question, "What is the main type of toilet your household uses?" Individuals are considered deprived if they have access to a community toilet or no access to toilet facilities. A person with no access to toilet facilities is considered more deprived. Regarding access to electricity, the question is asked, "Do you have electricity in your house?". A person is regarded as deprived if they have no access to electricity in their house. Sanitation and access to drinking water are indicators used in the original MPI method of Alkire and Foster. However, electricity access is not. Electricity access has been used in multiple other studies (Frame et al., 2016; Omotoso & Koch, 2017; Djahini-Afawoubo et al.,2023; Jackson & Yu, 2023).

Dwelling type
The original MPI study measured the standard of living and used floor type as the sole indicator. Other studies, such as Omotoso and Koch (2017) and Jackson and Yu (2023), expanded on this dimension by including factors such as floor and wall material, overcrowding, and dwelling type. Mushongera et al. (2017) and Fransman and Yu (2019) used overcrowding and dwelling type as indicators, while Frame et al. (2016) included dwelling type as an indicator. This paper uses dwelling type as an indicator motivated by Frame et al. (2016).

The Finscope SA survey does not incorporate questions relating to floor and wall type or overcrowding. It does, however, incorporate an observation the interviewer requires regarding the respondent's dwelling type. Individuals are regarded as deprived if their dwelling type is either an RDP house, an extended/renovated RDP house, or an informal dwelling – shack or hut, with an individual residing in an informal dwelling considered the most deprived. The motivation to include RDP housing as part of the cut-off is based on Charlton (2013), who confirms that the intention of the RDP initiative is the physical, social, and economic upliftment of a targeted population group, specifically, the poorest of the poor. To the author's knowledge, this has not been used in previous studies of multidimensional poverty within South Africa and is a new contribution to this field of study.

Standard of living – asset ownership
The standard of living dimension is broken down into two categories. The first category is information communication technologies (ICTs). The Finscope SA survey incorporates the question: "Please tell me which of these things do you use?" in which individuals are considered deprived if they lack ownership of at least one of the following ICTs: cell phone, computer laptop, or telephone (fixed line). ICTs as an indicator were included in studies such as Mushongera et al. (2017), Jackson and Yu (2023) and Djahini-Afawoubo et al. (2023).

The second category consists of a financial indicator in which individuals are considered deprived if they lack ownership of at least one of the following financial assets: unit trusts, education policy or plan, investment or savings policy, endowment policy, stokvel account at a bank, tax-free savings, structured deposits/ products (e.g., Structured Investment Plan), a

deposit account, or a call account. Financial indicators were used by Jackson and Yu (2023), as well as international research conducted by Iwasaki and Gi-Laitly (2013) and Mahamatra et al. (2018).

3.7 An analysis of mobile money's effect on poverty reduction

The method used to analyse the effects mobile money adoption on poverty is based on the model adopted by Djahini-Afawoubo et al. (2023) . In general, the econometric model adopted can be stated as follows:

$$Y_i = \beta X_i + \varepsilon_i \quad \textbf{(1)}$$

Y_i is the dependent variable of individual i, β is the vector of coefficients, X_i is a collection of explanatory variables for individual i, and ε is the error term (Djahini-Afawoubo et al., 2023). The model adopted by Djahini-Afawoubo et al. (2023) incorporates a contradictory dependent variable, which has a 1 value when the person in question is multidimensionally poor and takes on 0 otherwise. The censored deprivation of Akire and Santos (2011) is therefore used and adjusted so that $C_i \geq k$, $C_i(k) = 1$, and $C_i < K$, $C_i(k) = 0$.

Empirical evidence suggests that mobile money has a positive effect on poverty reduction. Suri and Jack (2016) suggested that introducing the M-PESA mobile money scheme lifted more than 190,000 Kenyan households out of poverty. The impact was driven mainly by an increase in the efficiency of the allocation of consumption and a change in financial behaviour related to savings and financial resilience. In measuring the adoption of mobile money, obstacles have occurred, particularly looking at multidimensional poverty, whereby the existence of bidirectional causality between mobile money and poverty. According to Lai et al. (1998), social resource theory states that an individual's access to resources dictates their access to information. An example of social resource theory is that a person with more considerable socioeconomic resources is more knowledgeable about existing financial services and products and is, therefore, more likely to adopt one of these financial products (Zhang et al., 2012), such as mobile money.

Due to the endogenous nature of mobile money in this study. Like Djahini-Afawoubo et al. (2023), an instrument variable analysis will be incorporated using an instrument that affects mobile money use but remains ineffective to poverty. Jack and Suri (2014) and Afawubo et al. (2020) utilised the travel time to the closest possible mobile money service provider as the instrument variable, while Djahini-Afawoubo et al. (2023) used distance as an identifier to the nearest mobile money agency. The rationale for using this instrument is that the closer a person is to a mobile money agency, the more likely and frequently the individual will utilise mobile money services. Using this instrument may introduce complications as the travel time to a mobile money service provider depends on the means of transport and may be a factor in an individual's income. Intuitively, this implies that multidimensionally poor individuals may take longer to reach mobile money services and will use this service less than those not multidimensionally poor.

As the distance to the nearest mobile money agency and time taken to reach a mobile money agency are not available data in the questionnaire, a ranking system is used based on the number of functions used via mobile money services and mitigate any possible endogeneity bias. The functions used to rank mobile money services usage are as follows:

1. Buy airtime.
2. Transfer cash to an individual from the same bank.
3. Transfer cash to an individual from a different bank.
4. Apply for a loan or an overdraft facility.
5. Transfer money from your account to someone without a bank account, who can then access it via an ATM or elsewhere with a PIN code that is sent to their cell phone.
6. Use of mobile money to send money to dependents outside of the household.

This variable is ranked from zero to four, with "zero" being the individual uses none of these functions, 'one' being the individual uses at least 'one' of the functions via mobile money services, 'two' is the individual uses at least 'two' of the services, and four being an individual uses all of these functions. Intuitively, the more functions the individual uses, the more frequently that individuals use mobile money services. Even though Jack and Suri (2014), Afawubo et al. (2020) and Djahini-Afawoubo et al. (2023) used a different variable, the authors' rationale for using distance from, or travel time to a mobile money service provider is to determine the frequency of use of mobile money services. The frequency of mobile money usage is achieved using the ranking system suggested above.

Therefore, A two-stage least squares method will be applied with the instrument used in the first stage to derive values for the second stage. The first stage using the instrument can be written as follows:

$$Y = \beta_0 + \beta_1 IV_{mmusage} + X\beta_x + \mu \quad \textbf{(2)}$$

Where Y represents mobile money adoption, $IV_{mmusage}$ is the instrument variable (mobile money usage), X represents the vector representing the other control variables, β_0, β_1, and β_x are the coefficients to be estimated, and μ is the error term.

As Y (multidimensional poverty) is a variable taking on a finite number of responses (i.e. y =1 for multidimensional poverty, and y=0 for no existence of multidimensional poverty, similar to Djahini-Afawoubo et al. (2023), a linear probability model (LPM) for binary response is used and is written as follows:

$$Prob\ (pov = 1|x) = \alpha_0 + \alpha_1\ AMi + \alpha_2\ K_i + \varepsilon_i \quad \textbf{(3)}$$

Where Prob $(pov = 1|x)$ is the probability that an individual is multidimensionally poor given a set of explanatory variables, AM is the adoption of mobile money, α_0, α_1, and α_2 are the coefficients to be estimated, K is a representation of other explanatory variables, and ε is the error term. The LPM model for binary response is used over logistic models as it deftly overcomes some econometric issues that arise when using logistic models (Wooldridge, 2010).

According to Wooldridge (2010), coefficients in the linear probability model have direct interpretations making them more intuitive for interpretation compared to the log-odds ratio produced by logistic models. Additionally, Wooldridge (2010) confirms that LPM's can be more robust to misspecification of the functional form or distributional assumptions compared to logistic models, especially when the relationship between the independent variables and the probability of the outcome is approximately linear. Furthermore, LPMs directly produce

predicted probabilities as the linear combination of the independent variables, which may be preferred in certain contexts where the focus is on absolute probabilities rather than odd ratios.

LPM's do also have drawbacks when compared to logistic models. For example, Wooldridge (2010) states that LPM's are sensitive to outliers, influential points and heteroscedasticity. It also assumes that effects of the independent variables are constant across all values of the predictors which may lead to misinterpretation of results.

3.8 Description of variables for LPM for binary response model

As mentioned, the dependent variable is multidimensional poverty obtained using the Akire and Santos (2011) method and the primary explanatory variable is mobile money adoption. Djahini-Afawubo et al. (2020) incorporated this by following a model using five steps which ranked the level of usage/trust in mobile money services. Similarly, Djahini-Afawoubo et al. (2023) considered mobile money as a variable taking on the value of 'one' for ownership of a mobile phone, 'two' if the individual knows about mobile money services, 'three' if the individual used this service at least once in the past 'four' if the individual opened an account specifically for mobile money services and 'five' if the individual displays a high degree of confidence in the service.

Due to insufficient data, a four-step process is used in this study, where mobile money is a multinomial variable taking on the value of 'one' if an individual owns at least one cell phone, 'two' if an individual knows that he/she can use mobile money on a cell phone, 'three' if an individual has previously used mobile money, and 'four' if the individual has received money via mobile money (indicating the existence of a mobile money account). Values one to four display increasing adoption rates.

Let us consider a hypothetical example of a user of mobile money services. The starting point is that a user must have a cell phone, which is the minimum requirement to utilise mobile money services. Secondly, the user must know about mobile money services and how to use them. This step is linked to the first step that Fall et al. (2015) termed 'knowledge'. Thirdly, if the product is accessible, it is likely that an individual will test it out; however, according to Afawubo et al. (2020), testing the service out cannot represent frequent use. Frequent use requires the existence of an account for future transactions This step is linked to the 'possession' step referred to by Fall et al. (2015).

As already described, the effects of mobile money on the reduction of poverty will likely have a positive effect by enabling the poor to financial inclusion (World Bank, 2014), increasing individuals' resilience to shocks (Afawubo et al., 2020), and facilitating remittances to the poor (Akobeng, 2016).

Besides mobile money adoption, other factors were considered based on empirical evidence from Mdluli and Dunga (2022), Chen et al. (2019), Atemnkeng and Vukenkeng (2016), Hassan and Birungi (2011) and Gebrekidan et al. (2021). Mdluli and Dunga (2022) analysed poverty in South Africa. They found that socioeconomic factors such as whether the head of the household was male or female, as well as the number of members within the household and traits such as age and marital status are all statistically significant in determining poverty. Similarly, Gebrekidan et al. (2021) measured multidimensional poverty in Ethiopia and found similar results. Chen et al. (2019) measured multidimensional poverty in China. They found a meaningful change in poverty when accounting for age, household income level and size, and marital status, supporting the findings of Mdluli and Dunga (2022) and Gebrekidan et al.

(2021). Djahini-Afawoubo et al. (2023) also found that employment status, access to health care, and place of residence (urban or rural) significantly impacted poverty.

Empirical evidence also points towards social capital positively impacting poverty reduction. Atemnkeng and Vukenkeng (2016) considered social capital as a significant factor affecting deprived households. The study found that social capital is a multifaceted construct and positively affects household welfare. Similarly, Hassan and Birungi (2011) measured the effect of social capital on household poverty in Uganda. The authors found that social capital in terms of membership in social organisations positively contributes to household income levels and poverty reduction. As such, membership to a savings group or association was used to measure social capital.

Due to the sensitive nature of South Africa's history of racial divide, studies of the determinants of poverty within South Africa suggest that race plays a crucial role in determining poverty levels. One such study conducted by Biyase and Zwane (2018) used the NIDS to determine the factors that influence household welfare and poverty within South Africa. Biyase and Zwane (2018) found that the race of the household contributes to the level of household wellbeing. These findings are supported by Mdluli and Dunga (2022).

Table 2 presents a simple correlation matrix between the study's primary variable, multidimensional poverty, and other main variables. As shown by the table, overall low correlations can be seen between multidimensional poverty and other main variables.

Table 2: Correlation matrix of multidimensional poverty and main variables

Covariate	Multidimentional pov	mobile money ad	Race	Employment	Education	Marital status	No access - food	No access - med	Number in HH	Gender	Age	Location
Multidimentional pov	1.0000											
mobile money ad	-0.0823	1.0000										
Race	0.2802	-0.0049	1.0000									
Employment	0.1685	-0.0501	0.1626	1.0000								
Education	0.1054	-0.1095	0.0994	-0.0135	1.0000							
Marital status	0.0874	0.0128	0.1947	0.0236	0.0102	1.0000						
No access food	0.1307	-0.0264	0.1627	0.1309	0.0770	0.0572	1.0000					
No access medical	0.0467	-0.0433	-0.0386	0.0858	0.0103	0.0245	-0.0107	1.0000				
Number in HH	0.1301	-0.0116	0.1896	0.2329	0.0539	-0.0777	0.0637	0.0247	1.0000			
Gender	0.0393	-0.0118	0.0558	0.1969	0.0260	0.0582	0.0008	-0.0148	0.1473	1.0000		
Age	-0.0493	-0.1167	-0.2186	-0.1578	0.1957	-0.2385	-0.0401	0.0298	-0.1423	0.0543	1.0000	
Location	0.2754	-0.0702	0.2799	0.2031	0.1279	0.1021	0.2060	0.0356	0.1559	0.0163	-0.0972	1.0000

Source: Author's calculations based on FinScope SA 2018 data

3.9 Scope and Limitations

This research is limited to investigating the effect mobile money has on poverty reduction within South Africa. This research does not investigate the factors that determine the use of mobile money as the theories underpinning the adoption of each technology stem from an ICT field rather than a development finance field of study. This research is limited to South Africa rather than a cross-sectional country study. Using cross-sectional country data could introduce the risk of treating different countries and economies as homogenous entities. Further justification for using South Africa is because it has one of the largest economies in Africa with a fast-growing and complex financial system, allowing for easier adoption of mobile technology such as mobile money and mobile banking. At the same time, South Africa has one of the highest unemployment, income inequality and poverty rates in Africa. The combination of these factors has made South Africa an interesting case for a study of the relationship between mobile money and poverty.

Additionally, this research is limited to measuring poverty on an individual level rather than a household or country level. The research is also restricted to measuring poverty from a non-monetary perspective. According to Jansen et al. (2015), non-monetary poverty can be defined as inadequate access to public services such as hospitals or schools, lack of private asset ownership, and increased vulnerability to crime. Additionally, only 2018 FinScope SA data has been used to derive a snapshot of South Africa's MPI and the effect of mobile money adoption on poverty rates. The use of only 2018 data is because all indicators were only asked in the 2017 and 2018 FinScope SA survey, making it ineffective to compute trend analysis. Given that the scope of this study is limited to South Africa, further studies can be extended to other developing or African countries as this research on the relationship between mobile money and poverty reduction is relatively under-researched.

Chapter 4
Discussion of Findings

4.1 Introduction

This chapter outlines the findings relating to the multidimensional poverty index within South Africa. Second, the results of the linear probability model will be presented, showing the effects each covariate has on multidimensional poverty. Lastly, the results of the robustness checks will be shown.

4.2 Assessing the proportion of the population deprived in each indicator.

Table 1 shows the headcount ratio, poverty intensity, and multidimensional poverty index of South Africa. The headcount ratio shows that 31.61% of the population is multidimensionally poor. These individuals are either a) deprived in all indicators within a single dimension or b) a combination across multiple dimensions, such as having no access to clean water or sanitation and being unemployed. We also learn that these individuals are deprived in 46.91% of the indicators according to the poverty intensity ratio. Furthermore, the multidimensional poverty index for South Africa was projected at 14.83%, which is the headcount ratio adjusted for the poverty intensity ratio. This adjustment is necessary as 31.61% of the population is not equally multidimensionally poor. Only using the headcount ratio to measure South African poverty implies that 31.61% of the population is poor in 100% of the indicators, which is inaccurate.

Table 2 displays the percentage of the population deprived in each dimension. 68.73% of the population were deprived of medical insurance. This represents a large portion of the population without medical aid, a hospital plan, or a hospital cash-back plan. Closely behind this was financial asset ownership. 66.33% of the population does not have investments, savings plans, stokvels, unit trusts, structured deposits, deposit or call accounts, or tax-free savings accounts. The third highest indicator was food and medical security, meaning that 31.13% of the population has gone to bed hungry without a means to obtain food or gone without medical treatment when needed, which, when combined with medical insurance, means that the population is most deprived in the medical dimension.

Table 1: Poverty intensity, headcount ratio and multidimensional poverty index of the population

Headcount ratio (H)	Poverty Intensity ratio (A)	MPI
31.61%	46.91%	14.83%

Source: Author's calculation using FinScope SA 2018 data

As per Table 2, 18.12% of the population is deprived from a personal work status perspective and either unemployed and not looking for work or unemployed and looking for work. This is followed by 15.4% of the population being deprived in terms of their dwelling, only having access to RDP houses or informal huts or shacks. The population was least deprived in the 'access to electricity' indicator, with only 1.86% being deprived. This is followed by 4.16% being deprived in the sanitation indicator, having access to either a community toilet or no access to toilet facilities.

Table 2: Percentage of the population deprived in each indicator.

Indicator	Percentage of Deprived
Dwelling Type	15.40%
Access to clean water	13.05%
Sanitation	4.16%
Access to Electricity	1.86%
ICT Ownership	5.03%
Medical Insurance	68.73%
Financial asset ownership	66.33%
Food and medical security	31.13%
Education Level Attained	4.94%
Personal Working Status	18.12%

Source: Author's calculation using FinScope SA 2018 data

4.3 Decomposition of South Africa's MPI

Table 3 shows each category and indicator's poverty headcount ratio (H) and poverty intensity (A). In contrast, table 4 shows the MPI estimates by category, namely gender, race, location, working status, and age group. As previously mentioned, the poverty headcount ratio of South Africa is 31.61%, indicating the amount of the population considered poor, with a poverty intensity of 46.91%, resulting in an MPI of 14.83%. Additionally, both the headcount ratio and MPI were relatively higher for individuals who are female, black, live in rural areas and unemployed. These findings support the empirical studies of poverty in South Africa reviewed earlier, albeit to different degrees.

Findings show that individuals regarded as black are subject to higher levels of poverty relative to the other ethnicities. Gradin (2013) suggests that a possible explanation for this is due to cumulative disadvantaged characteristics of individuals considered black. These cumulative difficulties are associated with little to no access to education and therefore education attainment, demographic structures, and also area of residence (rural or urban). Gradin (2013) also cites inertia of previous racial inequalities as a factor in explaining why individuals who are regarded as black are considered poorer than other racial groups.

With regards to females being poorer than males, the UNDP (2016) states that mutually reinforcing gender barriers exist which deprive women from opportunities and employment that their male counterparts have easier access to. Kehler (2001), who looked at the gender divide in South Africa, suggests that possible reasons for gender inequality is due to the diminishing socio-economic opportunities that are available for females. Cheteni et al., (2019) tested if geographical location impacts whether females are poor and their ability to uplift themselves out of poverty. The authors findings show that females in rural and farm areas are more likely to be poor compared to their male counterparts. The findings of this paper are

consistent with many other studies which show that in South Africa, females are more likely to be poor than males

Table 3 also shows the highest headcount ratio was unemployed individuals. Additionally, individuals living in rural areas had the highest ratio of poor to non-poor, as shown by the headcount ratio. Findings that individuals living in rural areas are more likely to be poor than individuals in urban areas are consistent with the findings shown above and within chapter 2 of this paper.

Table 3: MPI, Headcount Ratio (H) and Poverty Intensity (A) for gender, race, location, working status and age group categories.

Category	Indicators	H	A	MPI
All	All	31.61%	46.91%	14.83%
Gender	Female	35.53%	47.20%	16.77%
	Male	26.47%	46.40%	12.28%
Race	Asian/Indian	11.94%	37.99%	4.53%
	Black	41.87%	48.19%	20.18%
	Coloured	33.88%	42.95%	14.55%
	White	3.21%	36.76%	1.18%
Location	Urban	24.77%	45.54%	11.28%
	Rural	60.59%	49.27%	29.85%
Working status	Employed	17.91%	45.96%	8.23%
	Unemployed	70.34%	47.59%	33.48%
Age Group	16-29	38.95%	46.56%	18.13%
	30-44	30.59%	47.16%	14.43%
	45-59	27.79%	46.95%	13.05%
	60+	24.30%	47.19%	11.47%

Source: Author's calculation using FinScope SA 2018 data

Table 4 depicts the degree to which each subgroup contributed to South Africa's overall MPI. In 2018, 56.74% of the population consisted of females, and females contributed significantly more to the country's overall MPI. Females contributed a total of 64.17% between males and females towards South Africa's MPI. Regarding race, black individuals' contribution to South Africa's MPI was extremely high at 82.25%. These findings were expected as black individuals comprised 60.45% of the population.

Regarding an individual's location, 60.59% of the rural population is considered deprived compared to only 24.77% of the urban population. The urban population contributed 61% towards South Africa's MPI. However, this is expected as individuals in urban areas comprise 80.85% of the population. These results are aligned with the findings of Djahini-Afawoubo et al. (2023), Agbodji et al. 2015, and Jackson and Yu (2023) when considering only the headcount ratio. Additionally, 70.34% of unemployed individuals are considered poor, contributing 59.03% towards South Africa's MPI. Lastly, each age group are more or less equal in terms of the number of individuals considered poor, as well as the contribution towards the overall MPI, besides individuals who are 60+ who had lower poverty levels and a lower contribution towards South Africa's MPI.

Table 4: MPI decomposition by category

Category	Indicators	MPI	Population %	Contribution%
All	All	14.83%	100%	100%
Gender	Female	16.77%	56.74%	64.17%
	Male	12.28%	43.25%	35.82%
Race	Asian/Indian	4.53%	6.25%	1.91%
	Black	20.18%	60.45%	82.25%
	Coloured	14.55%	14.67%	14.40%
	White	1.18%	18.09%	1.44%
Location	Urban	11.28%	80.85%	61.51%
	Rural	29.85%	19.12%	38.49%
Working status	Employed	8.23%	73.80%	40.97%
	Unemployed	33.48%	26.14%	59.03%
Age Group	16-29	18.13%	29.00%	35.46%
	30-44	14.43%	36.98%	35.98%
	45-59	13.05%	21.18%	18.63%
	60+	11.47%	12.84%	9.93%

Source: Author's calculation using FinScope SA 2018 data

4.4 Robustness checks – Mobile money adoption and poverty reduction

As mentioned, bidirectional causality exists between mobile money and poverty. According to Lai et al. (1998), social resource theory states that an individual's access to resources dictates their access to information. An example of social resource theory is that a person with more considerable socioeconomic resources is more knowledgeable about existing financial services and products and is, therefore, more likely to adopt one of these financial products (Zhang et al., 2012), such as mobile money. Endogeneity, therefore, needed to be tested to determine whether bidirectional causality exists between mobile money adoption and multidimensional poverty. A Durbin (score) and Wu Hausman tests were done to determine whether endogeneity is present. The following hypotheses were created for both the Durbin (score) test and the Wu-Hausman test:

- **H_o: Mobile money adoption is an exogenous variable.**
- **H_a: Mobile Money is not an exogenous variable.**

Table 5 displays the results. Regarding the Durbin (score) test, since the p-value is significant at a 10%, 5%, and 1% significance level, we reject the null hypothesis that mobile money is exogenous, thereby confirming the presence of endogeneity. These results align with the Wu-Hausman test results with a significant p-value at 10%, 5% and 1% significance level. The results of these tests justified the use of an instrument variable method.

According to Dhrymes (2003), these tests assume that the instrument variable used is strong and valid. Further tests were conducted to test the strength of the instrument used. In order to test the weakness of the instrument, a first-stage regression was conducted using the endogenous variable (mobile money adoption) and the instrument (mobile money usage). The following hypothesis is created:

- **H_o: The instrument used is weak.**
- **H_a: The instrument used is not weak.**

The result of the first stage regression suggests that the instrument is statistically significant at a 10%, 5%, and 1% level. According to Stock and Yogo (2002), where a single instrument is used in a regression, the first stage F statistic must be greater than 10 to infer that the instrument is sufficiently strong. The F statistic is seen to be 265.102, which is large, implying a sufficiently strong instrument. We, therefore, reject the null hypothesis that the instrument used is weak.

Table 5 displays the results of equation (3). In the first stage, the instrument is regressed with and without controls. The results display that the instrument is positively correlated with mobile money adoption. This implies that the more an individual has used the basic functions of mobile money, the more likely that individual is to adopt the service as an everyday function of his/her life.

Results of the second stage confirms a negative and statistically significant effect of mobile money on multidimensional poverty within South Africa. This implies that mobile money reduces the likelihood of being multidimensionally poor. If mobile money adoption increases by 1, poverty would reduce by 15.17%. This result could be explained by the increase in financial inclusion of the poor after the adoption of mobile money (World Bank, 2014) and enabling remittances between foreign workers and the poor (Aker et al., 2016). Mobile money had the third largest effect on poverty. This could suggest that technology is starting to play a more significant role within poorer communities in South Africa.

Additionally, a lack of education (minimum of primary school) was statistically significant and positively correlated with multidimensional poverty. This implies that when individuals do not have an education or lack at least a primary school education, there is a 5.91% increased chance of being poor, all other things being equal. These results align with Gebrekidan et al. (2021), Mdluli and Dunga (2021) and Chen et al. (2019), who found that education and poverty are inversely related.

The results also suggest that an individual's location or residence has a statistically significant effect on poverty. Results show that individuals living in rural areas are 19.19% more likely to be poor than urban residents. According to the results, an individual's location contributed the second highest to poverty.

Table 5: Determinants of multidimensional poverty using instrument variable and Linear Probability in 2SLS

	First-Stage		Second-stage
	Mobile money adoption (without control variables)	Mobile money adoption (with control variables)	Effect on Poverty
Instrument MM	.3302031	0.3041	
	(0.01025)***	(0.0186)***	
Race = non-white		0.0039	.2092
		(0.0242)	(.0155)***
Employment status = unemployed		-0.0371	.0811
		(0.0252)*	(.0164)***
Lack of education		-0.1934	.0591
		(0.0386)***	(.0261)**
Marital status = divorced		0.0047	.0321
		(0.0208)*	(.0133)**
No access to medical		-0.0074	.0362
		(0.0185)	(.0119)***
No access to social capital		-0.0066	.0569
		(0.0399)	(.0256)**
Number in household		0.0007	.0118
		(0.0058)	(.0037)***
Gender = female		0.012	-.0007
		(0.0199)*	(.0128)
Age		-0.0634	.0014
		(0.0103)***	(.0073)
Location = rural		-0.0747	.1919
		(0.0262)***	(.0172)***
Mobile money adoption			-.1517
			(.0393)***
_cons	1.196877	1.566	.0608
	.0102565***	(0.0661)*	(.0820)
F-test	327.44	39.09	796.25
R-sq	0.0615	0.0794	0.1112
N	4995	4995	4994
Endogeneity Test			
Durbin (score) test		9.52706	
Prob		0.0020	
Wu-Hausman F(1,4981)		9.52042	
Prob		0.0020	
Instrument weakness			
R-sq		0.0795	
Adj R-squared		0.0775	
Partial R-squared		0.0505	
F (1,4982)		265.102	
Probability> F		0.000	
SE indicated in brackets			
* p < 0,1.			
***p < 0,05.			
***p < 0,01.			

Source: Author's calculation using FinScope SA 2018 data

This is consistent with the findings of Agbodji et al. (2015), Workneh and Eshete (2021), Djahini-Afawoubo et al. (2023) and Djahini-Afawoubo et al. (2020) also highlighted that the number of individuals considered poor were higher in rural and under-developed areas and lower in urban. Additionally, the results of this study showed that individuals in rural areas underwent a significantly slower reduction in poverty compared to urban areas. This implies that individuals in urban areas who are poor are likely to recover from being deprived faster than individuals within rural areas who are deprived to the same extent. Workneh and Eshete's (2021) study also found this to be true. These findings suggest that poverty reduction strategies must be more tailored to rural residents, or there needs to be an increased focus on rural residents compared to urban residents, or both.

The results in Table 5 also suggest that the effect of gender on poverty was small and lacked statistical significance. The results suggest that being male or female has no statistically significant or meaningful impact on poverty within South Africa. These results contradict the evidence shown by Djahini-Afawoubo et al. (2020), who showed that women were more likely to be poor than men, and the rate of poverty reduction was lower for women compared to men. These results may be due to the continued focus on striving for gender equality within South Africa, implying a degree of success of implemented strategies such as South Africa's gender policy framework and the Broad-Based Black Economic Empowerment (B-BBEE) framework, which has taken drastic initiatives to address the involvement of women in the labour market, especially in managerial positions. The results also showed that age is not a factor in determining the likelihood of an individual being poor. The effect of age on poverty was relatively small and statistically insignificant. These results contradict the results of Marchand and Smeeding (2016), who found that age has a significant effect on determining poverty.

According to the results, by far, the most significant contributor to poverty is ethnicity, with non-white individuals contributing the most towards poverty compared to white individuals. White consisted of individuals who were classified as Asian and white, while non-white consisted of individuals who were classified as Indian, coloured and black. The effect of non-white is statistically significant, and the degree of effect is large. Individuals who are classified as non-white are 20.92% more likely to be poor compared to individuals who are classified as white. These results align with many studies focusing on race and poverty both internationally (Hardaway & McLoyd, 2009; Elmelech & Lu, 2004; Paschall et al.,2018) as well as locally (Klasen, 2000; Jansen et al., 2015; Davids et al., 2022) to name but a few. This suggests that South Africa may need additional policies focusing on providing equal opportunities within the labour market and policies targeting a redistribution of wealth to target individuals stuck in a 'poverty trap'.

Regarding an individual's household size, the results demonstrated a positive and statistically significant relationship between household size and poverty. The results suggests that for small households, poverty decreased as the household size increased. On the other hand, for large households, the level of multidimensional poverty has gone up as the household size grew. Based on the tests, when a household increased from one to two individuals, the level of multidimensional poverty reduced; however, after increasing the household to three or more individuals, the level of multidimensional poverty started increasing.

The other variables measured included no access to medical care, no access to social capital, and employment status, which all had a positive statistically significant relationship on poverty, that is, individuals who lacked access to medical care, individuals who lacked access to social

capital, and unemployed individuals all had higher levels of multidimensional poverty. The contribution level towards poverty was not as pronounced as the effects of the other variables mentioned above.

4.5 Testing the results using robustness checks.

In order to validate the robustness of the results, the propensity score matching (PSM) method was used. This model is widely used in literature for robustness checks when accounting for selection bias. (Kainz & Pan, 2014; Atake, 2018; Keswell et al., 2012).

An individual who used mobile money, denoted as $M_i = 1$, and a non-mobile money user, denoted as $M_i = 0$, was used in the PSM model. Y_i represented the outcome of multidimensional poverty. This meant there were two potential outcomes: $Y_i\ (M_i = 1)$ if an individual was a mobile money user and $Y_i\ (M_i = 0)$ if the individual was not. The propensity score of the PSM model was deduced by utilising the following logit model:

$$Propensity\ scores_i = P(M_i = 1|X_i) = a + X'_i\beta + \varepsilon_i \quad \textbf{(1)}$$

Where M_i was used to indicate whether a person used mobile money, X_i denoted the set of covariates used, and Ei was the error term for the *i*th individual. A causal effect of mobile money users on poverty was assumed based on the differences between treated individuals (mobile money users) and the control group (non-mobile money users). This guaranteed a high level of comparability between treated and intreated groups. In order to make this comparison, the propensity scores using Equation 1. For each individual was used to construct a counterfactual group by highlighting an appropriate amount of individuals who don not use mobile money services while at the same time being comparable to individuals using mobile money services.

The covariates used in the propensity score model were based on existing literature (Djahini-Afawubo et al., 2023; Munyegera & Matsumoto, 2016; Myeni et al., 2020). These covariates were location, age, age squared, gender, number of individuals in a household, no access to medical care, no access to social capital, level of education (separated by individuals who attained high school, primary school, and no education), marital status, employment, and race.

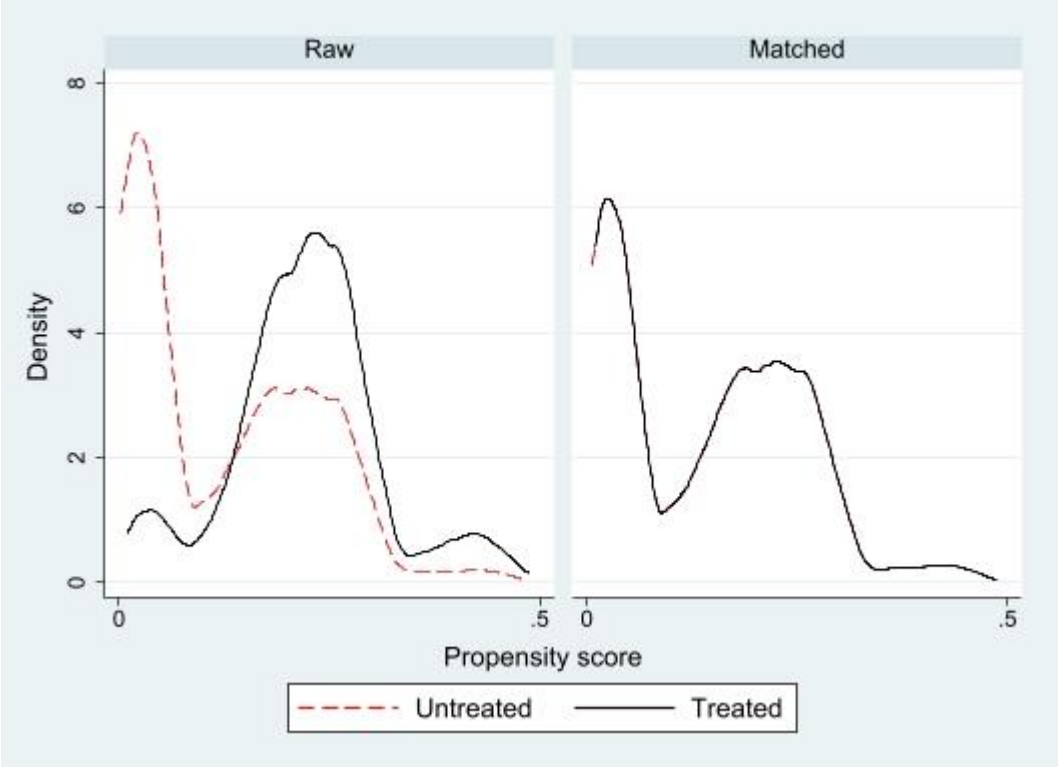
The PSM model primarily rests on two core hypotheses: the common support condition and the conditional independence assumption (CIA). In order for the results of the PSM model to be plausible, the hypotheses underpinning the model need to be checked. The tests conducted were as follows: sensitivity check proposed by Mantel and Haenszel (1959) , Kernal Density, and Common Support Check. These tests were based on existing literature (Djahini-Afaubo et al., (2023). All robustness checks were conducted using Stata 17.

4.5.1 Testing Conditional Independence

Fig. 1 is a graphical representation of the means of the treated and untreated (control) group after implementing the PSM model. The graph is a Kernal density plot using propensity scores of treated and untreated (Raw) pre and post the use of propensity score matching (Matched).

Fig. 1 shows that the distribution of the propensity scores for both the treated and untreated groups prior to matching is unbalanced. Fig.1 also displays the distribution of the propensity scores post-matching. The results show a perfect fit, meaning the PSM model successfully achieved a balance between the treated and control groups. This implies that the treated and control groups have the same characteristics and are more comparable in terms of observed covariates, allowing for a more accurate estimation of the treatment effect. The perfect fit allows the conclusion that mobile money usage is likely the only factor able to distinguish the two groups.

Figure 9. Kdensity plot of propensity scores of treated and untreated groups pre and post-matching



Source: Author's calculation using FinScope SA 2018 data

4.5.2 Checking for the possibility of a hidden bias

Becker and Caliendo (2007) suggest the possibility of unobserved covariates simultaneously affecting the assignment of individuals into treated and untreated groups based on an outcome variable (multidimensional poverty in this case), often referred to as hidden bias. In order to overcome the problem of hidden bias, a sensitivity analysis is conducted as suggested by Rosenbaum (2002). The *mhbounds* function was used to conduct a Mantel and Haenszel (1959) analysis for differing gamma. Gamma can be defined as the divergence of probabilities of the assignment to treated groups based on unobserved variables (Rosenbaum, 2000). Table 6 displays the results of the sensitivity analysis.

Table 6: Mantel and Haenszel (1959) sensitivity analysis

Gamma	Q_mh+	Q_mh-	p_mh+	p_mh-
1	7.81559	7.81559	2.8e-15	2.8e-15
1.02	8.02176	7.61154	5.6e-16	1.4e-14
1.04	8.22365	7.41117	1.1e-16	6.3e-14
1.06	8.4222	7.21507	0	2.7e-13
1.08	8.61753	7.02308	0	1.1e-12
1.1	8.80976	6.83503	0	4.1e-12
1.12	8.99901	6.65075	0	1.5e-11
1.14	9.18537	6.4701	0	4.9e-11
1.16	9.36895	6.29294	0	1.6e-10
1.18	9.54984	6.11913	0	4.7e-10
1.2	9.72813	5.94856	0	1.4e-09
1.22	9.9039	5.78109	0	3.7e-09
1.24	10.0772	5.61663	0	9.7e-09
1.26	10.2482	5.45505	0	2.4e-08
1.28	10.4169	5.29627	0	5.9e-08
1.3	10.5834	5.14018	0	1.4e-07
1.32	10.7477	4.98669	0	3.1e-07
1.34	10.91	4.83572	0	6.6e-07
1.36	11.0702	4.68718	0	1.4e-06
1.38	11.2284	4.54099	0	2.8e-06
1.4	11.3848	4.39709	0	5.5e-06
1.42	11.5392	4.25538	0	.00001
1.44	11.6919	4.11582	0	.000019
1.46	11.8428	3.97833	0	.000035
1.48	11.992	3.84285	0	.000061
1.5	12.1395	3.70932	0	.000104
1.52	12.2854	3.57768	0	.000173
1.54	12.4297	3.44787	0	.000283
1.56	12.5725	3.31985	0	.00045
1.58	12.7137	3.19357	0	.000703
1.6	12.8535	3.06897	0	.001074
1.62	12.9918	2.94601	0	.001609
1.64	13.1287	2.82465	0	.002367
1.66	13.2643	2.70483	0	.003417
1.68	13.3985	2.58653	0	.004847
1.7	13.5314	2.4697	0	.006761
1.72	13.663	2.3543	0	.009279
1.74	13.7934	2.2403	0	.012536
1.76	13.9226	2.12765	0	.016683
1.78	14.0505	2.01634	0	.021882
1.8	14.1773	1.90631	0	.028305

2_mh+:	Mantel-Haenszel statistic (assumption: overestimation of treatment Effect)
2_mh :	Mantel-Haenszel statistic (assumption: underestimation of treatment Effect)
p_mh+:	significance level (assumption: overestimation of treatment effect)
p_mh:	significance level (assumption: underestimation of treatment effect)

Source: Author's calculation using FinScope SA 2018 data

The gamma for the test was set between 1 and 1.85 with intervals of 0.02 to determine the effect of increasing gamma across all intervals. At gamma = 1.0, the Mantel Haenszel statistics are highly significant (very low p-values) under both overestimation and underestimation assumptions. As the gamma increases, the Mantel-Haenszel statistic remains significant at a 1% level for all levels of gamma besides a gamma of 1.74 and above, which is significant at a 5% level. This indicates a strong association between treatment and outcome. Even at gamma = 2.8, the Mantel-Haenszel statistics are significant. However, the p_mh+ starts to increase (from 0 to 0.028305), suggesting a possible decrease in significance under the assumption of overestimating treatment. This suggests there is a degree of sensitivity to extreme levels of gamma. Therefore, the presence of unobserved factors concurrently affecting the allocation into treated groups and the outcome variable may only be present at extreme levels of gamma.

4.5.3 Test of Common Support

The similarity of propensity scores between treated and untreated groups were checked. The results of the test are displayed in Table 7. The results of the test show that the common support region is [.13824998, .44610922]. As common support exists, it implies that the similarities between the treated and untreated groups were sufficient to make a valid comparison between the two groups. Table 8 provides estimates of the propensity scores. The table also shows the inferior bound, the number of treated and controls for each block. The total blocks is six which ensures that the mean propensity score is not different for treated and untreated groups in each block. The distribution of the treated and control within the final blocks was arranged with the inferior bound of each block.

4.5.4 The relationship between mobile money and poverty

In order to test the effect of mobile money on multidimensional poverty, several matching methods were used, namely, nearest neighbour (NN), kernel, stratification and radius. These matching methods were used to test the robustness of the results. These results are displayed in Table 8. Regarding the NN method, a treated group was matched with a untreated group based on the most similar propensity score. This was set with a caliper of 0.01 to avoid needing to match unique scores.

Overall, the outcome confirms mobile money's positive effect on multidimensional poverty. The average treatment effect on treated vary between -0.0697 and -0.10074. This variation between the two models is relatively small, suggesting that all matching methods achieved reasonably consistent results. The ATT suggests that the probability of being poor decreases by between 6.97% and 10.07% when the individual is a mobile money user, holding all things constant. The matching methods were all statistically significant, albeit to varying degrees of significance. As mentioned, the effect of mobile money and its poverty reducing nature is likely a result of an increase in financial inclusion of the poor after the adoption of mobile money (World Bank, 2014) and aiding in remittances between the poor (Aker et al., 2016).

Table 7: Estimated scores and common support results

The region of common support is [.13824998, .44610922]

Description of the estimated propensity score in region of common support

Estimated propensity score

	Percentiles	**Smallest**		
1%	.0054085	.0016981		
5%	.0149001	.0023724		
10%	.020984	.0024218	Obs	4.996
25%	.041805	.0026825	Sum of wgt.	4.996
50%	.1585708		Mean	.1505204
		Largest	Std. dev.	.1072064
75%	.2370504	.4817185		
90%	.281938	.4865789	Variance	.0114932
95%	.3043536	.4865789	Skewness	.4341729
99%	.4376975	1	Kurtosis	3.046732

Step 1: Optimal block number

Total Blocks = 6

Step 2: Balancing property – Propensity score

Balancing - Satisfied

Inferior bound – Number of treated + Controls utilised

Inferior of block of block of pscore	Mobile money usage 0	1	Total
0	646	9	655
.025	938	36	974
.05	296	15	311
.1	987	213	1.2
.2	1.317	437	1.754
.4	60	41	101
Total	4244	751	4995

Source: Author's calculation using FinScope SA 2018 data

Table 8: Matching methods and average treatment effect on treated (ATT)

Matching method	All		ATT
	Treated	Control	ATT
Nearest Neighbour	751	1003	-0.07 (0.022)**
Kernel	590	3578	-0.0697 (.01735)***
Stratification	590	3630	-0.10074 (0.00103)*
Radius	750	1030	-0.0795 (.01658)**

Source: Author's calculation using FinScope SA 2018 data

For policymakers and regulators to significantly reduce poverty in South Africa and achieve SDG goal 1 of completely eliminating poverty in all forms, the results show that focus should be placed on mobile money adoption as an additional factor. These policies should also target the vulnerable and previously disadvantaged groups, specifically the non-white and individuals without the necessary education to reverse the cycle of poverty. Additionally, promoting mobile money adoption amongst individuals in rural areas would accelerate the reduction in poverty as these groups are considered more multidimensionally poor than individuals in urban areas.

Chapter 5
Conclusions and Recommendations

5.1 Introduction

Many studies measure poverty using monetary measures within South Africa. However, only so many studies analyse multidimensional poverty using an MPI approach. Poverty rates continue to be one of the more essential areas for the government to focus efforts due to the high levels of poverty seen within South Africa. As poverty levels have been consistently high, it is important to identify additional tools to help combat them. Thus, this paper studies the use of mobile money as an additional tool for poverty reduction, specifically within South Africa. Firstly, this paper incorporates the Alkire and Santos (2011) method to calculate a MPI using both the headcount ratio (H) and the poverty intensity (A). In order to determine the degree of effect mobile money has on poverty, a linear probability model was used with a two-stage least squares model. Additionally, an instrument was used to address this endogeneity issue due to a two-way causal relationship between mobile money and multidimensional poverty. This paper also used a PSM to test robustness of results.

5.2 Summary and Policy recommendations

Based on the data collected in South Africa, the results indicated that South Africa had a poverty headcount ratio of 31.61%. This suggests that 31.61% of the population is deprived of at least a third of the indicators used. We also learn that these individuals are deprived in 46.91% of the indicators according to the poverty intensity ratio. Furthermore, the MPI for South Africa was calculated to be 14.83%, which is the headcount ratio adjusted for the poverty intensity ratio.

The implications of apartheid caused severe rates of poverty and inequality within South Africa, especially for women and children (Nnadozie, 2013). The South African government has attempted to address the high rates of poverty and increase the overall standard of living of population groups and geographic locations via targeted strategies and regulations. As shown by the empirical findings in this study, individuals considered non-white, living in rural areas, and unemployed, by far, contributed the most towards South Africa's MPI. Additionally, individuals who were considered non-white, living in rural areas, and unemployed had the highest MPIs. Much reform is still required regarding these indicators, and focus should be placed on the rural-urban gap regarding access to necessities such as education, social services, electricity and healthcare.

According to our sustainable development goals, goal six and seven focus on adequate access to sanitation and clean water; however, individuals in poorer communities still use buckets for sanitation purposes (Nhamo et al., 2019). This suggests that additional policies are required to increase access to sanitation and clean water. Additionally, this paper reveals that a significant portion of the population is deprived of medical security and financial assets. According to Neely and Ponshunmugam (2019), scarcity of resources, transportation, and social networks, all rooted in South Africa's economy and racial discrimination post-apartheid, are the main factors that dictate individuals' access to health care. Policies should target improved access to these indicators to see a significant decrease in South Africa's overall multidimensional poverty levels.

The results further indicate that race, location (urban and rural), and mobile money usage have the most significant effect on poverty. In contrast, other indicators such as education, marital status, and number of individuals in a household have a more negligible, statistically significant effect on poverty. Education still, however, remains an essential dimension for poverty reduction. Even though the general level of education has improved within South Africa, there has not been much success in improving the overall quality of education (Van der Berg, 2007).

According to Van der Berg (2007), despite the government's increasing educational expenditure, it has done little to improve educational performance. The unequal quality of education of children from poor socioeconomic backgrounds stunts their early learning performance, which leads to learners performing poorly (Spaull & Kotze, 2015). Furthermore, Van der Berg suggests that the quality of education is more important than years of schooling. The government requires additional focus to improve education within South Africa, especially for non-white children in the education system, which is crucial in reducing racial earnings.

Multiple matching methods were used to determine how mobile money affects poverty. All methods confirmed a positive statistically significant effect. This suggests that for policymakers to fast-track poverty reduction within South Africa, focus should be placed on improving the adoption of mobile money, especially for individuals not already using traditional bank accounts for transacting. Okello et al. (2020) suggested that tax breaks offered when using mobile money services could be a meaningful method of promoting use of mobile money services which would accelerate the growth of financial inclusion.

5.4 Avenues for future research

This research is limited to investigating the effect of mobile money on poverty reduction within South Africa and does not investigate the factors that determine the use of mobile money. This is mainly because the theories underpinning the adoption of each technology stem from an ICT field rather than a development finance field of study. Future research could focus on the theories underpinning the individuals decisions to adopt and use mobile money. Additionally, according to Djahini-Afawoubo et al. (2023), using mobile money also has undesirable consequences, such as money laundering and fraud, which are not analysed in this paper. Future research may focus on mobile money's less desirable socioeconomic effects.

Furthermore, this paper examines the effects of mobile money on poverty reduction in 2018 within South Africa. This eliminates the ability to conduct a trend analysis to measure the effect over time. Additional research in this field can be conducted over multiple years to determine mobile money's effect on multidimensional poverty over time. The research is also restricted to measuring poverty from a non-monetary perspective. According to Jansen et al. (2015), non-monetary poverty can be defined as inadequate access to public services such as hospitals or schools, lack of private asset ownership, and increased vulnerability to crime. The effect of mobile money on poverty reduction measured in monetary terms is relatively under-researched within South Africa. Given that the scope of this study is limited to South Africa, further studies can be extended to other developing or African countries, as this research is one of the first to measure the relationship between mobile money and poverty reduction. Further studies could also measure this relationship, including subjective variables as correlates of poverty.

References

1. Abdulai, A. M., Shamshiry, E., Abdulai, A. M., & Shamshiry, E. (2014). Theory and practice on the nexus between poverty, natural resources and governance. Linking Sustainable Livelihoods to Natural Resources and Governance: The Scale of Poverty in the Muslim World, 11-40.

2. Abiona, O., & Koppensteiner, M. F. (2018). The impact of household shocks on domestic violence: Evidence from Tanzania.

3. Abiona, O., & Koppensteiner, M. F. (2022). Financial Inclusion, Shocks, and Poverty Evidence from the Expansion of Mobile Money in Tanzania. Journal of Human Resources, 57(2), 435-464.

4. Abor, J. Y., Amidu, M., & Issahaku, H. (2018). Mobile telephony, financial inclusion and inclusive growth. Journal of African Business, 19(3), 430-453.

5. Addae-Korankye, A. (2019). Theories of poverty: A critical review. Journal of Poverty, Investment and Development, 48(1), 55-62.

6. Addison, T., Demery, L., Ferroni, M., Round, J., Grootgert, C., Marchant, T., & Noël, M. (1990). Making adjustment work for the poor: a framework for policy reform in Africa. World Bank.

7. Adeyemi, S. L., Ijaiya, G. T., & Raheem, U. A. (2009). Determinants of poverty in sub-Saharan Africa. African Research Review, 3(2).

8. Agbodji, A. E., Batana, Y. M., & Ouedraogo, D. (2015). Gender inequality in multidimensional welfare deprivation in West Africa: the case of Burkina Faso and Togo. International Journal of Social Economics, 42(11), 980-1004.

9. Agbu, O. (1997). Poverty Alleviation in Nigeria. An Examination of the International and Technical Dimensions. NES (comp.), Poverty Alleviation in Nigeria. Ibadan: NES Secretariat, 347-360.

10. Ahmad, A. H., Green, C., & Jiang, F. (2020). Mobile money, financial inclusion and development: A review with reference to African experience. Journal of Economic Surveys, 34(4), 753-792.

11. Aker, J. C., Boumnijel, R., McClelland, A., & Tierney, N. (2016). Payment mechanisms and antipoverty programs: Evidence from a mobile money cash transfer experiment in Niger. Economic Development and Cultural Change, 65(1), 1-37.

12. Akhter, N., & Khalily, B. (2017). Impact of mobile financial services on financial inclusion in Bangladesh. Institute for Inclusive Finance and Development (InM), Working Paper, 52.

13. Akobeng, E. (2016). Out of inequality and poverty: Evidence for the effectiveness of remittances in Sub-Saharan Africa. The quarterly review of economics and finance, 60, 207-223.

14. Alkire, S., & Foster, J. (2011). Counting and multidimensional poverty measurement. Journal of public economics, 95(7-8), 476-487.

15. Alkire, S., & Santos, M. (2011). Training material for producing national human development reports: the Multidimensional Poverty Index (MPI).

16. Alkire, S., Foster, J. E., Seth, S., Santos, M. E., Roche, J., & Ballon, P. (2015). Multidimensional poverty measurement and analysis: chapter 3–overview of methods for multidimensional poverty assessment.

17. Alkire, S., Kovesdi, F., Mitchell, C., Pinilla-Roncancio, M., & Scharlin-Pettee, S. (2020). Changes over time in the global Multidimensional Poverty Index. OPHI MPI Methodological Notes, 50.

18. Alkire, S., Roche, J. M., & Vaz, A. (2017). Changes over time in multidimensional poverty: Methodology and results for 34 countries. World Development, 94, 232-249.

19. Álvarez-Gamboa, J., Cabrera-Barona, P., & Jácome-Estrella, H. (2021). Financial inclusion and multidimensional poverty in Ecuador: A spatial approach. World Development Perspectives, 22, 100311.

20. Anyanwu, J. C. (1997). Poverty in Nigeria: Concepts, measurement and determinants. Poverty alleviation in Nigeria, 93-120.

21. Anyanwu, J. C., Kayizzi-mugerwa, S., & John, C. (2013). Determining the correlates of poverty for inclusive growth in Africa. Tunisia: African Development Bank.

22. Ardington, C., & Leibbrandt, M. (2004). Financial services and the informal economy. CSSR and SALDRU.

23. Aron, J., & Muellbauer, J. (2019). The Economics of Mobile Money: harnessing the transformative power of technology to benefit the global poor. Centre for the Study of African Economies.

24. Asongu, S. A. (2013). How has mobile phone penetration stimulated financial development in Africa?. Journal of African Business, 14(1), 7-18.

25. Asongu, S. (2015). The impact of mobile phone penetration on African inequality. International Journal of Social Economics, 42(8), 706-716.

26. Asongu, S. A., & Nwachukwu, J. C. (2016). *Mobile Phone Penetration, Mobile Banking and Inclusive Development in Africa*.

27. Asongu, S. A., & Odhiambo, N. M. (2019). Mobile banking usage, quality of growth, inequality and poverty in developing countries. Information Development, 35(2), 303-318.

28. Atake, E. H. (2018). The impacts of migration on maternal and child health services utilisation in Sub-Saharan Africa: evidence from Togo. Public health, 162, 16-24.

29. Atemnkeng, J. T., & Vukenkeng, A. W. (2016). Does social capital really determine poverty? Evidence from a Cameroon household survey. African Journal of Science, Technology, Innovation and Development, 8(1), 97-110.

30. Azjen, I. (1980). Understanding attitudes and predicting social behavior. Englewood cliffs.

31. Banerjee, A., Dolado, J. J., Galbraith, J. W., & Hendry, D. (1993). Co-integration, error correction, and the econometric analysis of non-stationary data. Oxford university press.

32. Barrantes, R. (2007). Analysis of ICT demand: what is digital poverty and how to measure it? Digital Poverty: Latin American and Caribbean Perspectives, 29-53.

33. Batista, C., & Vicente, P. C. (2018). Is mobile money changing rural Africa?. Working Paper, No. 1805. Revised in November 2020.

34. Becker, S. O., & Caliendo, M. (2007). Sensitivity analysis for average treatment effects. The stata journal, 7(1), 71-83.

35. Bhavnani, A., Chiu, R. W. W., Janakiram, S., Silarszky, P., & Bhatia, D. (2008). The role of mobile phones in sustainable rural poverty reduction. retrieved November, 22, 2008.

36. Bhorat, H., & Van der Westhuizen, C. (2013). Non-monetary dimensions of well-being in South Africa, 1993–2004: A post-apartheid dividend?. Development Southern Africa, 30(3), 295-314.

37. Bhorat, H., Stanwix, B., & Yu, D. (2014). Non-income welfare and inclusive growth in South Africa. Development Policy Research Unit, University of Cape Town.

38. Bird, J. (2018) 'Smart' insurance helps poor farmers to cut risk. Financial Times, 4 Dec. https://www.ft.com/content/3a8c7746-d886-11e8-aa22-36538487e3d0

39. Bird, K., Mckay, A., & Shinyeka, I. (2010). Isolation and poverty: The relationship between spatially differentiated access to goods and services and poverty.

40. Biyase, M., & Zwane, T. (2018). An empirical analysis of the determinants of poverty and household welfare in South Africa. The Journal of Developing Areas, 52(1), 115-130.

41. Blank, R. M. (2003). Selecting among anti-poverty policies: can an economist be both critical and caring?. Review of social economy, 61(4), 447-469.

42. Blau, F. D., & Kahn, L. M. (2000). Gender differences in pay. Journal of Economic perspectives, 14(4), 75-100.

43. Blumenstock, J., Cadamuro, G., & On, R. (2015). Predicting poverty and wealth from mobile phone metadata. Science, 350(6264), 1073-1076.

44. Bradshaw, T. K. (2006). Theories of poverty and anti-poverty programs in community development. In 50 Years of Community Development Vol I (pp. 98-116). Routledge.

45. Burns, S. (2018). M-Pesa and the 'market-led'approach to financial inclusion. Economic Affairs, 38(3), 406-421.

46. Chambers, R. (1988). Poverty in India: concepts, research and reality.

47. Chambers, R. (1989). Editorial introduction: vulnerability, coping and policy. Institute of Development Studies (IDS) Bulletin, 20(2), 1–7.

48. Charlton, S. (2013). State ambitions and peoples' practices: An exploration of RDP housing in Johannesburg (Doctoral dissertation, University of Sheffield).

49. Chen, K. M., Leu, C. H., & Wang, T. M. (2019). Measurement and determinants of multidimensional poverty: Evidence from Taiwan. Social Indicators Research, 145, 459-478.

50. Cheteni, P., Khamfula, Y., & Mah, G. (2019). Gender and poverty in South African rural areas. Cogent Social Sciences.

51. Cho, Y., & Hinata, Y. (2019). China's mobile banks offer 1-second loan decisions in farmland. Nikkei Asian Review.

52. Churchill, S. A., & Marisetty, V. B. (2020). Financial inclusion and poverty: a tale of forty-five thousand households. Applied Economics, 52(16), 1777-1788.

53. Cobla, G. M., & Osei-Assibey, E. (2018). Mobile money adoption and spending behaviour: the case of students in Ghana. International Journal of Social Economics.

54. Datt, G., & Jolliffe, D. (1999). Determinants of poverty in Egypt: 1997 (No. 583-2016-39582, pp. 1-61).

55. Davis, E. P., Sanchez-Martinez, M. (2014). A review of the economic theories of poverty. National Institute and Social Research. Discussion Paper, No. 435.

56. Davis, F. D. (1985). A technology acceptance model for empirically testing new end-user information systems: Theory and results (Doctoral dissertation, Massachusetts Institute of Technology).

57. Davids, Y. D., Roberts, B., Houston, G., & Mustapha, N. (2022). Race and Class Perceptions of Poverty in South Africa. In Paradise Lost (pp. 200-229). Brill.

58. Deloitte and GSMA. (2012). Sub-Saharan Africa Mobile Observatory 2012. https://www.gsma.com/publicpolicy/wpcontent/uploads/2013/01/gsma_ssamo_full_web_11_12-1.pdf

59. Della Peruta, M. (2018). Adoption of mobile money and financial inclusion: a macroeconomic approach through cluster analysis. Economics of Innovation and New Technology, 27(2), 154-173.

60. Demombynes, G., & Thegeya, A. (2012). *Kenya's Mobile Revolution and the Promise of Mobile Savings*. http://econ.worldbank.org.

61. Deng, L. A. (1995). Poverty reduction: lessons and experiences from sub-Saharan Africa. African Development Bank.

62. Dhrymes, P. J. (2003). Tests for endogeneity and instrument suitability. Department of Economics, Columbia University.

63. Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. Journal of the American statistical association, 74(366a), 427-431.

64. Djahini-Afawubo, K., Couchoro, M. K., Agbaglah, M., & Gbandi, T. (2020). Mobile money adoption and households' vulnerability to shocks: Evidence from Togo. Applied Economics, 52(10), 1141-1162.

65. Djahini-Afawoubo, D. M., Couchoro, M. K., & Atchi, F. K. (2023). Does mobile money contribute to reducing multidimensional poverty?. Technological Forecasting and Social Change, 187, 122194.

66. Donner, J., & Tellez, C. A. (2008). Mobile banking and economic development: Linking adoption, impact, and use. Asian journal of communication, 18(4), 318-332.

67. Donovan, K. (2012). Mobile money for financial inclusion. Information and Communications for development, 61(1), 61-73.

68. Downes, A. (2010). Poverty and its reduction in the small developing countries of the Caribbean. Proceedings of Ten Years of 'War against poverty', Manchester, UK, 8-10.

69. Duncombe, R., & Boateng, R. (2009). Mobile Phones and Financial Services in Developing Countries: a review of concepts, methods, issues, evidence and future research directions. Third World Quarterly, 30(7), 1237-1258.

70. Ebenezer, M., & Abbyssinia, M. (2018). Livelihood diversification and its effect on household poverty in Eastern Cape Province, South Africa. The Journal of Developing Areas, 52(1), 235-249.

71. Ejemeyovwi, J. O., & Osabuohien, E. S. (2018). Investigating the relevance of mobile technology adoption on inclusive growth in West Africa. Contemporary Social Science.

72. Ekanayake, E. M., & Moslares, C. (2020). Do remittances promote economic growth and reduce poverty? Evidence from Latin American countries. Economies, 8(2), 35.

73. Elesh, D. (1973). Poverty theories and income maintenance: Validity and policy relevance. Social science quarterly, 359-373.

74. Elmelech, Y., & Lu, H. H. (2004). Race, ethnicity, and the gender poverty gap. Social Science Research, 33(1), 158-182.

75. Esselaar, S., Gillwald, A., & Stork, C. (2007). Towards an African e-index: 2007 telecommunications sector performance in 16 African countries; a supply side analysis of policy outcomes.

76. Evans, M., Gough, I., Harkness, S., McKay, A., Dao, T. H., & Do, L. T. N. (2007). The relationship between old age and poverty in Viet nam. United Nations Development Program (UNDP) Vietnam Policy Dialogue Paper, 8.

77. Fall, F. S., Ky, Y., & Birba, O. (2015). Analyzing the mobile-banking adoption process among low-income populations: A sequential logit model. Economics Bulletin, 35(4), 2085-2103.

78. Finn, A., Leibbrandt, M., & Woolard, I. (2013). What happened to multidimensional poverty in South Africa between 1993 and 2010?. In SALDRU working paper, 99. Cape Town: Southern Africa Labour and Development Research Unit, University of Cape Town.

79. Foster, J., Greer, J., & Thorbecke, E. (1984). A class of decomposable poverty measures. Econometrica: journal of the econometric society, 761-766.

80. Frame, E., De Lannoy, A., & Leibbrandt, M. (2016). Measuring multidimensional poverty among youth in South Africa at the sub-national level.

81. Fransman, T., & Yu, D. (2019). Multidimensional poverty in South Africa in 2001–16. Development Southern Africa, 36(1), 50-79.

82. Gallardo, M. (2020). Measuring vulnerability to multidimensional poverty. Social Indicators Research, 148(1), 67-103.

83. Gans, H. J. (1995). The War against the Poor. The Underclass and Antipoverty Policy. BasicBooks, 10 East 53rd Street, New York, NY 10022-5299.

84. Gebrekidan, D. K., Bizuneh, A. M., & Cameron, J. (2021). Determinants of multidimensional poverty among rural households in Northern Ethiopia. Journal of Rural and Community Development, 16(1).

85. Gillwald, A., & Stork, C. (2009). Towards evidence-based ICT policy and regulation: ICT access and usage in Africa.

86. Gradín, C. (2013). Race, poverty and deprivation in South Africa. Journal of African Economies, 22(2), 187-238.

87. Gürbüz Cuneo, A. (2019). The Economics of Rural Populations in Sub-Saharan Africa: Financial Inclusion and Agriculture (Doctoral dissertation, Georgetown University).

88. Hardaway, C. R., & McLoyd, V. C. (2009). Escaping poverty and securing middle class status: How race and socioeconomic status shape mobility prospects for African Americans during the transition to adulthood. Journal of youth and adolescence, 38, 242-256.

89. Hasibul, I., Syed Abul, B., & AK Enamul, H. (2022). The Impact of Mobile Money on Long-Term Poverty: Evidence from Bangladesh.

90. Hassan, R., & Birungi, P. (2011). Social capital and poverty in Uganda. Development Southern Africa, 28(1), 19-37.

91. Hausman, J. A. (1978). Specification tests in econometrics. Econometrica: Journal of the econometric society, 1251-1271.

92. Helms, B. (2006). Access for all: Building inclusive financial systems. World Bank Publications.

93. Hurst, C. (2004). Social inequality: Forms, causes and consequences. New York, NY: Pearson Education Inc.

94. Iliffe, J. (1987). The African Poor. Cambridge: Cambridge University Press.

95. Infodev. (2012). Mobile Usage at the Base of the Pyramid in Kenya. http://www.infodev.org/en/TopicPublications.34.html

96. Inoue, T. (2018). Financial development, remittances, and poverty reduction: Empirical evidence from a macroeconomic viewpoint. Journal of Economics and Business, 96, 59-68.

97. IST-Africa (Conference), & Institute of Electrical and Electronics Engineers. (2013). 2013 IST-Africa Conference & Exhibition: 29-31 May 2013, Nairobi, Kenya.

98. International Telecommunication Union. (2009). Information Society Statistical Profiles 2009 Africa. Geneva: International Telecommunications Union. https://www.itu.int/dms_pub/itu-d/opb/ind/D-IND-RPM.AF-2009-PDF-E.pdf

99. International Telecommunication Union. (2012). Measuring the information society Geneva: International Telecommunications Union.

100. Iwasaki, E., & El-Laithy, H. (2013). Estimation of Poverty in Greater Cairo: Case Study of Three 'U nplanned'Areas. African Development Review, 25(2), 173-188.

101. Jack, W., & Suri, T. (2014). Risk sharing and transactions costs: Evidence from Kenya's mobile money revolution. American Economic Review, 104(1), 183-223.

102. Jackson, S., & Yu, D. (2023). Re-examining the multidimensional poverty index of South Africa. Social Indicators Research, 166(1), 1-25.

103. Jansen, A., Moses, M., Mujuta, S., & Yu, D. (2015). Measurements and determinants of multifaceted poverty in South Africa. Development Southern Africa, 32(2), 151-169.

104. Jung, S. Y., & Smith, R. J. (2007). The economics of poverty: Explanatory theories to inform practice. Journal of Human Behavior in the Social Environment, 16(1-2), 21-39.

105. Kadir, M., Hassan, K., Yusuf, H. A., & Abdulaziz, I. (2014). Poverty reduction through the ICT: Global system for mobile communication (GSM) perspective. Journal of Economics and International Finance, 6(9), 211-215.

106. Kainz, K., & Pan, Y. (2014). Segregated school effects on first grade reading gains: Using propensity score matching to disentangle effects for African-American, Latino, and European-American students. Early Childhood Research Quarterly, 29(4), 531-537.

107. Karlan, D., Kendall, J., Mann, R., Pande, R., Suri, T., & Zinman, J. (2016). Research and impacts of digital financial services (No. w22633). National Bureau of Economic Research.

108. Kehler, J. (2001). Women and poverty: the South African experience. Journal of international women's studies, 3(1), 41-53.

109. Keswell, M., Burns, J., & Thornton, R. (2012). Evaluating the impact of health programmes on productivity. African Development Review, 24(4), 302-315.

110. Klasen, S. (2000). Measuring poverty and deprivation in South Africa. Review of income and wealth, 46(1), 33-58.

111. Koomson, I., Villano, R. A., & Hadley, D. (2020). Effect of financial inclusion on poverty and vulnerability to poverty: Evidence using a multidimensional measure of financial inclusion. Social Indicators Research, 149(2), 613-639.

112. Kuklys, W., & Robeyns, I. (2005). Sen's capability approach to welfare economics. In Amartya Sen's Capability Approach: Theoretical Insights and Empirical Applications (pp. 9-30). Berlin, Heidelberg: Springer Berlin Heidelberg.

113. Ky, S., Rugemintwari, C., & Sauviat, A. (2018). Does mobile money affect saving behaviour? Evidence from a developing country. Journal of African Economies, 27(3), 285-320.

114. Lai, G., Lin, N., & Leung, S. Y. (1998). Network resources, contact resources, and status attainment. Social networks, 20(2), 159-178.

115. Lee, T., & Jun, J. (2007). The role of contextual marketing offer in Mobile commerce acceptance: comparison between Mobile Commerce users and nonusers. International Journal of Mobile Communications, 5(3), 339-356.

116. Lewis, O.(1966) The Culture of Poverty. Vilnus University Journals; Vol 215. No. 4 pp 1-25.

117. Lipton, M., & Ravallion, M. (1995). Poverty and policy. Handbook of development economics, 3, 2551-2657.

118. Macharia, J. (2013). Mobile banking influence on wealth creation and poverty reduction for the unbanked. In 2013 IST-Africa Conference & Exhibition (pp. 1-9). IEEE.

119. Mahapatra, B., Bhattacharya, R., Atmavilas, Y., & Saggurti, N. (2018). Measuring vulnerability among female sex workers in India using a multidimensional framework. PLoS One, 13(9), e0204055.

120. Makore, M. P. (2014). Exploring the use of mobile banking services: case study of Wizzit Bank, South Africa (Doctoral dissertation).

121. Mantel, N., & Haenszel, W. (1959). Statistical aspects of the analysis of data from retrospective studies of disease. Journal of the national cancer institute, 22(4), 719-748.

122. Marchand, J., & Smeeding, T. (2016). Poverty and aging. In Handbook of the economics of population aging (Vol. 1, pp. 905-950). North-Holland.

123. Mawejje, J., & Lakuma, P. (2019). Macroeconomic effects of Mobile money: evidence from Uganda. Financial Innovation, 5(1), 1-20.

124. May, J. D. (2012). Digital and other poverties: Exploring the connection in four East African countries. Information Technologies & International Development, 8(2), pp-33.

125. Mdluli, P., & Dunga, S. (2022). Determinants of poverty in South Africa using the 2018 general household survey data. Journal of Poverty, 26(3), 197-213.

126. Mizutani, A. (2021). Can Mobile Money Remittances Reduce Short-Term Poverty? Evidence from Kenya.

127. Mlachila, M., Tapsoba, R., & Tapsoba, S. J. (2017). A quality of growth index for developing countries: a proposal. Social Indicators Research, 134(2), 675-710.

128. Mohammed, A. M. (2019). Exploring the Relationship Between Mobile Money Development and Economic Growth: Evidence from Nigeria (Master's thesis, Faculty of Commerce).

129. Mohammed, J. I., Mensah, L., & Gyeke-Dako, A. (2017). Financial inclusion and poverty reduction in Sub-Saharan Africa. African Finance Journal, 19(1), 1-22.

130. Mothobi, O., & Grzybowski, L. (2017). Infrastructure deficiencies and adoption of mobile money in Sub-Saharan Africa. Information Economics and Policy, 40, 71-79.

131. Munyegera, G. K., & Matsumoto, T. (2016). Mobile money, remittances, and household welfare: Panel evidence from rural Uganda. World Development, 79, 127-137.

132. Mushongera, D., Zikhali, P., & Ngwenya, P. (2017). A multidimensional poverty index for Gauteng province, South Africa: evidence from Quality of Life Survey data. Social Indicators Research, 130(1), 277-303.

133. Must, B., & Ludewig, K. (2010). Mobile money: cell phone banking in developing countries. Policy Matters Journal, 7(2), 27-33.

134. Myeni, S., Makate, M., & Mahonye, N. (2020). Does mobile money promote financial inclusion in Eswatini?. International Journal of Social Economics, 47(6), 693-709.

135. Neely, A. H., & Ponshunmugam, A. (2019). A qualitative approach to examining health care access in rural South Africa. Social Science & Medicine, 230, 214-221.

136. Nhamo, G., Nhemachena, C., & Nhamo, S. (2019). Is 2030 too soon for Africa to achieve the water and sanitation sustainable development goal?. Science of the Total Environment, 669, 129-139.

137. Nnadozie, R. C. (2013). Access to basic services in post-apartheid South Africa: What has changed? Measuring on a relative basis. African Development Bank Group, Statistical Department.

138. Ntsalaze, L., & Ikhide, S. (2018). Rethinking dimensions: The South African multidimensional poverty index. Social Indicators Research, 135, 195-213.

139. Nyikahadzoi, K., Samati, R., Motsi, P. D., Siziba, S., & Adekunle, A. (2012). Strategies for improving the economic status of female-headed households in

eastern Zimbabwe: the case for adopting the IAR4D framework's innovation platforms. Journal of Social Development in Africa, 27(2), 59.

140. Okello Candiya Bongomin, G., Ntayi, J. M., Munene, J. C., & Malinga, C. A. (2018). Mobile money and financial inclusion in sub-Saharan Africa: the moderating role of social networks. Journal of African Business, 19(3), 361-384.

141. Okello Candiya Bongomin, G., Yourougou, P., & Munene, J. C. (2020). Digital financial innovations in the twenty-first century: Do transaction tax exemptions promote mobile money services for financial inclusion in developing countries?. Journal of Economic and Administrative Sciences, 36(3), 185-203.

142. Omar, M. A., & Inaba, K. (2020). Does financial inclusion reduce poverty and income inequality in developing countries? A panel data analysis. Journal of economic structures, 9(1), 37.

143. Omotoso, K. O., & Koch, S. F. (2017). Exploring child poverty and inequality in post-apartheid South Africa: A multidimensional perspective. Journal of Poverty and Social Justice, 26(3), 417–437

144. Paschall, K. W., Gershoff, E. T., & Kuhfeld, M. (2018). A two decade examination of historical race/ethnicity disparities in academic achievement by poverty status. Journal of Youth and Adolescence, 47, 1164-1177.

145. Posel, D., & Rogan, M. (2014). Measured as poor versus feeling poor: Comparing objective and subjective poverty rates in South Africa (No. 2014/133). WIDER Working Paper.

146. Ranieri, R., & Ramos, R. A. (2013). After all, what is inclusive growth?. International Policy Centre for Inclusive Growth (online document).

147. Rank, M. R. (2004). One nation, underprivileged: Why American poverty affects us all. Oxford University Press.

148. Richardson Jr, J. A., & London, J. K. (2007). Strategies and lessons for reducing persistent rural poverty: A social justice approach to funding rural community transformation. Community Development, 38(1), 92-107.

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

150. Rillo, A. D., & Levine, J. J. (2018). Leveraging remittance technologies for financial inclusion in Asia. LABOR MIGRATION IN ASIA, 3.

151. Rogan, M. (2016). Gender and multidimensional poverty in South Africa: Applying the global multidimensional poverty index (MPI). Social Indicators Research, 126, 987-1006.

152. Rogers, E. M. (1961). Bibliography on the Diffusion of Innovations. Department of Agricultural experiment station. Columbus, Ohio. Mimeo Bulletin, A.E 328.

153. Rosenbaum, P. R., & Rosenbaum, P. R. (2002). Overt bias in observational studies (pp. 71-104). Springer New York.

154. Sameti, M., Esfahani, R. D., & Haghighi, H. K. (2012). Theories of poverty: A comparative analysis. Arabian Journal of Business and Management Review (Kuwait Chapter), 1(6), 45-56.

155. Samuel, K., Alkire, S., Zavaleta, D., Mills, C., & Hammock, J. (2018). Social isolation and its relationship to multidimensional poverty. Oxford Development Studies, 46(1), 83-97.

156. Sekhampu, T. J. (2013). Determinants of poverty in a South African township. Journal of Social Sciences, 34(2), 145-153.

157. Sen, A. (1985). Commodities and capabilities. Amsterdam New York New York, NY.

158. Sen, A. (2000). Social exclusion: Concept, application, and scrutiny.

159. Sife, A. S., Kiondo, E., & Lyimo-Macha, J. G. (2010). Contribution of mobile phones to rural livelihoods and poverty reduction in Morogoro region, Tanzania. In *EJISDC* (Vol. 42). http://www.ejisdc.org

160. Silber, J. (2011). A comment on the MPI index. Journal of Economic Inequality, 9(3), 479.

161. Shams, M. K. (2009). Accelerating poverty reduction in Bangladesh through the Grameen family of companies. Building social enterprises as business ventures. Grameen Foundation Publication Series.

162. Sharpe, N. R. (2001). Statistics for management and Economics. The American Statistician, 55:4, 370-371.

163. Shy, O. (2010). Person-to-person electronic funds transfers: recent developments and policy issues. FRB of Boston Public Policy Discussion Paper, (10-1).

164. Shy, O. (2012). Account-to-account electronic money transfers: recent developments in the United States. Review of Network Economics, 11(1).

165. Spaull, N., & Kotze, J. (2015). Starting behind and staying behind in South Africa: The case of insurmountable learning deficits in mathematics. International Journal of Educational Development, 41, 13-24.

166. Statistics South Africa. (2012). Subjective Poverty in South Africa: Findings of the Living Conditions Survey 2009/2009.

167. Statistics South Africa. (2014). The South African MPI: Creating a multidimensional poverty index using census data. Pretoria: Statistics South Africa.

168. Statistics South Africa. (2022). Quarterly labour force survey: Pretoria. Statistics South Africa.

169. Stock, J. H., & Yogo, M. (2002). Testing for weak instruments in linear IV regression. National Bureau of Economic Research. Working Paper, 284.

170. Sukamolson, S. (2007). Fundamentals of quantitative research. Language Institute Chulalongkorn University, 1(3), 1-20.

171. Suri, T., & Jack, W. (2016). The long-run poverty and gender impacts of mobile money. Science, 354(6317), 1288-1292.

172. Suri, T., Aker, J., Batista, C., Callen, M., Ghani, T., Jack, W., Klapper, L., Riley, E., Schaner, S., & Sukhtankar, S. (2021). *Mobile Money*. https://run.unl.pt/bitstream/10362/128004/1/MM_VoxDev_LitRev.pdf

173. Tobbin, P., & Kuwornu J. (2011). Adoption of Mobile Money Transfer Technology: Structural Equation Modeling Approach

174. Tobbin, P. (2012). Towards a model of adoption in mobile banking by the unbanked: a qualitative study. info.

175. Turner, K., & Lehning, A. J. (2007). Psychological theories of poverty. Journal of Human Behavior in the Social Environment, 16(1/2), 57.

176. UNCAD. (2012). Mobile money for business development in the East African community.

177. United Nations Development Programme (2016). Human Development Report, New York: UNDP.

178. United Nations Development Programme (UNDP). (2019). Human development report 2019: Beyond income, beyond averages, beyond today: Inequalities in human development in the 21st century. UNDP.

179. Van der Berg, S. (2007). Apartheid's enduring legacy: Inequalities in education. Journal of African economies, 16(5), 849-880.

180. Vijaya, R. M., Lahoti, R., & Swaminathan, H. (2014). Moving from the household to the individual: Multidimensional poverty analysis. World Development, 59, 70-81.

181. Whisker, J., & Lokanan, M. E. (2019). Anti-money laundering and counter-terrorist financing threats posed by mobile money. Journal of Money Laundering Control.

182. Wolf, J. P. (2007). Sociological theories of poverty in urban America. Journal of Human Behavior in the Social Environment, 16(1/2), 41.

183. World Bank. (2000). World development report 2000/2001: Attacking poverty. The World Bank. https://documents1.worldbank.org/curated/en/673161468161371338/pdf/multi-page.pdf

184. World Bank. (2014). Global financial development report 2014: Financial inclusion (Vol. 2). World Bank Publications.

185. Wooldridge, J. M. (2010). Econometric analysis of cross section and panel data. MIT press.

186. Woolard, I., & Leibbrandt, M. (2006). Towards a Poverty Line for South Africa: Background Note. Southern African Labour and Development Research Unit, Cape Town.

187. Workneh, M. A., & Eshete, Z. S. (2021). Household level non-monetary poverty in Ethiopia and its driving factors: A multidimensional approach with panel estimation. Social Indicators Research, 154, 145-168.

188. Yu, D., Roos, P., & Barker, F. S. (2018). Frans Barker's The South African Labour Market. Van Schaik Publishers.

189. Zhang, Y., Lin, N., & Li, T. (2012). Markets or networks: Households' choice of financial intermediary in Western China. Social Networks, 34(4), 670-681.

Appendix A

TABLE OF DESCRIPTIONS					
Variable	Obs	Mean	Std. dev.	Min	Max
Location	4995	.190991	.3931213	0	1
Age	4995	2.162162	1.019891	0	4
Gender	4995	.5673674	.4954905	0	1
Number in household	4995	2.879279	1.744618	1	15
No access - Social	4995	.9371371	.2427404	0	1
No access - Medical	4995	1.264865	.5303341	1	3
Marital Status	4995	.6192192	.4856274	0	1
Education	4995	1.054855	.2574364	1	3
Employment	4995	.2158158	.4114283	0	1
Race	4995	.750951	.4325056	0	1
MMadoption	4995	1.261662	.7011359	0	4
Instrument	4995	.1961962	.5267623	0	5
Multidimentional Poverty	4995	.299159	.4579355	0	1