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Essays on financial inclusion and mobile banking

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Declaration

Yr wyf drwy hyn yn datgan mai canlyniad fy ymchwil fy hun yw'r thesis hwn, ac eithrio lle nodir yn wahanol. Caiff ffynonellau eraill eu cydnabod gan droednodiadau yn rhoi cyfeiriadau eglur. Nid yw sylwedd y gwaith hwn wedi cael ei dderbyn o'r blaen ar gyfer unrhyw radd, ac nid yw'n cael ei gyflwyno ar yr un pryd mewn ymgeisiaeth am unrhyw radd oni bai ei fod, fel y cytunwyd gan y Brifysgol, am gymwysterau deuol cymeradwy.

I hereby declare that this thesis is the results of my own investigations, except where otherwise stated. All other sources are acknowledged by bibliographic references. This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree unless, as agreed by the University, for approved dual awards.

Dedication

Nadine Cassirer

Thank you for your friendship and inspiration

For Patrick

With all my love

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Abstract

This dissertation examines the long-term effects of state interventions to address financial exclusion and explores the use of technology as a means of addressing this phenomenon. The first chapter traces the origins of financial inclusion and explores the role of the state in assisting 'unbanked' individuals. This includes documenting the long-term nature of technological innovations that transformed retail finance and which have subsequently been used to address financial exclusion. The case of the world-recognised mobile payment service, M-Pesa, credited with transforming access to financial services in Africa, adds to the literature on the state as an entrepreneur. The empirical results suggest that the state was actively involved in the development and deployment of applications of information and communication technologies that led to M-Pesa, a service which extends access to retail financial markets to the previously unbanked.

The second chapter uses a large data set of repeat household surveys undertaken over a ten-year period in South Africa to empirically assess the individual determinants of financial inclusion. The econometric findings suggest that, for the case of South Africa between 2005 and 2014, the most significant factors associated with financial inclusion were income, education and age. This chapter also documents the significant impact of policy interventions on the long-term access to financial services in South Africa. The findings suggest that the likelihood of being banked increased over the period of the study.

There is growing interest in the potential for mobile banking technologies to reach the unbanked population in Sub-Saharan Africa, a region where large portions of the population have access to a mobile phone but remain outside of the financial system. However, the factors driving mobile banking adoption remain unclear. The third chapter examines the influence of socio-demographic and cultural factors over time, on the intention to use mobile banking. The findings of this chapter suggest that income, education and institutional trust have a significantly positive effect on the behavioural intention to adopt mobile banking. The findings of this dissertation suggest that the state played an active role, both in advancing financial inclusion and in the use of technology to provide financial services to the unbanked population.

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INTRODUCTION

Background

Media articles and newspaper headlines are reporting how we are moving towards a cashless society (High, 2019; Leonards, 2019; Mead, 2019). This shift is partly due to the financial industry driving the use of digital payments as well as moves by many governments to encourage cashless payments (Del Angel, 2016). There are many economic benefits associated with a cashless society such as the efficiencies afforded by the electronic processing of transactions, reduced risk of fraud and cost-savings of processing digital payments rather than notes and coins (Garcia-Swartz, Hahn & Layne-Farrar, 2006). However, there are concerns that a move towards a cashless society could result in higher costs for merchants and could also raise privacy concerns as a digital trail is created for each digital transaction (Del Angel, 2016). A cashless society could also exclude individuals who do not have easy and affordable access to electronic means of payment (European Commission, 2008). Wider acceptance of digital payments depends on trust between the vendor and the customer that the transaction will be processed securely and that the security of the transaction will be maintained (Gefen, 2000; McKnight, Choudhury & Kacmar, 2002).

The idea of a cashless society is far from a new concept (Bátiz-Lazo, Haigh & Stearns, 2014). Authors of utopian thought such as Thomas More (1478-1535), Robert Owen (1771-1858) and Edward Bellamy (1850-1898) promoted a move away from cash by highlighting society's dependence on money and its negative impact on society (Hollow, 2012). In the early twentieth century, cheques and later debit and credit cards became widespread as an alternative to cash.

The popularity of cheques was evidenced by the estimated 22 billion cheques in circulation in the United States (US) alone in the mid-1960s (Lee, 1967). However, banks, particularly in Europe and the US, came under growing pressure to process and clear these large numbers of cheques in circulation. Banks were thus facing increasing staff, transport and printing costs. A number of studies claim that the prime motivation to automate banking was to find a way of addressing this significant increase in the number of cheques to be cleared (Bátiz-Lazo, 2018; Bátiz-Lazo & Wood, 2002; Bonin, 2004; Cortada, 2006). Mainly motivated by cost-saving, banks in the US and the Federal Reserve Bank looked to technological advances to reduce the time it took to process the cheques (Bátiz-Lazo *et al.,* 2014).

Technological advances included cash counting machines and the automation of the back-office function of the banks (Bátiz-Lazo & Wood, 2002). Banks in the US and Sweden were the earliest adopters of computers in the mechanisation of cash counting (Bátiz-Lazo *et al.,* 2014). These banks were trying to address overcrowding in bank branches as well as pressure from increasingly unionised workforces resisting Saturday morning working hours (Bátiz-Lazo, 2018). France introduced mechanised counting equipment as early as the 1920s, and by the 1950s, had adopted accounting machines (Bonin, 2004).

Further product innovations resulted in the issue of a credit card by Diners Club that allowed users to pay for meals at any participating restaurant in 1950. Shortly afterwards, the Bank of America issued a credit card that could be used for all payment purposes (Finchler, 1993). The use of cards grew rapidly in the mid-1960s thanks to the introduction of the debit card in mid-1970s (Bátiz-Lazo *et al.,* 2014). In the late 1960s commercial banks, and later savings banks in the UK, introduced Automatic Teller Machines (ATMs) to reduce high administrative costs (Bátiz-Lazo *et al.,* 2014). With the introduction of ATMs, cardholders could perform routine transactions such as withdraw and deposit cash, request balance enquiries, make transfers and process payments. This allowed banks to offer 24-hour banking services without the need for new branches or additional staff. The spread of ATM networks with real-time processing facilities was a key element in the subsequent introduction and expansion of Electronic Funds Transfers (EFTs) in the 1970s (Bátiz-Lazo, 2018). Through EFTs, banks were able to move away from costly, paper-based transactions. In the 1980s there were significant changes in retail banking and during this period, there was widespread diffusion of ATMs both in and across nations (Bátiz-Lazo, 2018).

After the introduction of debit cards, new cards were issued in the early 2000s based on technological advances such as wireless networks using Near Field Communication (NFC). The NFC is a form of contactless communication between devices such as smartphones or tablets facilitating contactless communication. The user is able to wave the device over an NFC-compatible device to send through the payment information wirelessly. Another successful contactless smart card was the Octopus card, launched in 1997 in Hong Kong and used mainly to pay for passenger transport (Au & Kauffman, 2008). By 2001, this card achieved 70% penetration among the residents of Hong Kong and can be regarded as one of the most successful electronic payment systems in the world (Ondrus & Pigneur, 2006). In London, the Oyster card was launched in 2003 and has been successful as a contactless smart card for making payments for public transport (Bodhani, 2011). Visa payWave was launched in 2007 as a debit or credit card using NFC (Pornwasin, 2014).

The global adoption and growth of mobile banking

From the emergence of the commercial internet in the early 1990s, there was speculation as to the future role of mobile telephones and internet banking in economies. Advances in mobile technology have resulted in the global adoption of smartphones and mobile applications which in turn, have driven innovations in mobile financial services (Liu, Kauffman & Ma, 2015). Mobile phones are able to store personal information which facilitates their use as a payment instrument. Furthermore, existing telecommunication billing systems can facilitate the processing of micropayments and mobile phones had already been used as a payment device in simple transactions such as downloading ringtones or purchasing data (Mallat, 2007).

Mobile payments can be defined as paying for goods, services or bills by using a mobile device connected to wireless and other communications technologies (Dahlberg, Mallat, Ondrus & Żmijewska, 2008). The mobile device is thus used to initiate, authorise and confirm the exchange of financial value for goods or services (Au & Kauffman, 2008). More recently, mobile payments have been defined in greater detail as "the use of an NFC enabled mobile device or a contactless card on a SIM to conduct payment in a proximity setting by connecting to a server, perform authentication and authorization, make a payment, initiate accounting and finally, confirm the completed transaction" (de Reuver, Verschuur, Nikayin, Cerpa & Bouwman, 2014, p. 332).

Mobile payments are convenient and easy to use for customers. Mobile network operators are able to provide the network infrastructure to facilitate mobile payments and are best placed to provide the data, bill clients for purchases and settle payments with merchants (Ondrus & Pigneur, 2006). This has resulted in mobile network operators providing financial services to their customers – services which were previously only offered by financial institutions. It has also provided opportunities for financial institutions to enter into partnerships with mobile network operators to provide financial services (Au & Kauffman, 2008).

Mobile payments can be regarded as a new payment network; as with other payment networks, obtaining critical mass is crucial for the future success of mobile payments. Payment technologies exhibit network externalities which are a relevant factor in mobile payment adoption (Economides, 1996). A consumer's decision to adopt a new payment technology is largely dependent on the number of merchants that accept the given payment method. Similarly, the more customers using a particular technology, the more

merchants are likely to accept the payment method. Thus, the success of customer adoption of mobile payment technology is dependent on both the perceived number of merchants and the number of customers.

The business process related to the use of mobile payments involves many different stakeholders and has a complex ecosystem. It can broadly be grouped into six sets of market participants, namely, (i) card schemes, (ii) mobile operators, (iii) retailers, (iv) device suppliers, (v) service providers and (vi) trusted service managers (to manage the contractual and technical connections between these participants) (Kemp, 2013). However, banks and mobile network operators each have their own specific strategic goals, business models and ways of doing business which makes collaboration more challenging (De Reuver *et al.,* 2014).

The widespread use of mobile payment technologies has been gradual in many countries (Żmijewska, Lawrence & Steele, 2004) and the extent to which customers use mobile devices to make payments differs from country to country. The results of the 2012 Global Mobile Money Adoption Survey revealed that 150 mobile money systems in 72 countries have been deployed (Pénicaud, 2013). Barriers to the success of mobile technologies include security concerns relating to the loss of data and personal information coupled with the reluctance of customers to adopt new technologies.

Innovations in payment technologies have seen the rise (and fall) of many online payment service providers as well as mobile payment service providers. The success of PayPal, an online service provider and the emergence of other similar providers, has further stimulated the growth of non-cash payments. More recently, companies such as Square, Softcard, Google, PayPal and Apple Pay have developed innovative payment services using mobile technology (Liu *et al.,* 2015).

In Africa, mobile money has been most widely adopted in Kenya. It was estimated that by 2012, 60% of the GDP of Kenya would move through mobile money (Pénicaud, 2013). This was mainly as a result of the 2007 launch of M-Pesa by Kenya's largest mobile network provider, Safaricom. M-Pesa is a mobile money product which facilitates person-to-person transfers through the use of mobile phones. As the population is spread throughout large parts of Kenya, the M-Pesa system allows users to transfer money via a Short Message Service (SMS) to another, without having to physically transfer the cash (saving on time, transport and lowering the risk of theft). As this system makes use of SMS technology, it provides a wide range of users with access to this technology as only a basic hand-held device is needed. The use of mobile technology greatly reduces the cost of sending money over large distances and provides certainty of

process and without the physical risk of theft (Jack & Suri, 2011). The M-Pesa system also includes agents dispersed around the country who convert e-money into currency and vice versa.

In emerging economies, mobile money is used as an alternative means of accessing financial services rather than going through formal financial institutions. In several countries, there are more mobile money accounts than bank accounts (GSMA, 2015). Mobile money is thus seen as a way of increasing financial inclusion by providing a variety of financial services to the previously unbanked. Financial inclusion policies aim to expand access to formal financial services to the broader population (Burns, 2018). The provision of a broad range of financial services at an affordable cost to the disadvantaged and low-income segments of society can result in economic benefits by allowing them to increase their income and the probability of being employed (Bruhn & Love, 2014). Governments and policymakers are increasingly recognising the importance of financial inclusion for long-term economic growth (Allen, Demirgüç-Kunt, Klapper & Peria, 2016; Demirgüç-Kunt, Klapper, Singer & Van Oudheusden, 2015).

Dissertation structure

This dissertation consists of three working papers (Chapters 1 to 3) written in such a way that they can be submitted to journals for publication.

Chapter 1: ***All about the state: Fifty years of innovative technology to deliver an inclusive financial sector***

Chapter 1 discusses the early financial inclusion initiatives undertaken as part of broader activities to address poverty as well as the role that the state in developing and using technology. The chapter elaborates on the historical origins of the drive towards financial inclusion and how this movement gained momentum in the 1990s. The role of technology in opening up access to financial services to the previously unbanked is also examined.

Chapter 2: ***Ethnicity, gender and public policy as determinants of financial inclusion in South Africa***

Financial exclusion is pronounced in Sub-Saharan Africa and there are limited studies on the individual determinants of financial inclusion in the region (Chikalipah, 2017). Chapter 2 identifies some of the key individual determinants of financial inclusion and assesses the long-term impact of policy interventions in South Africa through a longitudinal study.

Chapter 3: ***Trust matters: Insights into mobile banking adoption in Sub-Saharan Africa***

There is growing interest in the potential for mobile banking technologies to reach the unbanked population, particularly in Sub-Saharan Africa. As there is a high penetration of mobile phones in Sub-Saharan Africa, it is hoped that mobile phones can facilitate access to financial services for the previously unbanked. Consequently, Chapter 3 identifies some of the key individual determinants of mobile banking adoption. This will assist policymakers to determine the characteristics of mobile banking users in order to target interventions to non-adopters of mobile banking as a way of reaching the unbanked. This chapter also determines whether customers trust banks and whether this trust influences their intention to adopt mobile banking. Lastly, the chapter assesses whether the factors affecting mobile banking adoption change over time.

Financial exclusion and mobile banking

The concept of financial exclusion originated in the financial literature mainly due to concerns about the limited financial services resulting from the closure of many bank branches (European Commission, 2008). The notion was initially centred on exclusion from financial services due to lack of access to formal bank accounts and the proximity of bank branches. Subsequently, the concept of financial exclusion was broadened to include a number of factors, as indicated below by Kempson, Whyley, Caskey and Collard (2000, p. 9):

- Access exclusion: Access to financial products is restricted by the processes used to conduct risk assessments;
- Condition exclusion: Some financial products have conditions attached which make these products inappropriate for the requirements of certain people;
- Price exclusion: The prices associated with financial services are not affordable for certain people;

- Marketing exclusion: Certain segments of the population are excluded through the use of targeted marketing and sales;
- Self-exclusion: A number of individuals exclude themselves from formal financial services as they assume that they will be refused access (based on previous experience or experiences of people with similar circumstances).

More recently, the term 'financial *inclusion'* has been used to denote ways of addressing financial exclusion. Financial inclusion refers to the process of facilitating access to formal financial services. The World Bank (2019a) describes financial inclusion as follows: "Financial inclusion means that individuals and businesses have access to useful and affordable financial products and services that meet their needs – transactions, payments, savings, credit and insurance – delivered in a responsible and sustainable way". The notion of financial inclusion has evolved from initial concerns regarding the lack of access to bank accounts to incorporating a broader understanding of both financial and social inclusion. There are, however, limited studies exploring early initiatives to address financial inclusion before the 1990s, when the movement became recognised by policymakers and non-governmental organisations. Chapter 1 examines this topic as well as exploring the role of the state in leveraging technology to curb financial exclusion.

Globally, financial exclusion remains high, with approximately 1.7 billion individuals around the world who remain outside formal financial services (Demirgüç-Kunt *et al.,* 2018). The International Monetary Fund (IMF) has recognised that an effectively functioning financial sector can have a long-lasting effect on reducing income inequality and has outlined plans for the new decade to create a more inclusive financial sector (Georgieva, 2020). There is, however, a debate about which policies would be most effective in addressing financial inclusion, especially in emerging markets (Burns, 2018). More information is therefore needed on the individual characteristics of who uses financial services to provide context to the exclusion (Fungáčová & Weill, 2014; Klapper & Singer, 2015). Table 1 lists key studies on the individual determinants of financial inclusion.

Table 1 Studies on individual determinants of financial inclusion

Author/(s)	Data collection	Methodological approach	Location	Time frame	Key determinants
Kempson & Whyley (1999)	Family Resources Survey 87 interviews	Regression analysis Thematic analysis	United Kingdom (UK)	Single point	Area Employment status Income
Hogarth, Anguelov & Lee (2005)	Federal Reserve Board's Survey of Consumer Finances	Multivariate logistic regression	United States (US)	Multiple: 1989, 1992, 1995, 1998, 2001	Age Education Ethnicity Income
Beck & Brown (21)	EBRD's Life in Transition Surveys (LITS)	Probit regression analysis	28 transition countries and Turkey	Multiple: 2006 and 2010	Area Education Gender Household size
Honohan & King (2012)	FinScope Surveys	Probit regression analysis	Various countries in SSA	Single	Age, Area Education Income
Fungáčová & Weill (2014)	Global Findex Survey	Probit regression analysis	China	Single	Age Education Gender Income
Klapper & Singer (2015)	Global Findex Survey	Multinomial logit and probit regression analysis	Cross-country	Single	Education Gender Income
Allen, Demirgüç-Kunt, Klapper & Peria, (2016)	Global Findex Survey	Probit regression analysis	Cross-country	Single	Age, Area Education Employment Gender Income
Wentzel, Diatha & Yadavalli, (2016)	Household survey	Logistic regression analysis	South Africa	Single	Age Education Income
Zins & Weill (2016)	Global Findex Survey	Probit regression analysis	Cross-country (Africa)	Single	Age, Education Gender Income
Asuming Osei-Agyei & Ibrahim, (2019)	Global Findex Survey, Heritage Foundation data	Probit regression analysis	Cross-country (SSA)	Multiple: 2011 and 2014	Age Education Gender Income

The findings of the studies in Table 1 indicate that there are individual, social and demographical characteristics associated with financial inclusion. The findings of these studies suggest that income, education and age are key determinants of financial inclusion. Several studies have also suggested that gender influences the likelihood of financial inclusion (Allen *et al.,* 2016; Fungáčová & Weill, 2014; Klapper & Singer, 2015; Zins & Weill, 2016).

A number of these studies were conducted in one country or across countries at a single period (Allen *et al.,* 2016; Demirgüç-Kunt *et al.,* 2015; Fungáčová & Weill, 2014; Honohan & King, 2012; Kempson & Whyley, 1999; Wentzel *et al.,* 2016; Zins & Weill, 2016). Research also suggests that the majority (90%) of the financially excluded were in emerging economies (Alliance for Financial Inclusion, 2018). This particular finding informed Chapter 2 of the present study, which examines the determinants of financial inclusion in an emerging economy in Sub-Saharan Africa across time.

The importance of financial development for long-term economic growth has been recognised by policymakers around the world and the topic of financial inclusion is now dominating policy and research (Beck & Cull, 2013). Furthermore, there are limited empirical studies that have documented trends in financial inclusion over time that could assist policymakers to identify where policy interventions are required (Asuming *et al.,* 2019). Chapter 2 explores the implications of long-term financial inclusion policy by using longitudinal data obtained from household surveys over a ten-year period (2005 – 2014). The study, therefore, sheds light on the long-term determinants of financial inclusion.

The growing interest in mobile banking as a means of addressing financial exclusion informs Chapter 3. Although the adoption of mobile phones has grown exponentially, the adoption rate of mobile banking has not followed suit (Malaquias, Malaquias & Hwang, 2018). Chapter 3 explores the individual determinants of mobile banking adoption in Africa and, by scrutinising multiple periods, is able to assess whether these factors change over time. Table 2 outlines previous studies on the individual determinants of electronic and mobile banking adoption.

Table 2 Studies on the individual determinants of electronic and mobile banking adoption

Author/(s)	Data collection	Methodological approach	Location	Time frame	Key determinants
Lee & Lee (2000)	Consumer Finances Surveys	Logistic regression analysis	US	Single	Age, Education, Ethnicity, Income
Lee, Lee & Schumann (2002)	Consumer Surveys	Analysis of variance and multinomial logistic regression analysis	US	Single	Age, Education, Income
Kolodinsky, Hogarth & Hilgert (2004)	Consumer Surveys	Ordered probit regression analysis	US	Multiple: 1999, 2003	Age, Education, Ethnicity Income
Laforet & Li (2005)	Structured questionnaire	Chi-square and independent t-tests	China	Single	Gender Income
Laukkanen, Sinkkonen, Kivijärvi & Laukkanen (2007)	Internet survey	Independent t-tests	Finland	Single	Age, Gender, Income
Laukkanen & Pasanen (2008)	Internet survey	Logistic regression analysis	Finland	Single	Age, Gender
Sohail & Al-Jabri (2014)	Survey questionnaire	Analysis of Variance	Saudi Arabia	Single	Age, Education, Gender, Nationality, Occupation
Kikulwe, Fischer & Qaim, 2014)	Interviews and structured questionnaires	Probit regression analysis	Kenya	Multiple: 2009, 2010	Age Education, Land ownership
Arvidsson (2014)	Consumer survey and interview	Regression analysis	Sweden	Single	Age, Income
Zins & Weill (2016)	Global Findex Survey	Probit regression analysis	Cross-country (African countries)	Single	Age, Education, Gender, Income

The studies outlined in Table 2 identify the key individual determinants of electronic/mobile banking adoption. The findings suggest that the key determinants of mobile banking adoption are income, age and

education. Several studies also suggest that ethnicity (Kolodinsky *et al.,* 2004; Lee & Lee, 2000) and gender (Laforet & Lee, 2005; Laukkanen & Pasanen, 2008; Zins & Weill, 2016) influence the adoption of electronic and mobile banking.

Many studies on the adoption of electronic and mobile banking use static cross-sectional data (Arvidsson, 2014; Gu *et al.,* 2009; Laforet & Li, 2005; Laukkanen *et al.,* 2007; Laukkanen & Pasanen, 2008; Lee *et al.,* 2002; Lee & Lee, 2000; Sohail & Al-Jabri, 2014; Zins & Weill, 2016). This finding informed Chapter 3 which assesses the determinants of mobile banking adoption, determining whether these factors change over time. Furthermore, there has been extensive research on the role of trust, privacy and security beliefs and their effect on behavioural intention, specifically towards electronic technologies (Mcknight *et al.,* 2002; Gefen, Karahanna & Straub, 2003). Chapter 3 adds to the body of literature on institutional trust and its effect on the behaviour intention to adopt mobile banking (e.g. Arvidsson, 2014; Gu *et al.,* 2009). The chapter also provides insights into the individual determinants of mobile banking and the underexplored role of ethnicity in mobile banking adoption. Furthermore, by utilising multiple data points, highlights long-term factors in mobile banking adoption (e.g. Kikulwe, Fischer & Qaim, 2014; Kolodinsky *et al.,* 2004).

Summary

This introduction has sketched the background to the dissertation and discussed the broad literature on cashless innovations, the move towards financial inclusion and the role of the state in financial inclusion initiatives. The individual determinants of financial inclusion and mobile banking adoption were also discussed. The structure of the dissertation, composed of three working papers, was also explained. Each chapter contributes to research and practice in the fields of financial inclusion and the potential for financial technology to be used as a tool to reach the unbanked.

CHAPTER 1

All about the state: Fifty years of innovative technology to deliver an inclusive financial sector

Abstract

This chapter documents the long-term nature of technological innovations which have transformed retail finance and addressed financial exclusion. The chapter also contributes to the body of literature on the state as an entrepreneur. The roots of financial inclusion are traced back to the 1960s with a discussion of the role played by the state, in contrast to that of the private sector and disruptive innovation. The case of the world-recognised mobile payment service M-Pesa is then examined. This service, aimed at expanding access to retail financial markets to the previously 'unbanked', is credited with transforming access to financial services in Africa.

The empirical results suggest that the state was actively involved in the development and deployment of applications of information and communication technologies which led to M-Pesa. This study provides support for policies that promote mobile banking technology as a means of enhancing financial inclusion. The study also confirms that public-private partnerships, together with an enabling regulatory environment, facilitate technological innovation.

Keywords: Disruptive technology, financial inclusion, innovation, state as an entrepreneur, Kenya

JEL Codes: G20, H70, L30, O31, N0

1.1 Introduction

Conventional wisdom credits the private sector as the sole driver of the technological innovations used to address financial exclusion (Mendoza, 2007; U.S. Chamber of Commerce Foundation, 2015). This view, however, disregards the efforts by local and national governments, supranational organisations, social activists and non-government organisations to transform financial systems across the world to become more financially inclusive. In this chapter, it is argued that the state has played a vital role in the development of the technological innovations used to foster financial inclusion.

An inclusive financial sector provides the vast majority of households and micro and small enterprises with access to a broad range of financial services while ensuring access to these services over time (Imboden, 2005). Early financial inclusion dates back to the 1960s to initiatives launched by the US Federal government. These formed part of L.B. Johnson's (1963-1969) broader policy interventions to address poverty and ethnic discrimination. Regulatory change that characterised the 1980s saw a number of countries adopting similar legislation to those described above in the US. However, these initiatives mainly addressed the right of low-income individuals to have access to a cheque account.

The financial inclusion movement gained prominence in the 1990s when it expanded to include people with physical disabilities. Since then, financial inclusion has become associated with technological applications as a way of reducing poverty (Chibba, 2009; Hinson, 2011). The innovations used to address financial exclusion have been attributed to firms as diverse as infrastructure providers and mobile network operators (Demirgüç-Kunt *et al.,* 2018; Maurer, 2011; Okello, Bongomin, Ntayi & Munene, 2018), financial technology (fintech) start-ups (e.g. Gabor & Brooks, 2017; Jagtiani & Lemieux, 2017) and to a lesser extent, deposit-accepting financial institutions (Mullan, Bradley & Loane, 2017; World Bank, 2019b). These innovations, especially mobile banking, are described as disrupting the traditional banking sector and allowing consumers access to financial services, even in areas where bank service penetration is low (Schmidthuber, Maresch & Ginner, 2018).

This narrative of innovation and disruptive technology perpetuates the perception of the private sector as the source of long-term economic development. At the same time, it minimises the state's role of providing the finance, the right environment and, in some instances, active involvement in the development of technologies and their application, which have succeeded in reducing financial exclusion.

This chapter provides evidence that the state has played a pivotal role not only in promulgating a legislative framework but also in the development of technological innovations for financial inclusion.

These efforts of the state are explored in line with the contributions of Freeman and Duvall (1984), Leslie (2000), Bergquist and Söderholm (2011), MacKenzie (2018) and the recent contributions of Mazzucato (2011, 2014) on the entrepreneurial state. Empirical support emerges from a reinterpretation of public sources (such as newspaper articles, policy papers, reports by consultants and systematic studies by academics) and in particular, the narrative around the disruption of Kenyan retail financial services by M-Pesa.

The rest of this chapter is organised as follows: Section 1.2 discusses the concepts of disruptive and state-led innovations. Section 1.3 outlines the historical development of financial inclusion while Section 1.4 explores the technological innovation behind one of the world's most successful mobile payments services, M-Pesa. Section 1.5 summarises the findings and offers suggestions for future research.

1.2 About disruptive and state-led innovation

Several reasons can be put forward for the seeming dominance of the private sector in developing innovations. On the one hand, there was criticism of inadequate financial support from state institutions in the late 1970s and the resultant low rate of new business formation in the US (Fenn, Liang & Prowse, 1997). At around the same time, similar criticisms were levelled at UK state institutions and commercial banks (e.g. Coopey & Clarke, 1995; Bátiz-Lazo & Wardley, 2007).

On the other hand, there is the so-called 'neoclassical economics school of thought'. This is usually characterised by a combination of the following features: emphasis on rationality and utility maximisation, emphasis on market equilibrium and neglect of strong kinds of uncertainty, particularly fundamental uncertainty (Dequech, 2007). This school of thought posits that competition leads to an efficient allocation of resources within an economy, with the forces of supply and demand creating market equilibrium. Proponents of this approach view the state's involvement in markets as 'fixing a market failure' (Lazonick & Mazzucato, 2013). This rationale stems from the idea that the state is not active in the market in the first place, but rather businesses and other organisations undertake the bulk of economic activity. However, throughout the 20th century, governments have taken an active role in creating industries, technologies and markets (MacKenzie, 2018; Mazzucato, 2014).

Lazonick (2007) points to the active role of the state in developing the capabilities of the future labour force through its investments in federal, corporate and university research laboratories, and through

educational institutions. These investments augment the productive power of the economy through the creation of new knowledge while business enterprises have made ample use of this knowledge and capability. In the case of the US, state agencies (as opposed to state-owned enterprises) stemming from the New Deal created projects and stimulated innovation through political and financial prioritising (Scranton, 2006). The New Deal was a series of programs, public work projects, financial reforms, and regulations to address the needs for relief, reform, and recovery from the Great Depression. Freeman and Duvall (1984) suggested that the scope of the state's involvement in production extends beyond market regulation, defence and the provision of infrastructure, to engaging directly in the production of capital and consumer goods.

A number of systematic studies have indeed explored the role of the state in the genesis and financing of innovations. In his seminal work, Leslie (2000) documented the military's role (intentional or otherwise) in creating and sustaining Silicon Valley and how this contribution had been largely overlooked in most accounts of the Valley's success. Silicon Valley has since become recognised worldwide as a powerhouse of innovation and business creation (Engel, 2014). For their part, Block and Keller (2009) contend that 77 (88%) of the 88 most important innovations (as rated by R&D's annual awards) in the US between 1971 and 2006 had been fully dependent on the support of the federal government. This was especially the case during the early years of that period. The remaining 11 (12%) of the top innovations were not subject to federal funding but relied entirely on investments by the private sector.

However, the contributions of Mazzucato (2011, 2014) stand out in placing the state as a key actor in the process of innovation. Mazzucato (2011) asserted that the state plays an active role in the development of innovation, contrary to a Keynesian emphasis on taxation, subsidies, spending and regulation; or Schumpeter's emphasis on creating the 'right conditions' for innovation and growth. Mazzucato (2014) documents several case studies, shedding light on how public sector institutions initially funded all of the technologies that made Apple's i-products (iPhone, iPad, etc.) 'smart', namely, the Internet by the Defense Activated Research Projects Agency (DARPA), the global positioning system (GPS) by the US Navy, the touchscreen display by the Central Intelligence Agency (CIA) and the voice-activated personal assistant, Siri, also by DARPA. In short, Mazzucato (2014) suggests that the state assumed the role of an entrepreneur in many key innovations of the late 20th and early 21st centuries.

Alongside these affirmations of innovation, a growing number of studies have criticised the excessive interest in the 'white heat' moment of innovation as opposed to the greater use of resources in keeping machinery and infrastructure running (Russell & Vinsel, 2016). Examining this debate in greater detail is

beyond the scope of this study. Suffice to say that innovations are broadly classified as either incremental (continuous) or radical (discontinuous), depending on the degree of change associated with the innovation (Ettlie, Bridges & O'Keefe, 1984). The process of incremental innovation development relates to product improvements, upgrades and line extensions, reinforcing the existing capabilities of the organisation (Ettlie *et al.,* 1984; Veryzer, 1998). In contrast, radical innovation development relates to fundamental changes in the activities of an organisation, industry or society and represents a clear departure from existing practices (Bátiz-Lazo & Woldesenbet, 2006; Veryzer, 1998). Since the mid-1990s, research of radical innovations has been increasingly explored using the terminology of 'disruptive innovations' (Kilkki, Mäntylä, Karhu, Hämmäinen & Ailisto, 2018).

The term 'disruptive innovation' [1] or 'disruptive technology' was coined by Joseph Schumpeter (1883-1960). As noted by McCraw (2007), Schumpeter's appointment to Harvard in 1932 opened up an avenue for Austrian ideas on disequilibrium and business cycles into mainstream economic thought (which had, and to some extent continues to be, dominated by Marshallian ideas of market equilibrium). Schumpeter went further and became one of the first scholars to systematically explore the role of new, technology-based firms in causing economic growth and development.

In 1942, the concept of 'creative destruction' was formalised as a process "that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one" (Schumpeter, 1942, p. 83). Schumpeter's (1942) ideas on creative destruction posited that innovation causes market dislocations. This allows for the rise of new firms and the corresponding decline of the large incumbent firms whose leadership positions they assume (Spencer & Kirchhoff, 2006). The role of the entrepreneur was to disturb the equilibrium. However, new technology is only possible if there is access to credit and financing, emphasising the importance of financial markets (Gaffard, 2008).

It is beyond the scope of this study to provide full details of the genealogy of 'creative destruction'. Suffice to say that Christensen (1993) and shortly after, Bower and Christensen (1995), further developed the concept while analysing the failure of businesses to stay abreast when technology or markets changed. They argued that this process emanated from "disruptive technologies" (p. 45), claiming that customers have an important role in directing the activities of management, especially in the development of new technologies. However, by placing excessive reliance on the needs and perceived needs of their customers, existing incremental technologies may be favoured over disruptive ones. Companies that do

[1] In this study, there is no systematic distinction between 'disruptive innovation' and 'disruptive technology'.

not invest in disruptive technologies risk being blindsided by new emerging technological innovations. Managers will thus be unable to 'catch the wave' of these new technologies and will see their companies fail.

Christensen (1997) popularised the widespread use of terminology around 'disruptive innovation'. He explored in detail the reasons for the failure of respected and well-managed companies. Christensen (1997) maintained that by focusing on their main customers and seeking their opinions before investing in new technologies, managers ran the risk of ignoring rivals with disruptive technology. This is because, according to Christensen, a disruptive innovation introduces new devices or ways of doing things, effectively offering a new performance package. This process frequently redefines market boundaries and creates new customer groups. The technology, he continues, initially underperforms in existing ways of doing things in terms of the primary performance dimension of the products valued by main customer groups. In other words, in the early stages, the new technology only finds application and consumer interest in niche markets. Some examples of this would be the personal computer which was regarded as the preserve of hobbyist in the 1970s, before the launch of Apple II (1977) or the IBM PC (1981). Over time, this disruptive innovation improves on the primary dimension to the extent that it eventually appeals to mainstream customers and displaces the incumbent technologies as well as firms whose business model and value chain are geared to the outgoing technologies (Adner, 2002). A prime example is the launch of Windows 95 (1995) for the personal computer.

As mentioned above, Christensen's ideas received widespread acclaim over the years, with Google's N-Gram Viewer suggesting the point of inflection came in 2001[2]. Citations of both popular press and academic articles also suggest a steep upward trend from 2001 (Christensen, McDonald, Altman & Palmer, 2018). Soon, the term 'disruptive innovation' became common in all sorts of publications, with a quick search by Google estimating over 40 million online documents using it in 2019.[3] Indeed, some universities even offer modules in disruption studies.[4]

[2] See: https://books.google.com/ngrams/graph?content=disruptive+innovation&year_start=1990&year_end=2008&corpus=0&smoothing=3&share=&direct_url=t1%3B%2Cdisruptive%20innovation%3B%2Cc0#t1%3B%2Cdisruptive%20innovation%3B%2Cc0. Accessed 18 August 2019.

[3] See: https://www.google.com/search?client=firefox-b-d&q=disruptive+innovation. Accessed 8 August 2019.

[4] For example: the *London School of Economics'* "Cryptocurrency and Disruption", retrieved 18 August 2019 from http://www.lse.ac.uk/study-at-lse/Online-learning/Courses/Cryptocurrency-Investment-and-Disruption; *The Saïd Business School's* "The Oxford Digital Marketing: Disruptive Strategy Programme", retrieved 18 August 2019 from

For all their fame and common use, Christensen's ideas on disruptive innovation have since come under fire (King & Baatartogtokh, 2015; Markides, 2006; Schmidt & Druehl, 2008; Weeks, 2015). Christensen already admitted that the term was often loosely applied to explain the concept of innovation, particularly when explaining any industry shake-ups (Christensen, Raynor & McDonald, 2015). However, it was Lepore's (2014) article in *The New Yorker*, in which Christensen's ideas were heavily criticised, that drew widespread international attention to the topic (e.g. Bennet, 2014; Hill, 2014; Krugman, 2014). Yet regardless of criticism in systematic studies or the media, few terms in recent literature on innovation management are said to have been used as frequently as 'disruptive innovation' (Schmidt & Druehl, 2008) or considered as important in understanding the demand-side role of technology competition (Adner, 2002).

It was not surprising then, that in the debate over mobile money as a potentially disruptive technology, there was an absence of any state actors in the development and widespread adoption of this technology. Indeed, the disruptive nature of mobile money was identified in the early stages of mobile banking adoption. For instance, Ondrus and Pigneur (2006) describe how the technology required for mobile payments could improve through research and development and move away from catering only for a niche market to compete with incumbents (financial institutions) for mainstream customers. The authors conclude that mobile payments have the potential to take over the retail payments market for on-the-spot transactions "as the different stakeholders [agreed] that this could be the next big evolution in the payment market" (p. 255). Schmidthuber *et al.* (2018) describe mobile payment technology as providing a new performance dimension for products where previously there was no competition. Industry publications also view mobile money as transforming the financial services landscape and disrupting established financial services providers (Ernst & Young, 2019; GSMA, 2015; Napier, 2011; PricewaterhouseCoopers, 2016). The same trend has caught on in the popular media, which hails mobile payments and fintech providers as 'disruptive innovations' (Kilkki *et al.,* 2018; Lirtsman, 2016; Miller, 2019).

Omwansa and Sullivan (2012) describe the hugely successful mobile payment service M-Pesa in Kenya as a disruptive mobile money innovation. Mbiti and Weil (2016) concur that as a mobile money transfer

https://www.sbs.ox.ac.uk/oxford-digital-marketing-disruptive-strategy-programme and *Harvard's* "Disruptive Innovation: Strategies for a Successful Business", retrieved 18 August 2019 from https://www.exed.hbs.edu/disruptive-innovation/.

service, M-Pesa revolutionised the money transfer industry, becoming the dominant mobile transfer service in Kenya in 2009 (p. 254). Thus, the financial services industry was transformed by low-cost technology that could be used by anyone subscribed to the service on any mobile phone, that is, without the need for an internet connection and regardless of the device's data processing capabilities.

Against a backdrop of disruptive innovation and transformation, the remaining sections of this chapter explore whether this was indeed the case with the technological innovations used to address financial inclusion. This exploration ascertains the extent to which the state played a role in the development of mobile payments technology as a means of enabling financial inclusion, with particular reference to the case of M-Pesa.

1.3 Role of the state in the development and adoption of technology for financial inclusion

A distinction can be drawn between attempts at financial inclusion which took place as part of broader interventions to address poverty and segregation in the mid-1970s and those which took place more recently, in the 21st century. The earlier interventions stemmed from the New Deal policies and the social injustices that led to the civil rights movement (1954-1968) in the US. Specifically, President L.B. Johnson declared a 'war on poverty' in his state of the union address in 1964 (Danziger & Danziger, 2005). At the time, poverty levels were estimated to affect 17.3% of the total population in the US (House Budget Committee, 2014). President Johnson also set out a number of strategies to tackle poverty (Johnson, 1964a) and in his Economic Report to Congress, he reaffirmed the need to fight discrimination to ensure that all citizens had equal opportunities for education, jobs, good health and housing (Johnson, 1964b).

In response to President Johnson's call for poverty alleviation, Congress passed the Economic Opportunities Act in August 1964 and established the Office of Economic Opportunity to administer the local application of federal funds targeted at poverty relief. The Federal Truth in Lending Act was enacted in 1968 to prevent, among others, ethnic discrimination in lending. The Federal Truth in Lending Act has been described as pioneering legislation in the field of consumer credit regulation (Rohner & Miller, 2000).

Federal Truth in Lending was the first of many other pieces of legislation passed in the 1970s and 1980s to discourage deposit-taking and retail lending financial institutions from discriminatory behaviour and any other practices that supported segregation (Carbó Valverde, Gardener & Molyneux, 2007). As specified by Kane (1981), these regulatory changes are listed in Table 1.1.

Table 1.1 Regulations passed by US Congress

Regulations	Date
Fair Credit Reporting Act	1970
Fair Credit Billing Act	1973
Equal Credit Opportunity Act	1974
Real Estate Settlement Procedures Act	1974
Fair Credit Billing Act	1974
Home Mortgage Disclosure Act	1975
FTC Holder-in-Due Course Rule	1975
Consumer Leasing Act	1976
Fair Debt Collection Practices Act	1977
Community Reinvestment Act	1977
Financial Institutions Regulatory Act	1978
Right to Financial Privacy Act	1978
Electronic Funds Transfer Act	1978

***Source**: Kane (1981)*

As can be seen from Table 1.1, these pieces of regulation aimed to ensure that minorities, and particularly African Americans, had fair access to retail banking services such as current accounts and credit facilities. Regulatory interventions also sought to eliminate 'red-lining' activities of financial institutions, that is, practices where retail financial institutions would refuse to provide credit (particularly house mortgages in urban areas) to minorities despite the individual being creditworthy (US Treasury, 2010; Hillier, 2003; Cohen-Cole, 2010). The Housing and Community Development Act, also known as the Community Reinvestment Act of 1977, required financial institutions to advance credit throughout all of the geography of their operation and prohibited banks from limiting credit to only high-income neighbourhoods (Sarma & Pais, 2011). The spirit of the Community Reinvestment Act was to affirm the obligation of financial institutions to serve the needs of the community, including deposit-taking and credit, in the areas in which they were mandated to do business (US Congress, 1977).

Regulatory changes in the 1970s had a profound impact on lower-income groups, with bank fees increasing more for the poor, especially those unable to maintain minimum balances (Canner & Maland, 1987). A number of bank branch closures also affected these customer groups. These and other contributing factors led many of the less affluent consumers dropping out of the banking system (Brobeck,

1991). Social action groups noted that this phenomenon gave rise to the 'lifeline' bank movement, which voiced concerns that low-income groups were excluded from having bank accounts (Washington, 2006). This term was applied after the partial deregulation of banking and called for access to financial services for low-income groups at reduced costs (Canner & Maland, 1987).

The call for 'lifeline banking' was persistent throughout the 1980s, underlying the fact that a large proportion of low-income families did not have access to cheque or savings accounts and had to rely on cash, storefront cheque-cashing outlets and other mechanisms, often with very high service charges (Rubin, 1992). The likes of the Consumers' Union and the Consumer Federation of America played an active role in lobbying Congress in the late 1970s and 1980s on banking matters while trying to pass regulations that would enable low-income groups to return to the banking system (Brobeck, 1991). Consumer advocates argued that high fees and the maintenance of minimum balances were strong barriers to financial access of low-income individuals, and even more so amongst ethnic minorities.

A key development took place in 1986 when the Federal Financial Institution Examination Council announced its approval of a Joint Policy Statement on Basic Financial Services (Federal Financial Institution Examination Council, 1986). Through this statement, the Council recognised basic banking needs to include the following: a safe and accessible place to store money, the means to withdraw money and to the ability to make payments to third parties (Canner & Maland, 1987). The statement was followed by two household surveys conducted by the Federal Reserve Board, namely, the Consumer Credit Survey (1977) and the Survey of Consumer Finances (1983). Together they illustrated the extent and depth of financial exclusion in the US. These survey results estimated that close to 9.5 million (12%) of all US households did not have access to a savings or cheque account (Canner & Maland, 1987). The poorest households were the worst affected as 66% did not have access to savings or cheque accounts (Rubin, 1992). Furthermore, bank branches and ATMs were disproportionately located in high-income urban areas with only a few branches in low-income and minority residential areas (Brown, 1990). Additionally, prior to the passing the Americans with Disabilities Act (1990), there was no provision in the design and layout for the physically handicapped in retail bank branches, telephone banking or ATMs (Feingold, 2016).

Meanwhile, in Europe, a number of regulatory changes occurred to help low-income individuals to access bank accounts. Most of these, however, were national rather than regional or continental initiatives. For instance, France legislated the principle of a person's right to have a bank account via article 58 of the Banking Act in 1984 (Comité de la Réglementation Bancaire et Financière, 1984: Article 58). In 1998, the

French parliament reiterated the right to open a bank account (as per the 1984 legislation) and provided the right to basic bank account services. In 1992, the *Fédération Bancaire Française* (French Banking Federation) committed to providing affordable bank accounts with services that included a cash card, free access to a cash machine network, bank statements and a minimum number of cheques paid or cashed commission-free (Kempson, Atkinson & Pilley, 2004).

In 1987, Sweden passed the SFS 1987:617 *Bankrörelselag* (Law of Banking Business) which prohibited banks from refusing to open a savings or deposit account (Finansdepartementet, 1987). In 1996, the German *Bundesverband Deutscher Banken* (German Bankers' Association) also adopted a voluntary code that made provision for the *Jedemann-Konto* (Everyman Account), which was a current account without overdraft facilities (Sarma & Pais, 2011). In 1997, the *België Bankier Vereniging* (Belgian Bankers' Association) adopted a voluntary code of banking practice which provided for the right of every citizen (regardless of the amount or frequency of income) to open a savings account (Carbó Valverde *et al.,* 2007).

As can be seen from the examples above, in the 1990s, economic geography was an important determinant in addressing financial exclusion (Leyshon, French & Signoretta, 2008). Around this time, the term 'financial exclusion' was coined by those concerned about the limited access to bank branches as a number of retail bank branch closures had taken place (European Commission, 2008). Leyshon and Thrift (1995, p. 4) define financial exclusion as "processes that … prevent certain social groups and individuals from gaining access to the financial system". Research into the effects of bank branch closure outside the US suggests similar trends as in North America, where the greatest number of branch closures seemed to be in the poorest areas (Leyshon *et al.,* 2008; Leyshon & Thrift, 1993, 1994, 1995; Pollard, 1996).

The Consultative Group to Assist the Poor (CGAP) was established in 1995 as a non-profit organisation for the advancement of microfinance standards and for the advancement of more inclusive financial systems for the poor (CGAP, 2008). CGAP consisted of a global partnership of more than 30 leading development organisations[5] to advance the lives of the poor through financial inclusion (CGAP, 2019). It could be argued that the formation of the CGAP marked the inflection point at which financial exclusion was no longer a domestic issue but one affecting all nations, regardless of their degree of industrialisation. Financial inclusion thus came to the forefront in the 1990s, in part due to the perceived importance of reducing financial exclusion to facilitate long-term economic growth (Amidžić, Massara & Mialou, 2014).

[5] For more information on these organisations see https://www.cgap.org/about/member-organizations, retrieved on 20 August 2019.

As the 1990s progressed, the drive for financial inclusion began to be actively promoted by finance ministries and central banks around the world, primarily seeking to improve access to retail financial services for those who would otherwise be excluded (Amidžić *et al.,* 2014). The establishment of the Millennium Development Goals in 2000 reiterated the need for financial inclusion and emphasised the importance of coordinated actions to achieve this goal in governments, civil society and the private sector across the globe (United Nations, 2006, 2014). As a result, at the G20 meeting held in Seoul in 2010, the leaders of the G20 countries formally recognised that financial inclusion was a key pillar of long-term global economic development (Global Partnership for Financial Inclusion, 2016).

The Alliance for Financial Inclusion, a network of central banks, supervisors and other regulatory authorities, met in Mexico in 2011 to agree on a common set of principles. These principles were to inform financial inclusion policies to meet these measurable commitments (Alliance for Financial Inclusion, 2012). As a result of these discussions, common principles were identified to address financial exclusion. These came to be known as the Maya Declaration (Garang, 2014).

Also in 2011, the Global Findex Survey was launched by the World Bank to provide comparable information from 148 countries on how people save, borrow, make payments and manage risk. The results of the first survey in 2011 revealed the extent of exclusion, with an estimated 2.5 billion people – more than half of the world's population – not having access to financial services (Demirgüç-Kunt & Klapper, 2012a). Figure 1.1 below illustrates the approximate percentage of adults who had a bank account at the time of the first Global Findex Survey in 2011.

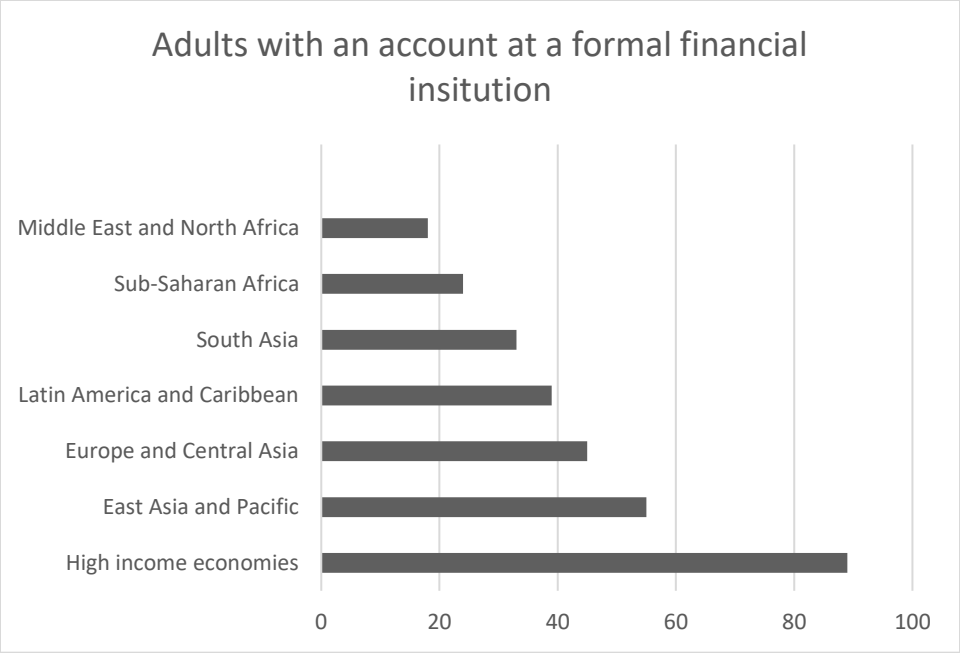


Figure 1.1 Global access of adults with a bank account at a formal institution in 2011

***Source**: Demirgüç-Kunt & Klapper (2012b)*

As can be seen in Figure 1.1, the Global Findex Survey results revealed that an estimated 90% of the unbanked population was found in emerging economies (Alliance for Financial Inclusion, 2016). These results reaffirmed the pressing need to design common strategies with clear targets to address financial exclusion (Demirgüç-Kunt, 2014).

As the drive for financial inclusion took hold, so did the links between this policy effort and the use of technology to achieve it. For instance, as early as 1999, the importance of technology was evidenced in the establishment of the Social Exclusion Unit by the UK government. This Unit brought together various stakeholders into Policy Action Teams, with the specific mandate of addressing social and financial exclusion (Mitton, 2008; Social Exclusion Unit, 2001). Reports emanating from these efforts not only estimated the number of people without access to financial services but also identified core retail banking features dependent on existing technology (New Policy Institute, 2007). These included wage, salary and benefit payments deposited directly into a bank account through an automated credit transfer, cash withdrawals at convenient access points (including access to ATM by the physically disabled) and bill payment by direct debit or credit transfer (Carbó Valverde *et al.,* 2007; HM Treasury, 1999).

Other notable early initiatives included that of the Australian government, which in 1997 piloted the use of electronic benefit transfers to process social welfare payments directly into bank accounts. The success

of this project led to a significant number of new bank accounts being opened amongst low-income individuals and minorities (Kempson *et al.,* 2004; Warton, 1999). Also in 1997 and with similar aims, the US Treasury introduced a policy which would require all government payments to be made by electronic funds transfer (EFT) (Barr, 2004; US Department of Treasury, 1997). As was the case in Australia, this initiative had a significant impact on the number of new bank accounts being opened amongst low-income individuals and minorities (Mitton, 2008).

Similar to the US and Australia, in 2003 the UK issued a policy which required the payment of social security benefits and state pensions directly into bank accounts through EFTs (Kempson *et al.,* 2004). Many other countries thereafter also introduced EFTs for government payments. These efforts were based on the notion that government-to-person (G2P) payments could drive transaction volume (both up or down), decrease transactions costs and draw more low-income individuals into the financial system (Pickens, Porteous & Rotman 2009).

Many non-banks were effectively leveraging wireless technology to meet the financial needs of unbanked or underbanked consumers (Bomser, 2010). By using the benefits of electronic money, regulators and the industry could play a complementary and dual role to provide consumers with easily accessible and affordable financial services (Minor, 2015). The World Bank also recognised the power of mobile technology, especially in Sub-Saharan Africa, through the aforementioned Global Findex Survey (Demirgüç-Kunt & Klapper, 2012b). In a 2011 report entitled 'The Mobile Financial Services Report', the World Economic Forum acknowledged the use of mobile technology in delivering financial services to the unbanked poor (World Economic Forum, 2011). Meanwhile, the United Nations emphasised the use of innovations in digital and mobile banking as a means of addressing financial exclusion. Consequently, in 2012, the United Nations established the 'Better than Cash Alliance' to advocate the digitisation of cash payments, in partnership with various donors, to alleviate poverty and drive inclusive growth (Better than Cash Alliance, 2019). In 2014, the United Nations Capital Development Fund launched the 'Mobile Money for the Poor' programme in partnership with AusAid. The programme encouraged poorer countries to use mobile banking for the retail delivery of financial services (UN Capital Development Fund, 2019).

On the one hand, therefore, the state gave birth to financial exclusion in the 1960s. On the other hand, it has also been active in shaping its development agenda. As this agenda evolved, the state played a pivotal role across the globe, particularly in using technology to boost the number of bank accounts since the late 1990s. This served to decrease financial exclusion amongst the low-income population and ethnic

minorities. As the next section illustrates, this was also the case in Africa and specifically, in the development of a mobile payments service called M-Pesa.

1.4 Financial inclusion in Africa and M-Pesa

As was the case in the US, Australia and Europe, countries in Africa also took steps to promote financial inclusion. In 2004, South Africa adopted a Financial Services Charter, with clear financial inclusion objectives and an agreement with the Banking Council resulted in the launch of a low cost, 'no-frills' bank account called the 'Mzansi' account (Sarma & Pais, 2011). This action was taken by individual banks on a voluntary basis in an attempt to redress the high number of the population who were excluded from the financial system.

Nigeria addressed financial exclusion by implementing a 'Cashless Policy' in June 2012 (Ezuwore-Obodoekwe, Eyisi, Emengini & Chukwubuzo, 2014). This policy had three primary objectives: (i) to promote the development and modernisation of the payment system, (ii) to reduce the cost of banking and promote financial inclusion and (iii) to improve the effectiveness of monetary policy in managing inflation and economic growth targets (Central Bank of Nigeria, 2011). Nigeria was (and remains) a largely cash-based economy. It was hoped that this policy would curb the demand for banknotes and coins whilst encouraging the use of electronic banking (Ezuwore-Obodoekwe *et al.,* 2014).

From the mid-2000s, various countries throughout Africa began to use mobile technology as a means of reaching the unbanked. Mobile phone operators increasingly recognised the potential for this technology to offer affordable basic banking services securely using the existing telecommunications infrastructure (Tieman, 2008). The lack of retail banking infrastructure together with the prevalence of mobile phones in Africa provided the ideal platform for mobile banking to meet the needs of the unbanked (Pilling, 2016). In many parts of Africa, urban workers send money to relatives through friends or by giving the money to bus drivers for a fee, however, they were at risk of theft through this cumbersome way of transferring money (Kantai, 2010).

In November 2004, the first mobile banking product called 'Wizzit' was launched in South Africa to provide mobile banking services aimed at the low income, previously unbanked population (Ismail & Masinge, 2012). In the following year, MTN (one of the largest mobile network operators) launched 'MTN Banking' in partnership with Standard Bank. The mobile banking services provided full-service transactional

banking. Users were provided with a MasterCard plastic payment card and access to the existing retail banking network. In addition, it allowed users to purchase prepaid electricity and mobile airtime (Anong & Kunovskaya, 2013). However, uptake was sluggish and the complexity of the product was identified as one of the barriers to adoption (Tieman, 2008). Soon after, the other major banks in South Africa launched mobile banking in partnerships with mobile telecommunications operators (Lawack, 2012).

Kenya has shown remarkable success with mobile banking, chiefly due to its mobile money service, 'M-Pesa' (with the 'M' denoting mobile and 'Pesa' denoting money in Swahili). This product was launched in 2007 by the mobile network operator, Vodafone, together with Kenya's largest mobile network provider, Safaricom. These mobile payment services have been described as life-changing for millions of the poorest of the poor, by giving them access to bank accounts and financial services (Peel, 2009; Wighton, 2011).

The idea behind M-Pesa began with Vodafone looking at ways to address issues such as the Millennium Development Goals to halve poverty by 2015. Nick Hughes, the Vodafone executive who initiated the M-Pesa project met with the representative from the UK's Department for International Development (DFID) at the World Summit for Sustainable Development in 2003 and was encouraged to submit a proposal to obtain funding from the recently set up Financial Deepening Challenge Fund (FDCF) (Hughes & Lonie, 2007).

A challenge fund can be described as an investment vehicle that provides grants or subsidies with an explicit public purpose between independent agencies, with grant recipients selected on a competitive basis through advertised rules and processes (O'Riordan, Copestake, Seibold & Smith 2013). Challenge funding requires competition winners to commit to delivering measurable outputs; the progress of the project is monitored against an action plan and includes sanctions for poor performance (Foley, 1999). Challenge funds thus assist with the provision of funding (to overcome typical internal competition for capital within an organisation). These funds can play an important role by initiating projects in new areas of business that can be regarded as riskier (Hughes & Lonie, 2007). Grant recipients retain significant discretion over the formulation and execution of their proposals and share risks with the grant provider (O'Riordan *et al.,* 2013).

The FDCF made £15m available for joint investments with the private sector for projects to improve access to financial services (Nathan, 2018). The mandate for the FDCF fund managers and proposal assessment team was seeking proposals involving the development of a new product or service; a new service that

could provide customers with access to goods or services that were currently unavailable to them; or the application of a technology that would reduce the cost of service provision (Hughes & Lonie, 2007). The M-Pesa project received funding of approximately £1 million in 2004 and this amount was matched by Vodafone (Cook, 2015).

Through the M-Pesa project, Vodafone entered into a new market, using its existing infrastructure to provide financial services specifically to the poor and previously unbanked. The vision of the M-Pesa team, under the leadership of Nick Hughes based in the UK and Susie Lonie in Kenya, was that the convenience of transferring small amounts of money electronically could have social and economic benefits in countries where the vast majority of people did not have access to traditional banks (Fildes, 2010). Vodafone first considered purchasing an off-the-shelf financial services platform, however, they did not find one that suited their needs. As a result, they appointed Sagentia, a UK software developer specialising in 'blue sky' strategic development, as the technical partner to develop the service (Hughes & Lonie, 2007). A small, dedicated team at Sagentia oversaw the development of the user application for the mobile phone, the communications software within the network and the centrally hosted account management system (Wooder & Baker, 2012). Importantly, the system also had to be extremely cost-effective as the sums of money transferred could be as little as 100 Kenyan Shillings (75 pence) (Sagentia, 2019).

In 2005, Sagentia finished product development after obtaining detailed specifications and identifying the needs of customers. The M-Pesa pilot project was then launched (Wooder & Baker, 2012). The pilot partnership was created between Vodafone, Safaricom, a microfinance institution called Faulu Kenya and the Commercial Bank of Kenya (Hughes & Lonie, 2007). Safaricom had a dominant position in mobile telephony in Kenya with approximately 77% of the total market share (Mas & Morawczynski, 2009). Safaricom saw the opportunity to retain its mobile network customers in a competitive Kenyan market by providing a mobile money service (Manson, 2014).

The initial service offering during the pilot phase had the following features: the ability to send and receive money and to buy airtime for the user or for other registered users on the same network via SMS (Wooder & Baker, 2012). The M-Pesa team used existing technology to create an innovative service, effectively monetising the airtime balances and providing basic financial services. At the time of the launch, Kenya had only 450 bank branches, 600 ATMs and 350 Western Union agents across the country with an estimated population of 36 million (Vaughan, 2007). This equates to 3.55 bank branches for every 100,000 adults compared the world average of 10.74 branches per 100,000 adults in 2007 (World Bank Group, 2019a).

In March 2007, after the success of the pilot, the M-Pesa service was officially launched in the market (Morawczynski, 2009). The absence of alternatives for domestic money transfers fuelled the growth of M-Pesa customers (Mas & Morawczynski, 2009). Michael Joseph, CEO of Safaricom (2000 – 2010) who pioneered M-Pesa in Kenya, attributed the success of the project for facilitating the safe transfer and storage of cash on mobile phones as opposed to notes and coins (Crabtree, 2012). Joseph further identified distribution as key in meeting customers' needs cost-effectively and at scale, by having partnerships between manufacturers of products and retailers who could distribute these services (Tescher, 2011). The small retail stores were crucial to the uptake of M-Pesa services as these retailers acted as *de facto* bank branches (Tescher, 2009). Agents around the country (utilising the existing Safaricom outlets) converted e-money into currency and *vice versa* (Jack & Suri, 2011). Importantly, the Central Bank of Kenya (CBK) exempted the agent banking (correspondence) network from the onerous regulation that governed banks and other financial institutions and allowed M-Pesa to contract with thousands of retail agents to offer their services (Burns, 2018).

The M-Pesa project team engaged with the CBK in the early stages of the project, before the service was launched. After detailed discussions, further developments of the service were made (Alliance for Financial Inclusion, 2010). Kenya did not have clear regulations in place for e-money services and the CBK obtained a legal opinion that the M-Pesa service did not need to meet the definition of a banking business and therefore did not need to comply with requirements of the Banking Act of 1989, as it was simply regarded as a service that facilitates the transfer of money (Porteous, 2009a). The CBK issued a letter confirming that it did not have an objection to the launch of M-Pesa. However, M-Pesa was governed by a monitoring framework, which allowed it to operate under limited regulation, in the absence of a detailed regulatory framework for mobile payments (Porteous, 2009a). This framework ensured that there were safeguards to address money laundering, consumer protection as well as product and agency concerns (Alliance for Financial Inclusion, 2010). M-Pesa services expanded in 2008 to include bill payments, bulk salary payments, cardless transactions at ATMs to allow customers access to M-Pesa services at PostBanks (Kenyan Post Office Savings Bank) (Muthiora, 2015). The CBK also authorised M-Pesa to provide foreign exchange business in 2008 (Ondiege, 2015).

The enabling regulatory environment facilitated by the CBK has been credited as key to the success of the large scale investments in new mobile technologies such as M-Pesa (Beck, Senbet & Simbanegavi, 2015; Burns, 2018; Ondiege, 2015; Porteous, 2009a). An enabling regulatory approach permits non-banks to issue electronic money, imposes capital requirements that are proportional to the risks of the e-money

businesses, permits agents to cash-in and cash-out electronic money and does not prescribe the implementation of interoperability (i.e. it allows a market-led approach) (GSMA, 2014). An enabling environment is an important component of successful mobile banking adoption and for the fast growth in mobile banking services (GSMA, 2017).

The CBK took an open, flexible supervisory and regulatory approach to mobile banking. This is in contrast with the traditional regulatory approach towards innovation which begins with legislation, then regulation and lastly innovation, which could take years (Beck, Senbet & Simbanegavi, 2015). In contrast, the CBK took a risk-based approach and allowed the innovation to take place (Cook, 2015). Other SSA countries such as Botswana, Ghana, Nigeria and South Africa did not have an enabling regulatory environment and these countries have not been successful in the wide-spread adoption of mobile banking for the period 2007 to 2015 (Burns, 2018). These countries instead had adopted a bank-led approach to mobile financial services and required mobile banking service providers to comply with strict banking legislation.

The regulatory approach taken by the Kenyan CBK was met with opposition. According to Michael Joseph, former CEO of Safricom, the banks in Kenya tried to thwart M-Pesa and formed a group to oppose the project (Crosman, 2011). The banking industry raised concerns to the Kenyan Minister of Finance that M-Pesa would not be able to develop the risk management skills and procedures to manage such a large payment system while the Kenyan Bankers Association accused the CBK of allowing a non-bank to provide financial services without needing to comply with onerous banking regulations (Burns, 2018). In response, the CBK ordered a due diligence audit to address the concerns raised by the banking industry. This took place towards the end of 2008 (Muthiora, 2015). The results of the audit confirmed that the M-Pesa payment service was secure and reliable, reiterating that mobile money service providers were not banking service providers[6] (Alliance for Financial Inclusion, 2010).

The CBK did, however, place a limit on the value of transactions (to address money laundering concerns), requiring agents to pre-deposit cash in a bank account in commercial banks (e-float), from which an electronic value was used to guarantee all consumers' deposits and withdrawals (Alliance for Financial Inclusion, 2010). The interest earned from these deposits was given to a non-profit trust (Burns, 2015). The regulations regarding know-your-customer (KYC) and anti-money laundering (AML) were much less

[6] A banking business as defined in the Banking Act (Central Bank of Kenya, 2009) is as follows: "(a) the accepting from members of the public of money on deposit repayable on demand or at the expiry of a fixed period or after notice; (b) the accepting from members of the public of money on current account and payment on and acceptance of cheques; and (c) the employing of money held or on current account, or any part of the money, by lending, investment or in any other manner for the account and at the risk of the person so employing the money".

stringent and were proportionate to size. The CBK permitted Safaricom to apply less stringent identification standards as Safaricom had imposed limits on the amount that could be held in the mobile money account or transacted in a given period. This facilitated access to financial services, particularly for rural communities which lacked formal documentation and rural banks that often did not have a cost-effective way to identify customers (Burns, 2018). It was hoped that M-Pesa could reach the unbanked in Kenya, especially in light of the findings of the 2006 FinAccess Survey which suggested that only 18.9% of the Kenyan population had access to formal banking services (Financial Sector Deepening Kenya, 2006).

In 2009, the Finance Act allowed for agent banking which allowed banking agents to offer mobile banking across Kenya. Thus it was telecommunications companies which predominantly drove the mobile banking model as they were largely exempted from banking regulations (Kantai, 2010). In 2010, the CBK altered the regulations again to allow commercial bank agents and their retail outlets to initiate new accounts and increased the number of deposits and withdrawals that could take place (Sadana, Mugweru, Murithi, Cracknell & Wright, 2011). Commercial banks were thus able to engage in agent banking while customers could access banking services without having to travel large distances to urban bank branches (Burns, 2018). After initially opposing the M-Pesa services, banks eventually embraced mobile money as a tool to provide financial services to the unbanked (Adams, 2011).

In 2011, the National Payment Systems Act (National Council for Law Reporting, 2011) was enacted which provided the CBK with oversight over mobile payment services. The Act consisted of a flexible framework for agency banking. The CBK adopted a functional approach to the oversight of mobile banking with both banks and non-banks, including mobile network operators, permitting them to provide mobile money services (Muthiora, 2015). These regulatory changes and amendments taken by the CBK created an enabling environment for agency banking and for mobile network operators. Regulatory and policy changes were also made in Tanzania in 2011/2 following the Kenyan approach, by deregulating mobile financial services and relaxing the regulations of MNO's and these changes have been credited with the high uptake of mobile banking adoption in Tanzania (Burns, 2018).

M-Pesa's financial services growth strategy relied on retail stores that sold airtime and mobile phones to provide services to the unbanked. This strategy resulted in M-Pesa becoming a powerhouse in mobile financial services (Wack, 2014). M-Pesa has since expanded to other networks and non-registered users, offering a variety of financial service features (Ondiege, 2015). In 2008, Vodafone for the first time provided international remittances using M-Pesa by entering into an agreement with Western Union to allow remittances from the UK to Kenya (Bills, 2008). In 2009, farmers could purchase insurance against

crop failure, rural communities could purchase safe water and could make microfinance repayments (Muthiora, 2015).

The M-Pesa facility became linked to formal bank accounts in 2010 through a partnership with the Equity Bank (Johnson & Arnold, 2012). This product, known as M-Kesho ('kesho' meaning tomorrow in Swahili), is a facility using the M-Pesa platform and agent network to offer more banking services to customers, such as interest-bearing accounts, loans and insurance (Kendall, Maurer, Machoka & Veniard, 2011). In 2012, M-Pesa launched another new product, M-Shwari ('shwari' meaning calm in Swahili), a savings and loan facility (Ondiege, 2015). In addition, by using M-Pesa, customers created data which could be used to underwrite small loans for consumers who did not have sufficient credit history (Crosman, 2015).

M-Pesa has been so successful that by 2015 it was estimated to have 20 million subscribers (Tshabalala, 2015) equating to 42% of Kenya's estimated population of 47.8 million (World Bank Group, 2019b). M-Pesa has provided access to a networked economy for all parts of the Kenyan population, from herdsmen, subsistence farmers, slum dwellers to urban dwellers (Pilling, 2016). Furthermore, M-Pesa has been described as a world leader in mobile money services (Burns, 2015). After approximately a decade of operation, nearly half of Kenya's Gross Domestic Product (GDP) flows through M-Pesa (Clozel, 2017). This success took place during the mid-2000s when many countries launched mobile money operations but only a handful achieved explosive growth, with the majority of mobile money schemes failing to ignite (Evans & Pirchio, 2014).

M-Pesa has had a positive impact on financial inclusion by reducing the number of unbanked individuals. According to the Global Financial Inclusion (Findex) database, the number of adults (aged 15 years or over) who have access to a bank account in Kenya has grown from an estimated 42% in 2011, to 75% in 2014 and to 82% in 2017 (Demirgüç-Kunt *et al.,* 2015, 2018; Demirgüç-Kunt & Klapper, 2012b). In terms of adults with bank accounts, Mauritius is the leading country in Africa with 90%, followed by Kenya with 82% as per the 2017 Global Findex Survey (Demirgüç-Kunt *et al.,* 2018). In Kenya, this is mainly due to the successful use of mobile banking.

To sum up, since the mid-2000s, the potential for technology to address financial exclusion has been recognised by global agencies such as the World Bank and the UN. Mobile technologies are now providing basic financial services for the poor and underbanked, especially in emerging economies. In the case of M-Pesa, the idea to address financial services through mobile services first arose in early 2003, and after receiving funding and further product development, was officially launched in 2007. This evidences that

it took a long period of time for the development of the technology used for mobile financial services. Furthermore, the state (both the UK and Kenyan governments) played an active role in the development of this technology. Firstly, the UK government called for proposals for innovations to be developed for the delivery of financial services through a challenge fund. Secondly, the UK government provided a significant capital contribution to fund the development of technology whilst also accepting the associated risks of the potential failure of this new technology. Thirdly, the Kenyan government adopted a bold risk-based approach to the regulation of mobile financial services. This approach allowed the innovation to occur (through a test-and-learn approach) without being constrained by regulations and provided an enabling regulatory environment for this technology to flourish.

1.5 Conclusion

By documenting the development of financial inclusion efforts from the early 1960s, this chapter examined the role of the state in the development of technology used to address financial inclusion, and specifically, the use of mobile banking. The findings suggest the length of time behind these technological innovations. From as early 2004, mobile technology solutions have been developed to address financial inclusion. These solutions were part of a collaborative effort of various role players, ranging from social activists, governments, non-governmental organisations and public-private partnerships. The findings of this chapter are in contrast to the view that the private sector alone has been spearheading disruptive technological innovations to address financial inclusion. This chapter sheds light the role of the state in shaping and directing technological change in financial services, especially in the delivery of financial services to the previously unbanked.

This has been the case with M-Pesa in Kenya, which has since become a world leader in mobile payment services. The state was an entrepreneurial force behind the development of the technology used to address financial inclusion. The idea behind the M-Pesa project was inspired by the Millennium Development Goals to halve poverty by 2015. In response to a public sector challenge fund, it sought to find innovative ways to improve access to financial services. As research and development of technology are both risky and often take years to develop, projects typically have to compete for funding within a company. With a challenge fund, the company is able to overcome this hurdle, with half of the funding coming from the outside provider and the other half matched by the company. The public sector challenge

fund seeks propositions that are innovative and pro-poor and can instigate transformational changes such as the M-Pesa project.

The M-Pesa project demonstrates that commercially viable, 'pro-poor products' (i.e. for-profit activities aimed at poverty alleviation) can be developed and are able to service low-income markets. The UK Department for International Development has been hailed as the pioneer of challenge funds (Foley, 1999; KPMG, 2012) while the World Bank has recognised the role that challenge funds play in developing transformational banking technologies (Ali & Phillips, 2017). M-Pesa, which began as a pilot project funded by a challenge fund, has evolved into providing financial services to the majority of the Kenyan population – not only transforming financial inclusion in the country but also influencing financial inclusion policies around the world.

Evidence documented in this chapter highlighted the role of the Central Bank of Kenya in creating a conducive regulatory environment for this technology to thrive. Unlike the many mobile money schemes around the world that have failed, M-Pesa has experienced exponential growth – largely because the innovation was not constrained by the regulatory environment. The regulatory environment allowed for both banks and non-banks to provide financial services through correspondence (agent) banking. The simplicity of mobile banking services and the availability of agent networks to cash in and cash out of the system also contributed significantly to the high uptake of these services. A fundamental difference between the high uptake of mobile banking services experienced in Kenya and other countries in Africa is due to Kenyan banks and non-banks being able to provide mobile financial services, unlike the regulations in other parts of Africa. Further research into other mobile payment systems can increase the understanding of policies and funding requirements that enhance the uptake of mobile banking by the unbanked.

CHAPTER 2

Ethnicity, gender and public policy as determinants of financial inclusion in South Africa

Abstract

This chapter explores the effectiveness of public policy in increasing financial inclusion. A large data set is used comprising repeat household surveys undertaken over a ten-year period. Contrary to previous results, the chapter provides evidence of the strong impact of policy on access to financial services in South Africa. South Africa adopted a formal financial sector consensus model and, together with private sector development, succeeded in increasing access to financial services to the previously unbanked. The findings suggest that between 2005 and 2014, the most significant factors associated with financial inclusion were income, education level and age. Furthermore, those with a tertiary education were 31% more likely to have a bank account than those in the lowest education category. Policies to address the gender gap appear to have had a measure of success as the findings indicate that women were 3.8% more likely to have a bank account than men. Lastly, the findings reveal that those from a black ethnic background remain less likely to be banked. Further policy interventions are therefore required.

Keywords: Economic growth, financial inclusion, financial services, logistic regression, South Africa (SA)

JEL codes: D14, G21, O4

2.1 Introduction

Since the 1990s, economic and financial authorities around the world have increasingly recognised the importance of financial inclusion for long-term economic growth. Financial inclusion broadly refers to the ability of entities and individuals to access formal financial services. The first global survey on financial inclusion by the World Bank in 2011 estimated that approximately 2.5 billion people – more than half of the world's population – did not have access to financial services (Demirgüç-Kunt & Klapper, 2012a). Ninety percent of the unbanked population was found in emerging economies (Alliance for Financial Inclusion, 2018).

Studies on financial inclusion initially explored the prevalence of the unbanked population in developed economies, at a country level and, more recently in cross-country comparisons. For instance, Kempson and Whyley (1999) investigated the sections of the population that did not have access to financial services in the United Kingdom (UK) using data from the 1995-1996 Family Resources Survey. Hogarth, Anguelov and Lee (2005) examined the use of bank accounts over the period 1989-2000 in the US. Kempson *et al.* (2004) analysed policy responses in the early 2000s towards financial exclusion through case studies in Australia, Belgium, Canada, France, the UK and the US. Devlin (2005) looked at financial exclusion in the UK in 2000, finding that the most significant factors associated with financial inclusion were employment status, followed by household income and housing tenure. Carbó-Valverde *et al.* (2007) outlined the nature and causes of financial exclusion in several European countries while Neuberger (2015) investigated financial inclusion, regulation and financial education in Germany. Cross-country studies have also examined the foundations of financial inclusion and the use of financial services (Allen *et al.,* 2016; Beck *et al.,* 2007, 2008; Demirgüç-Kunt *et al.,* 2015).

More recently, the focus of financial inclusion has shifted to emerging economies, where the lack of access to financial services is most pronounced. This has been the conclusion of studies looking at India (Burgess, Pande & Wong 2005; Ghosh & Vinod, 2017; Swamy, 2014), Indonesia (Johnston & Morduch, 2008) and China (Fungáčová & Weill, 2014). Several studies have been conducted on financial inclusion across Africa (Honohan & King, 2012; Klapper & Singer, 2015; Zins & Weill, 2016) as well as in individual countries, notably in Ghana (Akudugu, 2013), Kenya and Uganda (Johnson & Nino-Zarazua, 2011) and in South Africa (Wentzel *et al.,* 2016). These studies have broadly identified that younger, poorer individuals, especially those living in rural areas, are less likely to have access to formal financial services. Furthermore, there is a gender disparity with women less likely to have a bank account than men (Fungáčová & Weill, 2014; Ghosh & Vinod, 2017; Swamy, 2014).

Policies to address financial exclusion have taken various forms across the world. Civil society and non-governmental organisations have also played an active role in promoting financial access, carrying out research and providing financial literacy. For example, in countries such as Mexico, Trinidad and Tobago and the US, these efforts have been led by the public sector (Chibba, 2009). Private institutions, together with non-financial firms or formal financial firms, have driven inclusion initiatives in countries such as Colombia, Ghana, Kenya, the Maldives, Mongolia, Nigeria and the Philippines (Chibba, 2009). In contrast, South Africa adopted a joint approach between the public and the private sector. The formal financial sector in South Africa developed a Financial Sector Charter in conjunction with the government, to enhance and provide new services to the poor and the financially excluded (Banking Association of South Africa, 2014).

A common thread running through most of the studies at country level or cross-country level in developed and developing economies has been the use of cross-sectional data. This has had the effect of limiting the conclusions regarding the long-term effects of policy innovations. Moreover, as the social-economic conditions differ across countries (Johnson & Nino-Zarazua, 2011), it is probable that financial inclusion may be driven by different factors in each country (Wentzel *et al.,* 2016). As a result and despite growing evidence of the importance of financial inclusion in fostering long-term growth (Allen *et al*., 2016; Demirgüç-Kunt & Levine, 2008), little is known about its long-term underpinnings across individuals and countries (with the possible exception of the US). Similarly, little is known about the effectiveness of individual policies to foster long-term financial inclusion (Allen *et al.,* 2016). The key question of what types of policies promote both financial and economic development also remains a highly debated topic.

This chapter explores the long-term impact of the Financial Sector Charter in South Africa and the actions taken by formal financial institutions to expand financial services to the previously unbanked. The chapter contributes to three areas: (i) it informs the debate on the individual determinants, including ethnicity, which influences financial inclusion in South Africa, (ii) it contributes to gender studies that have found mixed results in the literature and (iii) unlike previous studies conducted in Africa which were conducted over one or two periods, longitudinal data is used to explore the individual determinants of financial inclusion and the long-term impact of policy interventions on financial inclusion.

The rest of the chapter is structured as follows: Section 2.2 provides a theoretical background on financial inclusion, Section 2.3 discusses the South African policy interventions for financial inclusion, Section 2.4 describes the measurement of financial exclusion, Section 2.5 describes the FinScope household surveys,

Section 2.6 discusses the econometric strategy, Section 2.7 discusses the results and Section 2.8 concludes while discussing potential policy implications.

2.2 Theoretical background

2.2.1 Financial inclusion and empirical support for financial inclusion

There is a long-standing debate about the role of financial development on economic growth (King and Levine, 1993; Levine, 1997, 2005). On the one hand, well-known economists such as Robert Lucas and Joan Robinson strongly dispute that financial development causes economic growth (Čihák et al., 2012), whilst on the other hand Merton Miller argues that financial development does indeed cause economic growth. Others such as Goldsmith, Gurley, McKinnon, Schumpeter and Shaw posit that the impact of financial development on economic growth cannot be ignored (Levine, 2005). Pioneering contributions to the understanding of the relationship between financial development and economic growth have been made by Goldsmith (1969), McKinnon (1973) and Shaw (1973). Reviews undertaken of the studies of the link between finance and economic growth have confirmed a strong positive link between the functioning of the financial system and long-run economic growth (Levine, 1997, 2005). Others, more recently suggest that there is a positive independent and causal relationship between finance and long-term economic growth (Demirgüç-Kunt & Levine, 2008).

The evidence of the benefits of financial inclusion (for example, proving that access to savings accounts increases savings or that access to credit has a positive impact on consumption and employment) is increasingly providing both an economic and political rationale for policy-makers and governments to promote financial inclusion (Allen *et al.,* 2016; Klapper & Singer, 2015). The term 'financial inclusion' has been defined in various ways. For instance, Afande and Mbugua (2015, p. 1) define it as "the ability of an individual, household or group to access a full range of responsibly delivered, affordably priced and reasonably convenient formal financial services". Beck *et al.* (2015, p. 15) define it as "access by enterprises and households to reasonably priced and appropriate formal financial services that meet the needs of enterprises and households". Amidžić *et al.* (2014, p. 5) define financial inclusion as "an economic state where individuals and firms are not denied access to basic financial services based on motivations other than efficiency criteria". For the purposes of this study, the definition of Amidžić *et al.* (2014) is used, namely, where individuals and companies do not have access to basic financial services, are regarded as financially excluded.

There are two types of financial exclusion, namely, voluntary or involuntary exclusion (World Bank, 2014a). The former refers to people who do not identify their need for financial services or choose to remain outside of the financial system due to cultural or religious beliefs. The latter refers to factors such as insufficient income, discrimination, lack of information, price barriers and other hindering factors (World Bank, 2014a). The drive for financial inclusion aims to promote access, remove barriers and eliminate obstacles faced by individuals or groups to affordable, safe and fair formal financial services, especially the vulnerable and the poor (Kempson & Whyley, 1999).

Studies have found that financial inclusion can alleviate poverty, reduce income inequality, increase the wealth of the low-income population and accelerate economic growth (Beck *et al.,* 2007; Bruhn & Love, 2014; Honohan, 2008; Levine, 1998; Swamy, 2014). There is still debate, however, as to whether or not it was policy interventions that resulted in greater financial inclusion (Bruhn & Love, 2014; Burgess *et al.,* 2005; Levine, 2008). Concerns have also been expressed that the provision of access to finance could result in the indebtedness of individuals (Burgess *et al.,* 2005; World Bank, 2014a).

2.2.2 Previous studies on the determinants of financial inclusion in Sub-Saharan Africa

Many Sub-Saharan African (SSA) countries have vast geographical areas that make the provision of financial services outside of the urban areas both difficult and costly. It has been thoroughly documented how developing economies are pioneering the use of mobile and technological innovations to address financial inclusion (Alliance for Financial Inclusion, 2011; Rouse & Verhoef, 2016, 2017). In SSA, 34% of adults are banked, of which 12% have a mobile money account, which is well above the global average of 2% (World Bank, 2015b).

The trends in the growth of financial inclusion and particularly, mobile payments in SSA, have attracted a number of studies on the individual determinants of financial inclusion in Africa. For instance, Johnson and Nino-Zarazua (2011) investigated the socio-economic, demographic and geographical factors affecting access to and exclusion from, formal, semi-formal and informal financial services in Kenya and Uganda in 2006. Akudugu (2013) explored the determinants of financial inclusion in Ghana using the 2011 Global Findex Survey data. As with other parts of West Africa, Ghana has a high number of unbanked individuals with an estimated 60% of the population not having access to formal financial services. In South Africa in 2011, Wentzel *et al.* (2016) examined the indicators of financial exclusion in the most financially vulnerable – the 'bottom of the pyramid'. Honohan and King (2012) looked at the role of the

individual, geographical and national characteristics influencing the use of financial services in 11 SSA countries using data from each country's most recent FinScope Household Survey (ranging from 2004 to 2009). Klapper and Singer (2015) investigated the role of informal financial services in Africa using the 2011 data from the Global Findex Survey, which indicated that less than a quarter of adults in Africa are banked at a formal financial institution. Zins and Weill (2016) examined the determinants of financial inclusion in Africa using the Global Findex Survey data for 2014 for 37 African countries with respect to age, education, gender and income and its association with formal and informal banking services. Their study also considered the barriers to financial inclusion, the motivations for savings and credit and the relationship of these factors to individual determinants.

In short, there is growing interest and mounting evidence exploring the extent of financial inclusion in Sub-Saharan Africa. To date, research has focused on the individual determinants of financial inclusion and barriers to financial access. The findings of these studies broadly indicate that there are individual determinants associated with financial inclusion. Persons with higher income, better education and who are older have been associated with greater financial inclusion. However, the results as to other individual determinants such as gender, geographical area and marital status have been mixed and to date, no studies have explored the impact of ethnicity. Furthermore, most of these studies have been cross-sectional for a single country or cross-country for one year, which does not take into account any changes over time.

2.3 South African policy interventions for financial inclusion

In South Africa, the banking sector has a highly developed technology infrastructure and financial retail infrastructure (Ismail & Masinge, 2012). However, bank branches and ATM networks are mainly located in urban areas while rural areas are poorly serviced. The South African banking sector is highly concentrated. Four large banks – ABSA, First National Bank, Nedbank and Standard Bank – account for 84% of the banking sector assets. This has left little incentive for these banks to cater to lower-income customers (World Bank, 2013). South Africa recognised the need to transform the financial sector to extend financial services outside the urban areas in order to reach a large proportion of the population excluded from financial services.

The government placed greater emphasis on financial inclusion, which was addressed by both public and market commitments to broaden access to financial services (Alliance for Financial Inclusion, 2011). In

2003, the Financial Sector Charter was signed, containing clear financial inclusion objectives and reforms of the financial sector (Banking Council, 2003). A key consequence of the Financial Sector Charter was the announcement by the Banking Council of the launch of a low cost, 'no frills' service called the 'Mzansi' bank account in 2004 (Sarma & Pais, 2011). This bank account was provided by the four major banks in South Africa, together with Postbank (the state-owned savings bank operated by the South African Post Office). This basic bank account, which was offered by these banks on a voluntary basis, targeted the poorest segment of the population (classified by the Living Standards Measure in levels 1-5) (Schoombee, 2009).

On average, however, only 70% of the Mzansi accounts remained active and in 2009 the major banks began to launch their own products aimed at the low-income segment of the population as a replacement of the Mzansi bank account. The banks also invested in the expansion of their ATM networks and bank branches in areas which were previously unserved to complement the Mzansi bank account. According to the International Monetary Fund's (IMF) Financial Access Surveys, the growth in ATMs showed an upward trend, especially in the years 2007 to 2011, and only began slowing after 2010 (International Monetary Fund, 2018).

Besides encouraging financial institutions to expand financial services, the government also took a decision to expand access to bank accounts. The South African Social Security Agency (SASSA) launched the SASSA Mastercard debit card for the electronic payment of social grants in 2012. South Africa made approximately 15 million social grant monthly payments to approximately 9.2 million people and provided the opportunity to use electronic payments systems to broaden financial inclusion (World Bank, 2013). A year after the launch, it was estimated that 1.6 million new SASSA cardholders had opened bank accounts (FinMark Trust, 2013) and by the end of 2014, 34% of the banked population owned a SASSA Mastercard (FinMark Trust, 2014a).

Overall, state policy interventions, together with private and non-profit organisations, have resulted in significant improvement in access to financial services to the previously unbanked population as South Africa made significant inroads towards achieving financial inclusion. After consensus was reached on the formal financial sector model in 2003, momentum was generated by private sector development, overseen by the government (Chibba, 2009). According to the FinScope Surveys, in 2004, an estimated 46% of the population had access to a bank account and by 2014, this had risen to 75% (FinMark Trust, 2014b).

2.4 Measuring financial exclusion

To explore the long-term determinants of financial inclusion in South Africa, fieldwork typically combines macroeconomic data (supply-side data) with household surveys (demand-side data). Access to financial services is usually measured by access to basic bank accounts, together with other proxies. The supply-side of financial inclusion provides information about the number of bank accounts held at financial institutions. This macroeconomic data has various shortcomings, such as difficulty in distinguishing between voluntary exclusion and involuntary exclusion (Repetto & Denes, 2010). The supply-side is not able to provide detailed disaggregated information of users based on demographics or about those that are excluded (Kanther & Nagabhushan, 2012). Demand-side data can supplement supply-side data by providing a more holistic understanding of financial inclusion, notably, through information about the use of financial services and by distinguishing between voluntary and involuntary exclusion (Honohan, 2008). The main source of this data is national household or consumer surveys and, more recently, cross-country surveys.

2.5 Household data: FinScope Household Surveys

This study uses household data (demand-side) to obtain a detailed understanding of the individual determinants of financial inclusion. Household surveys on financial services shed light on the individual behaviours and constraints of the use of financial services. This kind of information can be used to inform and evaluate policy interventions (Kanther & Nagabhushan, 2012). Household data has been used to explore the individual determinants of financial inclusion in empirical studies. Previous studies have largely used cross-sectional data to make cross-country comparisons for a single year (Allen *et al.,* 2016; Fungáčová & Weill, 2014; Honohan & King, 2012; Klapper & Singer, 2015). Other studies have explored the determinants of financial inclusion in one or more countries over one or two periods in time (Akudugu, 2013; Beck & Brown, 2011; Devlin, 2005; Hogarth *et al.,* 2005; Wentzel *et al.,* 2016).

The data[7] for this study was provided by FinMark Trust, consisting of annual FinScope Household Surveys between 2005 and 2014. This survey was first undertaken by the FinMark Trust in South Africa in 2003. By 2018, these surveys had been conducted in 18 other African countries as well as seven countries in

[7] In South Africa, the number of basic bank accounts (supply-side data) is not reported to the Central Bank (Repetto & Denes, 2010) and thus data on the use of financial services has to be obtained from other sources.

Asia (FinMark Trust, 2018). The FinScope household surveys provide country-specific information on the use of financial services. The FinScope surveys consist of face-to-face interviews with individuals across a country, with an average of 3 898 interviews per annum of South African adults (16+ years) for the period 2005 – 2014. The surveys used nationally represented samples based on Probability Proportional to Size (PPS) sampling. These surveys provide a nationally representative reflection of individuals, collecting comprehensive demographic information on financial usage as well as psychographic information on the respondents (Kanther & Nagabhushan, 2012). A caveat of the FinScope Household Surveys is that interviews are not conducted with the same household each year, as different people are selected randomly for each annual survey (Porteous, 2009b).

The FinScope surveys have been described as the most advanced data collection exercise to measure the use of financial services and facilitate cross-country comparisons (Cull & Scott, 2010). The data from these surveys have been used in previous studies exploring financial inclusion (Aterido, Beck & Iacovone, 2013; Bankable Frontier Associates LLC, 2007; de Koker & Jentzsch, 2013). Aterido *et al.* (2013) explored the gender dimension of financial inclusion to assess whether females (both at enterprise and individual level) in countries in SSA are more likely to be unbanked. Another study, conducted by Bankable Frontier Associates (2007), compared financial access across various SSA countries. The findings suggested that persons who were older, educated, had higher income and lived in urban areas were more likely to have a bank account (the report was commissioned by FinMark Trust). De Koker and Jentzsch (2013) combined FinScope data and Research ICT Africa data in a comparison of eight countries in Africa to assess whether the broadening of formal banking services reduced reliance on informal banking channels.

All these studies used cross-sectional data in cross-country comparisons for one period in time (complicated by the lack of comparable information for the same year) and did not explore the potential role of ethnicity in financial inclusion. The present study, therefore, seeks to identify the long-term determinants of financial inclusion and to explore the relationship between ethnicity and financial inclusion. The association of ethnicity with financial inclusion is an unexplored area of research and has the potential to influence access to financial services (Johnson & Nino-Zarazua, 2011). This study included an *ethnicity* variable due to South Africa's past political policies which were discriminatory based on the ethnic background of the individual. This was to assess whether the ethnic background of the individual is associated with financial inclusion.

2.6 Econometric strategy

2.6.1 Model specification

The nature of this study is that the dependent variable, *banking status*, is a dichotomous categorical variable (banked or unbanked). The outcome of the regression is a probability of belonging to one of the two conditions, namely, the dependent variable takes a value of 1 for banked individuals and a value of 0 for unbanked individuals. A nonlinear model was used in this study as the dependent variable is binary (1 or 0) and is not continuous. A logistic regression, namely, a binary logistic regression, was employed to identify any explanatory variables which were significantly related to the dependent variable. Logistic regression is appropriate in studies describing or testing a hypothesis between categorical or dichotomous independent and dependent variables (Hosmer & Lemeshow, 2000). Furthermore, binary logistic/probit regression models have been employed in previous studies on financial inclusion and thus this study also used logistic regression (Allen *et al.,* 2016; Demirgüç-Kunt *et al.,* 2013; Devlin, 2005; Klapper & Singer, 2015; de Koker & Jentzsch, 2013). Logistic regression does not make any assumptions of normality, linearity or homogeneity for the independent variables or for the analysis of dichotomous outcomes.

Logistic and probit models are among the most widely used in generalised linear models with binary dependent variables and the results are essentially the same (Cameron & Trivedi, 2009; Hahn & Soyer, 2005). The logistic model was selected over the probit model as it allows for the interpretation of the coefficients in terms of log-odds. The logistic model has been used to investigate the determinants of financial inclusion in other studies (e.g. Johnson & Nino-Zarazua, 2011; de Koker & Jentzsch, 2013; Wentzel *et al.,* 2016) and was therefore also used in the current study**.**

A logistic model was employed to investigate the demographic, economic and geographical determinants of financial inclusion in South Africa by using data from the FinScope Surveys for the period 2005 – 2014. The datasets for the individual survey years were pooled into a cross-section for a ten-year period and the model included year dummies and the error term for individuals for t periods.

$$Banking\ Status_{i,t} = \beta_1 Income_{i,t} + \beta_2 Education_{i,t} + \beta_3 Age_{i,t} + \beta_4 Gender_{i,t} + \beta_5 Area_{i,t} + \beta_6 Marital\ Status_{i,t} + \beta_7 Ethnic\ Background_{i,t} + \gamma_h Year * Region_i + \varepsilon_{i,t} \quad (1)$$

Banking status was coded 1 for banked and 0 for unbanked. In order to control for unobserved regional heterogeneity and the related omitted variable bias, the model included a control variable (*region*) for the

nine provinces in South Africa. Specifically, the year dummy was interacted with the province variable to control for time and within region effects. The explanatory variables are shown in Table 2.1.

Table 2.1 Explanatory variables

Name	Code/ values	Denoted as
Monthly personal income	No income R1 – R1,999 ($0.09 – $177) R2,000 – R5,999 ($178 – $351) R6,000 ($532) and above	*Income*
Age	16 – 29 years 30 – 39 years 40 – 49 years 50 years and above	*Age*
Education level	Primary school High school/matriculation Tertiary education	*Education*
Geographical area	Urban Rural	*Area*
Gender	Male Female	*Gender*
Marital status	Unmarried Married/Living with a partner	*Marital Status*
Ethnic background	Black Other ethnicities White	*Ethnicity*

***Source**: FinScope Household Surveys (2005 – 2014)*

As the explanatory variables in the equation (*age, rural, education level, gender, marital status, personal income and ethnicity*) are dichotomous or categorical, dummy variables were used to contrast the different variables, with the first-mentioned category used as a reference category in the final equation. This approach allowed for coefficients, standard errors and significance levels to be generated of a predicted logit transformation of the probability of the presence of the dependent variable (Wentzel *et*

al., 2016). In general, for *n* levels of a variable, *n*-1 dummies are included. *Age* was determined from the date of birth but was recoded into categories to allow for comparison with those reported in other years of the survey. The following variables were dichotomous, namely, *area* (rural or urban), *gender* (male or female) and *marital status* (married/living with a partner or unmarried). The remaining variables were categorical, with more than two categories per variable.

2.6.2 Variable selection

The model was fitted with six explanatory variables explored in previous studies of the determinants of financial inclusion in Africa and an additional variable for the ethnic background of the individual.

Income: The level of income of individuals or households has been associated with financial inclusion, with those from a poorer background more likely to be excluded from financial services (Allen *et al.,* 2016; Anson, Berthaud, Klapper & Singer, 2013; Fungáčová & Weill, 2014; Honohan & King, 2012; Klapper & Singer, 2015; Martínez, Hidalgo & Tuesta, 2013). The *income* variable was included in the estimation, with the average total monthly income before tax and other deductions coded into four categorical levels. The four categories were as follows: no monthly income, monthly income of R1 – R1 999 ($0.09 - $177), monthly income of R2 000 – R5 999 ($178 - $351) and monthly income of R6 000 ($532) and above. The age of the respondent has been included in various studies (Allen *et al.,* 2016; Anson *et al.,* 2013; Fungáčová & Weill, 2014; Honohan & King, 2012; Martínez *et al.,* 2013).

H1. Individuals with a higher income are more likely to be banked

Age: To determine the extent of the relationship between age and banking status, the *age* variable was coded into a categorical variable and to allow the results to be compared to other studies. It was coded into four different age categories as follows: 16 – 29 years, 30 – 39 years, 40 – 49 years and 50 years and above.

H2. Older individuals are more likely to be banked

Education: The level of education and its association with financial inclusion has been explored and found to be positively associated with inclusion (Anson *et al.,* 2013; Fungáčová & Weill, 2014; Honohan & King, 2012; Klapper & Singer, 2015; Martínez *et al.,* 2013). The *education* variable was coded into three levels, namely, primary school (if the respondent had primary school education or less), high school/matriculation (if the individual had completed high school or had some high school education) and

lastly, tertiary education (if the respondent had completed or had some tertiary education or technical training).

H3. Individuals with a higher level of education are more likely to be banked

Gender: The gender of the respondent was included as a dummy variable as the gender dimension has been explored in various studies on financial inclusion (Allen *et al.,* 2016; Honohan & King, 2012; Klapper & Singer, 2015). The dummy variable was coded 0 for males and 1 for females.

H4. Males are more likely to be banked

Area: The geographical area in which the respondent lives has been explored in some studies to determine whether living in a rural area is associated with financial exclusion (Allen *et al.,* 2016; Honohan & King, 2012; Klapper & Singer, 2015; Wentzel *et al.,* 2016). In the FinScope survey, the response to the question of where the individual lives were recorded as: in a rural/ tribal area, in an urban (formal or semi-formal) area or in a small metro area. These responses were coded as living in a rural or urban area with the variable coded 0 for an urban area and 1 for a rural area.

H5. Individuals living in an urban area are more likely to be banked

Marital status: The marital status of the respondent has been included in financial inclusion studies (Allen *et al.,* 2016; Klapper & Singer, 2015; Martínez *et al.,* 2013; Wentzel *et al.,* 2016). The *marital status* variable was recorded as follows: single and not living with a partner, single and living with a partner, divorced, widowed, married and living with a spouse and married and not living with a spouse. The *marital status* variable was recoded into a dummy variable as married/living with a partner, or unmarried. This variable was coded as 0 for unmarried and 1 for married/living with a partner.

H6. Individuals that are married/living with a partner are more likely to be banked

Ethnicity: The ethnicity of an individual has the potential to influence access to financial services (Johnson & Nino-Zarazua, 2011). The responses to the ethnic background were recorded as Black, White, Asian, Indian or Coloured. The responses were coded into the following categories – Black, White and other.

H7. The likelihood of being banked will differ by ethnicity

2.6.3 Descriptive statistics

The logistic regression model was run on the pooled dataset comprising observations for the period 2005 – 2014. Each year reported approximately 3 900 cases, derived from face-to-face interviews with individuals 16 years or older. These datasets included sampling weights to account for the differences in the ratio of the sample size to population size. A structural approach to this study was taken and these weights were excluded when calculating the univariate and logistic regressions (Cameron & Trivedi, 2009). The sample selections were made in particular to explore the target population, however, as a consequence of using the unweighted samples, the results should not be interpreted as estimating the census coefficients (Solon, Haider & Wooldridge, 2015). If a descriptive approach had been taken, then the use of weights would have been appropriate (Cameron & Trivedi, 2009). In order to address any concerns on the heteroscedasticity and serial correlation in the error terms, the Huber-White heteroscedasticity standard errors were included in the estimation (Moser, 2005). After excluding for missing information, the total number of observations was 30, 135. The missing data related mainly to income, where respondents refused to provide the information or where the respondent was unsure of the income they earned. In the pooled sample, 65.5 % indicated that they had a bank account and 35.5% of the sample was unbanked.

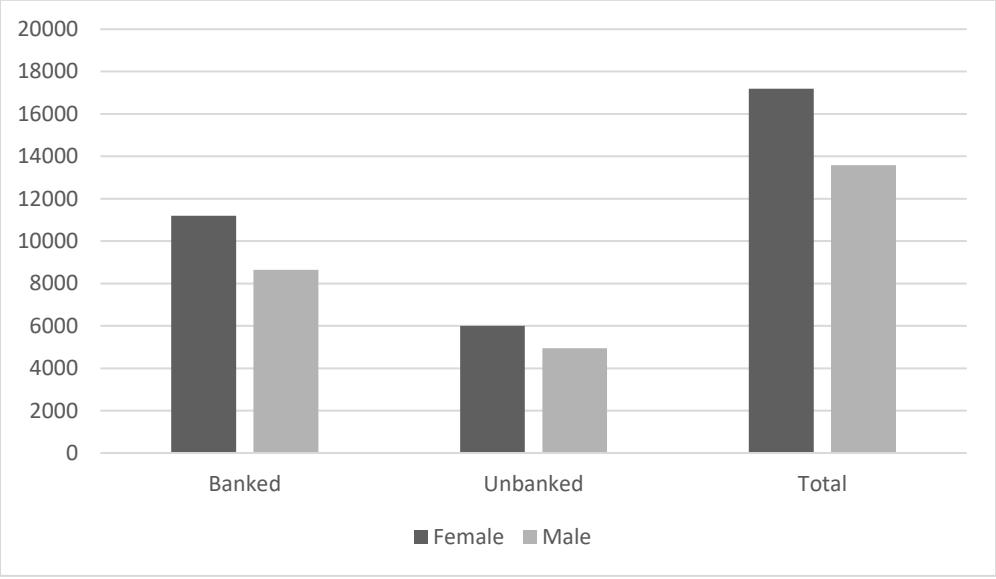


Figure 2.1 Banked status by gender in South Africa (2005 – 2014)

***Source**: FinScope Household Surveys (2005 – 2014)*

As illustrated in Figure 2.1, females comprised 55.88% of the pooled sample, with 65.48% being banked, whereas only 63.98% of males reported having a bank account. In the 2012 FinScope annual report, it was reported that females were more likely to be banked than males due to the introduction of the SASSA system for the electronic payment of social grants (as more women were recipients of social grants) (FinMark Trust, 2012). The sample of females in this study was slightly higher than the latest population census that was conducted in 2011, which estimated that 51% of the population in South Africa was female and 49% was male.

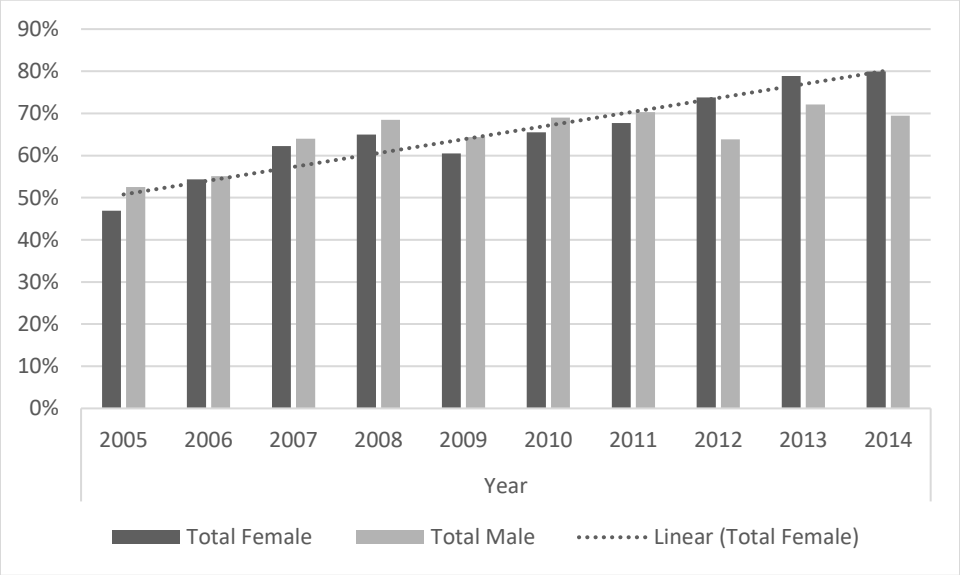


Figure 2.2 Percentage of the banked population by gender in South Africa (2005 – 2014)

***Source**: FinScope Household Surveys (2005 – 2014)*

As Figure 2.2 illustrates, from 2012 the number of females exceeded the number of males who were banked in the pooled sample. The survey recorded the response to gender as either male or female, as did the census in 2011. Future surveys may incorporate additional gender classifications that would allow the gender dimension to be explored further. The full descriptive statics for the pooled sample are provided in *Table 2.2.*

Table 2.2 Frequency measures for key variables

Variable	Frequency	%
Income		100
None	5 178	17.2
R1 – R1,999 ($0.09 – $177)	14 587	48.4
R2,000 – R5,999 ($178 – $531)	5 746	19.1
R6,000 ($532) and above	4 624	15.3
Education		100
Primary School	5 045	16.7
High School/Matriculation	21 188	70.3
Tertiary Education	3 902	12.9
Gender		100
Female	16 840	55.9
Male	13 295	44.1
Ethnic Background		100
Black	18 538	61.5
Other	7 430	24.7
White	4 167	13.8
Geographical Area		100
Urban	22 325	74.1
Rural	7 810	25.9
Marital status		100
Unmarried	17 695	58.7
Married/Living with a partner	12 440	41.3
Age		100
18-29 Years	10 650	35.3
30-39 Years	6 799	22.6
40-49 Years	5 493	18.2
50 Years and above	7 193	23.7

***Source**: FinScope Household Surveys, 2005 – 2014*

As shown in Table 2.2., the majority of individuals surveyed were single as 59% stated that they were unmarried compared to 41% who said that they were married/living with a partner. The surveys were conducted in both urban and rural areas, with 74.1% residing in urban areas and 25.9% in rural areas (the World Bank estimates that in 2011, approximately 63% of the population lived in urban areas and the remaining 37% in rural areas) (World Bank, 2011).

The majority of individuals reported a monthly income in the second income category (monthly income up to $177) and had a high school education. In 2005, approximately 50% of the sample were unbanked and in 2014, this number dropped to 24%. This already suggests that there has been a substantial improvement in the provision of financial services to the previously unbanked. The following Figure 2.3 illustrates the number of people that are banked over the period of the study.

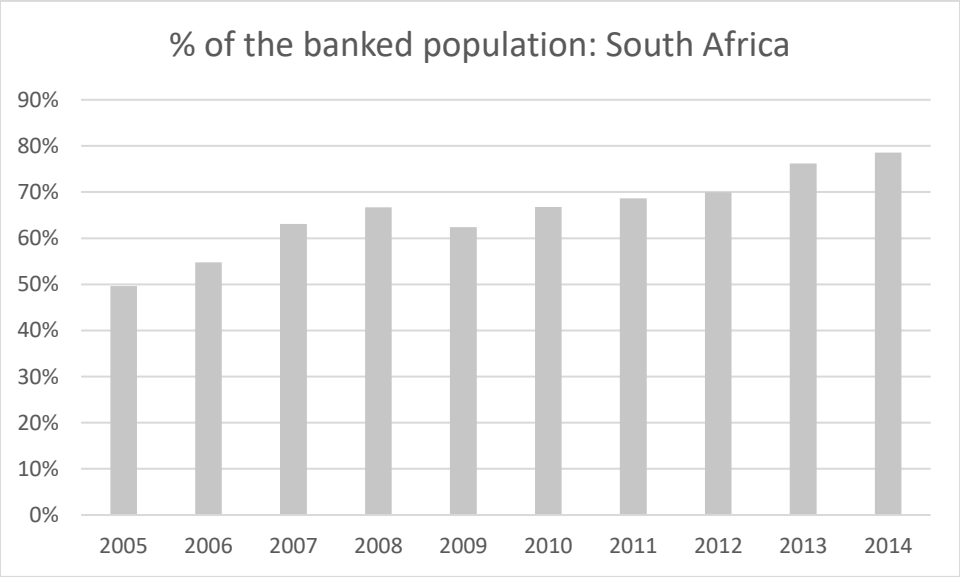
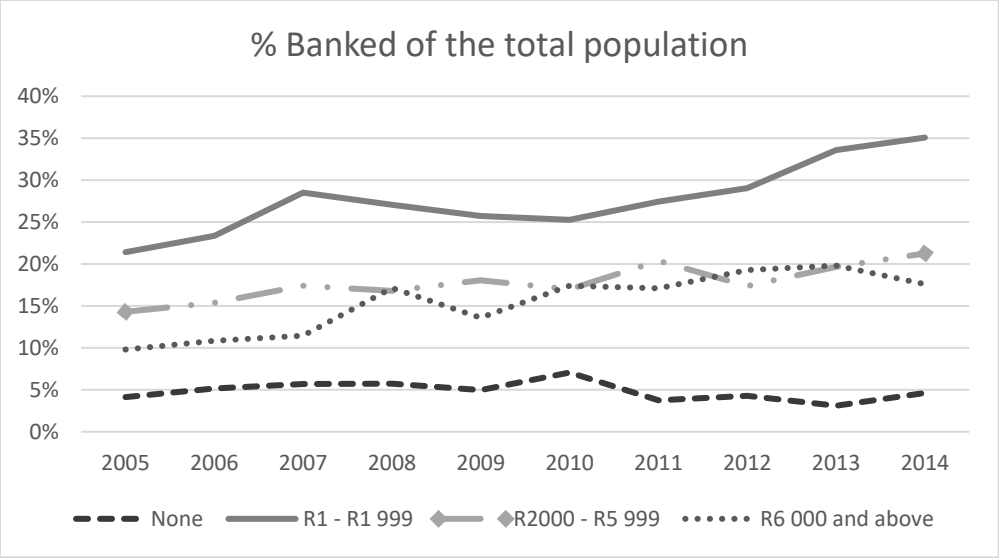


Figure 2.3 Percentage of the banked population in South Africa (2005 – 2014)

***Source**: FinScope Household Surveys (2005 – 2014)*

The change in banking status as shown in Figure 2.3 varied over the period of the study, showing a steady upward from 2005 until 2008. Thereafter there were was a decline in 2009, affected by the financial crisis, and thereafter the level of the financial inclusion continued to increase. The level of financial inclusion significantly improved from an estimated 50% in 2005 to an estimated 79% of the total population in 2014. The following Graph 2.1 further illustrates the change in the level of financial inclusion per income group.



Graph 2.1 Percentage banked by income category in South Africa (2005 – 2014)

***Source**: FinScope Household Surveys (2005 – 2014)*

The change in banking status per income group as shown in Graph 2.1 varied over the period of the study, with all income groups (with exception of the highest income group) showing a steady upward trend in banking status from 2010 until 2014. The income group earning a monthly income of R2 000 – R5 999 ($178 –$531) showed a marked increase in the number of banked individuals from 2012 until 2014. Those without income showed no upward trend over the period and indicate that these individuals remain excluded from formal financial services.

2.6.4 Testing goodness of fit

Omnibus tests are used to assess whether the variance explained the model in a set of data is significantly greater than the unexplained variance. To assess whether the model was a good fit for the data, a comparison was made between the observed and predicted data values of the outcome using the measure of the log-likelihood (Greene, 2012). The results of the Likelihood Ratio suggested that the model was better at predicting the probability of being banked than when only constants were included in the model.

To assess the significance of the individual coefficients in the logistic expression, the Wald test was used (Agresti, 2007). This test determines whether the parameters associated with a group of explanatory variables is zero. If the Wald Chi-square test is significant, then it can be concluded that the parameters

are not zero and therefore have explanatory power in the logistic expression. If the contrary is true, then these explanatory variables can be omitted from the expression (Agresti, 2007). The test of the logistic regression against a constant was found to be highly significant.

A standard R^2 cannot be computed for a logit analysis, however, a pseudo R^2 is useful insofar as it varies between 0 and 1 and can be interpreted in the standard manner (Devlin, 2005). The pseudo R^2 for the analysis was 0.3101, representing acceptable explanatory power for a cross-sectional study. To further test the goodness of fit, the proportion of correct predictions was used to assess whether the model estimation was a good fit to the observed data (Cameron & Trivedi, 2009). The model overall correctly predicted the banking status of 77.89% of the sample compared to the observed data, which further indicated that it was an adequate fit. This is shown in Table 2.3 below.

Table 2.3 Model predictions

		Predicted		
Observed Banking Status		**Unbanked**	**Banked**	**% Correct**
Unbanked		6,836	2,900	70.12%
Banked		3,764	16,635	81.55%
Overall %				77.89%

***Source**: FinScope Household Surveys, 2005 -2014*

Table 2.3 shows that the predicted results to identify individuals as banked were more accurate than the predictions for the unbanked. The model correctly predicted a positive predictive value of 81.55%. The model tended to under-predict the number of unbanked individuals.

2.7 Results

As a binary logit model was estimated for the dependent variable (*banking status*), the coefficients represented the log-odds ratios and indicated how the log of the odds of a certain outcome (banked)

compared to the omitted base category (unbanked) changed in response to individual characteristics. The results for the pooled logistic regression are presented in Table 2.4.

Table 2.4 Results of pooled regression

Variables	Coefficient 2005 - 2012	Log-odds 2005 - 2012	Marginal effects 2005 - 2012
30 – 39 years	0.327***	1.387***	0.049***
	(0.042)	(0.059)	(0.006)
40 – 49 years	0.315***	1.370***	0.048***
	(0.048)	(0.066)	(0.007)
50 years and above	0.548***	1.729***	0.082***
	(0.047)	(0.081)	(0.007)
High School/Matriculation	0.809***	2.245***	0.126***
	(0.042)	(0.094)	(0.007)
Tertiary education	2.240***	9.391***	0.310***
	(0.098)	(0.921)	(0.011)
Female	0.252***	1.286***	0.038***
	(0.031)	(0.040)	(0.005)
Rural	-0.419***	0.658***	-0.064***
	(0.037)	(0.025)	(0.006)
R1 – R1, 999 ($0.09-$177)	1.486***	4.418***	0.302***
	(0.040)	(0.179)	(0.007)
R2, 000 – R5, 999 ($178-$351)	3.330***	27.942***	0.571***
	(0.063)	(1.752)	(0.008)
R6,000 ($532) and above	4.563***	95.852***	0.639***
	(0.145)	(13.858)	(0.008)
Married	0.262***	1.299***	0.039***
	(0.034)	(0.044)	(0.005)
Other ethnicities	-0.001	0.999	-0.000
	(0.039)	(0.039)	(0.006)
White	1.131***	3.098***	0.158***
	(0.075)	(0.234)	(0.009)
Constant	-2.816***	0.060***	
	(0.146)	(0.009)	
Observations	30,135	30,135	30,135
Region FE	YES	YES	YES
Year FE	YES	YES	YES

Base categories for categorical variables are as follows: 16 – 29 years, primary school, male, urban, no income, unmarried, Black.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The results of the logistic regression indicated that the seven variables were significant in determining the banking status of an individual. In line with evidence documented in prior research (Devlin, 2005; Honohan & King, 2012; Klapper & Singer, 2015; Wentzel *et al.,* 2016), income was the most significant determinant of financial inclusion of the independent variables. These results are in line with the expectations of *H1*. The log-odds with respect to earnings categorised in the highest income category suggest that those in the highest income category were 95.9 times more likely to be banked than those with no income, whilst controlling for other factors. The marginal effects of income were also determined, which suggests that being in the highest income category increases the probability of having a bank account by 63.9% compared to those in the lowest income category.

A significantly positive association between education and banking status was found in line with the expectations of *H3*. It was the second most significant factor associated with banking status of the individual. Previous studies have found a significant positive association between education and financial inclusion (Allen *et al.,* 2016; Aterido *et al.,* 2013; Klapper & Singer, 2015; Wentzel *et al.,* 2016). The log-odds indicated that those with a tertiary education were 9.39 times more likely to be banked than those with little or no education, whilst controlling for other factors. The marginal effects were also determined to quantify the economic effect of education on the likelihood of having a bank account. The results suggest that those with tertiary education are 31% more likely to have a bank account than those with little or no education.

The age of the individual was found to be positively associated with financial inclusion, in line with expectations of *H2*. The results of the log-odds ratio indicate that persons 50 years and older are 1.73 times more likely to banked than those in the age group of 16 – 29 years. This finding corroborates previous studies, which found that older people are more likely to be banked than the youngest age groups (Allen *et al.,* 2016; Devlin, 2005; Wentzel *et al.,* 2016). Specifically, the findings of the present study suggest that those aged 50 years and older are 8.2% more likely to have a bank account than those in the 16-29 age category.

The findings of this study suggest that there is a significantly positive relationship between the banking status and marital status of the individual, in line with the expectations of *H6*. These findings confirm previous studies that suggest that married individuals are more likely to be banked (Allen et.al, 2016; Klapper & Singer, 2015; Wentzel et.al, 2016). The findings of this study also suggest that individuals in rural areas are less likely to be banked, and confirm *H5*. This finding is in line with prior studies that suggest

that there is a negative relationship between living in a rural area and the banking status of the individual (Beck & Brown, 2011; Honohan and King, 2012).

The findings of this study suggest that there is a significant association between ethnicity and banking status, whilst controlling for other factors and confirms *H7*. There was a statistically significant association between the white ethnic background and the likelihood of being banked. The results indicate that those from a white ethnicity were significantly positively associated with having a bank account. Specifically, the findings suggest that Whites were 15.8% more likely to be banked than Blacks. The implications of this result suggest that despite the policy interventions aimed at increasing access to financial services for those of a black ethnic background, there is still a need for targeted policy interventions. The results also indicate that those classified as 'other ethnicities' are not statistically different from individuals of a black ethnic background.

The gender dimension has produced varying results in the literature with some studies identifying a strong association of females being more likely to be unbanked (e.g. Devlin, 2005; Fungáčová & Weill, 2014; Klapper & Singer, 2015; Zins & Weill, 2016). Studies suggest that women were less likely to be banked due to gender differences in education, income and formal employment (Aterido, Beck & Iacovone, 2011), legal discrimination (Demirgüç-Kunt *et al.,* 2013) and lower participation in the financial sector (Aterido *et al.,* 2013). In contrast, however, other studies have found no significant association between being banked and gender (Akudugu, 2013; Allen *et al.,* 2016; Anson *et al.,* 2013; Wentzel *et al.,* 2016).

Furthermore, gender studies have reported varying results in Africa. Aterido *et al.* (2013) found that there was an unconditional gender gap in SSA, with fewer females having access to finance (at both an enterprise and individual level) than males. However, after controlling for important observable characteristics, the gender gap was no longer significant. Women appear to be disadvantaged in Africa in terms of education and labour employment, however, the reasons appear to lie outside of the financial sector (Aterido *et al.,* 2013). Other studies in Africa have found similar results suggesting that there is no significant association with financial inclusion and gender (Akudugu, 2013; Demirgüç-Kunt *et al.,* 2015; Honohan and King, 2012; Wentzel *et al.,* 2016). In contrast, Zins and Weill (2016) found that women in Africa were significantly less likely to access formal financial services than males. Johnson and Nino-Zarazua (2011) reported mixed results, with women in Kenya being more likely to be banked than males, however, no significant association with financial inclusion was found in Uganda.

The findings of this study suggest that there is a gender dimension in explaining financial inclusion and, in contrast to other studies, there is a significantly positive association between females and having a bank account in contrast to the expectations in *H4*. This study used data from samples over a ten-year period, unlike the previous studies on gender which were conducted at one or two points in time. Thus, the results incorporate the changes in banking status across time and the improvement in banking status of women. The results indicate that females are 3.8% more likely to be banked than males. This corroborates the earlier univariate results, which indicated that 65.48% of women are banked as opposed to 63.98% of men. Over the period of the study, targeted interventions and formal financial sector commitments were made to expand access for the women, as they were identified as less likely to be banked than men. The findings reflect a significant improvement in addressing the gender gap over the study period.

A possible explanation for the increase in the number of bank accounts opened by women is due to the deteriorating economic conditions in South Africa over the period of the study. There has been growing unemployment and an increase in the number of female-headed households. Another factor that is likely to have significantly affected the banking status of women was the launch of the SASSA Mastercard debit card in 2012. SASSA launched this debit card to facilitate the electronic payment of social grants. These social grants included the old age grant, war veterans grant, disability grant, grants in aid, child support grant, foster child grant, care dependency grant and social relief in distress grant (South African Social Security Agency, 2018). Women were likely to have been recipients of these grants, due to their role as caregivers.

As mentioned, a significant number of new bank accounts was opened after the government began transferring social welfare payments electronically in 2012 and provided welfare recipients with a SASSA Mastercard. To assess the impact of the launch of the SASSA electronic payment system further, a sub-set of the data was created for the period prior to the introduction of the new SASSA system (which occurred in 2012) and for the period thereafter. The regressions were run separately and the results were interpreted before and after the introduction of the SASSA card. The results are presented in Table 2.5.

Table 2.5 Results of logistic regression showing pre- and post-2012

	2005 - 2011	2005 - 2011	2012 - 2014	2012 - 2014
VARIABLES	**Log-odds**	**Marginal effects**	**Log-odds**	**Marginal effects**
30 – 39 years	1.279***	0.038***	1.687***	0.075***
	(0.063)	(0.008)	(0.139)	(0.012)
40 – 49 years	1.286***	0.038***	1.510***	0.060***
	(0.073)	(0.009)	(0.141)	(0.013)
50 years and above	1.473***	0.059***	2.540***	0.126***
	(0.081)	(0.008)	(0.239)	(0.012)
High School/Matriculation	2.592***	0.151***	1.378***	0.044***
	(0.127)	(0.008)	(0.123)	(0.013)
Tertiary education	11.460***	0.355***	3.431***	0.148***
	(1.226)	(0.013)	(0.827)	(0.025)
Female	1.084**	0.012**	2.109***	0.104***
	(0.039)	(0.005)	(0.132)	(0.009)
Rural	0.611***	-0.076***	0.775***	-0.034***
	(0.027)	(0.007)	(0.057)	(0.010)
R1 – R1,999 ($0.09 – $177)	4.076***	0.280***	6.329***	0.387***
	(0.186)	(0.008)	(0.560)	(0.017)
R2,000 – R5,999 ($178 – $351)	31.109***	0.581***	26.845***	0.581***
	(2.379)	(0.009)	(3.188)	(0.017)
R6,000 ($532) and above	73.520***	0.635***	255.795***	0.667***
	(11.949)	(0.010)	(82.618)	(0.016)
Married	1.365***	0.047***	1.192**	0.023**
	(0.054)	(0.006)	(0.084)	(0.009)
Other ethnicities	1.020	0.003	0.934	-0.009
	(0.046)	(0.007)	(0.075)	(0.011)
White	3.482***	0.183***	2.049***	0.087***
	(0.302)	(0.011)	(0.305)	(0.016)
Constant	0.063***		0.161***	
	(0.010)		(0.033)	
Observations	21,648	21,648	8,487	8,487
Region FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Each column represents the estimation results of the unweighted pooled logistic regression of equation 1 with region and year fixed effects with the pooled sample split between 2005 – 2011 and 2012 – 2014.

Reference categories: 16 – 29 years, primary school or less education, male, no income, unmarried, Black.

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The marginal effects of age in the period prior to 2012 suggest that those age 50 years and older were 5.9% more likely to have a bank account than the youngest age category, and those in the other age

categories were 3.8% more likely to have a bank account than the youngest age category, whilst controlling for other factors. After 2012 the marginal effects for age suggest that those age 50 years and older were 12.6% more likely to have a bank account than the youngest age category. Those aged 30 – 39 years were 7.5% more likely and those aged 40 – 49 were 6% more likely to have a bank account than the youngest age category, whilst controlling for other factors. Thus the effect of age is more pronounced after the introduction of the SASSA payment system and suggest that further government interventions are needed to address the youngest age group (16 – 29 years) who remain least likely to have a bank account.

The marginal effects of education in the period prior to 2012 suggest that those with tertiary education were 35.5% more likely to have a bank account than those in the lowest education category, and those with some high school were 15.1% more likely to have a bank account than those in the lowest education category, whilst controlling for other factors. After 2012 the marginal effects for education suggest that those with tertiary education were only 14.8.5% more likely to have a bank account than those in the lowest education category, and those with high school education were only 4.4% more likely to have a bank account than those in the lowest education category, whilst controlling for other factors. Thus the effect of education is less pronounced after the introduction of the SASSA payment system and suggest that the effect of the lack of education as a barrier to having a bank account was reduced after the period 2012.

The findings of the study indicated that those that were married/living with a partner were more likely to have a bank account that those that were unmarried. In the period prior to 2012, they were 4.7% more likely to have a bank account, however thereafter, they were only 2.3% more likely to have a bank account than those that were unmarried. Thus the likelihood of having a bank account for those that were unmarried increased over time.

A potential impact of the launch of the SASSA electronic payment system was that more women would open bank accounts. The marginal effects for females in the period prior to 2012 suggest that females were 1.2% more likely to have a bank account than males, whilst controlling for other factors (at the 5% significance level). However, after 2012, the association with gender was highly significant with females being 10.4% more likely to have a bank account than males, whilst controlling for other factors. Thus from 2012, women were more significantly more likely to have a bank account than men. This finding was also highlighted in the 2012 FinScope annual report, indicating that females were more likely to be banked than males due to the new SASSA system (FinMark Trust, 2012).

With respect to the geographical area where the individual resides, those living in rural areas prior to 2012 were 7.6% less likely to have a bank account than those residing in urban areas. Subsequently, the marginal effects suggest that those living in rural areas were only 3.4% less likely to have a bank account than those residing in urban areas. These findings suggest that the government policy of paying grants electronically positively impacted those living in rural areas to open bank accounts.

The government policy to pay grants electronically positively impacted those earning between R1 – R1, 999 ($.09 – $177) as they were 38.7% more likely to have a bank account than those in the lowest income category compared to prior 2012 when they were 28% more likely to have a bank account than those in the lowest income category. The marginal effects for the next income category remained the same as prior to 2012, whilst the likelihood of having a bank account for the highest income category strengthened from 63.5% to 66.7%.

Furthermore, this change impacted positively on ethnicity. People from a white ethnic background were 18.3% more likely to be banked than those from a black ethnic background prior to 2012. After 2012, however, Whites were 8.7% more likely to be banked than Blacks, whilst controlling for other factors. Thus the likelihood of having a bank account for Blacks increased over time and the policy to pay government grants electronically positively impacted access to financial services for Blacks.

The implementation of government-to-person payments not only reduced the cost per transaction for the government, but it impacted positively on financial inclusion. This highlights the important role that the state plays in addressing financial inclusion. These policies, in particular, addressed the inclusion of the previously excluded groups. More individuals were provided with access to the financial system and in particular, the increase in the number of women and those from a black ethnicity who opened bank accounts.

2.7.1 Robustness checks

The model specification was modified to assess whether the model was robust to changes in the sample specification. The pooled sample was divided into two groups, namely, by gender, to assess whether the baseline model was robust to changes in sample selection. The primary relationships of interest remained significant with the appropriate sign, thus supporting the baseline model (see Table 2.6 in the appendix).

One variable differed from the baseline model, namely, the relationship between banking status and other ethnicities, which were significant. In the baseline model, coming from a white or black background had a significant association with banking status, however, the relationship between other ethnicities was not significant. In contrast, in the female group, those from other ethnicities were 1.6% more likely to be banked than those from a black ethnic background. There was a change in the sign for the male group, with other ethnicities being 1.8% less likely to be banked than those from a black ethnic background. These results, whilst supporting the baseline model, suggest that the role of ethnicity also has a gender disparity (see Table 2.6 in the appendix for the results of this regression).

The regressions were run on the pooled dataset, with each regression using the full pooled sample with one year of the survey data excluded each time. These results were compared to the baseline model, which included all survey years. These results of these regressions supported the baseline model, with all the main variables of interest remaining significant with the appropriate sign. The most significant association with banking status was income, followed by education and age. These results are in line with the baseline model, confirming that the baseline model was robust to changes in the sample selection (see Tables 2.8 to 2.17 in the appendix).

A regression was also run with errors clustered on a regional level (for the nine provinces), to control for possible correlation between error terms across individuals within regions. The primary relationships of interest remained significant with the appropriate sign, thus supporting the baseline model (see Table 2.7 in the appendix for the results of this regression).

The model was also run with using the design weights, which were applied to the sample data. The weights were benchmarked to resemble the South African population (aged 15 and above) according to the midyear estimates of StatsSA for each respective year of the pooled sample. The regression was run on the pooled sample using the sample weights and heteroscedasticity-robust standard errors were reported. The results of the weighted sample had a lower pseudo-r-squared of 0.3067, indicating that the model had lower explanatory power than the baseline model, which had a pseudo-r-squared of 0.3101. The marginal effects of the variables of interest had a higher magnitude than the baseline model. This suggests that the magnitude of the effects of the variables on the banking status of individuals may be higher than those reported in the baseline model. However, the robust-standard errors for a number of variables were higher than those reported in the baseline model, indicating the results of the baseline estimation were more precise. The results of the weighted pooled sample suggest that the results were robust to re-weighting of the sample (see Table 2.18 in the appendix).

The regression was also run using a probit model for robustness. The results were found to be consistent with the logit model (see Table 2.19 in the appendix). This is in line with expectations that the results of the binary probit model would be essentially similar (Hahn & Soyer, 2005; Khatoon, Tiwari & Chatterjee, 2013).

2.8 Conclusion

Regulators and policymakers around the world have recognised the importance of financial inclusion for long-term economic growth. Further research is needed to identify the determinants of financial inclusion, especially in emerging markets, where exclusion is most pronounced. In particular, countries in Africa have higher financial exclusion rates than in other parts of the world. In this study, the long-term effectiveness of state interventions to address financial inclusion were assessed. The determinants of financial inclusion in South Africa were investigated to identify key determinants significantly associated with financial inclusion. The data was obtained from the FinScope Surveys in South Africa over a ten-year period. This data was obtained from repeat surveys to assess how these factors changed over time and to compare the findings with other studies in SSA.

The findings reveal that income is significantly positively associated with financial inclusion. In particular, those in the sample who had the lowest income were least likely to be banked. This suggests that policy interventions should be targeted at the lowest income groups to improve access to financial services. This finding is in line with other studies in SSA which have highlighted the association of income with financial inclusion. Education levels were also significantly positively associated with financial inclusion, and individuals with tertiary education were most likely to be banked. Promoting financial literacy could increase the number of banked individuals, especially for individuals with little or no formal lower education. The study also found a significant positive association with age, suggesting that those in the youngest age category, 16 – 29 years, were less likely to be banked than those in the older age categories. This finding is in line with the results of other studies in SSA, highlighting the importance of policy interventions targeted at the younger age groups.

This study also contributed to the debate on the gender dimension of financial inclusion. Previous studies in Africa have found that females are less likely to be banked than their male counterparts or that the gender dimension was not significantly associated with financial inclusion, whilst controlling for other factors. In contrast, the findings of this study suggest that there is a significantly positive relationship

between financial inclusion and being female. The increased likelihood of women having a bank account is partly due to growth in bank accounts after the launch of the SASSA MasterCard in 2012, together with financial inclusion policy interventions.

These findings are encouraging, as the gender disparity with respect to financial inclusion seems to have increased over the period of the study, indicating that women are now more likely to have a bank account than men. The findings confirm the success of state policy interventions to address financial exclusion. The study was not able to explore other genders and future studies could address the gender dimension with more inclusive categories for gender. Overall, South Africa's formal financial sector consensus model has positively affected financial inclusion, with an estimated 75% of the population accessing financial services.

This study uniquely explored the association of ethnic background with the likelihood of being banked in South Africa. The results indicated that there was a significant association between ethnic background and being banked, with Whites being 15.8% more likely to be banked than Blacks. Encouragingly this effect is reducing over time. After the introduction of the government policy to pay grants electronically in 2012 resulted in a number of new bank accounts being opened by Blacks. However, further policy interventions are needed to address financial exclusion for those from a black ethnic background. The results for the other ethnic groups were inconclusive. Current research has not explored the association between ethnic background and financial inclusion. Future studies could explore this further, providing greater insights into the relationship between ethnicity and financial inclusion.

Prior studies in SSA have, as yet, not explored the association between ethnic background and financial inclusion (Akudugu, 2013; Honohan & King, 2012; Johnson & Nino-Zarazua, 2011; Klapper & Singer, 2015; Wentzel *et al.,* 2016; Zins & Weill, 2016). Further research in this area would shed greater light on the role of ethnicity and access to financial services. Socio-economic circumstances differ across regions and countries in Africa, and research in other countries would indicate whether policy interventions should target specific ethnic groups to enhance financial inclusion.

Appendix

Table 2.6 Pooled sample with data split by gender

	Male	Male	Female	Female
VARIABLES	**Log-odds**	**Marginal effects**	**Log-odds**	**Marginal effects**
30 – 39 years	0.182***	0.025***	0.427***	0.068***
	(0.068)	(0.009)	(0.055)	(0.009)
40 – 49 years	0.204**	0.028**	0.365***	0.058***
	(0.080)	(0.011)	(0.062)	(0.010)
50 years and above	0.510***	0.070***	0.511***	0.081***
	(0.080)	(0.011)	(0.060)	(0.009)
High School/Matriculation	0.890***	0.125***	0.764***	0.126***
	(0.068)	(0.010)	(0.054)	(0.009)
Tertiary education	2.475***	0.318***	2.114***	0.305***
	(0.149)	(0.016)	(0.130)	(0.015)
Rural	-0.467***	-0.064***	-0.379***	-0.060***
	(0.059)	(0.008)	(0.049)	(0.008)
R1 – R1,999 ($0.09 – $177)	1.555***	0.308***	1.444***	0.294***
	(0.064)	(0.011)	(0.054)	(0.010)
R2,000 – R5,999 ($178 – $351)	3.476***	0.601***	3.205***	0.540***
	(0.089)	(0.012)	(0.091)	(0.011)
R6,000 ($532) and above	4.924***	0.681***	4.140***	0.596***
	(0.207)	(0.012)	(0.204)	(0.012)
Married	0.452***	0.062***	0.131***	0.020***
	(0.060)	(0.008)	(0.044)	(0.007)
Other ethnicities	-0.127**	-0.018**	0.098*	0.016*
	(0.062)	(0.009)	(0.051)	(0.008)
White	0.949***	0.126***	1.299***	0.185***
	(0.123)	(0.015)	(0.099)	(0.012)
Constant	-2.683***		-2.701***	
	(0.213)		(0.202)	
Observations	13,295	13,295	16,840	16,840
Region FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Each column represents the estimation results of the unweighted pooled logistic regression of equation 1 with region and year fixed effects for sub-samples by gender.

Reference categories: 16 – 29 years, primary school or less education, male, no income, unmarried, Black.

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.7 Results of equation 1 with errors clustered by region

Variables	**Log-odds**	**Marginal effects**
30 – 39 years	0.327***	0.049***
	(0.049)	(0.007)
40 – 49 years	0.315***	0.048***
	(0.017)	(0.003)
50 years and above	0.548***	0.082***
	(0.100)	(0.014)
High School/Matriculation	0.809***	0.126***
	(0.057)	(0.008)
Tertiary education	2.240***	0.310***
	(0.178)	(0.018)
Female	0.252***	0.038***
	(0.044)	(0.007)
Rural	-0.419***	-0.064***
	(0.069)	(0.010)
R1 – R1,999 ($0.09 – $177)	1.486***	0.302***
	(0.110)	(0.019)
R2,000 – R5,999 ($178 – $351)	3.330***	0.571***
	(0.084)	(0.013)
R6,000 ($532) and above	4.563***	0.639***
	(0.131)	(0.014)
Married	0.262***	0.039***
	(0.032)	(0.005)
Other ethnicities	-0.001	-0.000
	(0.088)	(0.013)
White	1.131***	0.158***
	(0.129)	(0.016)
Constant	-2.816***	
	(0.151)	
Observations	30,135	30,135
Region FE	YES	YES
Year FE	YES	YES

Each column represents the estimation results of the weighted pooled logistic regression of equation 1 with year fixed effects and the standard errors clustered at a regional level.
Reference categories: 16 – 29 years, primary school or less education, male, no income, unmarried, Black.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0

Table 2.8 Results of equation 1 without 2005 dataset

	Coefficient	Log-odds
Variables	**Pooled sample excluding 2005**	**Pooled sample excluding 2005**
30 – 39 years	0.351***	1.420***
	(0.0453)	(0.0644)
40 – 49 years	0.300***	1.350***
	(0.0517)	(0.0698)
50 years and above	0.518***	1.679***
	(0.0497)	(0.0834)
High School/Matriculation	0.803***	2.232***
	(0.0446)	(0.0996)
Tertiary education	2.202***	9.047***
	(0.106)	(0.963)
Female	0.293***	1.341***
	(0.0333)	(0.0447)
Rural	-0.411***	0.663***
	(0.0398)	(0.0264)
R1 – R1,999 ($0.09 – $177)	1.531***	4.625***
	(0.0427)	(0.198)
R2,000 – R5,999 ($178 – $351)	3.309***	27.35***
	(0.0656)	(1.793)
R6,000 ($532) and above	4.625***	102.0***
	(0.156)	(15.92)
Married	0.285***	1.330***
	(0.0367)	(0.0488)
Other ethnicities	-0.00344	0.997
	(0.0421)	(0.0420)
White	1.021***	2.777***
	(0.0812)	(0.226)
Constant	-2.373***	0.0932***
	(0.156)	(0.0145)
Observations	26,688	26,688
Region FE	YES	YES
Year FE	YES	YES

Each column represents the estimation results of the unweighted pooled logistic regression, excluding 2005, of equation 1 with region and year fixed effects.
Reference categories: 16 – 29 years, primary school or less education, male, no income, unmarried, Black.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.9 Results of equation 1 without 2006 dataset

	Coefficient	Log-odds
Variables	**Pooled sample excluding 2006**	**Pooled sample excluding 2006**
30 – 39 years	0.328***	1.388***
	(0.0450)	(0.0625)
40 – 49 years	0.335***	1.398***
	(0.0512)	(0.0716)
50 years and above	0.558***	1.747***
	(0.0493)	(0.0862)
High School/Matriculation	0.763***	2.145***
	(0.0447)	(0.0959)
Tertiary education	2.163***	8.695***
	(0.105)	(0.912)
Female	0.254***	1.289***
	(0.0331)	(0.0426)
Rural	-0.388***	0.678***
	(0.0396)	(0.0268)
R1 – R1,999 ($0.09 – $177)	1.488***	4.429***
	(0.0431)	(0.191)
R2,000 – R5,999 ($178 –$351)	3.276***	26.48***
	(0.0655)	(1.734)
R6,000 ($532) and above	4.558***	95.40***
	(0.152)	(14.51)
Married	0.280***	1.323***
	(0.0363)	(0.0480)
Other ethnicities	0.0332	1.034
	(0.0418)	(0.0432)
White	1.138***	3.121***
	(0.0793)	(0.247)
Constant	-2.824***	0.0594***
	(0.147)	(0.00875)
Observations	26,895	26,895
Region FE	YES	YES
Year FE	YES	YES

Each column represents the estimation results of the unweighted pooled logistic regression, excluding 2006, of equation 1 with region and year fixed effects.
Reference categories: 16 – 29 years, primary school or less education, male, no income, unmarried, Black.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.10 Results of equation 1 without 2007 dataset

	Coefficient	Log-odds
Variables	**Pooled sample excluding 2007**	**Pooled sample excluding 2007**
30 – 39 years	0.326***	1.385***
	(0.0451)	(0.0624)
40 – 49 years	0.285***	1.329***
	(0.0512)	(0.0680)
50 years and above	0.559***	1.749***
	(0.0494)	(0.0864)
High School/Matriculation	0.792***	2.207***
	(0.0445)	(0.0982)
Tertiary education	2.199***	9.014***
	(0.105)	(0.942)
Female	0.279***	1.321***
	(0.0331)	(0.0437)
Rural	-0.396***	0.673***
	(0.0396)	(0.0267)
R1 – R1,999 ($0.09 – $177)	1.493***	4.452***
	(0.0431)	(0.192)
R2,000 – R5,999 ($178 – $351)	3.310***	27.38***
	(0.0658)	(1.801)
R6,000 ($532) and above	4.601***	99.63***
	(0.151)	(15.02)
Married	0.246***	1.279***
	(0.0362)	(0.0463)
Other ethnicities	0.0255	1.026
	(0.0414)	(0.0425)
White	1.097***	2.994***
	(0.0797)	(0.239)
Constant	-2.824***	0.0594***
	(0.147)	(0.00875)
Observations	26,858	26,858
Region FE	YES	YES
Year	YES	YES

Each column represents the estimation results of the unweighted pooled logistic regression, excluding 2007, of equation 1 with region and year fixed effects.
Reference categories: 16 – 29 years, primary school or less education, male, no income, unmarried, Black.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.11 Results of equation 1 without 2008 dataset

	Coefficient	Log-odds
Variables	**Pooled sample excluding 2008**	**Pooled sample excluding 2008**
30 – 39 years	0.348***	1.417***
	(0.0448)	(0.0634)
40 – 49 years	0.329***	1.389***
	(0.0511)	(0.0710)
50 years and above	0.580***	1.785***
	(0.0494)	(0.0881)
High School / Matriculation	0.779***	2.180***
	(0.0439)	(0.0958)
Tertiary education	2.212***	9.135***
	(0.104)	(0.946)
Female	0.286***	1.331***
	(0.0330)	(0.0440)
Rural	-0.435***	0.647***
	(0.0396)	(0.0256)
R1 – R1,999 ($0.09 – $177)	1.497***	4.467***
	(0.0433)	(0.194)
R2,000 – R5,999 ($178 – $351)	3.331***	27.95***
	(0.0668)	(1.867)
R6,000 ($532) and above	4.646***	104.2***
	(0.156)	(16.30)
Married	0.251***	1.285***
	(0.0363)	(0.0466)
Other ethnicities	-0.00423	0.996
	(0.0414)	(0.0412)
White	1.114***	3.047***
	(0.0811)	(0.247)
Constant	-2.828***	0.0591***
	(0.148)	(0.00875)
Observations	26,854	26,854
Region FE	YES	YES
Year FE	YES	YES

Each column represents the estimation results of the unweighted pooled logistic regression, excluding 2008, of equation 1 with region and year fixed effects.
Reference categories: 16 – 29 years, primary school or less education, male, no income, unmarried, Black.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.12 Results of equation 1 without 2009 dataset

	Coefficient	Log-odds
Variables	**Pooled sample excluding 2009**	**Pooled sample excluding 2009**
30 – 39 years	0.336***	1.399***
	(0.0448)	(0.0626)
40 – 49 years	0.310***	1.363***
	(0.0511)	(0.0697)
50 years and above	0.565***	1.760***
	(0.0496)	(0.0874)
High School / Matriculation	0.796***	2.216***
	(0.0441)	(0.0977)
Tertiary education	2.226***	9.261***
	(0.106)	(0.980)
Female	0.284***	1.329***
	(0.0330)	(0.0439)
Rural	-0.445***	0.641***
	(0.0396)	(0.0254)
R1 – R1,999 ($0.09 – $177)	1.446***	4.248***
	(0.0432)	(0.183)
R2,000 – R5,999 ($178 –$351)	3.276***	26.47***
	(0.0665)	(1.761)
R6,000 ($532) and above	4.531***	92.87***
	(0.152)	(14.13)
Married	0.247***	1.280***
	(0.0363)	(0.0465)
Other ethnicities	-0.00710	0.993
	(0.0413)	(0.0410)
White	1.162***	3.195***
	(0.0797)	(0.255)
Constant	-2.790***	0.0614***
	(0.147)	(0.00900)
Observations	26,948	26,948
Region FE	YES	YES
Year	YES	YES

Each column represents the estimation results of the unweighted pooled logistic regression, excluding 2009, of equation 1 with region and year fixed effects.
Reference categories: 16 – 29 years, primary school or less education, male, no income, unmarried, Black
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.13 Results of equation 1 without 2010 dataset

	Coefficient	Log-odds
Variables	**Pooled sample excluding 2010**	**Pooled sample excluding 2010**
30 – 39 years	0.333***	1.395***
	(0.0442)	(0.0617)
40 – 49 years	0.363***	1.438***
	(0.0504)	(0.0724)
50 years and above	0.608***	1.837***
	(0.0492)	(0.0903)
High School/Matriculation	0.808***	2.244***
	(0.0439)	(0.0985)
Tertiary education	2.250***	9.488***
	(0.104)	(0.986)
Female	0.259***	1.295***
	(0.0325)	(0.0421)
Rural	-0.400***	0.670***
	(0.0393)	(0.0264)
R1 – R1,999 ($0.09 – $177)	1.524***	4.592***
	(0.0429)	(0.197)
R2,000 – R5,999 ($178 – $351)	3.372***	29.14***
	(0.0661)	(1.925)
R6,000 ($532) and above	4.605***	99.93***
	(0.152)	(15.18)
Married	0.224***	1.252***
	(0.0358)	(0.0449)
Other ethnicities	-0.0435	0.957
	(0.0409)	(0.0392)
White	1.144***	3.138***
	(0.0792)	(0.249)
Constant	-2.838***	0.0585***
	(0.148)	(0.00868)
Observations	27,418	27,418
Region FE	YES	YES
Year	YES	YES

Each column represents the estimation results of the unweighted pooled logistic regression, excluding 2010, of equation 1 with region and year fixed effects.
Reference categories: 16 – 29 years, primary school or less education, male, no income, unmarried, Black.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.14 Results of equation 1 without 2011 dataset

	Coefficient	Log-odds
Variables	**Pooled sample excluding 2011**	**Pooled sample excluding 2011**
30 – 39 years	0.333***	1.396***
	(0.0440)	(0.0614)
40 – 49 years	0.328***	1.388***
	(0.0505)	(0.0701)
50 years and above	0.568***	1.765***
	(0.0491)	(0.0866)
High School / Matriculation	0.798***	2.222***
	(0.0439)	(0.0975)
Tertiary education	2.241***	9.405***
	(0.104)	(0.974)
Female	0.249***	1.283***
	(0.0324)	(0.0415)
Rural	-0.404***	0.668***
	(0.0389)	(0.0260)
R1 – R1,999 ($0.09 – $177)	1.495***	4.461***
	(0.0419)	(0.187)
R2,000 – R5,999 ($178 – $351)	3.372***	29.15***
	(0.0662)	(1.931)
R6,000 ($532) and above	4.613***	100.8***
	(0.156)	(15.72)
Married	0.266***	1.304***
	(0.0359)	(0.0468)
Other ethnicities	-0.0205	0.980
	(0.0408)	(0.0399)
White	1.128***	3.089***
	(0.0788)	(0.243)
Constant	-2.820***	0.0596***
	(0.148)	(0.00881)
Observations	27,636	27,636
Region FE	YES	YES
Year FE	YES	YES

Each column represents the estimation results of the unweighted pooled logistic regression, excluding 2011, of equation 1 with region and year fixed effects.
Reference categories: 16 – 29 years, primary school or less education, male, no income, unmarried, Black.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.15 Results of equation 1 without 2012 dataset

	Coefficient	Log-odds
Variables	**Pooled sample excluding 2012**	**Pooled sample excluding 2012**
30 – 39 years	0.326***	1.386***
	(0.0446)	(0.0619)
40 – 49 years	0.321***	1.379***
	(0.0510)	(0.0704)
50 years and above	0.535***	1.707***
	(0.0492)	(0.0839)
High School / Matriculation	0.842***	2.321***
	(0.0438)	(0.102)
Tertiary education	2.305***	10.03***
	(0.101)	(1.017)
Female	0.215***	1.240***
	(0.0327)	(0.0405)
Rural	-0.443***	0.642***
	(0.0395)	(0.0253)
R1 – R1,999 ($0.09 – $177)	1.497***	4.468***
	(0.0424)	(0.189)
R2,000 – R5,999 ($178 – $351)	3.405***	30.10***
	(0.0670)	(2.017)
R6,000 ($532) and above	4.510***	90.97***
	(0.150)	(13.67)
Married	0.252***	1.287***
	(0.0359)	(0.0462)
Other ethnicities	-0.00734	0.993
	(0.0412)	(0.0409)
White	1.179***	3.252***
	(0.0800)	(0.260)
Constant	-2.828***	0.0591***
	(0.148)	(0.00876)
Observations	27,245	27,245
Region FE	YES	YES
Year FE	YES	YES

Each column represents the estimation results of the unweighted pooled logistic regression, excluding 2012, of equation 1 with region and year fixed effects.
Reference categories: 16 – 29 years, primary school or less education, male, no income, unmarried, Black.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.16 Results of equation 1 without 2013 dataset

	Coefficient	Log-odds
Variables	**Pooled sample excluding 2013**	**Pooled sample excluding 2013**
30 – 39 years	0.299***	1.349***
	(0.0442)	(0.0596)
40 – 49 years	0.290***	1.336***
	(0.0505)	(0.0675)
50 years and above	0.493***	1.637***
	(0.0490)	(0.0803)
High School / Matriculation	0.854***	2.348***
	(0.0438)	(0.103)
Tertiary education	2.307***	10.04***
	(0.100)	(1.007)
Female	0.209***	1.233***
	(0.0325)	(0.0400)
Rural	-0.442***	0.643***
	(0.0393)	(0.0252)
R1 – R1,999 ($0.09 – $177)	1.452***	4.272***
	(0.0420)	(0.179)
R2,000 – R5,999 ($178 – $351)	3.324***	27.77***
	(0.0659)	(1.829)
R6,000 ($532) and above	4.464***	86.83***
	(0.149)	(12.95)
Married	0.274***	1.315***
	(0.0357)	(0.0470)
Other ethnicities	0.00344	1.003
	(0.0409)	(0.0410)
White	1.183***	3.264***
	(0.0785)	(0.256)
Constant	-2.790***	0.0614***
	(0.147)	(0.00901)
Observations	27,238	27,238
Region FE	YES	YES
Year FE	YES	YES

Each column represents the estimation results of the unweighted pooled logistic regression, excluding 2013, of equation 1 with region and year fixed effects.
Reference categories: 16 – 29 years, primary school or less education, male, no income, unmarried, Black.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.17 Results of equation 1 without 2014 dataset

	Coefficient	Log-odds
Variables	**Pooled sample excluding 2014**	**Pooled sample excluding 2014**
30 – 39 years	0.293***	1.341***
	(0.0443)	(0.0593)
40 – 49 years	0.288***	1.334***
	(0.0505)	(0.0674)
50 years and above	0.492***	1.636***
	(0.0489)	(0.0799)
High School/Matriculation	0.848***	2.334***
	(0.0436)	(0.102)
Tertiary education	2.281***	9.783***
	(0.101)	(0.984)
Female	0.194***	1.214***
	(0.0324)	(0.0393)
Rural	-0.429***	0.651***
	(0.0391)	(0.0255)
R1 – R1,999 ($0.09 – $177)	1.438***	4.210***
	(0.0415)	(0.175)
R2,000 – R5,999 ($178 – $351)	3.334***	28.06***
	(0.0662)	(1.856)
R6,000 ($532) and above	4.491***	89.19***
	(0.150)	(13.38)
Married	0.295***	1.343***
	(0.0358)	(0.0480)
Other ethnicities	0.0183	1.019
	(0.0405)	(0.0413)
White	1.129***	3.092***
	(0.0777)	(0.240)
Constant	-2.781***	0.0619***
	(0.147)	(0.00908)
Observations	27,435	27,435
Region FE	YES	YES
Year FE	YES	YES

Each column represents the estimation results of the unweighted pooled logistic regression, excluding 2014, of equation 1 with region and year fixed effects.
Reference categories: 16 – 29 years, primary school or less education, male, no income, unmarried, Black.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.18 Results of the regression equation 1 using population weights

Variables	**Coefficient**	**Log-odds**	**Marginal effects**
30 – 39 years	0.420***	1.522***	0.066***
	(0.056)	(0.086)	(0.009)
40 – 49 years	0.258***	1.294***	0.041***
	(0.064)	(0.083)	(0.010)
50 years and above	0.406***	1.501***	0.064***
	(0.065)	(0.097)	(0.010)
High School / Matriculation	0.783***	2.188***	0.126***
	(0.057)	(0.125)	(0.009)
Tertiary education	2.286***	9.836***	0.334***
	(0.133)	(1.305)	(0.016)
Female	0.255***	1.291***	0.040***
	(0.041)	(0.053)	(0.006)
Rural	-0.420***	0.657***	-0.066***
	(0.049)	(0.032)	(0.008)
R1 – R1,999 ($0.09 – $177)	1.655***	5.233***	0.330***
	(0.054)	(0.283)	(0.009)
R2,000 – R5,999 ($178 – $351)	3.504***	33.248***	0.615***
	(0.084)	(2.781)	(0.010)
R6,000 ($532) and above	4.827***	124.835***	0.693***
	(0.207)	(25.837)	(0.011)
Married	0.364***	1.439***	0.057***
	(0.046)	(0.066)	(0.007)
Other ethnicities	-0.052	0.949	-0.008
	(0.057)	(0.054)	(0.009)
White	1.142***	3.132***	0.169***
	(0.113)	(0.354)	(0.015)
Constant	-3.013***	0.049***	
	(0.165)	(0.008)	
Observations	30,135	30,135	30,135
Region FE	YES	YES	YES
Year FE	YES	YES	YES

Each column represents the estimation results of the weighted pooled logistic regression of equation 1 with region and year fixed effects.
Reference categories: 16 – 29 years, primary school or less education, male, no income, unmarried, Black.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.19 Results of the regression equation 1 using the probit model

Variables	**Coefficient**	**Marginal effects**
30 – 39 years	0.195***	0.065***
	(7.836)	(0.008)
40 – 49 years	0.190***	0.064***
	(6.720)	(0.009)
50 years and above	0.322***	0.104***
	(11.750)	(0.009)
High School / Matriculation	0.491***	0.178***
	(19.727)	(0.010)
Tertiary education	1.284***	0.359***
	(23.305)	(0.012)
Female	0.145***	0.047***
	(7.934)	(0.006)
Rural	-0.250***	-0.084***
	(-11.299)	(0.008)
R1 – R1,999 ($0.09 – $177)	0.890***	0.343***
	(37.757)	(0.008)
R2,000 – R5,999 ($178 – $351)	1.911***	0.616***
	(57.200)	(0.008)
R6,000 ($532) and above	2.422***	0.669***
	(39.391)	(0.008)
Married	0.151***	0.049***
	(7.545)	(0.006)
Other ethnicities	-0.003	-0.001
	(-0.151)	(0.008)
White	0.608***	0.166***
	(14.695)	(0.009)
Observations	30,135	30,135
Year FE	Yes	Yes
Region FE	Yes	Yes
Pseudo R-squared	0.309	

Each column represents the estimation results of the unweighted pooled probit regression of equation 1 with region and year fixed effects.
Reference categories: 16 – 29 years, primary school or less education, female, no income, unmarried, Black.
Robust z-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

CHAPTER 3

Trust matters: Insights into mobile banking adoption in Sub-Saharan Africa

Abstract

There is growing interest in the potential for mobile banking technologies to reach the unbanked population in Sub-Saharan Africa (SSA) where large portions of the population have access to a mobile phone but remain outside of the financial system. However, the factors driving mobile banking adoption remain unclear, particularly the role of technological applications in garnering the trust of the unbanked. This chapter thus examines the influence of socio-demographic and cultural factors over time, on the use of mobile banking.

The findings reveal that bank trust has a significantly positive effect on the use of mobile banking. Ethnicity influences the usage of mobile banking, specifically those from a Black ethnicity were more likely to use mobile banking than those from other ethnicities. People aged 30-39 years were most likely to use mobile banking and income and education levels were significantly positively associated with the use of mobile banking. In particular, being classified in the highest income category increased the probability of using mobile banking by 9.44% compared to the lowest income category.

The findings in this chapter should assist policymakers, banks and fintech providers to better understand the determinants of mobile payments adoption, specifically consumer groups which are less likely to adopt and that consumer trust in banks can be transferred to trust in mobile banking services.

Keywords: Financial services, Sub-Saharan Africa (SSA), trust, use of mobile banking

JEL codes: G21, G41, O33

3.1 Introduction

After the financial crisis of 2008, there was a widespread lack of trust in financial institutions and concerns about the soundness of banks (Carbó Valverde, 2014). The public relations company, Edelman, conducted annual surveys on consumers' perceptions of trust across the globe. The Edelman Trust Barometer reflected that globally, 68% of the public had trust in financial service institutions in 2007 (Edelman, 2007) but that this dropped to 45% in 2009 (Edelman, 2009). The level of trust in financial services has since risen to 57% in the 2019 edition of the Edelman Trust Barometer (Edelman, 2019). This lack of trust in banks, coupled with the increased costs of lending and the limited availability of loan financing from banks, has fostered the demand for fintechs (Haddad & Hornuf, 2016). Technological changes have given rise to new practices, business models (Baden-Fuller & Haefliger, 2013) and changes in the method of delivering financial services.

Trust has always played a fundamental role in financial services, due in a large part to the fiduciary nature of many relationships within the sector (Devlin, Ennew, Sekhon & Roy, 2015). However, when financial institutions introduce technological innovations such as mobile banking, customers may perceive these services to be riskier and more uncertain as these services are virtual (Koenig-Lewis, Palmer & Moll, 2010; Zhou, 2011). Thus, providers need to build trust in order for consumers to adopt and use mobile banking and any other technologies. First-time adopters will need to rely on their personal perceptions of information quality and system quality to establish initial trust in mobile banking due to their lack of direct experience (Zhou, 2011).

There are two types of trust when assessing barriers to mobile banking adoption – trust in the institution (the mobile network operator and their agents providing the service) and trust in the technology (Koenig-Lewis *et al.,* 2010; Tobbin, 2012). Institutional trust means that a person believes the necessary impersonal structures are in place to anticipate a successful future endeavour (McKnight, Cummings & Chervany, 1998). Institutional trust refers to a person's trust in the system and is associated with their expectations of structural assurance and situational normalcy (Devlin *et al.,* 2015). Thus, before transferring this trust to the technology used to deliver these services, they first have to trust the institution providing the mobile financial services (Rotchanakitumnuai & Speece, 2003). Trust in technology refers to trust that the software will reliably fulfil one's needs, securely, dependably and consistently over time (McKnight, 2005).

An important self-reported barrier to financial services is the distrust of the financial institution (Allen *et al.,* 2016). Consumers often face high levels of risk in decision-making due to product complexity, the long-term nature and intangibility of many products offered by financial institutions (Ennew & Sekhon, 2007). Risk is present in many financial services, however, it is most significant in relation to savings and investment products (Devlin *et al.,* 2015). This, together with the bailout of many financial institutions often using taxpayers money, has compounded the public's distrust of banks (Carbó Valverde, 2014).

Approximately one billion of the financially excluded individuals own a mobile phone and 480 million have access to the internet (Demirgüç-Kunt *et al.,* 2018). Governments and non-governmental organisations have recognised that technology can be a tool to reach the unbanked population and for poverty reduction (Chibba, 2009; Hinson, 2011). Many countries around the world, such as Australia, South Africa, the US and the UK use EFTs for the payment of social grants and other government payments, which has resulted in new bank accounts being opened by the previously unbanked (Barr, 2004; Kempson *et al.,* 2004; New Policy Institute, 2007). The state has also been credited with playing an important role in the success of new mobile technology for the provision of financial services, by creating an enabling regulatory environment (Beck, 2008; Burns, 2018). Mobile devices have thus become an important tool to enhance financial inclusion in developing economies (Kim, Zoo, Lee & Kang, 2017).

Prior research on the determinants of mobile banking adoption has mostly been conducted using cross-sectional data at a single point in time (e.g. Arvidsson, 2014; Gu *et al.,* 2009; Laukkanen *et al.,* 2007; Laukkanen & Pasanen, 2008; Zins & Weill, 2016). In contrast, this study uses multiple data points, thereby offering a long-term perspective on the determinants of mobile adoption (e.g. Kikulwe *et al.,* 2014; Kolodinsky *et al.,* 2004). The study provides insights into mobile banking adoption in three broad areas. Firstly, it identifies individual characteristics of adopters and non-adopters of mobile banking and determines whether these characteristics change over time. Secondly, it examines the role of ethnicity, as a dimension of culture, on the behavioural intention for mobile banking adoption. Lastly, it explores the role of trust in banks as an enhancer of mobile banking adoption (e.g. Arvidsson, 2014; Gu *et al.,* 2009). The rest of the chapter is structured as follows: Section 3.2 looks at previous empirical studies on mobile banking adoption, Section 3.3 discusses the background to mobile banking adoption in SSA and the role of mobile banking in financial inclusion, Section 3.4 outlines the empirical strategy and results, and Section 3.5 concludes while discussing potential policy implications of this study.

3.2 Literature review

3.2.1 Prior studies on trust in electronic and mobile banking adoption

A key focus area of research in mobile banking adoption has been consumer trust, its associated applications and banks. Studies have examined the role of trust, privacy and security beliefs on behavioural intention, specifically towards electronic technologies (McKnight *et al.,* 2002; Gefen *et al.,* 2003). Perceived risk and trust are interlinked concepts which act as barriers to the adoption of online banking and mobile banking (Featherman & Pavlou, 2003; Kim *et al.,* 2017; Koenig-Lewis *et al.,* 2010).

One of the early studies on the predictors of mobile banking adoption in South Africa found that the use of mobile banking was very low despite the widespread use of mobile phones (Brown, Cajee, Davies & Stroebel, 2003). The study concluded that perceived risk associated with the use of mobile banking was a key risk and that greater awareness was needed of the benefits and functionalities of mobile banking. It was suggested that consumers who could foresee themselves using a wide variety of services would be more likely to adopt mobile banking. In another study exploring the use of mobile banking by the rural unbanked in Ghana, Tobbin (2012) found that most participants had some existing relationship with the mobile network operator (MNO) and therefore identified with the MNO's brand, unlike with banks. It was posited that the trust in the mobile network operator (from making calls) was transferred to mobile banking services. The study affirmed that building a strong brand could consolidate consumers' confidence and enhance the level of trust in mobile banking.

A study conducted at the early stages of mobile banking adoption indicated that adoption intention was mainly driven by the joint assessment of the risks and utility benefits (Luo, Li, Zhang & Shim, 2010). The study explored the multi-faceted dimensions of both trust and risk and suggested that performance utility was the main determinant of early adoption. Their findings suggested that pre-existing trust in banks did not have a significant impact on early mobile banking adoption. The authors posited that the risk of mobile banking was inherently higher due to the wireless nature of the mobile network platform, which was partly outside the control of banks and that those with a higher tendency to trust others and with greater self-efficacy would be more likely to adopt mobile banking.

In line with these findings, Chemingui and Iallouna (2013) found that trust in mobile banking and trust in the service provider did not appear to influence the intention to use mobile banking. Instead, they suggested that tradition (resistance to change) was the main barrier to adopting mobile banking. Similarly, Montazemi and Qahri-Saremi (2015) suggested that trust in the physical bank and the consumer's

propensity to trust did not have significant effects. The study concluded that structural assurances were the only significant antecedent of trust in internet banking adoption. Structural assurances referred to the assurance that the transactions conducted online would be smooth and secure.

In contrast, the findings of Gu *et al.* (2009) suggested that customers who trusted banks were more likely to see the advantages of mobile banking and to use it. The study also indicated that the key determinants of behavioural intention towards mobile banking adoption were perceived usefulness, trust and perceived ease of use. The authors suggested that trust was crucial for increasing behavioural intention and that structural assurances were the strongest antecedents of trust. Similarly, Arvidsson (2014) reported that trust in banks was positively associated with the adoption of mobile payment services and that ease of use was the most significant determinant of adoption.

In summary, the findings have been mixed on mobile banking adoption and trust in banks. This study proposes to explore this relationship further. Specifically, this study examines the role of institutional trust (a person's trust in the system and associated with their expectations of structural assurance and situational normalcy) on the use of mobile banking. A positive relationship is expected between trusting banks and the use of mobile banking services.

H1. The use of mobile banking will differ between consumers who trust banks and those who do not.

3.2.2 Prior studies on demographics of electronic and mobile banking users

Studies have found that demographic variables are significant predictors of the adoption or rejection of using innovations as well as the intention to use them (Rogers, 1983; Sahin, 2006). Earlier academic research has addressed consumer behaviour and the adoption of electronic banking. Dahlberg *et al.* (2008) reviewed studies on mobile payment services and concluded that there was a lack of research on how social and cultural factors impacted the growth of mobile payment services. In a more recent review of literature on mobile payments, Dahlberg, Guo and Ondrus (2015) highlighted the impact of changes in commercial, legal, regulatory, social and cultural environments on the intention to adopt mobile payment services.

A number of studies have been conducted on banking organisations and technology exploring the adoption of basic electronic banking from credit/debit cards, and more recently online banking (Carbó-

Valverde *et al.,* 2018). Concerning banking technologies, studies have emphasised the importance of ease of use, usefulness and usage by applying the Technology Acceptance Model (TAM). More recently, studies on mobile banking adoption followed similar theoretical and empirical approaches to those of online banking and the results of these papers suggest that age is the most statistically significant factor, with younger people more likely to adopt mobile banking (Luo *et al.,* 2010; Susanto, Chang & Ha, 2016; Zhou, 2018; Zhou, Lu & Wang, 2010).

A systematic review of academic literature on mobile banking, financial inclusion and development suggests that demographic characteristics differentiate between the behavioural intention of individuals who use mobile banking and those who do not (Kim *et al.,* 2017). Studies have also suggested that an individual's attitude towards mobile banking is predetermined by the person's demographics (Sohail & Al-Jabri, 2014). Education and income levels have also been identified as having a positive impact on electronic banking adoption (Kolodinsky *et al.,* 2004; Lee *et al.,* 2002; Lee & Lee, 2000). Specifically, it was found that those with higher education and higher income levels were positively associated with the adoption of electronic banking.

H2. Individuals with higher income and higher education are more likely to use mobile banking.

Gender, education and past experience with internet banking and the impact of these factors on mobile banking adoption have also been examined as moderators (Wang & Sun, 2016). Park, Yang and Lehto (2007) explored the adoption of technologies in China, with a particular focus on cultural aspects and their effect on the adoption of mobile banking. The study included four potential moderating variables, namely, age, gender, experience and voluntariness of use (social influence), to explore the relationship between antecedents and attitudes towards mobile banking adoption. The findings suggest that education and gender have significant moderating effects on the intention to adopt mobile banking.

Chawla and Joshi (2018) examined the moderating effects of a number of demographic factors (gender, age, qualification, educational background, experience, occupation, income and marital status) on antecedents and attitude towards mobile banking. The findings suggest that gender has a moderating effect on the ease of use and attitude towards mobile banking. The study also found that age and experience are moderators of trust and mobile banking adoption. Income had a moderating effect in measuring the relationship of perceived efficiency attitude towards mobile banking while experience moderated the relationship between trust and attitude towards mobile banking (Chawla & Joshi, 2018).

The present study thus includes several socio-demographic variables to shed light on the factors influencing the use of mobile banking services. The study also explores whether the use of mobile banking services differs depending on the gender of the individual. Several studies have suggested that men are more likely to adopt mobile banking and electronic banking channels than women (Garbarino & Strahilevitz, 2004; Laukkanen & Pasanen, 2008; Sohail & Al-Jabri, 2014). Gender differences have also been explored in terms of trust in mobile banking and electronic banking adoption, with findings suggesting that women are less likely to trust online and mobile banking services and are thus less likely to adopt these services than men (Garbarino & Strahilevitz, 2004; Malaquias & Hwang, 2016).

With respect to the ethnicity of users, there have only been limited studies exploring this factor in electronic banking adoption (Kolodinsky *et al.,* 2004). According to Goodenough (1971), culture is a set of beliefs or standards shared by a group of people which influence the behaviour of an individual. Ethnicity, as a dimension of culture, involves a sense of belonging to a specific group, separate from society at large, which is based on shared beliefs and habits (Usunier & Lee, 2005). The beliefs, values and behaviour of individuals echo the habits and practices of the cultural group to which they belong (Legoherel, Dauce, Hsu & Ranchhold, 2009).

In the context of technology adoption and use of electronic banking channels, several studies have considered the role of ethnicity. Lee, Lee and Schumann (2002) explored the role of ethnicity in the adoption of technological innovations; their findings suggest that ethnicity does not significantly impact adoption behaviour. In the area of electronic payment channels, Lee and Lee (2000) sought to establish whether ethnicity had a significant effect on various payment channels. They found that there was no impact on ATM or smart card adoption, however, Hispanics were more likely to adopt debit cards than other ethnicities and Whites were more likely to use direct payments than other ethnic groups. Kolodinsky *et al.* (2004) found that minorities were more likely to adopt automatic bill payments but that there was no significant influence on telephone banking and internet banking channels.

Only a few studies have explored the role of culture in the adoption of mobile banking (Park *et al.,* 2007). Ting, Yacob, Liew and Lau (2016) looked at the effect of ethnicity on the intention to use a mobile payment system. Their findings suggest that there are significant differences between certain ethnic groups. The current study seeks to establish whether ethnicity, as a dimension of culture, influences the use of mobile adoption.

H3. The use of mobile banking will differ depending on the ethnic group.

3.3 Financial inclusion and mobile banking in SSA

Since the early 1990s, the state in South Africa has been concerned about the lack of economic participation of black men and women as a consequence of the racially-based policies of the apartheid government (Chibba, 2009). The state had instituted processes of deracialising businesses and implemented a Black Economic Empowerment (BEE) policy as a means of redressing the economic injustices of the former dispensation (Arora & Leach, 2005). In 2003, the Financial Sector Charter was introduced, with targets including the provision of financial services to the low-income unbanked population as well as increasing black employment and black ownership in the financial sector (Kirsten, 2006). The state also used technology as a tool to reach the unbanked, for example, by paying social grants electronically, which resulted in new bank accounts being opened by the previously unbanked.

There are four main categories of mobile banking business models, namely, bank-led; telecom-led; independent non-telecom and non-bank agents; and any combination of bank and non-bank partnerships (Porteous, 2006). The type of business model employed is determined mainly by the regulations in the given country. Bank-led models are typically regulated by strict banking regulations whereas telecom-led models are either regulated by the telecoms regulators and/or banking regulations. The regulations are usually driven by the government's definition of e-money and therefore the regulation of mobile money.

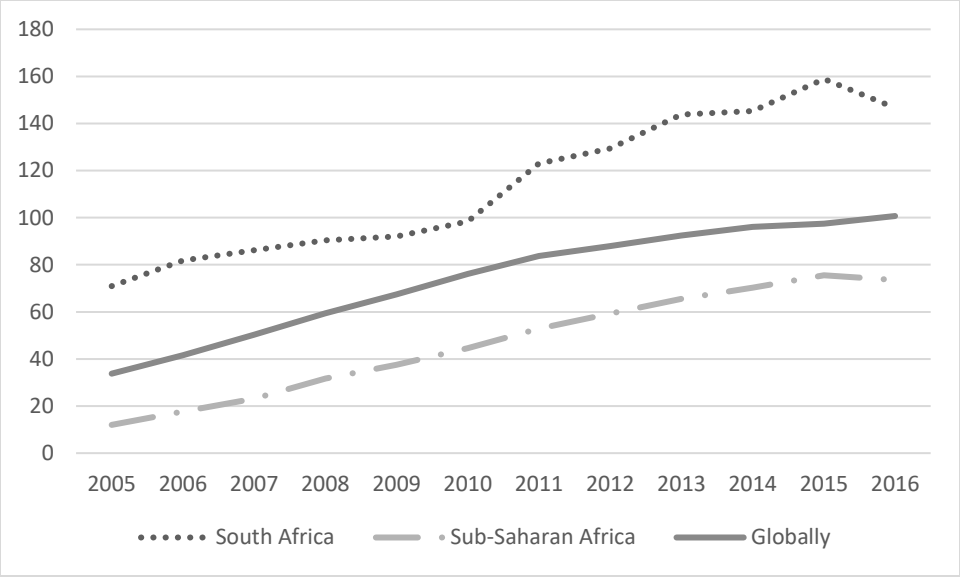
In South Africa, mobile banking service providers are mainly bank-led models or partnerships with banks, due to the strict banking requirements. In terms of regulations in South Africa, only registered financial institutions can offer banking services. Thus non-banks such as retailers and mobile telecommunications companies wanting to offer branchless banking had to partner with a registered bank (Consultative Group to Assist the Poor, 2008). As these mobile money providers were treated as banks, they had to comply fully with all the requirements associated with banks – such as customer identification by means of face-to-face identity verification and proof of residence. In 2005, the first mobile banking product – Wizzit – was launched in South Africa which was aimed at the low-income, previously unbanked population (Lawack, 2012). Vodacom South Africa launched M-Pesa in September 2010, in partnership with Nedbank, and it was hoped to have similar success as in Kenya. South Africa has a highly developed financial system and local banks have already made banking easily accessible to the low-income earners by increasing the number of branches in rural areas and providing bank accounts aimed specifically at the unbanked population. South Africa already had other mobile banking applications, a number of which were provided

by local banks. M-Pesa did not achieve profitability targets and in 2016 the decision was taken to withdraw these services in South Africa (van Zyl, 2016).

MTN (one of the largest mobile network operators) launched mobile money in 2012 and after regulatory approval was granted in 2014, it offered full banking facilities on mobile phones on their networks. In October 2009, First National Bank (FNB) was the first major bank to offer a mobile phone to send and receive money with its 'e-wallet'. Soon thereafter, other major banks offered mobile money products, often in partnership with MNOs, to their customers. FNB was the first major bank to launch a mobile banking application in 2011 (Alfreds, 2011). Thus, in South Africa consumers have a variety of opportunities to use mobile banking services, both from the major banks and mobile network operators. There has been a rise in mobile phones and improved access to the internet. Thus the improved access to mobile phones and mobile banking offerings combined with nearly 60% of the population under the age of 35, (Edelman, 2016) provide a conducive landscape for mobile banking to flourish in South Africa.

In emerging economies, mobile money has been used as a replacement for formal financial institutions and in several countries, there are more mobile money accounts than bank accounts (GSMA, 2015). This is especially the case where financial institutions are difficult to access. The lack of formal financial services in many areas in Africa is due to limited communication infrastructure, poor quality transport facilities and low population densities (Asongu & Nwachukwu, 2017). Poor people in developing economies have been innovators and have been successful in repurposing technologies from developed economies. Examples include mobile phones and mobile money, which are potentially promoting new media of exchange, methods of payment, stores of wealth and possibly measures of value (Maurer, 2012).

Developing economies, particularly in Sub-Saharan Africa, had pioneered the use of mobile and technological innovations to address financial inclusion (Alliance for Financial Inclusion, 2016; Rouse & Verhoef, 2016, 2017). The high growth and penetration of mobile phones had resulted in increasingly affordable financial services and cost-effective means of providing financial services to the previously unbanked (Asongu, 2013). The growth in mobile phone penetration is illustrated in Graph 3.1.



Graph 3.1 Mobile phone subscriptions per 100 people (2005 – 2016)

***Source**: World Bank's Mobile Subscriptions per 100 people (2019b)*

As illustrated in Graph 3.1, the number of mobile phone subscriptions in SSA showed increasing levels until 2015, when the number of subscriptions showed a slight decline. South Africa has a higher number of mobile phone subscriptions than the average number of mobile phone subscriptions in the SSA region as well as the global average. The high penetration of mobile phone subscriptions could facilitate the use of mobile banking in South Africa. Furthermore, financial technologies such as mobile money are able to provide new opportunities to democratise money and to address financial inclusion (Maurer, 2012). Maurer (2012) argues that poor people in developing economies have been innovators and have repurposed technologies such as mobile phones to facilitate informal money transfers. The role of mobile phones and mobile banking in inclusive human development has also been explored in various empirical studies. The findings suggest that mobile banking may mitigate poverty and inequality (Asongu & Nwachukwu, 2017; Asongu & Odhiambo, 2018; Mishra & Singh Bisht, 2013).

The growing use of mobile services by financial institutions differs from country to country, partly due to differences in the technological levels of operators and the strategies employed by the operators, but mainly as a result of resistance to new services by consumers (Chemingui & Iallouna, 2013). The success of mobile money in SSA has demonstrated how innovations can dramatically impact the way in which people conduct financial transactions and expand access to financial services (Demirgüç-Kunt & Klapper, 2012c). By 2014 it was estimated that in SSA, 34% of adults were banked, 12% of which had a mobile money account, which was well above the global average of 2% of adults (World Bank, 2015b). As the

world is moving away from cash-based economies, financial inclusion increasingly depends on having access to technology-based payments solutions (Fauss, 2016).

3.4 Econometric strategy

3.4.1 Model specification

A logistic model was developed to investigate the factors influencing mobile banking adoption in South Africa. The nature of this study is that the dependent variable – mobile banking status – is a dichotomous categorical variable (use of mobile banking). A logistic regression, namely binary logistic regression, was used to identify explanatory variables that were significantly related to the dependent variable. Logistic regression is a practical tool for analysing data with dichotomous dependent variables and has advantages over several other regression and discriminant analyses (Green *et al.,* 1998; Laukkanen, 2016). The use of logistic regression in research, such as customer-based decision making, has been recommended as it provides additional viewpoints and contributes to the marketing literature (Akinci, Kaynak & Atilgan, 2005). Logistic regressions have also been used to explore behavioural intention for mobile banking adoption (e.g. Laukkanen & Pasanen, 2008; Laukkanen, 2016).

The data was obtained from the FinScope Surveys in South Africa for the years 2006 until 2016. The FinScope Surveys are nationally representative and are benchmarked to mid-year population estimates provided by StatsSA. In the first stage of sample weighting, the primary sampling units (the enumerator areas) were selected with probability proportional to size, with the number of persons aged 16 years and older as a measure of size, from the population sampling frame. In the second stage, households were systematically selected in each primary sampling unit in the sample. In the third stage, the design weights of the respondents were adjusted to compensate for differential non-responses (TNS, 2016).

Questions relating to whether the respondents had trust in banks were only asked in specific survey years (2006, 2010, 2012 and 2016). These datasets were therefore selected for this study. The first mobile banking application was launched in South Africa in 2005 and thus the first dataset selected was 2006. This time horizon allows us to study both the early effects and the posterior effects of mobile banking adoption. By using data from repeat surveys, the study was able to assess how these factors changed over time. The datasets for the individual survey years were pooled into a cross-section and the model included year and region dummies and the error term for individuals for t periods. The pooled cross-sectional analysis allowed us to increase the number of observations and to assess the relationship across time

(Wooldridge, 2009). In order to address any concerns on the heteroskedasticity and serial correlation in the error terms, the estimation included heteroskedasticity-robust standard errors, in line with White (1980).

Model (1)

$$Mobile\ banking\ status_{i,t} = \beta_1 Bank\ trust_{i,t} + \beta_2 Ethnicity_{i,t} + \beta_3 Age_{i,t} + \beta_4 Gender_{i,t} + \beta_5 Geographical\ area_{i,t} + \beta_6 Income_{i,t} + \beta_7 Marital\ status_{i,t} + \beta_8 LSM_{i,t} + \beta_9 Education_{i,t} + \gamma_h Year + Region_{i,t} + \varepsilon_{i,t}$$

The variables that were included in the regressions are shown in Table 3.1 below.

Table 3.1 Variables in the equation

Variable	Code/ values	Denoted as
Mobile banking status	Mobile bank account No mobile bank account	*Mobile banking*
Age	Continuous variable	*Age*
Age squared	Square term	*Age squared*
Bank trust	Yes No	*Bank trust*
Education	Primary school High School/Matriculation Tertiary education	*Education*
Ethnicity	Black, White, Asian, Coloured	*Ethnicity*
Gender	Male Female	*Gender*
Geographical Area	Rural Urban	*Geographical area*
Living Standards Measure	LSM 1-2, LSM 3-4, LSM 5-6, LSM 7-8 LSM 9-10	*LSM*
Marital Status	Married/Living with a partner Unmarried	*Marital status*

Monthly personal income	No income R1 – R1,999 R2,000 – R4,999 R5,000 and above	*Income*
Time (year)	2006, 2010, 2012,2016	*Year*
Region	Western Cape, Eastern Cape, Northern Cape, Free State, KwaZulu Natal, North West, Gauteng, Mpumalanga and Limpopo	*Region*

***Source**: FinScope Household Surveys (2006, 2010, 2012 and 2016)*

The explanatory variables shown in column 1 of Table 3.1 were either dichotomous or categorical and dummy variables were included. The standard dummy variable technique was applied, which used the first-mentioned category as a reference in the final equation. This approach allowed for coefficients, standard errors and significance levels to be generated. These outputs are as a result of the predicted logit transformation of the probability of the presence of the dependent variable (Wentzel *et al.,* 2016). In general, for *n* levels of a variable, *n*-1 dummies are included.

A number of socio-demographic variables were included as studies have found that these factors affect the use of mobile banking. Age was included as it is a significant indicator of electronic banking adoption among those who are younger and are more likely to use electronic banking channels (Laukkanen, 2016; Laukkanen *et al.,* 2007; Lee *et al.,* 2002; Tsai, Zhu & Jang, 2013). Education and income levels also have a significant positive influence on electronic banking adoption (Brown *et al.,* 2003; Kolodinsky *et al.,* 2004; Lee *et al.,* 2002; Lee & Lee, 2000; Sohail & Al-Jabri, 2014). Gender has also been explored in a number of studies (Chawla & Joshi, 2018; Park *et al.,* 2007; Sohail & Al-Jabri, 2014) as well as ethnicity (Kolodinsky *et al.,* 2004; Lee *et al.,* 2002; Lee & Lee, 2000).

The marital status of individuals was included as this variable has been explored in other studies (Chawla & Joshi, 2018; Kolodinsky *et al.,* 2004; Lee *et al.,* 2002; Lee & Lee, 2000). A variable for the Living Standards Measure (LSM) was also included as it is frequently used in marketing research and provides a further indicator of the poverty levels of individuals (South African Audience Research Foundation, 2017). The aim of LSMs is to divide the population into different 'wealth' or 'poverty' groups without the use of income data (von Maltzahn & Durrheim, 2008). The study could thus explore the relationship between the LSM and the adoption of mobile banking. The relationship between financial inclusion and the geographical area had been explored in several studies (e.g. Beck & Brown, 2011; Honohan & King, 2012; Klapper & Singer, 2015). This study included a variable indicating whether the individual resided in an

urban or rural area to establish whether mobile banking adoption differed depending on whether individuals living in urban or rural areas.

3.4.2 Descriptive statistics

The logistic regression model was run on the pooled sample (2006, 2010, 2012 and 2016). The datasets included sampling weights to account for the differences in the ratio of the sample size to population size. The regressions were run including these using survey weights. A descriptive approach was taken and thus these weights were used when calculating the logistic regressions (Cameron & Trivedi, 2009). The sample selections were specifically made to explore the target population, and as a consequence of using the weighted samples, the results can be interpreted as estimating the census coefficients (Solon *et al.,* 2015).

The year of the survey is included as a variable in order to explore the effects of time. By using multiple data points, this study contributes to the research on the long-term determinants of mobile adoption to explore whether these factors change over time (e.g. Kikulwe *et al.,* 2014; Kolodinsky *et al.,* 2004). Table 3.2 provides a summary of the explanatory variables based on the unweighted sample.

Table 3.2 Descriptive statistics for pooled sample for years 2006, 2010, 2012 and 2016

Variable	Full sample	No trust in banks	Trust in banks
Number of observations			
% of population	100%	32%	68%
Time (year)			
2006	3240	1300	1940
2010	2102	399	1703
2012	2856	1520	1336
2016	3564	494	3070
Age			
16 - 29 years	4049	1317	2732
30 - 39 years	2794	826	1968
40 - 49 years	2107	648	1459
50 years and above	2812	922	1890
Education			
Primary school	1813	848	965
High school/Matriculation	8349	2545	5804

Tertiary Education	1600	320	1280
Ethnicity			
Black	7593	2444	5149
Coloured	2047	694	1353
Asian	648	171	477
White	1474	404	1070
Gender			
Male	4914	1545	3369
Female	6848	2168	4680
Geographical area			
Urban	8774	2588	6186
Rural	2988	1125	1863
Income			
No income	1879	777	1102
R1 - R1,999	5372	1933	3439
R2,000 - R5,999	2455	586	1869
R6,000 and above	2056	417	1639
Living standards measure (LSM)			
LSM 1-2	746	358	388
LSM 3-4	2056	840	1216
LSM 5-6	5053	1544	3509
LSM 7-8	2184	552	1632
LSM 9-10	1723	419	1304
Marital status			
Unmarried	7200	2331	4869
Married/Living with a partner	4562	1382	3180
Mobile banking			
No mobile bank account	10612	3495	7117
Has a mobile bank account	1150	218	932

***Source**: FinScope surveys (2006, 2010, 2012 and 2016)*

These survey years do not have repeat observations with the same individuals as each survey year was conducted on a different sample. Therefore, the dataset is a pooled cross-sectional dataset. Women approximated 58% of the sample size and the majority of individuals surveyed was unmarried/not living with a partner. The surveys were conducted in both urban and rural areas, with approximately 75% living in urban areas. The majority of individuals reported a monthly income in the second income category (R1 – R1,999) and had either commenced or completed a high school education. There was a high

proportion of respondents indicating that they trusted banks (an estimated 68% of the sample). The majority of the sample did not use mobile banking, with only 9.8% having a mobile banking account. The uptake of mobile banking in South Africa has been hindered by strict banking regulations, established financial retail infrastructure and a preference to use cash (Rouse & Verhoef, 2017).

3.4.3 Results

The Wald Chi-square test was used to determine the significance of the individual coefficients in the logistic expression. This test determines whether the parameters associated with a group of explanatory variables are significantly different from zero. If the Wald test is significant, then it can be concluded that the parameters are not zero and therefore have explanatory power in the logistic expression. The results indicated a significant value, which confirmed the results of the Omnibus test. The Omnibus test contrasts the results of the model without variables against the model including explanatory variables to predict the adoption of mobile banking.

The results of the number of correct predictions by the model against the observed data are shown in Table 3.3.

Table 3.3 Classification table of the pooled sample (2006, 2010, 2012 and 2016)

		Predicted		
Observed mobile banking status		**No mobile bank account**	**Mobile bank account**	**% Correct**
No mobile bank account		10, 423	189	98.22%
Mobile bank account		905	245	21.30%
Overall %				90.7%

***Source**: FinScope surveys (2006, 2010, 2012 and 2016)*

The results of the above tests indicated that the model overall correctly predicted a minimum of 90.7% of the sample compared to the observed data. Thus, it can be concluded that the model was an adequate fit. The model predicted results to identify individuals without mobile bank accounts more accurately than for those with mobile bank accounts. Thus, the model correctly predicted 21.3% of those with mobile

bank accounts and 98.22% of those without mobile bank accounts. The results of Hosmer and Lemeshow's goodness of fit test indicate that the model fitted the data (a significant p-value of 1.00 was obtained). This test assesses the frequency of the predicted outcomes to the frequencies of the observed data, with a significant result ($p > 0.05$) confirming the goodness of fit.

A standard *R* squared cannot be computed for a logistic analysis, however, a pseudo *R* squared is useful insofar as it varies between 0 and 1 and can be interpreted in the standard manner (Devlin, 2005). The pseudo *R* squared for the model was 0.3075, which is adequate for logistic regression analysis. As a binary logit model is estimated for the dependent variable (mobile banking), the coefficients represent the log-odds ratios and indicate how the log of the odds of a certain outcome (use of mobile banking), compared to the omitted base category (not using mobile banking), changed in response to individual characteristics. The results of the model are presented in Table 3.4 below and include the coefficients and log-odds. The marginal effects were also calculated to show the change in probability when the independent variable increased by one unit for continuous variables (and for binary variables the change from 0 to 1).

Table 3.4 Results of logistic regression of equation 1

VARIABLES	Coefficient	Log-odds	Marginal effects
Age	-0.0297***	0.971***	-0.0007***
	(0.00402)	(0.00390)	(0.0001)
Bank trust - yes	0.304**	1.356**	0.0067**
	(0.123)	(0.167)	(0.0027)
High school	0.966***	2.627***	0.0155***
	(0.363)	(0.954)	(0.0042)
Tertiary education	1.823***	6.192***	0.0477***
	(0.381)	(2.360)	(0.0085)
Coloured	-0.442**	0.643**	-0.0091***
	(0.172)	(0.110)	(0.0031)
Asian	-0.798***	0.450***	-0.0140***
	(0.238)	(0.107)	(0.0032)
White	-0.389**	0.677**	-0.0082***
	(0.159)	(0.107)	(0.0030)
Female	-0.143	0.867	-0.0033
	(0.0970)	(0.0841)	(0.0023)
Rural	-0.0511	0.950	-0.0012
	(0.160)	(0.152)	(0.0036)
R1-R1,999	1.232***	3.429***	0.0130***
	(0.259)	(0.887)	(0.0024)
R2,000-R5,999	2.558***	12.91***	0.0606***
	(0.256)	(3.308)	(0.0065)
R6,000 and above	3.009***	20.27***	0.0944***

	(0.272)	(5.517)	(0.0124)
LSM 3-4	-0.827*	0.437*	-0.0148
	(0.490)	(0.214)	(0.0116)
LSM 5-6	-0.146	0.865	-0.0035
	(0.455)	(0.394)	(0.0117)
LSM 7-8	0.379	1.461	0.0118
	(0.471)	(0.688)	(0.0129)
LSM 9-10	0.722	2.058	0.0267*
	(0.488)	(1.004)	(0.0152)
Married	0.0945	1.099	0.0022
	(0.109)	(0.120)	(0.0026)
2010 year	2.437***	11.44***	0.0412***
	(0.211)	(2.420)	(0.0060)
2012 year	2.404***	11.07***	0.0398***
	(0.200)	(2.212)	(0.0045)
2016 year	2.427***	11.32***	0.0408***
	(0.190)	(2.148)	(0.0043)
Constant	-6.834***	0.00108***	
	(0.569)	(0.000612)	
Observations	11,762	11,762	11,762
Region and Year FE	YES	YES	YES
Pseudo R-squared	.3075		

Each column represents the estimation results of the weighted pooled logistic regression of model 1 with region and year fixed effects.
Robust standard errors in parentheses/ Z score in parentheses
Reference categories: No trust in banks, primary school education, black, male, urban, no income, LSM 1-2, unmarried

*** p<0.01, ** p<0.05, * p<0.1

The following variables were found to be significant and to influence the use of mobile banking: age, bank trust, education, ethnicity and income. The most significant factors influencing the use of mobile banking were income and education. Specifically, those with high income and better education were more likely to use mobile banking which is in line with the expectations of *H2*. The Living Standards Measure was only significant at the 1% level, with those in the LSM 3-4 category more likely to adopt mobile banking than those in the LSM 1-2 category. Geographical area, gender and marital status had no significant influence on the use of mobile banking.

As indicated in prior research, income was significantly associated with mobile banking adoption (Kolodinsky *et al.,* 2004; Laforet & Li, 2005; Lee *et al.,* 2002; Lee & Lee, 2000). Being in the highest income category increased the probability of using mobile banking by 9.44% compared to those in the lowest

income category. The importance of the relationship between education and mobile banking was confirmed. Education was significantly positively related to mobile banking, illustrating the fact that educated people with higher education are more likely to adopt mobile banking. In this study, the coefficients were particularly high for tertiary education, which increased the probability of using mobile banking by 4.77% compared to those with primary school education.

Education and income levels have also been identified as having a positive impact on electronic banking adoption (Kolodinsky *et al.,* 2004; Lee *et al.,* 2002; Lee & Lee, 2000). The findings of the present study suggest that education and income are the most important individual characteristics explaining mobile banking adoption. With respect to gender, there was a negative relationship with mobile banking adoption but the association was not significant. This finding is in line with studies suggesting that men are more likely to use electronic banking than women (Garbarino & Strahilevitz, 2004; Laukkanen & Pasanen, 2008; Sohail & Al-Jabri, 2014).

Trust in banks was found to be significantly positively associated with the use of mobile banking. These findings are consistent with the expectations of *H1*. The results suggest that when consumers trust banks, they will perceive mobile banking as useful and are willing to use it. These results confirmed the contention that trust in banks has a positive relation to electronic/mobile banking adoption (Arvidsson, 2014; Gu *et al.,* 2009; Montazemi & Qahri-Saremi, 2015). This finding was in contrast to studies suggesting that pre-existing trust in banks does not have a significant influence on the adoption of mobile banking (Chemingui & Iallouna, 2013; Luo *et al.,* 2010). Luo *et al.* (2010) conclude that the use of wireless technology, which falls partly outside the control of banks, results in higher risk perception and the lack of transfer of pre-existing trust.

In order to explore the relationship between bank trust and the use of mobile banking further, the marginal effects were calculated. The economic magnitude of the effect of bank trust on the use of mobile banking was low. The relative importance of trust in banks as a factor influencing mobile banking adoption was lower than expected. A possible explanation for the lower influence may be due to differences in sampling strategy. In the current study, respondents were randomly selected from the total population whilst in the Arvidsson's (2014) study respondents were sampled from the population of early adopters of mobile banking. Thus the results from a study of the general population may differ, as prior studies have shown that the factors influencing early adopters differ from late adopters of mobile banking (Kim, Mirusmonov & Lee, 2010; Laukkanen & Pasanen, 2008).

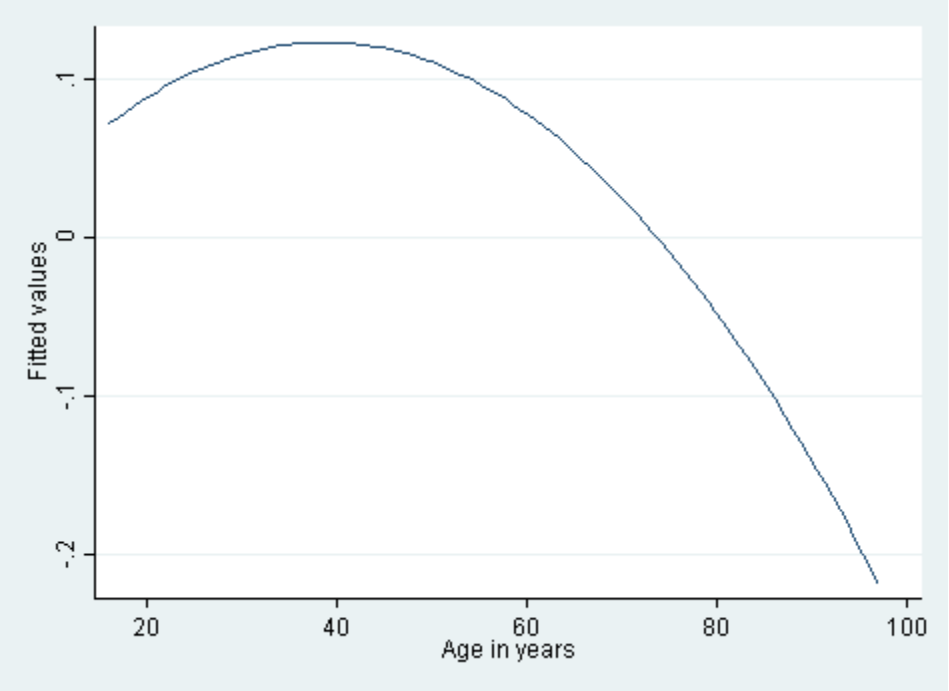
The findings of this current study suggest that socio-demographical factors, namely income and education, were the main predictors of mobile banking use. The findings of Gu *et al*. (2009) and Montazemi and Qahri-Saremi (2015) identified that bank trust was a significant factor influencing adoption however, these studies did not include socio-demographic variables and thus the relative importance of bank trust to these variables could not be assessed. As the findings of this study suggest that wealthier and more educated individuals were more likely to use mobile banking, mobile network operators and financial service providers should focus activities at educating consumers of the benefits of mobile banking to broaden access to the wider population.

The use of mobile banking services in South Africa were also influenced by ethnicity. The findings of this chapter suggest that there was a significant association between ethnicity and the use of mobile banking, whilst controlling for other factors, thus confirming *H3*. This finding is broadly in line with that of Kolodinsky *et al.* (2004) and Lee and Lee (2009) who found ethnicity to be a significant determinant of the adoption of electronic banking services. The findings of this study specifically reveal that Blacks were more likely to adopt mobile banking than other ethnicities. This is again broadly in line with the aforementioned studies that found that Blacks (and other minorities) were more likely to adopt certain electronic banking channels than Whites. The findings of this study also corroborate the results of the Consumer and Mobile Banking Services 2016 survey which indicated that Blacks (and other minorities) were more likely to adopt mobile banking services than Whites (Board of Governors of the Federal Reserve System, 2016). This study explored the relationship between ethnicity and the use of mobile banking unlike previous studies on ethnicity which focused on electronic banking, but the findings were broadly similar. To explore this relationship further, the marginal effects were calculated. The findings suggest that Asians were 1.4% less likely to use mobile banking than Blacks, whilst controlling for other factors. The marginal effects for other ethnicities were less than 1%, whilst controlling for other factors. Thus the relative importance of ethnicity as a factor influencing the use of mobile banking appears to be low and that income and education remain the drivers for mobile adoption in South Africa.

The age of an individual was found to be significantly negatively associated with mobile banking, with those in the older age groups less likely to use mobile banking. This finding is in line with previous studies which indicate that older age groups are less likely to use electronic banking channels (Laukkanen, 2016; Laukkanen *et al.,* 2007; Lee *et al.,* 2002; Tsai *et al.,* 2013). Consumers in the older age groups tend to resist new technologies, whilst the younger age groups are more likely to adopt mobile technologies. These aforementioned studies used age as a categorical variable, with consumers grouped into different age

groups. By including age as a continuous variable in the model, this study was able to explore this association further.

In order to determine whether this association was linear, the square term of age was included in the model (see Table 3.5 in the appendix for the results of this regression). After introducing the squared term on mobile banking adoption, evidence in support of non-linearity was found. The findings indicated that there was a non-linear relationship between age and mobile banking, as suggested by Kikulwe *et al.* (2014). As the age term was positive and its squared term was negative, this suggested a convex relationship. The inflection point in the relationship was reached at approximately 40 years of age. Thus, the increased likelihood of mobile banking adoption improved up to this threshold limit, beyond which it entered a negative relationship. To illustrate this relationship, the coefficients of age and mobile banking adoption were plotted, as shown in Graph 3.2 below.



Graph 3.2 Relationship between age and mobile banking adoption

***Source**: FinScope surveys (2006, 2010, 2012 and 2016)*

Graph 3.2 illustrates that mobile banking adoption initially shows a positive association with age, but thereafter this relationship becomes negative, for consumers older than 40. Other studies have found that, contrary to the traditional views of adoption and innovation theory, it is not the youngest age group

that is adopting mobile banking (Laukkanen & Pasanen, 2008). The results of this study confirm this expectation. These results are also broadly in line with Sohail and Al-Jabri (2014), who conclude that mobile users are in the age category of 36 – 40 years, and Laforet and Li (2005), who suggest that users aged 35–44 years are the most likely to use mobile banking.

This study also explored the effects of time on mobile banking adoption and included a year dummy variable for each year of the survey. The year of the survey variable had a significantly positive effect on the use of mobile banking. In particular, consumers were more likely to use mobile banking in all survey years, compared to consumers in 2006.

3.4.4 Robustness checks

In order to assess whether socio-demographic factors are associated with mobile banking, a regression was run which included only socio-demographic factors. The results of this regression support the baseline model, with the main variables of interest remaining significant. The marginal effects indicated that those in the highest income category were 10.2% more likely to use mobile banking than the lowest income group. Education was also an important factor, as those with tertiary education were 6.2% more likely to use mobile banking than those in the lowest education category. This is in line with the baseline model that also identified income and education as significant factors influencing mobile banking adoption (see Table 3.6 in the appendix for the results). The pseudo-r-squared for this model was 0.306, compared to the baseline pseudo-r-squared of 0.3075. This supported the inclusion of the bank trust variable in the baseline model.

Furthermore, the model specification was modified to assess whether the model was robust to changes in the sample specification. The regressions were run on the pooled dataset, with each regression excluding one year of the survey data. These results were then compared to the baseline model. The pooled regressions yielded similar results, with only two variables from all three regressions no longer yielding significant results when compared to the baseline model (2.5% of the variables). Therefore, the results were considered to be in line with the baseline model and robust to changes in the sample selection (see Tables 3.7 – 3.10 in the appendix for the results of these regressions).

In order to assess the robustness of the model to the region effects and the effect of the period of the samples, the interaction term of year and region was included. The primary relationships of interest remained significant with the appropriate signs (see Table 3.11 in the appendix). Furthermore, the model

specification was modified to assess whether the model was robust to changes in the sample specification. The samples from the baseline model were split into two samples – those who trusted banks and those who did not. The main variables of interest remained significant, except for ethnicity. In the sub-sample of those who did not trust banks, the role of ethnicity was no longer significant whereas those who did trust banks, the relationship was significant. There was also a change in the relationship between age and mobile banking. This relationship was negative for those who trusted banks and positive for those who did not. This finding suggests that if a person does not trust banks, then the older they get, the more likely they will be to use mobile banking. The opposite would be true for those who did trust banks. The results are presented in Table 3.12 in the appendix and support the baseline model.

The model was run without applying the sampling weights and heteroskedasticity-robust standard errors were reported (Solon *et al.,* 2015). The results of the unweighted sample had a lower pseudo-r squared of 0.2842, indicating that this model had a lower explanatory power compared to the baseline model. However, the robust standard errors for several variables were lower, indicating that the unweighted estimation was more precise. The results are presented in Table 3.13 and are consistent with the baseline model. The model was also run using the probit model, with the results being broadly in line with the baseline model, confirming expectations. The results are shown in Table 3.14 in the appendix.

3.5 Conclusion

This study explored the determinants of mobile banking adoption in South Africa, which is characterised by a low uptake of mobile banking. The South African government only allowed non-banks to provide mobile financial services if they partnered with a bank. Thus, providers of mobile financial services had to comply with strict banking regulations. This study focused on whether the socio-demographic characteristics and institutional trust, specifically trust in banks, influenced the adoption of mobile banking.

The findings of this study contribute to three broad areas. Firstly, they inform the debate on the individual determinants, including ethnicity, which influenced mobile banking adoption in Africa. Secondly, they contribute to gender studies, which have found that men are more likely to adopt mobile banking. Thirdly, this study used longitudinal data to explore the individual determinants of mobile banking and the role of trust in mobile banking adoption.

These findings suggest that income is significantly associated with mobile banking adoption. Those with higher income were more likely to adopt mobile banking while those with the lowest income were least likely to be to use mobile banking. This is in line with other studies which have highlighted the association between income and mobile banking use. Education levels were also significantly positively associated with mobile banking use, indicate that individuals with tertiary education were most likely to use these services. The study also found a significant negative association with age, suggesting that those aged above 40 would be less likely to adopt mobile banking than those in the younger age categories. Banks, fintechs and policymakers could thus specifically target mobile banking initiatives at the other age groups, particularly the youngest age group (16-29) and those older than 40 years to enhance the adoption of mobile banking.

This study also explored the association between ethnic background and the likelihood of using mobile banking. The results indicated that there was a significant association between ethnicity and mobile banking use, with other ethnicities being less likely to use mobile banking than a black person was. Only a handful of studies has examined the association between ethnic background and mobile banking adoption, and future studies could explore this further.

Previous studies have found that females are less likely to use mobile banking than their male counterparts, whilst controlling for other factors. The findings of this study suggest that the gender dimension was not significantly associated with mobile banking adoption. The study also reveals that the likelihood of adopting mobile banking increases over time, with individuals more likely to adopt mobile banking than in earlier survey years. Trust in banks was significantly associated with the use of mobile banking, whilst controlling for other factors. This highlights the importance of trust in banks, and the findings suggest that this factor can positively influence the adoption of mobile banking. Banks and financial institutions can focus on awareness campaigns to their customers, highlighting the benefits and functionalities of mobile banking solutions, and thereby potentially transferring the consumer's trust in banks to mobile banking services. The present study was unable to assess whether trust in the technology (the mobile banking application) influenced mobile banking adoption and future research could explore this relationship.

Literature has pointed to the potential role of mobile banking to reach the previously unbanked. This study has shed light on the consumer use of mobile banking in South Africa. The findings suggest that consumers of mobile banking services in South Africa are more likely to be wealthier, well-educated, Black individuals. The potential of mobile banking to transform the financial service landscape by providing access to the

previously unbanked has not yet been reached. South Africa has adopted a bank-led model of mobile banking and thus requiring the mobile banking services providers to comply with strict banking regulations. Policy reforms and further relaxation of the regulation of MNOs following the example of Kenya and Tanzania could assist in creating an enabling environment for mobile banking to flourish. The high penetration of mobile phones, together with a young population, creates the potential for banks and fintech providers to enhance mobile banking adoption and to reach the previously unbanked population through the provision of innovative financial solutions in South Africa.

Appendix

Table 3.5 Results of logistic regression of equation 1 including the square term for age

VARIABLES	Coefficient	Marginal effects
Age	0.050**	0.001**
	(0.025)	(0.001)
Age squared	-0.000***	-0.000***
	(0.000)	(0.000)
Bank trust - yes	0.303**	0.0065**
	(0.124)	(0.003)
High School	0.905**	0.0142***
	(0.362)	(0.004)
Tertiary education	1.761***	0.045***
	(0.380)	(0.008)
Coloured	-0.421**	-0.008***
	(0.172)	(0.003)
Asian	-0.767***	-0.013***
	(0.238)	(0.003)
White	-0.318**	-0.007**
	(0.159)	(0.003)
Female	-0.170*	-0.004*
	(0.098)	(0.002)
Rural	-0.041	-0.001
	(0.160)	(0.003)
R1-R1,999	1.169***	0.016***
	(0.259)	(0.002)
R2,000-R5,999	2.410***	0.055***
	(0.262)	(0.006)
R6,000 and above	2.805***	0.081***
	(0.280)	(0.012)
LSM 3-4	-0.810*	-0.013
	(0.484)	(0.011)
LSM 5-6	-0.105	-0.002
	(0.449)	(0.011)
LSM 7-8	0.445	0.013
	(0.464)	(0.012)
LSM 9-10	0.803*	0.029**
	(0.481)	(0.015)
Married	0.009	0.001
	(0.112)	(0.003)
2010 year	2.421***	0.040***
	(0.211)	(0.006)
2012 year	2.413***	0.039***
	(0.199)	(0.004)
2016 year	2.449***	0.040***

	(0.189)	(0.004)
Constant	-8.084***	
	(0.637)	
Observations	11,762	11,762
Region FE	YES	YES
Year FE	YES	YES
Pseudo R-squared	.310	

Each column represents the estimation results of the weighted pooled logistic regression of model 1 with the inclusion of the square term of age and region and year fixed effects
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Reference categories: Primary school education, black, male, urban, no income, LSM 1-2, unmarried

Table 3.6 Results of logistic regression with only socio-demographic variables

VARIABLES	Coefficient	Log-odds	Marginal effects
Age	-0.030***	0.971***	-0.001***
	(0.004)	(0.004)	(0.000)
High school	1.006***	2.734***	0.019***
	(0.364)	(0.996)	(0.005)
Tertiary education	1.872***	6.499***	0.062***
	(0.382)	(2.482)	(0.008)
Coloured	-0.431**	0.650**	-0.005
	(0.172)	(0.112)	(0.004)
Asian	-0.770***	0.463***	-0.0163***
	(0.237)	(0.110)	(0.0036)
White	-0.387**	0.679**	-0.006
	(0.157)	(0.107)	(0.004)
Female	-0.142	0.867	-0.001
	(0.0970)	(0.0841)	(0.002)
Rural	-0.0544	0.947	-0.004
	(0.159)	(0.151)	(0.004)
R1-R1,999	1.237***	3.446***	0.014***
	(0.258)	(0.890)	(0.003)
R2,000-R5,999	2.579***	13.19***	0.061***
	(0.256)	(3.373)	(0.006)
R6,000 and above	3.035***	20.80***	0.102***
	(0.272)	(5.649)	(0.010)
LSM 3-4	-0.818*	0.441*	-0.007
	(0.490)	(0.216)	(0.008)
LSM 5-6	-0.134	0.875	0.009
	(0.456)	(0.399)	(0.008)
LSM 7-8	0.393	1.482	0.026***
	(0.471)	(0.698)	(0.009)
LSM 9-10	0.722	2.058	0.043***
	(0.488)	(1.005)	(0.011)
Married	0.0947	1.099	0.002
	(0.109)	(0.120)	(0.003)
2010 year	2.474***	11.87***	0.052***
	(0.212)	(2.513)	(0.005)
2012 year	2.348***	10.46***	0.038***
	(0.196)	(2.053)	(0.004)
2016 year	2.467***	11.79***	0.050***
	(0.190)	(2.235)	(0.004)
Constant	-6.698***	0.001***	
	(0.576)	(0.001)	
Observations	11,762	11,762	11,762

Year and Region FE	YES	YES	YES
Pseudo R-squared	.306		

Each column represents the estimation results of the weighted pooled logistic regression of mobile banking indicator on a set of socio-demographic indicators with region and year fixed effects.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Reference categories: no trust in banks, primary school education, black, male, urban, no income, LSM 1-2, unmarried

Table 3.7 Results of regression without the 2006 survey dataset

VARIABLES	Coefficient	Log-odds
Age	-0.030***	0.971***
	(0.004)	(0.004)
Bank trust - yes	0.310**	1.364**
	(0.127)	(0.173)
High school	0.939***	2.557***
	(0.363)	(0.928)
Tertiary education	1.791***	5.993***
	(0.382)	(2.290)
Coloured	-0.465***	0.628***
	(0.178)	(0.112)
Asian	-0.761***	0.467***
	(0.244)	(0.114)
White	-0.476***	0.621***
	(0.165)	(0.102)
Female	-0.143	0.867
	(0.100)	(0.086)
Rural	-0.023	0.978
	(0.162)	(0.158)
R1-R1,999	1.325***	3.761***
	(0.276)	(1.038)
R2,000-R5,999	2.645***	14.09***
	(0.273)	(3.845)
R6,000 and above	3.123***	22.72***
	(0.288)	(6.540)
LSM 3-4	-0.814	0.443
	(0.512)	(0.227)
LSM 5-6	-0.163	0.850
	(0.476)	(0.405)
LSM 7-8	0.309	1.362
	(0.492)	(0.669)
LSM 9-10	0.694	2.001
	(0.509)	(1.018)
Married	0.0739	1.077
	(0.112)	(0.121)
2012 year	-0.043	0.958
	(0.150)	(0.144)
2016 year	-0.0246	0.976
	(0.136)	(0.132)
Constant	-4.385***	0.0125***
	(0.601)	(0.008)
Observations	8,522	8,522

Each column represents the estimation results of the weighted pooled logistic regression excluding the 2006 dataset with region and year fixed effects.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Reference categories: no trust in banks, primary school education, black, male, urban, no income, LSM 1-2, unmarried

Table 3.8 Results of regression without the 2010 survey dataset

VARIABLES	Coefficient	Log-odds
Age	-0.031***	0.970***
	(0.005)	(0.005)
Bank trust - yes	0.323**	1.381**
	(0.138)	(0.190)
High school	0.964**	2.621**
	(0.432)	(1.132)
Tertiary education	1.859***	6.417***
	(0.455)	(2.921)
Coloured	-0.372*	0.689*
	(0.198)	(0.136)
Asian	-0.639**	0.528**
	(0.268)	(0.142)
White	-0.330*	0.719*
	(0.183)	(0.131)
Female	-0.116	0.890
	(0.110)	(0.098)
Rural	0.072	1.074
	(0.185)	(0.199)
R1-R1,999	1.156***	3.176***
	(0.332)	(1.056)
R2,000-R5,999	2.596***	13.41***
	(0.333)	(4.463)
R6,000 and above	3.029***	20.68***
	(0.350)	(7.233)
LSM 3-4	-0.586	0.557
	(0.451)	(0.251)
LSM 5-6	0.236	1.266
	(0.412)	(0.522)
LSM 7-8	0.948**	2.580**
	(0.435)	(1.122)
LSM 9-10	1.205***	3.336***
	(0.457)	(1.524)
Married	0.0237	1.024
	(0.124)	(0.127)
2012 year	2.430***	11.36***
	(0.205)	(2.323)
2016 year	2.450***	11.59***
	(0.194)	(2.246)
Constant	-7.305***	0.001***
	(0.681)	(0.000)
Observations	9,660	9,660

Each column represents the estimation results of the weighted pooled logistic regression excluding the 2010 dataset with region and year fixed effects.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Reference categories: no trust in banks, primary school education, black, male, urban, no income, LSM 1-2, unmarried

Table 3.9 Results of regression without the 2012 survey dataset

VARIABLES	Coefficient	Log-odds
Age	-0.032***	0.969***
	(0.005)	(0.005)
Bank trust - yes	0.248	1.281
	(0.155)	(0.198)
High school	0.728*	2.071*
	(0.429)	(0.889)
Tertiary education	1.749***	5.750***
	(0.447)	(2.572)
Coloured	-0.447**	0.640**
	(0.195)	(0.125)
Asian	-1.001***	0.368***
	(0.283)	(0.104)
White	-0.302*	0.739*
	(0.181)	(0.134)
Female	-0.179	0.836
	(0.115)	(0.096)
Rural	-0.228	0.796
	(0.197)	(0.157)
R1-R1,999	1.165***	3.205***
	(0.288)	(0.923)
R2,000-R5,999	2.254***	9.526***
	(0.284)	(2.703)
R6,000 and above	2.706***	14.97***
	(0.303)	(4.534)
LSM 3-4	-1.029*	0.357*
	(0.576)	(0.206)
LSM 5-6	-0.380	0.684
	(0.550)	(0.376)
LSM 7-8	0.130	1.139
	(0.570)	(0.650)
LSM 9-10	0.423	1.527
	(0.592)	(0.904)
Married	0.0693	1.072
	(0.127)	(0.136)
2012 year	2.488***	12.04***
	(0.214)	(2.570)
2016 year	2.515***	12.36***
	(0.190)	(2.345)
Constant	-6.189***	0.002***
	(0.631)	(0.001)
Observations	8,906	8,906

Each column represents the estimation results of the weighted pooled logistic regression excluding the 2012 dataset with region and year fixed effects.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Reference categories: no trust in banks, primary school education, black, male, urban, no income, LSM 1-2, unmarried

Table 3.10 Results of regression without the 2016 survey dataset

VARIABLES	Coefficient	Log-odds
Age	-0.027***	0.973***
	(0.006)	(0.005)
Bank trust - yes	0.335**	1.397**
	(0.152)	(0.212)
High school	1.355***	3.876***
	(0.467)	(1.811)
Tertiary education	1.977***	7.219***
	(0.489)	(3.534)
Coloured	-0.453**	0.635**
	(0.229)	(0.146)
Asian	-0.745**	0.475**
	(0.320)	(0.152)
White	-0.449**	0.638**
	(0.214)	(0.137)
Female	-0.119	0.888
	(0.131)	(0.116)
Rural	-0.102	0.903
	(0.214)	(0.193)
R1-R1,999	1.259***	3.521***
	(0.311)	(1.095)
R2,000-R5,999	2.778***	16.09***
	(0.307)	(4.944)
R6,000 and above	3.177***	23.98***
	(0.332)	(7.968)
LSM 3-4	-0.870	0.419
	(0.649)	(0.272)
LSM 5-6	-0.351	0.704
	(0.590)	(0.415)
LSM 7-8	-0.0363	0.964
	(0.609)	(0.588)
LSM 9-10	0.472	1.602
	(0.632)	(1.013)
Married	0.248*	1.281*
	(0.147)	(0.188)
2012 year	2.436***	11.43***
	(0.212)	(2.424)
2016 year	2.332***	10.30***
	(0.199)	(2.054)
Constant	-7.116***	0.001***
	(0.677)	(0.001)
Observations	8,198	8,198

Each column represents the estimation results of the pooled logistic regression excluding the 2016 dataset with region and year fixed effects.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Reference categories: no trust in banks, primary school education, black, male, urban, no income, LSM 1-2, unmarried

Table 3.11 Results of the regression including the interaction term of year and region

	Base Line Model	With interaction term (year and region)
VARIABLES	**Coefficient**	**Coefficient**
Age	-0.030***	-0.030***
	(0.004)	(0.004)
Bank trust – yes	0.304**	0.318**
	(0.123)	(0.124)
High school	0.966***	0.979***
	(0.363)	(0.362)
Tertiary education	1.823***	1.838***
	(0.381)	(0.380)
Coloured	-0.442**	-0.425**
	(0.172)	(0.172)
Asian	-0.798***	-0.763***
	(0.238)	(0.246)
White	-0.389**	-0.394**
	(0.159)	(0.159)
Female	-0.143	-0.135
	(0.0970)	(0.0982)
Rural	-0.0511	-0.127
	(0.160)	(0.165)
R1-R1,999	1.232***	1.257***
	(0.259)	(0.259)
R2,000-R5,999	2.558***	2.579***
	(0.256)	(0.260)
R6,000 and above	3.009***	3.027***
	(0.272)	(0.275)
LSM 3-4	-0.827*	-0.819*
	(0.490)	(0.488)
LSM 5-6	-0.146	-0.194
	(0.455)	(0.456)
LSM 7-8	0.379	0.306
	(0.471)	(0.472)
LSM 9-10	0.722	0.653
	(0.488)	(0.494)
Married	0.0945	0.0936
	(0.109)	(0.110)
2010.year	2.437***	2.523***
	(0.211)	(0.648)
2012.year	2.404***	2.791***
	(0.200)	(0.626)
2016.year	2.427***	2.509***
	(0.190)	(0.629)
2.region		0.322

		(0.805)
3.region		1.495*
		(0.815)
4.region		0.516
		(0.779)
5.region		0.742
		(0.725)
6.region		0.539
		(0.800)
7.region		0.349
		(0.675)
8.region		0.442
		(0.903)
9.region		0.685
		(0.900)
2006b.year#1b.region		0
		(0)
2006b.year#2o.region		0
		(0)
2006b.year#3o.region		0
		(0)
2006b.year#4o.region		0
		(0)
2006b.year#5o.region		0
		(0)
2006b.year#6o.region		0
		(0)
2006b.year#7o.region		0
		(0)
2006b.year#8o.region		0
		(0)
2006b.year#9o.region		0
		(0)
2010o.year#1b.region		0
		(0)
2010.year#2.region		-0.365
		(0.952)
2010.year#3.region		-1.388
		(0.983)
2010.year#4.region		-0.439
		(0.884)
2010.year#5.region		-0.516
		(0.817)
2010.year#6.region		-0.308
		(0.912)
2010.year#7.region		0.0824

		(0.749)
2010.year#8.region		0.577
		(0.988)
2010.year#9.region		-0.0316
		(0.979)
2012o.year#1b.region		0
		(0)
2012.year#2.region		-0.717
		(0.873)
2012.year#3.region		-2.338**
		(0.947)
2012.year#4.region		-1.548*
		(0.858)
2012.year#5.region		-1.577*
		(0.813)
2012.year#6.region		-2.476***
		(0.902)
2012.year#7.region		0.0821
		(0.718)
2012.year#8.region		0.112
		(0.967)
2012.year#9.region		-0.239
		(0.949)
2016o.year#1b.region		0
		(0)
2016.year#2.region		-0.276
		(0.854)
2016.year#3.region		-2.578***
		(0.947)
2016.year#4.region		-0.965
		(0.850)
2016.year#5.region		-0.242
		(0.763)
2016.year#6.region		-0.364
		(0.859)
2016.year#7.region		0.327
		(0.712)
2016.year#8.region		-0.158
		(0.952)
2016.year#9.region		-0.743
		(0.947)
Constant	-6.834***	-7.026***
	(0.569)	(0.806)
Observations	11,762	11,762

Each column represents the estimation results of the logistic regression of model1 with the addition of the interaction term of year and region including year fixed effects.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Reference categories: no trust in banks, primary school education, black, male, urban, no income, LSM 1-2, unmarried

Table 3.12 Results of regressions separately for those that trust banks and those that do not

VARIABLES	Coefficient: Bank trust	Coefficient: No bank trust
Age	-0.031***	0.974***
	(0.005)	(0.007)
High school	0.800*	5.061**
	(0.428)	(3.230)
Tertiary education	1.650***	12.45***
	(0.447)	(8.432)
Coloured	-0.413**	0.715
	(0.185)	(0.322)
Asian	-0.929***	0.879
	(0.260)	(0.501)
White	-0.530***	1.119
	(0.174)	(0.404)
Female	-0.146	0.910
	(0.109)	(0.193)
Rural	-0.280	2.311**
	(0.181)	(0.843)
R1-R1,999	1.281***	2.459*
	(0.297)	(1.272)
R2,000-R5,999	2.470***	16.48***
	(0.292)	(8.855)
R6,000 and above	2.896***	32.41***
	(0.309)	(19.27)
LSM 3-4	-1.104**	0.0997***
	(0.516)	(0.0638)
LSM 5-6	-0.539	0.279***
	(0.476)	(0.121)
LSM 7-8	-0.0797	0.610
	(0.492)	(0.205)
LSM 9-10	0.224	
	(0.512)	
Married	0.124	0.842
	(0.122)	(0.205)
2010 year	2.450***	10.95***
	(0.230)	(5.652)
2012 year	2.492***	9.169***
	(0.226)	(3.914)
2016 year	2.441***	11.29***
	(0.208)	(5.231)
Constant	-5.846***	0.001***
	(0.607)	(0.001)
Observations	8,049	3,355

Region FE	YES	YES
Year FE	YES	YES

Each column represents the estimation results of the pooled logistic regression split between those that have trust in banks and those that do not have trust in banks with region and year fixed effects.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Reference categories: primary school education, black, male, urban, no income, LSM 1-2, unmarried

Table 3.13 Results of the baseline model without using survey weights

VARIABLES	Coefficient	Log-odds	Marginal effects
Age	-0.0295***	0.971***	-0.0009***
	(0.00297)	(0.00289)	(0.0001)
Bank trust - yes	0.244***	1.276***	0.0074***
	(0.0931)	(0.119)	(0.0027)
High School	0.851***	2.342***	0.0188***
	(0.287)	(0.672)	(0.0046)
Tertiary education	1.701***	5.482***	0.0600***
	(0.299)	(1.641)	(0.0082)
Coloured	-0.177	0.837	-0.0056
	(0.114)	(0.0958)	(0.0035)
Asian	-0.643***	0.526***	-0.0166***
	(0.172)	(0.0902)	(0.0036)
White	-0.184	0.832	-0.0058*
	(0.115)	(0.0960)	(0.0035)
Female	-0.0329	0.968	-0.0010
	(0.0732)	(0.0708)	(0.0023)
Rural	-0.127	0.881	-0.0039
	(0.132)	(0.116)	(0.0040)
R1-R1,999	0.952***	2.590***	0.0137***
	(0.199)	(0.515)	(0.0025)
R2,000-R5,999	2.113***	8.277***	0.0600***
	(0.195)	(1.614)	(0.0055)
R6,000 and above	2.618***	13.70***	0.1001***
	(0.203)	(2.787)	(0.0095)
LSM 3-4	-0.379	0.684	-0.0070
	(0.379)	(0.260)	(0.0078)
LSM 5-6	0.338	1.402	0.0087
	(0.353)	(0.496)	(0.0080)
LSM 7-8	0.796**	2.216**	0.0259***
	(0.365)	(0.809)	(0.0092)
LSM 9-10	1.119***	3.060***	0.0431***
	(0.373)	(1.141)	(0.0110)
Married	0.0573	1.059	0.0018
	(0.0784)	(0.0830)	(0.0025)
2010.year	1.996***	7.358***	0.0575***
	(0.160)	(1.174)	(0.0058)
2012.year	1.781***	5.933***	0.0452***
	(0.158)	(0.935)	(0.0045)
2016.year	1.492***	4.447***	0.0320***
	(0.156)	(0.693)	(0.0035)
Constant	-6.331***	0.00178***	

	(0.480)	(0.000854)	
Observations	11,762	11,762	11,762
Region FE	YES	YES	YES
Year FE	YES	YES	YES
Pseudo R-squared	.2842		

Each column represents the estimation results of the unweighted pooled logistic regression of equation 1 with region and year fixed effects.
Robust standard errors in parentheses/ Z score in parentheses
Reference categories: No trust in banks, primary school education, black, male, urban, no income, LSM 1-2, unmarried *** p<0.01, ** p<0.05, * p<0.1

Table 3.14 Results of the probit regression for equation 1

VARIABLES	Coefficient	Marginal effect
Age	-0.015***	-0.001***
	(-7.377)	(0.000)
Bank trust - yes	0.182***	0.010***
	(2.905)	(0.003)
High School	0.415***	0.016***
	(2.777)	(0.004)
Tertiary education	0.911***	0.062***
	(5.650)	(0.010)
Coloured	-0.211**	-0.0101***
	(-2.360)	(0.003)
Asian	-0.429***	-0.017***
	(-3.360)	(0.004)
White	-0.193**	-0.010**
	(-2.198)	(0.004)
Female	-0.079	-0.004
	(-1.539)	(0.003)
Rural	-0.036	-0.002
	(-0.441)	(0.005)
R1-R1,999	0.564***	0.013***
	(5.099)	(0.002)
R2,000-R5,999	1.220***	0.068***
	(10.795)	(0.007)
R6,000 and above	1.497***	0.114***
	(12.202)	(0.014)
LSM 3-4	-0.398*	-0.017
	(-1.742)	(0.013)
LSM 5-6	-0.081	-0.005
	(-0.374)	(0.013)
LSM 7-8	0.209	0.016
	(0.927)	(0.015)
LSM 9-10	0.394*	0.036**
	(1.677)	(0.018)
Married	0.065	0.004
	(1.129)	(0.003)
2010.year	1.214***	0.049***
	(11.985)	(0.007)
2012.year	1.175***	0.045***
	(12.316)	(0.005)
2016.year	1.189***	0.047***
	(13.384)	(0.005)
Observations	11,762	11,762
Pseudo R-squared	0.308	

Each column represents the estimation results of the weighted pooled probit regression of equation 1 with region and year fixed effects.
Robust z-statistics in parentheses
Reference categories: primary school education, black, male, urban, no income, LSM 1-2, unmarried
*** p<0.01, ** p<0.05, * p<0.1

CONCLUSION

Introduction

The importance of financial development for long-term economic growth has been recognised by policymakers around the world and the topic of financial inclusion is now dominating the research agenda and policy debates (Beck & Cull, 2013). Governments and policymakers are increasingly recognising the importance of financial inclusion for long-run economic growth (Allen *et al.,* 2016; Demirgüç-Kunt *et al.,* 2015). The drive towards financial inclusion aims to improve and expand financial services to a broader range of the population. Evidence of the benefits to individuals is increasingly providing both an economic and political rationale for policy-makers and governments to promote financial inclusion (Allen *et al.,* 2016; Klapper & Singer, 2015). Studies have found that financial inclusion can alleviate poverty, reduce income inequality and increase the wealth of the low-income population (Beck *et al.,* 2007; Bruhn & Love, 2014; Honohan, 2008; Levine, 1998). The state has played an active role, both in advancing financial inclusion and in the use of technology to provide financial services to the unbanked population.

Main findings

This study provided insights into financial inclusion, with particular reference to the role of the state and the role of technology as a means of reaching the unbanked. Chapter 1 explored the origins of the drive towards financial inclusion and outlined how early steps were first undertaken as part of broader efforts to reduce poverty, before being recognised as a separate agenda. These initial steps included the recognition of an individual's right to have a bank account as part of the so-called 'life-line banking' movement, which increased the awareness of the high number of bank branch closures that resulted in the exclusion of many individuals. Furthermore, the findings of this chapter suggested that the state played an active role in the use of technology to address financial exclusion, in particular, the use of electronic bank transfers for government payments that led to a high number of new bank accounts being opened.

The state played a pivotal role by developing the legislative framework conducive for technological innovations to occur and, in some instances, provided the risk capital as part of the active development of the technologies used to address financial inclusion. The state's role was highlighted in the case of

M-Pesa in Kenya, which has since become a world leader in mobile banking. The research and development of new technologies to address financial inclusion are both risky and very costly, with many taking years to develop. Thus, funding for these projects is crucial. The M-Pesa project began as a response to a Challenger Fund, which called for proposals to expand financial services to the previously unbanked and to reduce the costs of these services. The project received approximately £1 million from the Financial Deepening Challenge Fund (FDCF) which was set up by the UK's Departmental for International Development, and this funding was matched by Vodafone. This project developed new technology to deliver financial services to the unbanked population through the use of mobile phones and allowed non-banks to provide financial services.

The government in Kenya played a crucial role in the uptake of mobile banking services by fostering an enabling regulatory environment. The legislation allowed innovations to flourish and for non-banks to provide financial services without the need to comply with strict regulations required by formal financial institutions. Later on, this legislation also permitted banking agents to provide financial services; banks could thus provide financial services across vast geographical areas in Kenya where there were no established bank branches.

The success of these initiatives has been highlighted in the Global Findex Survey which estimated that in 2011, only 42% of the population in Kenya had access to formal financial services, however, by 2017, this has risen to 82%. The survey results support the use of mobile banking technologies as a means of reaching the unbanked, especially in emerging markets. The findings of Chapter 1 thus suggest that the provision of funding, together with an enabling regulatory environment, can drive mobile banking adoption and that mobile banking services for the unbanked can be commercially viable.

In the first global survey of financial inclusion in 2011, the World Bank estimated that two billion people remained excluded from formal financial services, highlighting the need for further research into the effectiveness of existing inclusion policies. This included research into the determinants of financial inclusion, especially in emerging markets, where the prevalence of financial exclusion is most pronounced. The objective of Chapter 2 was to identify the key determinants of financial inclusion in South Africa. Furthermore, the chapter also sought to assess the long-term effects of policy interventions introduced by the state and financial institutions. The chapter employed a logistic regression using household data obtained from the FinScope Surveys over a ten-year period.

Table 3 below contains the findings for the main variables of interest of Chapter 2, comparing and contrasting these with prior studies on the determinants of financial inclusion.

Table 3 Summary of main variables

Variable	Author and results (+) (-) (ns)	Expected significance	Expected relationship	Actual findings
Age	Allen *et al.* (2016) Devlin (2005) Hogarth *et al.* (2005) Wentzel *et al.* (2016) (+)	Yes	Positive (+)	Age was significantly positively associated with having a bank account, in line with previous studies suggesting that older people were more likely to be banked than younger people.
Education	Allen *et al.* (2016) Aterido *et al.* (2011) Beck & Brown (2011) Hogarth *et al.* (2005) Wentzel *et al.* (2016) (+)	Yes	Positive (+)	The findings suggested that education was significantly positively associated with banking status, in line with previous studies.
Ethnicity (White)	Hogarth *et al.* (2005) (-)	Yes	Positive (+)	The findings suggested that the association between ethnicity and having a bank account was significant and specifically, that Whites were more likely to be banked than Blacks. Other ethnicities were less likely to be banked than Blacks, however, the association with banking status was not significant.
Geographical area (rural)	Beck & Brown (2011) Honohan & King (2012) (-)	Yes	Negative (-)	The findings suggested that those in a rural area were significantly less likely to have a bank account than those in urban areas were.
Gender (female)	Anson *et al.* (2013) Beck & Brown (2011) Fungáčová & Weill (2014) (-) Honohan & King (2012) (n/s)	Yes	Negative (-)	The findings suggested that there was a significantly positive association between being female and having a bank account.
Income	Beck & Brown (2011) Devlin (2005) Hogarth *et al.* (2005) Honohan & King (2012) Wentzel *et al.* (2016) (+)	Yes	Positive (+)	Income had a significantly positive association with having a bank account and confirmed the findings of previous studies.
Year of survey	Hogarth *et al.* (2005) Beck & Brown (2011) (+)	Yes	Positive (+)	There was a significantly positive association. The likelihood of having a bank account increased over the period of the surveys.

***Source**: Data obtained from FinScope Surveys (2005 – 2014)*

Notes: (+) indicates a positive relationship between the banking status and the attribute; (-) indicates a negative relationship between the banking status and the attribute; (ns) indicates the relationship is not significant between the banking status and the attribute.

The findings of Chapter 2 suggested that individuals with higher income, who are older and with better education, were more likely to have a bank account. Moreover, contrary to other studies, the findings revealed that women in South Africa were more likely to have a bank account than men. Other studies have either found that gender is not a significant determinant of financial inclusion or that women are less likely than men to have a bank account. Several possible explanations are posited for this. As this study covered a ten-year period, the effects of deteriorating economic conditions and high unemployment have resulted in more women entering the workforce and there has been an increase in female-headed households. Another significant factor was the introduction of the SASSA card in 2012, together with the change to the electronic payment of social grants. The findings suggest that over the period of the study, the gender disparity increased and that after the launch of the SASSA card, women were 10.4% more likely to have a bank account than men. The state's electronic payment of social grants not only resulted in cost savings but also in the opening of new bank accounts for the previously unbanked, many of whom were women and from a Black ethnicity.

Chapter 2 also uniquely explored the role of ethnicity in Sub-Saharan Africa. The findings suggested that ethnicity was a significant determinant of financial inclusion and specifically, that Whites were more likely to have a bank account than Blacks. Over the period of the study, however, the magnitude of the effect lessened. This suggests that the public-private sector approach to address financial inclusion in South Africa, together with Black Economic Empowerment (BEE) policies, seems to have had a positive effect on broadening access to financial services.

The study covered a ten-year period (2005 – 2014), unlike the majority of existing research, which has focused on a single period in time. The study was, therefore able to gauge the long-term effects of policy interventions taken by the government and financial institutions. South Africa adopted a joint approach between the public and the private sector in addressing financial exclusion. The financial sector developed a Financial Sector Charter, in conjunction with government, to enhance existing services and provide new ones to the poor and the financially excluded.

The findings revealed that the relationship between the year of the survey and banking status was significant and positive, suggesting that the likelihood of having a bank account increased over the period of the study. It would, therefore, appear that over the period of the study the interventions have had a

positive impact on financial inclusion, with individuals being more likely to have a bank account in 2014 than in earlier survey years. The findings of this study support the view that a public-private sector approach to financial inclusion can positively impact the unbanked population in the long term.

Policymakers, non-governmental agencies and activists have also been promoting the use of technology as a means of addressing financial exclusion. Mobile banking has been recognised as an effective tool to reach the unbanked, especially in areas where there is an absence of retail banking infrastructure. Chapter 3 employed a logistic regression model to explore the factors likely to influence the decision to adopt mobile banking. The third chapter also added to the scant literature on the role of ethnicity and institutional trust in mobile banking adoption. Table 4 below contains the findings for the main variables of interest of Chapter 3, comparing and contrasting these with prior studies on factors influencing online/mobile banking adoption.

Table 4 Summary of main variables

Variable	**Author and results (+) (-) (ns)**	**Expected significance**	**Expected relationship**	**Actual findings**
Age	Laukkanen (2016) Laukkanen *et al.* (2007) Lee *et al.* (2002) Tsai *et al.* (2013) (-) Zins & Weill (2016) (+)	Yes	Negative (-)	Age was significantly negatively associated with mobile banking, in line with findings of previous studies. People were more likely to use mobile banking up to the age of 40 years, thereafter the relationship became negative.
Bank trust	Arvidsson (2014) Gu *et al.* (2009) Montazemi & Qahri-Saremi (2015)(+) Chemingui & Iallouna (2013) Luo *et al.* (2010) (ns)	Yes	Positive (+)	The findings suggested that trust in banks has a significantly positive association with mobile banking adoption. Trusting banks increased the likelihood of adopting/using mobile banking.

Education	Al-Jabri & Sohail (2014) Kolodinsky *et al.* (2004) Lee & Lee (2000) (+)	Yes	Positive (+)	In line with previous studies, the relationship was significantly positive, with those with higher education more likely to adopt mobile banking.
Ethnicity (non-Whites)	Kolodinsky *et al.* (2004) Lee & Lee (2000) (+) Lee *et al.* (2002) (ns)	Yes	Positive (+)	The findings suggested that the role of ethnicity was significant and that Blacks were more likely to adopt mobile banking than other ethnicities.
Gender (female)	Laukkanen & Pasanen (2008) Al-Jabri & Sohail (2014) (+) Zins & Weill (2016) (-)	Yes	Negative (-)	The findings suggested that the relationship was negative, however, the association with mobile banking was not significant.
Income	Kolodinsky *et al.* (2004) Laforet & Li (2005) Lee *et al.* (2002) Lee & Lee (2000) (+)	Yes	Positive (+)	Income had a significantly positive relationship with mobile banking adoption/use and confirmed the findings of previous studies.
Year of survey	Kikulwe *et al.* (2014) (+) Kolodinsky *et al.* (2004) (+) internet banking and direct payments (-) for telephone banking.	Yes	Positive (+)	There was a significantly positive relationship between mobile banking and the year of the survey. The likelihood of adoption of mobile banking increased over the period of the surveys.

***Source**: FinScope Surveys (2005, 2010, 2012 and 2016)*

Notes: (+) Indicates a positive relationship between the intention to use/adopt mobile banking and the attribute; (-) indicates a negative relationship between the intention to use/adopt mobile banking and the attribute; (ns) indicates the relationship is not significant between the intention to use/adopt mobile banking and the attribute.

The findings suggest that individuals with higher income, who were younger and better educated, were more likely to adopt mobile banking. The relationship between age and mobile banking was non-linear. Younger people were more likely to adopt mobile banking up until the age of 40 years old, thereafter the relationship between age and mobile banking adoption was negative. Banks, fintechs and non-

governmental organisations could specifically address mobile banking initiatives for those aged 16-29 and those older than 40, as the study suggested that these age groups were less likely to adopt mobile banking.

The findings revealed that Blacks were more likely to use mobile banking than other ethnicities. A possible explanation for this is that Blacks tend to rely on their mobile phones for access to the internet more than other ethnicities. Blacks also use their mobile devices more than Whites to access mobile services such as job searches and submitting job applications, searching for medical information and for mobile education (Anderson, 2015). Thus Blacks would be more likely to use their mobile devices to access banking services, as reflected in this study. Another possible explanation is that many people from a black ethnic background reside in townships and on the outskirts of cities and thus have limited proximity to banks and ATMs. The adoption of mobile banking provides access to financial services without the need to travel long distances to reach bank branches and ATMs.

Chapter 3 contributed to the limited research on the relationship between trust in banks and the use of mobile banking. Fintechs, non-governmental organisations and financial institutions could focus on awareness campaigns on the benefits, ease and convenience of mobile banking solutions and potentially transfer consumers' trust in banks to mobile banking services. The results of the study indicate that the likelihood of mobile banking adoption increases over time and that individuals in 2016 were more likely to adopt mobile banking than those in the earlier survey years.

Overall the findings of this study suggest that younger, wealthier and better-educated individuals were more likely to use mobile banking in South Africa. This is in stark contrast to the experience in Kenya where there was a wide-spread use of mobile banking, mainly due to the success of M-Pesa. M-Pesa has transformed the financial services landscape and provided access to the previously unbanked, especially the poorest of the poor in Kenya.

There were several key differences in the banking and regulatory landscape between Kenya and South Africa likely to have impacted the levels of mobile banking adoption. South Africa had a highly developed retail banking network and relatively high levels of financial inclusion. At the time of the launch of M-Pesa in 2007, it is estimated that 50% of South Africans had access to formal financial services, whilst only an estimated 21% of Kenyans had access to formal financial services (Bankable Frontier Associates LLC, 2007). Furthermore, in South Africa, there were several low-cost mobile transfer services provided by retail stores (Chigada & Hirschfelder, 2017). In addition, only banks and MNO's in partnership with banks were able to offer mobile banking services in South Africa. In contrast, Kenya had a limited retail banking

network, an absence of low-cost mobile transfer services and an enabling regulatory environment where banks, mobile network operators and banking agents could provide mobile financial services.

The experience in South Africa is that mobile banking, for the main part, was used as an additional tool to access financial services by individuals who already have access to bank accounts. Further policy reforms and the relaxation of the regulation of mobile network operators and other mobile banking service providers could create an enabling environment for mobile banking to flourish in South Africa.

Limitations and future research

The findings in Chapter 1 are limited by the source materials. Future studies could enrich these findings by conducting interviews with the key actors. The empirical research in Chapters 2 and 3 employed logistic regressions which interpret the association between independent variables and the dependent variable. However, these results could not be interpreted as a causal relationship. Due to the cross-sectional nature of the data, the studies could not observe the same individuals across time as fresh samples were drawn for each survey year. Future research could be done on repeat samples over time, to observe the same individual at different points in time. This would allow for the interpretation of a causal relationship.

Chapters 2 and 3 explored the role of gender in influencing financial inclusion and mobile banking adoption. The data obtained from the FinScope surveys coded the gender responses as male or female. Respondents were therefore not able to classify themselves into more inclusive categories. Future studies could address the gender dimension with more inclusive categories.

Two types of trust were identified as potential barriers to the adoption of electronic banking and mobile banking services. The first was institutional trust and the second was trust in technology. Chapter 3 investigated the role of institutional trust and the use of mobile banking. Future studies could assess the role of trust in technology in influencing the use of mobile banking. Future research could also be conducted by interviewing focus groups, specifically those ethnicities that were less likely to adopt mobile banking, to obtain a more detailed understanding of the cultural and community influences on the behavioural intentions of individuals.

The benefits of mobile banking are well documented but future research could also assess whether mobile banking can result in the indebtedness of individuals. This would contribute to the ‘pain of payment’ literature that explores the psychological effects of using different payment methods. Research has

suggested that the use of non-cash payment methods could result in consumers spending more than if they had used notes and coins for the transaction. Thus, future research could explore whether consumers using mobile payments spend more than customers using physical cash payments.

The datasets were obtained for one country over time therefore, future research could be done using a cross-country analysis. The FinScope surveys have been conducted in numerous countries, both in Africa and in other parts of the world. Future research could use data from the FinScope surveys from different countries to compare results and identify country-specific determinants of financial inclusion. Lastly, qualitative research could be conducted by interviewing unbanked individuals who do not use mobile banking to gain greater insights into the barriers to adopting these mobile financial services.

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