THE FINANCIAL INCLUSION CONUNDRUM IN LESOTHO: IS MOBILE MONEY THE MISSING PIECE IN THE PUZZLE?

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Abstract

The prolific use of mobile telephones in developing countries has given birth to financial innovations such as mobile money. As a result, the use of mobile money has expanded the grid of financial services to include previously unbanked populations in Africa. This development is a harbinger for increased financial intermediation and positive spill-overs in terms of credit growth to entrepreneurs and faster economic growth. Based on monthly data for the period 2013m7 – 2015m12, this study employs time series techniques to unpack the proliferation of mobile money and its attendant impact on financial inclusion in Lesotho. The findings reveal existence of long-run steady state relationship between financial inclusion and mobile money in Lesotho and that mobile money Granger causes financial inclusion both in the short-run and long-run in Lesotho. Therefore, financial inclusion policies should be directed towards leveling the playing ground for mobile money to flourish to create a more financially inclusive society in Lesotho.

JEL classification: C01, C22, C87, G23, O10, O30

Key words: Financial inclusion, mobile money, credit growth

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1. INTRODUCTION

Many developing countries especially in Africa are characterized by financial exclusion in the form of low access to financial services. This is mainly a result of banking infrastructure gaps that hinder an all -inclusive financial system (Andrianaivo & Kpodar, 2012). According to Beck & Maimbo (2013) approximately 2.5 billion people in the world lack access to financial services and have to rely on cash or informal financial services which are typically unsafe, inconvenient and expensive. However, more than half of households in developing countries do not have an account with a financial institution. In the case of Lesotho, approximately 38% of the adult population has a bank account, which indicates that the majority of the adult population still lacks access to basic financial services (Ketly & Kasi, 2015).The mainstream banking sector fails to deliver financial services to millions of consumers especially those residing in rural areas. Banks are biased in favour of affluent consumers due to high costs of physical infrastructure and operational costs as well as low profits associated with serving the low income consumers (Dube, 2014). This lack of access to financial services not only limits the ability of the poor to save, repay debts and manage risk responsibly but also indirectly exposes them to poverty (see Donovan, 2012).

The development of mobile money has provided a glimpse of hope for the financially excluded members of the population. Mobile money is perceived as a solution that can circumvent poor banking infrastructure and geographical isolation and can offer low-cost distribution of financial services through the mobile phone network. In addition, the surge and near-universal use of mobile phones and the huge number of airtime distributors that can act as access points make mobile money a cost-effective solution to financial access (Ketly & Kasi, 2015).Following the successful adoption of mobile money in Kenya, numerous countries have scaled up their efforts to implement it in an effort to increase access to financial services. Hence, it is crucial to study the impact of mobile money on financial inclusion. This study pursues this objective in the context of Lesotho using monthly data for the period 2013m7 – 2015m12.

The rest of the paper is organized as follows: Section 2 reviews the literature on mobile money and financial inclusion while section 3 discusses mobile money developments in Lesotho. Section 4 describes the data and presents the analytical framework and section 5 discusses the empirical results. Section 6 concludes the paper and offers a menu of recommendations.

2. REVIEW OF THE LITERATURE

2.1 The Definition of Financial Inclusion and Identification of its Constraints

Financial inclusion is defined as a process that ensures ease of access, availability and usage of the formal financial system for all members of an economy. It entails access to financial services such as payment services, remittance facilities, savings, loans as well as insurance services offered by the formal financial system at costs that can be afforded by the poor and disadvantaged social groups. An inclusive financial system has several benefits. First, it facilitates efficient allocation of productive resources and can potentially lower the cost of capital. Second, access to appropriate financial services can considerably improve the management of finances on daily basis. Third, it can also help in reducing the growth of informal sources of credit such as money lenders that are often found to be exploitative. An all-inclusive financial system enhances efficiency and welfare by providing avenues for secure and safe saving practices and it also facilitates availability of a whole range of efficient financial services (Sarma & Pais, 2011). According to Dube et al (2014) financial inclusion does not only ensure access to basic financial services by all, but also promotes economic growth, reduces poverty and inculcates a savings culture in rural areas.

The issue of inclusive financial system has attracted greater attention both in academic and policy circles and has become a policy priority in many countries around the globe. Therefore, financial regulators, governments and the banking industry over the world have beefed up efforts to develop and implement various initiatives that deepen financial inclusion. For instance, the United States (US) has developed legislative measures that require banks to offer credit throughout their areas of operation without discriminating between the rich and the poor. France has also developed measures that emphasize a person's right to have a bank account. Furthermore, the banking industry has introduced products such as "no-frills" accounts and "General Credit Cards" for low deposits and launched low cost bank accounts to promote financial inclusion. In addition, micro-finance institutions and "Self-Help Groups" have also been promoted in some countries such as India to take care of the excluded groups (Sarma & Pais, 2011). These efforts are meant to ensure access and affordable financial services to the poor to allow them to plan for routine expenses, cope with external shocks and better cover unanticipated expenses. In addition, they contribute to increased

access to more stable and productive activities (Gwalani & Parkhi, 2014). This, not only enhances economic growth and reduces poverty, but also promotes social inclusion[1].

The degree of financial inclusion differs among countries depending on their stages of economic and financial development. Developed countries such as the US and United Kingdom (UK) have managed to provide financial services to the vast majority of their populations. However, in developing countries particularly in Africa, the issue of financial inclusion still remains a challenge as most countries are severely constrained by limited infrastructure and the other difficulties of accessing financial institutions, which leave large proportions of the population, especially those who reside in remote areas, with low access to affordable financial services or completely excluded from financial services (see Kempson,2006 and Oji,2015).

The literature identifies both demand and supply side constraints to financial inclusion. For example, people may choose not to use formal financial services because they do not need such services due to religious and cultural reasons, and/or lack of trust in formal financial institutions. Lack of trust may be a result of, among others, fear of bank failure or fraud. In addition, people who wish to use formal financial services may face several barriers. First, inaccessibility due to difficulty in reaching service points or absence of such services in the vicinity. Second, unaffordability as formal financial services are often too costly for low income persons. Third, inappropriate product design, which results in products that do not meet the needs of excluded customers. Fourth, inability to meet eligibility criteria, for example not having sufficient assets to meet conditions for the extension of a loan or being unable to provide documentation evidencing identity. In addition, other demand side constraints include cumbersome documentation and procedures that customers have to undergo when opening a bank account, limited literacy and numeracy skills, information asymmetry due to lack of awareness, branch operating hours, which may be inflexible for some sections of the population (see De Koker & Jentzsch, 2013; Gwalani & Parkhi,2014 and Kempson,2006).

[1] Social inclusion is defined as the degree to which people are and feel integrated in the different relationships, organizations, sub-systems and structures that constitute everyday life. As a process, it refers both to integration into social, economic and civic life and the pursuit of active citizenship as well as a means to counter poverty understood in the sense of capability deprivation (see Cardo, 2014).

On the supply side, some people who had initially utilized formal financial services may opt to withdraw from such services due to high costs inherent in maintaining them, lack of trust or faith in the banking system, bad credit records, difficulties associated with the management of their spending and inappropriate product design as well as complex procedures for availing financial services. Apart from that, regulatory requirements which require financial service providers to adopt stringent disclosure requirements, which must be met by the customers before the service is provided, deter customers from participating in the formal financial system (De Koker & Jentzsch, 2013). In addition, financial service providers may decide not to offer some services to customers if they feel that the environment does not protect their interests (Central Bank of Lesotho, 2013). Thus, in spite of intensified efforts to increase access and use of financial services, many developing countries still have the vast majority of their populations unbanked[2].

2.2 The Role of Telecommunication Technologies in improving Financial Inclusion

The conventional banking system has not been able to provide financial services to a large number of low-income and poor people, especially in remote areas, due to high costs of physical infrastructure, operational costs and unprofitability arising from serving low income consumers (see Boston Consulting Group, 2011; Goss, Mas, Radcliffe & Stark, 2011). However, the diffusion of information and communication technologies (ICT) and mobile telephony have the potential to significantly reduce barriers to financial inclusion and therefore allow millions of people who were otherwise excluded from the formal financial system to perform financial transactions relatively cheaply, securely, and reliably through their mobile phones (Dube at al,2014). Mobile money, defined as the provision of a range of financial service such as mobile banking, mobile payments and mobile transfers to consumers through mobile devices, is one of many possibilities arising from advancement in technology. It encompasses common functions such as balance checks, funds transfer, depositing and withdrawing cash (cash-in and cash out), savings, access to credit, bill payments, airtime purchase and long distance remittance of funds (Donner and Tellez, 2008; Kasseeah & Tandrayen-Ragoobur, 2012; Jenkins, 2008).

[2] According to Gross et al (2012) and Breitbach & Walstad (2014/2015) the unbanked are individuals or households without checking or savings accounts and operate largely outside the banking system when making financial transactions. On the other hand, the underbanked are individuals or households that have a bank account(checking, savings or money market account), but supplement the account with alternatives to traditional banking services such as non-bank money orders, non-bank check-cashing services, payday loans, rent-to-own agreements, payday loan, payroll card or pawnshops.

Mobile phones have a great potential for delivering financial services to a broader base of customers due to their enormous uptake by large number of the unbanked and the poor in developing countries. Moreover, mobile phone systems can be placed anywhere as long as there is wireless phone connection and this overcomes the problem of distance and lack of bank branches in remote areas. In this regards, it enables the possibility of ubiquitous access to financial services. Furthermore, mobile money financial services are commonly set up with infrastructure provided by a network of "cash merchants" (or "agents"), who may be located all over the country, as well as a host of other supporting businesses such as banks, agent aggregators and liquidity management firms (Donovan, 2012; Ramada-Sarasola, 2012). Therefore, it does not only enable new entrants to the banking system but also offers such services at lower costs because it does not incur the costs of physical roll-out and faces lower costs of handling low-value transactions(Flores-Roux & Mariscal, 2010).

The fact that mobile money uses existing mobile infrastructure to deliver all services online brings cost efficiency to the provision of cash-in and cash-out services to the poor(Flores-Roux & Mariscal, 2010). These it lowers transaction costs, which translate into savings for the poor. Consequently, this assists the poor to reallocate their resources efficiently to smoothen their consumption patterns (Donovan, 2012 and Dube, 2014). In addition, it reduces transportation costs[3] and improves information flows between transacting parties while allowing efficiency gains (see Bhatia et al, 2008 & Sife et al, 2010).It can also be viewed as the most reliable, accessible and convenient medium for the delivery of financial services by poor households due to its speed and liquidity as well as its ability to act as a store of value since mobile money value does not decline with time[4].

Mobile money also increases the large scale financial connectedness among distant households and individuals. This allows users/customers to benefit from remittances from either family members or friends living in remote areas within the same country or abroad. Assuming other things remain the same, this alone improves the economic well-being as this acts as source of income for the poor (Hinson, 2011; Morawczynski & Pickens, 2009; Alleman & Rappoport, 2010), According to Morawczynski (2010) using mobile money also increases money circulation, boosts local consumption for the rural people as well as spurs economic activity by enabling "just-in-time"

[3] This is relevant in cases where users or traders in rural areas would need to travel from to urban areas to send and receive money.
[4] Unlike cash, mobile money does not attract charges, which ultimately reduces its value. However, its value remains the same until it is used.

transfers that make capital available whenever and whenever it is needed. Apart from that, by acting as a channel through which households and individuals receive remittances, mobile money often enables households and individuals to absorb shocks arising from job losses and poor harvests, loss of relatives, health problems and so on(Donovan, 2012).

Mobile money serves as a form of savings account for people without a formal bank account. Thus, it enables them to engage in a safer and more efficient savings mechanism and improves efficiency and regularity of savings (Nandhi, 2012). In connection with this, by acting as remittance channel mobile money increases the income of the rural users, which leads to increase in savings. Apart from that, these mobile money accounts have the potential of adding social value to low-income people, who usually face constraints with respect to opening a formal bank account (Jack & Suri, 2011). In addition, mobile money account has the potential of integrating the mobile money users into the formal financial services grid by providing access to other accounts that cover a wide range of other financial services' needs (Alexandre & Eisenhart, 2013 and Flores-Roux & Mariscal, 2010). Furthermore, the fact that mobile money is less visible than other alternatives including cash enables mobile money users to keep their money safe from dangers of theft and accessibility by other family members (Jack & Suri, 2011). In this regard, it promotes privacy and individual autonomy within the family while also makes it possible to facilitate or enable financial transactions that either did not occur before or that were conducted at a higher risk and price (Donovan, 2012).

Moreover, when it has reached large scale and there is large customer base, provision mobile money services can also prove to be commercially viable. It generates considerable revenue for both service providers and cash agents, the success of which may lead to increased labor demand and employment generation for the poor. In recent years, access and use of more sophisticated financial services such as savings, credit, and insurance has proved to be far more beneficial to the poor. In light of this development, financial institutions, banks, governments, and other institutions have taken advantage of the payment services that are deployed by mobile money operators to actively innovate and develop these financial services and offer them to customers. For instance, in Lesotho some Alliance Insurance Company has partnered with Econet Telecom Lesotho (ETL) to offer funeral insurance covers for consumers whereas in Kenya, Equity Bank has partnered with Safaricom to offer micro savings account, credit and insurance. In addition, some governments have already adopted mobile money electronic payment services platform for cash transfers to reduce leakage, transaction costs and overheads. For instance, in Tanzania mobile money has also been

adopted by the government to collect all levies, fees and taxes paid by the public. This helps to enhance the government's ability to monitor financial flows, collect tax revenue, and reduce illicit corruption and fraud (Donovan, 2012).

While mobile money reduces the dependency on cash and contributes to the development of an electronic ecosystem of financial services, it also generates data[5] in the form of financial transaction records. These transaction records can be efficiently used to analyze creditworthiness, enhance credit monitoring as well as facilitate access to micro-loans or other financial services (see Andrianaivo & Kpodar, 2012 and Mutsune, 2015). Furthermore, the data generated by mobile money can also act as tool that can be used to report suspicious financial transactions that mobile money operators or banks can identify in an effort to combat money laundering and terrorism financing (Alexandre & Eisenhart, 2013 and De Koker & Jentzsch, 2013). This is pertinent given the rampant increase in money laundering and terrorism financing activities in recent years.

From the business perspective, the payment behavior data of the unbanked and poor customers can shed some light on how poor customers transact, their payment behavior as well as their financial service needs. Therefore, the providers of highly data-dependent areas such as credit, insurance can use the payment data of customers to build business case to serve this new and diverse segment of the market that has largely been ignored by the many financial service providers. In addition, banks can use this information to develop opportunities to cross-sell additional products such as credit, long-term savings accounts, which enhance the business case for low-value bank accounts. On the other hand, the mobile money operators can generate revenue by selectively selling the data to other parties that can utilise it to market products and services that assists in terms of broadening the services that keep customers loyal to their existing mobile money schemes (Alexandre & Eisenhart, 2013)

Mobile money has several unique attributes that make mobile based transactions attractive. However, it also presents inherent risks, including money laundering, privacy and security, consumer protection, fraud, and liquidity risks just like any retail payment system. In many mobile money implementations, proportionally risk adjusted anti-money laundering (AML) procedures have been applied to extend the service to the underserved populations. These adjusted AML requirements are

[5] According to Alexandre and Eisenhart(2013), data is a strong asset for both financial inclusion and financial integrity.

usually counterbalanced by transaction volume and value restrictions placed on the account. However, rogue actors circumvent these controls by dividing a large transfer of funds into small ones, which fit within the definition of the restrictions applied using multiple mobile phones and accounts and then transfer the funds. This is possible because unlike traditional banking, which require the face-to-face interaction, mobile technology-enabled payments create a more opaque and anonymous experience that may permit the opportunity for criminal activity. This is increasingly plausible as mobile retail payments can occur rapidly and in cross-border environments. In addition, there are numerous schemes for money laundering and terrorist financing that may migrate to the mobile channel. For instance, the runners of the so-called "digital value smurfing" scheme bypass banks and regulatory reporting requirements by exchanging ill-gotten funds for digital value through mobile devices and thereby enable the proceeds of crime or terrorist financing to be transmitted over airwaves to anywhere the runners intend to take funds(see Merritt ,2010 and Lake, 2013).

Mobile money may also compromise sufficient elements of the customers' information and privacy. This may not only allow another party to replicate the customer's identity in the system and use it to fraudulently conduct transactions but also exposes the customer to other risks such as lost payments through faulty transmissions, or criminal activity on the part of the mobile operator, agent, or other payment service providers. In connection with this, the recent surge in smart phone applications may introduce vulnerabilities to malware attacks, which may increase payments risks as bad actors gain access to personal information stored in the handset or accessed through a phone application (Lake,(2013).In addition, lack of cash or electronic float at the agent outlet may temporarily or permanently disable a client wishing to deposit or withdraw money to or from the system. On one hand, poor network coverage and insufficient service points may make it difficult for customers to undertake transactions, leading to withdrawal from the service. This can consequently compromise revenue generation by the agents. On the other hand, system technical errors and transaction delay by the network usually leave customers and agents in a difficult position to know whether or not the transaction has been delivered and therefore unsure whether or not to re-submit the transaction. Moreover, transactions within mobile payment network travel through many communication systems to reach to the mobile money backend. Any breakage in this chain as well as lack of literacy by the customer can lead to inability to transact by such a customer. The length of the chains of message handling within the mobile money operation may also delay balance

updates for any given transaction. This exposes the customer to possibility of incorrect decline in future transactions due to insufficient funds (see Lake, 2013).

According to Lake (2013) mobile money products are often delivered by consortia of mobile network operators (MNOs), banks, agent network managers as well as agents. Therefore, any significant relationship difficulty among these parties within this consortium could result in service unavailability to the client. Consequently, this could not only cause unnecessary inconvenience on the part of the customer but also lead to inability to transact. In addition, lack of clarity as to who holds customer's money may make it difficult for the customer to enforce rights whenever necessary. Therefore, the mobile payments landscape demands a collaborative effort among different stakeholders to balance intervention for risk mitigation with market innovation. These include mobile networks operators, banks, airtime sales agents, retailers as well as regulators.

2.3 Adoption of Mobile Money and Developments in Financial Inclusion: African Country Experiences

Mobile money services have become popular in developing countries predominantly due to large unbanked populations and low levels of financial inclusion. Among the countries that implemented this service, Kenya is a global leader in mobile payments implementation and adoption with its M-Pesa (mobile money in Swahili) service. Initially launched in 2007 by Safaricom, a subsidiary of Vodafone, for person-to-person transfers, M-pesa has become probably the most renowned and successful mobile money service to date. In May 2008, 14 months after its launch, M-Pesa had 2.7 million users and almost 3,000 agents (GSMA, 2012). Within five years of its launch, it had 15 million customers[6] and more than 18,000 agents and was processing $10 billion per year (Lal & Sachdev, 2015). It has become so successful to the extent that almost all households use it (IOS Press, 2012).

At its launch as money transfers service, M-pesa adopted the slogan "send money home". This positioned it to serve as an "urban-rural" remittance corridor to take advantage of significant domestic remittance market in Kenya. It allowed many urban migrants to remit to their relatives in rural areas (Gugler, 2002 & Donovan, 2012). In addition, it has since grown to provide many other financial services including bill payments, loan transactions, international remittances and public

[6] This represents 37.5% of the country's population.

transport payments. The overwhelming dominance of Safaricom in the Kenyan market and high mobile telephony penetration rate as well as increased demand for additional services paved the way for M-Pesa's great success. In addition, an enabling regulatory environment and the relatively high availability of decision-making data continued to support its development (IOS Press, 2012). Of course, M-pesa still faces challenges. These include lack of universal mobile phone access (Jack & Suri, 2011a) and difficulties with liquidity management by agents and raising start-up capital (Eijkman, Kendall & Mas, 2009).Therefore, in order to develop further, Kenya needs to further enhance its institutional and market environments and develop consumer protection provisions. (Bilodeau et al, 2011).

Following the successful launch of M-pesa in Kenya, many mobile network operators (MNOs) became eager to launch such products in their jurisdictions. Therefore, one year after the Kenyan launch, Vodacom[7] launched M-pesa in April 2008 in Tanzania. Nonetheless, the user uptake of this service in Tanzania has been much slower compared to Kenya. In June 2009, 14 months after the launch, M-pesa had 280,000 users and 1,000 agents in Tanzania (Rasmussen, 2009). The slow M-pesa uptake in Tanzania was due to the fact that Vodacom may not have carefully judged the unique country context prior to implementing it in Tanzania. Therefore, it could not contextualize advertising to suit the level of financial literacy in the country for customers to understand the product. In addition, there were weaknesses in terms of contextualizing the nature of remittance market, which is urban-rural, rural-urban, urban-urban and rural-rural.

Still following the Safaricom's M-pesa in Kenya, Mobile Telephone Network (MTN) Uganda, launched MTN money in March 2009. In June of the same year, Airtel launched Airtel money. In an effort to increase their market share, other MNOs also launched their mobile money services. For instance, Uganda's Telecom launched M-sente in March 2010, Warid Telecom launched Warid Pesa in December 2011 and Orange Telecom launched Orange money in the first half of 2012. Since its launch, the subscriber base has increased steadily with over 9 million people using mobile money in 2012. Similarly, the number of mobile money transactions also reached 242 million during the same year while the total value exchange recorded US$4.5 billion during the same time period. Of this large subscriber base country wide, MTN money has the largest market share with over 15,000 agents and it remains one of the most successful mobile financial services deployments in East

[7] A subsidiary of South African Vodacom Pty (Ltd)

Africa. The successful expansion of this service is partly attributed to both high mobile phone network roll-out and mobile phone adoption rates (Munyegera and Matsumoto,2014; Orotin et al,2013).

With 15 million adults and mobile penetration rate of 74% of the population, Ghana had five mobile money services in 2010, the sixth of which was not operating in spite of acquiring a licence. These include AfricXpress(txtNpay) launched in 2008,MTN mobile money launched in July 2009 with nine partner banks, Airtel money launched in April 2010 with six partner banks and Tigo Cash established in October 2010 with three partner banks. Among these mobile money services, MTN money is the most successful mobile money deployment in Ghana. In 2011, it had 1.8 million registered customers, 4,000 trained agents in Accra and 2,000 in other parts of the country. Four years after the launch, the service had registered 4.8 million customers, 19, 500 merchants and 18.5 million transactions. Its success is underpinned by heavy investment in above-the line marketing and a primary marketing message focused on domestic remittance. This is due to the fact that Ghana has a large number of households that depend on domestic remittances because of increase in urbanization in city centres and constant migration (see CGAP, 2011 and Tobbin, 2010).

As the largest and most populous economy in Africa with a largest proportion of the population remaining unbanked, Nigeria is a promising market for mobile financial services. In March 2014, Nigeria had licensed 18 MNOs. These include Guaranty Trust Bank (GTBank), United Bank of Africa (UBA/Afripay), Stanbic IBTC, Ecobank, Fortis MFB, Pagatech, Paycom, eTranzact, Eartholeum, M-Kudi and Virtual Terminal Network (Phillips Consulting, 2013). Since commencement of operations in 2012, mobile money had 9,989,297 subscribers, 67,494 enrolled agents and conducted over 11 million transactions worth over N105 billion. However, mobile payments market in Nigeria is still in its infancy. This is in part due to rapid deployment and rollout of the system, which has been inhibited by a number of challenges. These include inadequate capital outlay on the part of the MNOs, basic infrastructural challenges – power, telecommunications network etc, lack of awareness/customer education which has slowed down the adoption rate and lack of wide-spread agent network (see Ingba, 2014; Yakub et al, 2013 and Grameen Foundation, 2014)

In Zimbabwe, Ecocash was launched by Econet Services on the 30th September 2011. Initially, Ecocash invested heavily on upfront capital to build mass of agents and active subscribers. In this case, Ecocash provided incentives such as high commissions (80% of transaction revenues) and performance based rewards to their agents. In addition, they ensured adequate float liquidity for transactions and cash-on –hand to encourage investment in their business. They invested a lot of money on consumer marketing utilizing above-the-line to raise awareness and below-the-line to educate consumers on the service and drives registration. This service initially focused on the underserved segments of the population in semi-urban and rural areas and offered person-to-person transfers but over time the service expanded to other multiple products. The service achieved great success to the extent that it reached an agent network of 4,000 agents, 2.3 million customer registrations (which is equivalent to 31% of the country's adult population) just within 18 months after launch, with 1 million of them active as well as an annualized transaction volume valued at 22% of the country's GDP (Lal & and Sachdev, 2015).

In South Africa, Vodacom tried to replicate the model deployed in Kenya. However, service was launched as a mobile alternative to existing financial and payments infrastructure and was rolled out largely to better-off parts of the country, where there is robust banking environment. The launch plan was not prepared based on the identified target market or an analysis of financial flows/ potential use cases of such market. Therefore, the service effectively did not serve the large remittance corridors of the lower income and rural populations. In addition, the service experienced challenges relating to customer registration and sustaining usage for registered customers. This was due to poor marketing to consumers, which resulted in poor understanding and lack of trust in the service Furthermore, the registration process was lengthy and slow, and this resulted in weak adoption. The service used retail stores as agents, but it was only available at a limited number of locations after launch. Inadequate float management led to suspension of cash-out transactions by many outlets until a certain amount of sales had been registered. At the end, many retailers decided to discontinue acting as M-pesa agents as the service was disrupting their retail business. As a result of these problems the service only had 1.2 million registered users two years after launch, with 7% annual growth, and of which only 1% appeared active. With this mediocre performance, Vodacom opted to discontinue the service at the end of 2013. However, it has since been re-launched with a new banking partner and new model, with a focus on serving the unbanked and low income

segments of the population (Lal and Sachdev, 2015). Consequently, the service was discontinued in 2016.

3. FINANCIAL EXCLUSION, MOBILE TELEPHONY AND MOBILE MONEY DEVELOPMENTS IN LESOTHO

3.1 Financial Exclusion

Lesotho has four licensed banks; namely Standard Lesotho Bank (SLB), Nedbank Lesotho, First National Bank Lesotho (FNBL) and Lesotho Postbank (LPB), which form the core of the financial system. Among these banks, SLB is the largest in terms of assets. In addition, there are 6 credit-only Micro Finance Institutions (MFIs) namely Letshego Financial Services, Alibaba Financial Services, Net Loans, Edu Loans, Lesana Lesotho Limited, Blessings Financial Services and Thusong Financial Services with Letshego Financial Services only the largest. There also 70 formal money lenders and approximately 250 savings and credit cooperatives (SACCOs) as well as one large financial cooperative i.e. Boliba Savings and Credit Cooperative. Furthermore, there are 30 licensed insurance brokers and 10 licensed insurance companies that generally specialize in both general insurance and life insurance. However, the analysis focuses on the banking sector as it forms the largest part of the financial sector in Lesotho and it has been the primary distributor of financial services products in the country.

Access to banking is relatively low in Lesotho[8] due to limited banking infrastructure- bank branches and devices infrastructure (ATMs and POSs). Table 1 shows that in 3 years, from 2013 to 2015, banking infrastructure has expanded by only 2 branches, 39 ATMs and 365 point of sales (POSs). Therefore, the country has not seen much change in terms of financial inclusion. This situation is exacerbated by the fact that large proportion of this banking infrastructure is also mainly situated in urban areas though two-thirds of the country's population resides in rural areas. This mismatch implies that 55% of the population travels more than an hour to get to a bank branch while only 24% of Basotho live within 30 minutes travel time from a bank branch. According to Jefferis and Manje (2014), only 29.5% of the rural population in Lesotho is banked compared to 57.9% in urban areas. The provision of financial services in Lesotho is made even more difficult by the mountainous terrain of the country, which makes the banking infrastructure difficult and expensive to distribute to most of Basotho. Despite the low banking access in Lesotho,

[8] This is the lowest in the Southern African Customs Union (SACU).

it is unlikely that banks will significantly increase the number of bank branches and device infrastructure (ATMs and POSs) on account of low population densities, financial viability, small financial markets and mountainous terrain of the country (Ketly and Kasi, 2015).

Table 1: Banking Infrastructure

	Branches			ATMs			POS		
	2013	2014	2015	2013	2014	2015	2013	2014	2015
SLB	17	17	17	73	82	86	307	448	529
FNBL	6	6	8	42	45	59	393	474	423
Nedbank	9	9	9	24	28	27	68	85	149
LPB	13	13	13	2	7	8	35	38	37
Total	45	45	47	141	158	180	803	1045	1168

Source: Central Bank of Lesotho

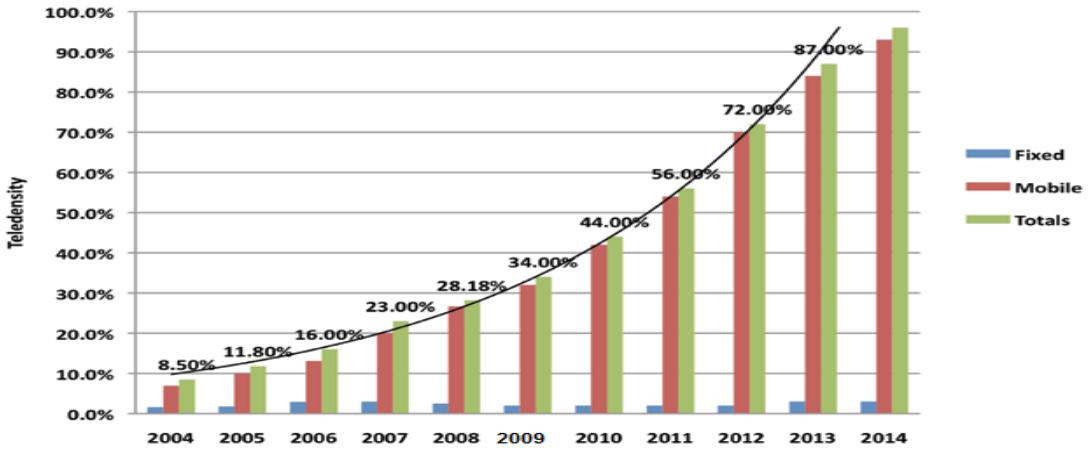
According to the FinScope surveys conducted among 15 African countries, the level of financial inclusion in Lesotho stands as high as 80.9% of the adult population, using the traditional measure of financial inclusion. However, only 45.8% of the adult population uses bank and non-bank formal services, of which 38% has bank account with a financial institution. The use of informal services is relatively high, with 62.4% of the adult population using these services particularly funeral insurance, which is a limited product compared to the wide range of financial services needs of the people in the economy (Lesotho FinScope, 2011 and Jefferis and Manje, 2014). Within the Southern African Customs Union (SACU) and Southern African Development Community (SADC) regions, Lesotho has a high level of financial inclusion in the region; it is exceeded by only South Africa and Namibia (see Ketly and Kasi, 2015).

3.2 Mobile Telephone Industry

The launch of the first commercial mobile telephone services three decades ago saw a phenomenal growth in mobile communications around the world. According GSMA (2012b) the total mobile penetration has more than doubled in all regions of world since 2005. This can be attributed to a number of factors including a fall in handset and usage costs and an improvement in service quality and network. On the other hand the use of fixed lines has decreased as they remain undeveloped and unavailable to the majority of the population in developing countries. Low-income countries are experiencing faster growth rates– more than twice as fast as in high income countries in the 21st century (GSMA, 2012b).As of mid-2015; Sub-Saharan Africa (SSA) region had 367

million unique subscribers and 680 million connections (GSMA, 2015). This significant mobile phone penetration has increased the availability of basic mobile services such voice, texts and basic text-related services to millions of people across all income groups in SSA.

Figure 1: Sector Teledensity Trends 2004-2014



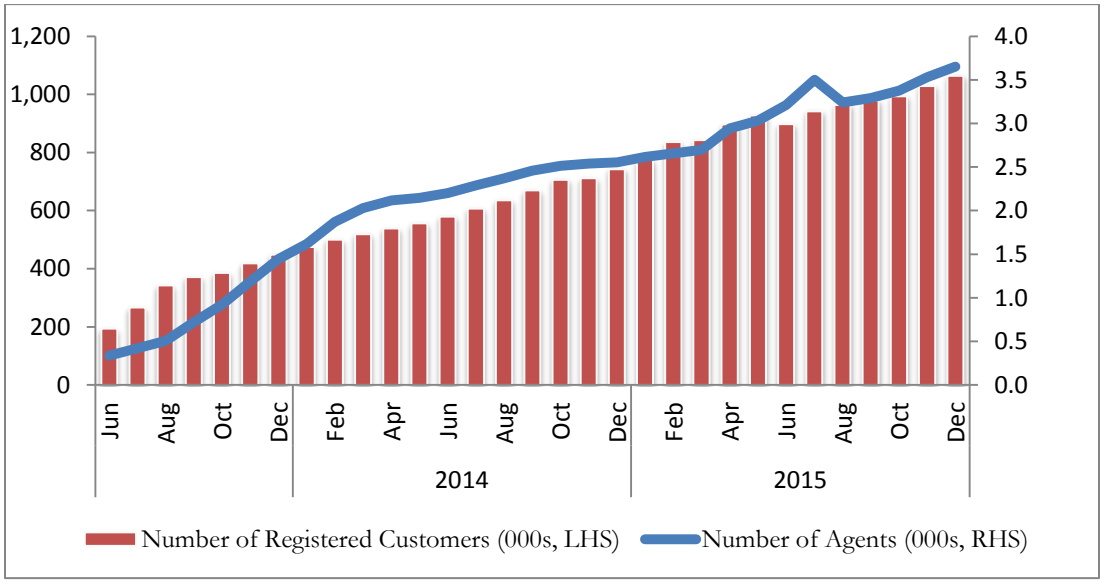
Source: Lesotho Communications Authority Annual Report 2013-2014

In the context of Lesotho the mobile phone industry is dominated by two mobile network operators (MNOs), namely Econet Telecom Lesotho (ETL) and Vodacom Lesotho (VCL).The former came into being following the merger between Telecom Lesotho and Econet Ezi ~ Cel Lesotho in April 2008 while the latter is a subsidiary of South Africa-based Vodacom and began operating in Lesotho in 1996. There is effective competition in the mobile sector between these two MNOs and they provide network services to their subscribers. Figure 1 shows the mobile sector teledensity trends over a period of ten years from 2004 to 2014. In 2014, the mobile subscribers reached a total of 1,753,323 from 1,580,713 reported in the previous year. This translates into a teledensity of approximately 93% of the population (98% of which are the prepaid subscribers while only 2% are post-paid subscribers).However, the fixed line subscriber base remained constant at 3% during the same year. The mobile subscribers accounted for 97% of telecommunication market share compared to fixed subscribers at 3%.Overall, based on the 2006 population census figure of 1,880,661 for Lesotho, the teledensity for both fixed and mobile subscribers increased from 87% to 96%. In addition, the geographic coverage area with access to communications service (most of which is driven by mobile services) has also increased. This is reflected in the coverage maps of the two major network operators, depicted in appendices, 1 and 2 (LCA Annual Report, 2013/2014).

3.3 Mobile Money

The success of mobile money in East Africa especially M-pesa in Kenya saw many countries around the globe adopting the same model to launch similar products in their jurisdictions. This is because M-pesa has allowed millions of people who were otherwise excluded from the formal financial system to perform financial transactions relatively cheaply, securely, and reliably. In the same manner, ETL and VCL in Lesotho launched mobile money services in an effort to narrow financial exclusion and drive economic development in Lesotho. ETL launched its mobile money service, Eco-cash, in October 2012 while VCL launched M-pesa in July 2013. Since its launch until December 2015, M-pesa signed up to 745,242 customers with 1999 agents. On the other hand, Eco-cash has accumulated 318,786 customers and 1480 agents countrywide during the same period

Figure 2: Number of Registered Mobile Money Customers and Agents

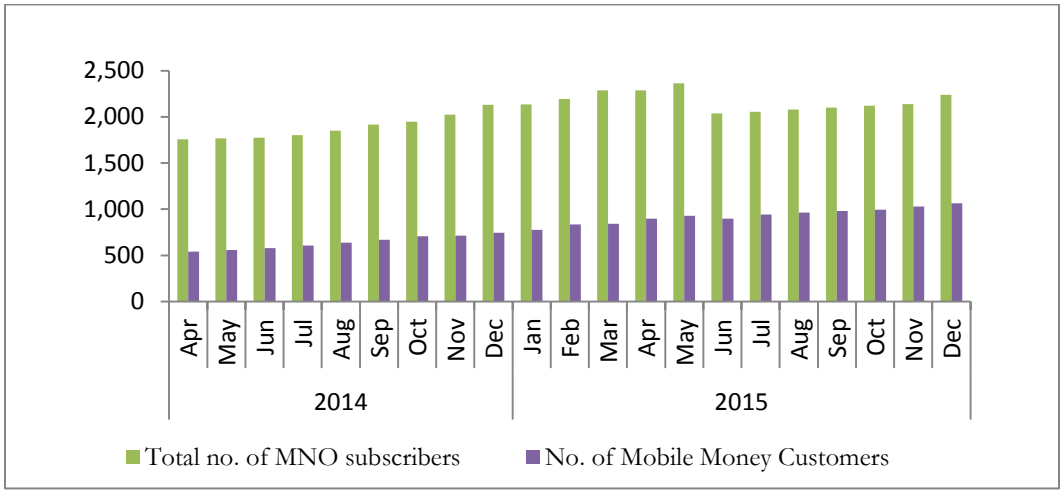


Source: Central Bank of Lesotho, 2015

The number of registered mobile money customers in Lesotho kept increasing since mobile money inception as indicated by Figure 2. Based on 2006 population census figure of 1,880,661 inhabitants, the number of registered mobile money customers increased from 10% in June 2013 to approximately 57% of the population in December 2015.On the other hand, the number of agents increased exponentially from 337 in June 2013 to 3654 in December 2015. Figure 2 indicates the number of registered mobile money customers and agents in Lesotho since June 2013. Based on 2006 population census figure of 1,880,661 inhabitants, the number of registered mobile money customers increased from 10% in June 2013 to approximately 57% of the population in December

2015. As a proportion of MNO subscribers, the two MNOs achieved approximately 48% market penetration in December 2015. This is reflected in Figure 3 below.

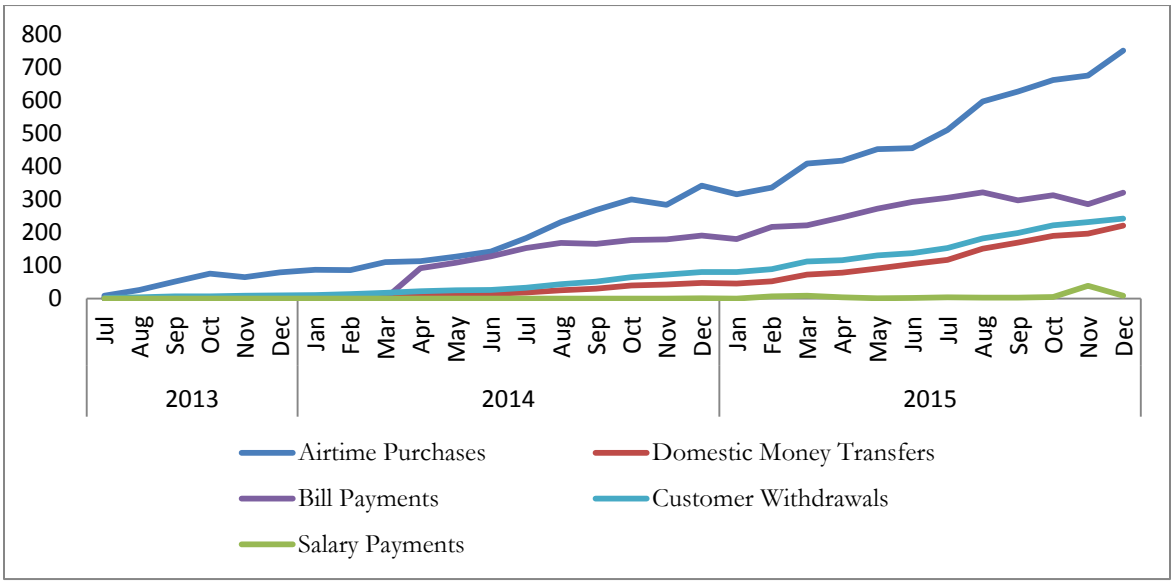
Figure 3: Number of Subscribers and Mobile Money Users during April 2014-2015(in thousands)



Source: Central Bank of Lesotho, 2015

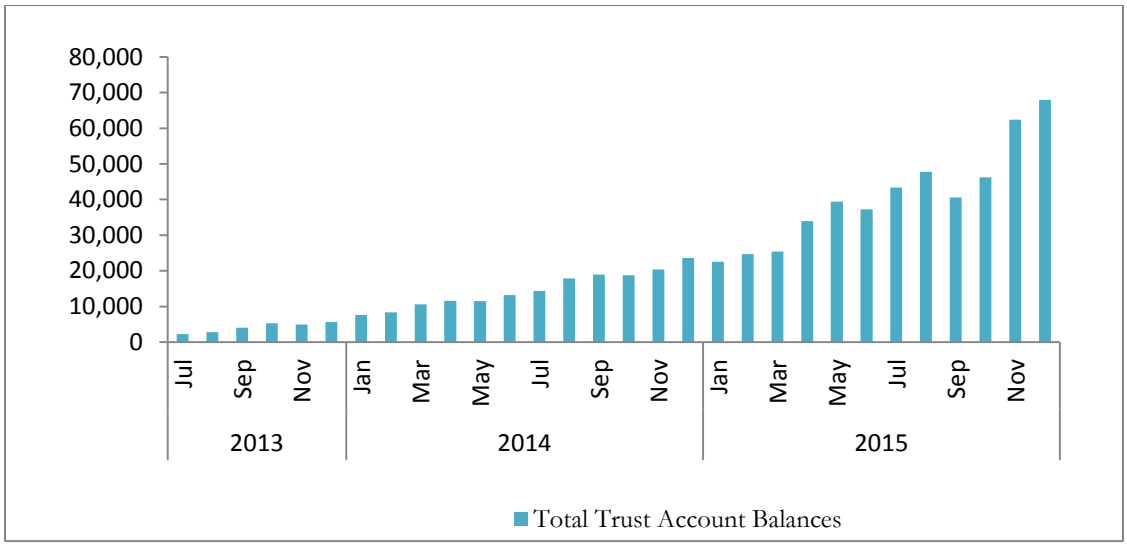
Consistent with the increasing market penetration, mobile money transaction volumes, especially customer's withdrawals, bill payments, domestic money transfers and airtime purchases, keep an upward trend since the inception this service. Figure 4 shows that as of December 2015, mobile money has processed a total of 751,743 airtime purchases, 243,169 customer cash withdrawals, 321,768 bill payments and 221,257 domestic money transfers. However, its use case in the processing of salaries has remained significantly limited despite its potential to reduce the hurdles of salaries processing of contract and casual workers by different organizations in the country including the Government of Lesotho (GoL). The high uptake and usage of mobile money is also consistent with the growth of trust account balances of the two MNOs (see Figure 5). The growth in adoption and usage of mobile money in Lesotho is attributed to the gradual appreciation of the product especially by the urban based users and heightened efforts by MNOs in advertising and educating customers about this product offering.

Figure 4: Volume of Mobile Money Transactions (in thousands)



Source: Central Bank of Lesotho, 2015

Figure 5: Trust Account Balances (in thousand Maloti)



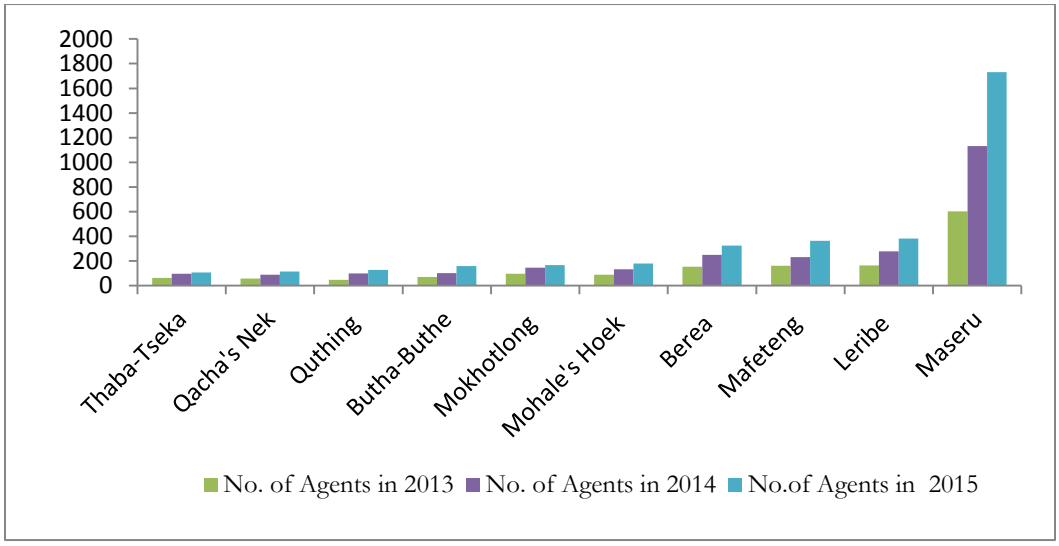
Source: Central Bank of Lesotho, 2015

However, as indicated in Figure 6 below, mobile money is used mainly in urban districts as opposed to rural districts[9], where there is high financial inclusion gap due to limited banking infrastructure. This is attributed to failure by MNOs to reach remote areas as a result of lack of

[9] This is because the physical presence of agents in the vicinity not only actually drives knowledge about the product but could also increase its usage by customers. Product appreciation by customers increases its usage.

customer education and poor agent network in rural areas and inaccessibility of some rural areas due to mountainous terrain. Therefore, there is need for more efforts on the part of MNOs scale up customer education on mobile money and increase agent recruitment in rural areas**.** In addition, MNOs should promote the use of mobile money in its electronic form in conducting transactions. This will solve agent liquidity problem as customers would not need to convert mobile money into cash prior to undertaking transactions.

Figure 6: Agent Network per District (Number of Agents per district)



Source: Central Bank of Lesotho, 2015

As indicated before, approximately 48% of adult populations who own mobile phones use mobile money services. However, a large number of mobile phone users still do not use mobile money services. Therefore, there is potential for other mobile phone users who have not yet signed up for mobile money services to do so as time progresses. This is possible because the banking infrastructure is limited and primarily situated in urban areas, although the majority of Lesotho's population resides in rural areas. In addition, it is unlikely that banks will significantly expand their bank branches and devices (ATMs and POS) because establishing such infrastructure in rural areas would not be financially viable. Therefore, the difficulty of accessing financial infrastructure by the majority of rural population creates an opportunity for mobile money to provide a solution. This is because it provides lower cost and convenient alternative to traditional banking products, which the poor in rural areas can afford.

4. METHODOLOGY

4.1 Data Type and Sources

Financial inclusion and mobile money cannot be directly measured; therefore, they need to be measured by means of proxies. Table 2 below gives the description and measurement of variables. These data are available at the Central Bank of Lesotho (CBL) and covers the period 2013m7 through 2015m12. This sample period was chosen as comprehensive data on mobile money started to be collected in 2013.

Table 2: Description of Variables

Variable	Measurement	Description	Source
FI_t	Total deposits per 1000 adults	Aggregate deposits held by commercial banks divided by 1000 adult population.	CBL
	Total credit per 1000 adults	Total credit extended by commercial banks divided by 1000 adult population.	CBL
	Number of automatic teller machines(ATMs) per 1000 adults	Number of ATMs divided by 1000 adults	CBL
	Number of Point of sales(POSs) per 1000 adults	Number of POSs divided by 1000 adults	CBL
MM_t	Mobile money transaction (values) divided by 1000 adults	These include values of the following transactions; airtime purchases, domestic money transfers, customer withdrawals, and customers deposits and float[10] (each divided by 1000 adults)	CBL
	Trust account balance per 1000 adults	This is the current cumulative balance in the mobile money trust accounts held by commercial banks in the name of mobile money agents and customers divided by 1000 adults	CBL
	The number of registered mobile money customers	The total number of customers(users) who have registered for both M-pesa and Eco-cash	CBL
$M2_t$	Broad money	Broad money (M2) in Lesotho consists of M1 and quasi money.	CBL

4.2 Model Specification

This study adopts the approach followed Andrianaivo and Kpodar (2011, 2012) and Lundqvist and Erlandsson (2014) who examine the relationship between financial inclusion and mobile money by using the following bivariate econometric model:

$$FI_t = \propto_0 + \propto_1 MM_t + \varepsilon_t \quad (1)$$

[10] The sum of customer withdrawals and deposits.

where FI_t denotes natural logarithms of financial inclusion, MM_t represents natural logarithms of indicators of mobile money and ε_t denotes the random error term.

4.3 Estimation Strategy: Autoregressive Distributed Lag (ARDL) Bounds Testing Procedure and Granger Causality

4.3.1 Primary Model(Bivariate Model)

In examining the relationship between financial inclusion and mobile money, the study estimates equations (1). This is done in three steps. First, the paper determines the order of integration of the variables using the Augmented Dickey Fuller and Phillips and Perron (1988) tests. The latter test is also used in addition to the former as it caters for serial correlation, endogeneity of regressors and allows for the possibility of heteroskedastic disturbance terms (Hamilton, 1994). While acknowledging the fact that the autoregressive distributed lag (ARDL) bounds testing allows for the presence of *I*(0), *I*(1) or mixed integrated variables in the estimation, pre-testing of the order of integration of the variables to ensure the absence of *I*(2), whose presence would nullify the procedure.

Second, after establishing the integration properties of variables, the study employs ARDL bounds testing approach to cointegration developed by Pesaran and Shin (1999) and advanced by Pesaran et al (2001) to study the existence long-run relationship between mobile money and financial inclusion. This procedure is preferred to other cointegration techniques due to the several advantages. For example, ARDL bounds testing is applicable irrespective of whether the underlying regressors are *I*(0), *I*(1) or mutually cointegrated. In addition, this procedure still remains robust for cointegration analysis in empirical macroeconomic studies where small samples size is a common phenomenon. Furthermore, it also has finite-sample critical values as opposed to other cointegration approaches for which the distribution of the test statistics may be unknown in finite-samples. In particular, Narayan (2005) develops a set of sample-specific critical value bounds for the sample sizes ranging from 30 to 80 using the same approach and GAUSS code used by Pesaran et al (2001) in generating the asymptotic values. Furthermore, this technique generally provides unbiased estimates of the long-run model and valid -statistics even in the presence of endogenous regressors.

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The paper transforms the financial inclusion model (equation 1) into an ARDL framework as follows:

$$\Delta FI_t = \beta_0 + \sum_{t=1}^{p} \beta_{1t} \Delta FI_{t-i} + \sum_{t=0}^{p} \beta_{2t} \Delta MM_{t-i} + \beta_3 FI_{t-1} + \beta_4 MM_{t-1} + \mu_t \quad (2)$$

where all variables are as previously defined, Δ is the first difference operator, p is the lag length,β 's are parameters to be estimated, and μ_t is a white-noise error term. Similarly, the other variable in equation (2) as a dependent variable, the other equation can also be estimated.

According to the ARDL bounds testing procedure, cointegration test between the variables is conducted using the Wald test (*F*-statistic). The test imposes restrictions on the estimated long-run coefficients of one period lagged level of the variables to be equal to zero. The two sets of critical *F*-values (lower and upper bound values) for a given level of significance are reported by Pesaran et al (2001) for large sample sizes and Narayan (2005) for small sample data. The lower bound values assume that all variables in the ARDL model are integrated of order zero, or *I*(0), while the upper bound values assume that the variables are integrated of order one, or *I*(1). Therefore, if the computed *F*-statistic is below the lower bound value, *I*(0), the null hypothesis of no cointegration cannot be rejected. Conversely, if the computed *F*-statistic exceeds the upper bound value, *I*(1), the null hypothesis is rejected and it is concluded that the variables are cointegrated. Nevertheless, the result becomes inconclusive if the *F*-statistic falls between the two bounds.Once cointegration has been established between the variables using ARDL bounds testing procedure, then the next step is to estimate the long-run and short-run error correction models from the established cointegration regression. The long-run model and the associated error correction model are given by:

$$FI_t = \delta_0 + \sum_{t=1}^{m} \delta_{1t} FI_{t-i} + \sum_{t=0}^{m} \delta_{2t} MM_{t-i} + \mu_t \quad (3)$$

$$\Delta FI_t = \theta_0 + \sum_{t=1}^{p} \theta_{1t} \Delta FI_{t-i} + \sum_{t=0}^{p} \theta_{2t} \Delta MM_{t-i} + \theta_3 ECT_{t-1} + \mu_t \quad (4)$$

Where all variables are as previously defined, δ's and θ's are the parameters to be estimated, p and m are the lag lengths and θ_3 is the coefficient of the error correction term, which measures the speed of adjustment to the long-run equilibrium following a shock to the system.

According to Granger (1969 and 1988) cointegration among the variables may imply the existence of causality between the variables at least in one direction. However, it does not indicate

the direction of causality between the variables. Therefore, once cointegration has been established between mobile money and financial inclusion using ARDL bounds testing procedure, then the third step is to employ a dynamic Granger causality test to determine the short-run and long-run causal effects between mobile money and financial inclusion. For this purpose, the error correction model (equation 4) is used to examine Granger causality from mobile money to financial inclusion. In this test, the short-run causality is implied by the significance of the t −statistic (or Wald statistic) on the first differences of lagged independent variables. On the other hand, the long-run causality is captured by the significance of the t-statistic on the coefficient of the lagged error correction term. Nevertheless, if there is no cointegration between the variables only short-run causality can be determined.

4.3.2 Robustness Checks(Trivariate Model)

In addition to estimating the bivariate relationship between financial inclusion and mobile money, the study also estimates this relationship in the context of a trivariate model where broad money (M2) is used as a control variable. This is done to avoid omission of variable bias inherent in a bivariate model, which may lead to unreliable results (Lütkepohl, 1982). The use of broad money (M2) is motivated by its high correlation with gross domestic product (GDP)[11] because data for the latter is only available annually in Lesotho. For this purpose, cointegration between financial inclusion, mobile money and M2 is established using the following ARDL model:

$$\Delta FI_t = \varphi_0 + \sum_{t=1}^{p} \varphi_{1t} \Delta FI_{t-i} + \sum_{t=0}^{p} \varphi_{2t} \Delta MM_{t-i} + \sum_{t=0}^{p} \varphi_{3t} \Delta M2_{t-i} + \varphi_4 FI_{t-1} + \varphi_5 MM_{t-1} + \varphi_6 M2_{t-1} + \mu_t \quad (5)$$

Where $M2_t$ denotes natural logarithms of broad money (M2), Δ is the first difference operator, p is the lag length, φ's are parameters to be estimated, and μ_t is a white-noise error term. This test is conducted using the steps discussed earlier. Once this is done, the following trivariate long-run and short-run models are estimated.

$$FI_t = \gamma_0 + \sum_{t=1}^{m} \gamma_{1t} FI_{t-i} + \sum_{t=0}^{m} \gamma_{2t} MM_{t-i} + \sum_{t=0}^{m} \gamma_3 M2_{t-i} + \mu_t \quad (6)$$

[11] The correlation between M2 and GDP is approximately 99%.

$$\Delta FI_t = \vartheta_0 + \sum_{t=1}^{p} \vartheta_{1t} \Delta FI_{t-i} + \sum_{t=0}^{p} \vartheta_{2t} \Delta MM_{t-i} + \sum_{t=0}^{p} \vartheta_{3t} \Delta M2_{t-i} + \vartheta_4 ECT_{t-1} + \mu_t \quad (7)$$

Where all variables are as previously defined, γ's and ϑ's are parameters to be estimated, and $\vartheta_4$is the speed of adjustment to the long-run equilibrium following a shock to the system. The estimated trivariate error correction model (equation 7) is also used to examine the short-run and long-run Granger causality from mobile money to financial inclusion.

5. ANALYSIS OF EMPIRICAL RESULTS

5.1 Unit Root Test Results

As a standard practice in time series analysis, the unit root properties of the each series are studied. The test results are presented in Table 3. The results show that all the variables used in the study are integrated of order one, that is $I(1)$ except the log of the number of mobile money customers, log of domestic money transfers per 1000 adults and log of airtime purchases per 1000 adults, which are $I(0)$. Therefore, the case of a mixed order of integration of the variables, $I(1)$ and $I(0)$, has been established.

Table 3: ADF and PP Unit Root Test Results

Variable	Variable in levels		Variable at first differences		Conclusion on order of integration
	ADF statistic	PP statistic	ADF statistic	PP statistic	
ltc	-1.1503	-1.1247	-6.6015*	-6.8463*	I(1)
	(0.6817)	(0.6922)	(0.0000)	(0.0000)	
ltd	-1.7384	-1.4626	-6.7076*	-12.0432*	I(1)
	(0.4022)	(0.5379)	(0.0000)	(0.0000)	
$latm$	-0.0362	0.1257	-8.0843*	-7.8044*	I(1)
	(0.9474)	(0.9623)	(0.0000)	(0.0000)	
$lpos$	-1.0243	-0.7022	-4.9448*	-9.3211*	I(1)
	(0.7309)	(0.8309)	(0.0005)	(0.0000)	
$ltab$	-2.2781	-3.2690**			I(0)
	(0.1853)	(0.0260)			
lmc	-4.4050*	-4.3937*			I(0)
	(0.0017)	(0.0017)			
$ldmt$	-1.3231	-2.1980	-5.6164*	-5.7529*	I(1)
	(0.6045)	(0.2112)	(0.0001)	(0.0001)	
lap	-3.7548*	-4.1114*			I(0)
	(0.0083)	(0.0035)			
lcd	-1.9792	-1.9792	-7.6065*	-8.9371*	I(1)
	(0.2936)	(0.2936)	(0.0000)	(0.0000)	
lcw	-2.4652	-2.4652	-6.0511*	-6.5952*	I(1)

	(0.1340)	(0.1340)	(0.0000)	(0.0000)	
$lflt$	-1.6307	-1.6307	-6.3914*	-7.0360*	I(1)
	(0.4537)	(0.4537)	(0.0000)	(0.0000)	
$lm2$	-2.0451	-7.4735	-1.9559	-11.3808	I(1)
	(0.2689)	(0.0000)	(0.3035)	(0.0000)	

Note: Values in parentheses are probability values. * and ** denote the level of statistical significance at 1 and 5% , respectively. The variables ltc = log of total credit per 1000 adults, ltd = log of total deposit per 1000 adults, $latm$ =log of the number of ATMs per 1000 adults, $lpos$ = log of the number of POSs per 1000 adults, $ltab$ = log of trust account balances per 1000 adults , lmc =log of mobile money customers, $ldmt$ = log of domestic money transfers per 1000 adults, lap = log of airtime purchases per 1000 adults, lcd = log of customer deposits per 1000 adults, lcw = log of customers withdrawals per 1000 adults, $lflt$ = log of amount of float per 1000 adults. In addition, $lm2$ denotes the log of M2.

5.2 The Relationship between Financial Inclusion and Mobile Money

5.2.1 The Long-run Relationship – Cointegration Results

Appendix 3 presents the results of ARDL bounds testing between financial inclusion and mobile money tested in the context of a bivariate model. The results indicate that the calculated F-statistic is greater than the upper bound critical value at either 1% or 5% levels of significance when financial inclusion is a dependent variable in each model. Hence, the null hypothesis of no cointegration is rejected in all models. Similarly, the existence of long-run relationship is also obtained even in the case of trivariate models; four models where log of total credit is a dependent variable and two models where the log of the number of POSs is a dependent variable (see appendix 5)[12]. Therefore, there is a strong evidence of long-run steady state relationship between financial inclusion and mobile money both in a bivariate and trivariate setting in Lesotho.

The results of the long-run estimates of the bivariate models are presented in Tables 4 and 5 (also see Appendix 4) and those from a trivariate model are presented in Appendix 6. The results show that the long-run coefficients are not only positive but also statistically significant at 1% level of significance in all models, and therefore consistent with a priori expectations. Thus, this finding suggests that all explanatory variables representing mobile money determine financial inclusion in the long-run in Lesotho in the bivariate model. For instance, an increase in trust account balances avails more funds to the banking industry, which can be used for credit extension. In addition, the higher the proportion of mobile money users in the country, the higher the number people with access to some form of financial services. The long-run estimates of a trivariate model support the established long-run relationship with positive and statistically significant coefficients.

[12] However, the rest of the trivariate models where the logarithms of total credit and number of POSs are dependent variables, which were reported in the bivariate case, did not produce robust results and therefore are not reported in the paper. In the same manner, the trivariate models where logarithms of total deposit and number of ATMs are dependent variables are not reported by the paper because did not produce robust results.

Table 4: Total Credit Models (bivariate case)

Relation Horizon	Explanatory Variable	Dependent Variable, Log of total Credit(ltc)						
Short-run	$ECM(-1)$	-0.3387* (0.0010)	-0.2881** (0.0105)	-0.2933** (0.0165)	-0.2993* (0.0018)	-0.2819* (0.0004)	-0.5872* (0.0021)	-0.3659* (0.0011)
	$d(ltab)$	0.0243*** (0.0913)						
	$d(lmc)$		0.1151* (0.0026)					
	$d(ldmt)$			0.0257*** (0.0797)				
	$d(lap)$				0.0172** (0.0200)			
	$d(ltc(-1))$				0.0404 (0.7738)		0.2564** (0.0208)	
	$d(ltc(-2))$						0.2676** (0.0240)	
	$d(lcd)$					0.0131** (0.0215)		
	$d(lcw)$						0.0463* (0.0029)	
	$d(lflt)$							0.0129* (0.0042)
	$D2014M2$	-0.0309* (0.0000)	-0.0293* (0.0000)	-0.0267* (0.0000)	-0.0312* (0.0000)	-0.0299* (0.0000)	-0.0274* (0.0000)	-0.0283* (0.0000)
	$D2014M5$	-0.0232* (0.0000)	-0.0212* (0.0000)	-0.0208* (0.0000)	-0.0249* (0.0000)	-0.0239* (0.0000)	-0.0290* (0.0000)	-0.0229* (0.0000)
	c			1.1881** (0.0163)				
Long-run	$ltab$	0.0764* (0.0000)						
	lmc		0.1976* (0.0000)					
	$ldmt$			0.0545* (0.0000)				
	lap				0.0788* (0.0000)			
	lcd					0.0594* (0.0000)		
	lcw						0.0654* (0.0000)	
	$lflt$							0.0316* (0.0000)
	$D2014M2$	-0.0743* (0.0000)	-0.0653* (0.0034)	-0.0522* (0.0010)	-0.0862* (0.0001)	-0.0751* (0.0021)	-0.0329* (0.0043)	-0.0579* (0.0005)
	$D2014M5$	-0.0564* (0.0000)	-0.0489* (0.0062)	-0.0423* (0.0001)	-0.0728* (0.0000)	-0.0611* (0.0002)	-0.0383* (0.0003)	-0.0488* (0.0000)

	c	6.3061*	5.4774*		6.3609*	6.3739*	6.3485*	6.3591*
		(0.0000)	(0.0000)		(0.0000)	(0.0000)	(0.0000)	(0.0000)
Diagnostics	JB	0.3807	0.4087	1.2081	0.3588	0.5760	0.6145	0.8277
		(0.8267)	(0.8152)	(0.5465)	(0.8358)	(0.7498)	(0.7355)	(0.6611)
	BG-LM test	1.7161	7.7595	10.5822	0.8073	1.2754	2.4491	3.2395
		(0.4240)	(0.1008)	(0.1022)	(0.6679)	(0.5285)	(0.2939)	(0.1979)
	RESET	0.2733	0.3278	1.8590	0.8073	0.2162	1.0866	0.0596
	test(F-statistic	(0.6061)	(0.5725)	(0.1859)	(0.6679)	(0.6465)	(0.3103)	(0.8093)

Note: *, ** and ***denote the level of statistical significance at 1%, 5% and 10%, respectively. The variables $ltab, lmc, ldmt, lap, lcd, lcw$, and $lflt$ are defined as previously. D2014M2 and D2014M5 are dummy variables representing decline in total credit owing to stringent requirements by some banks. The values in parentheses are the probability values.

Table 5: ATMs & POS Models (bivariate case)

Relation Horizon	**Explanatory Variable**	**Dependent Variable, Log of the number of ATMs ($latm$)**			**Dependent Variable, Log of the number POSs per 1000 adults($lpos$)**		
Short-run	$ECM(-1)$	-0.3964*	-0.1635*	-0.2925*	-0.4349**	-0.4034*	-0.3374*
		(0.0007)	(0.0000)	(0.0025)	(0.000)	(0.0000)	(0.0001)
	$d(ldmt)$	0.0248**			0.0345*		
		(0.0361)			(0.0071)		
	$d(lcd)$		0.0131**				
			(0.0168)				
	$d(lcd(-1))$		-0.0174*				
			(0.0038)				
	$d(lcw)$			0.0292**		0.0356**	
				(0.0336)		(0.0198)	
	$d(lpos(-1)$				0.0469	0.1441	0.0651
					(0.7306)	(0.3264)	(0.6811)
	$d(lflt)$						0.0141**
							(0.0112)
	$D2015M9$				-0.0356*	-0.0344*	-0.0329*
					(0.0000)	(0.0000)	(0.0094)
Long-run	$ldmt$	0.0698*			0.1184*		
		(0.0000)			(0.0000)		
	lcd		0.0858*				
			(0.0001)				
	lcw			0.0797*		0.1347*	
				(0.0000)		(0.0000)	
	$lflt$						0.0697*
							(0.0000)
	$D2015M9$				-0.1077*	-0.0999*	-0.1109*
					(0.0005)	(0.0042)	(0.0094)
	c	-1.0876*	-1.1598*	-0.1378*	-0.4780*	-0.5678*	-0.5948*
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Diagnostics	JB	3.3114	1.2398	4.2663	1.8559	1.2775	2.5985
		(0.1910)	(0.5380)	(0.1185)	(0.3954)	(0.5280)	(0.2727)
	BG-LM	5.7391	2.2872	6.6705	2.5594	1.7548	2.1869
	Test	(0.1250)	(0.3187)	(0.1544)	(0.1096)	(0.4159)	(0.3351)
	RESET	1.2528	1.6367	1.3367	1.6804	0.0066	0.1451

Test	(0.1300)	(0.1250)	(0.1150)	(0.2083)	(0.9359)	(0.7071)

Note: *, ** and ***denote the level of statistical significance at 1%,5% and 10%, respectively. The variables $latm$ = log of the number of ATMs, $lpos$ = the log of the number of point of sales (POS) devices and other variables are as previously defined. D2015M9 is the dummy variable representing the decline in the number of POS as a result of cancellation of contract between some merchants and one commercial bank, which owned the POSs. The values in parentheses are the probability values.

5.2.2 Diagnostic Tests Results

Following the establishment of long-run estimates in each model, the next step involves the estimation of the error correction model (ECM). The results of short-term elasticities estimated within the ARDL framework together with their associated diagnostic tests also are presented in Tables 4 and 5 (also see Appendices 4 and 6). Diagnostic tests were applied to the estimated ECMs to ensure the reliability of the estimated parameters. The results show that all estimated ECMs pass all specification tests. For example, the findings show absence of serial correlation, normality of residuals and no heterokesdasticity (as the models were estimated using White's heteroskedasticity standard errors). In addition, Ramsey's RESET test for the stability of the models together with CUSUM and CUSUMQ tests (though not presented here) suggest that the models are stable over the sample period.

5.2.3 The Short-run Relationship

Consistent with the long-run dynamics, the results of estimated short-run elasticities show that mobile money influences financial inclusion in Lesotho. This is supported by the positive and statistically significant coefficients of the explanatory variables in all bivariate error correction models and triavariate error correction models that passed the robustness checks. This finding provides evidence that in addition to influencing the dynamics of financial inclusion in the long-run, mobile money also has significant impact on the dynamics of financial inclusion in the short-run. The findings also show that the coefficient of the lagged error correction term, which indicates the speed of adjustment to long-run equilibrium in the event of a shock to the system, is negative and statistically significant at either 1% or 5% level of significance. This suggests that in the bivariate setting, on overage, 16% to 85% (depending on proxies that are used) of the disequilibrium of financial inclusion is corrected in the current month following a shock in the previous month on the one hand. On the other hand, the speed of adjustment in the trivariate error correction models implies that, on average, 14% to 50% of the disequilibrium from the previous month is corrected in the current month. In addition, the fact that the coefficient of the lagged error correction term is statistically significant and bears a correct sign (i.e. negative) in all models implies that the series are

non-explosive and that long-run equilibrium is attainable. Therefore, this is consistent with the cointegration relationship between the variables in each model.

5.2.4 Granger Causality between Financial Inclusion and Mobile Money

The existence of a cointegrating relationship between the variables may suggest that there must be Granger causality in at least one direction, but does not show the direction of temporal causality between the variables (see Granger, 1969 & 1988). Therefore, the paper employs the estimated error correction models to also examine both short-run and long-run Granger causality between financial inclusion and mobile money. The short-run causality can be determined by the significance of the Wald F-test (or t-statistic) on the first differences of the explanatory variables on one hand. On the other hand, the long-run causality can be examined by the significance of the t-statistics on the coefficient of the lagged error correction term. Granger causality can be unidirectional in either directions or bidirectional. However, this paper specifically focuses on establishing unidirectional Granger causality from mobile money to financial inclusion, which answers the research question in this study.

Based on the estimated error correction models presented in Tables 4 and 5 (also see Appendices 4 and 6), the coefficients of all the first differences of explanatory variables in each model appear with expected positive signs and are also statistically significant at either 5% or 1% levels of significance. This result provides evidence of short-run Granger causality from mobile money to financial inclusion. Similarly, the negative and statistically significant coefficient of the lagged error correction term in the same models supports long-run Granger causality from mobile money to financial inclusion. Thus, in general the findings imply that indeed mobile money Granger causes financial inclusion both in the short-run and long-run in Lesotho.

6. CONCLUSION AND POLICY RECOMMENDATIONS

The acquisition and use of mobile telephone in Sub-Saharan Africa has grown significantly in recent years and now covers a large proportion of the region's population. This has led to emergence of financial innovations such as mobile money, which has expanded the grid of financial services to include the previously unbanked and underbanked sections of population, who could not access formal financial services on account of limited banking infrastructure. Empirical evidence has shown that this new development has increased financial intermediation with positive spill-overs in terms of credit growth to entrepreneurs and consequently leads to faster economic growth and

perhaps broader economic development. This study employs ARDL bounds testing approach to cointegration and Granger causality test based on ECM to examine the impact of mobile money on financial inclusion and the direction of causality between these variables in Lesotho using monthly data from July 2013 to December 2015.

The findings suggest a strong evidence of long-run steady state relationship between financial inclusion and mobile money in Lesotho with positive and statistically significant long-run coefficients, which are consistent with apriori expectations. In addition, the estimated ECM models provide evidence that mobile money also has significant impact on the dynamics of financial inclusion in the short-run in Lesotho. For instance, the results suggest that, on overage, 16% to 85% of the disequilibrium of financial inclusion is corrected in the current month following a shock in the previous month. Furthermore, the findings show that mobile money Granger causes financial inclusion both in the short-run and long-run in Lesotho.

The findings of this paper underscore the importance of mobile phone diffusion and hence mobile money in extending financial services in Lesotho. This is because it has resolved the hurdles of limited banking infrastructure by allowing the previously unbanked and under banked sections of the population to access financial services. This could also serve as a breakthrough for these people to build accounts history that would consequently help them to open formal bank accounts with the banking industry in Lesotho. Therefore, policy makers in Lesotho should promote and facilitate interaction and investments in mobile phone technology deployment and its related financial services. In addition, financial inclusion policies should be directed to leveling the playing ground for mobile money to flourish to create a more financially inclusive society in Lesotho. In this regard, the legal and regulatory framework should be friendly and accommodative to enable more innovation in mobile money and other digital financial services. This would contribute drastically to financial development and consequently faster economic growth.

MNOs should work hard to scale up the use of mobile money in remote areas of the country, where the majority of people still do not have access to financial services. This could be achieved through more customer education, improving network coverage in rural areas of the country and growing agent network in rural areas by negotiating with Chinese businesses, which have more reach in rural communities, to become agents and hence act as cash-in and cash-out points. More

importantly, the MNOs should endeavor to promote the use of mobile money in its electronic form in carrying out transactions. These would help resolve many of the hurdles related to liquidity management by the MNOs. Lastly, MNOs should work towards forming many partnerships with all commercial banks and other financial institutions in Lesotho to ensure interoperability between MNOs and commercial banks[13]. This would lead to more access to banking services and allow innovation of more services.

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[13] Of course, there are already interesting developments on the ground with Ecocash customers having access to their bank accounts with SLB.

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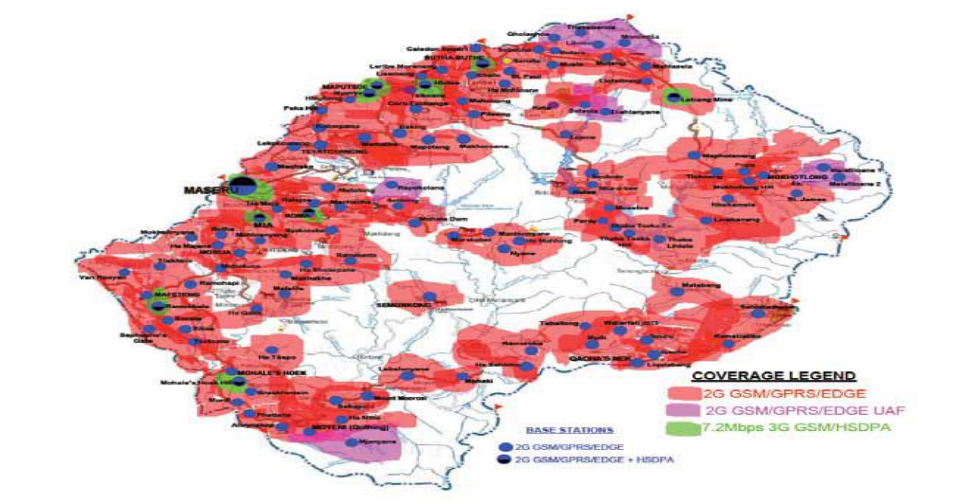
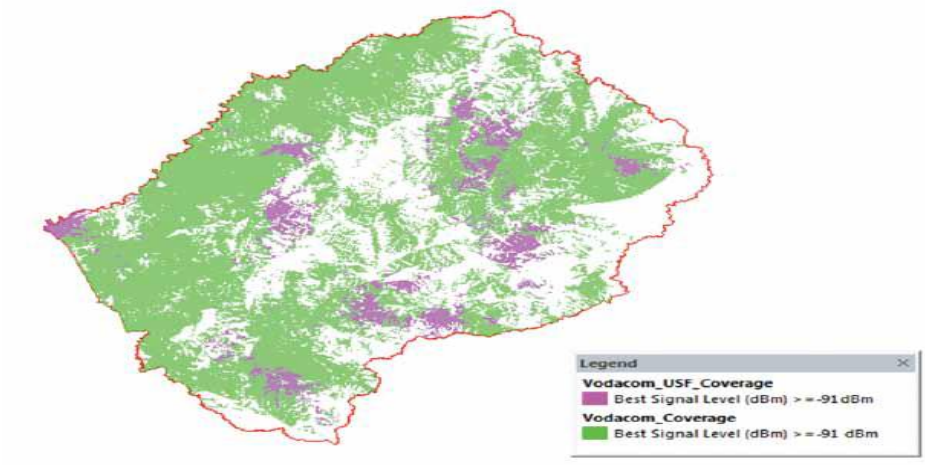
LIST OF APPENDICES

Appendix 1: Econet Telecom Lesotho (ETL) Coverage Map as at 31st March 2014



Source: Lesotho Communications Authority Annual Report, 2013-2014

Appendix 2: Vodacom Lesotho (VCL) Coverage Map as at the 31st March 2014



Source: Lesotho Communications Authority Annual Report, 2013-2014

Appendix 3: ARDL Bounds Testing to Cointegration Results (bivariate case)

Total Credit Models								
Model	**F-statistic**	**Critical value bounds of the F-statistic**						**Evidence of Cointegration?**
		99%		95%		90%		
$k = 1$		$I(0)$	$I(1)$	$I(0)$	$I(1)$	$I(0)$	$I(1)$	
$F_{ltc}(ltc\backslash ltab)$	17.57*	6.027	6.760	4.090	4.663	3.303	3.797	Yes
$F_{ltc}(ltc\backslash lmc)$	14.67*	6.027	6.760	4.090	4.663	3.303	3.797	Yes

$F_{ltc}(ltc\backslash ldmt)$	9.72*	8.170	9.285	5.395	6.350	4.290	5.080	Yes
$F_{ltc}(ltc\backslash lap)$	16.20*	6.027	6.760	4.090	4.663	3.303	3.797	Yes
$F_{ltc}(ltc\backslash lcd)$	12.26*	6.027	6.760	4.090	4.663	3.303	3.797	Yes
$F_{ltc}(ltc\backslash lcw)$	14.04*	6.027	6.760	4.090	4.663	3.303	3.797	Yes
$F_{ltc}(ltc\backslash lflt)$	14.78*	6.027	6.760	4.090	4.663	3.303	3.797	Yes
Total Deposit Models								
$F_{ltd}(ltd\backslash lcw)$	6.24**	6.027	6.760	4.090	4.663	3.303	3.797	Yes
$F_{ltd}(ltd\backslash ldmt)$	6.31**	6.027	6.760	4.090	4.663	3.303	3.797	Yes
$F_{ltd}(ltd\backslash lflt)$	5.16**	6.027	6.760	4.090	4.663	3.303	3.797	Yes
$F_{ltd}(ltd\backslash lmc)$	6.24**	6.027	6.760	4.090	4.663	3.303	3.797	Yes
ATMs and POS Models								
$F_{latm}(latm/ldmt)$	9.47*	6.027	6.760	4.090	4.663	3.303	3.797	Yes
$F_{latm}(latm\backslash lcd)$	9.37*	6.027	6.760	4.090	4.663	3.303	3.797	Yes
$F_{latm}(latm\backslash lcw)$	7.76*	6.027	6.760	4.090	4.663	3.303	3.797	Yes
$F_{lpos}(lpos\backslash ldmt)$	17.56*	6.027	6.760	4.090	4.663	3.303	3.797	Yes
$F_{lpos}(lpos\backslash lcw)$	15.19*	6.027	6.760	4.090	4.663	3.303	3.797	Yes
$F_{lpos}(lpos\backslash lflt)$	13.34*	6.027	6.760	4.090	4.663	3.303	3.797	Yes

Note: 1) k is the number of regressors and 2) * and ** denote the level of statistical significance at 1% and 5%, respectively.

Appendix 4: Total Deposit Models (bivariate case)

Relation Horizon	Explanatory Variable	Dependent Variable, Log of Total Deposits per 1000 adults (ltd)			
Short-run	$ECM(-1)$	-0.8519*	-0.8063*	-0.7928*	-0.8003*
		(0.0002)	(0.0002)	(0.0005)	(0.0004)
	$d(lcw)$	-0.0443			
		(0.1188)			
	$d(ldmt)$		0.0178		
			(0.4890)		
	$d(lflt)$			0.0128	
				(0.2759)	
	$d(lmc)$				0.1685***
					(0.0552)
Long-run	lcd	0.0518*			
		(0.0000)			
	$ldmt$		0.0446*		
			(0.0000)		
	$lflt$			0.0258*	
				(0.0000)	
	lmc				0.1700*
					(0.0000)
	c	3.7045*	3.7429*	3.7008*	2.9298*
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
Diagnostics	JB	0.3983	0.2679	0.3557	0.3557
		(0.8194)	(0.8746)	(0.8371)	(0.8371)
	BG-LM Test	0.8984	1.7444	3.2587	0.9878
		(0.6381	(0.4180)	(0.1961)	(0.6102)
	RESET test	0.0143	0.0323	0.1107	0.0177

	(0.9057)	(0.8588)	(0.7421)	(0.8952)	

Note: *, ** and *** denotes the level of statistical significance at 1%, 5% and 10%, respectively. The variables are as previously defined. The values in parentheses are the probability values.

Appendix 5: ARDL Bounds Testing to Cointegration Results (trivariate Case)

Total Credit Models								
Model	**F-statistic**	**Critical value bounds of the F-statistic**						**Evidence of Cointegration?**
		99%		95%		90%		
$k = 2$		$I(0)$	$I(1)$	$I(0)$	$I(1)$	$I(0)$	$I(1)$	
$F_{ltc}(ltc\backslash lcd, lm2)$	9.65*	5.155	6.265	3.538	4.428	2.915	3.695	Yes
$F_{ltc}(ltc\backslash lap, lm2)$	11.46*	5.155	6.265	3.538	4.428	2.915	3.695	Yes
$F_{ltc}(ltc\backslash lmc, lm2)$	10.73*	5.155	6.265	3.538	4.428	2.915	3.695	Yes
$F_{ltc}(ltc\backslash lflt, lm2)$	11.07*	5.155	6.265	3.538	4.428	2.915	3.695	Yes
POS Models								
$F_{lpos}(lpos\backslash lcd, lm2)$	9.43*	5.155	6.265	3.538	4.428	2.915	3.695	Yes
$F_{lpos}(lpos\backslash lap, lm2)$	16.28*	5.155	6.265	3.538	4.428	2.915	3.695	Yes

Note: 1) k is the number of regressors and 2) * and ** denote the level of statistical significance at 1% and 5%, respectively.

Appendix 6: Total Credit and POS Models (trivariate Case)

Relation Horizon	**Explanatory Variable**	**Dependent Variable, Log of total credit (ltc)**				**Dependent Variable, Log of the number POSs per 1000 adults($lpos$)**	
Short-run	$ECM(-1)$	-0.3831*	-0.4959*	-0.3489*	-0.4406*	-0.2744*	-0.1355*
		(0.0004)	(0.0001)	(0.0048)	(0.0009)	(0.0001)	(0.0000)
	$d(lcd)$	0.0118**				0.0171*	
		(0.0316)				(0.0086)	
	$d(lap)$		0.0158**				0.0083***
			(0.0281)				(0.0649)
	$d(lmc)$			0.1122*			
				(0.0061)			
	$d(lflt)$				0.0115*		
					(0.0088)		
	$d(lm2)$	0.1722**	0.1566**	0.0412**	0.1429**	0.1493**	0.1224***
		(0.0162)	(0.0248)	(0.0685)	(0.0346)	(0.0294)	(0.0668)
	$d(lm2(-1)$		-0.1478***				
			(0.0652)				
	$d(lpos(-1)$					0.0004	
						(0.9979)	
	$D2014M2$	-0.0262*	-0.0288*	-0.0289*	-0.0247*		
		(0.0000)	(0.0000)	(0.0000)	(0.0000)		
	$D2014M5$	-0.0243*	-0.0285*	-0.0221*	-0.0235*		
		(0.0000)	(0.0000)	(0.0000)	(0.0000)		
	$D2015M9$					-0.0361*	-0.0367*
						(0.0000)	(0.0000)

Long-run	lcd	0.0386*				0.1104*	
		(0.0015)				(0.0001)	
	lap		0.0364**				0.1055**
			(0.0387)				(0.0250)
	lmc			0.1542*			
				(0.0005)			
	$lflt$				0.0244*		
					(0.0001)		
	$lm2$	0.4584**	0.6598*	0.2718***	0.2949**	0.6433**	1.1955***
		(0.0153)	(0.0084)	(0.0894)	(0.0102)	(0.0294)	(0.0630)
	$D2014M2$	-0.0583**	-0.0598*	-0.0573*	-0.0477*		
		(0.0101)	(0.0014)	(0.0001)	(0.0000)		
	$D2014M5$	-0.0521**	-0.0578*	-0.0461*	-0.0436*		
		(0.0051)	(0.0003)	(0.0000)	(0.0000)		
	$D2015M9$					-0.0361*	-0.2930**
						(0.0000)	(0.0172)
	c	3.2710**	1.9126	3.8384*	4.3659*	-4.9514**	-8.6480**
		(0.0108)	(0.2223)	(0.0037)	(0.0013)	(0.0128)	(0.0474)
Diagnostics	JB	0.0250	0.3364	0.6649	0.3387	0.6063	1.4491
		(0.9876)	(0.8452)	(0.7171)	(0.8442)	(0.7385)	(0.4846)
	BG-LM	0.0889	0.7029	3.1935	1.6178	2.1697	1.9632
	Test	(0.9565)	(0.7037)	(0.2026)	(0.4453)	(0.3380)	(0.3747)
	RESET	0.0924	1.82E-05	0.4036	0.2120	0.3896	0.4011
	Test	(0.7640)	(0.9966)	(0.5318)	(0.6497)	(0.5396)	(0.5328)

Note: * , ** and *** denote the level of statistical significance at 1%, 5%, and 10%, respectively. The values in parentheses are probability values.