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Access to finance for small and medium-sized firms: Evidence form Eastern Sub-Saharan Africa

Aparna A. Gosavi

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ACCESS TO FINANCE FOR SMALL AND MEDIUM-SIZED FIRMS: EVIDENCE FROM
EASTERN SUB-SAHARAN AFRICA

A Dissertation

by

APARNA A. GOSAVI

Submitted to Texas A&M International University
In partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

August 2015

Major Subject: International Business Administration

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ABSTRACT

Access to Finance for Small and Medium-Sized Firms: Evidence from Eastern Sub-Saharan
Africa (August 2015)

Aparna A. Gosavi, B.SC., M.B.A., MS

Chair of Committee: Dr. George R.G. Clarke

Mobile money is widely used by individuals since its launch in the midst of the last decade. Nowadays, this service is also making its way through businesses that use mobile money for their financial transactions. The use of mobile money has transformed the way businesses in developing countries operate, particularly in Sub-Saharan Africa. Notably, firms in Kenya, Tanzania, Uganda, and Zambia are saving time for financial transactions, satisfying customers' and suppliers' requests to transact in mobile money and reducing costs of financial transactions. Currently, among the firms that use mobile money about 64 percent of firms receive payments from their customers in the form of mobile money. Additionally, more than 44 percent of businesses use the service to pay their suppliers. This dissertation examines the service usage among businesses using the World Bank's Enterprise Surveys Program data set for the year 2013, making the study applicable to the present time.

Firstly, the dissertation investigates the type of firms that are more likely to use mobile money, and whether mobile money compliments the formal banking system. The results indicate that older firms are 20 percent more likely to use the service than younger firms, whereas medium and large-sized firms are 24 percent and 45 percent respectively less likely to use the service than small firms. Also, the firms that use mobile money are 20 percent more

likely to have bank accounts. Secondly, the dissertation examines whether the enterprises that use mobile money are less credit constrained than other firms. The investigation reveals that the firms that use mobile money are 25 percent more likely to have bank loans. Finally, the dissertation addresses the gender bias regarding whether female-owned firms are more likely to be credit constrained than their male counterparts, and whether mobile money can help these firms to mitigate the problem of credit rationing. The results indicate that female-owned firms exhibit the Pecking Order Hypothesis for their capital structure and that these firms are 16 percent more likely to have bank loans compared to their male counterparts.

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INTRODUCTION

1.1 Overview:

Mobile money is a financial tool that enables users to make and/or receive payments using their mobile phone devices. In its primitive form, mobile money can be used for buying goods and services such as groceries, cab rides, bus tickets, as well as for financing services such as bill payments, payroll deposits, and micro insurance, and domestic and international remittances. This utility has been effective in transferring money far and wide, a particular characteristic of the service that makes it popular amongst users. The service allows users to carry out financial transactions with speed, safety, and reduced transaction costs. Notably, four Sub-Saharan African countries — Kenya, Tanzania, Uganda, and Zambia — have been experiencing an exponential growth in the use of mobile money by individuals and businesses alike.

The staggering number of mobile money users, transactions, and its monetary value indicate that mobile money is going to be the future of monetary transactions in the African region. A Global Mobile Money Adoption Survey (Global System Mobile Association, 2011) indicates that by June 2012, the service had 81.8 million users around the globe, of which 56.9 million originated from Sub Saharan-Africa, nearly twice the number of Facebook users in the region. Moreover, in the month of June, 2012 alone, the service was used by 30 million individuals, resulting in 224.2 million transactions and totaling up to US\$ 4.6 billion worth of transactions. This number exceeded 196.3 million transactions in the first quarter of June, 2012 on PayPal. In addition, the report notes that 72 countries have 150 mobile money systems

This dissertation follows the style of the *Journal of Banking and Finance*.

providers and that another 109 such systems are underway. In its white paper, Society for Worldwide Interbank Financial Telecommunications (2012) predicts that a growing number of consumers are using mobile phones for financial transactions, topping 900 million users and a US\$ 1 trillion value of transactions by 2015.

Safaricom, a mobile-phone provider of the UK based Vodafone, launched its mobile money service in Kenya in early 2007, 2.37 million people enrolled for the service in a little over one year (Jenkins, 2008). The potential need and rapid growth of the mobile money service took the company that introduced this service in Kenya, by a complete surprise. The Head of International Mobile Payment Solutions for Vodafone Group Dr. Nick Hughes said that “an uptake of the service has surprised us but shows the need in the market place for very simple, secure, and low-cost service.”¹ The service demonstrated an astounding potential to facilitate the transfer of money among largely impoverished individuals. This tremendous potential was corroborated by the fact that in mid-May, 2008, the very first mobile money summit was held in Cairo, Egypt to assess the future growth of the service and to map out the future role to be played out by the regulators.

Mobile phones are the basic platform for mobile money (Hughes and Lonie, 2007), therefore owning mobile phones is key for using the service effectively. The growth of mobile phones in the region is due to underdeveloped telecommunication sector. This is due to the fact that a landline network is costly for countries that have poor infrastructure to support that sector. The Sub-Saharan African region has some of the lowest levels of infrastructure development in the world. In Kenya and Tanzania around 14 percent of the roads are paved (numbers for Uganda and Zambia are not available) and in all four countries under study, only one fifth of the

¹ Hughes, Nick, Head of International Mobile Payments, Vodafone Group. May, 14, 2008. Presentation at Groupe Speciale Mobile Association Mobile Money Summit.

population has access to electricity (World Bank, 2014a). In these countries, only 0.50 telephone landlines are available per 100 people (World Bank, 2013b). This problem of inadequate infrastructure is addressed by mobile-phone providers by implementing a network of specialized base stations covering about over 5-10 kilometers in radius. The base stations are equipped with diesel generators to overcome the erratic power supply. Therefore, unlike developed countries that invested in landlines before adopting mobile phones, this region experienced mobile phones leapfrogging landlines.

Other than underdeveloped infrastructure, the International Telecommunications Union offers a few more reasons for the sorry state of telecommunications sector in the region. It notes that dearth of foreign exchange, scarcity of investments, meager private sector participation, and disorganized investments are contributing factors to the poor state of the telecommunication sector. A majority of African countries from the mid of 1990s, started reforming their monopoly-based government ran telecommunication industry by acknowledging shortcomings due to the lack of technological advances. As a result of reforms in the telecommunications sector in Africa, 17 countries in the region had private land-line operators, 36 countries had set up independent regulatory entities for the sector, and 45 had issued licenses to private mobile phone providers.

The telecommunication sector reforms can take a form of four inter-connected factors such as privatize government-owned telecommunication facilities, allow competition, allow foreign investment, and establish an autonomous regulatory body to promote healthy competition. However, oftentimes, privatization of government-owned firms can result in retaining part ownership or in granting a monopoly for a limited time. There are general consensuses that full privatization works better than partial privatization. Nevertheless, once

competition came into play, the telecommunication sector in the region experienced a rapid increase in terms of service providers, number of customers, service quality, and reduced prices (Wallsten, 2001). Privatization and competition complement each other, resulting in “deepening network penetration” (Li and Xu, 2002) and improved performance of service providers (Fink et al., 2003).

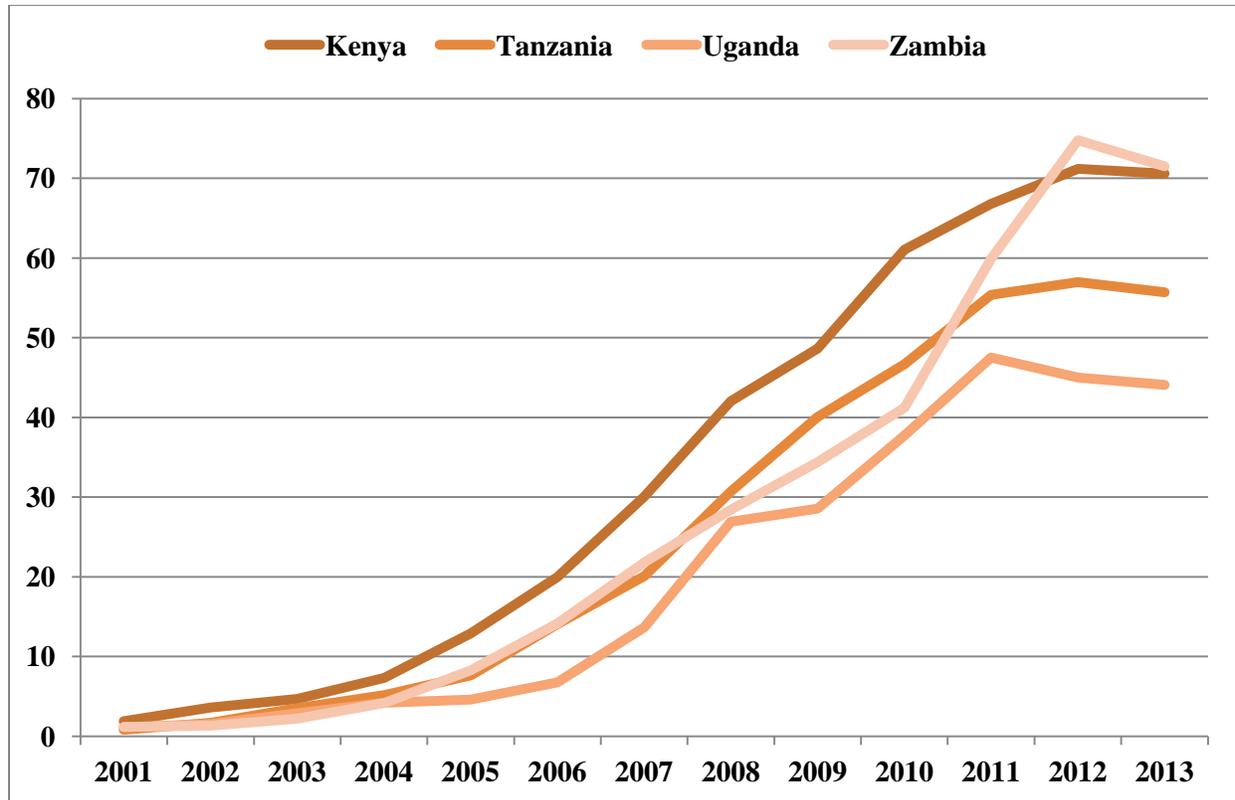


Figure 1: Mobile cellular subscription (per 100 people)

Source: The World Bank’s World Development Indicators, 2014

The reforms in telecommunication sector led to more choices, better service quality, and more customer-centric services in mobile phone services. It took a while for mobile phones to reach the less unfortunate people in the society, though. The first mobile adopters were mainly young, wealthy, educated, urban, and male, seeing as handsets and services were expensive. Aker and Mbiti (2010) claim that by 2009, a decrease in prices of both, handsets and service

charges, mobile phone ownership extended to include the more under-privileged, elderly, and rural population. They claim that in Africa, mobile phones help individuals minimize information asymmetries in areas such as prices of commodities, potential buyers and sellers, job openings, natural calamities, and the well-being of loved ones. Based on an independent survey from Kenya, Demombynes and Thegeya (2012) find that overall, mobile phone usage rates are the same amongst men and women as well as between rural and urban areas. In Africa, an increase in access to mobile networks by 1 percent results in a 0.5 percent increase in real GDP per capita (Djiofack-Zebaze and Keck, 2009).

Over the past decade, the four mentioned countries have experienced a rapid adoption of mobile phones among individual users from all walks of life (see Figure 1). Among these four countries, Kenya has experienced the highest growth in terms of mobile phone subscribers. The mobile phone subscription rate for Zambia rose above Kenya's in mid-2011, but the growth rate for both countries has merged since mid-2012. The remaining two countries, Tanzania and Uganda, experience a steady growth in the number of mobile phone subscribers as well. This adoption rate for mobile phones is astounding when we look at the rate for landline penetration and a large number of people who lack access to clean drinking water, a basic necessity for human beings. The rate of landline subscriptions ranges from 0.2 to 1.7 per 100 people among the four countries.

Like individuals, businesses also faced numerous obstacles in obtaining landlines and hence adopted mobile phones. The World Bank's Enterprise Surveys Program (2007) found that Kenyan businesses had to wait for a hundred days to get a landline connection and to pay a bribes of US\$ 117 (GDP US\$ 780), and had to deal with interruption for 36 days in a year (Aker and Mbiti, 2010). Therefore, to overcome these problems, businesses started using mobile

phones. By 2013, there was a sudden jump in the usage of mobile phones among businesses – 95 percent in Kenya, 78 percent in Tanzania, 85 percent in Uganda, and 90 percent in Zambia had mobile phones in their business operations (World Bank, 2013a). The adoption of mobile phones by firms has shown positive impact on business operations. Samuel et al. (2005) use a direct survey method to examine the adoption rate of mobile phones and its impact on businesses. They study the impact of mobile phone adoption on firms especially with respect to supply chain management from South Africa and Egypt. They maintain that for firms this adoption not only led to improved communication with suppliers but also resulted in increased profits and reduced time in financial transactions.

Additionally, the analysis of World Bank’s Enterprise Survey Program conducted in 2013 offers a few interesting insights on the usage of mobile phones by firms beyond financial transactions. The survey asked enterprises in Tanzania, Uganda, and Zambia a question regarding use of mobile phones for various business operations other than financial transactions. The survey did not ask this particular question in Kenya because of a high mobile subscription rate by firms to the tune of 99.14 percent in that country (World Bank, 2007). A detailed analysis of the question reveals that enterprises are more inclined to use mobile phones to attract new customers and to advertise their products than to offer special deals or recruit new employees (see Table 1). The analysis indicates that the enterprises have also started using mobile phones for their peripheral business operations. Because of the ubiquitous nature of mobile phones, which have multiple applications — communication, SMS, and remote access — the mobile money-service providers have a ready-to-use platform to launch the mobile money service. The service has become more appealing than other financial tools such as cash and

debit, credit, or pre-paid cards (International Finance Corporation, 2011). This trend is especially prevalent in Sub-Saharan Africa.

Table 1: Use of mobile phones by firms for business operations other than financial transactions (%)

<i>Use mobile phones to</i>	<i>Tanzania</i>	<i>Uganda</i>	<i>Zambia</i>
Attract new customers	32	28	40
Engage in marketing or to advertise products	24	28	38
Offer special deals or promotions	11	26	32
Recruit new employees	19	22	23

Source: Based on author's calculations of the Enterprise Surveys Program (2013)

1.2 A leap from mobile phones to mobile money:

In the Philippines in 2001, the idea of Smart Money was brought about — essentially as a “clearing and settlement system” for its wide network of “prepaid airtime sellers”(Mas, 2009). Under this arrangement, cell phone users bought wholesale airtime through agents of Smart Money and paid for it from bank accounts via their phones in real time.

There are various dimensions surrounding mobile money services. The mobile money service is relatively new (introduced in Kenya in March, 2007) in developing countries, and is not yet adopted by the developed countries. It is, therefore, important to understand three elements related to the service. These three elements are:

1. How the service works,
2. Why it appeals to individual users, and
3. How the service makes its way through businesses.

Besides these three elements, an overview of the industrial structure of the region under study, and the state of lending institutions and access to finance are relevant to the context of the bigger picture thus leading to the research questions. It also discusses the relevant data set used in this thesis coupled with contributions of the thesis.

Since the launch of mobile phones, phone companies in three countries — Kenya, Tanzania, and Uganda — have allowed their users to buy pre-paid credits (air-time) and they could also forward these credits to other users. The recipients of these phone credits can visit the mobile phone company retail shops and convert these phone credits into cash or they can use these phone credits to buy goods and services. This unique process was a small step towards the evolution of mobile money.

The real boost to the service came in early 2007 when Safaricom — a leading cell-phone-network provider in Kenya — officially started running the money transfer process, known as M-PESA.² It is a Short Message Service (SMS) based on a money-transfer process that enabled users to deposit, withdraw, and send money from the accounts stored on their mobile phones. In general, costs associated with the SMS are cheaper than those of conversations on mobile phones. Thus, oftentimes, SMS is used to substitute verbal conversations on mobile phones. It is, therefore convenient for mobile phone users to employ the SMS (a feature that they have grown accustomed to since the launch of mobile phones) for the use of the service (Medhi et al., 2009; Morawczynski and Pickens, 2009). Moreover, the commission for M-PESA is 50 percent cheaper than that of traditional financial services offered by banks (see Table 2).

1.3 A typical mobile money service process:

There are three interlinked levels in the mobile money service process (see Figure 2)³. In the following, the description of a typical M-PESA process in Kenya is provided⁴. This process can be used as an archetype for the mobile money services offered by other service providers all over the world.

² M-PESA: M stands for mobile and PESA means money in Swahili, a local language in Kenya.

³ Hughes, N. and Lonie, S. were leading a team at Vodafone that invented the concept of mobile money for the Kenyan market.

⁴ Mas and Mrawczynski (2009) and Hughes and Lonie (2009) offer a detailed description of the M-PESA service.

Table 2: A comparison of commissions charged among M-PESA, Post Office, and Western Union

<i>Amount (Khs)*</i>	<i>Money send to a M-PESA user</i>	<i>Money send to a non-M-PESA user</i>	<i>Money send via Post Office</i>	<i>Domestic transfer via Western Union</i>
100	30	75	n/a	500
500	30	75	n/a	500
1,000	30	75	n/a	500
5,000	30	100	n/a	500
10,000	30	175	300	600
20,000	30	350	650	700
35,000	30	400	650	1200

1 Kenyan Shillings (Khs)* = 0.012 US\$

Sources: Comminos et al. (2009) and Jack and Suri (2011)

Senders and receivers: Typically, senders and receivers open virtual financial accounts with agents of Safaricom. These accounts are linked to their phone numbers and are directly accessible via SIM cards. There are no charges for opening accounts and depositing money. The registered customers can deposit or withdraw money via their mobile phones. The charges are different for different services and they differ quite significantly. Commissions are deducted from the funds transacted and are then collected by Safaricom. Customers can transfer money to non-M-PESA users as well. Any transactions to non-M-PESA users are charged three times the regular commission. The services available to customers are: transfer money, pay bills, buy mobile air-time credit, and access bank accounts. Free ATM withdrawals are allowed only at outlets that are authorized by Safaricom. There are extra charges for using non-Safaricom ATM centers. All transactions are authorized and recorded in real time on customers SMS's.

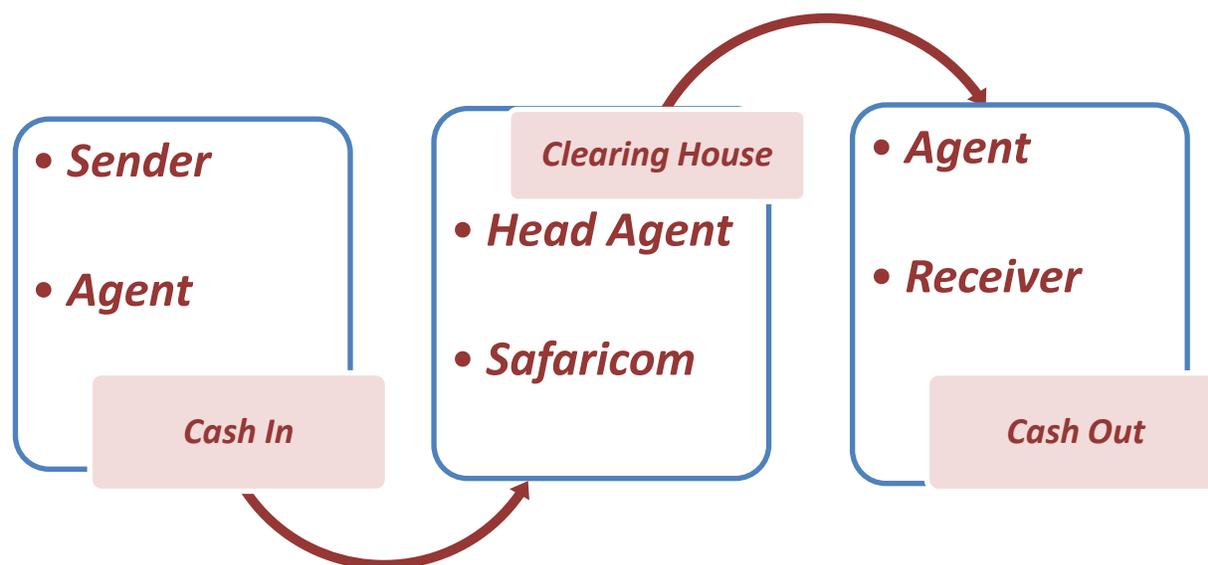


Figure 2: A typical mobile-money-service process

Agents: These are people who are in charge of retail stores that facilitate functions such as opening accounts, depositing and/or withdrawing money. The agents are responsible for maintaining records of deposits and withdrawals of funds. Three copies of these transactions are then recorded in log books and are signed by the respective customers. The first copy of that transaction stays with the agent, the second copy goes to the store's master agent (the next person in the process or the higher level person), and the last copy goes to Safaricom. All this information, with the exception of the signature, is also sent via SMS to the customers, and captured electronically by Safaricom and stored for six months.

Safaricom: The Company has twofold responsibilities: a. paying commissions to agents for each deposit or withdrawals of funds, and b. depositing money, equivalent to customer-account balances, in pooled accounts with one of the three government-regulated banks. Because account balances of the service do not receive any interest, the interest accumulated on

these pooled accounts is transferred to a not-for-profit trust that is controlled by the parent company. Vodafone, the parent company, securely maintains the accounts of customers on its own servers. Finally, Top Image is an outside agency that is appointed by Safaricom to evaluate, train, and supervises agents who work at the retail shops. Usually, this agency visits retail agents at least once a month to evaluate their liquidity positions and their overall functioning. It is an independent organization that gives a regular feedback to Safaricom on improving or providing better services with efficiency.

1.4 The appeal of mobile money service at the individual level:

Due to lack of employment opportunities in rural areas, most of the workers migrate to urban areas, leaving their families behind in villages. Before the launch of mobile money, these rural-urban migrant workers would send money to family members through friends or other relatives (who travel led back home). They (who travelled back home) would then pass the money onto the immediate family of the sender. This method of sending money back home was convenient. However, there were many problems. Trust was an issue with some of those who carried it back home; they would steal some of the money or possibly lose it along the way, or their lives were endangered as word got around of them having money in their possession. These carriers also demanded commission and travelling expenses that were usually more than the commissions paid on mobile money transfers (Morawczynski, 2009) .

Additionally, money was also transferred to villagers via buses and cab companies. Unfortunately, this method proved risky and oftentimes the money never reached its final destination. In Tanzania, bus companies charged 10 percent commission besides the risk of theft. For example, the cost of sending US\$15 from Nairobi to the Western provinces by M-PESA in 2008 was two fifth the post office rate and one fifth the cost of sending by bus. Post

offices also offered money transfer services and had considerable presence in rural areas. However, people complained about their inefficiency and illiquidity (Mas, 2009). Western Union was a formidable option for remittances and although, this method was secure, it proved to be expensive and had fewer geographic footprints in rural areas (Aker and Mbiti, 2010).

Mobile money therefore emerged as a viable option for a money-transfer service that became immensely useful to rural-urban migrants (Mas and Morawczynski, 2009; Mas, 2009; Demombynes and Thegeya, 2012; Gupta, 2013). Most of the migrant workers owned land -1 to 5 acres- in villages which is, for the most part, used in cultivating crops for domestic consumption. Therefore, the families of these workers live in villages to take care of the land. Most of the migrant workers value their ancestral land hence would like to go back, after retirement and even make it their final resting place (Mas and Morawczynski, 2009; Mas 2009). Consequently, families of these migrant workers are dependent upon the money remitted back home, ranging from a minimum of 50 to almost 100 percent of the recipients' incomes. Heyer and Mas (2009) maintain that people use the service because the pervasive nature of retail agents increases the convenience and reduces opportunity costs (travel time to the retail agent and eliminates the time spent long queues), an important factor for the poor. Also, the electronic nature of transactions enhances safety and offers real-time transactions (Demombynes and Thegeya, 2012; Plyler et al., 2010). Finally, the service users can pay for unforeseen health care costs without sacrificing for other needs, such as food.

1.5 The adoption of mobile money service by businesses:

Businesses mostly use the service to receive money from customers, and pay bills to suppliers. In Kenya, businesses in informal sectors use mobile money to pay salaries, in Tanzania, rural retail trades use mobile money to send money to urban wholesalers, and in

Zambia, mobile money service is used to support payments among major wholesale and retail networks (Heyer and Mas, 2009).

Table 3: Use of mobile money by firms (%)

<i>Use of mobile money by firms</i>	<i>Kenya</i>	<i>Tanzania</i>	<i>Uganda</i>	<i>Zambia</i>
Use mobile money for financial transactions	50	40	46	3
Use mobile money for suppliers	40	42	50	44
Use mobile money for customers	72	54	66	40

Source: Based on author's calculations of the Enterprise Surveys (2013)

Based on the analysis of the World Bank's Enterprise Surveys Program data set (2013), responses for the usage of the service by firms are analyzed (see Table 3). Kenya tops the list on two fronts: use of the service for financial transactions and for customers, whilst, Uganda tops the list for the most use of the service for suppliers, and Zambia falls to the bottom of the list in nearly all three categories.

The survey questioned each firm separately on the many reasons for using the service. The analysis of data collected from the surveys offers some interesting insights as to why these businesses use the mobile money service. The firms surveyed were given six options to choose from for the main reason for using the service. The following bar chart (see Figure 3) presents the reasons for these four countries. The main reason among all four countries, for using the service is a reduction in time spent on financial transactions, wherein 52 percent of firms in Tanzania, 43 percent in Kenya, 36 percent in Uganda, and 40 percent in Zambia give preference to this reason.

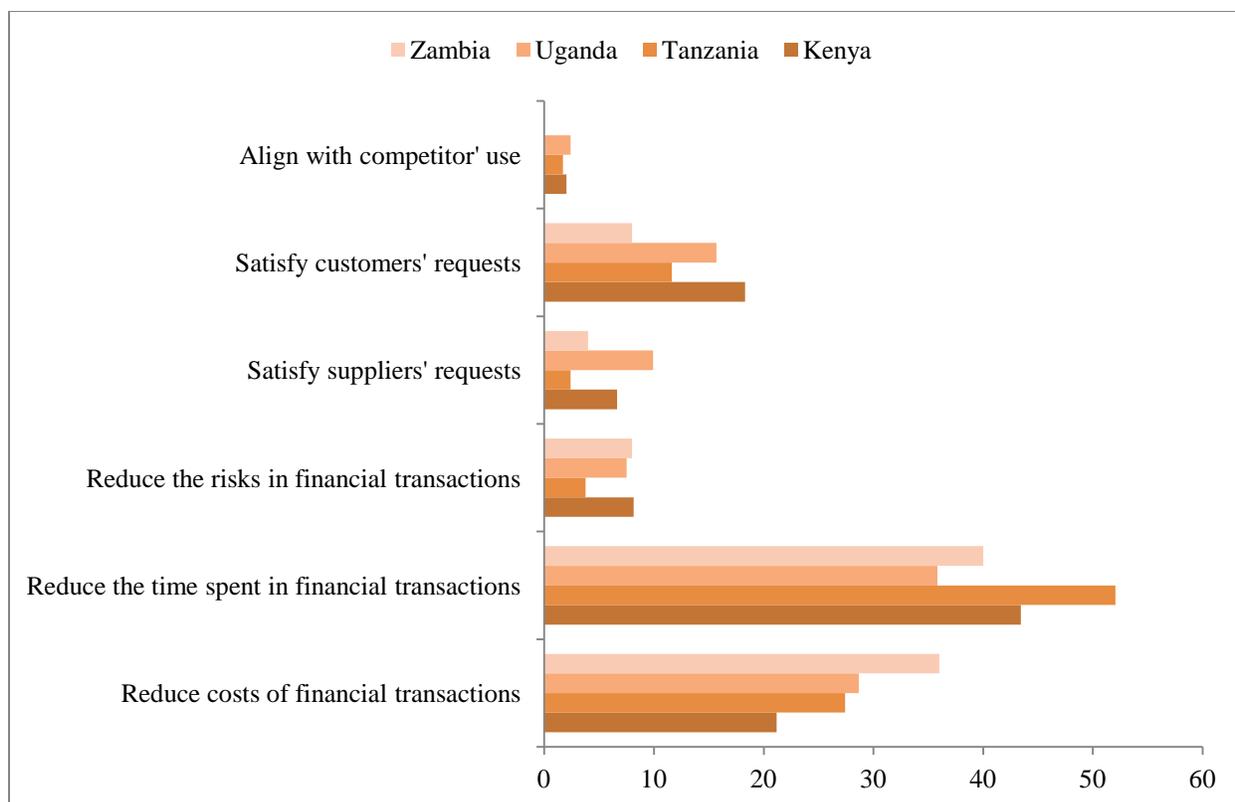


Figure 3: Main reasons for using mobile money by firms (%)

Source: Based on author's calculations of the Enterprise Surveys (2013)

One of the potential reasons for selecting the choice of a reduced time in financial transactions could be due to the banking habits and banking access in these countries (see Table 4). Uganda has the highest number of commercial bank branches per 1,000 km² whereas Zambia has the lowest. For commercial bank branches for every 100,000 adults, Kenya tops the list with 5.49 bank branches; almost twice as large as Tanzania, Uganda, and Zambia. Although the number of ATMs per 1,000 km² for all countries, with the exception of Zambia, is more or less the same, the amount of ATMs per 100,000 adults is highest for Tanzania. Thus, even if Tanzania tops the list for the number of ATMs per 100,000 adults, it trails behind the remaining three countries for access to commercial banks. Therefore, in the survey, more than 50 percent of the firms from Tanzania say that using mobile money saves their time in dealing with

financial transactions as opposed to a smaller number of firms from Kenya, Uganda, and Zambia.

The second main reason for using this service is that it reduces the costs of financial transactions. One of the potential reasons for this second choice could be the commissions that are charged by mobile money service providers (see Table 2). Also, unlike in developed countries, in developing countries, banks charge fees to deposit and withdraw money from banks.

Table 4: Bank access

<i>Bank Access</i>	<i>Kenya</i>	<i>Tanzania</i>	<i>Uganda</i>	<i>Zambia</i>
Commercial bank branches per 1,000 km ²	2.31	0.64	2.45	0.45
Commercial bank branches per 100,000 adults	5.49	2.21	2.62	4.44
ATMs per 1,000 km ²	4.18	4.20	3.74	0.86
ATMs per 100,000 adults	9.94	14.57	4.00	8.58

Source: International Monetary Fund (2012)

A field study was commissioned by Global System Mobile Association (2011) in Tanzania to study the role played by the service in micro and small firms offered some interesting insights on the adoption of mobile money. Although cash is king in the country, firms use the service if there is trust between senders and recipients. The use of the service is usually initiated by sellers. If some firms use mobile money, then the other firms in the same location starts using it. The acceptance of the service is more predominant if transactions are for frequent and small goods including standardized goods, avoiding the problem of goods returned. Firms also report having more liquidity, increased efficiency, and an improvement in the growth of the firm. Finally, firms report practicing the Just in Time (JIT) technique for inventory management, since the adoption of the service.

1.6 The existing industrial structure in the region:

The industrial structure in Sub-Saharan Africa helps us discern the use of the service among business communities. The Structural Adjustment Policies, which needed to reduce government spending and size of the public sector, in the 1980s and 1990s engineered by International Monetary Fund and other global-financial-aid agencies led to the growth of informal sector in the Sub-Saharan Africa region. As a result of this, people who lost their jobs due to downsizing in the government run businesses turned to informal sector for employment (International Bank for Reconstruction and Development, 2014). Typically, these informal firms are unregistered, are run by owners, and are either micro or small enterprises in nature⁵. Because a majority of new jobs are created in the informal sector, the relative size of this sector is ever increasing.

Thus, the region has a large number of micro and small firms, a fewer number of medium-sized firms and a small number of large firms (see Table 5). However, few micro and small firms grow to transform into medium or large-sized firms (Altenburg and von Drachenfels, 2008). Typically, these micro and small firms belong to the informal sector of the economy. Schneider (2004) estimates a share of the informal sector in 145 economies. His estimation shows that the percent of the economy representing the informal sector as a percent of the official GDP in Kenya is 36 percent, in Tanzania 60.2 percent, in Uganda 45.4 percent, and in Zambia 50.8 percent.

⁵ The World Bank defines a micro firm that has less than 5 employees, a small firm that has in between 5 and 19 employees, a medium firm that has in between 20 and 99 employees, and a large firm that has more than 99 employees.

Table 5: Firms in the sample by their sizes and sectors

Size Sector	<i>Small (in between 5 and 19 employees)</i>	<i>Medium (in between 20 and 99 employees)</i>	<i>Large (more than or equal to 100 employees)</i>	Total
Manufacturing	663	419	180	1262
Retail	519	177	31	727
Services	275	138	48	461
Total	1457	734	259	2450

Source: Based on author's calculations of the Enterprise Surveys (2013)

The magnitude of employment also supports the fact that the informal sector comprising of micro and small firms dominates the region. There are some studies that estimate the percentage share in the form of employment of the economy in the informal sector for agriculture and non-agriculture sectors. United Nations Development Program (2004) on the private sector and development estimates that a share of non-agricultural labor that is employed in the informal sector accounts for 80 percent. In a country-specific study for Kenya, Orwa (2007) maintains that self employment (informal employment) accounted for over four million individuals in 2000, and that number rose to over 5 million individuals in just two years in 2002. This increase represented more than 74 percent of the total employment for that period.

Some studies offer explanation for the growth of informal sector. Palmade (2005) maintains that firms remain informal because the time, costs, and efforts of registering with authorities are prohibitively high for firms in the informal sector. In his study, which focuses on the reasons behind a growth of the informal sector in Southern and Eastern African economies, Mead (1994) maintains that usually, the less fortunate people, who lack employment opportunities, get pushed into self-employment, and thus, help shape the informal sector. This notion of “pushed self-employment” has also been demonstrated by various countries in the Sub-

Saharan African region. Nelson and De Bruijn (2005), who study the informal sector in Tanzania, claim that the ever increasing size of this sector is due to lack of employment opportunities in the formal sector. Finally, Bigsten (2004) claims that usually, the business owners in the informal sector in Kenya lack experience and education. So, they are not in a position to compete with the firms in the formal sector nor do they find jobs in the formal sector. Hence, these individuals are left with the only option of setting up businesses in the informal sector as a means to survive.

These micro and small firms remain the same even after a considerable amount of time. Sandefur (2006) examines the Ghanaian census data of employment in manufacturing firms from 1987 through 2003. His analysis is based on the number of workers employed by firms, a proxy to a size of a firm. He concludes that in these two periods, few micro and small firms demonstrated sizeable increase in their operations in general, and firms do not make a transition from micro or small enterprises to large firms in particular.

One more characteristic of the industrial sector in Sub-Saharan Africa is anemic inter-firm linkages in the form of economic exchanges between the formal and informal economy. Very few enterprises are integrated into “value chains” and those chains are short (Altenburg and von Drachenfels, 2008). In his case studies on Kenya and Tanzania, Lawrence (2005) demonstrates that “linkages between the small scale and large scale sectors are weak, and backward linkages are particularly weak between small scale manufacturing and agriculture.” Also, Yumkella and Vinanchiarachi (2003) confirm that in the Sub-Saharan Africa region, small and micro firms are not in a position to supply semi-finished products to large firms because these micro and small firms are not capable of fulfilling requirements of large firms in terms of quality and uninterrupted supply of products. Finally, in a country-specific study on Uganda,

Kappel et al. (2004) study over 250 micro and small firms that belong to 10 sectors and are located in urban areas. They observe that a majority of the firms do not have any economic exchanges with other firms and that 80 percent of these firms have never supplied any products to medium or large firms.

Firms in the Sub-Saharan African region also lack export activities as part of their total sales. In 1980s, the countries in the region adopted liberalization and trade policy reforms. However, a majority of countries experienced an increase in imports without any formidable increase in exports (Ackah and Morrissey, 2005). The region experienced high growth rates in the early 2000s, partly because of increased commodity prices. However, the global share of merchandise export is less than 3 percent, thereby exposing the goods to be exported to high volatility of prices and exchange rates around the globe (Altenburg and von Drachenfels, 2008). Finally, among the firms under this study, more than 80 percent of the firms were not engaged in any kind of export — direct or indirect — activities.

1.7 The state of access to credit for enterprises:

Academicians in development research posit that for starting and thriving of a business venture, a healthy business-enabling environment is a key. One of the main components for a healthy business-enabling environment is an easy access to finance for these enterprises. However, access to credit can act as a major hurdle for firms, slowing down their growth prospects. To enhance access to credit for entrepreneurs and businesses, economies should strive to bolster not only the legal rights of creditors and borrowers under collateral and bankruptcy laws, but also the scope and openness of credit information (World Bank, 2014b). But, it posts numerous challenges for economies in developing countries to set up infrastructure that promotes access to finance. Barriers to access formal banking services can range from lack of money to

regular income to maintain minimum balances to financial illiteracy to fewer geographical foot prints of banks, especially in remote areas. Therefore, many people use both—formal and informal—sectors for financing their activities.

Restricted credit can lead to weak entrepreneurial initiative and inferior quality of projects in the private sector (Klapper and Parker, 2011). Because credit is originated by the banking system, it is important to get a closer look at the financial system in Sub-Saharan Africa, a process that may help us understand credit constrained faced by the private sector. Although banks in the region are ‘well-capitalized and over-liquid,’ they lend less to the private sector than banks in other developing countries (Beck and Cull, 2013). Commercial banks, which have fewer geographical foot prints but control a majority of total bank assets, face financial repression — a vehicle that allows a government to finance its deficit via relending money from banks (Reinhart and Rogoff, 2009). In addition, these banks earn high profits by charging fees on banking services coupled with a large interest rate differential between loans and deposits. Moreover, non-banking financial institutions and local money lenders represent a relatively small portion of the credit market wherein they offer loans of smaller sizes and higher interest rates compared to commercial banks (Hansen and Rand, 2014).

There are many problems with lending to businesses in the region. Sacerdoti (2005) notes that the severe problem of financing to small and medium enterprises in Sub-Saharan Africa can be attributed to lending practices of banks, which are for the most part, loan money to governments and large firms because these loans are less risky and also provide banks with adequate returns. He claims that micro financing, especially in Tanzania, has the potential to play the role of traditional banking system.

Additionally, gender is a powerful determinant of economic and financial opportunities in developing countries. The gender gap not only affects opening a bank account (globally, 47 percent of women own or co-own a bank account as opposed to 55 percent of men) but also influences saving methods. This gender gap also becomes evident in access to credit for female-owned enterprises (Asiedu et al., 2013). Participation of women in the labor force in Sub-Saharan Africa is staggering. In this region, women are more likely to be a part of the workforce and to own a business than elsewhere in the world because they cannot afford to stay at home (Blackden and Hallward-Driemeier, 2013). According to a World Bank (2012b) report on World Development Indicators, labor force participation rates for women of age 15 and above are 62 percent in Kenya and Zambia, 88 percent in Tanzania and 76 percent in Uganda. In comparison, that number is 57 percent in the U.S.! As regards Gender Equity Index (2012), which encompasses education, economic activity, and women empowerment on a scale of zero through one, Kenya scores 0.58, Uganda scores 0.63, Tanzania scores 0.60, and Zambia scores 0.49. The same index for the U.S. is 0.72.

Mobile money has emerged as a viable option to address the problem of financial inclusion. FinScope conducted surveys to measure the demand for and access to credit among adults in the African region. Their recent surveys found that mobile money is instrumental in increasing the number of people with financial inclusion. Mobile money has tremendous potential to enhance savings and loans services, a notion that is supported by reports at the country level. In Kenya, mobile money has credited with changing the financial landscape of the country forever. In Tanzania, although the service is mostly used for paying bills and fees at the individual level and for receiving and paying bills at the business level; it is foreseen as the next

major area of development. In Uganda, the number of registered mobile money users is higher than the number of formal bank account holders.

1.8 The data set:

The World Bank has been instrumental in boosting the business climate for economic development, especially in developing countries. It promotes healthy business environment in order to achieve an increase in employment opportunities and investments. The Enterprise Surveys Program is an ongoing World Bank's program that collects data with respect to experiences of enterprises and impressions about the business environment in which they survive and flourish. Starting from 2005, the program has been using a standardized methodology for administering a questionnaire for sampling, implementation, and quality control. Currently, the program covers more than 130,000 enterprises in 125 countries, most of which are client-countries of the World Bank. Because the survey program facilitates comparison across countries and time, it helps researchers to formulate policy recommendations for improvement in the business environment⁶.

The sample of the program contains nonagricultural-formal firms. The program strongly focuses on generating panel data, a process that facilitates researchers to study firms over a long period of time. It encompasses the information about enterprises with respect to firm characteristics, firm performance, and business environment. The anonymous raw data sets are made available to researchers on the web site of the program. The firms in the sample belong to all three sectors in the economy — manufacturing, retail, and services. The construction, transportation, and communication sectors are also part of the sample. However, agriculture, extractive industries, and fully government-owned firms are not incorporated in the sample. Also, only formal firms, which are registered, are part of the sample. A stratified random

⁶ For more detailed discussion on the Enterprise Surveys Program see World Bank's enterprisesurveys.org.

selection is used to draw samples. The standard strata for each country are geographical location, sectors, and firm size. The stratification under geographical location is geared toward including representatives of the prime economic centers in a country. The stratification of the sectors is based up on the size of the economy, and the stratification of the firm size is small (5-19 employees), medium (20-99 employees), and large (100 and more employees).

One peculiar characteristic of this wave of Surveys is that for the first time questions on adoption of mobile money by firms are included in the questionnaire. The Surveys on this particular set of questions begins by asking a question “does this establishment use mobile money for any of its financial transaction?” The Surveys further asks the firms the reasons behind using the service (analysis of this question appears in Figure 3). It also enquires whether the firms use mobile money to receive and to pay their customers and suppliers. Finally, it also provides the information about the annual percentage of payments and receipts transacted in the form of mobile money.

The questionnaire used is translated into the local language of the surveyed country. Also, pretesting and pilot interviews are conducted before the main field work is undertaken, resulting in fewer measurement errors. Moreover, the questions are simple and direct, and participating firms are specifically noted about the anonymity and confidentiality of their responses.

1.9 Contributions of the dissertation:

Thus far, the success stories of mobile money usage revolve mostly around individual users from many different backgrounds, each one varying in socio-economic class, educational level, banking habits/access, and location. Although there are a handful of papers that examine the usage of mobile money by firms, these studies suffer from a few notable shortcomings.

1. Sample sizes are as small as 40, making those studies inaccurate representatives of the population.
2. Geographical areas for field studies are oftentimes limited to a municipality, questioning whether the application of their findings is universal.
3. Independent surveys do not compartmentalize sectors; consequently, the results of these surveys fail to represent the respective country's economy. And
4. Finally, not one of these studies includes a detailed empirical analysis.

This dissertation, addresses all the aforementioned short comings, making the study an ideal representative of the population — a literary gap this dissertation seeks to bridge. The exposition not only draws on the very first empirical research for the use of this service by firms from Sub-Saharan African countries but also uses the data — which have observations of more than 3,000 firms — covers four countries in Sub-Saharan Africa, and includes all sectors in those economies.

This is the first dissertation that uses a current, rich, and comprehensive data set from the World Bank Enterprise Surveys Program, 2013.

This dissertation contributes to the existing body of literature in three ways:

1. Establishing a relationship between firms that use mobile money and their characteristics,
2. Analyses whether mobile money is complimenting the formal banking sector, and
3. Observes whether the usage of mobile money helps enterprises to facilitate easy access to credit.

This dissertation studies the relationship among four Sub-Saharan African countries— Kenya, Tanzania, Uganda and Zambia, making it a comprehensive study.

The dissertation also investigates whether female-owned firms in these four countries are more credit constrained than their male counterparts and whether mobile money can help these firms to mitigate this problem. This investigation adds to the ongoing debate on whether female-owned firms are credit constrained. If the tight credit by the financial sector is the prime reason for lack of access to finance in the private sector, then classification and characterization of credit rationed firms can help policy makers to devise guidelines to address the problem. The dissertation uses two newly introduced measures in the literature to identify firms that are credit constrained.

CHAPTER 1

WHICH FIRMS ARE MORE LIKELY TO USE THE MOBILE MONEY SERVICES?

1.1 Literature review:

Thus far, the literature on mobile money deals mainly with individual mobile money users. The individuals are shaped by varied social-economic levels, educational levels, banking habit/banking access, and regional locations. However, it is critical to go beyond the success stories of these individuals because some of them could become future entrepreneurs or business owners, making them potential users of the service in their enterprises. Moreover, the introduction of new products in the service — integration of mobile money and the formal banking service — contributes to increase the customer base for the same. Hence, this section examines the characteristics of firms that use the mobile money service. We seek to find out whether the mobile money service compliments the formal banking system.

The use of mobile money is also evident even during times of chaotic governance. When Morawczynski (2009) conducted a survey in Kenya, social unrest erupted due to the disputed presidential elections of Dec, 2007. Although a majority of banks and micro financial institutions were closed during the violence, Safaricom M-PESA outlets were functioning, empowering users to access their money to escape to their villages, and therefore survive the social disturbance. The survey indicates that urban agents saw the number of customers registering for the service double or triple, experienced urban migrants making withdrawals rather than deposits, and served over 500 customers every day.

Mobile money can also be put to use during the time of natural calamities. In their study on Rwanda, Blumenstock et al. (2012) show that there was a significant increase in airtime transfer to people in the Lake Kivu area, a region that was affected by an earthquake in 2008,

thus demonstrating that the service has the potential for allowing those affected by natural calamities to receive financial assistance too.

1.2 Hypotheses development and econometric methodology:

Unlike early individual cell phone and mobile money users, the early mobile money users in case of businesses were micro and small enterprises. After interviewing 75 firms in Kenya, Mas and Ng'weno (2012) claim that usually large firms in the formal sector are less likely to use the service than small firms in the informal sector. They argue that reasons for not using the service by large firms are twofold: 1. The mobile money transactions do not get reflected in the computer systems, therefore employees from the accounting departments have to enter each transaction manually, a process that increases time, errors, and frauds. 2. Transfer of funds from mobile money account to a firm's normal account takes four days, whereas checks take two days to get converted into cash.

There are a few other functional problems of the service providers. For example, Safaricom keeps mobile money transfer records of businesses up to six months. Also, system delays and downtime at Safaricom make it harder for customers, especially for those who wait until last minute to make a payment. Moreover, corporate transactions have a lower limit for transferring funds from firms' mobile money accounts to bank accounts. In addition, they have a maximum limit for receiving payment in the form of mobile money, and businesses like to see a hard copy of payment.

Kendall et al. (2012) study more than 800 small and medium enterprises from four urban and semi-urban locations in Kenya. The study concludes that the service is picking up in the small and medium enterprises. Their survey shows that 99 percent of the firms have at least one active service account and that 80 percent of them use mobile money at least once a week. That

number for individual users is one, in two weeks. In addition, 48 percent respondents say that their customers initiate the payment by the service, resulting in a cascading effect for the service usage. The customers claim they use the service because it is convenient for frequent payments that require traveling long distances. Moreover, they do not have to travel to unsafe areas to make or receive payments, and very importantly, they do not have to leave their work during business hours in order to take care of payments or receipts. Therefore, a key question is does the size affect mobile money used. Therefore, the first hypothesis is

Hypothesis 1a: Smaller firms are more likely to use the mobile money service than medium or large firms.

Where smaller firms are firms that employ in between 5 to 19 employees, medium –sized firms are firms that employ in between 20 to 99 employees, and large firms are the firms that employ more than 100 employees.

Age of the firm is another aspect of firm-level characteristic that influences the use of mobile money. Firms are more likely to use the service if they have a long term business association with their business partners. Thus, although the use of the service by businesses is a recent phenomenon, they are more likely to use the service if they are in the business for a long time and have built a trustworthy relationship with their customers and suppliers to transact money electronically. The age of the firm is thus a proxy to how long the firm is in the business. Therefore, the second hypothesis is

Hypothesis 1b: Older firms are more likely to use the mobile money service than younger firms.

Where younger firms are the ones that are in the business up to 5 years, middle-aged firms are the ones that are in the business in between 5 to 10 years, and older firms are the ones that are in the business for more than 10 years.

Joining the formal banking system has its own difficulties. For example, identity cards, which are issued by governments to keep a record of an individual's whereabouts, need to be presented while opening a bank account. The Sub-Saharan region is rural where poverty and lack of education are prevalent. Corruption together with bureaucracy makes it difficult for individuals to join the formal banking system. For businesses, often the lack of necessary accounting expertise and the lack of maintaining financial statements keep them away from using the formal banking system. More importantly, unlike banks in developed countries, banks in developing countries charge high fees on transactions sometimes charge fees on deposits, thus, making it challenging for businesses to get into the system.

Mobile money has emerged as a viable option to overcome the difficulties of joining the formal banking system. In its early stage, the mobile money service was not technically viewed as a bank. This was because it did not offer interest on mobile money account balances — a major concern, especially in countries where inflation is always on the rise — mobile money account balances did not facilitate access to credit, and money stored in mobile money accounts was not insured (Aker and Mbiti, 2010; Jack and Suri, 2011). Thus, the storage of money in the form of mobile money could be viewed as a rudimentary bank account. As the service started infiltrating Sub-Saharan Africa, the formal banking sector sensed tremendous potential in the market for offering bank-related services via mobile money, by teaming up with mobile money service providers. Mobile money service providers and banks thus collaborated and they then

started offering innovative services that are need based — a clear case of necessity leading to an invention according to the demand of the situation.

A year into its launch, Safaricom in Kenya began exploring various ways of increasing products and customers. In early 2008, Safaricom partnered with PesaPoint, one of the leading ATM service providers in Kenya. PesaPoint has more than 110 ATMs scattered, in all eight provinces of the country. These ATM centers offer many advantages to mobile money users: mobile money users do not need bank accounts to use ATMs; unlike mobile money agents, ATMs are accessible 24 hours 365 days a year; ATMs carry more cash than agents do; and ATMs can transact in large amounts (up to US\$ 500) whereas the commission structure of agents discourage them to deal with large transactions (Mas and Morawczynski, 2009). Therefore, when mobile money users employ the ATMs, they use in reality a different kind of banking service, thus getting them closer to joining the formal banking system. In essence, they are similar, but not the same.

There are some studies that demonstrate that mobile money service supports the formal banking service. From their two rounds of surveys of individual users of mobile money from Kenya, Jack and Suri (2011) demonstrate that the monetary value of M-PESA transactions is almost a “hundred times smaller than the average check transactions.” In Kenya, in Feb 2009, Zain, a mobile network company introduced an innovative mobile money service, taking it to a whole new level. It introduced Zap (oftentimes, establishing its stores next to M-PESA) with the slogan “mobile wallet”. Its services are linked to bank accounts, making it one of the reasons behind its growth rates. Zap’s initial growth rate (200,000 since its launch) was almost the same as M-PESA’s (260,000 in first three months). This growth rate for Zap was an indication that users view the service solely as means of financial transactions that they like to use coupled with

their bank accounts. Additionally, Zap's growth rate is an indication that mobile money users are more likely to have bank accounts, proving mobile money compliments the banking system.

This leads to investigating whether firms that use mobile money also have bank accounts. In other words, the hypothesis tests whether mobile money compliments the formal banking sector.

Hypothesis 1c: The firms that use mobile money services have bank accounts.

Probit Model:

Prob. (Firms that use mobile money for financial transactions_{ij}) = ($\beta_0 + \beta_1$ Firm – level characteristics_{ij}) + γ_j country dummies

Thus, the probability of the "i th" firm that uses the service for its financial transactions in the "j th" country depends upon various firm characteristics such as age, size, sector, bank accounts, and legal status.

To test these three hypotheses, the characteristics of the firms, such as size (small, medium, and large), age (up to 5 years, 5-10 years, and greater than 10 years) , and banking access are taken into account. One more interesting dimension of firm characteristic to look at is the sector to which the firms belong. Because the data set encompasses all three sectors— manufacturing, retail, and services—of the economy, I can investigate whether the sector to which the firm belongs has any impact on the use of mobile money. The model also controls for the legal status of the firm. These forms of firm-level characteristics are used extensively in the literature (Asiedu et al., 2013; Beck et al., 2013; Clarke et al., 2012; Rajan and Zingales, 1996).

The variables are calculated as follows. The dependent variable is use of mobile money by firms for financial transactions and this has been given a value of "1" if firms use the service and "0" otherwise. The key independent variable is an array of firm-level characteristics. In particular, the array has dummy variables for firm sizes (small firms: up to 19 workers, medium

firms: between 20 and 99 workers, and large firms: 100 or more workers). The array has age of the firm (up to 5 years, in between 5-10 years, and more than 10 years). It also includes a dummy whether firms have bank accounts. Finally, it also includes a sector of the industry where a firm belongs to a sector such as manufacturing, services, or retail. The model uses Standard Industrial Code (SIC) code for the main product as the industry type of the firms surveyed. The model also controls for the legal status of the firms. Finally, it also uses a country fixed effect to control for time invariant variables among four countries.

1.3 Results:

The base-line probit regression coefficients (Table 6, column 1) of the mobile money usage by firms show interesting insights into these firms' characteristics. The older firms (10-99 years) are 20 percent more likely to use the service than younger or middle-aged firms. The firm's size matters. Specifically medium and large firms are less likely to use the service than small firms. In particular the coefficient for large firms is more negative (45 percent) than for medium-sized firms when compared to the coefficient of small firms. Also, firms that use mobile money are 22 percent more likely to have bank accounts. However, a sector to which the firm belongs does not have any effect on the use of mobile money. Also, being a sole proprietor, limited liability, or partnership firm does not make the firm more or less likely to use the service.

As regards businesses at the country level, businesses in Zambia are less likely to use the service than businesses in Kenya, followed by businesses in Tanzania and Uganda. Therefore, it is interesting to analyze as to why mobile money services are more successful in Kenya than in the other three countries. This is because the introduction of the mobile money service and its penetration among the four countries under study differs significantly. In just one year, Kenya had 9 million customers and almost 17,000 agents, half of them outside the urban areas

Table 6: Results for the firms that use mobile money and their characteristics
Dependent variable (binary): Use of mobile money by firms for financial transactions

<i>Independent Variables</i>	<i>Regression Coefficients (Probit model)</i>	<i>Regression Coefficients (Linear probability model)</i>
Firm-Level Characteristics		
Firm Age [dummy, the omitted age is up to 5 years]		
Medium-aged (5 to 10 years)	0.127 (1.32)	0.040 (1.40)
Old-aged (10 to 99 years)	0.198 (2.30)*	0.065 (2.48)*
Firm Size [dummy, the omitted size is small firms (5 to 19 workers)]		
Firm size: medium (20 to 99 workers)	-0.246 (-3.81)**	-0.079 (-3.92)**
Firm size: large (more than 100 workers)	-0.450 (-4.48)**	-0.146 (-4.67)**
Sector type [dummy, the omitted sector is services sector]		
Sector type: manufacturing	-0.051 (-0.68)	-0.015 (-0.65)
Sector type: retail	-0.012 (-0.15)	-0.002 (-0.07)
Firms with bank accounts		
	0.219 (2.73)**	0.069 (2.78)**
Firm's legal status [dummy, the omitted type is limited liability]		
Firms with sole proprietorship	0.034 (0.50)	0.011 (0.56)
Firms with partnership	0.108 (1.27)	0.030 (1.16)
Country Dummies ¹		
Tanzania	-0.189 (-2.41)*	-0.072 (-2.46)*
Uganda	-0.158 (-2.24)*	-0.059 (-2.19)*
Zambia	-1.856 (-17.97)**	-0.475 (-23.34)**
Pseudo R-Squared	0.1609	0.43762
Number of observations	2,719	2,719

Source: Based on author's calculations of the Enterprise Surveys (2013)

Note: t-statistics are in parentheses. ***, **, * are statistically significant at 1, 5, and 10 percent significance levels respectively. The omitted country is Kenya ¹.

Table 7: Probit regression results for the micro firms in Kenya that use mobile money and their characteristics

Dependent variable (binary): Use of mobile money by firms for financial transaction

<i>Independent Variables</i>	<i>Regression Coefficients</i>
<i>Firm-Level Characteristics</i>	
Firm Age [dummy, the omitted age is up to 5 years]	
Medium-age (5 to 10 years)	0.302 (2.17)*
Old-age (10 to 99 years)	0.080 (0.64)
Firm Size [dummy, the omitted size is micro firms (1 to 5 workers)]	
Firm size: small (5 to 19 workers)	-0.208 (-2.01)*
Firm size: medium (20 to 99 workers)	-0.337 (-2.71)**
Firm size: large (more than 100 workers)	-0.365 (-2.37)*
Sector type [dummy, the omitted sector is services sector]	
Sector type: manufacturing	-0.419 (-3.36)**
Sector type: retail	-0.167 (-1.36)
Firms with bank accounts [dummy]	-0.084 (-0.65)
Firm's legal status [dummy, limited liability]	
Firms with sole proprietorship	-0.030 (-0.33)
Firms with partnership	0.155 (1.22)
R-Squared	0.0366
Number of observations	1,089

Source: Based on author's calculations of the Enterprise Surveys (2013)

Note: t-statistics are in parentheses. ***, **, * are statistically significant at 1, 5, and 10 percent significance levels respectively.

(Aker and Mbiti, 2010). As far as individual users in the country are concerned, 73 percent are mobile money users, and 23 percent use this service at least once a day (Demombynes and Thegeya, 2012). Again, in the same country, since the inception of the service, on an average more than 10,000 new users signed up from the last quarter of 2007 and almost 68 percent of the

households have at least one family member who is a registered user of the service (Jack and Suri, 2011). Interestingly, the service formed 13.3 percent of GDP (International Finance Corporation, 2011).

There are a few other reasons for the uptake of the service in Kenya. Heyer and Mas (2009) argue that the success of the service depends upon three factors: transactions with large volume but small denominations, needed to offset low transaction costs and margins, as well as fixed costs; speed of penetration in the market: needed to address the age old -“chicken and egg problem,”- between users and agents; the coverage: anytime, anywhere, and anyone (send money). They claim that these three conditions are perfectly satisfied by the service in Kenya. A phenomenal growth in Kenya is also attributed to domestic remittances. They further note that in Kenya, registration for the service is easy because an account can be opened just by showing a national identity card, which most people possess. However, in Tanzania, a country without the cards, registration is tiresome, and often, accounts cannot begin functioning on the spot. Also, anti-money-laundering (AML) laws make registration harder for users who want to transact above US\$ 1300. Finally, Kimenyi and Ndung'u (2009) maintain that the uptake of the service in Kenya is credited to judicious macroeconomic policies, a conducive legal and tax environment, a healthy competition, and a favorable, legal and tax system for businesses.

In Tanzania, Vodacom, a company where-65 percent holding is owned by Vodafone and 35 percent owned by a Tanzanian shareholder-Mirambo Ltd.-launched its service in April 2008, by collaborating with six super dealers, to develop a business relationship with retail agents. Thus, these six super dealers took center stage in structuring the network. However, without direct control over its business, Vodacom was not in a position to penetrate the market, effectively (Heyer and Mas, 2009). Although commissions offered to retail agents in Tanzania

were comparable to those in Kenya, a lack of a credible relationship between the company and the retail agents led to a slower penetration of the service. Therefore, the company built its own network, resulting in additional expenses. Nevertheless, Vodacom remains the market leader (5.9 million subscribers capturing 79 percent of the market as of 2009), even though there are other three service providers- Zain, Tigo, and Zantel. Initially, Vodacom launched the service for nationwide remittances. However, this kind of service is less needed in Tanzania than in Kenya because the trend of urban migrants sending money to family members in rural areas is not as common as it is in Kenya (International Finance Corporation, 2010).

In Uganda, the service, which was launched in Dec, 2008, has three mobile money service providers: MTN Uganda, Uganda Telecom, and Zain Uganda. In 2010, there were about 9.9 million subscribers among them around 45 percent use it for money transfer, which is one of the prime factors for money transfer (Ndiwalana et al., 2010). The first two service providers subtract transaction costs automatically from the users' accounts, but for Zain Uganda, its retail agents collect transaction charges that are recommended meaning that the agents have a leeway to change these charges depending upon demand and supply. According to a Bank of Uganda (2013) annual report, there was a 40 percent increase in mobile money transactions by value from the period of July, 2012 to July, 2013. Also, domestic remittances can be on the rise, as students who are studying at institutes away from their homes. However, these remittances are not for a long period of time and therefore cannot be viewed as permanent or recurrent business.

In Zambia, the service is relatively new. The mobile money service was first introduced by Mobile Transactions Zambia (MT) in 2009 that offered services such as payments and receipts. According to the latest Bank of Zambia report, the number of mobile money service

users was more than 126,000 in Dec, 2009, and the same number rose to 250,000 by the end of 2010. During the same period, the number of ATMs was 428 and 509 respectively. According to a survey conducted in mid of 2010 by Intermedia (2010) in Zambia, two third of the respondents said that the service was not available in their area, making the country a market for future growth of the mobile money service providers. In 2012, another company named Zoono started the service with a goal of providing access to the mobile money not only for individuals but also small and medium enterprises.

As a robustness check, I run a linear probability model with robust standard error. The regression coefficients of the test are displayed in Table 6, column 2. The linktest is performed to check the goodness of fit for the model. The squared term in the linktest does not have more explanatory power, indicating that the model passes the test. Furthermore, predictors are grouped to test visually that the model is accurate.

I also investigate the relationship between usages of mobile money by micro firms (see Table 7). A data set is only available for micro firms in Kenya. Nevertheless, its investigation offers a few interesting insights at the micro-firm level. As far as size is concerned, small, medium, and large firms are less likely to use the service than micro firms. As expected, the coefficient on the large-sized firms is the most negative, indicating that the larger the firm, the less likely it is to use the service. Also, medium-aged firms are more likely to use the service than younger-aged firms. Additionally, firms that belong to the manufacturing sector are less likely to use mobile money than firms that belong to the services sector.

In the data set, the information is also available on whether firms use the service for customers and suppliers and what percentages of these payments are made using the service. To analyze this information, I use Cragg's tobit alternative model Burke (2009) instead of the tobit

model. This is because in the sample, currently, among the firms that use mobile money, about 64 percent of firms receive payments from their customers in the form of mobile money and 3 percent of them use the service for more than 80 percent of customer-related transactions. Similarly, more than 44 percent of businesses use the service to pay their suppliers and 3 percent of them use mobile money for more than 80 percent of supplier-related transactions. The Cragg's tobit alternative model allows independent variables to affect a decision variable (such as whether to use the service for suppliers or customers) differently from the extent variable (i.e., the percentage of the transactions if the firms use the service). The results for the Cragg's Tobit alternative model are presented below (see Table 8). The firms that use money to pay for their suppliers are less likely to be large firms than small ones, but more likely to be partnership firms than limited liability firms. On the other hand, the firms that use the service to receive money from their customers are less likely to be medium and large firms than small firms, more likely to be manufacturing and retail firms than services firms, and more likely to be sole proprietorship and partnership firms than limited liability firms.

1.4 Conclusions and policy recommendations:

The dissertation uses the World Bank's Enterprise Survey Program data set from 2013 to study the characteristics of the firms that use mobile money services in four Sub-Saharan African countries. The Survey was conducted in Kenya, Tanzania, Uganda, and Zambia and consisted of almost 3000 firms in all sectors of the economy, thus making its analysis universal to the African region. The dissertation uses a probit model to study characteristics of firms that use the service. The results indicate that older firms are 20 percent more likely to use the service than younger firms. Also, medium-sized firms are 24 percent and large firms are 45 percent less likely to use the service than small firms. Finally, firms that use the service are 22 percent more likely to

Table 8: The Cragg's truncated alternative model regression results for the firms that use mobile money for suppliers and customers vis-a-vis their characteristics

Dependent variable (binary): Use of mobile money by firms for their suppliers and customers

<i>Independent Variables</i>	<i>Regression Coefficients (Suppliers)</i>		<i>Regression Coefficients (Customers)</i>	
	<i>Probit</i>	<i>Truncated</i>	<i>Probit</i>	<i>Truncated</i>
<i>Firm-Level Characteristics</i>				
Firm Age [dummy, the omitted age is up to 5 years]				
Medium-aged (5 to 10 years)	0.2082 (1.69)*	-7.3819 (-0.31)	0.2985 (2.66)***	33.5603 (1.12)
Old-aged (10 to 99 years)	0.3068 (2.75)**	-12.9693 (-0.60)	0.2385 (2.33)**	7.2209 (0.28)
Firm Size [dummy, the omitted size is small firms (5 to 19 workers)]				
Firm size: medium (20 to 99 workers)	-0.1227 (-1.58)	-26.9874 (-1.53)	-0.2299 (-3.14)**	-25.8087 (-1.24)
Firm size: large (more than 100 workers)	-0.4605 (-3.47)***	-164.9271 (-2.08)**	-0.5942 (-4.99)***	-154.0302 (-1.79)*
Sector type [dummy, the omitted sector is services sector]				
Sector type: manufacturing	-0.0691 (-0.75)	33.7529 (1.56)	-0.0388 (-0.45)	90.1133 (2.00)*
Sector type: retail	-0.0370 (-0.38)	13.8277 (0.68)	0.0189 (0.21)	60.2921 (1.67)*
Firms with bank accounts				
	0.2073 (2.06)**	-32.4044 (-1.61)	0.2532 (2.66)***	-32.2613 (-1.35)
Firm's legal status [dummy, the omitted type is limited liability]				
Firms with sole proprietary	0.0646 (0.77)	6.0730 (0.37)	-0.0463 (-0.60)	51.3932 (1.80)*
Firms with partnership	0.1883 (1.72)**	48.6591 (2.09)**	0.0983 (0.95)	66.7208 (1.90)*
Country Dummies				
Wald chi2(12)	Yes 117.91	Yes 117.91	Yes 227.94	Yes 227.94
Number of observations	2,645	2,645	2,576	2,576

Source: Based on author's calculations of the Enterprise Surveys (2013)

Note: t-statistics are in parentheses. ***, **, * are statistically significant at 1, 5, and 10 percent significance levels respectively.

have bank accounts. However, firm level characteristics such as sector and legal status do not less likely to make the firms use the service. Moreover, firms in Zambia are less likely to use mobile money followed by firms in Tanzania and Uganda than firms in Kenya.

The data is also analyzed for firms that use the service for their suppliers and customers. The results for the Cragg's tobit alternative model indicates that the firms that use mobile money to pay for their suppliers are less likely to be large firms than small ones, but more likely to be partnership firms than limited liability firms. On the other hand, the firms that use the service to receive money from their customers are less likely to be medium and large firms than small firms, more likely to be manufacturing and retail firms than services firms, and more likely to be sole proprietorship and partnership firms than limited liability firms. The data set for micro firms in Kenya indicates that small, medium, and large firms are less likely to use the service than micro firms. Also, medium-aged firms are more likely to use the service than young firms.

One of the potential reasons for not using the service by medium and large firms is the functional characteristics of the service such as, a cap on the money transacted, time needed to see the money transferred, and a back-up service for records by service providers. Usually, medium and large businesses have monetary value of financial transactions more than the cap set by service providers. They have accounting departments to maintain records of financial transactions. Therefore, shortcomings of the service may discourage the above-mentioned firms from using mobile money.

The policy recommendations for the providers of mobile money stem from a few problems associated with the service. Mas and Ng'weno (2012) cite a few shortcomings associated with the service: mobile money transactions do not get reproduced in the computer systems of businesses, therefore employees from the accounting departments have to enter each

transaction manually, a process that increases time, errors, and frauds; transfer of funds from mobile money account to a firm's normal account takes four days, whereas checks take two days to get converted into cash; system delays and downtime at Safaricom make it harder for customers who wait until the last minute to make a payment; corporate financial transactions have a lower and upper limit on transferring funds from the firms' mobile money accounts to bank accounts; Safaricom keeps the records of mobile money transfers for businesses only up to six months; and businesses like to see a hard copy of payment.

The providers of mobile money have tremendous potential to serve the business community, making the service a win-win proposition for both parties involved. To this end, the dissertation provides a few policy recommendations for mobile money service providers. One of the potential reasons for not using the service by medium and large firms can be the cap (US\$ 500) on the amount of money one can transfer in one transaction. Generally, medium and large businesses have transactions that are more than the cap of US\$ 500 per transaction. Thus, if the service providers increase the limit on monetary transactions, they may experience an increase in their customer base.

Also, service providers keep the record of monetary transactions only for six months. This also acts as a major problem for accounting departments in medium and large firms. Usually, accounts in medium and large firms are audited; thus these firms need records of all financial transactions for a given financial year. Therefore, service providers need to maintain records of financial transactions at least for a considerable amount of time (say five years), they may get more customers. Furthermore, these transactions need to be made available upon demand without any time delay. Transactions take three days to be reflected at the firm level. Thus, it would be beneficial for all parties involved, if transactions get reflected at the firm level

on real time basis. Finally, system delays and downtime at the end of the service providers act as a hurdle for the business community to view the service as a reliable and viable option to perform financial transactions. Therefore, service providers need to pay attention to develop the dependable infrastructure of the service.

The governments in these countries can play a role in regulating the transactions via this service. In particular, financial transactions via mobile money can be used for auditing and tax purposes. This specific provision will help small and micro businesses especially, because they often do not have resources and expertise to maintain records of their financial transactions. Additionally, these electronic transactions can be used by financial institutions to scrutinize creditworthiness of businesses, a key player in granting and extending credit.

CHAPTER 2

DO THE FIRMS THAT USE MOBILE MONEY ARE LESS CREDIT CONSTRAINED CREDIT THAN OTHER FIRMS?

2.1 Literature review:

The banking system plays a vital role in the economy by providing financial resources in the society where they are needed the most. It is viewed as a channel for deploying financial resources to their optimum use. The direct benefits of access to financial resources are numerous. The adequate financial resources may be put to work by meeting a large spectrum of investment and operational activities. There is a widespread consensus that access to finance favorably affects firm performance (Beck and Demirgüç-Kunt, 2008; Beck et al., 2006; Klapper et al., 2006). It is argued that faster firm growth is not feasible without a constructive support from the banking sector.

Barriers to access for financial resources can take various forms (Demirguc-Kunt et al., 2008). They range from eligibility for opening a bank account in terms of documentation and paperwork to affordability in terms of fees and minimum balances to physical barriers in terms of bank branches and ATMs. Also, applying and processing for various financial products such as loans, overdraft, and line of credit may be barriers because they often take a long time and require collateral.

This problem of access to credit for enterprises is particularly severe in Sub-Saharan Africa. Sacerdoti (2005) maintains that in Sub-Saharan Africa, bank credit to private sector as a percentage share of GDP is as low as 20 percent. He identifies a few things that are necessary to deepen the banking sector in Sub-Saharan Africa: reliable information of a borrower; availability of collateral and it should be enforceable; an independent and effective judicial system;

competitive environment among banks; and innovation in lending practices to suit the financial needs of the borrower. He also identifies various dimensions to develop and foster a credit culture in the region. These dimensions are improved book keeping and accounting standards, availability and nature of collateral, and reliable credit information.

A World Bank (2014b) report on Doing Business notes various measures that have been taken to enhance access to credit by the countries under study. In 2010, the government of Kenya passed and implemented a law on credit bureaus that would provide “a regulated and reliable system of credit” for credit providers. A World Bank (2010) report on Doing Business notes that Zambia strengthened access to credit information by making it mandatory for banks and non-bank financial institutions registered with Bank of Zambia to use credit reference reports and provide data to the Bureau. In addition, a World Bank (2011b) report on Doing Business notes that Uganda attempted to enhanced access to credit by establishing a new private credit bureau. Finally, a World Bank (2014b) report on Doing Business observes that Tanzania improved its credit information system through new regulations that provide for the licensing of credit reference bureaus and outline the functions of the credit reference data bank.

There is a positive association between the existence of foreign banks and availability of private credit. There is overwhelming evidence that the presence of foreign banks leads to many positive changes in the factors surrounding lending and borrowing. The foreign banks enhance domestic competition, making capital markets efficient; expand access of financial services, increasing proliferation of financial services; and strengthen financial achievements of their clients, improving financial stability of the capital markets (Bonin et al., 2005; Clarke et al., 2003; Clarke et al., 2005; Clarke et al., 2001; Crystal et al., 2002; Cull and Martinez Peria, 2010).

The presence of foreign banks in Sub-Saharan Africa is strong. By 2009, the percentage of foreign bank assets among total bank assets was 38 percent in Kenya, 57 percent in Tanzania, 89 percent in Uganda, and 100 percent in Zambia. The presence of foreign banks is touted for a variety of reason, ranging from an improvement in private credit to an increase in financial deepening to enhance competition (Clarke and Cull, 2006; Clarke et al., 2003; Crystal et al., 2002). However, the presence of foreign banks in low-income countries, such as countries in Sub-Saharan Africa, has a “negative impact on credit due to limited market share, where enforcing contracts is costly and where credit information is limited,” (Claessens and Horen, 2014).

A few studies offer insights on the formal bank’s lending practices to businesses. Financial Sector Assessment Program (2003) reports that banking sector in Uganda is dominated by four foreign-owned banks, controlling 73 percent of total banking sector’s assets, 68 percent of loans, and 75 percent of deposits⁷. Also, there is a persistent shortfall of long-term loans, for example in June, 2002; more than 85 percent of the loans were short-term in nature. However, the country has a “fairly well-developed and diversified microfinance industry.” But, their financial conditions are not strong enough to cater to a large number of people. Financial Sector Assessment Program (2010) report enumerates lending practices for Tanzania. The report notes that in December, 2009, large commercial-domestic banks (16.4 percent assets of GDP) and major commercial international banks (9.7 percent assets of GDP) and foreign banks (16.8 percent assets of GDP) together dominate the banking system in the country. These banking institutions primarily serve large enterprises that represent up to 70 percent of these banks’ loan portfolio. The report further notes that smaller banks lack extended geographical foot prints and

⁷ Financial Sector Assessment Program (FSAP), which is a joint undertaking of the World Bank and the International Monetary Fund, reports on a country’s financial structure.

are not in a position to compete with large banks. Moreover, only one in six individuals in the country has access to financial services offered by formal institutions and that number drops down to less than one in ten for the rural areas.

2.2 Hypothesis development and econometric methodology:

The analysis of the Enterprise Surveys Program (2013) data reveals the kind of relationship businesses have with the banking system. The survey asked a question whether enterprises have checking and or savings accounts. The survey also asked a separate question whether enterprises have the overdraft facility. The cross-sectional analysis of these two questions reveals interesting insights (see Table 9).

Table 9: The number of firms with and without bank accounts vis-a-vis overdraft facilities and line of credit

	<i>Have checking and or savings accounts</i>	<i>Do not have checking and or savings accounts</i>
<i>Have the overdraft facility</i>	456	36
<i>Do not have the overdraft facility</i>	1751	388
Total	2213	424
<i>Have the line of credit or loan facility</i>	533	50
<i>Do not have the line of credit or loan facility</i>	1671	366
Total	2204	416

Source: Based on author's calculations of the Enterprise Surveys (2013)

Although almost all firms have accounts with banks, one third of these firms do not have overdraft facilities with banks. Moreover, the same trend is observed in the cross-sectional analysis of having checking and or savings accounts and having a line of credit or loan. Out of the firms that have accounts with banks but do not have overdraft or credit facilities with banks, small and medium enterprises are in large number than large enterprises.

Lack of access to credit is particularly severe in developing countries where most entrepreneurs rely on personal funds or retained earnings to start or expand their businesses (World Bank, 2012a). The Sub-Saharan Africa region is not an exception to this premise. This problem is predominantly observed for firms that are not large. It is echoed by a pattern in the form of how businesses of varied sizes (measured in terms of number of workers employed by them) finance their working capital. The percentages of firms that finance their working capital in between 50 and 100 percent by retained earnings are essentially small and medium firms. More than 80 percent of the small firms and more than 75 percent of the medium firms finance their working capital via retained earnings (see Figure 4). However, that number is 60 percent for large firms. Moreover, almost the same pattern is observed when financing for fixed assets is concerned. Additionally, the number of small and medium firms investing in fixed assets is less than one third of the total firms in the sample.

One more avenue to finance working capital can be financing by business partners, i.e., trade credit. This form of financing, which is usually of a short term nature, is widely used by firms. Oftentimes, trade credit is used by firms that have a limited access to financial institutions (Petersen and Rajan, 1997). Indeed, in the sample under study, 47 percent of the small firms use trade credit for working capital, and that number is 32 percent of medium-sized firms. Moreover, 114 firms in the sample use trade credit to finance their fixed assets. It is a very dangerous financing pattern, because these firms are using a short term financing to finance a long term investment asset.

In spite of reforms undertaken by the governments along with a strong presence of foreign banks in the region, access to credit for firms is not encouraging. Although businesses have checking or savings accounts with banks (see Table 9), they do not necessarily have a

borrower-lender relationship with them. Additionally, a large number of firms are using retained earnings to finance their working capital and fixed assets needs (see Figures 4 and 5). This trend is especially prevalent among small and medium-sized enterprises. If this is the case, then there is a strong possibility that these businesses are more geared to use mobile money for financial transactions than to use bank accounts for the same.

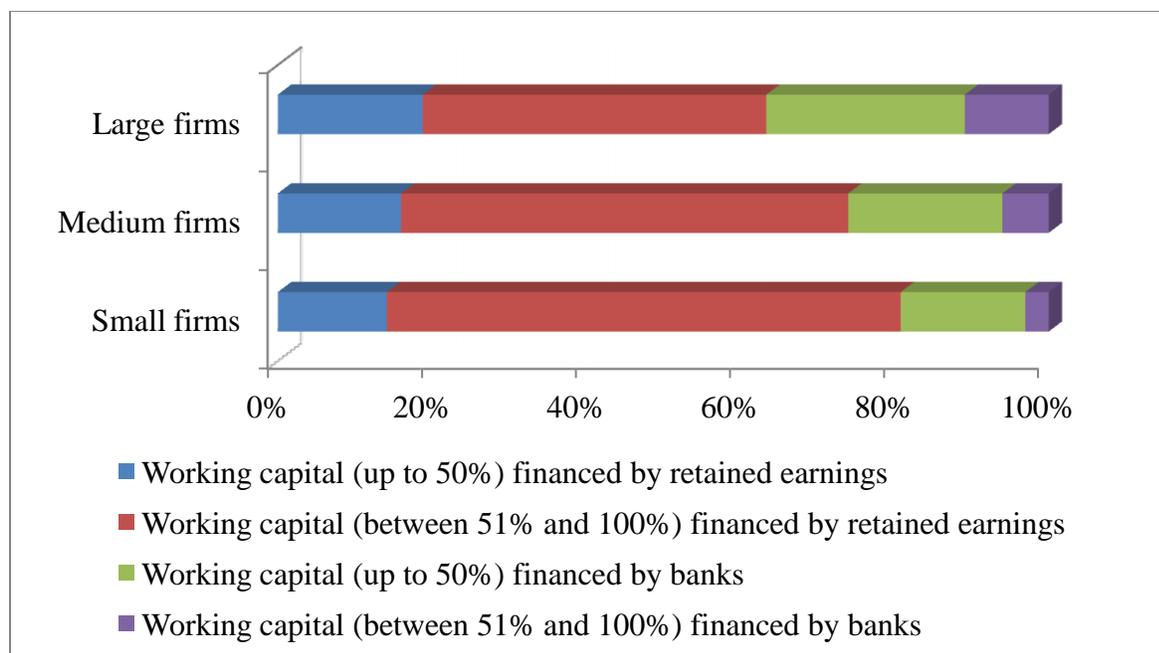


Figure 4: Percentage of working capital financed by retained earnings and banks

Source: Based on author's calculations of the Enterprise Surveys (2013)

The mobile money service has been evolving and emerging as a viable option to increase a customer base of the unbanked population. In March 2010, Safaricom has teamed up with Equity Bank to launch a mobile money product known as M-KESHO⁸, a fully-integrated mobile savings service. By the end of 2010, there were, at least, seven service providers offering some form of access to bank accounts via mobile phones. A user of M-KESHO does not require a formal bank account, but the user can sign up for it via Safaricom agents. In 2011, the user could

⁸ For more detailed discussion, see Demombynes, G., Thegeya, A., 2012. Kenya's mobile revolution and the promise of mobile savings, World Bank Policy Research Working Paper, Available at SSRN 2017401

earn an interest of 0.5 percent per year on deposits up to 2000 Kenyan shillings, and could pay an interest of 3 percent per year on loans above 10,000 Kenyan shillings (inflation at that time was 18.9 percent). In the first six months, M-KESHO had 600,000 plus subscribers. Banks have sensed the potential of this nascent market and have started to build up their own agent networks.

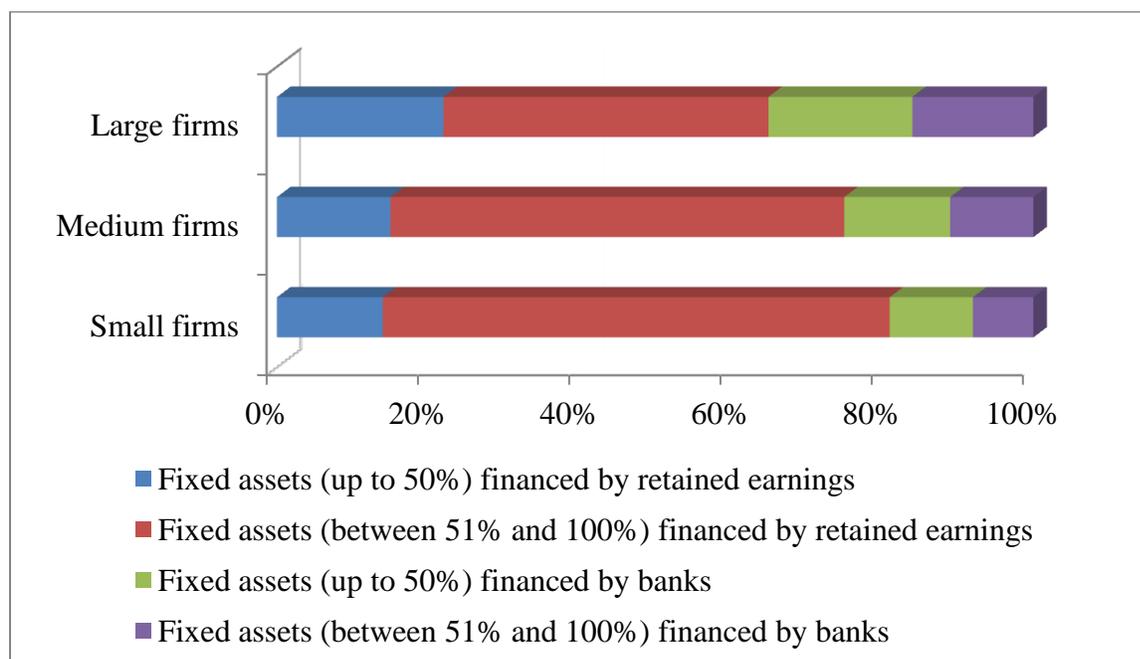


Figure 5: Percentage of fixed assets financed by retained earnings and banks

Source: Based on author's calculations of the Enterprise Surveys (2013)

The mobile-money-service-provider companies team up with banks to offer more services in order to increase their customer base. These new services are not only offering interest on balances in mobile money accounts, but also offer loans. Banks can use historical records of transactions in the form of mobile to extend credit to businesses. This is due to the fact that a majority of businesses lack audited accounts, a key to grant credit by banks. One of the main reasons for the lack of managing accounts is that these businesses do not have sufficient infrastructure to maintain books of accounts. In this situation, the use of mobile money for

financial transactions by firms can emerge as a potential option — for both businesses and banks — to develop a lender-borrower relationship.

This discussion leads me to examine the question whether the usage of mobile money by firms help them to have easy access to finance. To answer this question, following hypothesis and ordered-probit model are used.

Hypothesis: The firms that use mobile money are more likely to have credit than other firms.

Ordered-Probit Model:

$$\text{Access to finance}_{ij} = \beta_0 + \beta_1 \text{Use of mobile money}_{ij} + \beta_2 \text{Firm - level characteristics}_{ij} + \gamma_j \text{Country dummies}$$

Thus, the probability of the "*i th*" firm experiences obstacles in obtaining credit in the "*j th*" country depends upon whether the firm uses mobile money, and various firm-level characteristics such as size, age, sector, export activities, audited accounts, form of liability, and banking habits.

Measuring access to finance status of firms:

The access to finance status of firms, which is a dependent variable, is constructed by using the financial matters section of the Enterprise Surveys. The model uses two newly introduced measures of credit constrained variable to identify access to finance status of the firms.

Credit-constrained variable measurement 1:

Under this measurement, the dissertation follows Allen et al. (2014) definition of credit-constrained firms. According to this definition, a firm is characterized a value of “3” if the firm

has a bank loan or line of credit, is ascribed a value of “2” if the firm has a bank account and is given a value of “1” if the firm does not have a bank account or a bank loan or line of credit.

In the first measurement, the dependent variable takes three possible values (3, 2, and 1) corresponding to “firms with bank loans or line of credit,” “firms with bank accounts,” and “firms with no bank accounts or bank loans.” Because the dependent variable is categorical, the model is estimated as an ordered-probit model. A positive regression coefficient on a variable indicates that an increase in the variable will increase the likelihood that firms will have bank loans or line of credit. Whereas, a negative regression coefficient on a variable indicates the opposite, that is an increase in that variable means that firms will have no bank accounts or bank loans or line of credit.

Credit-constrained variable measurement 2:

Following , Kuntchev et al. (2012) the dissertation constructs two groups that measure the degree to which the firms are credit rationed during the fiscal year as indicated by the survey.

The first group consists of firms that are credit constrained. In order to be called credit constrained, this group comprises of firms that fulfill all of the following conditions.

1. Apply for loans or line of credit but their applications got rejected.
2. Do not apply for credit because the terms and conditions of loans are not favorable. These terms and conditions could be forms of a complex application process, unfavorable interest rates, high collateral requirements, insufficient size of loans or maturity, and doubts about the loan application approval.

The second group consists of firms that are not credit constrained. This group has both firms that have external sources of financing and firms that do not. It includes firms that meet the following conditions.

1. Do not apply for external funding because they have sufficient capital — in the forms of retained earnings — to satisfy their financial needs.
2. Applied for loans during the last fiscal year and had loans outstanding at the time of survey.

Thus, credit constrained is a dummy variable for credit constrained firms, which is equal to one if the firm is not credit constrained, and zero otherwise.

The model controls for various standard firm-level characteristics. It controls for firm-level characteristics which may set a stage for the firm with respect to the degree of ease for access to financial products that are offered by banks. In particular, the regression has dummy variables for firm sizes (small firms: up to 19 workers, medium firms: between 20 and 99 workers, and large firms: 100 or more workers). Also, the regression controls for a type of the industry a firm belongs. In particular, within the economy, some types of industries depend more heavily on external financing than others and these variations in terms of external financing generally do not vary across the countries (Rajan and Zingales, 1996). The model uses Standard Industrial Code (SIC) code for the main product as the industry type for firms in the survey. The model also controls for other firm-level characteristics such as age, export activities, audited accounts, and legal status. Finally, it also has country dummies.

2.3 Results:

I begin the econometric analysis by conducting a nonparametric test. I use the Chi Square (χ^2) test because it is the most used statistical test among the nonparametric statistical tests family for testing independence of variables.

Table 10: Nonparametric test results for credit-constrained measurement 1 and the usage of mobile money

<i>Dependent Variable from credit constrained measurement 1</i>	<i>Key independent variable: Use of mobile money for financial transactions</i>		<i>Total</i>
Dummy values	0	1	
1	354	275	629
2	1,278	636	1,914
3	289	117	406
Total	1,921	1,028	2,949

Pearson chi2 (2) = 30.5156 Pr = 0.000

Source: Based on author's calculations of the Enterprise Surveys (2013)

The results of the test for both the measures of credit constrained measurements vis-à-vis the usage of mobile money for financial transactions along with the crosstab of the data are given above and below (see Tables 10 and 11). The values of Chi Square for both measurements are statistically significant.

Table 11: Nonparametric test results for credit-constrained measurement 2 and the usage of mobile money

<i>Dependent Variable from credit constrained measurement 2</i>	<i>Key independent variable: Use of mobile money for financial transactions</i>		<i>Total</i>
Dummy values	0	1	
0	920	588	1,508
1	772	333	1,105
Total	1,692	921	2,613

Pearson chi2 (1) = 21.9153 Pr = 0.000

Source: Based on author's calculations of the Enterprise Surveys (2013)

The table below (see Table 12) shows the regression results for the mobile money usage and credit constrained status of the firms. The results for both the measures of credit-constrained firms indicate that firms that use mobile money for their financial transactions are less likely to be credit constrained than other firms. In particular, for the credit constrained measurement 1, the coefficient on the usage of mobile money indicates that firms that use mobile money are 25 percent more likely to have bank loans or line of credit than other firms.

Table 12: Regression results for credit-constrained status of the firms and the usage of mobile money

Dependent variable: Credit constrained firms

<i>Measurement of credit constrained firms</i>	<i>Measurement 1: Based on Allen et al. (2014)-ordered probit model</i>	<i>Measurement 2: Based (Kuntchev et al., 2012) on - probit model</i>
<i>Independent Variables</i>	<i>Regression Coefficients</i>	<i>Regression Coefficients</i>
<i>Use of mobile money for financial transactions</i>	0.251 (4.76)**	0.222 (3.51)**
<i>Firm Level Control Variables</i>		
Log (age)	-0.026 (-0.52)	0.053 (1.38)
Firm Size [dummy, the omitted size is small firms (5 to 19 workers)]		
Firm size: medium (20 to 99 workers)	0.293 (5.18)**	0.320 (4.81)**
Firm size: large (100 or more workers)	0.578 (6.50)**	0.516 (4.89)**
Sector type [dummy, the omitted sector is services sector]		
Sector type: manufacturing	0.015 (0.24)	-0.251 (-3.32)**
Sector type: retail	-0.0806 (-0.08)	-0.039 (-0.48)
Export [dummy]	0.060 (0.65)	-0.092 (-1.34)
Audited accounts [dummy]	0.469 (8.54)**	-0.039 (-0.61)
Firm's legal status [dummy, the omitted type is limited liability]		
Sole proprietorship firm	-0.065 (-1.11)	0.071 (1.02)
Partnership firms	-0.261 (-3.32)**	0.300 (3.25)**
Country Dummies	Yes	Yes
Pseudo R-Squared	0.0909	0.0419
Number of observations	2,672	2,240

Source: Based on author's calculations of the Enterprise Surveys (2013)

Note: t-statistics are in parentheses. ***, **, * are statistically significant at 1, 5, and 10 percent significance levels respectively.

As expected, the larger the firm the more it is likely to have bank loans or line of credit.

Moreover, the coefficient on the large firms is more negative (58 percent) with higher t-value.

Similarly, for the credit constrained measurement 2, the positive coefficient on the key dependent variable suggests that the firms that use mobile money are 22 percent less credit constrained. Moreover, in this result, the coefficients on the size of the firms are as per established norms.

These results are encouraging because the more the firms use the mobile money service; the less they are likely to be credit constrained. Thus, for firms, mobile money can not only make financial transactions safer, cheaper, and saves time and but also addresses the problem of access to finance.

2.4 Conclusions and policy recommendations:

This particular chapter investigates whether firms that use mobile money are less credit constrained than other firms. Because, generally, trade credit constitutes a significant portion of financing working capital, I begin my investigation by studying the relationship between trade credit for financing working capital and access to finance. The results show that firms that use this form of credit are 15 percent more likely to report that access to finance is a severe problem. Thus, if firms are struggling with credit for working capital, accessing credit for financing fixed assets can be even more challenging. Therefore, the question arises that if the firms report that they face problems for access to credit then is there any possibility that the firms that use mobile money appear to be less credit rationed? I investigate this question because recently, banks have teamed up with mobile money providers and have started offering loans to mobile money users. In order to examine this question, it is critical to correctly identify the credit constrained firms. In order to do so, two newly introduce measures to identify credit rationed firms are used. Furthermore, the model controls for a large number of firm-level characteristics such as age,

size, sector, audited accounts, export activities, and form of liability, thus, making the study more vigorous.

The econometric results indicate that firms that use mobile money are 25 percent more likely to have bank loans or overdraft facilities and 22 percent less credit constrained. These interesting results are encouraging, especially for countries from Sub-Saharan Africa. Because financial inclusion and access to finance are vexing problems for firms in the region, it can be claimed that adoption and proliferation of mobile money services help firms to address these problems to a great extent. The governments in the region can play a constructive role to further enhance the usage of the service at both the ends —banks and firms. The governments can allow banks to offer loans and overdrafts based on transactions on mobile money services. In other words, banks can use mobile money transactions as a form of “electronic-based creditworthiness” of firms. This association between banks and mobile money providers has a tremendous potential to support business activities in the region.

CHAPTER 3

ARE FEMALE-OWNED FIRMS MORE CREDIT CONSTRAINED THAN THEIR MALE COUNTERPARTS?

3.1 Literature review:

In this last chapter, I examine whether there is a gender bias in granting credit to firms. Before I present the analysis of this question, I like to discuss a theory in finance that focuses on the way businesses prioritize their capital structure. This discussion is important for two reasons:

1. It explains the role played by external credit in financing business activities, and 2. It offers a deep understanding of financing patterns of male and female-owned firms. The Pecking-Order Hypothesis is an important theory in corporate finance that explains the way businesses finance their capital structure⁹. Myers (1984) provides a characterization of observed corporate financing preferences. He posits that there are three forms of corporate financing behavior:

1. Irrespective of volatility in profits, stock prices, or profitable investment avenues, managers favor stable dividends.

2. Managers prefer financing via retained earnings to financing via debt or equity.

3. If the businesses have to raise funds externally, managers choose to raise funds that are least risky. Under these circumstances, securities that are least risky to highest risky are: straight debt, convertible debt, preferred stocks, and common stocks.

He further claims that this universally exhibited preferences for financing business activities are due to the costs associated with them. Myers and Majluf (1984) postulate that cost associated with various financing avenues increases due to information asymmetry. They argue that capital markets are persistently uninformed about firms with respect to their various

⁹ A pecking order is a feeding hierarchy of stature that is observed among animals such as hens.

investment opportunities and profits from those opportunities. This problem of information asymmetry is more severe in small and medium-sized firms. Therefore, capital markets tend to finance these profitable projects at higher costs. Thus, managers, who always presume to act in the best interest of the firm and its value, realize that the cost of external financing is more than it should be. Hence, they prefer to rely more on retained earnings than external financing. This financing behavior is more prevalent in case of small and medium-sized firms (Sánchez-Vidal and Martín-Ugedo, 2005; Watson and Wilson, 2002). These findings are especially of great importance because of the large number of small and medium-sized firms in the region under study (see Table 5).

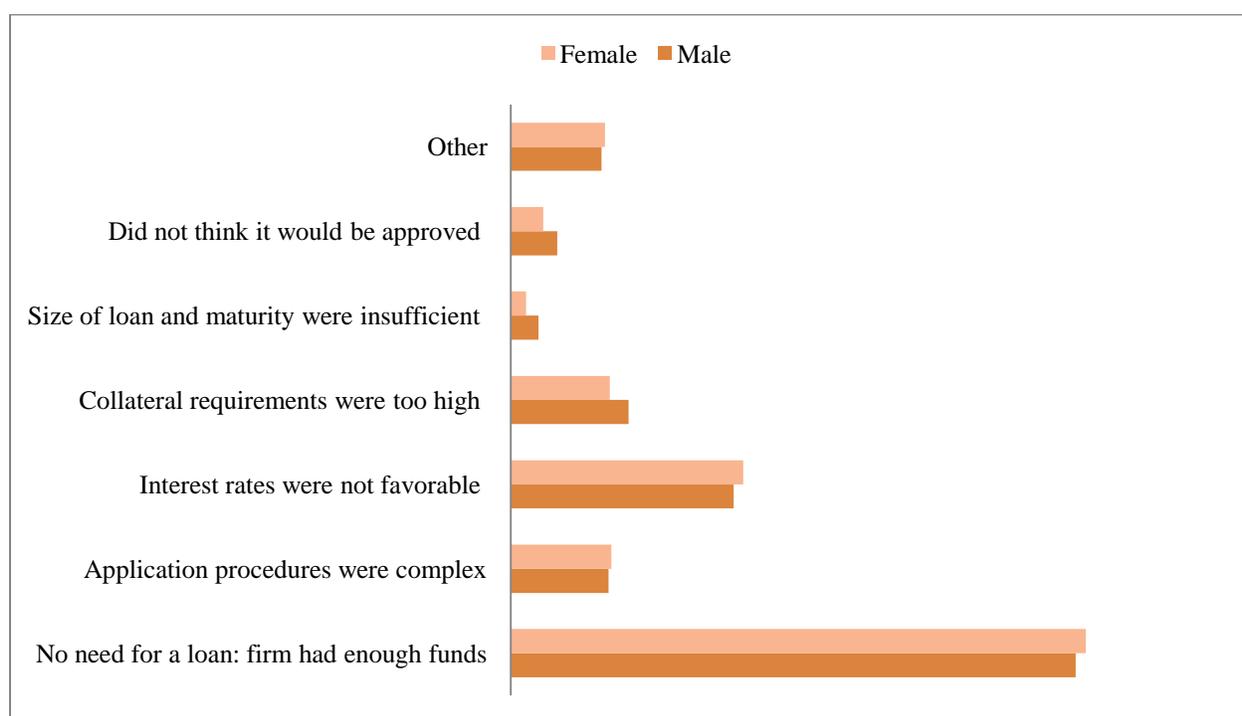


Figure 6: Reasons cited for not applying to loans based on gender (%)

Source: Based on author's calculations of the Enterprise Surveys (2013)

Indeed, this hypothesis is supported by the firms under study. The Surveys specifically asked a question on reasons of not applying to loans. A statistical analysis of this question reveals that, irrespective of gender, almost fifty percent of firms report to have enough internal

funds to finance business activities (see Figure 6). Furthermore, two percent of the firms in the data set have their shares listed on the stock markets. They also exhibit the similar financing behavior and claim that they do not need external financing. However, female-owned firms outnumbered their male counterparts for availability of internal funds. The second feature that stands out from the figure is that a fewer number of prospective applicants thought that size of loans and maturity were not sufficient.

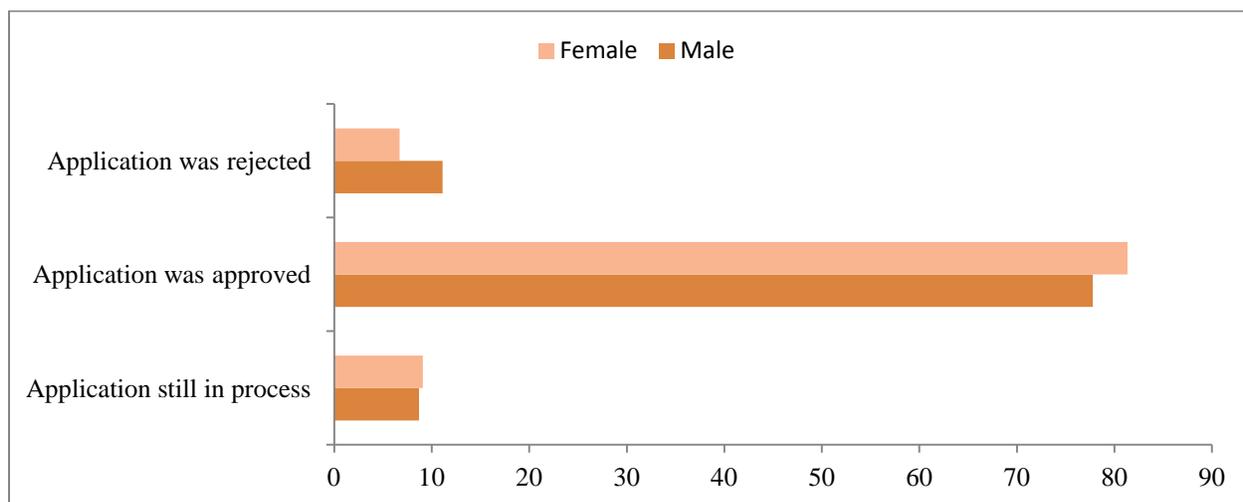


Figure 7: The application status of loans based on gender (%)

Source: Based on author's calculations of the Enterprise Surveys (2013)

Another interesting aspect of financing is the analysis of the loan application status based on gender (see Figure 7). The loan application approval rate is almost 4 percent higher for female-owned firms than their male counterparts. On the other hand, the loan application rejection rate is almost 4.5 percent lower for female-owned firms than other comparable firms. Among female-owned firms, 20 percent apply for loans.

If both-male and female-owned firms-depend on internal funds to a large extent, then it is critical to examine that when external funds are needed, whether there is any gender bias in extending credit. It turns out that gender discrimination is one of the major aspects of access to financing. These dimensions range from the extent of dependence on external finance and trade

finance to the frequency of applying for external finances to terms and conditions of approved loans. There may be some differences between female and male-led firms in terms of risk taking behavior-a key factor that many a time affects demand for loans. Another dimension to gender discrimination concerns access to credit for growth prospects of the female-owned firms and usually the prospects for women is lower than their male counterparts (World Bank, 2011c). Moreover, financial institutions treat loan applications of businesses differently depending upon their age, number of employees, sector of activity, legal status and export-oriented activities (Aterido et al., 2011; Bardasi et al., 2011; Sabarwal and Terrell, 2008).

The number of female-owned firms in the region is startling. In a sample under study for this dissertation, more than 35 percent of women own businesses. That number was 25 percent in the U.S. in 2000 (Coleman and Robb, 2009) and was 28 percent in the Eastern Europe and Central Asia in 2005 (Sabarwal and Terrell, 2008). Because access to credit not only encourage business activities but also their growth, it is critical to look at whether there exists a gender gap with respect to access to credit. It is often perceived that female-owned firms are more credit constrained than male-owned firms (Alesina et al., 2013; Aterido et al., 2011; Coleman, 2000; Presbitero et al., 2014) and access to credit is the greatest challenge for these firms (Orser et al., 2006). The firms run by women are less likely to get loans than firms run by their male counterparts, although the credit gap becomes thin with firms size and the formal sector (World Bank, 2011a).

Usually, women start businesses with lower investment than other comparable firms, an observation that holds even for developed countries. In an independent survey of 600 small proprietary firms in the UK that are owned in equal numbers by men and women, Sara and Peter (1998) document that while establishing a business, men deploy more capital than women do.

They maintain that because of this lower investment at the “founding stage,” female-owned firms remain underfunded even in the long run. Moreover they also note that these firms are less likely to use bank services in the form of over draft, loans, and informal credit from suppliers. A report prepared by the U.S. department of commerce (2010) also observes considerable differences between financing methods of male and female-owned firms. In the U.S., female start their businesses with less capital than men do and are less likely to take loans for expansion (United States Department of Commerce, 2010).

Among female-owned firms, lack of access to finance can be determined by level of education and income, and expertise in dealing with business environment. These factors can potentially affect women’s ability to maintain financial records, a key to obtain loans from banks. Also, women may be more susceptible to default on loan repayments if their educational level and business experience are of a low level. Thus, these constraints make women less likely to get loans for their businesses, a practice known as “statistical discrimination,” a prevalent phenomena in Sub-Saharan Africa (Aterido et al., 2011). Moreover, lack of asset ownership can also have an adverse effect on empowerment and self-employment opportunities for women (World Bank, 2014c).

Productivity and profitability also play a role in obtaining credit. In Eastern Europe and Central Asia, female-led firms are not only less likely to be productive but also less likely to be profitable than their male counterparts (Sabarwal and Terrell, 2008). Using the enterprise Survey data for Sub-Saharan Africa, (Aterido et al., 2011) document that the firms in which women are key strategic decision-makers, are less productive than other comparable firms. Therefore, these firms are less creditworthy and more risky, and it is harder for them to get credit.

Differentials in interest rates, collateral, and size of loans are also observed as a factor of gender discrimination. Alesina et al. (2013) note that in Italy, female-owned firms pay higher interest rates on their loans than their male counterparts. However, for the same country, Bellucci et al. (2010) document that female-owned firms do not pay higher interest rates. However, the authors claim that these firms face rigid credit constraints than other comparable firms and that these firms “pledge collateral more often.” Using a survey data set from 1990s for micro and small firms from Ecuador, Baydas et al. (1994) demonstrate that fewer female entrepreneurs apply for loans than their male counterparts and that a rejection rate for female entrepreneur’s loan applications is not high, rather their loan sizes are smaller. They claim that the smaller size of loans is due to inbuilt information asymmetry with regards to female-owned firms. In the same vein, based on three rounds of surveys from 1987 to 1993 to 2001 of female-owned small businesses in the US, Treichel and Scott (2006) document that firms with women ownership apply less frequently for loans and borrow less than other comparable firms. However, they further note that loan applications of men-owned firms are not more likely to be approved than their women counterparts. Bellucci et al. (2010) find that female-owned firms are not discriminated based on interest rates however the factors that play against them are tougher collateral requirements and credit availability. The authors further claim that gender-based discrimination in access to finance is partly induced by the loan-officer’s taste, after controlling for duration of relationship with lending institutions and individual effects.

One major aspect of female-owned enterprises is the decision-making authority of their own firms. Usually, husbands or male partners of these female entrepreneurs, who may not be fully involved in day-to-day business operations, make decisions that can have a long lasting impact on businesses operations. Firms — in which women have a part ownership — men make

decisions in 77 percent of the business affairs, a number making it imperative to focus on decision-makers and not ownership while appraising the performance of firms (Aterido and Hallward-Driemeier, 2011). Thus, this decision making role played by non-owners affects not only the performance of these firms but also the availability of credit avenues in the forms of lending institutions.

Usually, female-owned firms are more concentrated in retail and services sectors than in manufacturing and construction sectors (Treichel and Scott, 2006). Generally, a large number of women entrepreneurs set up their businesses in industries that require less capital, a potential sign that women face more barriers regarding access to finance than their male counterparts (Klapper and Parker, 2011). There is a high probability that firms with women ownership are not likely to get loans and even if they get loans, they have to pay a higher rate of interest than other comparable firms' (Muravyev et al., 2009). Therefore, women business owners rely more on internal or informal financing to start and run their businesses. In their study on Ethiopia, Tanzania and Zambia for micro and small firms' women entrepreneurs, Richardson et al. (2004) maintain that because of the obstacle to finance, women depend upon retained earnings from business operations to finance their businesses operations.

Some country specific studies demonstrate that female-owned firms are more credit constrained than their male counterparts. Asiedu et al. (2013) use World Bank's Enterprise Surveys Program data for 2006 for comparing access to credit by female-owned firms in Sub Saharan Africa, Latin America, East Asia and Pacific, and East and Central Europe. They find that access to finance is more tilted toward males than females in Sub Saharan Africa, suggesting that gender does play a role when the credit is given. This gap is even more in Sub Saharan Africa than the one observed in other remaining regions under study. In the same vein,

Presbitero et al. (2014) maintain that female-owned firms in Barbados, Jamaica and Trinidad and Tobago are more credit constrained. They follow a broader definition of women-led businesses.

Some studies suggest that the small size of female-owned firms is the main reason for these firms to be credit constrained. In their study for the Sub-Saharan African region regarding gender gap for firms and individuals, Aterido et al. (2011) claim that firms owned by women are small and belong to sectors that are symbolized by “limited use of external finance.” Therefore, female-owned firms are at a disadvantage in access to finance, however, the onus lies not with the financial sector, but with the very nature of the businesses they operate in. Also, for a specific study of the manufacturing sector in 16 Sub-Saharan countries, Hansen and Rand (2014) maintain that comparatively small-sized female-owned firms are not financially more constrained than small-sized male-owned firms, however, medium-sized female-owned firms are. Finally, in the same vein, Hallward-Driemeier (2011) suggests that in the African region, because women own small firms, they may face more financial constraints.

3.2 Hypothesis development and econometric methodology:

A common narrative emerges from all the empirical evidence seen so far. The female-owned firms generally start with fewer funds, are still developing, and are less efficient and profitable. These characteristics of female-owned firms influence their candidacy as borrowers, and therefore, they are less likely to apply for loans. Even if they get loans, the size of loans is small, while the interest rates are higher, and collateral requirements are more. This dissertation contributes to the ongoing debate on gender discrimination in credit rationing with the help of two newly introduced credit-constrained variables in the literature to identify credit-constrained firms. Because these new variables are based on the various financial aspects of the firms, such as financing fixed assets and working capital, bank accounts, and loans or overdraft facilities,

they reflect a true picture of the financial health of female-owned firms. Additionally, the descriptive analysis of the data set (see figures 7) reveals that more number of female-owned firms' loans applications get approved than their male counterparts. Therefore, based on this discussion, it can be claimed that the gender bias of female-owned firms are not credit rationed.

In addition, I also investigate whether there is any relationship between credit-constrained status of female-owned firms and their usage of mobile money. To answer this question, it is important to know how the service has made lives of female users better in terms of their financial security. According to the responses of some female users of the service, mobile money offers a few additional benefits to them. In her field research of 14 months in two locations in Kenya, Morawczynski (2009) interviewed urban migrants, who send money back home and their rural recipients. Her study focuses on the service's impact on the livelihoods of the people who receive this money. Responses of female users in the Kibera area reveal that the M-PESA service acts as "secret savings" for them. They state that these secret savings are handy in case of emergencies and also for groceries, sickness, and school fees. The women further say that they like to keep money outside of their homes because they fear that their husbands may find the saved-money and take it. Additionally, they claim that they prefer mobile money to banks because it is more accessible, in that they do not have to travel into town to deposit or withdraw money, and they can check account balances anytime on mobile phones without their husbands noticing. Many also intend to start a small business, such as selling vegetables, with their mobile money savings. Thus, these so-called secret mobile money savings have the potential to nurture entrepreneurial skills in women, thereby making them financially independent.

There is additional evidence that the service leads to an increase in savings and financial independence in women. The survey findings of M-PESA users in Kenya show that because remittances in the form of mobile money are invisible, family members, especially women, who are late adopters of the service, may be in a position to retain more money than ever before (Jack and Suri, 2011). In addition, Demombynes and Thegeya (2012) also find that the service empowers women by providing them with an independent place, to store and manage their finances, that is not only private but also well beyond reach of their family members.

Based on the women's aforementioned attitude toward the mobile money usage at the individual level, one may conclude that female-owned firms are more likely to adopt mobile money in their firms as opposed to their male counterparts. However, one can argue that the appeal of the service at the individual level for females is mainly because of its secret transactions and secret savings. But, when females become business owners, they can no longer maintain any secrecy with financial transactions of their firms, resulting in less adoption of the service than their male counterparts. Therefore, if firms are owned by females, the appeal of mobile money fades away. Therefore, the adoption of mobile money does not make female-owned firms more or less credit constrained. This rationale leads us to the second hypothesis. To test this particular hypothesis, female-owned firms are interacted with the mobile money usage.

All this discussion leads me to investigate whether female-owned firms are credit constrained and to examine whether these firms use mobile money for their financial transactions.

Hypothesis 3a: Female-owned firms are less credit constrained than their male counterparts.

Hypothesis 3b: The usage of mobile money by female-owned firms does not make them more or less likely to be credit constrained.

To test this hypothesis, the following model is used.

$$\begin{aligned} \text{Prob. of credit constrained}_{ij} \\ = \beta_0 + \beta_1 \text{Female-owned firms}_{ij} + \beta_2 \text{Firms-level control}_{ij} \\ + \gamma_j \text{country dummy} \end{aligned}$$

Thus, the probability of the "*i th*" firm in the "*j th*" country is credit constrained depends upon gender of its owner and the usage of mobile money along with various firm characteristics such as size, age, sector, export activities, audited accounts, and liability.

In the sample under study, 35.34 percent of the firms have female ownership. Among the firms with female owners, 85.22 percent have a checking and or saving accounts. As regards the size of female-owned firms, 57 percent belong to small firms (between 5 and 19 workers), 32 percent belong to medium firms (between 20 and 99 employees), and 11 percent belong to large firms (over 100 employees). As far as trade credit for working capital is concerned, 26 percent of female-owned firms use this informal credit, while that number is 18 percent for male-owned firms. The trade credit for fixed assets is used by 6 percent of female-owned firms, whereas that number is 3 percent for male-owned firms.

Measuring credit constrained status of firms:

The credit constrained status of firms, which is a dependent variable, is constructed by using the financial matters section of the Enterprise Surveys. The model uses two measures of credit constrained variable.

Credit-constrained-variable measurement 1:

Under this measurement, the dissertation follows Allen et al. (2014) definition of credit-constrained firms. According to this definition, a firm is characterized a value of "3" if the firm

has a bank loan and loan or line of credit, is ascribed a value of “2” if the firm has a bank account and is given a value of “1” if the firm does not have a bank account or a bank loan.

In this measurement, the dependent variable takes three possible values (3, 2, and 1) corresponding to “firms with bank loans or line of credit,” “firms with bank accounts,” and “firms with no bank accounts or bank loans.” Because the dependent variable is categorical, the model is estimated as an ordered-probit model. A positive regression coefficient on a variable indicates that an increase in the variable will increase the likelihood that firms will have bank loans or line of credit. Whereas, a negative regression coefficient on a variable indicates the opposite, that is an increase in that variable means that firms will have no bank accounts or bank loans.

Credit-constrained-variable measurement 2:

Following Kuntchev et al. (2012), the dissertation constructs two groups that measure the degree to which the firms are credit rationed during the fiscal year as indicated by the survey. The first group consists of firms that are credit constrained. In order to be called credit constrained, this group comprises of firms that fulfill all of the following conditions.

1. Apply for loans or line of credit but their applications got rejected.
2. Do not apply for credit because the terms and conditions of loans are not favorable. These terms and conditions could be forms of a complex application process, unfavorable interest rates, high collateral requirements, insufficient size of loans or maturity, and doubts about the loan application approval.

The second group consists of firms that are not credit constrained. This group has both firms that have external sources of financing and firms that do not. It includes firms that meet the following conditions.

1. Do not apply for external funding because they have sufficient capital — in the forms of retained earnings — to satisfy their financial needs.
2. Applied for loans during the last fiscal year and had loans outstanding at the time of survey.

Thus, credit constrained is a dummy variable for credit constrained firms, which is equal to one if the firm is credit not constrained, and zero otherwise.

Measuring female-owned firms:

The key independent variable is firms that are owned by females. The survey provides specific information on the structure of ownership of firms. This variable is based on a question from the Survey. The Survey specifically asks a question that “amongst the owners of the firm, are there any females?” Thus, the women-led firms are the firms that have women as owners. Although an answer to this question does not specifically reveal the information regarding number of female owners or percentage of ownership in the firm, the answer certainly provides information about the female ownership. In many studies based on Enterprise Surveys data set, a firm is considered to be female owned if at least one of the owners is a female (Aterido et al., 2011; Bardasi et al., 2011; Hansen and Rand, 2014). Thus, the dissertation proposes the following variable that represents female ownership structure of the firms: A female ownership is a dummy variable for female-owned firms, which is equal to one when answer to the above-mentioned question is yes and zero otherwise.

Firm-level control variables:

It is critical to control for a large number of observable firm-level characteristics that may take into account firms’ risk aversion behavior and creditworthiness-key components for granting loans. These control variables are vital in order to capture the existence of gender bias

in access to credit because they alleviate the problem of omitted variable bias. The Survey offers large and exhaustive set of standard firms-level control variables.

Two extensively used measures of the firms' risk averse behavior and informational murkiness are age and size. Because usually, younger and smaller firms are unable to provide verifiable data about their business activities to lending institutions, these firms are more likely to be credit constrained. In a model, a firm size is the dummy variable — small firms: are those having up to 19 workers, medium firms: between 20 and 99 workers, and large firms: 100 or more workers. As regards the age of firms, the variable has three age groups — young-aged firms: up to 5 years old, medium-aged firms: from 5 to 10 years old, and old-aged firms: from 10 to 99 years old. One more measure of firm riskiness is associated with the involvement in some form of export activities — direct or indirect. This measure captures global economic ups and downs, currency exposure, and diverse sources of revenue.

The model also takes advantage of the available information on the legal status of the firm. The Survey provides information regarding limited liability, sole proprietorship, and partnership status of the firm. Moreover, a sector to which the firm belongs also plays a role in extending credit. Thus, the model controls for sectors of firms that belong to the manufacturing, services, or retail sectors. Finally, the model also has country dummies.

3.3 Results:

I begin the econometric analysis by conducting a nonparametric test. I use the Chi Square (χ^2) test because it is the most used statistical test among the nonparametric statistical tests family for testing independence of variables. The results of the test for both the measures of credit constrained measurements vis-à-vis the female-owned firms along with the crosstab of the

data are given below (see Tables 13 and 14). The values of Chi Square for both measurements are statistically significant.

Table 13: Nonparametric test results for credit-constrained measurement 1 and female-owned firm

<i>Dependent Variable from credit constrained measurement 1</i>	<i>Key independent variable: Female-owned firms</i>		<i>Total</i>
Dummy values	0	1	
1	338	289	627
2	1,249	645	1,894
3	292	117	409
Total	1,879	1,051	2,930

Pearson chi2 (2) = 40.5765 Pr = 0.000

Source: Based on author's calculations of the Enterprise Surveys (2013)

Table 14: Nonparametric test results for credit-constrained measurement 2 and female-owned firms

<i>Dependent Variable from credit constrained measurement 2</i>	<i>Key independent variable: Female-owned firms</i>		<i>Total</i>
Dummy values	0	1	
0	956	548	1,504
1	720	370	1,090
Total	1,676	918	2,594

Pearson chi2 (1) = 17.9153 Pr = 0.000

Source: Based on author's calculations of the Enterprise Surveys (2013)

I also run the Z- test to determine whether the differences in the number of observations between male and female-owned firms vis-à-vis various firm-level characteristics are statistically significant. The results are given below (see Table 15). The p-values indicate that the differences between male and female-owned firms with respect to their firm-level characteristics are statistically significant.

Table 15: The Z-test for gender and firms-level characteristics

<i>Firm-level characteristics</i>	<i>Z-scores</i>	<i>p-values</i>	<i>Confidence level (%)</i>
Age	-37.83	< 0.01	99
Size	-14.25	< 0.01	99
Sector	1.75	< 0.10	90
Export activities	3.63	< 0.01	99
Audited accounts	7.057	< 0.01	99
Legal status	-13.83	< 0.01	99
Use of mobile money	15.49	< 0.01	99

Source: Based on author's calculations of the Enterprise Surveys (2013)

The regression results for the two credit constrained measurements vis-à-vis female-owned firms indicate that female-owned firms are not credit constrained (see Table 16). According to the credit constrained measurement 1, female-owned firms are 16 percent less likely to be credit constrained, and for the credit constrained measurement 2, that number is almost 12 percent.

In the same regression results, as far as firm-level characteristics are concerned, the signs of their coefficients are as per expectations. For example, older firms are less credit constrained than other firms. Medium and large firms are less credit constrained than small firms. Moreover, the coefficient on large firms is more than the coefficient on medium-sized firms. Additionally, firms that are audited are less likely to be credit rationed than other firms. Finally, partnership firms are more credit constrained than limited-liability firms.

The regression results for the two credit constrained measurements vis-à-vis female-owned firms that use mobile money indicate that the usage of mobile money by these firms does not make them more or less likely to be credit constrained (see Table 17)¹⁰. In other words, for both the credit constrained measurements: the interaction term of female-owned firms and usage

¹⁰ The main results in the Table 17 are robust for the usage of mobile money as an independent variable. Results will be made available upon request.

of mobile money is statistically not significant. However, the coefficients on age, size and audited firms are according to the expectations.

Table 16: Regression results for two credit-constrained measurements vis-a-vis female-owned firms

Dependent variable: Credit constrained firms

<i>Measurement of credit constrained firms</i>	<i>Measurement 1: Based on Allen et al. (2014)-ordered probit</i>	<i>Measurement 2: Based on(Kuntchev et al., 2012)-probit</i>
<i>Independent Variables</i>	<i>Regression Coefficients</i>	<i>Regression Coefficients</i>
<i>Female-owned firms</i>	0.164 (3.13)**	0.118 (1.99)*
<i>Firm Level Control Variables</i>		
Log (age)	0.077 (2.26)*	0.048 (1.26)
Firm Size [dummy, the omitted size is small firms (5 to 19 workers)]		
Firm size: medium (20 to 99 workers)	0.271 (4.55)**	0.334 (5.01)**
Firm size: large (100 or more workers)	0.531 (5.50)**	0.506 (4.75)**
Sector type [dummy, the omitted sector is services sector]		
Sector type: manufacturing	-0.002 (-0.03)	0.243 (3.20)**
Sector type: retail	-0.014 (-0.19)	0.043 (0.53)
Export [dummy]	0.056 (0.92)	0.092 (1.34)
Audited accounts [dummy]	0.446 (7.74)**	0.040 (0.62)
Firm's legal status [dummy, the omitted type is limited liability]		
Sole proprietorship firm	-0.021 (-0.33)	-0.055 (-0.78)
Partnership firms	-0.257 (-3.13)**	-0.288 (-3.10)**
Country Dummies	Yes	Yes
Pseudo R-Squared	0.0882	0.0385
Number of observations	2,437	2,228

Source: Based on author's calculations of the Enterprise Surveys (2013)

Note: t-statistics are in parentheses. ***, **, * are statistically significant at 1, 5, and 10 percent significance levels respectively.

Table 17: Regression results for two credit-constrained measurements vis-a-vis female-owned firms that use mobile money

Dependent Variable: Credit constrained firms

<i>Measurement of credit constrained firms</i>	<i>Measurement 1: Based on Allen et al. (2014)-ordered probit model</i>	<i>Measurement 2: Based on(Kuntchev et al., 2012)-probit model</i>
<i>Independent Variables</i>	<i>Regression Coefficients</i>	<i>Regression Coefficients</i>
<i>Female-owned firms that use mobile money</i>	0.048 (0.45)	0.013 (0.11)
<i>Firm-Level Controls</i>		
<i>Age</i>		
Log (age)	-0.078 (-2.29)*	0.048 (1.25)
<i>Firm Size [dummy, the omitted size is small firms (5 to 19 workers)]</i>		
Medium Size (20 to 99 workers)	-0.283 (-4.75)**	0.318 (4.75)**
Large Size (more than 100 workers)	-0.554 (-5.71)**	0.480 (4.49)**
<i>Sector type [dummy, the omitted sector is services sector]</i>		
Manufacturing Sector	-0.005 (-0.08)	0.250 (3.28)**
Retail Sector	0.004 (0.06)	0.042 (0.50)
<i>Firms with export activities [dummy]</i>	-0.076 (-1.24)	0.095 (1.37)
<i>Audited accounts [dummy]</i>	-0.448 (-7.74)**	0.045 (0.70)
<i>Firm's legal status [dummy, the omitted type is limited liability]</i>		
Sole proprietorship firm	0.019 (0.30)	-0.052 (-0.73)
Partnership firms	0.262 (3.18)**	-0.290 (-3.12)**
<i>Country Dummy</i>	Yes	Yes
<i>Pseudo R--Squared</i>	0.0919	0.0424
<i>Number of observations</i>	2,430	2,226

Source: Based on author's calculations of the Enterprise Surveys (2013)

Note: t-statistics are in parentheses. ***, **, * are statistically significant at 1, 5, and 10 percent significance levels respectively.

The regression results for the two credit constrained measurements vis-à-vis female-owned firms that use mobile money indicate that the usage of mobile money by these firms does not make them more or less likely to be credit constrained (see Table 17)¹¹. In other words, for both the credit constrained measurements: the interaction term of female-owned firms and usage of mobile money is statistically not significant. However, the coefficients on age, size and audited firms are according to the expectations.

3.4 Conclusions and policy recommendations:

The capital structure of firms plays a vital role in financing business activities. According to the Pecking Order Hypothesis, when firms need capital, they first rely on their internal funds, then they apply for loans, and finally they raise equity capital. This financing behavior is more prevalent in small and medium-sized firms. Because the data set under study has a majority of small and medium-sized firms, whether these firms follow the hypothesis is an important aspect to examine. Indeed, the firms do follow the hypothesis. Then, the question arises, if the firms need to raise capital by loans, is there any gender discrimination in granting credit to these firms? To answer this question, two newly introduced measurements for identifying credit rationed firms are used. The results indicate that female-owned firms are 25 percent more likely to have bank loans or line of credit than their male counterparts, revealing that these firms have more credit than their counterparts.

The result that female-owned firms are not credit rationed is surprising for a couple of reasons:

1. Two newly introduced measures to identify credit constrained firms are used. These measures correctly identify credit rationed firms. This is due to the fact that they take into

¹¹ The main results in the Table 17 are robust for the usage of mobile money as an independent variable. Results will be made available upon request.

account all aspects of bank financing such as whether firms have bank accounts, whether they have loans or line of credit outstanding in the last fiscal year, whether they use bank financing for working capital or fixed assets, and why their loan applications gets rejected.

2. It can be claimed that female-owned firms are viewed differently than their counterparts by lending institutions. One of the potential reasons can be usually, females are more honest than males (Ones and Viswesvaran, 1998). Moreover, even the presence of females in the parliaments leads to less corruption in those governments (Dollar et al., 2001; Swamy et al., 2001). Therefore, one can argue that when female-owned firms apply for bank loans, banks may think that there is a greater likelihood that these firms will pay back principal and interest in full and on time. Moreover, the quality of their collateral may be more reliable. These intriguing results show that female-owned firms are not credit constrained after all and that attitude of lending institutions for granting credit towards female-owned firms is not driven by the gender of their owners.

As far as the usage of mobile money by the female-owned firms is concerned, it does not make them more or less likely to be credit constrained. However, the governments can encourage these firms to adopt the service by offering subsidies on transaction costs. This measure may help female-owned firms to build up their electronic transaction records which may be used to grant loans.

CONCLUSIONS

Mobile money is a financial tool that can transfer money via mobile phones far and wide with safety, security, and speed. The large number of users (30 million) of mobile money and an astounding monetary value (US\$ 4.6 billion) of the same indicate that mobile money is the future of financial transactions in the developing world. This tool was formally introduced in Kenya during the early part of 2007 and within six months more than two million individuals signed up for the service. The initial success of the service is partly credited to the migrant workers who live in urban areas for their employment and send money back home to their families that live in rural areas. Additionally, the fees charged for transferring money via mobile money are the cheapest compared to the fees charged by banks, post offices, or Western Union. Unlike branches of banks, post offices, or Western Union, the outlets of the mobile money service providers are ubiquitous. Like individuals, businesses have also adopted mobile money. These businesses use the service for their financial transactions such as to make and to receive payments from suppliers and customers. As the service has evolved, banks have sensed the potential of the service and have teamed up with mobile money service providers. This particular association between mobile money service providers and banks has helped businesses to establish a relationship with banks in terms of obtaining credit.

To study the usage of mobile money by firms, I use the World Bank's Enterprise Surveys data set for the year 2013. The data set contains information about enterprises regarding their performance, source of financing, capital structure, and the business environment that surrounds them. The Surveys are available for four countries namely, Kenya, Tanzania, Uganda, and Zambia. It is the first comprehensive survey that contains a set of questions specifically on the usage of mobile money.

I begin my study about the association between firms and their adoption of mobile money by examining which firms are more likely to use the service. Because the service is relatively new and recently adopted by businesses in the region, it is interesting to investigate what types of firms are more likely to embrace the service. To investigate this question, I use the probit model. In the model, the dependent variable is the usage of mobile money for financial transactions and the independent variables are various firm-level characteristics such as age, size, sector, banking habits, and legal status. The model also has country dummies. The results indicate that the older firms (10-99 years) are 20 percent more likely to use the service than younger firms. Moreover, the firm's size matters. Specifically, medium firms are 24 percent and large firms are 45 percent less likely to use the service than small firms. In particular, the coefficient of large firms is more negative than that of medium-sized firms when compared to the coefficient of small firms. Also, firms that use mobile money are 22 percent more likely to have bank accounts. Thus, the service compliments the formal banking sector. However, a sector to which the firm belongs does not have any effect on the use of mobile money. Also, being a sole proprietor, limited liability, or partnership firm does not make the firm more or less likely to use the service. As regards businesses at the country level, businesses in Zambia are less likely to use the service than businesses in Kenya, followed by businesses in Tanzania and Uganda. As a robustness check, I run linear probability model.

This data set is also available for micro firms in Kenya. These results are almost identical to the baseline model. The data is also analyzed for firms that use the service only for their suppliers and customers. The results for the Cragg's tobit alternative model indicate that the firms that use mobile money to pay for their suppliers are less likely to be large firms than small ones. But, these firms are more likely to be partnership firms than limited liability firms. On the

other hand, the firms that use the service to receive money from their customers are less likely to be medium and large firms than small firms, more likely to be manufacturing and retail firms than services firms, and more likely to be sole proprietorship and partnership firms than limited liability firms. The data set also has information available on micro firms in Kenya. Therefore, I study the adoption of the service by these micro firms vis-à-vis their characteristics. These results are almost identical to the baseline model.

The second question that I investigate is whether firms that use the service have better access to finance than other firms. This particular question is of a great importance because access to finance plays a vital role in the economic development and appears to be a vexing problem for the region under study. In order to answer this question, it is critical to separate credit-constrained firms from non-credit-constrained firms. To identify these two groups of firms, I use two newly introduced measures in the literature namely, Allen et al. (2014) and Kuntchev et al. (2013). After controlling for a large number of firm-level characteristics, both measures indicate that firms that use mobile money are not credit constrained. In particular, for the first measurement, firms that use the service are 25 percent more likely to have bank loans or line of credit than other. For the second measurement, these firms are 22 percent less credit constrained. These results are intriguing because they show that the association between mobile money service providers and banks has tremendous potential to address the vexing problem of access to finance.

In the last question, I study the capital structure of firms to test the Pecking Order Hypothesis. I find that the Pecking Order Hypothesis holds for firms under study, i.e., when firms need capital for their business activities they first use their retained earnings, then apply for bank loans and finally go for equity financing. I also test whether female-owned firms are more

credit constrained than their male counterparts and whether usage of mobile money can help these firms to solve this particular problem. This question is of a key interest because there are 35 percent firms that are owned by females. The regression results indicate that for both the credit constrained measurement, the female-owned firms are almost 15 percent less likely to be credit constrained. This interesting result may be due to the fact that generally, female are considered to be more honest and to have higher moral standards than males. Therefore, female-owned firms are viewed differently than their male counterparts. The loan granting institutions may consider loans to female-owned firms less risky than other firms. In the same chapter, I also examine whether the usage of mobile money by female-owned firms help them with credit. The results show that the adoption of mobile money for financial transactions by these firms does not make them more or less likely to be credit rationed.

These exciting results have many policy implications. Currently, medium and large-sized firms are less likely to use the service due to the cap (US\$ 500) on the amount that can be transacted via mobile money. Therefore, the governments in these countries can raise this limit to attract more medium and large businesses to adopt the service. Also, the service compliments the formal banking service. Because financial inclusion and access to finance are vexing problems for businesses in the region under study, the governments can encourage the banks to use the mobile money transactions as a basis for extending credit. This process can lead to undertake more business activities.

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