

**Investigating determinants of access to formal credit - South
African women entrepreneurs in the informal sector**

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ABSTRACT

Financial inclusion remains vital for the empowerment of women. Women, particularly in the informal sector, face the challenge of access to formal credit. The aim of the study is to investigate the determinants of access to formal credit by women in the informal sector. A logit regression model is employed as an estimation technique, to empirically test the relationship between individual characteristics and access to formal credit. The study uses data from the 2016 FinScope National Survey to identify which of these determinants affects access to credit in South Africa. The FinScope data consists of a nationally representative sample size of 4992 South African men and women aged 16 years and older.

The findings indicate that ‘fear of applying for a loan’, ‘loan from moneylenders’ as well as ‘loan from family and friends’ were variables found to be statistically insignificant determinants of access to credit. In line with expectation, the results indicate that possession of a tertiary education; having undergone vocational training; being older; having access to a communication device; and having a positive attitude towards technology, increase the chances of access to credit. The results also prove the hypotheses that being female; an entrepreneur in the informal sector; possession of a primary education; being based in a rural area; having an irregular source of income; or the use of internal funds are negatively correlated to access to credit. The findings highlight the need to find meaningful solutions to address access to credit for women entrepreneurs in the informal sector in South Africa.

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List of acronyms

ASA	Association for Social Advancement
ATM	Automated Teller Machine
BRAC	Bangladesh Rural Advancement Committee
CBDA	Cooperatives Banks Development Agency (CBDA)
CDB	Community Development Banks
CDFI	Community Development Finance Institution
DMA	Development Microfinance Association
DFI	Development Finance Institution
DWYPD	Department of Women, Youth and People with Disabilities
EA	Enumeration Areas
FIC	Financial Intelligence Centre
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GEM	Global Entrepreneurship Monitor
GOF	Goodness of Fit
GPII	Global Partnership for Financial Inclusion
ICT	Information and Communications Technology
IFC	International Finance Corporation
ILO	International Labour Office

ITC	Information Technology Centre
IV	Instrumental Variable
JSA	Job Seeker Allowance
LSM	Living Standards Measure
MFI	Micro Finance Institution
MFSA	Microfinance South Africa
MSME	Micro, Small and Medium Enterprises
NCA	National Credit Act
NCAA	National Credit Amendment Act
NCR	National Credit Regulator
NGO	Non-Governmental Organisation
NIDS	National Income Dynamics Study
NSS	National Service Scheme
NSSO	National Sample Survey Office
OECD	Organisation for Economic Co-operation and Development
RIA	Research ICT Africa
SALDRU	Southern Africa Labour and Development Research Unit
SEFA	Small Enterprise Finance Agency
SESE	Survey of Employers and the Self-Employed
SDG	Sustainable Development Goals
SME	Small and Medium Enterprises
SSA	Sub-Saharan Africa
SSS	Society for Social Service
StatsSA	Statistics South Africa
TAM	Technology Acceptance Model

TMSS	Thengamara Mohila Sabuj Sangha
TVET	Technical and Vocational Education and Training
UK	United Kingdom
USA	United States of America
VAT	Value-Added Tax
VIF	Variance Inflation Factor
WFIF	Women's Financial Inclusion Framework

CHAPTER 1: INTRODUCTION

1.1 Research area and context

Financial inclusion plays a vital role in poverty reduction and economic development. Financially included individuals are able to contribute to economic development as they are able to participate in economic activities, such as micro-enterprises. The Global Findex database reports that 69 per cent of the adult population owned an account in 2017. For the Sub-Saharan region, 32.8 per cent of the adult population owned an account at a financial institution. And 69 per cent of adults in South Africa were reported to own an account (Demirgüç-Kunt, Klapper, Ansar, Hess, Kokas, Larson, Sigrid & Singer, 2018).

Access to credit is an important indicator of financial inclusion. Credit allows individuals and businesses to respond to unforeseen events, as well as financing start-ups and expanding existing businesses (Fanta & Makina, 2019). Several findings indicate that access to formal credit has a significant impact on a business's performance indicators (Nwosu & Orji, 2017; Ismael, 2013; Emmanuel & Masaru, 2014). Credit constraints create a barrier to the efficient allocation of capital and result in widening the income equality gap, by hindering the flow of funds to the poor (Aterido, Beck, & Iacovone, 2013). Although formal credit is seen as vital for business, a significant gap still exists.

Multitudes of financial services providers serve the same target market of 'creditworthy' customers (Fanta & Makina, 2019). Financial institutions deem the information asymmetry in the informal sector costly because of the detailed MSME risk assessments required (International Finance Corporation, 2019). This problem is further evidenced by informal businesses generally not being banked, further hampering the bank's ability to assess cash flows using electronic data (International Finance Corporation, 2019). Another impediment to access to formal credit for informal enterprises arises from financial institutions preferring formal business or formalisation of these businesses. Women in the informal sector

are predominantly found in low-paying jobs. This presents a challenge, as the type of informal business operated by women is inherently survivalist, with little chance of expansion. Globally, the inability to show collateral is a major reason for the gender gap in formal financial inclusion (Demirgüç-kunt, Klapper, Ansar, Hess, Kokas, Larson, Sigrid & Singer, 2018). In developing countries, low levels of education and financial literacy affect women entrepreneurs' ability to access credit (Baliamoune-Lutz & Lutz, 2017).

Gender inequality remains an important topic and has been nominated as part of the Sustainable Development Goals. In terms of the intersectionality theory, gender as a social identity, plays a significant part in an individual's lived experiences (Carastathis, 2014; Corlett & Mavin, 2014; Parent, DeBlaere, & Moradi, 2013; Mabilo, 2018). Therefore, in order to address challenges facing women, a study that focuses on gender needs to be cognisant of other identities that may interact with and impact upon the experiences of such identity (Warner & Shields, 2013). Drawing on the intersectionality theory, women's challenges, including access to formal credit will therefore be multipronged and likely to harm the choices they make. Hence, a study must be undertaken to investigate the interdependence of factors affecting women. This paper attempts to discover whether being a women entrepreneur, in the informal sector in South Africa, hinders access to formal credit.

1.2 Problem statement

Given South Africa's dire economic status, increasing unemployment and inequality ratings, it would be imprudent for researchers to disregard the informal sector as an alternative to formal employment or its opportunities for job creation. Mabilo (2018) argues that the economic deterioration in South Africa, with the increase in poverty, underdevelopment and limiting of social mobility, has led to the reinvention of formal economic activities in the informal sector, highlighting the importance of this activity during economic downturns. Yet access to finance remains a constraint for this sector. Globally, the IFC estimates the demand for finance by the

informal sector to be roughly \$2.9 trillion (IFC, 2019). In Africa, a paltry 0.2 per cent of enterprises in the informal sector have access to formal credit (Mothobi, Gillwald & Aguera, 2020). Women make up an important component of this sector; at least 36 per cent of the South African informal sector consists of women entrepreneurs (Statistics South Africa, 2020). The finance gap for women entrepreneurs is estimated to be \$1.7 trillion in developing countries (Bruhn, Hommes, Khanna, Singh, Sorokina & Wimpey, 2017). And an estimated 70 per cent of women in Africa have no access to finance (Daniels, 2014; Department of Women, 2015). Studies reveal that women are less likely to access formal credit than men (Nwosu & Orji, 2017; Alesina, Lotti & Mistrulli, 2013; Fanta, Mutsonziwa, Berkowitz, Maposa, Motsomi & Khumalo, 2017). Financial inclusion enables social and economic development, particularly for low-income people, women, youth and SMMEs (National Treasury, 2011). Financial inclusion makes a substantial contribution towards real economic growth by stimulating greater productivity in the agricultural and MSME space, especially those owned and managed by women (FinMark Trust, 2018). Access to finance acts as a catalyst for the empowerment of women by allowing them to fully utilise their resources, as well as invest in their businesses (Rashdan & Eissa, 2019). If women's empowerment and gender equality are to be fully achieved, more studies should focus on the financial support of precarious workers in the informal sector, where women are predominantly found. The government and other role-players should start creating an enabling environment to stimulate economic activity in the informal sector (Fourie, 2013). This includes understanding women entrepreneurs and the factors that impede their access to finance (Maurya & Mohanty, 2019). Mabilo (2018) articulates the importance of the subject matter succinctly:

“The informal economy is a crucial source of living for women-headed households. Given the importance of informal economic activities for entire households, further constraints

to women's advancement in the informal economy and their opportunities for progression in the labour market can potentially intensify household burdens for women”.

Therefore, contributing to governments' and other role players' better understanding of how gender and other key variables operate in the informal sector and influence access to credit, should result in their finding new tools to improve financial inclusion for women entrepreneurs in the informal sector.

1.3 Research objectives

Given the sophistication of the financial system in South Africa, compared to other developing countries, the scope is limited to problematic gaps in financial inclusion in this context. This results in the absence of other indicators of financial inclusion, such as account ownership and savings, thus exclusively focussing on access to formal credit. The objective of the study is to understand whether being female and operating in the informal sector influences the extent of financial inclusion, particularly access to formal credit. Having identified determinants of financial inclusion and access to formal credit from literature, the study uses data from the 2016 FinScope National Survey to investigate determinants of access to credit by women entrepreneurs in South Africa. The FinScope data consists of a nationally representative sample size of 4992 South African men and women, aged 16 years and older.

1.4 Research questions and scope

The overarching research question for this study is: ‘What are the determinants of access to formal credit for women entrepreneurs in the informal sector?’ To address this question, the paper seeks to answer the following sub-questions:

1. How does being a female entrepreneur in the informal sector in South Africa influence access to formal credit?
2. How does being a female in South Africa influence access to formal credit?

3. How do demand side determinants influence access to formal credit in South Africa?

1.5 Purpose and significance of research

The purpose of this study is to understand the factors that influence the extent of financial inclusion, specifically concerning access to credit. The measurement of financial inclusion consists of supply- and demand-side determinants of financial inclusion. Supply-side determinants include ATMs per capita; GDP per capita; urbanisation; information and communication; interest rates; internet access; literacy rate. Studies investigating supply-side determinants have been widely undertaken as the availability of the data is not limited. While studies focusing on the demand-side factors are largely dependent on the database at the disposal of the researcher (Gadanecz & Tissot, 2017). Despite the limitation of demand-side data due to the reliance on surveys, Cámara and Tuesta (2017) argue that demand-side surveys add significant information about the extent of financial inclusion as they provide reasons why individuals do not use formal financial services.

In developing a financial inclusion model, the study uses disaggregated data likely to provide individual characteristics that affect financial inclusion. The development of the ‘access to credit’ model considers determinants identified in empirical literature, such as socio-demographics of individuals or households, including gender; owner’s age and employment status; income; location; level of education; financial literacy level; age and size of firm; available collateral and keeping accounting records. The ‘access to credit’ model is modified in this paper to include the entrepreneurs operating in the informal sector, informal financial sector available to micro-entrepreneurs, use of internal funds due to lack of demand for credit by micro-entrepreneurs; women’s fears concerning applying for a loan; access to a communication device as well as attitude towards technology.

The model includes entrepreneurs in the informal sector as a determinant and would be suitable for the SSA region where the informal sector dominates. This modification would prove valuable for the following SSA countries, with higher proportions of the informal sector than South Africa, which are: 84.8 per cent (Ghana), 90.9 per cent (Rwanda), 90.6 per cent (Benin), 80.4 per cent (Nigeria), 65.5 per cent (Burkina Faso), 87.6 per cent (Uganda), and 58.5 per cent (Egypt) (International Labour Office, 2018).

The developing world indicates a higher portion of women informally employed than men; and the informal sector being a major source of income and job creation especially providing livelihoods to the female-headed households (Maurya & Mohanty, 2019; International Labour Office (ILO), 2018; Statistics South Africa, 2017; Gikenye & Ocholla, 2014). Women entrepreneurs are most likely to be found in the informal sector in developing countries, as this employment allows them the flexibility to work and take care of household duties (Chant & Pedwell, 2008). As female entrepreneurs in the informal sector are included as a determinant, the model modified for gender and the informal sector determinants would be best applied in the developing world.

As SSA has a prevalent informal sector, the use of internal funds and lack of demand for formal credit as a determinant, would apply to this region. This is supported by the study in nine African countries which revealed that 83 per cent of the informal enterprises were self-funded (Mothobi, Gillwald & Aguera, 2020).

As a trait of the informal sector, the informal financial sector remains the preferred choice for enterprises and this determinant will assist in understanding whether individuals prefer informal financial sector access to formal credit. Also, in developing countries, the requirement of collateral for access to credit is due to the pronounced information asymmetries. Collateral is one of the necessary characteristics that influence credit for the model in the SSA region.

Further, the sophistication of the financial system and ITC infrastructure is crucial for the applicability of this model as the dependent variable relates to formal credit from banks. The SSA financial market is relatively underdeveloped, compared to South Africa, and this may impact on the applicability of formal credit as a dependent variable. However, the ownership of a mobile device and the attitude towards technology are important determinants in Africa, especially Kenya, due to the mobile money wave.

The study also contributes to expanding empirical literature regarding understanding of determinants of financial inclusion. Various writers have expanded empirical literature regarding the understanding of determinants of financial inclusion in different regions. The study contributes to this conversation by focusing on South Africa, as well as narrowing financial inclusion in access to credit. Further, the study contributes to the gendered theories, and inconclusive theory, regarding whether gender plays a role in access to formal credit. The analysis and findings of the study also contribute to the literature regarding an important segment of the developing world: the informal sector.

1.5 Outline of the study

The study consists of five chapters. Chapter 1 gives background to the research study. This chapter details the gap in the literature regarding the determinants of access to formal credit. The chapter further outlines the research objectives and sub-questions to address the identified problem. Chapter 2 consists of a literature review which properly integrates and synthesises relevant theoretical and empirical literature and concludes by summarising the hypotheses identified. Chapter 3 discusses the research methodology, detailing the research approach and justification thereof; estimation techniques and variables; data collection and analysis; reliability and validity of research design; as well as research limitations. Chapter 4 details the findings and Chapter 5 concludes the study, providing recommendations for relevant stakeholders.

CHAPTER 2: LITERATURE REVIEW

2.1 Theoretical literature

Financial inclusion

Financial inclusion has continually been identified as one of the tools to foster economic and social development. Proponents argue that financial inclusion is a tool for poverty alleviation, social integration and is a driver of economic development and equality (Varghese & Viswanathan, 2018; Zins & Weill, 2016; Demirguc-kunt et al., 2017). Over the years, the concept has evolved, moving away from being seen only as micro-credit but including all types of financial products available to all segments of the community. Adalessossi and Kaya (2015) adequately summarise the concept of inclusiveness: that it is not about using every financial service but being able to choose to use them as desired.

Globally, much attention has been drawn to financial inclusion and subsequently, various initiatives have been implemented. The positive results of the initiatives are evidenced by the World Bank Financial Inclusion report (Global Findex data) indicating that 69 per cent of the global adult population owned an account in 2017. However, the increase in access to an account in a financial institution has not translated to increased levels of account use. The 2017 Global Findex data indicates that 13.7 per cent of accounts held in financial institutions were inactive for the last 12 months. The results, moreover, indicate that, globally, only 32.6 per cent of debit and credit card holders used those cards to make payments, whereas 22.3 per cent of individuals used an account to pay bills. Individuals are increasingly making and receiving digital payments, with the figures increasing from 41.5 per cent in 2014 to 52.3 per cent in 2017 (Demirgüç-kunt, Klapper, Ansar, Hess, Kokas, Larson, Sigrid & Singer, 2018).

According to the 2017 Global Findex data, in Sub-Saharan Africa (SSA), only 32.8 per cent of individuals owned an account at a financial institution. The utilisation levels of formal financial services for the SSA region are similarly low, with 7.1 per cent of accounts held at

financial institutions inactive for the past 12 months. Other usage indicators, such as paying bills using an account, online purchases, debit and credit card purchases are all below 10 per cent. And similar to global trends, SSA increased the use of digital payments, growing from 26.9 per cent in 2014 to 34.4 per cent in 2017. The Sub-Saharan region has seen significant growth in financial inclusion, mainly due to the significant growth in mobile money use. This is demonstrated by 21 per cent of adults having a mobile money account in 2017, close to twice the percentage in 2014 (Klapper et al., 2018).

In the South African context, the 2017 Global Findex data indicate that 69 per cent of adults owned a bank account in 2017 and 13.3 per cent of accounts held at financial institutions were inactive in the past 12 months, compared to 7.1 per cent in Sub-Saharan Africa. The report indicates that 13.5 per cent of the banked population used an account to pay utility bills, 14.1 per cent used the internet to pay bills or buy something online and 25.3 per cent used a debit or credit card to make a purchase. Unlike the global trend, South Africa saw less than two per cent growth in digital payments made or received, moving from 58.8 per cent in 2014 to 60.1 per cent in 2017 (Klapper et al., 2018).

The World Bank defines financial inclusion as individuals and businesses having access to useful and affordable financial products and services—transactions, payments, savings, credit and insurance—that meet their needs, and which are delivered responsibly and sustainably (World Bank, 2018). The Centre for Financial Inclusion emphasises that full financial inclusion means access to a quality suite of financial services, provided at affordable prices, conveniently and with dignity for the clients that use them (including disabled, poor and rural populations). Other definitions detail financial inclusion as the provision of a broad range of affordable, accessible and regulated financial products and services to segments of society where financial services are needed but unavailable (Banking Association South Africa, 2018; FinmarkTrust, 2019; Shettar, 2016). These terms highlight the key concepts of financial

inclusion, namely (1) access (2) to appropriate and affordable financial products (3) by vulnerable groups (4) to meet/suit their needs.

The Global Partnership for Financial Inclusion (GPFI) outlines the three dimensions of measurement of financial inclusion being access to, usage and quality of financial services (Global Partnership for Financial Inclusion, n.d.). The World Bank describes access as the depth and extent of financial inclusion, often proxied by bank branch, ATMs, point of sale penetration etc. (World Bank, 2015). The usage indicators determine the frequency and duration of use of financial services by clients, with quality referring to whether financial products and services meet the needs of clients (World Bank, 2015). Although these dimensions assist in measuring financial inclusion, the measurement of financial inclusion is dependent on how it is defined (Nuzzo & Piermattei, 2020). There is no universally accepted definition for financial inclusion, with most countries drafting financial inclusion policies with definitions that are well suited for their context (Gadanecz & Tissot, 2017; Cámara & Tuesta, 2017; Nuzzo & Piermattei, 2020), making ‘true’ cross country comparison difficult.

Another complexity to the measurement of financial inclusion is that, even though the existing financial inclusion indicators such as accounts, borrowings, savings and insurance indicate inclusivity, individual measurement of the indicators leads to distortion of the level of financial inclusion in a particular country (Nuzzo & Piermattei, 2020). The multidimensional nature may not be accurately captured by single indicators. Instead, it is more appropriately determined by considering a large set of indicators (Cámara & Tuesta, 2017). Several studies have attempted to solve this dilemma by using a single index or synthetic indices. This index captures all relevant dimensions of financial inclusion, while maintaining parsimonious models, permitting cross-country comparisons (Nuzzo & Piermattei, 2020).

Further, the measurement of financial inclusion includes the determination of the most appropriate indicator of the level of financial inclusion in a particular context. For example, the

2017 Global Findex data records that sub-Saharan Africa is home to all ten economies where more adults have mobile money accounts than an account at a financial institution (Klapper et al., 2018). If financial inclusion in these ten economies were measured in terms of an account in a financial institution, measurement of financial inclusion would be distorted. Therefore, researchers in different contexts need to identify the financial inclusion indicator that adequately represents financial inclusion. Given the sophistication of the financial system in South Africa, compared to other developing countries, the scope dimension is limited to problematic gaps in financial inclusion for the South African context, focussing on access to formal credit.

Once the financial inclusion indicator is identified, it will be important to investigate the determinants that affect the level of financial inclusion. On the supply-side, several studies identify factors such as GDP, financial infrastructure, regulation among others as determinants of financial inclusion. On a much larger scale, Rafeeq (2018) analyses forty-eight countries over a 12-year period, dividing the countries between high-income and low-income countries. In his study, out of the five potential macro-determinants of financial inclusion: GDP per capita; age; dependency ratio; urbanisation; information and communication; and rule of law, only GDP per capita does not affect financial inclusion at a global level. Furthermore, the study reveals that for low-income and high-income countries, GDP per capita and the rule of law are not statistically significant, whereas age dependency ratio, urbanisation, information and communication are determined to be statistically significant.

Evans (2016) investigated the determinants of financial inclusion in Africa for the 2005 to 2014 period and the study finds that GDP per capita, broad money as a percentage of GDP, literacy rate, internet access and the presence of the Islamic banking structures significantly affected financial inclusion in Africa including Sub-Saharan Africa. Asuming, Osei-agyei & Mohammed, (2019) also find that the GDP per capita and number of ATMs meaningfully

determine the ownership and use of accounts. Oyelami, Saibu & Adekunle 2017) find that interest rates and bank innovation (ATM usage as a proxy) significantly affect financial inclusion in Sub-Saharan Africa. In contrast to the findings in sub-Saharan Africa, Wokabi and Fatoki (2019) find that interest rates are not a statistically significant determinant for financial inclusion in East Africa (namely, Kenya, Uganda, Tanzania, Rwanda and Burundi). However, they concur that GDP is a determinant of financial inclusion in East Africa. David, Oluseyi & Emmanuel's (2018) results for the period 1990 to 2016 reveal that there is a positive and significant relationship between GDP per capita, broad money, credit, internet users and internet cafés and financial inclusion in Nigeria.

The measurement of financial inclusion based on supply-side indicators (such as ATMs, branches, infrastructure) disregards the financial needs of a society and may not present the best way to measure financial inclusion. A concern about supply-side information is that it may fail to capture the extent of financial inclusion as it does not inform on the real population using financial services or financial systems (Cámara & Tuesta, 2017). For example, in certain SSA countries, a mobile money account is a better measurement of financial inclusion as this product adequately meets the needs of the poor in those countries. This highlights the complexity of measuring the quality of financial inclusion and shows that access to financial services alone cannot be the measure of financial inclusion, whether the product meets the needs of customers should be considered. All three dimensions of inclusion must be considered as concentrating on access and usage only results in limited knowledge about the quality of financial services (Cámara & Tuesta, 2017). Existing literature has also identified demand-side determinants/variables of financial inclusion.

Demirgüç-kunt and Klapper (2012) provided the first analysis of demand-side determinants of financial inclusion using the Global Findex database. The database included 148 economies globally. Their analysis revealed that concerning developing economies,

individual characteristics determine account ownership. In terms of gender, a 6–9 per cent gender gap existed in developing countries with more men owning a formal account. Inability to show collateral, poor awareness of financial education and less business experience are some of the major reasons for such a gender gap in formal financial inclusion. The study further revealed that, in developing economies, the richest households were twice as likely to have a formal account as the poorest. Education level further explains the variation of use of formal accounts, especially in developing economies where individuals with tertiary or higher education are twice as likely to use formal accounts, than those with primary education or less. The report further shows that age is a significant determinant across all regions, and individuals between the ages of 25 and 64 have a higher probability of owning an account than adults younger or older than this age range.

In the same year, Allen, Demirgüç-kunt, Klapper and Peria (2012) used data of 123 countries and over 124 000 individuals to analyse the characteristics linked to the use of formal accounts. The findings indicate that, across all regions, there is no difference between males and females saving at a financial institution. However, they note that in developed countries there are differences in savings, based on income and education level of individuals.

Demirgüç-kunt and Klapper (2012) conducted a similar analysis of the African continent and similarly to the global results, men in Africa are more likely to have an account in a formal financial institution than women. They also found that adults in the highest income quintile, with tertiary education, were more likely to possess an account than the poor or individuals with primary education or less. Corresponding to global analysis, adults within the age group 25 to 64 are more likely to hold an account in a financial institution than adults younger or older than this age range.

A study was conducted by Zins and Weill (2016) using the 2011 Global Findex database for 37 African countries, to examine the determinants of financial inclusion in the

sub-Saharan African (SSA) region. Their findings correspondingly indicate that being male, rich, better educated and older results in enhanced financial inclusion. Due to the significance of mobile banking on financial inclusion in sub-Saharan Africa, the authors further analyse the individual characteristics for mobile banking and infer that the same determinants for traditional banking apply to mobile banking. In the informal financial sector, which plays a huge role in the sub-Saharan African context, Zins and Weill (2016) find that the determinants differ from those of the formal financial sector. The first finding is that women are likely to save in informal savings rather than with a financial institution. Although education is a determinant for such savings, it does not affect informal savings. The choice of the channel of savings does not seem to matter, as results indicate that the probability of saving, both formally and informally, increases as one gets older. They conclude that income and education are the biggest drivers of financial inclusion in Africa.

A study of 31 countries in sub-Saharan Africa, using the 2011 and 2014 Global Findex database, was undertaken and indicated that females are less likely to own an account at a financial institution than males, citing that women are less likely to be formally employed (Asuming, Osei-agyei, & Mohammed, 2019). The results additionally confirm that financial inclusion increases with age, and the authors suggest that this is because younger adults in SSA have less access to jobs compared to older adults.

Soumaré, Tchana and Kengne (2016) analyse two of the least financially inclusive regions in the African continent, west and central Africa. In central Africa, the results indicate that females are less likely to have an account, while single persons had less chance of owning an account than married persons. Their results also reveal that individuals who trust financial institutions are likely to use their accounts more frequently. In west Africa, Soumaré et al. (2016) find that being female and single has no bearing on account ownership. Concerning

savings, individuals with at least secondary education and aged between 25 and 64 are more likely to save. Moreover, divorced individuals are more likely to save than married or single.

Soumaré et al. (2016) also find that women and those living in rural areas are less likely to use their accounts versus men and persons living in urban areas. High-income households and full-time self-employed persons are more likely to use an account. In both western and central Africa, the more educated and the older an individual is, the higher the chances of owning an account. Rich individuals living in urban areas have a higher probability of owning an account. Unemployed individuals have a lower chance of owning a formal account than employed. In terms of savings, the income level is not a determinant, whereas the higher the education level, the more frequent the use of an account is. While findings reveal that single and divorced individuals use their accounts less than married persons.

A study in Ghana by Ansaful (2019) reveals that females owned more bank accounts and applied for loans more than males. Another study in Ghana by Akudugu (2013) revealed that gender as a determinant was not found to be statistically significant. Concerning age and literacy, these individual characteristics were positively correlated to financial inclusion (Akudugu, 2013). The poor in Ghana tend to be excluded from the formal financial system. Whereas, distance, lack of documentation, lack of money and lack of trust were found to be negatively correlated to financial inclusion and seen as barriers (Akudugu, 2013).

Lotto (2018) investigates the determinants of financial inclusion in Tanzania and the results indicate that the probability of having a bank account is reduced for women. Individuals with a higher education are likely to be financially included. Lotto (2018) argues that the reason for this is that the more educated the individual, the higher the level of income they receive. The results indicate that an increase in the level of income of individuals and households increases the chances of their being financially included. Older individuals have a higher

chance of being financially included. However, after a certain age, the chances of being financially included reduce.

In Uganda, Akileng, Lawino and Nzibonera (2018) discover that income and age were positively related to financial inclusion. However, education and gender are not statistically significant determinants of financial inclusion in the Ugandan context. Authors Abel, Mutandwa and Le Roux (2018) and Ngoma (2019) investigate the determinants of financial inclusion in Zimbabwe with findings corresponding to Tanzania's that financial inclusion reduces after a certain age. The argument is that once persons reach retirement age, their interest in using financial products diminishes. Both Abel et al. (2018) and Ngoma (2019) observe a positive relationship between education and financial inclusion. Contrary to results found in central Africa, trust in the financial system has a positive relationship with financial inclusion in Zimbabwe. This is consistent with the argument made by Shankar (2013) that negative bank experiences or negative perceptions of banks result in self-exclusion. Both studies in Zimbabwe show a positive relationship between income and financial inclusion. Ngoma's (2019) findings reveal that individuals in the lowest income quintile were less likely to save as much as individuals in higher income quintiles. In addition, individuals who are employed have higher chances of saving and borrowing compared to unemployed individuals. Females in Zimbabwe have a lower chance of having a formal account compared to their male counterparts.

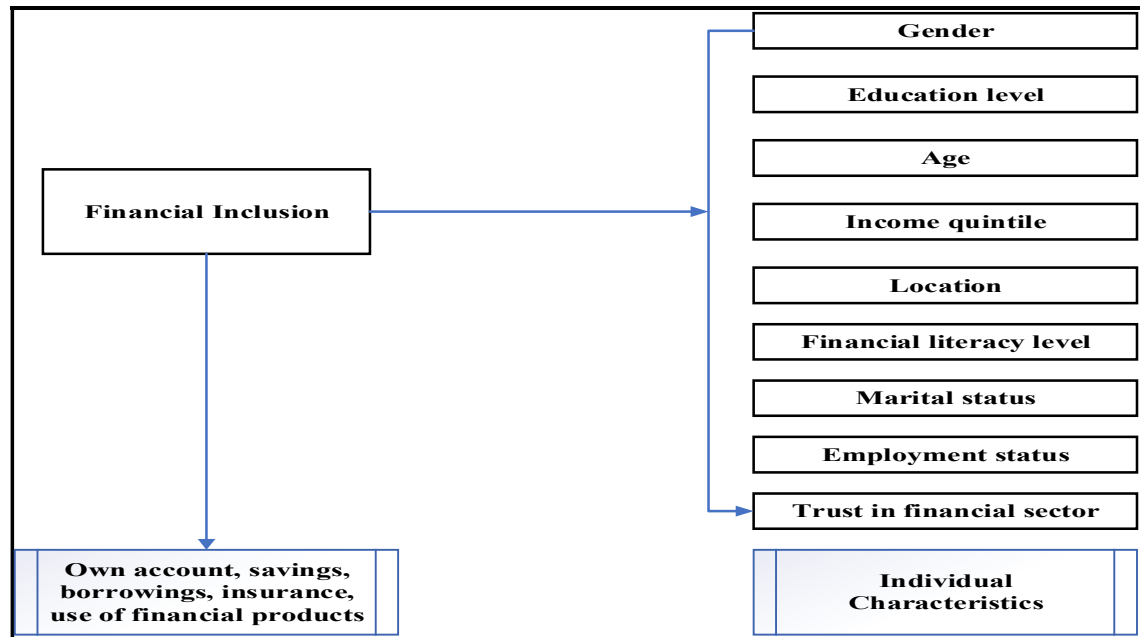
Concerning Nigeria, a study conducted by Abdu, Buba, Idi and Muhammad (2015) reveals that age, high-income level and higher education are positively correlated to ownership of an account and savings, whereas age-squared, being female, and individuals with low incomes have reduced chances of having an account. And concerning taking up of insurance, age, higher-income households and at least a secondary education, increase the chances of having a formal insurance policy.

Rashdan and Noura (2019) conducted a similar study for the Egyptian context in which age proved to have a positive relationship with ownership of a formal and a credit account, whereas age-squared negatively correlated to financial inclusion. The authors argue that this is a result of lack of interest by older citizens in the formal financial system. Increased education level and the higher the income of an individual increased the probability of financial inclusion. Similarly, being employed increased the chances of being financially included.

In a study in Ethiopia by Timbula, Mengesha, Mekonnen and Kebede (2019) age was positively correlated to financial inclusion. However, after a certain age, a negative relationship is observed between age-squared and financial inclusion. Financial literacy and education were also found to positively influence financial inclusion. And, as income increases, so do the chances of being financially included.

In summary, factors that are statistically significant in one context may not be significant in another. There is evidence that GDP per capita, numbers of ATMs, interest rates and internet access are amongst the supply-side factors that impact on the level of financial inclusion. On the demand side, indicators of financial inclusion identified from literature include income quintile; education level; marital status; rural residence; financial literacy; gender; age; employment status; and trust of financial institutions as illustrated in Figure 1 below.

Figure 1: Financial inclusion model



Source: Author's summary of literature reviewed

Access to credit

Access to credit is an important indicator of financial inclusion. A prominent credit programme, enhancing financial inclusion, was first observed through the micro-credit model. Micro-credit, in its modern form, became apparent through the Structural Adjustment Programmes by the World Bank in the 1970s (Esty, 2011; Mader, 2018). It is argued that the establishment of micro-credit is a result of bridging the financial inclusion gap of the poor, with little to no assets (Bin Amin & Jalal Uddin, 2018; McHugh, Baker & Donaldson 2019). The micro-credit model mainly targeted individuals from rural areas and initially provided micro-credit without the requirement of collateral. McHugh, Baker and Donaldson (2019) define micro-credit as credit offered by responsible lenders to the financially excluded, based on relationship banking practices. This definition firstly distinguishes micro-credit lenders from unregulated moneylenders and, secondly, illustrates credit practices different to mainstream credit.

Over the years, the concept of micro-credit evolved to micro-finance, as more of the micro-financial institutions increased product offerings to include savings, insurance etc. The

most notable pioneer for microfinance is the Bangladeshi bank, Grameen Bank established in 1983 (Bin Amin & Jalal Uddin, 2018). The Grameen methodology is centred around the provision of group loans to individuals in rural areas. To provide micro-finance services, the bank depended on foreign donors, and later moved to depositors savings in 1998, which played a huge role in its operational and financial sustainability (Bin Amin & Jalal Uddin, 2018). Grameen Bank is among several Micro-Finance Institutions (MFIs) operating in rural Bangladesh, including Bangladesh Rural Advancement Committee (BRAC); Grameen Bank; PROSHIKA; Association for Social Advancement (ASA); The Society for Social Service (SSS); and Thengamara Mohila Sabuj Sangha (TMSS) (Islam et al., 2013).

In Brazil, a prominent financial inclusion program is observed via the Community Development Banks (CDB). The modus operandi of CBDs resembles that of a micro-finance methodology, also emphasising local development in the community (Pozzebon et al., 2019). In their study, Pozzebon et al. (2019) detail the foundations of the CBD model founded by Banco Palmas with the support of NGOs, to extend micro-credit to the local community. The authors expand on the fact that Banco Palmas developed its credit evaluation methods dependent on social collateral and credit analysis in the form of verification of an applicant's trustworthiness through neighbours' corroboration.

The above-mentioned methodology is similar to the Grameen Bank's, with two distinct features, in that no interest is charged by the bank and a local currency was created for the Palmas network. The local currency, Palmas, was established to encourage local consumption (Pozzebon et al., 2019). Two further expansions to the normal micro-credit methodology are noted from the Palmas model. First, extensive research on the consumption needs of the locals to encourage the creation of businesses that supply those needs; second, a network was established, similar to CBDs in Brazil, that were later established, following the Palmas framework.

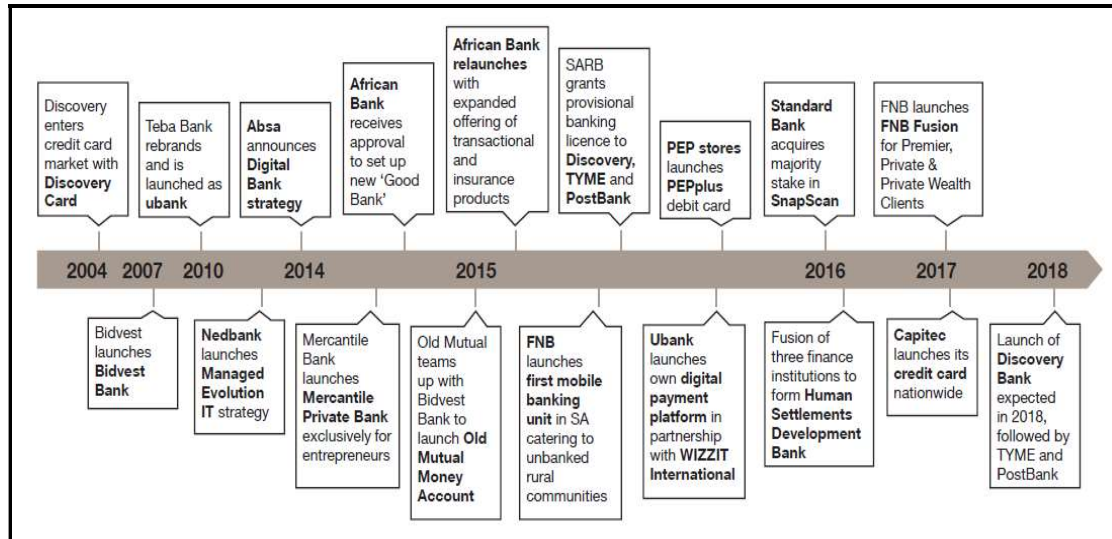
In Italy, Banca Etica emerged with a replica of the Grameen model modified for a developed economy (Becchettia & Garciab, 2011). The bank finances mainly micro-enterprises operating in various sectors. The Grameen model was tailored to include borrowers that were affiliated to large networks, with pre-existing relationships with Banca Etica (Becchettia & Garciab, 2011). The constituents of the bank included cooperatives (43.5 per cent), associations (46.6 per cent) and others (10 per cent). The authors argue that the long relationship with secondary institutions was advantageous to the bank. However, information asymmetries existed as the bank did not know the end-user (Becchettia & Garciab, 2011).

Another micro-credit programme observed in a developed economy related to the provision of loans by Community Development Finance Institutions (CDFIs) in the UK. In their study regarding CDFIs in the UK, authors McHugh et al. (2019) discuss that the model, true to the core of financial inclusion, bridges the societal gap between financial institutions and the poor. Micro-lending is seen as an alternative to the welfare system found in developed economies. The authors argue that the unemployment benefits, such as the Job Seeker Allowance (JSA), inadvertently discourages individuals from seeking entrepreneurial opportunities, who consequently lack demand for credit (McHugh et al, 2019). The CFDI model is, therefore 'forced' to offer alternative micro-credit that will appeal to the financially excluded individuals. MFIs operating in South Africa are discussed in the next paragraphs, which also detail the institutional and policy landscape of South Africa.

Unlike the rest of Africa, South Africa has a sophisticated financial system. This robustness is also seen in the capital markets, the Johannesburg Stock Exchange being the most stable exchange in Africa. The South African banking landscape comprises five prominent banks: ABSA, First National Bank, Standard Bank, Nedbank and Capitec. This last bank, serving the lower LSM, has observed tremendous growth in customer numbers in recent years. Although these are the prominent banks, Figure 2 below shows how new banks have entered

the banking sector and how existing banks have launched new products and services or made significant changes between 2004 and 2018.

Figure 2: Recent developments in the South African banking market



Source: *The future of banking: A South African perspective* (Camarate & Brinckmann, 2017)

However, South Africa is split into two economies (BankservAfrica, 2018). In one, the sophisticated banking sector provides services to a minority of elite financial services users (BankservAfrica, 2018). This segment is mainly dominated by ABSA, First National Bank, Standard Bank and Nedbank. This market has been well served, benefiting from various products offered by banks (cross sales). In the second economy, many South Africans remain outside the traditional banking system, operating in an informal economy that is cash centred (BankservAfrica, 2018). It is estimated that nearly 50 per cent of the transactions in South Africa are done via cash and that share reflects 58.2 per cent of the country's gross domestic product (GDP) (BankservAfrica, 2018). The cash usage continues at an upward trajectory and the preference of debit-card holders is to transact using cash (PriceWaterhouseCoopers, 2019). Bank charges are higher for cash deposits and withdrawals; however, this has not deterred the use of cash. And most South Africans continue to use the informal sector to transact (Hardie, 2019). This situation is exacerbated by the fact that the informal financial markets are entrenched within communities, making provision of their informal products more accessible

to those communities.

The banking sector has seen certain disruptors, such as Capitec, Ubank and African Bank, dominating the lower LSM market (Orsmond, Mackenzie, Mokoena & Van Rensburg, (2013), Capitec, African Bank, Post Bank and ABSA offered unsecured loans to low-income households and the poor (Mjuza & Ntsalaze, 2019). Capitec’s operating model has been specifically tailored to provide unsecured high-margin-yielding loans since its inception in 2001 (Orsmond et al, 2013). This penetration in the lower LSM has been observed mostly in the form of personal loans rather than business loans. This has left entrepreneurs in the informal sector still facing challenges in terms of accessing formal credit from banks. Nonbank financial players have entered the South African market to provide finance to SMEs. Figure 3 demonstrates the players in the South African market which excludes nonbank players servicing the informal sector, microfinanciers.

Figure 3: Nonbank financial players in South Africa



Source: A credit lifeline: How banks can serve SMEs in South Africa better (Cunha et al., 2020)

In South Africa, microfinance institutions, together with the government, play a significant role in the extension of finance to the informal sector (International Finance Corporation, 2018).

Figure 4 below shows the diverse characteristics of microfinance providers, with microenterprise loans offered to entrepreneurs in the informal sector. Microfinance South Africa (MFSa), a representative body of legally incorporated microfinanciers, provide funding for individuals who are unable to obtain funding from mainstream financial institutions (MFSa, 2017). Its members, in certain cases, remain the only credit provider in rural areas, as mainstream banks abandon those areas due to the economies of scale and the high costs required to service such low-density areas (MFSa, 2017). Another association, Development Microfinance Association (DMA), includes not-for-profit development finance providers, with 90 per cent of clients being female (International Finance Corporation (IFC) 2018). The members of DMA mainly provide short term unsecured consumer loans (IFC, 2018), not necessarily serving entrepreneurs in the informal sector. Two large MFIs, the Small Enterprise Foundation and Phakamani Foundation, dominate the microfinance field in rural South Africa. The two MFIs predominately target women entrepreneurs in the informal sector in Mpumalanga, Limpopo, North West, Gauteng, KwaZulu Natal and the Eastern Cape. MFIs specifically model their businesses to target mainly, women which deviates from a certain theory reviewed—that there is gender bias against women in terms of provision of credit. Their model is the exact opposite and may have a gender bias against men. Further, although the literature reviewed asserts that inadequate collateral has been a hindrance for women when applying for and obtaining credit, MFIs do not require collateral in the form of assets but value more social collateral.

Figure 4: Profile of the microfinance sector in South Africa

Product	Micro deposit	Salary-based microloans	Microenterprise loans
Suppliers	1. Primary banks 2. Alternative banks 3. Financial cooperatives 4. Stokvels 5. Development finance institutions	1. Primary banks 2. Alternative banks 3. Financial cooperatives 4. Microlenders 5. Development finance institutions	1. Primary banks 2. Alternative banks 3. Not-for-profit microenterprise lenders 4. Development finance institutions
Stage of development	Maturing	Maturing	Early stage

Source: Over-indebtedness of microfinance borrowers in South Africa (Mjuza & Ntsalaze, 2019)

There has been great progress in the nonbanking field to facilitate access to finance for the informal sector. These players have taken advantage of digitisation, as well as data analytics, to develop more cost-effective credit assessment models (Cunha, Entwisle, Jeenah & Williams, 2020). One such nonbank financial institution provides finance to spaza shops fitted with a till device which deducts a portion of each sales transaction as part of the collection method (Cunha et al., 2020). This further enables informed risk assessments as the lender is able to gather beneficial information from sales and cash flow. This deviates from the literature in that, because informal businesses are generally not banked, a bank's ability to assess cash flows using electronic data is hindered (IFC, 2019). The credit analysis by certain MFIs is also different from the banks', as they use the Progress Out of Poverty Index and similar indices to ascertain income and assets. Another South African nonbank financial institution uses a fully automated assessment processes necessitating minimal documentation (Cunha et al., 2020). A facilitator of widespread funding is the entrance of sector-specific banks, collaborating with non-financial services institutions like the Post Office (Camarate & Brinckmann, 2017). Certain MFIs have partnered with the South African Post Office and commercial banks to facilitate disbursements and repayment of group loans through the group bank accounts.

Although the previous paragraph details positive strides that have been taken to increase

access to the informal sector, there have been some impediments. Opponents of financial inclusion have criticised microfinance institutions (MFIs) for the high finance costs charged that include high-interest fees, once-off initiation fees, and monthly administration fees that total a higher annual effective interest rate. As MFIs target mostly women in the informal sector, the higher interest charges and fees are mostly borne by women who do not have any alternative. This departs from the theory reviewed that women are not discriminated against in terms of higher interest rate charged. Furthermore, these institutions are also seen as overburdening the poor and in turn causing stress and depression. And traditional banks typically lend to SMEs that have an existing transactional banking history with them, consequently excluding unbanked businesses (Cunha et al., 2020).

In terms of government initiatives specific to the funding of micro business, the Small Enterprise Finance Agency (SEFA) bridges this gap. The government agency wholesales its funds to various intermediaries such as microfinance institutions. The microfinance institutions, in turn, on-lend to micro businesses. Policy has been drafted and amended to attempt to cater for the needs of the vulnerable. The National Credit Act (NCA) was implemented in 2007 and amended in 2014 to form the National Credit Amendment Act (NCAA). The NCAA and the National Credit Regulations have been effective from 13 March, 2015. The main objectives of the Act include the promotion of a fair and non-discriminatory marketplace for the access of credit, as well as responsible lending (MicroFinance South Africa, 2017). The Regulator also reviewed the limitation of fees and interest in relation to the provision of credit and provided a maximum cap for both (MicroFinance South Africa, 2017). As MFIs in South Africa are regulated by the NCR, which focuses on consumer protection and education, MFIs are required to demonstrate providing these to their customers (Marini, Andrew & Van der Laan 2017).

The National Treasury published a draft Financial Inclusion Policy in 2020. Part of its goals is to review the mandate of the Cooperatives Banks Development Agency (CBDA), to

ensure alignment with the needs of the microfinance sector (National Treasury Republic of South Africa, 2020). The draft policy also includes a priority pillar regarding the formalisation of informal business in order for such business to access financial services (National Treasury Republic of South Africa, 2020). The Department of Women, Youth and People with Disabilities (DWYPD) has drafted a Women's Financial Inclusion Framework (WFIF) with one of its aims being the provision of interventions for financial and non-financial needs of women (Department of Women Youth and People with Disabilities, 2019).

There has, however, been a certain policy that has hampered the facilitation of credit to the informal sector. It is believed that formal MFIs face the same regulatory environment as banks in terms of compliance with the NCA, FIC Act, Protection of Personal Information Act, resulting in a substantial number of non-formal credit providers (IFC, 2018). The formalisation process of informal business is seen as onerous (IFC, 2018) with non-formal businesses run by women being hindered in terms of accessing credit (Maluleke, 2019).

Although micro-credit has made significant strides in providing funding to vulnerable groups, a significant gap still exists. It is estimated that, globally, 65 million micro, small and medium enterprises (MSMEs) are credit-constrained and that the value of that financing gap amounts to \$30 billion (Bruhn, Hommes, Khanna, Singh, Sorokina & Wimpey, 2017). Credit allows individuals and businesses to respond to unforeseen events as well as finance start-ups and expansion of existing businesses (Fanta & Makina, 2019). Several findings indicate that access to formal credit has a significant impact on a firm's performance indicators (Nwosu & Orji, 2017; Ismael, 2013; Emmanuel & Masaru, 2014). Credit constraints create a barrier for the efficient allocation of capital and result in widening the income equality gap by hindering the flow of funds to the poor (Aterido, Beck & Iacovone, 2013). In the USA, Mach and Wolken (2012) found that credit-constrained firms were likely to go out of business as opposed to non-constrained firms. Barriers of access to formal credit become more visible in developing

countries, where such constraints affect growth, productivity and ability to innovate (Presbitero & Rabellotti, 2016).

MSMEs rely heavily on banks to finance their businesses but smaller firms are more constrained due to the lack of funding (Caglayan & Xu, 2016). Findings in east Europe and central Asia reveal that small firms are less likely to have access to formal credit than profitable firms (Hainz & Nabokin, 2019). One of the key barriers for firms in South Africa is access to formal credit together with access to markets and access to skills (International Finance Corporation, 2018; Herrington, Kew & Mwangi, 2017). An empirical study reveals that approximately 18 per cent of South African firms indicated that access to finance was a major obstacle (Hassan, 2013). Berg and Fuchs (2013) find that in South Africa, only eight per cent accounts for loans to SMEs from banks, which is below the average of the developing world of 12.3 per cent. The 2016/17 GEM Global Report indicates that 50 per cent more South African companies closed down due to lack of access to finance, compared to the average for Africa (Herrington et al., 2017).

Involvement in the informal sector has been detrimental to entrepreneurs' access to credit for a multitude of reasons. Similar to all MSMEs, the informal sector has remained underserved by the mainstream financial sector and a sizeable financing gap for this sector exists. The informal sector faces numerous challenges including limited access to markets, technology and finance (Gikenye & Ocholla, 2014). Globally, the IFC estimates the demand for finance in the informal sector to be roughly \$2.9 trillion (IFC, 2019). In Africa, a paltry 0.2 per cent of enterprises in the informal sector have access to formal credit (Mothobi et al., 2020).

There exist a multitude of financial service providers, other than regulated MFIs, that serve the same target market of 'creditworthy' customers (Fanta & Makina, 2019). One of the reasons for the saturation of these services with creditworthy clients is the availability of data and history which aids in the credit assessments. Whereas informal entrepreneurs pose

significant traits of information asymmetry and, as a result, the products aimed at this group are accompanied by increased transaction costs. This is further emphasised by the statistical discrimination by banks which results from the lack of data collection to ascertain the creditworthiness of firms due to the difficulty and substantial costs of obtaining that information (Galli, Mascia & Rossi, 2020). Consequently, a market with high levels of information asymmetries will likely lead to high transaction costs and perpetuate the barriers to financial inclusion (Aduda & Kalunda, 2012).

Financial institutions deem the highly asymmetrical information in the informal sector costly, due to detailed MSME risk assessments required (IFC, 2019). The lack of reliable credit information on MSMEs is a major obstruction for financial institutions extending credit to this sector (FinmarkTrust, 2019). This is due to their inability to verify the client's identification, as well as assess the ability of the firm to repay the loan. Banking institutions require numerous documents to verify Know-Your-Client information in the light of the anti-money-laundering laws and to perform necessary customer due diligence. In most cases, individuals operating in the informal sector do not have these documents, which involuntarily exclude them from benefitting from formal financial products (Abel et al., 2018).

This problem is further evidenced by the fact that informal businesses are generally not banked, further hampering the bank's ability to assess cash flows using electronic data (IFC, 2019). Smith (2019) argues that information asymmetry is reduced when a large share of a firm's transactions go through the banking system, giving banks the perception that non-banking clients are riskier, due to the unavailability of information. Banks currently use screening technologies that focus on transactional lending, through codification of information (Presbitero & Rabellotti, 2016). This might imply that for informal entrepreneurs to obtain formal credit, opening and using a bank account for their business activities is imperative, and will ultimately aid in the mitigation of the high information asymmetries that exist.

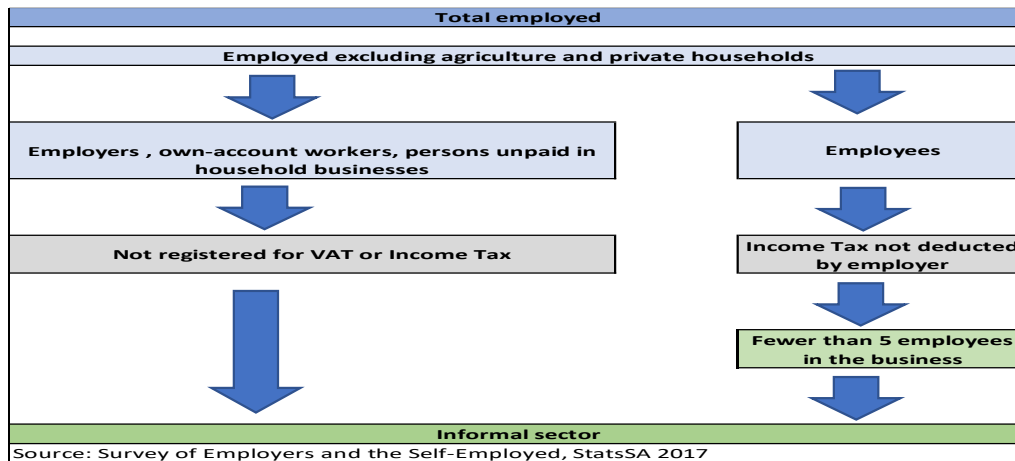
Another impediment to access to formal credit for informal enterprises arises because of financial institutions preferring formal business or formalisation of these businesses. The bank's credit process is not favoured by individuals operating in the informal sector because of the high taxes, long time requirements for registration, licensing and inspection (Bukonya, Kasse & Nansubuga, 2014). This is supported by the legalistic theory, which contends that the existence of the informal sector is due to small businesses avoiding regulatory requirements. The avoidance of high regulatory compliance costs, as well as the perceived lack of fees, has made transacting in the informal financial sector more attractive for the poor. The likelihood of enterprises in the informal sector formalising their businesses, is minimal. This may result in financial institutions never tapping into this sector, unless credit processes are altered to cater to this target group. It is therefore anticipated that entrepreneurs in the informal sector are less likely to access formal credit.

The informal sector and formal credit

There is no single universal definition for the informal sector. A potential reason for this disunity is the various activities that may be described as informal, which differ from person to person making it problematic to estimate the size of the sector in a particular region (Mabilo, 2018). Farazi (2014) argues that the existence of the various definitions is due to the heterogeneous nature of the sector. One definition refers to the informal sector as businesses involved in the production of goods and services to generate employment or a form of income outside the scope of formal business (International Labour Office, 2018; Fapohunda, 2012). Fapohunda (2012) lists certain characteristics that are unique to the informal sector, such as informal business organisation; use of rudimentary technology; lack of separation between funds for consumption and for production; ease of entry and exit; reliance on family labour as well as the small requirement for capital.

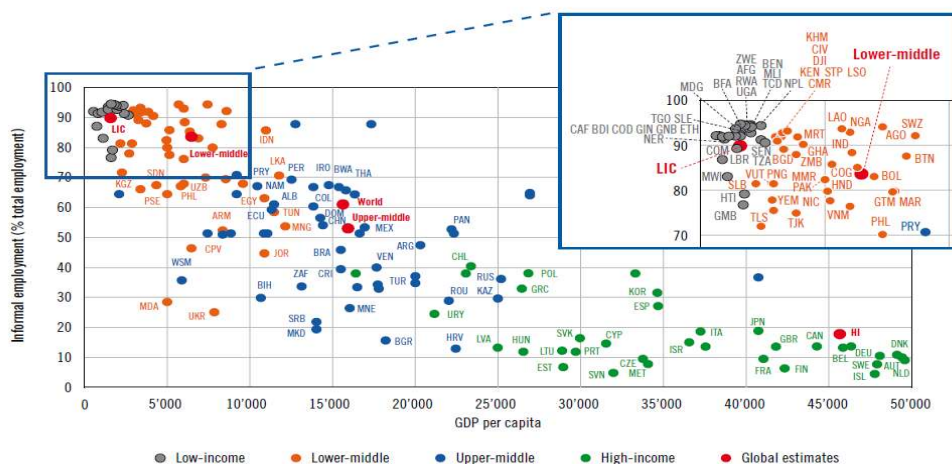
Another definition by Statistics South Africa, the agency responsible for the collection and reporting of statistics in South Africa, uses two sets of criteria to define the informal sector (informally self-employed and in informal employment). The first criterion comprises employers in informal enterprises, own-account workers (no employees), and persons working in their household business without pay and whose business is not VAT or income tax registered (Statistics South Africa, 2017). Informal employment consists of employees whose employers employ fewer than five employees and do not deduct income tax from employees' wages/salaries (Statistics South Africa, 2017). These employees constitute informal wage employment, which includes employees of the informal enterprise; casual or day labourers; paid domestic workers; contract workers; unregistered and undeclared workers; and homeworkers (Chen, 2012). For this study, the first part of the StatsSA expanded definition is taken into consideration, being individuals informally self-employed. Figure 5 below demonstrates the two-part definition with the use of a diagram.

Figure 5: Illustration of the two definitions of the informal sector



Globally, around two-billion men and women earn their living from the informal economy and account for 61 per cent of global employment (ILO, 2018). The informal sector is present in every economy with the size of the sector varying according to countries' socio-economic development levels. However, it is significantly more prevalent in developing countries (ILO, 2018). Developing countries reflect low levels of Gross Domestic Product (GDP) and this factor contributes to the size of the informal sector. Countries with the lowest GDP per capita tend to have higher levels of the informal sector (ILO, 2018; Williams & Youssef, 2014). This theory holds true globally and is illustrated in Figure 6.

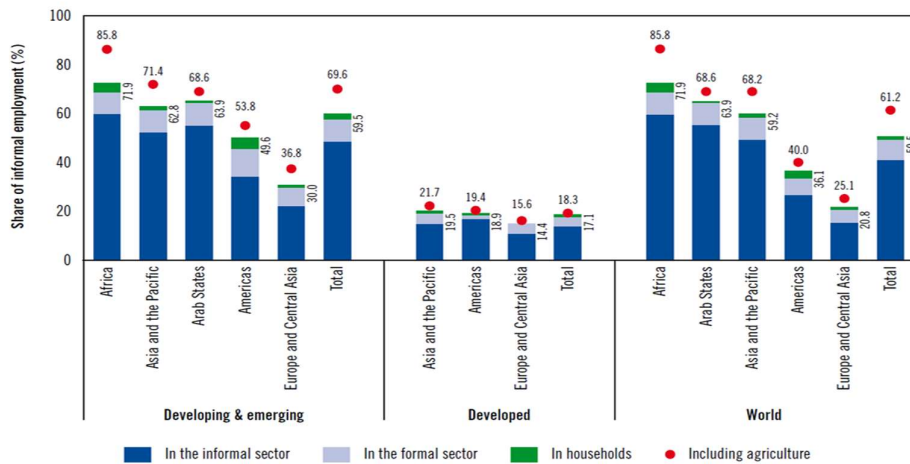
Figure 6: Share of informal employment in the total employment and GDP per capita



Source: Women and Men in the Informal Economy: A Statistical Picture (ILO 2018)

Unsurprisingly, Sub-Saharan Africa has a sizeable informal economy. The informal sector contributes between 38 per cent (Medina, Jonelis, Cangul, Mansoor, Allard, Owen, Robinson, Sancak & Schneider, 2017). and 55 per cent (African Development Bank, 2013) of Sub-Saharan Africa’s GDP, according to the two different estimations by the IMF and the African Development Bank. About 60 per cent of the potential working population in developing countries earn their living in the informal sector (Fapohunda, 2012). Figure 7 below indicates that Africa has the highest share of informal employment, proving that the dualist theory holds true for the continent. Dualists argue that with economic development, there is an unavoidable and organic shrinking of the informal sector (Williams & Youssef 2014). Contending that the informal sector is a sign of underdevelopment and ultimately of growth in a country's economy, this sector will end gradually as the labour market absorbs surplus labour (Williams 2014; Williams & Youssef 2014).

Figure 7: Components of informal employment as a percentage of total employment



Source: Women and Men in the Informal Economy: A Statistical Picture (ILO 2018)

In South Africa, the informal and survivalist sector makes up 85 per cent of the MSME sector (International Finance Corporation, 2018). Of the 5 780 815 MSME businesses, 2 893 925 are survivalists, 2 070 164 are informal businesses, and 816 726 are formal businesses

(International Finance Corporation, 2018). Slightly lower than these figures, Statistics South Africa estimated 1,8 million informal businesses in South Africa (Statistics South Africa, 2017). StatsSA estimates that the informal sector (non-agricultural) constitutes 17.7 per cent of the employed labour force (Statistics South Africa, 2020). This is quite small compared to the share of the informal sector in peer countries. For instance, the ILO reported the percentage of the informal sector in South Africa as 21.8 per cent, whereas its peers reported 84.8 per cent (Ghana), 90.9 per cent (Rwanda), 90.6 per cent (Benin), 80.4 per cent (Nigeria), 65.5 per cent (Burkina Faso), 87.6 per cent (Uganda), and 58.5 per cent (Egypt) (International Labour Office, 2018). South Africa's GDP per capita remains higher than its above-mentioned peers, proving that the more developed an economy, the smaller its informal sector. Notwithstanding, the MSME space remains fairly small for South Africa's GDP per capita and it is argued that it should be three times the size (International Finance Corporation, 2018).

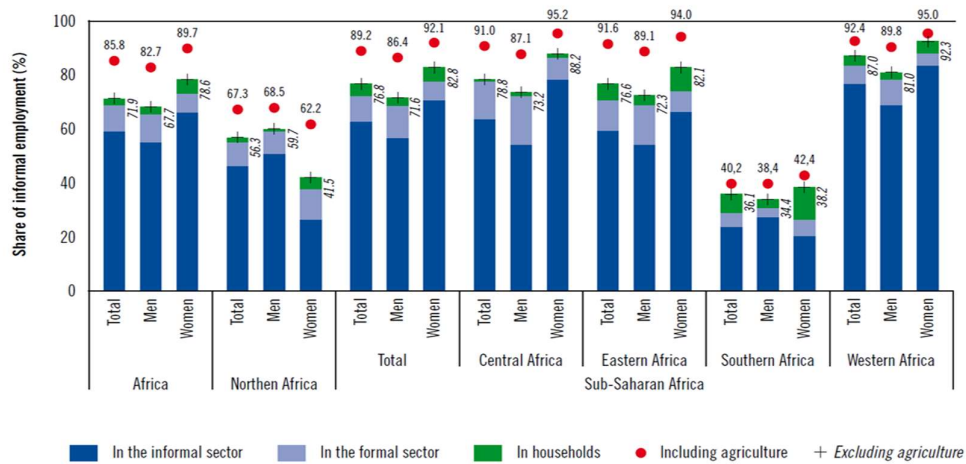
Globally, the informal sector has proven to be a greater source of employment for males (63 per cent) than women (58.1 per cent) (International Labour Office, 2018). In contrast, the developing world indicates a higher portion of women informally employed than men, and a major source of income and job creation especially providing livelihoods to female-headed households (International Labour Office, 2018; Maurya & Mohanty, 2019; Statistics South Africa, 2017; Gikenye & Ocholla, 2014). Women entrepreneurs are most likely to be found in the informal sector in developing countries as this employment allows them the flexibility to work and take care of household duties (Chant & Pedwell, 2008).

In Africa, 82.7 per cent of men that are employed are informally employed, compared to 89.7 per cent for women (International Labour Office, 2018). The ILO report further finds that the lower the GDP per capita in a country, the more likely that the informal sector will be dominated by women (International Labour Office, 2018). As seen in Figure 8 below, for most of the African regions, more women rely on the informal sector as a source of employment

than men. Several factors have contributed to the dominance of women in the informal sector in developing countries. Women are denied formal sector employment because of family responsibilities and lack of skills, as well as social and cultural barriers (Fapohunda, 2012). Authors Nishimwe-Niyambanira and Sabela (2019) and Aterido, Beck & Iacovone (2013) concur that women often miss the opportunities to participate in the labour market due to their assumed role of taking care of the household. Moreover, women's participation in the labour force is impeded by challenges that are specific to women. For instance their level and quality of education, interruption of work for childbearing, weak bargaining power, fewer role models, and discriminating employment practices (Department of Women, 2015).

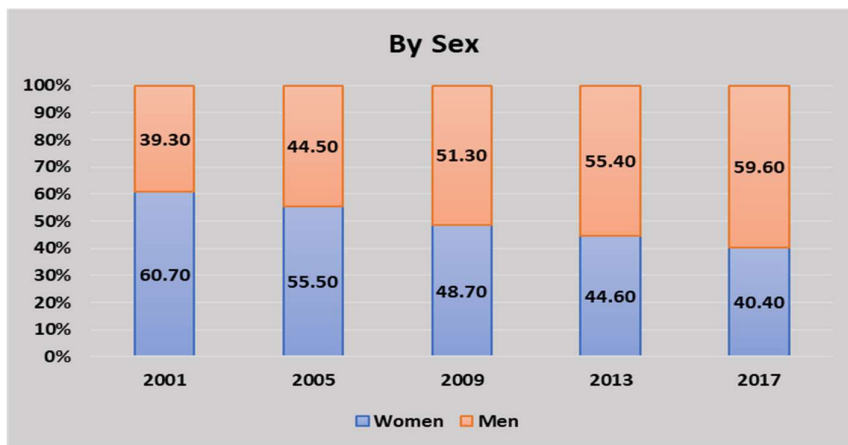
Approximately 41.3 per cent of South African households are headed by women, according to the 2016 Census (Statistics South Africa, 2016). This household dynamic has increased the role of the informal sector as women's contribution to the household income has increased (Mabilo, 2018), with 36 per cent of the informal sector in South Africa consisting of women in 2019 (Statistics South Africa, 2020). The historical trend, between 2001 and 2017 in South Africa is illustrated in Figure 9 below, with the male dominance over the informal sector increasing.

Figure 8: Components of informal employment as a percentage of total employment: The informal sector, formal sector and household sector, Africa



Source: Women and Men in the Informal Economy: A Statistical Picture (ILO 2018)

Figure 9: Individuals running at least one informal business, by sex, 2001–2017



Source: Survey of Employers and the Self-Employed, StatsSA 2017

The relationship between macroeconomic growth and gender is a complex one due to the endogeneity issue: gender inequality is shaped by macro-economic policies which, in turn, influence the rate of macro-economic growth (Manda & Mwakubo, 2014). Duflo (2012) explains that, on one hand, development plays a role in reducing inequality as economic growth results in empowerment of all members of society (including women). And on the other, the empowerment of women will likely result in economic growth. The theories that conceptualise

gender and economic development were, for a long time, divided between neoliberals/optimists and critical/feminist scholars. These theorists viewed the relationship between gender and economic development as linear.

Neoliberals believe that economic growth should enhance women's status as, by its very nature, it encourages social integration, creates employment opportunities for members of society, including women (Eastin & Prakash, 2013; Manda & Mwakubo, 2014). These scholars argue that economic growth should have a positive impact on gender equality and are likely to advance even greater equality between women and men. They further argue about whether it would then be necessary to establish specific policies and interventions, designed for women, if they have already benefitted from economic development.

Critical scholars, on the other hand, argue that economic development is structured to promote a patriarchal system that leads to women occupying lower levels of society (including jobs) and consequently undermining gender equality (Eastin & Prakash, 2013; Manda & Mwakubo, 2014). These scholars argue that an intervention directed to women's empowerment is crucial for gender equality, such as promoting education among women and eliminating distortions in the labour market. The critical theorists argue that gender equality removes barriers that women face and affords them the same access to education and economic opportunities as men (Manda & Mwakubo, 2014). It further levels the playing field between the two genders providing them equal chances to be socially active individuals making decisions and contributing to policies (Manda & Mwakubo, 2014). They argue that the degree of benefit from economic growth between men and women is not the same, as women face other challenges such as social and cultural challenges (Duflo, 2012). The intersectionality concept outlines this challenge as a result of social identities.

Gender inequality remains an important topic and has been outlined as part of the Sustainable Development Goals. In terms of the intersectionality theory, gender as a social

identity, plays a significant part towards the individual's lived experiences (Carastathis, 2014; Corlett & Mavin, 2014; Parent, DeBlaere, & Moradi, 2013; Mabilo, 2018). Therefore, in order to address challenges facing women, a study that focuses on gender needs to be cognisant of other identities that may interact with and impact upon the experiences of such identity (Warner & Shields, 2013). Drawing on the intersectionality theory, women's challenges, including access to formal credit, will therefore be multipronged and likely to impact on the choices they make.

Several studies across the world have investigated whether there is gender bias against women in their access to finance, and have provided varying conclusions. Galli et al. (2020) describe taste-based discrimination as a preference and belief that is not based on any objective criteria. An example of taste-based discrimination occurs when female firms apply for financing and are rejected solely because of their gender. Galli et al. (2020) and Previous (2019) argue that females that apply for formal credit face a higher rejection rate than men. A study in Italy argues that female-owned firms are discriminated against as they are charged higher interest on credit obtained, even when there is no evidence to suggest that women borrowers are riskier than men (Alesina, Lotti & Mistrulli, 2013). This is further substantiated by findings in OECD countries indicating that women are less likely to receive formal credit than men and receive smaller loans than men (Adema, Ali, Frey, Kim, Lunati, Piacentini & Queisser, 2014).

Contrary to Alesima et al. (2013) and Adema et al., (2014), several authors have dismissed the argument that the lack of access to formal credit by females is due to gender discrimination. In studies of different countries in Europe, findings reveal that no evidence suggests gender discrimination in women's access to bank finance (Stefani & Vacca, 2013; Ongena & Popov, 2016; Calcagnini et al., 2015; Asiedu, Freeman & Nti-Addae, 2012(Asiedu et al., 2012)(Asiedu et al., 2012)(Asiedu et al., 2012)(Asiedu et al., 2012)). Rather, there is evidence that women's access to bank finance is significantly determined by

the characteristics of female-owned firms, such as size, age, and sector (Stefani & Vacca, 2013; Calcagnini et al., 2015). Ongena and Popov (2016) find that there are no differences in loan terms such as interest rates and collateral requirements. In fact, white female firms in the USA paid lower interest rates than white male-owned firms (Asiedu et al., 2012). The argument that there is gender discrimination does not hold true when assessing the target market of micro-finance institutions (MFIs). MFIs target women as they have high repayment rates and contribute to growth in the economy (Sarumathi & Mohan, 2011; Al-Mamun & Mazumder, 2015).

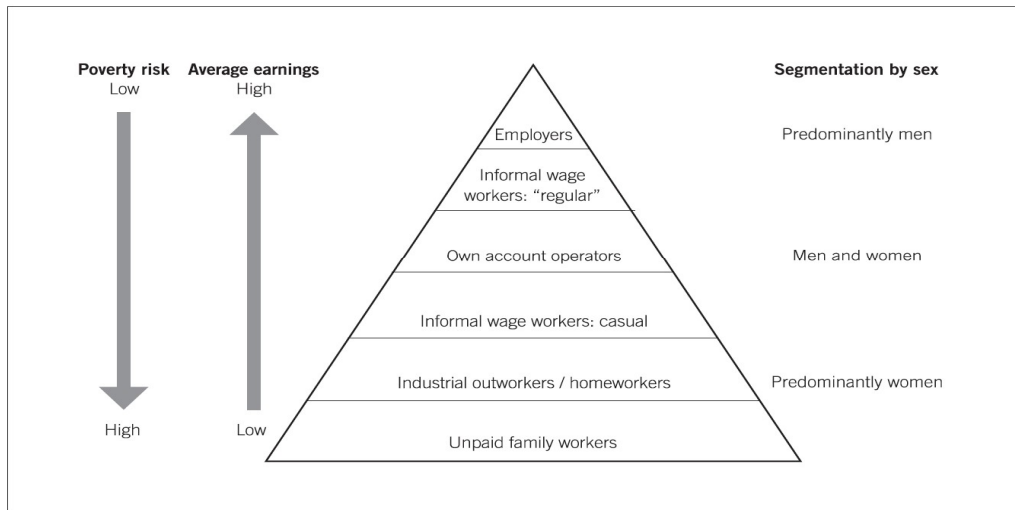
Access to finance acts as a catalyst for the empowerment of women by allowing them to fully utilise their resources as well as invest in the business (Rashdan & Eissa, 2019). Yet the finance gap for women entrepreneurs is estimated to be \$1.7 trillion (32 per cent of the MSME finance gap) in developing countries (Bruhn et al., 2017). An estimated 70 per cent of women in Africa do not have access to finance (Daniels, 2014; Department of Women, 2015). Firms, especially women-owned firms, with credit constraints have a lower output and lower investment in capital assets to enable them to expand (Nwosu & Orji, 2017). Nonetheless, women are less likely to access formal credit compared to men (Nwosu & Orji, 2017; Alesina, Lotti & Mistrulli, 2013; Fanta et al., 2017), and for women that obtain formal credit, the average loan amount is likely less than that obtained by men (Tran, Elahi, Zhang, Abid, Pham & Tran, 2018). In a study relating to SSA economies, findings indicate that women are less likely to borrow formally (Zins & Weill, 2016). It is therefore hypothesized that females have lower chances of accessing formal credit.

Having outlined the importance of the informal sector and gender in access to finance, the following sections discuss theory regarding determinants of access to credit used in the development of the model for this paper.

Women in the informal sector are predominantly found in low-paying jobs. Except for Asia, an insignificant number of women operate in informal construction or transportation work, sectors dominated by males (Ulrichs, 2016). Women in the informal sector tend to dominate the informal manufacturing industry in most parts of the world, except Sub-Saharan Africa (Ulrichs, 2016). Women tend to be involved in low value-adding activities with businesses set up as a means of survival (Kasseeah & Tandrayen-Ragoobur, 2015). While men are employers and own-account workers, women opt for industrial work and unpaid work (see Figure 10 below). Authors Rashdan and Eissa (2019) and Aterido et al. (2013) argue that the existing gender gap in access to formal financial services is due to female participation in the economy and not necessarily due to the operations of the financial sector itself.

Women in the informal sector are likely to set up shop out of necessity and not because they've identified an opportunity in the market. This results in women dominating survivalist jobs. They may not have the desire to expand a business and consequently access formal credit, unlike entrepreneurs that start the business from choice (Williams, 2014). The South African entrepreneurship landscape demonstrates the same patterns as the rest of the world where 50.1 per cent of women in the informal sector operated in the manufacturing industry in 2017 (Statistics South Africa, 2017). A report on entrepreneurship in South Africa outlines the distinction between male and female entrepreneurs with men mostly opportunity entrepreneurs whilst women are necessity entrepreneurs (Turton & Herrington, 2012) .

Figure 10: Informal employment: Hierarchy of earnings & poverty risk by employment status & sex



Source: *The informal economy: Definitions, theories, and policies*. Martha Alter Chen, 2012

The lower household income is further driven by the fact that South African women accept comparatively lower wages and participate in the survivalist vocation (Meiring, Kannemeyer & Potgieter, 2018). Statistics South Africa (2017) reported that in 2017, 55.3 per cent and 67.5 per cent of women generated turnover between R0 and R1000, and profit between R0-R1500, as opposed to 38.9 per cent and 46.5 per cent reported by men, respectively for the same ranges. This presents a challenge as the type of informal business operated by females is inherently survivalist with little chances of expansion. The minimal turnover and profits barely cover their livelihoods and this begs the question whether their businesses could afford loans or not, especially when financial institutions are more likely to provide finance to profitable economic activities as opposed to businesses with unstable profits (Kasseeah & Tandrayen-Ragoobur, 2015). In Tanzania individuals with a higher income are more likely to access loans, as a higher income is seen as a guarantee and some form of security (Lotto, 2018). It is expected that individuals with minimal or irregular income are less likely to access formal credit.

Globally, an inverse relationship is observed between the level of education and employment in the informal sector (International Labour Office, 2018). ILO findings reveal that those with secondary and tertiary education are less likely to be informally employed than individuals with no education or possessing only primary education (International Labour Office, 2018). In their study, Nguyen (2015) finds that there is a relationship between education and the likelihood of a women's involvement in the informal sector. Education remains a key driver for women's participation in the informal sector (Nguyen, 2015). In South Africa, similarly to the ILO findings, individuals with lower levels of education are more likely to choose informal entrepreneurship (Lloyd & Liebbrandt, 2018). Using the 2017 After Access Informal Business Survey, Mothobi et al. (2020) found that 70 per cent of individuals working in the informal sector in South Africa had attained only primary education.

In developing countries, low levels of education and financial literacy impact on women entrepreneurs' ability to access credit (Baliamoune-Lutz & Lutz, 2017). It was further observed that possessing a lower degree of education and operating in the informal market impedes access to formal financial services for women (Aterido et al., 2013; Farazi, 2014). In Nigeria, it was found that individuals with tertiary education are most likely to borrow from a financial institution (Abdu, Buba, Idi & Muhammad, 2015). A study in Ghana revealed that the level of education affects the ease of accessing credit by the informal sector with differences noted between men and women (Peprah, 2013). Thus, it is expected that the low levels of education are negatively correlated to access to credit.

Rural areas are home to persons predominantly operating in the informal sector. Globally, 80 per cent of people living in rural areas are likely to be in informal entrepreneurship. In contrast, about 43.7 per cent of individuals living in urban areas are likely to be engaged in the informal sector (International Labour Office, 2018). Perrot (2017) argues that in rural South Africa, women are extremely affected by poverty which results in them

taking up employment in the informal sector and this is expected for this study. Even with urbanisation, people living in rural South Africa are still more likely to operate in the informal sector due to the lack of employment opportunities found in rural areas (Lloyd & Liebbrandt, 2018).

Females, youth, poor, and individuals living in rural areas are generally financially excluded (Allen, Demirguc-Kunt, Klapper, & Martinez Peria, 2016). In most developing countries, moreover, in rural areas, women do not own land nor have rights to land, making it difficult to access formal credit from financial institutions (FAO, 2019). Rural areas are out of reach for many financial institutions making access to credit in the rural areas a challenge. The transaction costs required to serve individuals outside urban areas rarely match the potential revenue. This has also necessitated the emergence of micro-finance institutions and community development banks to address the credit gap in rural areas. Based on the theory, it is anticipated that individuals living in rural areas are less likely to have access to formal credit.

Globally, it is more likely than not that younger individuals and relatively older persons will engage in informal entrepreneurship. Around 77 per cent and 78 per cent of young and older persons respectively are in informal employment, with youth prevalence in developing countries (International Labour Office, 2018). In South Africa, older individuals are more likely to be self-employed in the informal sector (Lloyd & Liebbrandt, 2018) with the average age of informal entrepreneurs being 42 years, per SESE 2013 data (Fourie, 2018). The formal sector in South Africa has provided more opportunities for youth than the informal sector (International Finance Corporation, 2018). The reason for this is perhaps the significant wage gap between the formal and informal sectors, which discourages individuals from undertaking informal employment or self-employment in the informal sector.

Age was observed to be positively related to financial inclusion (Akudugu, 2013; Lotto, 2018; Timbula, Mengesha, Mekonnen & Kebede 2019). In West Africa, Soumaré et al. (2016)

find that credit increases with age. Rashdan and Noura, (2019) found that age has a positive relationship with ownership of a credit account in Egypt. The hypothesis is, therefore, as age increases so does the likelihood of accessing formal credit.

Collateral acts as financial security for the recovery of loans if the client defaults. Possession of collateral is regarded as part of the characteristics of the borrower used in credit assessment, especially when the risk to repayment is high (Domeher & Abdulai, 2012). The necessity for collateral is more crucial in developing countries where information asymmetry is significant (Domeher & Abdulai, 2012). This becomes a hindrance for women in accessing formal credit as they generally cannot provide any form of collateral. Inadequate access to collateral is cited by Mothobi et al. (2020) as one of the barriers for access to formal finance by the informal sector. This is particularly the case for women. Banks mostly require some form of collateral to approve a loan, which women generally do not possess and thus cannot access formal finance (Previous, 2019; (Bahta et al., 2015)(Bahta et al., 2015)(Bahta et al., 2015)Bahta, Strydom & Donkor, 2015).

Globally, the inability to provide collateral is one of the major reasons for such a gender gap in formal financial inclusion (Demirgüç-Kunt et al., 2018). This has led to women often finding themselves financially excluded as they do not have the collateral required by the formal financial sector (Previous, 2019). It stands to reason that women in the informal sector will be categorised as risky borrowers and thus may fail to obtain credit if they do not have collateral. The paper hypothesizes that possessing collateral increases the chances of accessing credit and thus is positively correlated to access to credit.

Equally important is women's attitude to and perception of access to finance, which is another reason for lack of access to formal credit by women entrepreneurs. Women often fear applying for loans or have the belief that their loans will be rejected and are thus discouraged from applying for formal credit. Studies in Europe reveal that female firms apply less often for

bank loans than male-owned firms because of fear of rejection and consequently rely on informal finance (Galli & Rossi, 2015; Ongena & Popov, 2016). It has been observed that females feel discouraged and less confident in their bargaining capabilities when dealing with the formal financial system. It is deemed appropriate to include this variable in the ‘access to credit’ model. Taking the above into account, it is anticipated that the fear of being rejected decreases the chances of access to credit.

Smaller firms’ preference for the use of internal funding instead of external funding, is regarded as another determinant of access to credit (Mothobi et al., 2020). In Eastern Europe and Central Asia, small firms have a six per cent lower probability of demand for a loan, suggesting the use of internal funding (Hainz & Nabokin, 2019). A study in nine African countries revealed that 83 per cent of informal enterprises were self-funded (Mothobi et al., 2020). In the South African SESE survey, over 75.4 per cent of informal entrepreneurs in 2017 used their own money to fund their businesses as indicated in Table 2 below, and indicative of low demand for formal credit or external funding (also illustrated in Figure 11 below). Findings by StatsSA reveal that over 90 per cent of informal businesses had no debt, as seen in Figure 12 below (Statistics South Africa, 2017).

Women are more likely to depend on internal funding than men and usually hold back from taking out loans (Galli et al., 2020). Galli et al. (2020) further highlight the dependency on internal funds, which is increased by women’s lack of interest in expanding their businesses. This has been evidenced by the nature of businesses operated by women in the informal sector, which are survivalist in nature. Another reason that explains the use of internal funds by women emanates from their low appetite for risk and fear of loss of control of their businesses (Calcagnini, Giombini & Lenti. 2015). The paper considers women entrepreneurs in the informal sector and therefore the model is modified to include this determinant that is prevalent in this sector. Individuals in the South African informal sector are likely to use internal funds

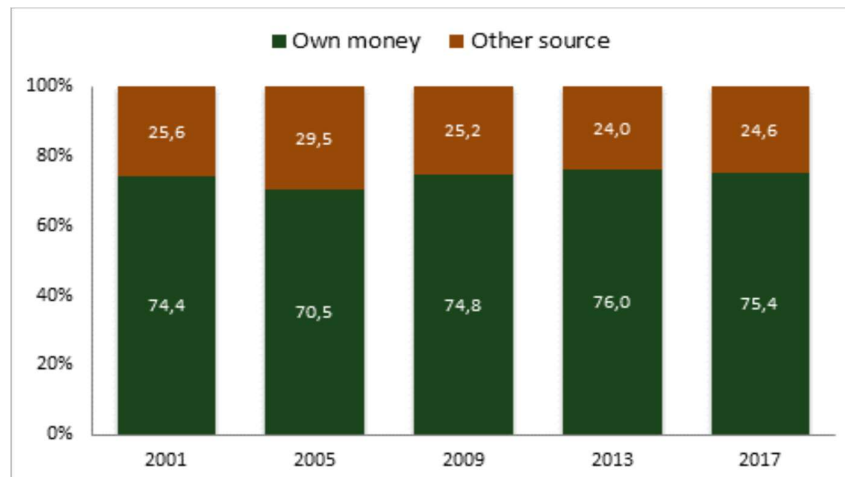
to fund their enterprises instead of formal credit. The paper hypothesises that the use of internal funds and lack of demand for credit decreases the chances of access to credit.

Table 2: Source of money to start informal businesses, 2001–2017

	2001	2005	2009	2013	2017
	Percent				
Whether or not money was needed					
Yes	63,7	74,7	64,4	59,5	58,6
No	36,3	25,3	35,6	40,5	41,4
Total	100,0	100,0	100,0	100,0	100,0
Source of money					
Own money	74,4	70,5	74,8	76,0	75,4
Other source	25,6	29,5	25,2	24,0	24,6
Total	100,0	100,0	100,0	100,0	100,0
Those who use their own money, source of own money					
Previous and/or present wage employment	44,1	57,9	47,4	53,8	56,8
Other business	3,2	4,4	3,1	2,8	4,4
Sale of livestock/crops	2,9	1,6	3,3	2,0	1,5
Sale of other assets	5,2	3,4	4,5	2,7	2,3
Inheritance	5,3	6,0	6,2	3,0	3,6
Pension from work	3,5	2,2	3,3	4,0	3,6
Retirement/severance pay	5,2	2,6	5,2	4,4	3,2
A policy that matured	0,6	0,2	0,5	0,1	0,1
Money paid out from a stokvel	6,0	2,3	8,8	5,8	5,9
Other	24,1	19,4	17,6	21,3	8,5
Total	100,0	100,0	100,0	100,0	100,0

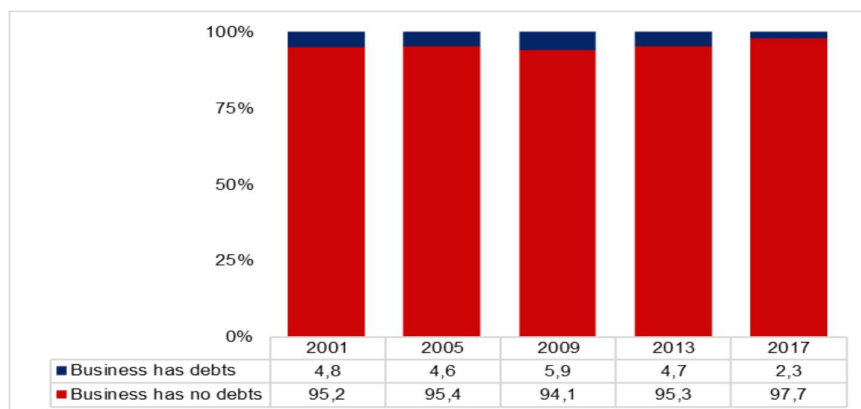
Source: Survey of Employers and the Self-Employed, StatsSA 2017

Figure 11: Source of money to start informal businesses, 2001–2017



Source: Survey of Employers and the Self Employed, StatsSA 2017

Figure 12: Proportion of those running informal businesses who had business debts, 2001–2017



Source: Survey of employers and the self-employed, StatsSA 2017

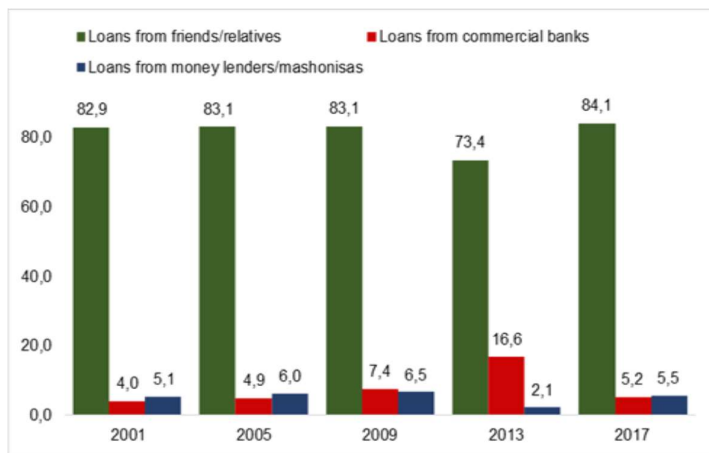
MSMEs rely heavily on sources of credit from the informal financial sector (Bruhn et al., 2017). The ease and speed of obtaining informal credit with minimal requirements make the informal financial sector much more attractive. Hardie (2019) argues that individuals who opt for the informal financial sector are likely to be experienced users of financial services and perhaps use the informal financial sector for its ease or for offer of a better deal. Data from the FinScope Survey demonstrates that 45 per cent of people make use of informal financial services (Kameshnee, Brendan & Candice, 2018). In developing countries, a significant portion of the population accesses credit through the informal financial sector (de Koker & Jentzsch, 2011).

The informal financial sector remains the preferred choice for enterprises in the informal sector. Informal financial services refer to “financial services rendered outside the scope of formally regulated and supervised financial services sector” (De Koker & Jentzsch, 2011). De Koker and Jentzsch (2011) describe these services as community-based; dependent on social networks and mutual trust as well as reduced information asymmetries, as the parties have sufficient knowledge of one another. The informal financial sector takes various forms and includes self-help groups/stokvels/societies, rotating savings and credit associations, mashonisas (moneylenders), village savings-and-loan associations as well as friends and family. Kasseeah and Tandrayen-Ragoobur (2015) argue that for informal firms, the informal

financial sector becomes the only source of finance. Figure 13 below indicates the various sources of credit obtained by individuals in the informal sector in South Africa with loans from friends and relatives significantly high.

Women tend to access more informal financial services than men (Genetics Analytics, 2018; Nwosu & Orji, 2017; Fanta et al., 2017). Women entrepreneurs who are discouraged from applying for formal credit are likely to depend on informal credit (Ongena & Popov, 2016). In the case of South Africa, women continue to use credit from the informal financial sector such as stokvels, burial societies, moneylenders, and loans from family and friends (Mathonsi, 2011). This alternative source of finance is considered to affect the desire to access formal credit, especially for individuals in the informal sector, and is considered in the development of the model. It is anticipated that the use of informal financial services (family and friends as well as mashonisas) decreases the chances of access to credit and is likely to be negatively correlated to access to credit.

Figure 13: Proportion of those who borrowed money to start an informal business by the source of money, 2001–2017



Source: Survey of employers and the self-employed, StatsSA 2017

Africa has made huge strides towards increasing financial inclusion through mobile money, nevertheless, Mothobi, Gillwald & Aguera, (2020) argue that outside of mobile money

services, the continent lags in terms of optimal employment of other fintech platforms, such as crowdfunding. Madzwamuse and Kouakou (2018) argue that the fourth industrial revolution and its would-be implications have been dominantly biased towards the formal sector. The authors further argue that this analysis disregards the makeup of Africa's economies, where most activity occurs in the informal sector. South Africa also has large scope for fintech companies to fill the financing gap within the informal sector (International Finance Corporation, 2018), and should take advantage of the fact that it has the most fintech start-ups in SSA (Genetics Analytics, 2018).

Women entrepreneurs in the informal sector are the hardest hit as fintech companies' priorities have disregarded the informal sector as well as women. Mondato, a consulting firm specialising in digital finance and fintech, emphasises that, in its current form, the design of financial services does not meet women's needs and a digital alternative model to serve low-income women remains to be developed (Mondato, 2017). Gender is often overlooked in assessing the impact of fintech in providing technological solutions to women (Genetics Analytics, 2018). At the same time, it is important to realize that the ability of fintech to provide solutions for women is affected by the fact that women have limited access and use of technology compared to men (Madzwamuse & Kouakou, 2018; Njuki et al., 2019).

Mothobi et al. (2020) detail the After Access Survey performed by Research ICT Africa (RIA) in 2017 which is relevant to this paper. RIA surveyed the informal sector in nine African countries including South Africa. The study reveals that Kenya has been the most successful country in servicing the informal sector, with 68 per cent of informal business using mobile money. South Africa trails Kenya with 53 per cent of informal entrepreneurs using formal banking services. Access to the internet remains quite low in Africa with only seven per cent of informal entrepreneurs on average using the internet for business purposes. These low levels of use are probably due to the lack of internet-enabled devices. South Africa leads the continent

with 24 per cent of informal enterprises making use of the internet and 20 per cent of informal enterprises owning a computer. These levels remain low and further promotion of the benefits of the technology in the informal sector is required. The October 2018 report released by the Pew Research Centre indicates that South Africa has the highest mobile phone ownership on the continent with 51 per cent of South Africans owning a smartphone, 40 per cent owning a basic phone and nine per cent not owning a phone (Silver & Johnson, 2018).

Limited studies exist empirically testing the relationship between technology (especially communication devices) and access to credit. A study in Zimbabwe indicated that vulnerable groups adopted mobile banking for its accessibility, speed and security (Mago & Chitokwindo, 2014). One study indicated that lack of internet access reduced the chances of a household's owning a bank account while households with mobile devices were more likely to own a bank account than people with none (McHenry et al., 2017). While the use of mobile phones led to increased savings in poor households in SSA (Ouma et al., 2017) and had a positive relationship with financial inclusion in a review of 44 African studies (Evans, 2018). Mobile phones may be used to deliver financial services where financial institutions have not been able to reach, and therefore access to a communication device is expected to be positively correlated to access to credit.

Entrepreneurs in the informal sector in Africa may lack an understanding of how the internet may assist their informal business (Mothobi et al., 2020). Although the Technology Acceptance Model (TAM) is not discussed in this study, the study assesses whether attitude towards technology achieves greater credit access. Aboelmaged and Gebba (2013) apply TAM to investigate the adoption of mobile banking, and results show that perceived usefulness caused a significance adoption of mobile banking. In their study applying TAM to understand consumer acceptance of technology-enabled financial services, Wentzel, Diatha & Yadav (2013)(Wentzel et al., 2013)(Wentzel et al., 2013)(Wentzel et al., 2013) find that attitude is a

significant construct. Based on these studies, it is anticipated that a positive attitude towards technology influences the desire to access credit using technology and is positively correlated with access to credit.

On reviewing the literature, it becomes clear that the theories resulting from investigating the relationships between formal credit and informal sector business and women are mixed and context specific. Whether there is gender bias involved in credit provision can best be tested by the evaluation of the credit models and methods of banks and the proportion of female loan applications declined. Discrimination is hard to prove, hence the contrasting theories reviewed. However, the actual statistics of access to formal credit by women are low, indicating that there are other explanatory variables for this phenomenon. On assessing whether being employed in the informal sector hinders women entrepreneurs' ability to access funding, it is deemed to be plausible. Understanding the mainstream institutions and their need for credit assessment, one sees that the information asymmetries in this sector may influence access to credit. That age plays a role in determining access to credit is deemed a plausible theory, as age determines the life stage of an individual with older individuals having a credit history as well as acquired assets. Focusing on the theory that owning collateral is positively correlated to access to credit, this may be true in mainstream finance. However, reviewed literature of how nonbank players operate, suggests that, in the context of women entrepreneurs in the informal sector, this theory may need to be further investigated.

As mentioned, while discussing the South African institutional landscape, mainstream banks are not ordinarily found in rural areas, leaving MFIs to provide financial services to the rural population. It would, naturally, be possible for individuals living in rural areas to be financial excluded and for that explanatory variable to be negatively correlated to access to formal credit. Education has been widely tested in existing literature, even in terms of financial inclusion as a broad term. There is a consistent theory across regions, that the more educated

an individual is, the more likely they are to be able to access formal credit. Further, persons in the informal sector generally do not possess high education levels, and thus the expected hypothesis is justified.

A construct that is difficult to theorise is the woman entrepreneur's attitude to and perception of access to formal credit. However, the prevalence of the informal financial sector may suggest a preferred choice, as opposed to formal credit. In the South African context that includes stokvels that are entrenched in the communities and may be easier to access. Hence the inclusion of the informal financial sector as a key explanatory variable in the informal sector context. This is linked with internal funding as well as preference for funds from friends and family. In the South African context, mobile money has not taken off as seen in other countries of the continent. However, with retail stores entering the South African credit market and targeting the lower LSM, mobile phones may prove instrumental in enhancing financial inclusion. Therefore, the theory that possessing a mobile device increases the chances of access to formal credit, is expected to be true.

Proposed framework

The development of the financial inclusion model in this paper takes into account the literature reviewed above. As mentioned, financial inclusion is difficult to measure because there is no universal definition. This results in different scholars and policy makers measuring financial inclusion differently. The second complexity is a result of the multidimensional nature of financial inclusion indicators. Financial products and services have evolved for different contexts and therefore the degree of financial inclusion differs from one context to another. To address the gap found in the literature, the model is narrowed to access to credit as the financial inclusion indicator. The dependent variable is access to formal credit and relates to credit from a bank.

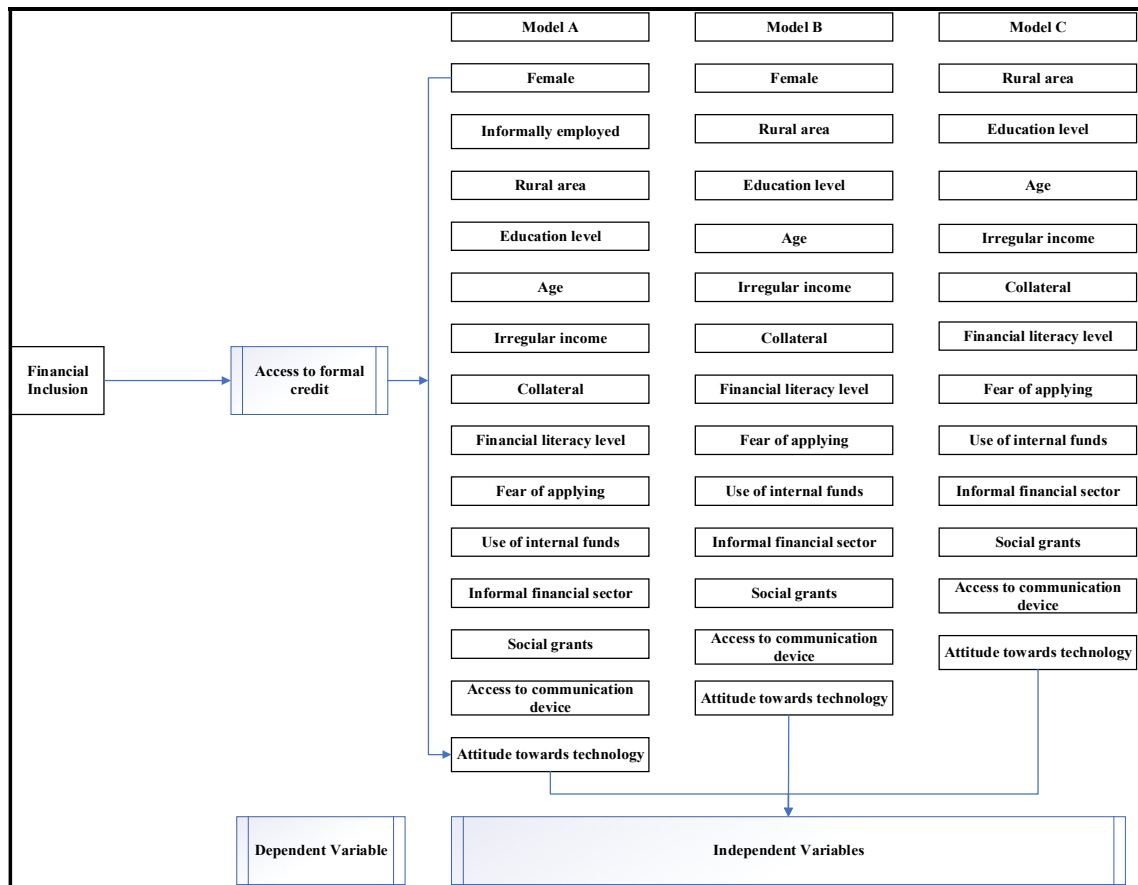
The model also delves into the demand-side factors, as there has been extensive

literature regarding the supply-side factors. Further, it is argued that the demand side factors contribute to the literature as they provide data regarding the constituents. The existing 'access to credit' model is modified in this paper to include determinants that specifically affect the informal sector as well as those that have been excluded in the literature. The model is disaggregated to focus on females in the informal sector as there is limited empirical evidence on how being an entrepreneur in the informal sector influences access to credit.

For the first research sub-question, the independent variables are: female; entrepreneurs in the informal sector; living in the rural area; education level; age; irregular income; collateral by the owner; fear of applying for formal credit by the owner; owner using internal sources to fund business due to lack of demand for credit; the owner obtaining credit from informal finance sources (including family and friends and mashonisas); access to a communication device and attitude towards technology.

To truly understand whether these determinants are unique to women entrepreneurs in the informal sector, two further questions are posed that assess access of credit to females as well as access to credit nationally. For the independent variables in the second research sub-question, the entrepreneur in the informal sector variable is excluded, as the aim of this question is to assess how being female affects access to formal credit. For the third research sub-question, entrepreneur in the informal sector and the gender variables are excluded to assess determinants of access to formal credit for South Africans. A logit model is used as the dependent variable is dichotomous as illustrated in Figure 14 below.

Figure 14: Determinants of access to credit



Source: Author's elaboration

The model includes entrepreneurs in the informal sector as a determinant and would be suitable for the SSA region where the informal sector dominates. This modification should prove valuable for the following SSA countries, with higher proportions of informal sectors than South Africa, namely: 84.8 per cent (Ghana), 90.9 per cent (Rwanda), 90.6 per cent (Benin), 80.4 per cent (Nigeria), 65.5 per cent (Burkina Faso), 87.6 per cent (Uganda), and 58.5 per cent (Egypt) (International Labour Office, 2018).

The developing world indicates a higher proportion of women informally employed than men. This is a major source of income and job creation, especially providing livelihoods to female-headed households (International Labour Office, 2018; Maurya & Mohanty, 2019; Statistics South Africa, 2017; Gikenye & Ocholla, 2014). Women entrepreneurs are most likely to be found in the informal sector in developing countries as this employment allows them the

flexibility to work and take care of household duties. As female entrepreneurs in the informal sector are included as a determinant, the model modified for gender and informal sector determinants would best be applied in the developing world.

As SSA has a prevalent informal sector, the use of internal funds and the lack of demand of formal credit determinant would apply to this region. This is supported by the study in nine African countries which revealed that 83 per cent of the informal enterprises were self-funded (Mothobi et al., 2020). Also, a part of the informal sector, the informal financial sector remains the preferred choice for enterprises, and this determinant will assist in understanding whether individuals prefer informal financial sector access to formal credit. Also, distinct to developing countries is the requirement for collateral to access credit, due to the pronounced information asymmetries. Collateral is part of the necessary characteristics that influence credit for the model in the SSA region.

Further, the sophistication of the financial system and ITC infrastructure is crucial for the applicability of this model as the dependent variable relates to formal credit from banks. The SSA financial market is relatively underdeveloped, compared to South Africa and thus may impact on the applicability of formal credit as a dependent variable. However, the ownership of mobile devices and the attitudes towards technology are important determinants in Africa, especially Kenya, due to the mobile money wave.

2.2 Empirical literature

The empirical section will focus on access to credit as a measurement of financial inclusion, specifically the study focuses on determinants that affect access to formal credit. Formal credit constitutes credit from banks. Studies that have assessed demand determinants of access to credit have been reviewed to first identify the determinants noted in the theoretical literature and second, to substantiate hypotheses identified in the theoretical literature based on the relationship between access to credit and the independent variables.

A study was conducted in India that examined the determinants of access to credit by female-owned informal enterprises (Maurya & Mohanty, 2019). In the paper, the informal sector represents unincorporated private non-agricultural enterprises owned by individuals or households in the production of goods and services, with a maximum of nine employees. The dependent variable relates to access to formal credit (banks, DFIs, regional rural banks, MFIs and other institutional bodies). The independent variables considered include the social category of the owner; employment size of the enterprise; location of the enterprise; registration status; the number of activities the business is engaged in; the age of the firm; sector and region in which the firm operates; growth status of the firm; whether the owner or firm has a bank account; whether the firm has accounting records; assets and gross profit that the firm generates. A probit model was selected for this study.

Secondary data was obtained from the Unincorporated Non-Agricultural Enterprises Excluding Construction (NSS 73rd Round) which was conducted by the NSSO during 2015–2016 and sampled 30 650 women entrepreneurs in the informal sector. The study revealed that women entrepreneurs in the informal sector face tougher constraints to formal credit due to low productivity and growth within their enterprises. Of those investigated, a paltry 3.33 per cent had access to formal sources of credit and those remaining either self-funded or obtained credit from informal financial sources to fund their businesses (Illustrated by Table 1 below). Contrasting (Biyase & Fisher, 2017), results indicate that micro-enterprises in the rural areas are likely to obtain formal credit. The reason for this is the presence of micro-finance institutions in rural India. Land collateral and age of firm are negatively related to credit access while maintaining accounting records is positively associated with credit access.

The independent variables in this model pertain mostly to the micro-enterprise as the legal entity with little data provided about the women running the firm. Usually, the micro-enterprise is not distinct from the owner and therefore characteristics of the owner are deemed

crucial and influence access to credit. Another shortcoming of the model is that keeping financial records is included as a determinant, while most informal entrepreneurs do not have accounting records and it can be argued whether the inclusion of this variable is necessary to the model.

Table 1: Sources of finance for women’s enterprises in the informal sector in India

Sector	No finance (%)	Informal sources (%)	Formal sources (%)	Both (%)
Rural	91.33	4.74	3.35	0.58
Urban	92.22	4.04	3.31	0.52
Total	91.8	4.37	3.33	0.5

Source: What restricts credit to women enterprises? Evidence from India’s informal sector Maurya & Mohanty, 2019.

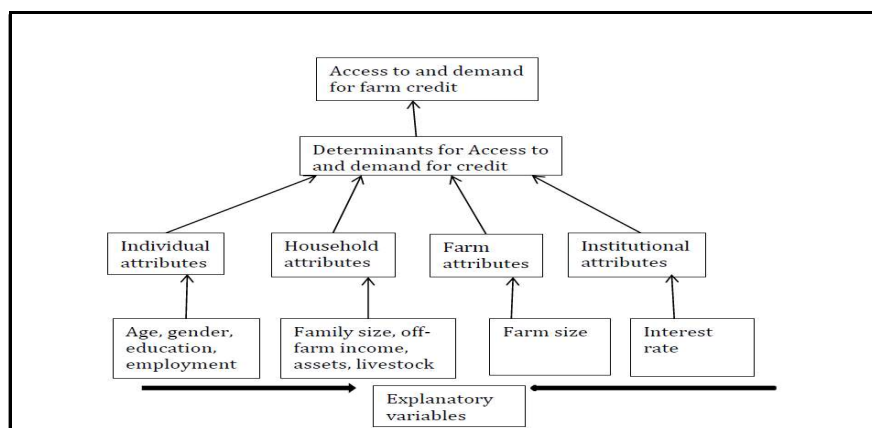
A study was conducted in Tigray, Ethiopia investigating the determinants of access and demand to farm credit (Auma & Mensah, 2014). The paper divided the determinants of access/demand for credit into four categories: individual, household, farm, and institutional attributes, as shown in Figure 15 below. The study considers the five dependent variables being ‘access to farm credit’, ‘demand for farm credit’, ‘amount of credit’, ‘fertilizer use intensity’ and ‘manure adoption’. The independent variables selected for their model included: gender of household head; age of household head; marital status of household head; religion of household head; education of household head; employment status; other income; consumption expenditure; family size; purpose of credit; farm expenditure; durable farm assets; and durable house assets. A bivariate logit model was used for cross-sectional data of 519 households.

Their results indicate that male-headed households were less likely to demand and access credit, due to extra income that men are able to generate from hiring out their skills. Farming is noted to have a positive correlation to demand for and access to credit. Large farms were likely to demand credit. Religion had a negative correlation to demand for credit because the Muslim religion does not permit borrowing as paying interest is considered a sin. The

findings revealed a positive relationship between family size and demand for credit. Education was found to be negatively correlated with the demand for farm credit as educated individuals would likely opt for other vocations, not farming. However, education is positively correlated to access to credit. Age and age-squared are positively and negatively correlated to demand for credit respectively. The reason cited is that as people get older, their demand for credit declines because they do not want their children to inherit debt when they die.

The shortcoming of this model is that demand is measured by obtaining responses to the question 'have you got credit?' This question is unlikely to indicate an individual's demand for credit. The measurement of demand can only be determined if questions are posed such as 'do you or does your business require credit'. The reason for this could be because the study used secondary data and the questionnaire was not specific to the researcher's questions and objectives. Another shortcoming of the model is that one of the dependent variables relates to a continuous variable being amount of credit. For this dependent variable, a logit model is used. However, it is deemed inappropriate as the outcomes are not discrete. The data collected is for 16 communities from Tigray region in Ethiopia and might not be representative of the Ethiopian population. The model is limited to credit for farm input expenditure and is limited to agricultural entrepreneurs. The model concentrates on the characteristics of the household head which could be selection bias, as more males could occupy this role. This is further evidence in the descriptive statistics where 69.8 per cent of the sample was male.

Figure 15: Determinants of access to and demand for farm credit



Source: Auma & Mensah, 2014

Penaloza (2015) investigates the determinants of access to credit for 110 000 SMEs involved in the industrial and services sectors in Latin America, using the 2006 and 2010 enterprise surveys conducted by the World Bank. The survey constitutes firms in fourteen countries: Argentina, Bolivia, Chile, Colombia, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela. The dependent variable is access to credit, including credit from commercial banks government financial institutions and informal sources. While the independent variables included in this model were: company size (number of employees and amount of sales); years of operation of the company; technological capacity (tenure email, website, quality certifications, training of workers in quality courses); characteristics of the organization (experience, share concentration, holding a bank account); sectoral indicators (activity, country and locations of the firm). The study uses a logit model because the function type of the dependent variable was found to be a logistic curve. The results indicate that larger and older firm have greater accessibility to credit. Investment in technology is positively correlated to access to credit. This model, like the study in India, focuses on firms and disregards individual characteristics. The informal financial sector may be impacted by different determinants as opposed to formal credit. Zins and Weill (2016) find that the determinants for access to the informal financial sector differ from those of the formal financial sector.

Cuéllar (2019) analyses a sample of 55 countries published by the World Bank for their credit model in the period between 2006 and 2017. The dependent variable is the number of customers that obtained loans from financial institutions for every ten thousand adults. Independent variables include depth of credit information for companies; ATMs per ten thousand inhabitants; ATMs per ten thousand inhabitants squared; uncertainty avoidance; pragmatism; quality of education; vulnerable employment. The study uses a static panel and the Panel-Corrected Standard Errors in R. As in the theoretical literature reviewed, level of education and quality of employment is positively correlated to credit. The model analyses determinants from a supply-side point of view and, as mentioned, does not provide critical data about individuals' characteristics that affect access to credit, which is the current gap in the literature.

Biyase and Fisher (2017) investigate the determinants of access to formal credit by poor households in South Africa, using 2008–2012 data from the National Income Dynamics Study (NIDS) with a sample of over 28 000 individuals. The dependent variables include access to formal credit and the amount of credit, which are dichotomous and continuous respectively. Independent variables include age; asset ownership; household income; household size; race; levels of education; gender of household head; employment status of household head; urban area; farm area and province. The estimation technique used is the Heckman selection model, which takes into consideration sample selection bias, as data were not observable for certain variables.

The results indicate that education of the household head is an important determinant of the probability of receiving a loan. It was revealed that a loan was more likely to be approved if the head of the household was employed. The probability of receiving a loan was positively correlated with household income and assets, although the coefficients are statistically insignificant. Females are less likely to be approved for loans than males. Households living in

the poorest provinces (Eastern Cape, KwaZulu-Natal, Limpopo etc,) are less likely to be approved for a loan than those residing in the Western Cape. Households living in traditional rural areas and farm areas are less likely to be approved for a loan than households in urban neighbourhoods.

The financial inclusion determinants used by Biyase and Fisher (2017) are most consistent with the variables identified in this paper. The shortcoming of this study is that the dependent variable for the NIDS data is not observable for all data and therefore there is sample selection leading to a Heckman selection model being used. For a dichotomous dependent variable, probit and logit estimation techniques are more suitable.

This concluding paragraph summarises the anticipated relationship between the dependent and independent variables from the literature reviewed. It is noted that being female reduces the chance of access to credit, while operating in the informal sector and is expected to be negatively correlated to access to credit. The reason for this may be the formal financial sector's unwillingness to lend in this particular market. It is expected that the low levels of education found within the informal sector are negatively correlated to access to credit.

It is also expected that individuals based in rural areas are less likely to have access to formal credit. There are fewer bank branches further away from urban centres, and this may be the reason for the decrease in access to formal credit in rural areas. Older individuals dominate the informal sector and age is positively correlated to access to formal credit, as older individuals have some form of income to service the loan. It is expected that possessing collateral increases the chances of access to credit. Collateral is seen as security in the event the borrower defaults and therefore increases the chances of accessing formal credit.

It is expected that irregular income reduces access to formal credit because of the difficulty and uncertainty of servicing the loan. It is further anticipated that the fear of being rejected decreases the chances of access to credit, as such individuals will not apply for loans.

The use of internal funds affects demand for credit and decreases the chances of access to credit. It is anticipated that the access to informal financial services is likely to be negatively correlated to access to credit. Access to a communication device is expected to be positively correlated to access to credit, while it is anticipated that a positive attitude towards technology is positively correlated to access to credit.

CHAPTER 3: METHODOLOGY

3.1 Research approach and strategy

This study aimed to investigate how certain individual characteristics identified in the literature affect access to formal credit. The research sub-questions are explanatory in nature as they seek to examine the relationship between variables. The independent variable for all three research sub-questions is formal credit. The individual characteristics for the first research sub-question are female: entrepreneurs in the informal sector; rural area; education levels; age; irregular income; collateral by the owner; fear of applying for formal credit by the owner; owner using internal sources to fund business due to lack of demand for credit; the owner obtaining credit from informal finance sources (including family, friends and mashonisas); access to a communication device and attitude towards technology. Entrepreneur in the informal sector variable is excluded for the second research sub-question, while entrepreneur in the informal sector and female variables are excluded for the third research sub-question.

Quantitative research attempts to understand the general trends regarding certain characteristics, explain reasons for predictions as well as the causal relationships among various subjects (Kraska, 2010; Woodwell, 2014). Unlike qualitative research, quantitative research aims at testing theory as opposed to theory generation (Noordin & Masrek, 2016). In essence, quantitative research involves the identification of theory, development of hypotheses based on the theory, and testing data to validate or invalidate the hypotheses (Bettany-Saltikov

& Whittaker, 2014; Haq, 2014; McCusker & Gunaydin, 2014). Hypotheses regarding the relationship between the independent variables and access to formal credit have been developed in Chapter 2 of this study, based on theoretical and empirical literature. Following a quantitative research approach, these hypotheses are tested using the data available for the South African context to validate or invalidate the theory.

Quantitative research usually employs a deductive research approach for testing of hypotheses (McCusker & Gunaydin, 2014; Saunders & Bezzina, 2015). A deductive approach seeks to explain causality relationships based on established theories (Woodwell, 2014a). Considering the research questions and the evidence of pre-existing theories, a quantitative deductive research approach was therefore appropriate for this study. The research approach is also widely advocated as it offers objective results that can be generalised from the sample to the population (Noordin & Masrek, 2016; Haq, 2014) and outcomes are likely to predict the behaviour of subjects outside the context of the study (Woodwell, 2014a).

3.2 Model specification

Estimation techniques

As mentioned above, the research sub-questions are explanatory in nature and therefore seek to explain the relationship between the dependent and independent variables and how statistically significant the relationship is. Hypotheses regarding the relationship between these variables have been developed in Chapter 2. To test the hypotheses, data collected was assessed by way of statistical analysis (Kraska, 2010; Woodwell, 2014b). The most appropriate statistical techniques to test a causality relationship include regression analysis and has been employed for this study.

The dependent variable for the three research sub-questions is access to formal credit. The responses to the credit access strand included the following: credit from bank; credit from other formal (non-bank sources); credit from family and friends; credit from informal sources

and not borrowing. Credit from bank was used as a proxy for access to formal credit. The outcome of the responses to this credit strand/dependent variable was one of two possible outcomes, 'Yes' or 'No', and is thus dichotomous. The dichotomous independent variable was converted into dummy variables with 'Yes' represented by 1 and 0 for otherwise. The binary outcomes of the dichotomous dependent variables coded as 0 or 1 necessitated the use of a binomial regression model as opposed to a multinomial regression model.

When the dependent variable is dichotomous or discrete, both probit and logit regression models are appropriate to estimate the relationship between dependent and independent variables (Fullerton, 2020; Kasseeah & Tandrayen-Ragoobur, 2015; Woodwell, 2014b; Cakmakyapan & Goktas, 2013). Whereas estimation techniques such as Ordinary Least Squares (OLS) are best suited for the analysis of a continuous dependent variable (Smith & McKenna, 2013). OLS is not suited for data that is discrete in nature, as heteroskedastic errors occur (Johnston et al., 2020) and instead a maximum likelihood estimation is used when data is discrete (Cakmakyapan & Goktas, 2013).

A probit or a logit model may be used for the same data and the same purpose and will likely yield similar conclusions (Osborne, 2015; Woodwell, 2014b; Cakmakyapan & Goktas, 2013). A logit model estimates the relationship between a binary dependent variable and independent variables using log-odds, whereas a probit model uses probability as a metric (Osborne, 2015). In their study comparing probit and logit models, Cakmakyapan and Goktas (2013) concluded that the logit model is preferable for larger sample sizes as an increase in sample size increased the probability of observations. A probit model becomes appropriate when the error term is normally distributed and corrects for possible endogeneity, whilst a logistic model assumes that the error term follows a standard logistic distribution (Maurya & Mohanty, 2019; Johnston et al., 2020; Cakmakyapan & Goktas, 2013; Osborne, 2015). Being prudent, it is assumed that the error term for the regression is not normally distributed and

therefore the study employed a logit model. However, the result of not selecting the probit model is the existence of endogeneity bias, for which the probit model corrects. The next paragraph discusses endogeneity bias theory.

Endogeneity in a regression model exists when the regressor x , also known as the explanatory variable, correlates with the error term (Antonakis, Bendahan, Jacquart, & Lalive, 2014; Sharma, 2017; Ullah, Akhtar & Zaefarian, 2018; Zahid, Rahman, Khan, Ali & Shad, 2020). The causes for endogeneity include the omission of important variables/constructs, simultaneous causality or measurement error (De Grange, Gonzalez, Vargas & Troncoso, 2015; Sharma, 2017; Ullah et al., 2018). Should two variables simultaneously cause/affect each other, then the model evidences a simultaneity bias (Antonakis et al., 2014; Ullah et al., 2018).

It is vital to address endogeneity by comprehensively reviewing the literature regarding research design (theoretically), and using statistical techniques that will ensure rigour (empirically) (Ullah et al., 2018). Before testing the hypotheses, the data should be investigated for possible endogeneity (Zahid, Rahman, Khan, Ali & Shad, 2020). In order to identify endogeneity of individual regressors the Durbin–Wu–Hausman test is widely used and determines whether the explanatory variable is correlated to the error term (Antonakis et al., 2014; Sharma, 2017; Ullah et al., 2018; Zahid et al., 2020). In the first step, one explanatory is included as a dependent variable, with the second step testing the coefficients to determine whether the error term is significant (Ullah et al., 2018). Should the Hausman test indicate a significant test statistic, the variable is endogenous and correlated to the error term (Ullah et al., 2018) and a two-stage analysis is required (Sharma, 2017). Endogeneity bias, as determined by the Hausman test, also signals that the predictor is not a valid instrument (Zahid et al., 2020). In this study, the test for endogeneity was not performed and is included as a research limitation. However, the next paragraphs detail the impact of not addressing endogeneity and ways to address it.

Once endogeneity is identified, there are various methods of removing it. The most widely used solution is the use of Instrumental Variables (IV) (De Grange, et al., 2015) . Instrumental variables address endogeneity caused by omitted variables (Zahid et al., 2020), simultaneous causality (Ullah et al., 2018) and measurement error (Becker, 2016). IV is used to resolve endogeneity of multiple independent variables (Zahid et al., 2020). Therefore, for a regression equation with an endogenous explanatory variable, an IV (third variable that does not appear in the equation) which is not correlated with the error term, correlated with the endogenous explanatory variable (Sharma, 2017; Zahid et al., 2020) and independent from the dependent variable/outcome (Sharma, 2017) is used.

However, obtaining instrumental variables for multiple explanatory variables may prove difficult (Ullah et al., 2018) as they are reliant on exogenous information (Galvao, Montes-Rojas & Song, 2017), especially as the requirements of a suitable IV require the IV to affect the explanatory variable, but not have a direct affect on the dependent variable, and finding of such may prove difficult (Becker, 2016). Some argue that instrumental variables may be unsuitable for addressing endogeneity as IV may be correlated with the error term (Galvao et al., 2017) and thus selection of IV should be based on theory (Sharma, 2017). Besides these difficulties, researchers need to demonstrate that efforts were made to ensure rigorous estimation procedures and acknowledge alternative methods to resolve endogeneity (Ullah et al., 2018).

There are various alternatives to IV estimation. The next common approach being controlling of omission bias and potential confounders (Sharma, 2017). Adjusting for potential confounders is not always possible, as data collected by the researcher may be limited and the potential of omitted variables is mainly there, as researchers can never adjust for all conceivable confounders (Sharma, 2017). Another approach used by De Grange, Gonzalez, Vargas and Troncoso, (2015) is the maximum entropy approach which incorporates an alternative version

of the logit model that includes a functional form of a fixed point equation. Certain researchers argue that the most important guide to avoiding the omission of key variables is extensive theoretical literature review, which will also guide the direction of hypotheses and building of models (Antonakis et al., 2014; Sharma, 2017; Ullah et al., 2018).

The hypotheses developed under the literature review are tested under the research sub-questions. The independent variables are the identified determinants that affect access to formal credit in the South African context. The independent variables consisted of nominal, continuous, ordinal and dichotomous responses and are illustrated in Table 3 below.

Table 3: Descriptive statistics for access to formal credit

Variable	Definition of variables	Proxy	Source of data	Hypothesised relationship
Dependent Variables				
<i>Access to formal credit</i>	Indicates individuals who borrowed from a bank. Dummy variable equals one if the respondent has credit from formal bank or other formal non-banks, zero otherwise	<ul style="list-style-type: none"> • Credit at a bank 	2016 FinScope Survey	N/A
Independent Variables				

<i>Female</i>	Dummy variable equals one if the individual is female, zero otherwise.	<ul style="list-style-type: none"> • Female 	2016 FinScope Survey	Negatively correlated to access to credit
<i>Entrepreneurs in the informal sector</i>	Indicates entrepreneurs in the informal sector. Dummy variable equals one if the individual is in the informal sector	Informally employed (income source): <ul style="list-style-type: none"> • Money from rent • Piece job • Selling things to neighbours or on the street 	2016 FinScope Survey	Negatively correlated to access to credit
<i>Primary education</i>	Dummy variable equal to one if the individual has a primary education, zero otherwise.	<ul style="list-style-type: none"> • Education level 	2016 FinScope Survey	Negatively correlated to access to credit
<i>Secondary education</i>	Dummy variable equal to one if the individual has a secondary education, zero otherwise.	<ul style="list-style-type: none"> • Education level 	2016 FinScope Survey	Negatively correlated to access to credit

<i>Tertiary education</i>	Dummy variable equal to one if the individual has a tertiary education, zero otherwise.	<ul style="list-style-type: none"> • Education level 	2016 FinScope Survey	Positively correlated to access to credit
<i>Vocational/specialised training</i>	Dummy variable equal to one if the individual has vocational/specialised training, zero otherwise.	<ul style="list-style-type: none"> • Education level 	2016 FinScope Survey	Positively correlated to access to credit
<i>Rural</i>	Dummy variable equal to one if the individual is located in a rural area, zero otherwise.	<ul style="list-style-type: none"> • Location 	2016 FinScope Survey	Negatively correlated to access to credit
<i>Age</i>	Continuous variable	<ul style="list-style-type: none"> • Age of the respondent (in years) 	2016 FinScope Survey	Positively correlated to access to credit
<i>Age squared</i>	Continuous variable	<ul style="list-style-type: none"> • Age squared of the respondent (in years) 	2016 FinScope Survey	Positively correlated to access to credit

<i>Irregular income</i>	Dummy variable equal to one if the respondent cites no regular income as a reason for not having a loan, zero otherwise.	<ul style="list-style-type: none"> Respondent responds yes to “I don’t have a regular income” as a reason for not having a loan 	2016 FinScope Survey	Negatively correlated to access to credit
<i>Collateral</i>	Dummy variable equal to one if the individuals have collateral, zero otherwise.	<ul style="list-style-type: none"> Possess a Title Deed 	2016 FinScope Survey	Positively correlated to access to credit
<i>Fear</i>	Dummy variable equal to one if the respondent cites fear as a reason for not having a loan, zero otherwise.	<ul style="list-style-type: none"> Responds yes to “I am scared to approach a bank or place where I can borrow money” 	2016 FinScope Survey	Negatively correlated to access to credit
<i>Credit from friends and family</i>	Individuals that responded to “have borrowed from friends and family.” Dummy variable equal to one if the respondent has credit from friends	<ul style="list-style-type: none"> Responded yes to “borrowing from family and friends” 	2016 FinScope Survey	Negatively correlated to access to credit

	and family, zero otherwise			
<i>Credit from moneylenders</i>	Individuals that responded to “have borrowed from the informal financial sector.” Dummy variable equal to one if the respondent has credit from informal sources, zero otherwise	Informally served (Includes): <ul style="list-style-type: none"> • Responded yes to “borrowing from Mashonisa or loan shark” 	2016 FinScope Survey	Negatively correlated to access to credit
<i>Use of internal funds due to lack of demand for credit</i>	Dummy variable equal to one if the respondent cites no demand for loan as reason for not having a loan, zero otherwise.	<ul style="list-style-type: none"> • Responded yes to “I don’t want to have debt” 	2016 FinScope Survey	Negatively correlated to access to credit
<i>Access to communication device</i>	Dummy variable equal to one if the individual has access to a communication device, zero otherwise.	<ul style="list-style-type: none"> • Responded yes to “owning a cell phone” 	2016 FinScope Survey	Positively correlated to access to credit

<i>Positive attitude towards technology</i>	Dummy variable equal to one if the individual believes that technology will help organise their financial life better, zero otherwise.	<ul style="list-style-type: none"> Responded “agree”, “slightly agree”, “completely agree” that technology will help organise their financial life better 	2016 FinScope Survey	Positively correlated to access to credit
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As there are multiple independent variables, the model constitutes a multiple regression. The appropriate estimation technique that has been used in this study is a binomial logit multiple linear regression. The equations for the three research sub-questions are presented below:

Sub-question 1 (Model A): How does being a female entrepreneur in the informal sector in South Africa influence access to formal credit?

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + \beta_{13} X_{13} + \beta_{14} X_{14} + \beta_{15} X_{15} + \beta_{16} X_{16} + \beta_{17} X_{17} + \varepsilon,$$

Where;

$i = 1, \dots, 4992$

Y_i = Access to formal credit

β_0 = Constant

X_1 = Female

X_2 = Entrepreneur in the informal sector

X_3 = Primary education

- X_4 = Secondary education
- X_5 = Tertiary education
- X_6 = Vocational training
- X_7 = Rural
- X_8 = Age
- X_9 = Age squared
- X_{10} = Irregular income
- X_{11} = Collateral
- X_{12} = Lack of demand for credit
- X_{13} = Fear
- X_{14} = Credit from friends and family
- X_{15} = Credit from moneylenders
- X_{16} = Access to communication device
- X_{17} = Attitude towards technology
- ε = Probabilistic error term

Sub-question 2 (Model B): How does being a female in South Africa influence access to formal credit?

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + \beta_{13} X_{13} + \beta_{14} X_{14} + \beta_{15} X_{15} + \beta_{16} X_{16} + \varepsilon,$$

Where;

- i = 1..., 4992
- Y_i = Access to formal credit
- β_0 = Constant
- X_1 = Female

- X_2 = Primary education
- X_3 = Secondary education
- X_4 = Tertiary education
- X_5 = Vocational training
- X_6 = Rural
- X_7 = Age
- X_8 = Age squared
- X_9 = Irregular income
- X_{10} = Collateral
- X_{11} = Lack of demand for credit
- X_{12} = Fear
- X_{13} = Credit from friends and family
- X_{14} = Credit from moneylenders
- X_{15} = Access to communication device
- X_{16} = Attitude towards technology
- ε = Probabilistic error term

Sub-question 3 (Model C): How do demand-side determinants influence access to formal credit in South Africa?

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + \beta_{13} X_{13} + \beta_{14} X_{14} + \beta_{15} X_{15} + \varepsilon,$$

Where;

$i = 1, \dots, 4992$

Y_i = Access to formal credit

β_0 = Constant

X_1 = Primary education

X_2 = Secondary education

X_3 = Tertiary education

X_4 = Vocational training

X_5 = Rural

X_6 = Age

X_7 = Age squared

X_8 = Irregular income

X_9 = Collateral

X_{10} = Lack of demand for credit

X_{11} = Fear

X_{12} = Credit from friends and family

X_{13} = Credit from moneylenders

X_{14} = Access to communication device

X_{15} = Attitude towards technology

ε = Probabilistic error term

3.3 Data collection

The research sub-questions investigate which determinants affect access to formal credit. The paper used secondary data to answer the research sub-questions. The data collected consists of a sample of 4992 individuals (16+ years). The FinMark Trust conducted a cross-sectional field survey between June and August 2016 using a standardised questionnaire and interviews as data collection instruments. The survey research is an appropriate research design as the data collected includes characteristics of the individuals and whether such characteristics influence access to formal credit. The data collected from the survey was analysed using statistical tools to answer the research sub-questions. The survey questions were closed-ended, and the response outcomes can be converted into numerical data for the quantitative research.

3.4 Data analysis

The collected data has been analysed with the assistance of the E-views statistical package. Scatter plot graphs have been used to visualize the relationship between each independent variable and the dependent variable, as well as the observed linearity (Meuleman et al., 2014). The dependent variable, namely access to formal credit, is also categorical in nature. The independent variables are categorical except for age and age-squared. The dependent variable and the categorical independent variables are converted into dummy variables coded 0 or 1. It is likely that four data points of 0 and 1 on the y-axis and x-axis will be observed on the scatter plots due to both independent and dependent variables being categorical. In the case of age and age-squared, the continuous variables, the graph will plot all the age and age-squared observations between 0 and 1.

One of the assumptions for a regression model is that the distribution of the residuals are normal, that the distribution peaks once, and both the skewness and kurtosis equal zero (Meuleman et al., 2014). The Kernel Density will be applied for the regression residuals to test for normality and whether this assumption is true for the set of data. If the standardised

residuals are not normally distributed, a logit model is employed and descriptive statistics of the mean and standard deviation of the sample are not deemed necessary. Further, for continuous variables, a Quantile-Quantile Plot (Q-Q Plot) may be used to test normality. For this study, the Q-Q plots will apply for age and age-squared. A Q-Q plot is not suitable for assessing normality of categorical data as only two data points will be observed along the line.

As mentioned above, the study employs a multivariate regression model as the model assesses how multiple independent variables affect access to formal credit. Generally, multivariate models present multicollinearity issues. Multicollinearity occurs when one independent variable perfectly predicts one or more other independent variables, increasing the standard error of the coefficients (Woodwell, 2014b; Daoud, 2017; Alin, 2010). In instances where multicollinearity exists, the researcher is unable to determine which of the perfectly correlated independent variables affects the dependent variable. To test for multicollinearity amongst the independent variables, the Variance Inflation Factor (VIF) has been used. The VIF measures the amount of multicollinearity in a set of multiple regression variables. A VIF value that is greater than 10 means that the variable is significantly affected by multicollinearity (Alin, 2010). For independent variables with a value greater than 10, the regression model has been re-run excluding each correlated independent variable and ultimately selecting the variable that is statistically more significant than the other.

There are several methods to assess the robustness of a regression model and include the Akaike information criterion (AIC), Goodness of Fit and R-squared. The AIC indicates the amount of data that is lost during the process of building a regression model. The lower the AIC value, the better the model. The Hosmer-Lemeshow test will be used to examine the goodness of fit of the model and has been widely used for a logit regression (Paul et al., 2013). A Hosmer-Lemeshow GOF $\text{Pr} > \text{ChiSq}$ (p-value) of less than 0.05 means that model is not a good fit (Paul et al., 2013). Pseudo- R^2 measures how well a model fits the specific set of data

(Cakmakyapan & Goktas, 2013). Or put in another way, measures how much the variation in the dependent variable is attributable to the independent variables. Pseudo- R^2 is used to compare models based on the assessment of the explanatory power of each (Woodwell, 2014b).

The McFadden Pseudo- R^2 is commonly used in statistical packages and the higher the McFadden's Pseudo- R^2 , the more robust the model is and the more likely that the independent variables explain the variation of the dependent variable. McFadden, who defined the Pseudo- R^2 in 1979, suggested that a Pseudo- R^2 ranging between 20 per cent and 40 per cent indicates a good model fit with a value above 40 per cent indicating a great fit (Hemmert et al., 2018). The acceptable ranges of Pseudo- R^2 indices, such as the McFadden, used in a logit regression model are significantly lower when compared to R^2 and Adjusted R^2 used in OLS regression model (Smith & McKenna, 2013). Smith and McKenna (2013) argue that the guidelines for R^2 and Adjusted R^2 used in OLS may not be appropriate for logit regression models using the McFadden Pseudo- R^2 . For this study the 20 to 40 per cent range was used as a guideline to assess the robustness of the models.

3.5 Reliability and validity

Validity is the rigour in which the findings reflect the data accurately, and reliability relates to the consistency of analytical procedures and elimination of biases that may influence findings (Noble & Smith, 2015). These authors argue that quantitative research enables the use of statistical methods to establish whether the research findings are reliable and valid. Statistics provide valid data which is free from the researchers' emotion and subjectivity, unlike qualitative research (McCusker & Gunaydin, 2014). For a credible research study, the researcher should be interested in representing the characteristics of a subject accurately and consistently (Mohajan, 2017). The use of the logit regression in this paper therefore enables reliability and validity.

3.6 Research limitations

Secondary data is advantageous to researchers with limited time and resources, as data has been collected. Even with these benefits, the most common disadvantage of secondary data analysis and potential limitation is the fact that the primary data were collected for another purpose. As the data is not collected by the researcher, the data may not be able to answer specific questions posed by the secondary researcher (Johnston, 2014). For this research, the questions asked in the primary questionnaire and the answers obtained from respondents align with the research sub-questions and objectives. A further limitation is that the data obtained reports missing information such as refusal to respond or selection of the 'do not know' response by respondents.

An alternative household survey, namely the 2017 National Income Dynamics Study (NIDS)–Wave 5, is available. The panel survey was implemented by the Southern Africa Labour and Development Research Unit (SALDRU) at the University of Cape Town. The NIDS survey is more recent than the 2016 FinScope Survey and includes a higher sample of interviewed candidates (over 28 000 individuals). The disadvantage of the NIDS data is that the dependent variable is not observable for all data and therefore there is sample selection, although the Heckman selection method can address this issue as observed with the study conducted by (Biyase & Fisher, 2017) using 2008–2012 NIDS data. For a dichotomous dependent variable, probit and logit estimation techniques are more suitable. This limitation is not observed with the FinScope data, rendering the data more suitable for the research methodology undertaken, although the NIDS data is more recent.

Another research limit that needs to be outlined is the generalisability limitations. Sample representativeness is one of the disadvantages of secondary data as the purpose of the primary data collector and the secondary data researcher may not be the same and, therefore, the data sampling plan employed would have been different. The informal sector in South

Africa in 2018 was 21.8 per cent: 36 per cent of the informal sector is made up of women. Therefore, women in the informal sector approximate about 7.84 per cent in terms of the national statistics. Of the 4992 sample, 477 individuals identified are in the informal sector and 187 are females in the informal sector. The total of individuals identified as in the informal sector is 9.56 per cent and females in the informal sector make up 3.74 per cent and are therefore not representative of the SA demographics.

The whole nationally representative sample of 4992 individuals was tested. Further, two models are employed, one excluding the entrepreneur in the informal sector variable and another excluding both entrepreneur in the informal sector and female variables. The difference in the statistical significance and relationship of the dependent and independent variables between the models is further observed to assess whether this subset reflects the same results as the entire sample.

The study did not consider the possibility of endogeneity as a result of using non-experimental/observable data. Randomised experiments are considered the “gold standard” for causal inferences (Becker, 2016; Rohrer, 2018). However such experiments are not always practical for all research. The study used observational data and therefore statistical analysis of such data creates causal estimates’ exposure to possible confounding, which can result in spurious correlation (Antonakis et al., 2014; Rohrer, 2018). A confounding variable is a third variable that influences both the dependent and independent variable (Szumilas, 2010). Researchers using observable data are encouraged to make better choices in terms of research design and appropriate statistical analysis, in order to reduce the impact of endogeneity as much as possible (Sharma, 2017; Ullah et al., 2018).

Although the study uses observable data, instrumental variable estimations may be able to correct for causality (Becker, 2016). As the study did not attempt to address the endogeneity problem, this is considered a research limitation, as endogeneity threatens internal validity

(Antonakis et al., 2014; Sharma, 2017). Should researchers who adopt non-experimental designs not address endogeneity bias, the results from the research findings are likely to be spurious/coincidental (Antonakis et al., 2014; Ullah et al., 2018). Although the coefficient may demonstrate the expected hypothesis based on theory reviewed, the existence of endogeneity may still present incongruent estimation that is not reflective of the population parameter (Antonakis et al., 2014), sometimes resulting in coefficients having the wrong sign (Antonakis et al., 2014; Ullah et al., 2018). Therefore, caution should be taken in relation to the research inferences drawn in this study.

The choice of the research approach, quantitative methodology, has some limitations in terms of providing insight into the qualitative/descriptive factors. A mixed approach often assists in terms of providing statistical analysis as well as descriptive insights of the constructs. Further, the data obtained by the researcher is limited in terms of supply-side factors and therefore excludes variables from overall institutional context, which shape the relationship between credit and the informal sector.

Women entrepreneurs are heterogenous in nature, including women in the informal sector. However, the data obtained imposed a limitation in terms of understanding the types of business activities the women were involved in. The data does not disaggregate per sector or business activity, rather per source of income. The types of sources of income listed were as follows: informally employed; self-employed; farming and fishing; formally employed; government dependent; no income; other income; and remittance dependent. Three of the sources of income were identified as entrepreneurial in nature, being informally employed; self-employed; farming and fishing. The sources of income for informally employed were further disaggregated as follows: money from rent; piece job; and selling things to neighbours or on the street. Due to the lack of data disaggregation by type of business that women engage in, the study is limited in terms of providing qualitative insights of the women entrepreneurs.

This type of limitation was addressed by Díaz-García and Brush (2012) in their study, by incorporating both qualitative and quantitative research. Their research mitigated the limited explanatory power of the quantitative model by employing qualitative research. It therefore, catered for the heterogeneity in the women sampled.

CHAPTER 4: RESEARCH FINDINGS, ANALYSIS AND DISCUSSION

4.1 Preliminary test results

Scatter plots visualising the relationship between the independent variables and the dependent variable have been included in the Appendices. Through the observation of the scatter plots, age, age-squared, owning a cellphone, accessing loans from family and friends, individual having a positive attitude towards technology, having tertiary education and vocational training are positively correlated with access to formal credit. While owning collateral, use of internal funds, irregular income, being female, fear of applying for credit, being an entrepreneur in the informal sector, accessing loans from moneylenders, primary and secondary education as well as living in rural areas are negatively correlated to access to credit. The relationships observed via the scatter plots confirm the hypotheses developed in Chapter 2 except for two variables. Owning collateral is expected to increase the chance of accessing funds. Having access to loans from family and friends was anticipated to have a negative impact on accessing formal credit. These preliminary unexpected relationships will be further discussed under the regression results.

4.2 Regression results

One of the assumptions for a regression model is that the distribution of the residuals is normal, that the distribution peaks once and both the skewness and kurtosis equal zero (Meuleman et al., 2014). The Kernel Density was applied for the regression residuals to test for normality and

whether this assumption is true for the set of data. The skewness and kurtosis for Model A were 3.797618 and 31.19577 respectively. As these do not equal to zero, a logit regression model is deemed appropriate. Furthermore, as the error term is not normally distributed, the study will not analyse the descriptive statistics. However, the results are included in the Appendices. For continuous variables, a Quantile-Quantile Plot (Q-Q Plot) may be used to test normality. For this study, the Q-Q plots apply for age and age-squared. For age, the data points are on the line with fat tails, indicating that age is normally distributed. For age-squared, the data points fall off the line and are negatively skewed. The normal distribution graph and Q-Q plots are included in the Appendices.

The age and age-squared variables had significantly high VIF values. Likely, age and age-squared were highly correlated. Secondary and primary education are likely highly correlated. The regression model was then re-run excluding one of the two variables with a value greater than 10. And ultimately selecting the variable more statistically significant than the other. Secondary education and age-squared variables were removed since they had a large VIF values and were less significant. The VIF results are included in the Appendices showing the VIF before and after removing the variables with high VIFs. After the exercise, all variables have low VIF values indicating that multicollinearity has been dealt with.

The regression analysis is based on the three equations outlined under chapter 3. The outcomes of the estimation technique are illustrated in the three logit regression models as shown in Table 4 below. The table is followed by a discussion of the robustness of the models as well as the results.

Table 4: Logit regression results

Variables	Model A	Model B	Model C
c	-3.291364	-3.396163	-3.509892
Entrepreneur in informal sector	-1.270332****	NA	NA
Female	-0.286363****	-0.241454***	NA
Age	0.031079****	0.031182****	0.031112****
Cell phone	1.067282****	1.057515****	1.039654****
Collateral	-0.620731****	-0.613744****	-0.617065****
Lack of demand for credit	-0.789511****	-0.770679****	-0.767236****
Family and friends	-0.218555	-0.241166	-0.234592
Fear	-1.042601	-1.118274	-1.083789
Irregular income	-0.792711**	-0.938390***	-0.932666***
Moneylenders	-0.161771	-0.151410	-0.151686
Positive attitude	0.258805***	0.269733***	0.261827***
Primary education	-1.694036****	-1.693298****	-1.718664****
Rural	-1.071538****	-1.138382****	-1.148208****
Tertiary education	1.963173****	2.009260****	2.025395****
Vocational training	1.547454****	1.617852****	1.650954****
Total observations	4992	4992	4992
Observations with Dep =1	901	901	901
Observations with Dep =0	4091	4091	4091
McFadden R-squared	0.235247	0.227100	0.225394
Akaike info criterion	0.728542	0.735834	0.737044
Log likelihood	-1802.441	-1821.641	-1825.662
H-L Statistic	10.3592	16.2698	10.0953
Prob. Chi-Sq(8)	0.2407	0.0387	0.2584

Source: Author's calculation using E-views software

Coefficients are presented and p-values are denoted as follows: **** significant at 0.1 per cent, *** significant at 1 per cent, **significant at 5 per cent, *significant at 10 per cent.

The primary aim of the study was to assess how being a woman entrepreneur in the informal sector affects one's chances of accessing credit. Model A therefore includes the informal sector variable as well as the female variable alongside the determinants of access to formal credit identified in the literature. The McFadden Pseudo- R^2 is 0.24 for Model A and in line with the acceptable range. Whilst the Hosmer-Lemeshow GOF $Pr > ChiSq$ (p-value) is 0.24 at 8 degrees of freedom for Model A. Based on GOF $Pr > ChiSq$ (p-value), there is insufficient evidence that the model does not fit the data.

Modifications are made to Model A to control for the 'entrepreneur in the informal sector' variable. The logit results for this modification are outlined in Model B. The reason for this modification to the model is to determine whether being in the informal sector increases or decreases one's chance of accessing formal credit. The modified Model B results in a McFadden Pseudo- R^2 of 0.23 and in line with the acceptable range, however with a Hosmer-

Lemeshow GOF $\Pr > \text{ChiSq}$ (p-value) of 0.04 at 8 degrees of freedom. As the p-value is less than 0.05, there is evidence that the model does not fit the data.

A further modification to the model is made by controlling for both the 'entrepreneur in the informal sector' and 'female' variables as illustrated in Model C. This modification allows for the comparison between a woman entrepreneur in the informal sector, females and individuals in South Africa and whether it is beneficial or not to be a woman entrepreneur in the informal sector in relation to access to credit. The McFadden Pseudo- R^2 is 0.23 for Model C and in line with the acceptable range. The Hosmer-Lemeshow GOF $\Pr > \text{ChiSq}$ (p-value) is 0.26 at 8 degrees of freedom for Model C, which means there is insufficient evidence that the model does not fit the data.

When comparing the three models in terms of the most robust model, Model A is the better fit as the model has the highest McFadden Pseudo- R^2 and log likelihood, as well as the lowest AIC out of the three models. This may suggest that the robustness of the model is improved by the inclusion of the 'entrepreneur in the informal sector' and 'female' variables to assess determinants of access to formal credit. All three models are at the lower end of the McFadden Pseudo- R^2 acceptable range, implying that there are other variables that are not factored in this model, that would explain the change in the dependent variable.

Based on the Model A, at a significance level of 0.1 per cent, an entrepreneur in the informal sector is 1.270332 times less likely to access formal credit than an entrepreneur outside of the informal sector. This negative relationship is consistent with the hypothesis developed that entrepreneurs involved in the informal sector have lower chances of accessing formal credit. This is mostly affected by the existence of information asymmetry in the informal sector that results in difficulty in credit assessments.

Both Models A and B indicate that being female is a significant determinant of access to finance, with the significance level at 0.1 per cent and 1 per cent respectively. Model A

indicates that a female in the informal sector is 0.28 times less likely to access formal credit than males in the informal sector. By controlling for the informal sector variable, Model B reveals that females are 0.24 times less likely to access formal credit than males. What this implies is that females in the informal sector are worse off in terms of access to credit when compared to females nationally. The relationship observed in these findings is in line with predictions made in the study that being female decreases the women probability of accessing credit.

The findings indicate that age is a meaningful factor in relation to access to formal credit with the p-value at 0.1 per cent significance level in all the three models. Age is a continuous variable and is interpreted differently to categorical variables. For all three models, a one-year increase in age increases the probability of accessing credit by 0.31. As the coefficient is relatively the same in all three models, it may be inferred that the gender and informal sector variables do not affect the relationship between age and access to credit. For all three models, the relationship is in line with the expectation that age is positively correlated to access to formal credit.

Primary education is a meaningful determinant at a significance level of 0.1 per cent for all three models. Model A indicates that females in the informal sector are 1.69 times less likely to access formal credit than males in the informal sector. Controlling for the informal sector variable does not significantly affect the chances of females accessing credit, as illustrated by the -1.69 coefficient in Model B. Model C indicates that individuals with primary education are 1.71 times less likely to access credit than those that possess higher education. The results of the three models indicate that possessing only primary education has a less severe impact on access to credit for females in the informal sector and females in general than individuals nationally. The three models validate the hypothesis that the lower the level of education, the less likely the individual will access credit.

Tertiary education, in line with theory, is a significant determinant of access to credit, also at a significance level of 0.1 per cent for all three models. Female entrepreneurs in the informal sector with tertiary education are 1.96 times more likely to access credit than male entrepreneurs in the informal sector. The chances increase to 2.00 times and 2.02 times for females with tertiary education and for individuals with tertiary education respectively. By controlling for the two variables, it can be observed that it is more beneficial for females and individuals nationally to possess a tertiary education to increase their chances of access to credit. The three models validate the hypothesis developed—that increase in education increases the chances of access to credit.

Vocational training also proved to be a statistically significant determinant for access to credit at a significance level of 0.1 per cent in all three models. As indicated in Model A, females in the informal sector who have undergone vocational training are 1.54 times more likely to access formal credit as opposed to males in the informal sector. The chances of accessing credit due to vocational training increase to 1.61 times for females as opposed to males. Individuals who have undergone vocational training are 1.65 times more likely to have access to credit than individuals that have not undergone such training. Based on the size of the coefficients, vocational training is more beneficial in terms of access to credit for individuals nationally. Although vocational training is not as high a level as tertiary education, the results indicate that having vocational training increases the probability of accessing credit, in line with predictions.

The results of the models above validate that location is a statistically significant factor in terms of access to credit at a level of 0.1 per cent. Female entrepreneurs in the informal sector based in rural areas are 1.07 times less likely to access formal credit compared to male entrepreneurs in the informal sector based, in rural areas. Although the chances are reduced, the results in Model A illustrate that female entrepreneurs in the rural informal sector have

greater chances of accessing credit than females and individuals based in rural areas (as seen in Model B and Model C). The negative relationship between being based in a rural area and access to credit is expected.

Common in the informal sector is irregular income. The variable is included in the model and is found to be a determinant of access to credit at a significance level of 5 per cent for Model A and 1 per cent for Model B and Model C respectively. A female entrepreneur in the informal sector who depends on irregular income is 0.79 times less likely to access formal credit than a male entrepreneur in the informal sector. When controlling for the informal sector variable, the odds reduce to 0.93 times for females compared to males. The results of the three models are telling and suggest that irregular income is to be expected in the informal sector and has a lesser impact on access to credit compared to females and individuals nationally. The results are in line with the hypothesis developed, that having irregular income decreases the chances of accessing formal credit.

Collateral (proxied as possessing a title deed) is a significant factor in determining access to credit with the significance level at 0.1 per cent. Per Model A, women entrepreneurs in the informal sector with collateral are 0.62 times less likely to access credit than male entrepreneurs in the informal sector. Whereas females and individuals nationally possessing collateral are 0.61 times less likely to access credit. These results are contrary to the hypothesis developed that possessing collateral increases the chances of access to credit.

Narrowing our study to the informal sector suggests that individuals in this sector use their own funds to meet their business needs as opposed to external sources of funds. This led to the inclusion of this variable in the model, proxied by lack of demand for credit. The variable substantially impacts access to credit as indicated by the significance level of 0.1 per cent in all three models. Women entrepreneurs in the informal sector who use own funds are 0.78 times less likely to access credit as opposed to male entrepreneurs in the informal sector.

Controlling for the informal sector and female variables indicates that females in the informal sector are worse off than females who use their own funds or individuals who use their own funds, as the chances only reduce by 0.77 times in Model B and 0.76 times in Model C. The findings are consistent with the expectations that lack of demand for credit is negatively correlated to access to credit.

With the evolution of technology and the widespread success of mobile money on the continent, access to a communication device is included in the model to assess whether it is a determinant for access to credit and the relationship thereof. Access to a communication device is a statistically significant determinant of access to credit, at a 0.1 per cent level for all three models. Per Model A, women entrepreneurs in the informal sector owning a mobile device increases their chances of accessing credit by 1.06 times as opposed to male entrepreneurs in the informal sector. Model B and C coefficients are slightly lower than Model A at 1.05 times for females owning a mobile device and 1.03 times for individuals owning a mobile device. This implies that it is beneficial for women entrepreneurs in the informal sector to own a mobile device to increase chances of access to credit. In line with expectations, access to a communication device increases the chance of access to credit as seen by the positive coefficients in all the three models.

The 'positive attitude' variable is statistically significant at 1 per cent for all three models. Women entrepreneurs in the informal sector who have a positive attitude towards technology are 0.25 times more likely to access credit than males in the informal sector. While females who have a positive attitude towards technology are 0.26 times more likely to access credit than males. And as anticipated, individuals with a positive attitude towards technology are likely to access credit.

A new component was included in the model, based on literature reviewed: 'fear of applying for a loan', which is unique to females. 'Fear of applying for a loan' is negatively

correlated to access to credit and in line with expectations. However, this variable was not found to significantly affect access to credit and does not statistically prove the hypothesis. Fear of applying for a loan, therefore, is not a determinant of access to formal credit.

Access to the informal financial sector was also identified as a possible determinant of access to credit with this determinant split between ‘loans from moneylender’ and ‘loans from friends and family’ variables. ‘Loans from moneylender’ and ‘loans from friends and family’ variables are both negatively correlated to access to credit as anticipated. In all models, these variables are statistically insignificant and cannot be considered as factors that impact on access to credit.

4.3 Odds Ratio

Interpretation of the coefficient of a logit model is possible with an odds ratio, which is not the case for probit models (Norton & Dowd, 2018). Odds ratios are simple to compute and also apply to discrete explanatory variables (Norton & Dowd, 2018). The ratio is computed as the exponentiated coefficient in a logit model (Norton & Dowd, 2018). Simply put, an odds ratio represents the odds that a dependent variable/outcome will occur, given a particular exposure, compared to the odds of that dependent variable/outcome occurring in the absence of that exposure (Szumilas, 2010). Odds ratio = 1 means that the exposure does not affect the odds of the outcome; Odds ratio > 1 means that the exposure is associated with higher odds of the outcome; Odds ratio < 1 means that the exposure is associated with lower odds of the outcome (Szumilas, 2010). Table 5 below demonstrates the odds ratios to better explain the impact of the variables in this study. With the first variable interpreted as “entrepreneurs in the informal sector have 0.28 lower odds of accessing formal credit, compared to entrepreneurs in the formal sector”. All the variables can be interpreted in this manner.

Table 5: Odds Ratio

C	Odds Ratio		
	Model A	Model B	Model C
Entrepreneur in informal sector	0.28		
Female	0.75	0.79	
Age	1.03	1.03	1.03
Cellphone	2.91	2.88	2.83
Collateral	0.54	0.54	0.54
Lack of demand for credit	0.45	0.46	0.46
Family and friends	0.80	0.79	0.79
Fear	0.35	0.33	0.34
Irregular income	0.45	0.39	0.39
Moneylenders	0.85	0.86	0.86
Positive attitude	1.30	1.31	1.30
Primary education	0.18	0.18	0.18
Rural	0.34	0.32	0.32
Tertiary education	7.12	7.46	7.58
Vocational training	4.70	5.04	5.21

Source: Author's calculation using Excel

CHAPTER 5: RESEARCH CONCLUSION AND RECOMMENDATIONS

5.1 Research discussion

The aim of the study is to determine factors that impact access to formal credit, particularly for women entrepreneurs in the informal sector. The study employs a logit regression model to empirically test the determinants of access to credit in South Africa.

The findings reveal that being female reduces the chances of accessing credit. The gender gap in relation to credit holds true in the South African context. These results are consistent with the findings that women are less likely than men to access credit (Nwosu & Orji, 2017; Alesina, Lotti & Mistrulli, 2013; Adema, Ali, Frey, Kim, Lunati, Piacentini & Queisser, 2014; Fanta et al., 2017; Zins & Weill, 2016; Biyase & Fisher, 2017). The same holds true for women in the informal sector. Being female in the informal sector results in being in a worse off position, in relation to access to credit, than females nationally. The fact that women in the informal sector are less likely than females nationally to access credit is because of the characteristics of this sector, such as information asymmetries, which contribute to the lack of supply of credit to informal entrepreneurs. Further, women dominate survivalist jobs and may

not have the desire to expand their businesses and consequently access formal credit, unlike entrepreneurs who start a business from choice (Williams, 2014).

Consistent with the literature reviewed and expectations, the findings show that age is a significant determinant of access to formal credit, and that the older the individual, the more likely they are to access formal credit. These results are consistent with the empirical evidence in West Africa (Soumaré, Tchana & Kengne, 2016) and Ethiopia (Auma & Mensah, 2014). The results however indicate that age, as a determinant of credit access, is not affected by the individual being female or involved in the informal sector.

The lower levels of education, such as only possessing primary education, which are prevalent in the informal sector, play a huge role in access to credit. The results are consistent with reviewed literature and indicate that individuals with low levels of education are less likely to access formal credit than individuals with higher levels of education (Auma & Mensah, 2014; Cuéllar, 2019; Biyase & Fisher, 2017; Chandio et al., 2017). For a women entrepreneur in the informal sector, possessing only a primary education does not negatively affect her chances of access to credit, as it does for females nationally.

Also, confirming the reviewed literature is the positive relationship between tertiary education and access to formal credit. Higher levels of education are not limited to tertiary education, as observed in the results section, undergoing vocational training also increases the chances of access to credit. In terms of impact, having a tertiary education is not as beneficial to women in the informal sector as it is to females and individuals nationally. And having undergone vocational training, as a woman in the informal sector, does not increase one's chances of access to credit as it does for females nationally.

The results indicate that individuals based in rural areas are less likely to access formal credit. Most entrepreneurs in the rural areas are female and, due to lack of banking infrastructure in rural areas, those women's chances of obtaining credit are reduced. The

findings are consistent with another South African study using NIDS data by Biyase and Fisher (2017). The findings also revealed that, although being based in rural areas decreases the chance of access to credit, women in the informal sector are better off when compared to women in the rural areas.

The informal sector is synonymous with precarious income. Financial institutions are more likely to provide finance to profitable economic activities rather than to businesses with unstable profits (Kasseeah & Tandrayen-Ragoobur, 2015). Therefore, the profound existence of precarious income-generating activities in the informal sector affects access to credit. The findings reveal that individuals with irregular incomes are less likely to access formal credit as the likelihood of paying the loan may prove difficult. The results suggest that irregular income is to be expected in the informal sector and has less impact on access to credit than to individuals nationally.

Contrary to the reviewed literature that collateral availability is positively related to access to credit, the results indicate a negative relationship between collateral and access to formal credit. The possible reason for this variation may relate to Domeher and Abdulai's (2012) argument that the cost of perfecting security, especially for small loans, results in less reliance on collateral as a significant determinant for providing credit. The authors argue that banks would likely concentrate on credit history, profitability and cash flows to assess debt serviceability. The results are also consistent with Maurya and Mohanty's (2019) findings that land ownership is negatively correlated to access to credit because of the high cost of land collateral as cited above. The inconsistency of this outcome may be as a result of two factors. The first, extensively discussed under estimation techniques and research limitation, is the possibility of endogeneity due to confounding. A confounding variable is a third variable that influences both the dependent and independent variable (Szumilas, 2010) and can result in inconsistent/spurious correlation. Sometimes resulting in coefficients having the wrong sign

(Antonakis et al., 2014; Ullah et al., 2018). This may be the case, as the study did not attempt to address endogeneity. The second reason may be the proxy used as collateral. The proxy selected was “possession of a title deed”.

The findings reveal that use of internal funds (proxied by lack of demand) is negatively correlated to access to credit, as expected. This is more profoundly noticed with women as they are more likely to be reliant on internal funds instead of applying for loans (Galli, Mascia & Rossi, (2020). Further, females in the informal sector are less likely to access credit than females, or any individuals nationally, who use their own funds.

The impact of technology-enabled financial services has had a positive effect on financial inclusion. The results indicate that owning a communication device increases the chances of access to credit. Mobile devices may be used to deliver financial services where financial institutions have not been able to reach, such as rural areas and the informal sector. The findings reveal that it is beneficial for women entrepreneurs in the informal sector to own mobile devices to increase their chances of access to credit. Moreover, having a positive attitude towards technology is also observed as positively correlated to access to credit.

In conclusion, although most of the coefficients demonstrated the expected hypothesis, based on theory reviewed, the existence of endogeneity may still present incongruent estimation that is not reflective of the population parameter (Antonakis et al., 2014). Therefore, caution should be exercised in relation to the research inferences drawn in this study.

5.2 Research conclusion and recommendations

Traditionally, the financial inclusion model has focused on primary, secondary and tertiary education. The informal sector is dominated by individuals with low levels of education and understanding that most microenterprise owners do not possess tertiary education. This paper attempted to examine whether an alternative type of education might increase the probability of access to credit. The model in this paper therefore includes vocational training as part of the

education element. Not only does vocational training assist in obtaining craftsman skills, but such skills are also likely to result in increased income, particularly in the informal sector.

The results indicate that vocational training, like tertiary education, is positively correlated to access to credit. Further, women entrepreneurs in the informal sector with vocational training are 1.54 times more likely than their male counterparts to access credit. Vocational training, unlike tertiary education, is accessible to microentrepreneurs as their curricula are geared to artisan and entrepreneurial skills. It would be imperative then that Technical and Vocational Education and Training (TVET) colleges in South Africa promote vocational training to microenterprises. Collaboration between TVET colleges and government agencies such as the Small Enterprise Finance Agency, which provides loans to MSMEs, will likely yield favourable results in terms of increasing financial inclusion. Herrington and Kew (2018) recommend that vocational programmes and curricula need to be redesigned to incorporate a business component in order to appeal to youth as a preferred higher education option.

The traditional financial inclusion model did not factor for technology and the benefits of technology in relation to access to credit. Technology overcomes the distance barrier to accessing finance, resulting in increasing financial inclusion in rural areas. In this study, owning a mobile device and having a positive attitude towards technology have been included as part of the model. Both the variables are positively correlated to access to credit. More interestingly, it is found that women entrepreneurs in the informal sector who own mobile devices are more likely to benefit, in relation to access to credit, than other groups.

Mobile devices are therefore imperative in the enhancement of access to credit for women in the informal sector. South Africa has a sophisticated and mature financial system which may result in a lower uptake of mobile money or other technology-enabled solutions. In order for such solutions to be attractive to women in the informal sector, the products need to

be easily accessible and understandable. Further, in order for people to develop a positive attitude regarding technology, some form of digital finance knowledge is required. Initiatives need to be undertaken to educate women in the informal sector about the benefits and threats of technology. Further, digital finance via a communication device in the language of the user will also enable better understanding.

Although collateral has been part of the model, a new insight from the results is that collateral does not positively correlate to access to credit in the South African context. This begs the question whether collateral should be used for creditworthiness assessment for microenterprises. Women entrepreneurs in the informal sector, especially in rural South Africa, are unlikely to possess collateral. Creditworthiness assessment that focuses on other measures to ascertain debt serviceability, may prove to be more effective. The findings validate the practices by microcredit programmes in which social collateral is deemed more important than material assets. With such programmes, the members of the group guarantee the trustworthiness of their fellow member.

Financial products are typically designed with conditions that tend to be unsuitable to attract vulnerable groups and thereby further drive financial exclusion (Moyo, 2018). Njuki et al. (2019) argue that a key barrier to women using financial services is product design, which does not suit the needs and priorities of women. The author further argues that women entrepreneurs are a heterogeneous group and, therefore, there is a need to segment the market according to gender. A study on such segmentation is likely to reveal that women entrepreneurs are underserved and possess different constraints, requirements, and aspirations. And similarly, authors Njuki et al. (2019) and Vossenbergh et al. (2018) advocate for gender-transformative financial inclusion that entails making the financial system “women-able”, rather than making women bankable. In terms of policy, the proposed Conduct of Financial Institutions (COFI) Bill draws attention to the fact that several products are unsuited for the masses in South Africa

(National Treasury of the Republic of South Africa, n.d.).

Lastly, enhancement of financial inclusion for women cannot be looked at in isolation. Women's businesses, especially women's businesses in the informal sector, should be provided with support, so that these businesses are able to attract funding, even from mainstream banking and not only from NGOs and MFIs. This includes obtaining business acumen skills and basic financial skills.

5.3 Recommendation for future research

There remain several knowledge gaps in research regarding access to credit in general. The following recommendations for future research will contribute to the body of knowledge:

- As the study revealed that the informal financial sector is not a significant determinant of access to formal credit, another study may be undertaken to investigate the determinants of access to informal credit in South Africa. This may assist in determining whether determinants of access to informal credit differ from those of formal credit;
- A longitudinal study may be undertaken, based on the Technology Acceptance Model. To assess whether changes in the perception of technology over time impacts access to credit;
- Cross-country analysis can be undertaken, using a single index, to investigate determinants of access to credit in sub-Saharan Africa. This will enable a 'true' comparison of the extent of financial inclusion in different contexts; and
- As there are research limitations acknowledged with regard to secondary data, a qualitative research approach should be undertaken to investigate the reasons for the lack of demand for formal credit by the informal sector.
- Future research should incorporate instrumental variables estimations or alternatives to resolve endogeneity bias, as a result of the use of observable data for statistical analysis.

This will enable internal validity as well as provide confidence in the consistency of the coefficients and inferences drawn.

- In order to provide more descriptive insights over and above the statistical analysis, future research should consider a mixed method approach to this topic. This may provide other factors that influence the access to formal credit by women entrepreneurs in the informal sector.
- The data obtained for the study includes variables from the demand-side/individual characteristics. This does not allow the assessment of how the broader financial institutional landscape frames how credit interacts with the informal sector. Future research should consider collection of data which includes such variables, to test the relationship between the institutional and policy landscape and the informal sector.
- Future studies will do well to capture the heterogenous nature of women entrepreneurs. Data should be collected and segmented in order to provide a much richer/disaggregated explanation. This type of research mitigates the limited explanatory power of the quantitative model by including qualitative research.

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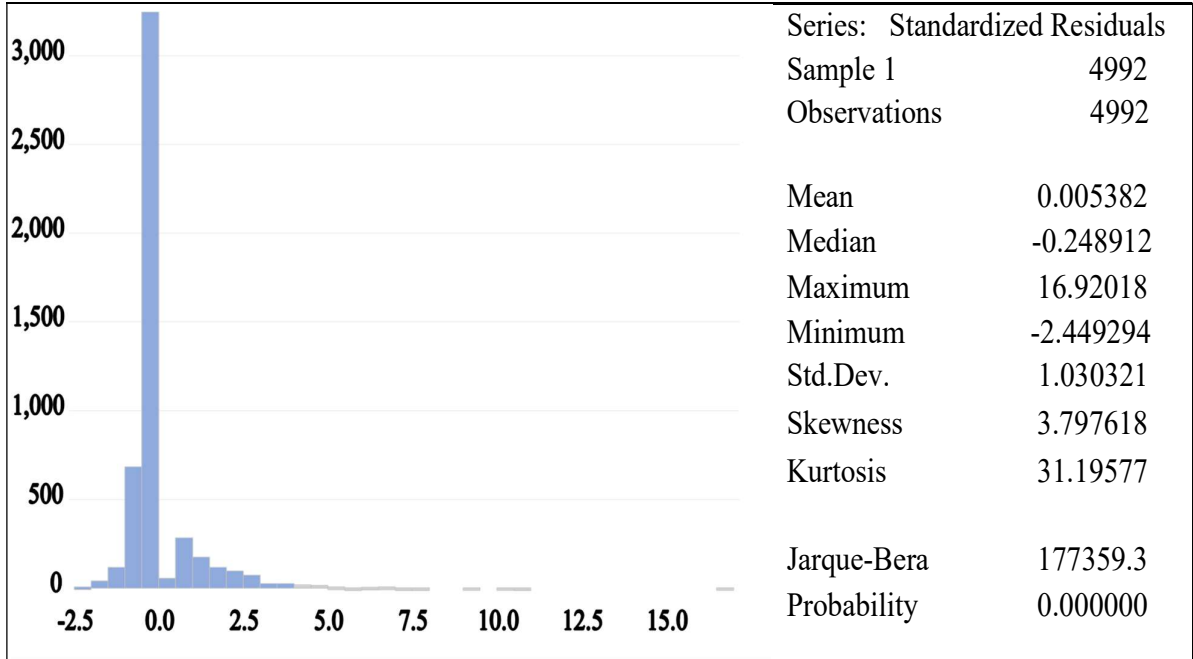
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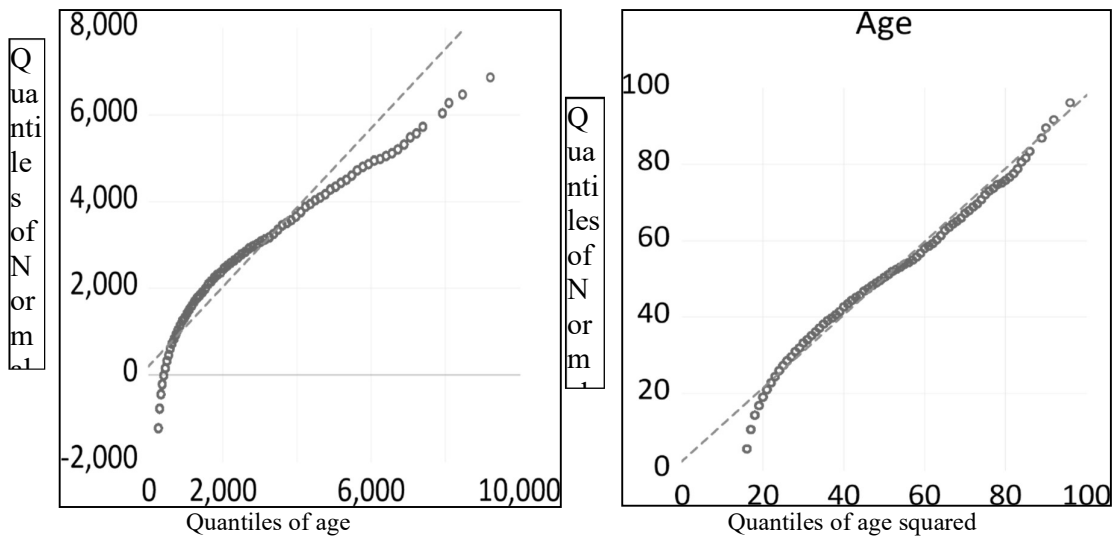
APPENDICES

Appendix 1: Normality Tests

Normal distribution graph – Model A



Normality of continuous variables – Q-Q plots for Model A



Appendix 2: Descriptive Statistics

Categorical Descriptive Statistics for Explanatory Variables		
Variable	Mean	Standard Deviation
Age	38.76783	15.42278
Cell phone	0.854968	0.352168
Collateral	0.502604	0.500043
Demand for credit	0.417268	0.493157
Family and friends	0.054688	0.227392
Fear	0.006611	0.081044
Female	0.566306	0.495634
Entrepreneur in the informal sector	0.095553	0.294007
Irregular income	0.043670	0.204380
Moneylenders	0.009215	0.095560
Positive attitude	0.289864	0.453744
Primary education	0.069511	0.254347
Rural	0.205529	0.404128
Tertiary education	0.136018	0.342842
Vocational training	0.024038	0.153184

Appendix 3: Multicollinearity Tests

Variance inflation factors (VIF) values before removing variables with high initial VIFs

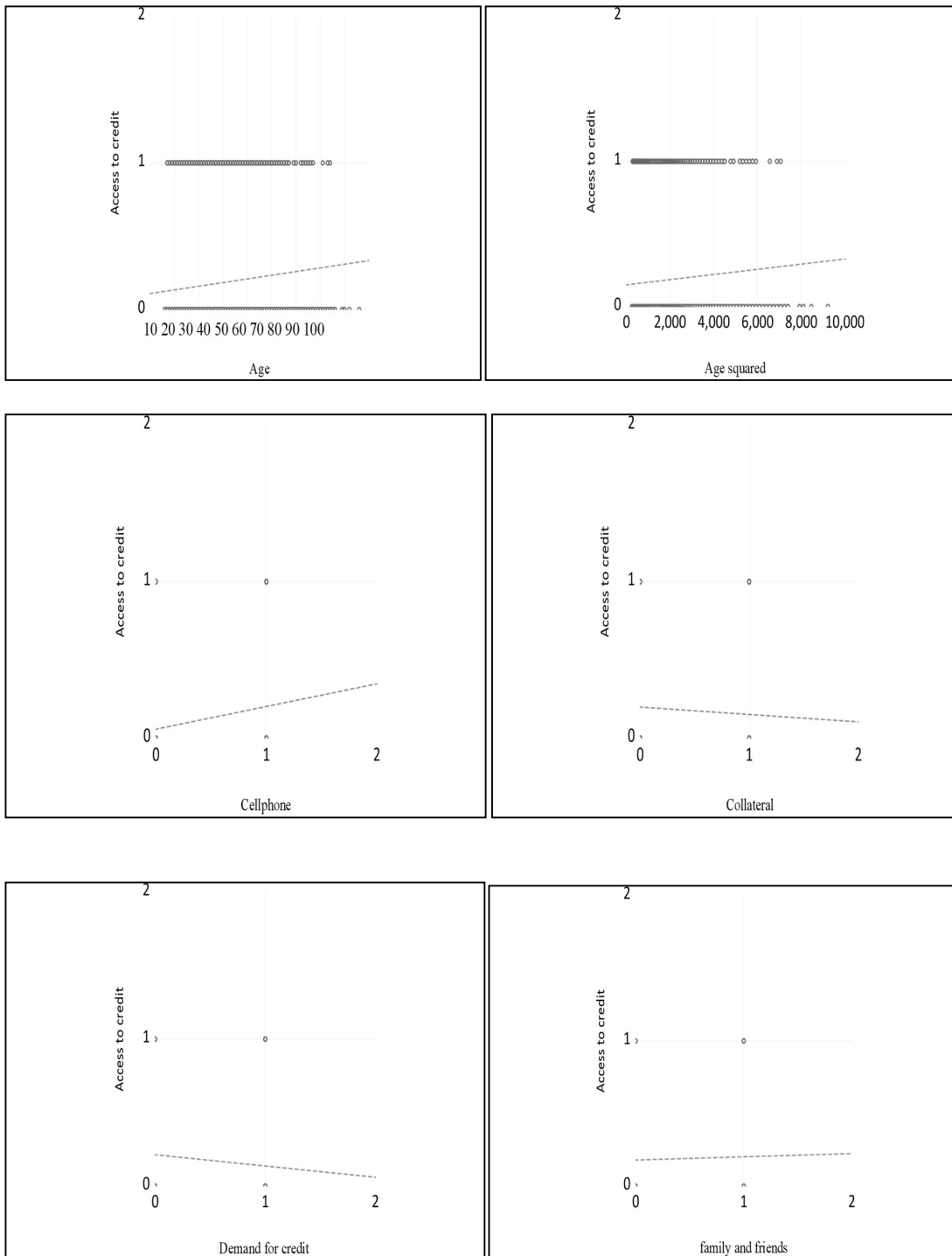
Variance Inflation Factors (Before)	Model A – Centered VIF	Model B – Centered VIF	Model C – Centered VIF
C	NA	NA	NA
Entrepreneur in the informal sector	1.019572	NA	NA
Female	1.016266	1.009774	NA
Age	31.98365	31.74287	31.76087
Age squared	32.17943	31.92934	31.95547
Cell phone	1.034306	1.034319	1.032687
Collateral	1.077394	1.075570	1.074314
Demand for credit	1.073575	1.072811	1.071915
Family and friends	1.056595	1.057926	1.056958

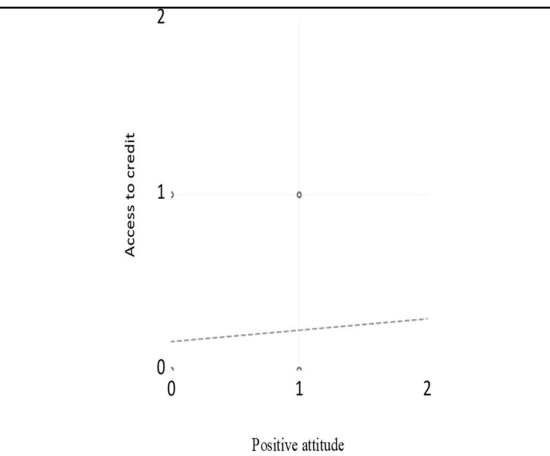
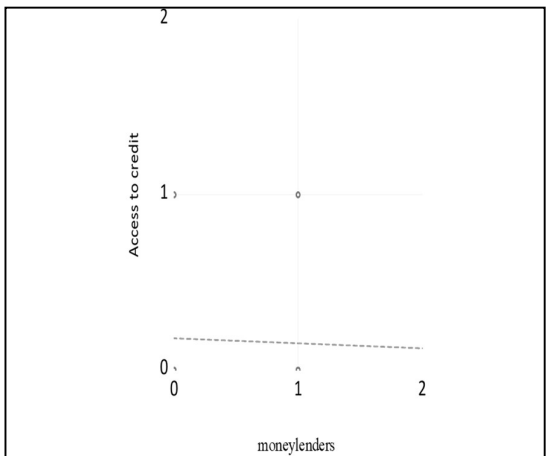
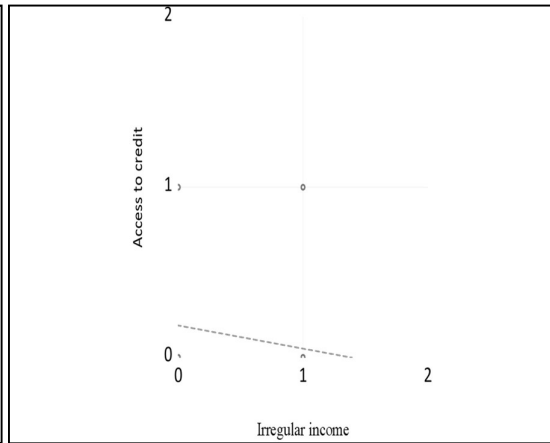
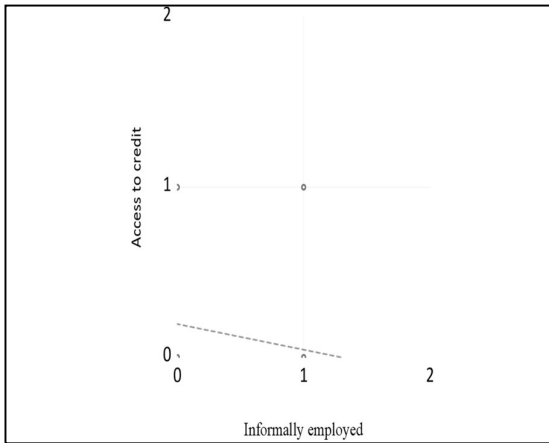
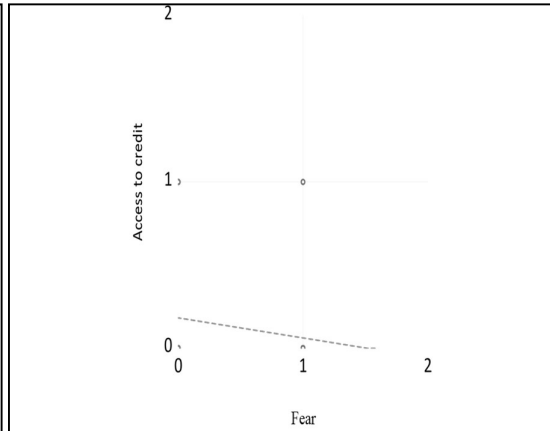
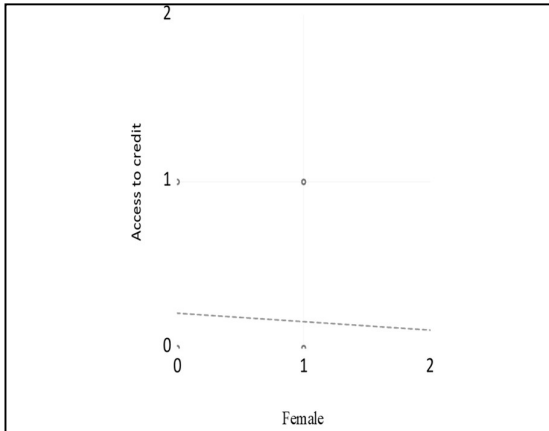
Fear	1.006972	1.007444	1.007068
Irregular income	1.011415	1.006906	1.007223
Moneylenders	1.011643	1.012819	1.012697
Positive attitude	1.024512	1.023979	1.022682
Primary education	3.462590	3.452141	3.428980
Rural	1.039441	1.034786	1.035704
Secondary education	36.66905	36.81136	36.64861
Tertiary education	32.97917	33.12617	33.01075
Vocational training	7.894439	7.927761	7.879987

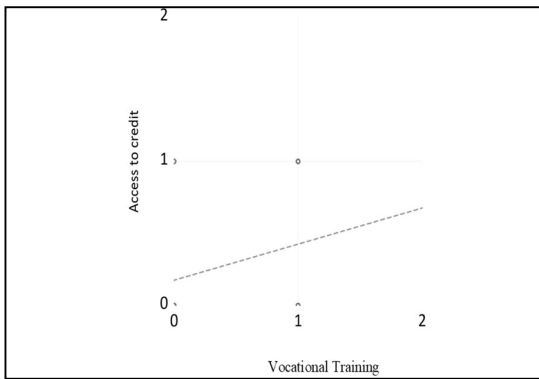
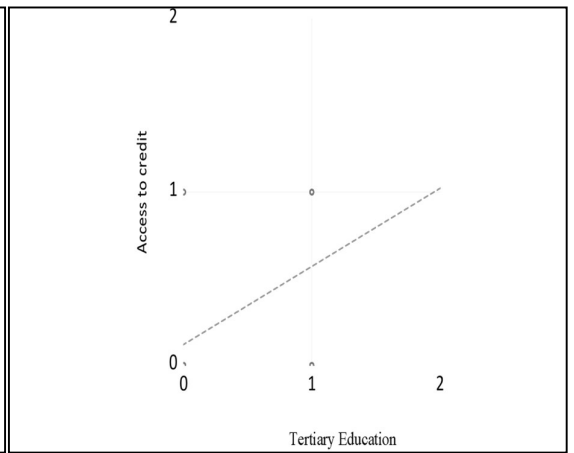
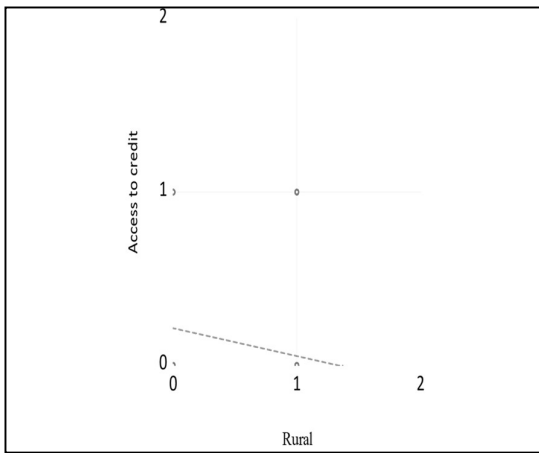
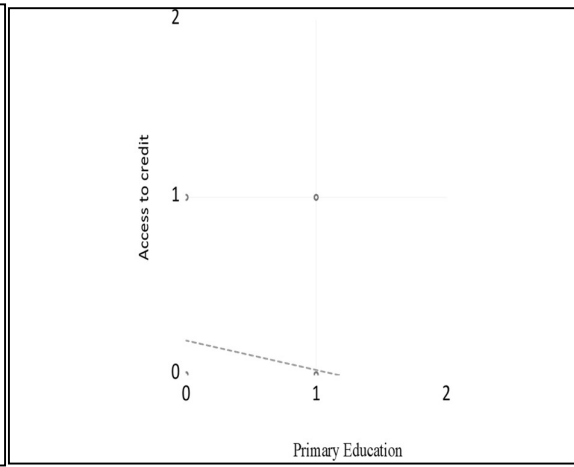
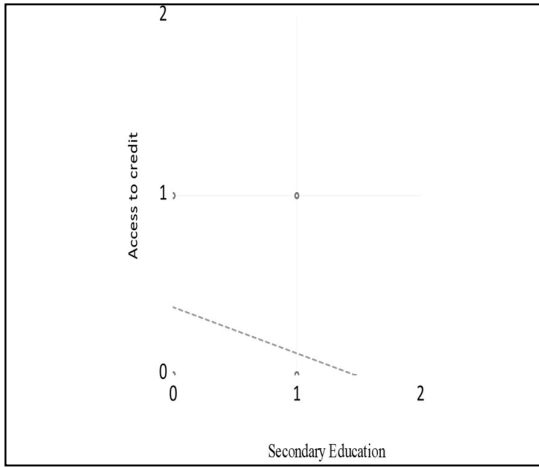
Variance inflation factors (VIF) values after removing variables with high initial VIFs

Variance Inflation Factors (After)	Model A – Centered VIF	Model B – Centered VIF	Model C – Centered VIF
C	NA	NA	NA
Entrepreneur in the informal sector	1.014330	NA	NA
Female	1.013378	1.008229	NA
Age	1.164829	1.156821	1.156084
Cell phone	1.030207	1.029987	1.028388
Collateral	1.084258	1.081870	1.080935
Demand for credit	1.079573	1.077859	1.076974
Family and friends	1.049996	1.051429	1.050706
Fear	1.007913	1.008287	1.007998
Irregular income	1.010461	1.007021	1.007354
Moneylenders	1.010665	1.012011	1.011731
Positive attitude	1.027948	1.027199	1.025991
Primary education	1.048203	1.045438	1.045117
Rural	1.024871	1.021720	1.020990
Tertiary education	1.059774	1.059323	1.057693
Vocational training	1.033418	1.033680	1.031037

Appendix 4: Scatter Plots







Appendix 5: Goodness of Fit Test

Goodness of fit – Model A

Goodness-of-Fit Evaluation for Binary Specification – Model A									
Andrews and Hosmer-Lemeshow Tests									
Grouping based upon predicted risk (randomize ties)									
	Quantile of Risk		Dep=0		Dep=1		Total Obs	H-L Value	
	Low	High	Actua l	Expect	Actual	Expect			
1	0.0010	0.0225	488	492.428	11	6.57189	499	3.02347	
2	0.0226	0.0419	485	483.046	14	15.9544	499	0.24731	
3	0.0420	0.0613	476	473.209	23	25.7911	499	0.31851	
4	0.0613	0.0825	468	463.240	31	35.7600	499	0.68252	
5	0.0828	0.1090	444	452.541	56	47.4587	500	1.69840	
6	0.1090	0.1447	434	436.286	65	62.7142	499	0.09529	
7	0.1447	0.1885	432	416.513	67	82.4869	499	3.48349	
8	0.1886	0.2673	380	388.025	119	110.975	499	0.74624	
9	0.2673	0.5093	312	314.580	187	184.420	499	0.05725	
10	0.5095	0.8827	172	171.132	328	328.868	500	0.00669	
	Total		4091	4091.00	901	901.000	4992	10.3592	
H-L			10.359						
Statistic			2		Prob. Chi-Sq (8)		0.2407		
Andrews Statistic			11.036		Prob. Chi-Sq (10)		0.3547		
			1						

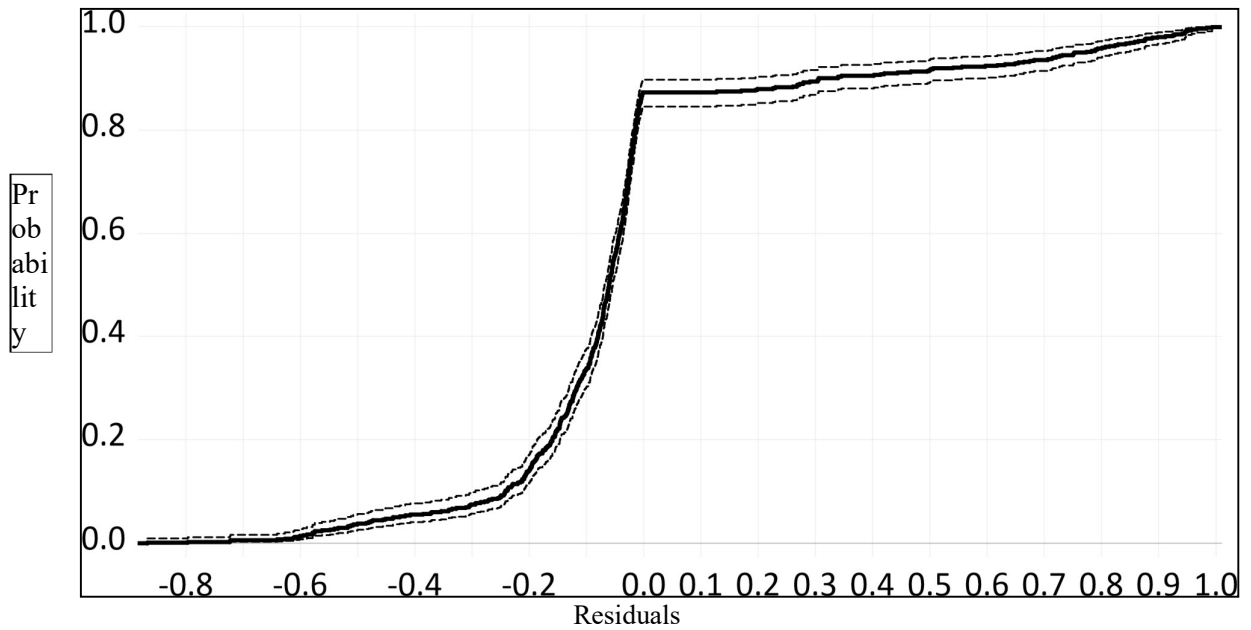
Goodness of fit – Model B

Goodness-of-Fit Evaluation for Binary Specification – Model B								
Andrews and Hosmer-Lemeshow Tests								
Quantile of Risk		Dep=0		Dep=1		Total	H-L	
Low	High	Actual	Expect	Actual	Expect	Obs	Value	
1	0.0007	0.0262	486	491.192	13	7.80805	499	3.50726
2	0.0262	0.0454	482	481.117	17	17.8825	499	0.04517
3	0.0454	0.0641	481	471.584	18	27.4159	499	3.42186
4	0.0642	0.0845	454	462.018	45	36.9820	499	1.87751
5	0.0845	0.1113	447	451.330	53	48.6699	500	0.42678
6	0.1116	0.1443	433	435.689	66	63.3107	499	0.13084
7	0.1443	0.1840	438	417.586	61	81.4141	499	6.11670
8	0.1840	0.2612	383	390.315	116	108.685	499	0.62944
9	0.2612	0.5059	317	316.593	182	182.407	499	0.00143
10	0.5069	0.8773	170	173.575	330	326.425	500	0.11279
Total		4091	4091.00	901	901.000	4992	16.2698	
H-L Statistic		16.2698		Prob. Chi-Sq(8)		0.0387		
Andrews Statistic		20.0013		Prob. Chi-Sq(10)		0.0292		

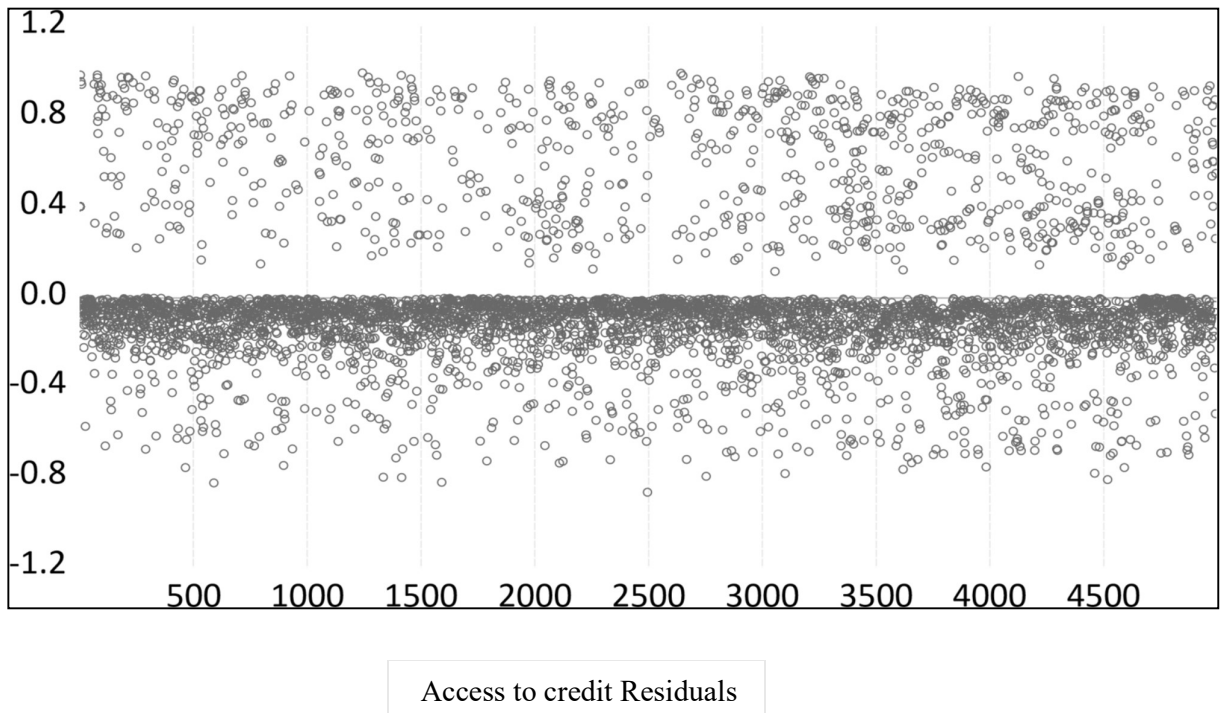
Goodness of fit – Model C

Goodness-of-Fit Evaluation for Binary Specification – Model C								
Andrews and Hosmer-Lemeshow Tests								
Quantile of Risk		Dep=0		Dep=1		Total	H-L	
Low	High	Actual	Expect	Actual	Expect	Obs	Value	
1	0.0006	0.0263	485	491.116	14	7.88399	499	4.82066
2	0.0263	0.0462	484	480.877	15	18.1234	499	0.55859
3	0.0462	0.0646	474	471.363	25	27.6372	499	0.26639
4	0.0646	0.0856	464	461.568	35	37.4322	499	0.17085
5	0.0858	0.1109	450	451.269	50	48.7313	500	0.03660
6	0.1110	0.1436	425	435.140	74	63.8601	499	1.84635
7	0.1436	0.1835	429	417.835	70	81.1654	499	1.83432
8	0.1837	0.2578	396	390.735	103	108.265	499	0.32704
9	0.2578	0.5094	314	316.666	185	182.334	499	0.06140
10	0.5094	0.8789	170	174.434	330	325.566	500	0.17306
Total		4091	4091.00	901	901.000	4992	10.0953	
H-L Statistic		10.0953		Prob. Chi-Sq(8)		0.2584		
Andrews Statistic		10.9897		Prob. Chi-Sq(10)		0.3583		

Observed versus expected probability – Model A



Predicted versus actual residuals – Model A



Appendix 6: Logit regression results

Model A: Logit regression results

Dependent Variable: Access to credit				
Method: ML - Binary Logit (Newton-Raphson / Marquardt steps)				
Sample: 1 4992				
Included observations: 4992				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-3.291364	0.224671	-14.64973	0.0000
Age	0.031079	0.003057	10.16699	0.0000****
Cell phone	1.067282	0.177337	6.018374	0.0000****
Collateral	-0.620731	0.094165	-6.591981	0.0000****
Lack of demand for credit	-0.789511	0.092426	-8.542104	0.0000****
Family and friends	-0.218555	0.178867	-1.221889	0.2217
Fear	-1.042601	0.764483	-1.363798	0.1726
Female	-0.286363	0.085677	-3.342376	0.0008****
Entrepreneur in informal sector	-1.270332	0.238111	-5.335031	0.0000****
Irregular income	-0.792711	0.335321	-2.364033	0.0181**
Moneylenders	-0.161771	0.465671	-0.347393	0.7283
Positive attitude	0.258805	0.091010	2.843706	0.0045***
Primary education	-1.694036	0.352863	-4.800829	0.0000****
Rural	-1.071538	0.154158	-6.950892	0.0000****
Tertiary education	1.963173	0.098642	19.90197	0.0000****
Vocational training	1.547454	0.207287	7.465276	0.0000****
McFadden R-squared	0.235247	Mean dependent var		0.180489
S.D. dependent var	0.384633	S.E. of regression		0.333135
Akaike info criterion	0.728542	Sum squared resid		552.2302
Schwarz criterion	0.749426	Log likelihood		-1802.441
Hannan-Quinn criteria.	0.735862	Deviance		3604.883
Restr. deviance	4713.784	Restr. log-likelihood		-2356.892
LR statistic	1108.901	Avg. log-likelihood		-0.361066
Prob (LR statistic)	0.000000			
Obs with Dep=0	4091	Total obs		4992
Obs with Dep=1	901			
H-L Statistic	10.3592	Prob. Chi-Sq(8)		0.2407

Wald test: **** significant at 0.1 per cent, *** significant at 1 per cent, **significant at 5 per cent, *significant at 10 per cent

Model B - Logit regression results

Dependent Variable: Access to credit				
Method: ML - Binary Logit (Newton-Raphson / Marquardt steps)				
Sample: 1 4992				
Included observations: 4992				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-3.396163	0.223688	-15.18261	0.0000
Age	0.031182	0.003062	10.18228	0.0000****
Cell phone	1.057515	0.176800	5.981434	0.0000****
Collateral	-0.613744	0.093686	-6.551068	0.0000****
Lack of demand for credit	-0.770679	0.092076	-8.370038	0.0000****
Family and friends	-0.241166	0.177122	-1.361582	0.1733
Fear	-1.118274	0.765910	-1.460059	0.1443
Female	-0.241454	0.085035	-2.839451	0.0045***
Irregular income	-0.938390	0.330087	-2.842855	0.0045***
Moneylenders	-0.151410	0.462846	-0.327130	0.7436
Positive attitude	0.269733	0.090628	2.976279	0.0029***
Primary education	-1.693298	0.351749	-4.813938	0.0000****
Rural	-1.138382	0.153409	-7.420575	0.0000****
Tertiary education	2.009260	0.098098	20.48225	0.0000****
Vocational training	1.617852	0.206512	7.834175	0.0000****
McFadden R-squared	0.227100	Mean dependent var		0.180489
S.D. dependent var	0.384633	S.E. of regression		0.334403
Akaike info criterion	0.735834	Sum squared resid		556.5533
Schwarz criterion	0.755412	Log likelihood		-1821.641
Hannan-Quinn criteria.	0.742696	Deviance		3643.282
Restr. deviance	4713.784	Restr. log-likelihood		-2356.892
LR statistic	1070.502	Avg. log-likelihood		-0.364912
Prob (LR statistic)	0.000000			
Obs with Dep=0	4091	Total obs		4992
Obs with Dep=1	901			
H-L Statistic	16.2698	Prob. Chi-Sq(8)		0.0387

Wald test: **** significant at 0.1 per cent, *** significant at 1 per cent, **significant at 5 per cent, *significant at 10 per cent

Model C: Logit regression results

Dependent Variable: Access to credit				
Method: ML - Binary Logit (Newton-Raphson / Marquardt steps)				
Sample: 1 4992				
Included observations: 4992				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-3.509892	0.220653	-15.90681	0.0000
Age	0.031112	0.003057	10.17809	0.0000****
Cell phone	1.039654	0.176548	5.888786	0.0000****
Collateral	-0.617065	0.093494	-6.600031	0.0000****
Lack of demand for credit	-0.767236	0.091929	-8.345998	0.0000****
Family and friends	-0.234592	0.176722	-1.327464	0.1844
Fear	-1.083789	0.764268	-1.418075	0.1562
Irregular income	-0.932666	0.329535	-2.830250	0.0047***
Moneylenders	-0.151686	0.463036	-0.327589	0.7432
Positive attitude	0.261827	0.090512	2.892724	0.0038***
Primary education	-1.718664	0.351743	-4.886131	0.0000****
Rural	-1.148208	0.153229	-7.493428	0.0000****
Tertiary education	2.025395	0.097832	20.70288	0.0000****
Vocational training	1.650954	0.205991	8.014680	0.0000****
McFadden R-squared	0.225394	Mean dependent var		0.180489
S.D. dependent var	0.384633	S.E. of regression		0.334654
Akaike info criterion	0.737044	Sum squared resid		557.5031
Schwarz criterion	0.755317	Log likelihood		-1825.662
Hannan-Quinn criteria.	0.743449	Deviance		3651.324
Restr. deviance	4713.784	Restr. log-likelihood		-2356.892
LR statistic	1062.460	Avg. log-likelihood		-0.365718
Prob (LR statistic)	0.000000			
Obs with Dep=0	4091	Total obs		4992
Obs with Dep=1	901			
H-L Statistic	10.0953	Prob. Chi-Sq(8)		0.2584

Wald test: **** significant at 0.1 per cent, *** significant at 1 per cent, **significant at 5 per cent, *significant at 10 per cent