DETERMINANTS OF HOUSEHOLD CREDIT DEMAND IN ZAMBIA

BY

SILUMBU WABEI

A dissertation submitted to the University of Zambia in partial fulfillment of the requirements of the degree of Master of Arts in Economics

THE UNIVERSITY OF ZAMBIA
LUSAKA
2012
I, *Silumbu Wabei*, declare that this dissertation:

a) Represents my own work;

b) Has not previously been submitted for a degree at this or any other University; and

c) Does not incorporate any published work or material from another dissertation.

Signed………………………………………………….

Date………………………………………………….
APPROVAL

This dissertation of Silumbu Wabei has been approved as fulfilling the requirements for the award of the degree of Master of Arts in Economics by the University of Zambia.

Signed:                                                                                     Date:

.........................................................................................  ..........................................................
.........................................................................................  ..........................................................
.........................................................................................  ..........................................................
.........................................................................................  ..........................................................
Determinants of Household Credit Demand in Zambia

By

Silumbu Wabei

ABSTRACT

There is a serious lack of empirical evidence on household credit demand in Zambia. This has led to an information gap in terms of evidence-based policy that would aid policy makers in the formulation of possible policy intervention to help stimulate and sustain household credit. Therefore, this dissertation attempts to partially fulfill this gap by analyzing the determinants of household credit demand in Zambia. Using a sample size of 20,000 households from the Living Conditions Monitoring Survey (LCMS) V of 2006, a probit model was used to predict the probability of borrowing due to the binary nature of the dependent variable. In addition, a subsequent tobit procedure was implemented to take into account the potential selectivity bias that arises due to the non-random choice of borrowing households. The total amount of borrowing per household, taken as a proxy of credit demand, is the dependent variable. Various important explanatory variables that influence credit demand were regressed against total borrowing. The explanatory variables include the size of the household, gender, age, education, total household expenditure, remittances received and residence. The discrete choice models that control for potential endogeneity and selectivity bias showed that all the explanatory variables were significant correlates of credit demand. These results reveal that the likelihood of credit demand will be higher with an increase in the size of the household, age and education. Furthermore, remittances received and residence in an urban area also increases the probability of borrowing. On the other hand, the probability of borrowing declines when a household is headed by a female or has low levels of expenditure. Based on these results, it is recommended that policy makers promote basic infrastructure for financial sector development in rural areas and focus on education policy that will enhance employment opportunities and individuals’ future income. They should also form credit schemes for the elderly and implement policies that are gender sensitive to gender inequalities in the financial market.
To my parents Mooka Akapelwa Silumbu and Doris Masuwa Silumbu
AKNOWLEDGEMENTS

I wish to express my gratitude to my supervisor, Dr. C. Mphuka, for the guidance that he provided me while I was writing this dissertation. I also want to acknowledge the help that I have received from Prof. M. Ndulo and Dr. F. Masiye, who helped me to acquire an in-depth knowledge of the research methodology. The support of my family, friends and colleagues was also invaluable in completing this study. Finally, I wish to thank my sponsors, Bank of Zambia for having provided me with the opportunity and financial support to complete my Master of Arts degree in Economics at the University of Zambia.
# TABLE OF CONTENTS

## CHAPTER ONE

**INTRODUCTION**

- Household Credit and Economic Growth
- Evolution of Household Credit in Zambia
- Statement of the Problem
- General Objective
- Specific Objectives
- Hypotheses
- Significance of the Study

## CHAPTER TWO

**STRUCTURE OF CREDIT MARKETS IN ZAMBIA**

- Formal Credit
- Informal Credit

## CHAPTER THREE

**LITERATURE REVIEW**

- Determinants of Household Credit Demand in Literature
- A Model of Household Credit

## CHAPTER FOUR

**DATA AND VARIABLES**

- Data
- Definition of explanatory variables
- Household Demographic Variables
- Character of the Dependent Variable

## CHAPTER FIVE

**METHODOLOGY**

- Theoretical framework
- The Empirical Models
- Standard Probit and Instrumental (IV) Probit models
- Standard Tobit and Instrumental (IV) Tobit models
- Estimation Strategy
Estimation of the Standard Probit Model ......................................................... 28
Estimation of the Standard Tobit Model ............................................................ 30
CHAPTER SIX ........................................................................................................ 31
RESULTS AND DISCUSSION .............................................................................. 31
CHAPTER SEVEN ................................................................................................... 36
CONCLUSION, POLICY IMPLICATIONS AND LIMITATIONS .............................. 36
Conclusion and Policy Implications ................................................................. 36
Limitations ........................................................................................................... 38
REFERENCES ....................................................................................................... 39
LIST OF TABLES

Table 1: Share of total loans and advances by sector........................................2
Table 2: Ten Largest Microfinance Institutions in Zambia..................................7
Table 3: Sample Distribution by Province and Residence...................................17
Table 4: Age and Sex Distribution of the Sample.............................................18
Table 5: Distribution of borrowing between male and female head of households ....19
Table 6: Definition of explanatory variables...................................................20
Table 7: Descriptive Statistics...........................................................................21
Table 8: Character of the dependent variable...................................................23
Table 9: Probit models predicting the probability of borrowing.........................31
Table 10: Tobit models predicting the probability of borrowing.........................32
## List of Abbreviations and Acronyms

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSAs</td>
<td>Census Supervisory Areas</td>
</tr>
<tr>
<td>FHH</td>
<td>Female Head of Household</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GLS</td>
<td>Generalized Least Squares</td>
</tr>
<tr>
<td>IV</td>
<td>Instrumental Variable</td>
</tr>
<tr>
<td>LCMS</td>
<td>Living Conditions Monitoring Survey</td>
</tr>
<tr>
<td>MFIs</td>
<td>Microfinance Institutions</td>
</tr>
<tr>
<td>MHH</td>
<td>Male Head of Household</td>
</tr>
<tr>
<td>NSCB</td>
<td>National Savings and Credit Bank</td>
</tr>
<tr>
<td>PSUs</td>
<td>Primary Sampling Units</td>
</tr>
<tr>
<td>SEAs</td>
<td>Standard Enumeration Areas</td>
</tr>
<tr>
<td>ZANACO</td>
<td>Zambia National Commercial Bank</td>
</tr>
</tbody>
</table>
CHAPTER ONE

INTRODUCTION

Household credit is a major part of overall private sector credit in many countries and its importance has been increasing. In Zambia, as in other parts of Africa, household credit leads to welfare improvements. Without household credit, the millions of cash-starved households are unable to borrow in times of low income and therefore making them vulnerable to economic shocks. Expanding access to credit therefore remains a key ingredient of development strategies worldwide. Levine (2005) shows that household credit enhances economic growth by easing the liquidity constraints on households who are involved in entrepreneurial activities; this leads to the formation of new firms and the expansion of existing ones. Kedir (2000) also shows that access to household credit can also help households to smooth consumption in the face of idiosyncratic and/or covariate risks.

Household Credit and Economic Growth

According to theory, the relationship between household credit and economic growth is ambiguous. The Keynesian model of Output determination argues that Aggregate Demand (total amount of goods and services demanded in the economy) determines output or economic growth (Dornbusch et.al., 1998). The model further postulates that Consumption and Investment demand are usually the biggest components of Aggregate Demand. Therefore, any factors leading to an increase in these two components should stimulate Aggregate Demand and consequently economic growth. McKinnon (1973) finds that an increase in household credit raises the demand for consumption and the demand for investment goods. His findings support the assertion that household borrowing to finance consumption and purchase of capital goods adds to the productive capacity of an economy which leads to economic growth.
Conversely, the evidence on some cross country regressions on household credit suggests that it either has no effect on medium and long-term economic growth (Beck et al. 2008) or that it even reduces growth. Jappelli and Pagano (1994) argue that greater availability of household credit reduces private savings and economic growth. Aghion et al (2005) suggest a positive significant impact on Gross Domestic Product per capita growth only of enterprise credit but not household credit.

Thus, the general view is that household credit is important for one core thing; *consumption smoothing* (consumers sacrifice future consumption in order to obtain greater satisfaction from current consumption) which potentially leads to welfare improvements.

**Evolution of Household Credit in Zambia**

On a sectoral basis, household credit in Zambia has continued to account for the largest share of outstanding credit. The data in Table 1 below shows that household credit is an important part of the lending activities of the financial sector. In fact, in Zambia, the financial sector lends more to the household sector than to any other sectors. According to table 1 below, household credit has been increasing from 11.2 percent in 2006 to 29.4 percent in 2011.

**Table 1**

<table>
<thead>
<tr>
<th>Share of total loans and advances by sector, 2006-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sector</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Household credit</td>
</tr>
<tr>
<td>Agriculture</td>
</tr>
<tr>
<td>Manufacturing</td>
</tr>
<tr>
<td>Wholesale and trade</td>
</tr>
<tr>
<td>Financial Services</td>
</tr>
<tr>
<td>construction</td>
</tr>
<tr>
<td>Mining and Quarrying</td>
</tr>
<tr>
<td>Source: Bank of Zambia, 2012</td>
</tr>
</tbody>
</table>
The pie chart below shows that in 2011, household credit accounted for the largest share of credit at 29 percent. The agricultural sector was second at 18 percent, followed by other sectors like real estate, transport, storage and communications at 17 percent. Manufacturing was fourth at 12 percent while wholesale and retail trade was fifth at 11 percent. This was followed by financial services at 5 percent and finally construction and mining and quarrying at 4 percent respectively.

![Share of total loans and advances by sector-2011]

**Source:** Author’s illustration based on Monetary Policy Statement of 2012.

The major factors behind this substantial growth of household credit include improved asset quality, a pick-up in economic growth, moderation in inflation and inflation expectations, decline in real interest rates, rising income of households and increased competition with the entry of new private sector banks. Other factors include financial deepening from a low base, structural shifts in supply elasticities and rise in efficiency of credit markets (Bank of Zambia, 2012).
**Statement of the Problem**

There is little information on the determinants of household credit demand in Zambia despite the critical role it plays in *consumption smoothing* and its possible consequences for the economy’s macroeconomic and financial stability. This leads to an information gap which limits policy makers from implementing policies that would improve households’ welfare based on empirical evidence. Consequently, a study of household credit demand is worth pursuing as the associated policy implications are important steps in providing a foundation for rational and evidence-based decision making. This will partially fulfill the information gap and aid policy-makers to come up with policies that will promote household lending by commercial banks and micro-lending institutions.

**General Objective**

The general objective is to investigate household credit demand in Zambia.

**Specific Objectives**

i. To determine the significant variables that influence household credit demand

ii. To understand the structure of household credit demand in Zambia.

iii. To draw policy implications for household credit demand from the empirical findings.

**Hypotheses**

i. There is no relationship between the female head of the household and total borrowing

ii. There is no relationship between the level of education of the head of the household and total borrowing

iii. There is no relationship between total household expenditure and total borrowing

iv. There is no relationship between residence and total borrowing
Significance of the Study

As far as I am aware, no study has yet looked specifically into the determinants of household credit demand in Zambia, although there are studies that looked into the determinants of credit demand in other countries in the Sub-Saharan Africa region. Bendig, et al., (2009), Diagne (1999) and Kedir (2000), carried out studies to evaluate the determinants of credit demand for groups of African developing countries, with similar features to Zambia. However, it is impossible to isolate the Zambian-specific determinants of household credit from these studies.

This study therefore intends to shed light on these issues by identifying the determinants of household credit in Zambia. It is important to identify the determinants of household credit, which would aid policy makers in the formulation of possible policy intervention to help stimulate and sustain household credit which will lead to welfare improvement of the Zambian people.

The remainder of the study is organized as follows. Chapter two gives insight into the structure of the credit markets in Zambia. Chapter three discusses the literature on the empirical issues surrounding household credit demand. It also provides a model of household credit. Chapter four gives a description of the data, introduces explanatory variables and gives a description of the nature of the dependent variable. The theoretical framework, empirical models and estimation strategy is presented in chapter five and the results and discussion in chapter six. Concluding remarks, some policy implications, limitations and recommendations for further research are finally highlighted in chapter seven.
CHAPTER TWO

STRUCTURE OF CREDIT MARKETS IN ZAMBIA

This chapter attempts to explain the nature and structure of household credit in Zambia. It broadly explains that households can either borrow from the formal or informal financial sector. This however does not mean that households restrict themselves to only one form of credit product, but there is usually an overlap between the usage of formal and informal credit.

The credit market in Zambia can be segmented into two main sectors; the formal sector and informal sector. The formal sector comprises commercial banks and non-bank financial institutions (comprising the three building societies, registered micro finance institutions and the National Savings and Credit Bank (NSCB); while the informal sector comprises unregistered micro lenders (kaloba), relatives and friends (Ministry of Finance, 2004).

Formal Credit

Commercial banks are the largest source of formal credit for households as they stand out as the largest financial player in the Zambian credit market. They hold about 90 percent of financial system assets and foreign equity participation is significant, accounting for three quarters of the banking system capitalization. The banking system in Zambia is comprised of 19 commercial banks out of which Barclays Bank, Standard Chartered Bank, Citibank, Stanbic Bank and Zambia National Commercial Bank (ZANACO) are the five largest banks.

In terms of assets, Barclays is the largest bank accounting for 24.3% of commercial banking assets and about 18.3% of commercial banking deposits in the country. Zambia National Commercial Bank is second and has total assets valued at ZMK 4.72 trillion, with shareholders' equity of about ZMK 582.7 billion (Bank of Zambia, 2009).
The Microfinance sector in Zambia is unusually undeveloped, even by African standards. The sector is young, small in size, fragmented, and has a limited outreach. Financial inclusion is low, at just 37.3 percent of adults and the demand for microfinance in Zambia is high (mftransparency, 2011). Although well diversified, with a variety of different institution types, the sector has had limited support and will have to overcome many challenges in its development.

Table 2

<table>
<thead>
<tr>
<th>Microfinance Institution</th>
<th>Number of Active Borrowers</th>
<th>Gross Loan Portfolio (ZMK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FINCA Zambia</td>
<td>14,879</td>
<td>17,703,826,092</td>
</tr>
<tr>
<td>Microbankers Trust (MBT)</td>
<td>14,300</td>
<td>8,200,000,000</td>
</tr>
<tr>
<td>Harmos Micro-Enterprise Development</td>
<td>9,800</td>
<td>7,227,940,834</td>
</tr>
<tr>
<td>CETZAM Financial Services</td>
<td>6,399</td>
<td>15,315,329,318</td>
</tr>
<tr>
<td>Meanwood Finance Corporation</td>
<td>4,889</td>
<td>16,000,000</td>
</tr>
<tr>
<td>Agora Microfinance Limited (AMZ)</td>
<td>2,287</td>
<td>2,042,386,000</td>
</tr>
<tr>
<td>Empowerment Microfinance Institution</td>
<td>1,559</td>
<td>2,360,550,702</td>
</tr>
<tr>
<td>MicroCredit Foundation (MCF) Zambia</td>
<td>1,500</td>
<td>145,178,300</td>
</tr>
<tr>
<td>Pulse Financial Services</td>
<td>1,481</td>
<td>18,835,000,000</td>
</tr>
<tr>
<td>ECLOF Zambia</td>
<td>462</td>
<td>568,000,000</td>
</tr>
</tbody>
</table>

Source: MF Transparency Transparent Pricing Initiative 2011

Table 2 above shows the ten Largest Microfinance Institutions in Zambia. According to the table, FINCA Zambia is reported to have the highest coverage with 14,879 active borrowers and a gross loan portfolio of K 17,703,826,092. Microbankers (MBT) Trust is second with 14,300 active borrowers and a gross loan portfolio of K 8,200,000. ECLOF Zambia is the smallest among the ten with 462 active borrowers and a gross loan portfolio of K 568,000,000.
The Argument for Microfinance

Robinson (2007) argues that conventional theories of finance are not suited to explain the way microfinance works. Despite her acute critique, she maintains a focus on entrepreneurial lending and misses the non-entrepreneurial scope of microfinance. There is a lot of emphasis on entrepreneurship and most MFIs lend only for productive purposes. This is based on the premise that investing in enterprises will generate revenues which will promote economic growth and enable enterprises to repay the loans. Therefore, any non-productive or “consumption” loan is considered economically non-beneficial for households, and more importantly, carries a high risk of default.

However, contrary to this argument, post utilization data from MFIs suggests that a majority of the loans taken by households are utilized for consumption purposes with near perfect repayment. Karlan and Zinman (2007) demonstrate the positive impacts of consumption credit on the well-being and productivity of individuals. Households do borrow to pay for education or pay for a medical service which is an investment in human and social capital and therefore cannot be considered to be non-productive.

Informal Credit

Informal credit is very important to Zambia. As a general definition, Ayyagari et al (2008) suggest that informal credit relates to any and all non-market institutions such as credit cooperatives and moneylenders that do not rely on formal contractual obligations enforced through a codified legal system.

In Zambia, the most common type of informal lending comes from unregistered micro lenders called kaloba. Melzer (2007) found that only 14 percent of Zambians have a kaloba of which 90 percent are located in rural areas. The high utilization of informal credit in rural areas is attributed to lack of banking facilities. However, in areas where there is access to banking facilities, the main problem is the high cost of opening and maintaining a bank account.
CHAPTER THREE

LITERATURE REVIEW

This chapter explores relevant literature on the determinants of household credit demand. It includes more African specific findings and discusses them. Since this is an applied study, the literature review focuses on empirical findings. Finally, it also outlines a model on household credit demand.

Determinants of Household Credit Demand in Literature

Researchers have tried to estimate the determinants of credit demand in various studies. But each study differs in its underlying objective and therefore in the model and the variables under examination. Most studies focus on the borrowers’ personal characteristics or attributes of the credit, rather than the purpose the loan is utilized for.

Fanwell (2001) analyzed factors that affect household demand for credit in Malawi. The study covered 404 households in Nkhotakota, Rumphi, Dedza, Dowa and Mangochi. The analysis used an Ordinary Least Squares estimation of the extent of credit demand and finally, a probit analysis. The results indicate that credit demand was positively and significantly dependent on household expenditure and family size. This was as a result of larger family size exerting stress on the household, which is mostly reflected through an increased probability of borrowing.

Rweyemamu et al (2003) also examined the determinants of credit demand in Tanzania. Demand for credit was hypothesized as being determined by household size, years of schooling of household head, household income, expenditure, and borrowing transaction costs. Through a regression analysis, they found that credit demand is negatively affected by borrowing transaction costs. They further found that demand for credit was positively influenced by household size, years of schooling of household head, expenditure and
household income. The study argues that the increase in credit demand as a result of more years of schooling is associated with more productive jobs and more income, while the increase of credit demand as a result of a higher level of expenditure is associated with households’ desire for more income to meet their desired consumption.

Kedir (2000) analyzed the determinants of access to household credit and loan amount in Ethiopia. A probit model and a tobit procedure which controls for potential non-randomness/selectivity bias in observing borrowing households was applied in the study. The study found geographical location of households as a significant factor. Kedir found that most households who lived in the urban areas of Addis Ababa are more likely to borrow relative to most households located in the rural areas of Mekele. Kedir argues that this is because most households in Addis Ababa are located closer to financial intermediaries like banks and micro financial institutions relative to those in Mekele. The study also found that current household resources, schooling of the household head, value of assets, collateral, number of dependants, marital status and age as significant factors.

Bendig, et al., (2009) used a multivariate probit model to simultaneously determine Household demand for Credit in Ghana. In this study, household survey data from 350 households in Ghana was used. Their findings indicated that the social economic status of households (assets, schooling, land per capita in acres, employment and remittances) were positively related to credit demand, while female headship, exposure to shocks (illness or death) were negatively and significantly correlated with credit demand. In this study, remittances were a significant factor as they represent additional income source and collateral, enabling households to borrow. However, this is a mere correlation. While this interpretation is plausible, there is need to dismiss the possibility that remittances could actually prevent borrowing as they may well be substitutes for formal loans and the relationship would thus be negative.
Pitt and Khandker (2002) identify gender and the education level of the household head as significant correlates of credit demand. Education played a vital role in determining credit demand as lenders prefer higher-educated customers because they usually have higher income volatility, and therefore, a smaller default risk. Jabbar et al., (2002) identifies family size, primary economic activity of the household head and interest rate as additional determinants of the demand for formal credit. Zeller and Sharna (2002) point out that borrowing during adverse times is an integral part of the likelihood system of households in developing countries.

Kumar (2008) also investigated whether consumption expenditure determined credit demand in Uttar Predish (UP) and Bihir. Ordinary Least Squares (OLS) was used to analyze the data and since the dependent variable (credit demand) also had zero values, truncated regressions were also run using the Tobit Model. The regression results indicated that medical expenses and family size were positively correlated with credit demand, while family daily wage and remittances negatively correlated with credit demand. In this study, unlike the one done by Bendig, et al., (2009) in Ghana, it can be seen that the relationship between remittances and credit demand is negative and remittances now act as substitutes for loans. This entails that the direction of the relationship between remittances and household borrowing is ambiguous.

Barslund and Tarp (2008) find countervailing impacts of education, number of dependants, assets, credit history and secure land rights on the demand for formal and informal loans, but most of the mentioned variables (except for assets) have a statistically significant effect only on either formal or informal credit demand. Other variables, such as connections to credit institutions, exhibit a positive significant impact on the demand for both formal and informal loans.
A Model of Household Credit

Victor (2000) elaborates a model for household credit demand that incorporates an explicit financial sector with firms that specialize in the production and selling of credit services to households. Accessing these credit services permits households to finance part of their current purchases of consumption or capital goods with current income. The model is as follows;

i. The economy is populated with infinitely lived identical households with preferences over consumption and leisure.

ii. The expected life time utility of the representative household is given by:

\[ E_0 \sum_{t=0}^{\infty} \beta^t \{ \mu(C_t) + V(1-n_t) \} \]  

(1)

Where \( C_t \) is consumption purchases at time \( t \), \( n_t \) is work effort at time \( t \), \((1-n_t)\) is leisure given a per period time endowment of unity, \( 0 < \beta < 1 \) is the time discount factor, and \( \mu \) and \( V \), the utility obtained from consumption and leisure, respectively. Utility obtained from consumption is given by \( \mu(C) = \ln(c) \), while utility obtained from leisure is given by \( V(1-n) = A(1-n) \) with \( A > 0 \). Households purchase both consumption and investment goods \( I_t \) in the commodity market and have the option of using cash or credit.

Let \( g_{1t} \) and \( g_{2t} \) denote household purchases of cash and credit goods, respectively. The household’s total purchases of goods must thus satisfy the following resource constraint:

\[ g_{1t} + g_{2t} = C_t + I_t = C_t + K_{t+1} - (1-\delta)K_t \]  

(2)
Where $K_t$ is the household's stock of capital and $\delta \in (0, 1)$ is the capital depreciation rate.

In addition to households, the economy is also populated by many producers of two types. Firms in the goods producing sector (Sector 1) employ labor $n_{lt}$ and capital $k_{lt}$ to produce output $Y_t$ according to a Cobb-Douglas production technology:

$$Y_t = F(k_{lt}, n_{lt}) = k^{\alpha} n^{1-\alpha}_{lt}, \text{ where } \alpha \in (0,1). \quad (3)$$

Credit producers in the financial sector (Sector 2) employ labor $n_{2t}$ and capital $k_{2t}$ to produce a flow of credit services $q_t$ according to technology:

$$q_t = Q(k_{2t}, n_{2t}) = \phi k^{\gamma} n^{1-\gamma}_{2t}, \text{ where } \phi > 0 \text{ and } \gamma \in (0,1). \quad (4)$$

Since it is likely that labour employment is more intensive and variable than physical capital in the provision of credit services over the business cycle, capital is assumed to be supplied inelastically to the financial sector so that $k_{2t} = k_2$. The purchase of a unit of credit services permits households to finance a unit of a good with credit: $g_{2t} = q_t$. Finally, the financial sector also consists of financial intermediaries who accept cash deposits from households, receive monetary injections from the central bank, and provide loans to credit producers. These credit producers use the borrowed funds to finance household credit purchases within the period.

- The money supply process is given by:

$$M_{t+1}^s = M_t^s + X_t = (1 + \chi_t)M_t^s \quad (5)$$
Where the beginning of period $t$ nominal money supply per household is given by $M_t^*$, $X_t$ is the monetary injection, and $x_t$ is the money growth rate between period $t$ and $t+1$.

To keep the flow of funds tractable, Victor (2000) adopts the “family” methodology of Lucas (1990) and Furest (1992). That is, each representative family consists of a worker/shopper pair, a goods producing firm, a credit-producing firm, and a financial intermediary. However, since at the end of the period the family reunites and pools their cash receipts, these monetary injections will be symmetric across families. Given this structure, the timing of events within period $t$ will proceed as follows;

The family begins the period with capital stock $K_t$ and nominal cash holdings $M_t$ and deposits $D_t$ dollars into the financial intermediary. The family then separates. The state of nature $S_t \in S$ is revealed in the form of a monetary injection to the financial intermediary, $X_t$, where $S$ is the compact continuous support of the stochastic money growth rate. The financial intermediary now has available $D_t + X_t$ dollars to loan out.

The nominal interest rate financial intermediaries charge for loans and pay on deposits is given by $R_t$. The worker travels to the labor market and supplies a total of $n_t$ hours of work effort in the goods and financial sector and receives a nominal wage payment $W_t$. Goods and credit services are then produced with $n_{1t}, K_{1t}, K_2$ and $n_2$. The shopper first travels to the financial sector to rent out the capital stock $K_t$ to goods and credit producers at a rental price of $r_t$ and to purchase a given amount of credit services $q_t$ at price $P_{qt}$. It is assumed that households may finance these credit services with end-of-period income. The shopper then travels to the goods market to buy consumption and capital
goods at price $P_{gt}$ where $g_{1t}$ is financed with cash and $g_{2t} = q_t$ with credit services. Credit producers are obligated to finance household purchases of $g_{2t}$ in the goods market and a fraction $\sigma < 1$ of that quantity must be in the form of cash. To obtain that cash, credit producers borrow an amount $\beta_t$ from the financial intermediary. This leads to the following cash-in-advance constraints for shoppers and credit producers, respectively;

$$P_{gt}g_{1t} \leq M_t - D_t$$  \hspace{1cm} (6)

$$\sigma P_{gt}Q(k_2, n_{2t}) \leq \beta_t$$  \hspace{1cm} (7)

At the end of the period the family reunites to enjoy the consumption of goods. All credit loans (between households, credit producers, goods producers, and the financial intermediary) are repaid and households receive rental income generated by the capital stock. The family pools its cash receipts and enters period $t+1$. The end-of period $t$ cash holdings of the family must thus satisfy the following budget constraint:

$$M_{t+1} = \left[ M_t + D_t R_t + r_t P_{gt} K_t + W_t n_t - P_{gt} (g_{1t} + q_t) - P_{qt} q_t \right] + X_t (1 + R_t) +$$

$$\left[ P_{gt} F(k_{1t}, n_{1t}) - W_t n_{1t} - r_t P_{gt} K_{1t} \right] + \left[ P_{qt} q_t Q(k_2, n_{2t}) - W_t n_{2t} - r_t P_{gt} K_2 - \beta_t R_t \right]$$  \hspace{1cm} (8)

The first term in brackets represents the cash receipts of the worker/shopper, the second is the cash holdings of the financial intermediary, the third is the profits of the goods-producing firm, and fourth is the profits of the credit producer, net of loan repayments to the financial intermediary. The family’s optimization problem thus consists of choosing a sequence $\{g_{1t}, q_t, n_t, K_{t+1}, P_t, n_{1t}, n_{2t}, K_{1t}, \beta_t\}$ maximizing (1) subject to (2), (6), (7), and (8).
CHAPTER FOUR

DATA AND VARIABLES

This chapter outlines what type of data was used. It defines the explanatory variables, shows some descriptive statistics, and explains household demographic variables. Finally, it also defines the character of the dependent variable.

Data

The study is based on cross sectional data from the Living Conditions Monitoring Survey (LCMS) V 2006. The survey was used because it contains variables of interest. It contains detailed sections on demographic and socioeconomic household characteristics, education, employment, income and consumption. The sampling frame used for the LCMS V was developed from the 2000 Census of Population and Housing. Cluster random sampling was used as the population is dispersed across a wide geographical area. Zambia is administratively demarcated into 9 provinces, which are further divided into 72 districts. The districts are further subdivided into 150 constituencies, which are in turn divided into wards. Wards are further divided into Census Supervisory Areas (CSAs), which are further subdivided into Standard Enumeration Areas (SEAs). The survey adopted the Square Root sample allocation method, (Kish, 1987). This approach offers a compromise between equal and proportional allocation. A sample of 1,000 Standard Enumeration Areas (SEAs) was drawn to cover approximately 20,000 households. In analyzing the data, sampling weights were used. Specifically, SEAs constituted the Primary Sampling Units (PSUs). This was to ensure that estimates are not biased. In addition, sampling weights were used because they play a critical role in estimating standard errors.
Sample Size and Distribution

Table 3 below shows the sample size by province and residence. The sample size used was 20,000 households. The highest proportion of the sample was reported on the Copperbelt Province (15 percent) while the lowest proportion was in North-Western Province (6 percent).

Furthermore, 65 percent of the sample lived in rural areas, while 35 percent lived in urban areas. Lusaka and Copperbelt provinces were the most urbanized provinces with 85 percent and 79 percent of their population living in urban areas respectively.

Table 3: Sample Distribution by Province and Residence

<table>
<thead>
<tr>
<th>Province</th>
<th>Number of Households</th>
<th>Percentage Share</th>
<th>Rural Percentage Share</th>
<th>Urban Percentage Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>2,000</td>
<td>10</td>
<td>1,560</td>
<td>440</td>
</tr>
<tr>
<td>Copperbelt</td>
<td>3,000</td>
<td>15</td>
<td>630</td>
<td>2,370</td>
</tr>
<tr>
<td>Eastern</td>
<td>2,800</td>
<td>14</td>
<td>2,576</td>
<td>224</td>
</tr>
<tr>
<td>Luapula</td>
<td>1,600</td>
<td>8</td>
<td>1,408</td>
<td>192</td>
</tr>
<tr>
<td>Lusaka</td>
<td>2,800</td>
<td>14</td>
<td>420</td>
<td>2,380</td>
</tr>
<tr>
<td>Northern</td>
<td>2,600</td>
<td>13</td>
<td>2,184</td>
<td>416</td>
</tr>
<tr>
<td>North Western</td>
<td>1,200</td>
<td>6</td>
<td>1,020</td>
<td>180</td>
</tr>
<tr>
<td>Southern</td>
<td>2,400</td>
<td>12</td>
<td>1,872</td>
<td>528</td>
</tr>
<tr>
<td>Western</td>
<td>1,600</td>
<td>8</td>
<td>1,376</td>
<td>224</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20,000</strong></td>
<td><strong>100</strong></td>
<td><strong>13,046</strong></td>
<td><strong>6,954</strong></td>
</tr>
</tbody>
</table>

Source: Author's illustration based on Living Conditions Monitoring Survey of 2006.

Age and Sex Distribution of the Sample

Table 4 below shows the age-sex distribution of the sample. The Table shows that 66 percent of the 20,000 households that were sampled had young people aged between 0-24 years. Forty-two percent of the sample was aged 0-14 years, while 24 percent was aged 15-24 years.
Table 4: Percentage Distribution of Sample by 5 Year Age-Groups and Sex

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Percent Female</th>
<th>Percent Male</th>
<th>Female Percent</th>
<th>Male Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4</td>
<td>2,400</td>
<td>12</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>5-9</td>
<td>3,000</td>
<td>15</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>10-14</td>
<td>3,000</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>15-19</td>
<td>2,600</td>
<td>13</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>20-24</td>
<td>2,200</td>
<td>11</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>25-29</td>
<td>1,600</td>
<td>8</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>30-34</td>
<td>1,400</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>35-39</td>
<td>1,000</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>40-44</td>
<td>800</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>45-49</td>
<td>600</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>50-54</td>
<td>400</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>55-59</td>
<td>400</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>60-64</td>
<td>200</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>65+</td>
<td>400</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>20,000</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Author’s illustration based on Living Conditions Monitoring Survey of 2006.

Gender and Access to Credit

Access differs for men and women, with women having less access to credit. Table 5 below shows that out of 20,000 households that were sampled, only 1,280 borrowed. This means 93.6 percent are not using any type of formal or informal service provider. This does not mean there is no need to borrow or that households are not engaging in activities that fulfill functions of credit. They are probably using sub-optimal activities, that is, methods with higher costs and higher risks. This could also be as a result of credit constraints such as asymmetric information, high transaction costs and risk rationing imposed by borrowers unwilling to lose their collateral (Hoff and Stiglitz, 1990; Aryeety and Udry, 1997; Boucher et al., 2005).
In addition, out of 1280 that borrowed, only 260 female headed households borrowed. This could be because female-headed households often lack collateral compared to male headed households. The national PRSP (2002-2004) indicates that about 60 percent of Female Headed Households (FHH) lack collateral, as opposed to 51 percent of the Male Headed Households (MHH).

**Table 5: Distribution of borrowing between male and female head of households**

<table>
<thead>
<tr>
<th>Sex</th>
<th>Not borrowed</th>
<th>Borrowed</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>15,486</td>
<td>1,018</td>
<td>16,504</td>
</tr>
<tr>
<td>Female</td>
<td>3,234</td>
<td>262</td>
<td>3,496</td>
</tr>
<tr>
<td>Total</td>
<td>18,720</td>
<td>1,280</td>
<td>20,000</td>
</tr>
</tbody>
</table>

*Source: Author’s illustration based on Living Conditions Monitoring Survey of 2006.*

Finally, it is important to note that households do not restrict themselves to only one form of credit product (either formal or informal), but there usually is an overlap between the usage of formal credit and informal credit (Melzer, 2009). This entails that informal products are not necessarily a substitute for using formal products.

**Definition of explanatory variables**

The vector of explanatory variables includes demographic and socioeconomic household characteristics, education, employment, expenditure and information about remittances. Table 6 below summarizes the definition of the variables;
Table 6: Definition of explanatory variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Household size</strong></td>
<td>Household size</td>
</tr>
<tr>
<td><strong>Female head</strong></td>
<td>Dummy variable, 1 if household is headed by a female, 0 otherwise</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>Age of the household head</td>
</tr>
<tr>
<td><strong>Age squared</strong></td>
<td>Age of the household head squared</td>
</tr>
<tr>
<td><strong>Head education</strong></td>
<td>Number of schooling years of the household head</td>
</tr>
<tr>
<td><strong>Employment</strong></td>
<td>Dummy variable, 1 if household head is employed, 0 otherwise</td>
</tr>
<tr>
<td><strong>Total expenditure</strong></td>
<td>Total expenditure</td>
</tr>
<tr>
<td><strong>Remittances</strong></td>
<td>Dummy variable, 1 if household receives remittances from former household members who have migrated, 0 otherwise</td>
</tr>
<tr>
<td><strong>Residence</strong></td>
<td>Dummy variable, 1 if household resides in urban area, 0 otherwise</td>
</tr>
</tbody>
</table>

*Source: Author's illustration based on Living Conditions Monitoring Survey of 2006.*

The mean and the standard deviation are two of the most important statistics for researchers. This is because each time any variable is measured, it is important to know where the centre of the distribution is and how spread out the distribution is. The mean and standard deviation of each variable is outlined in table 7 below.
Table 7: Descriptive Statistics

<table>
<thead>
<tr>
<th>variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household size</td>
<td>5.33</td>
<td>2.91</td>
</tr>
<tr>
<td>Female head</td>
<td>0.224</td>
<td>0.417</td>
</tr>
<tr>
<td>Age</td>
<td>41.6</td>
<td>14.1</td>
</tr>
<tr>
<td>Age Squared</td>
<td>1930.4</td>
<td>1351.1</td>
</tr>
<tr>
<td>Head education</td>
<td>3.89</td>
<td>5.03</td>
</tr>
<tr>
<td>Total expenditure</td>
<td>350537.8</td>
<td>1070191</td>
</tr>
<tr>
<td>Remittances</td>
<td>0.121</td>
<td>0.326</td>
</tr>
<tr>
<td>Employment</td>
<td>0.931</td>
<td>0.253</td>
</tr>
<tr>
<td>Location</td>
<td>0.485</td>
<td>0.499</td>
</tr>
</tbody>
</table>

Source: Author's illustration based on Living Conditions Monitoring Survey of 2006.

Household Demographic Variables

In considering household demographics, the following expectations are adopted;

It is assumed that there is a strong relationship regarding certain demographic characteristics of the household and the probability of total borrowing. Household size correlates very strongly with total borrowing and hence, larger households refer to households with more children and elderly people, and not households with more economically active adults. Therefore, it is assumed that household size positively affects credit demand, as larger households are likely to be more vulnerable to economic shocks.

A positive relationship is presumed with regard to age of the household head. Decreasing marginal effects of age are controlled for by including age squared. Specifically, the need for credit demand is very likely to decrease when the household head retires. Furthermore, gender issues are taken into account by
controlling for female headship. The likelihood of credit demand is assumed to be lower in female-headed households, as these are often lack collateral relative to their male headed counterparts.

**Education characteristics**

In order to capture the education level of the household, the number of schooling years of the household head is taken as an indicator for the human-capital endowment of the whole household. In line with the literature, it is assumed that fewer years of schooling will reduce credit demand. In addition, low education levels are often correlated to less productive jobs and lower incomes, which, in turn, can be expected to reduce both access to credit.

**Expenditure**

In line with the literature, it is expected that a higher level of current consumption will have a positive effect on total borrowing. It is assumed that households with a higher level of consumption are more likely to demand more credit as they would want more income to meet their desired consumption. Furthermore, the Life Cycle Model postulates that households are more likely to borrow in times of lower income to finance current consumption and repay in a period of high income.

**Employment status**

A dummy variable indicating the employment status of the household head was created. The dummy takes the value of 1 if the household head is employed and 0 otherwise. It is assumed that households with a head who is employed are more likely to demand credit than households with an unemployed head. This is because financial institutions are more likely to offer credit to those economic agents with a stable flow income, that is, those in employment.
Remittances
The direction of the relationship between remittances and total borrowing is, however, not straightforward. On the one hand, remittances may well be substitutes for formal loans and the relationship would thus be negative. On the other hand, it may be that remittances represent an additional income source and collateral, enabling households to access products they could otherwise not obtain. In both models we use a dummy variable, which takes on the value of 1 if a household receives remittances from former household members who have migrated, and 0 otherwise.

Residence
In line with most of the studies on the demand for credit, it is assumed that a household’s proximity to an adequate financial institution is crucial to its demand for household credit services, as proximity strongly determines transaction costs. A dummy variable has been included in the analysis, taking into account a household’s residence. The dummy variable, takes on the value of 1 if the household resides in an urban area, and 0 otherwise. It is expected that households residing in urban areas are more likely to utilize credit services than those in rural areas as they have close proximity to most commercial banks and have the ability to meet the high cost of opening and maintaining a bank account.

Character of the Dependent Variable

<table>
<thead>
<tr>
<th>Not borrowed=0 Borrowed=1</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>18,720</td>
<td>93.6</td>
<td>93.60</td>
</tr>
<tr>
<td>1</td>
<td>1,280</td>
<td>6.40</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>20,000</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Author’s illustration based on Living Conditions Monitoring Survey of 2006.*
From table 8 it can be seen that the dependent variable income borrowed is censored. Censoring occurs when data on the dependent variable is lost (or limited). Data on the dependent variable is lost by limiting it to 1 if households borrow and 0 otherwise. From table 8 it can be seen that 18,720 households or 93.6 percent of the sample did not borrow and that only 1,280 households or 6.4% of the sample borrowed. This shows that in as much as the level of household credit is increasing in Zambia (see table 1), there are still so many households that are unable to access credit. A possible explanation is that households in Zambia face an environment characterized by underdeveloped capital markets and omnipresent information asymmetry.
CHAPTER FIVE

METHODOLOGY

This section presents the theoretical model which is narrowed down to empirical model. It also outlines the estimation strategy used in the study.

Theoretical framework

The genesis of the theory of household credit demand is the life-cycle model. Credit demand is driven by households’ desire to smooth consumption over the life-cycle as pointed out by the permanent income hypothesis of Modigliani (1986) and Friedman (1957). A representative household maximizes the utility function subject to an intertemporal budget constraint:

$$\max E \left[ \sum_{t=0}^{T} (1+\theta)^{-t} u(c_t) \right]$$

(9)

s.t. $$A_{t+1} = (1+r)(A_t + y_t - c_t)$$

(10)

Where E is expectation, T denotes the time horizon of the household, $c_t$ is consumption at time $t$, $y_t$ is labor income at time $t$, $A_t$ is household net assets at time $t$, $r$ is the rate of return on the assets, and $\theta$ is the discount rate. The first order condition of this problem is the standard Euler equation (Chen and Chivakul, 2008):

$$E_t u'(c_{t+1}) = \frac{(1+\theta)}{(1+r)} u'(c_t)$$

(11)
The Euler equation implies that households will try to maximize their utility by smoothing marginal utility over the life cycle. In a period of low income, households will borrow to finance current consumption and repay in a period of high income. In a world with perfect capital markets, households will be able to borrow the amount of money they desire to smooth their consumption.

Furthermore, the model considers age to be one of the most important factors suggested by theory (Chen and Chivakul, 2008). Young households and individuals are likely to have a high demand for credit because of their expectation of higher income and higher consumption in the future compared with their current low income. As their age increases, their income becomes higher which make them less likely to borrow because they have enough income to meet current consumption.

**The Empirical Models**

The empirical modeling of the determinants of credit demand or probability of borrowing can be handled by estimating either a probit model or a tobit model. A probit model is used due to the binary nature of the dependent variable. The tobit model handles the potential selectivity bias that arises due to the non-random choice of borrowing households. These models share the feature that OLS regression leads to inconsistent parameter estimates when the dependent variable is categorical. Generally, OLS on the whole sample or just the uncensored sample will provide inconsistent estimates.

The only limitation of probit and tobit models is that they require normal distributions for all unobserved components of utility. In many, perhaps most situations, normal distributions provide an adequate representation of the random components. However, in some situations, normal distributions are inappropriate and can lead to perverse forecasts.
**Standard Probit and Instrumental (IV) Probit models**

In considering the probit model, assume an underlying latent response variable $y_i^*$ which is defined by;

$$y_i^* = \beta x_i + \mu_i$$  \hspace{1cm} (12)

Actually, we do not observe $y_i^*$ but a dummy dependent variable $y$ which takes a value of either 1 or 0. In the present context, a value of 1 is assigned to households that borrowed and 0 otherwise. $x_i$ represents a vector of household characteristics and the $\mu_i$ is the error term which is normally distributed with zero mean and constant variance. Households are represented by subscript $i$.

However, one important empirical issue is the potential endogeneity of the household expenditure variable which is entered on the right hand side as one of the predictors of the probability of borrowing. Therefore, Amemiya’s GLS (generalized least squares) estimator was adopted which is sometimes referred to as IV (instrumental variables) probit estimation to control for endogeneity (Newey, 1987). ‘Community income’ was used as an instrument. Since there was no valid instrument in the data set, a new variable called ‘community income’ was generated in stata. The exogeneity of the expenditure variable is validated by the Exogeneity test and the Smith-Blundell’s exogeneity test given at the bottom of table 9 and 10.

In the IV probit context, equation (12) can be specified as;

$$y_i^* = \gamma y_i + \beta x_i + \mu_i$$  \hspace{1cm} (13)

Where $y_i$ is the variable that is potentially endogenous (i.e. total household expenditure) which has a non-zero correlation with the error term $\mu_i$;
\( x_i \) represents a vector of exogenous variables, \( \gamma \) and \( \beta \) are vectors of parameters to be estimated. Our independent variables \( (x) \) are; the size of household, gender, age, the education level of the head of household, total household expenditure, remittances received, employment and residence.

**Standard Tobit and Instrumental (IV) Tobit models**

The tobit model handles the potential selectivity bias that arises due to the non-random choice of borrowing households. In addition, the IV tobit model is an appropriate estimation framework to account for the endogeneity of the household expenditure variable. The IV tobit model can be defined as:

\[
y_i^* = y_i \beta + x_i \gamma + \mu_i = z_i \delta + \mu_i
\]

(14)

where \( y_i^* \) denotes the dependent variable (i.e. credit amount), \( y_i \) is the variable that is potentially endogenous (i.e. total household expenditure), and the rest of the variables are as defined earlier.

**Estimation Strategy**

This section presents how the probit and tobit models are estimated. The tobit and probit models are similar in many ways. They each have the same structural model, just different measurement models i.e. how the \( y^* \) is translated into the observed \( y \) is different. In the tobit model, we know the value of \( y^* \) when \( y^* > 0 \), while in the probit model we only know if \( y^* > 0 \). Since there is more information in the tobit model, the estimates of the \( \beta \) should be more efficient.

**Estimation of the Standard Probit Model**

The analytical modeling of the determinants of credit demand or probability of borrowing can be handled by estimating a probit model due to the binary nature of the dependent variable. The probit model can be estimated as follows;
\[ \text{prob}(y = 1) = F(X \beta) = \Phi(X \beta) \]
\[ = \int_{-\infty}^{X \beta} \phi(t) dt \]  
\[ (15) \]

And we are interested in the marginal effects given by the equation below;
\[ \frac{\partial E\left( \frac{y}{X} \right)}{\partial X} = \phi(X \beta) \beta \]  
\[ (16) \]

To estimate the coefficients we use maximum likelihood estimation. Thus we want to find \( \beta \) to maximize \( \text{prob}(Y / \beta, X) \). In the simple case we have \( y_i = 1 \) and \( y_i = 0 \). Thus, the joint density function is;
\[ \text{Pr}(y_1, y_2, \ldots, y_n / \beta, X) = \prod_{y_{i=1}} \text{Pr}(y_i = 1 / \beta, X) \times \prod_{y_{i=0}} \text{Pr}(y_i = 0 / \beta, X) \]  
\[ (17) \]

If we assume the \( F \) is symmetric and \( \text{prob}(y = 1) = F(X, \beta) \) then the likelihood function is;
\[ L = \prod_{y_{i=1}} F(X, \beta / \beta, X) \times \prod_{y_{i=0}} [1 - F(X, \beta / \beta, X)] \]  
\[ (18) \]

Due to the assumption that the distributions are identical and independent we have;
\[ L = \prod F\left( \frac{X_i \beta}{\beta, X} \right)^{y_i} \times \prod \left[ 1 - F\left( \frac{X_i \beta}{\beta, X} \right) \right]^{(1-y_i)} \]  
\[ (19) \]

Then the log likelihood function is;
\[ \log L = \sum y_i \ln F\left( \frac{X_i \beta}{\beta, X} \right) + \sum (1-y_i) \ln \left[ 1 - F\left( \frac{X_i \beta}{\beta, X} \right) \right] \]  
\[ (20) \]

So we maximize equation (20) with respect to \( \beta \). Under the first condition we differentiate the log likelihood and equate the result to zero and solve for \( \beta \).  

29
However we do not solve for the estimate of beta analytically, but we do it numerically by setting an initial value of beta and calculating the values of the log likelihood that will give you the beta value which maximizes the log likelihood.

**Estimation of the Standard Tobit Model**

To take into account the potential selectivity bias that arises due to the non-random choice of borrowing households, a standard tobit model has to be estimated. The likelihood function for the censored normal distribution is:

\[
L = \prod_{i=1}^{N} \left[ \frac{1}{\sigma} \phi \left( \frac{y_i - \mu}{\sigma} \right) \right]^{d_i} \left[ 1 - \Phi \left( \frac{\mu - \tau}{\sigma} \right) \right]^{1-d_i} \tag{21}
\]

Where \( \tau \) is the censoring point. In the traditional tobit model, we set \( \tau = 0 \) and parameterize \( \mu \) as \( X_i \beta \). This gives us the likelihood function for the tobit model:

\[
L = \prod_{i=1}^{N} \left[ \frac{1}{\sigma} \phi \left( \frac{y_i - X_i \beta}{\sigma} \right) \right]^{d_i} \left[ 1 - \Phi \left( \frac{X_i \beta - \tau}{\sigma} \right) \right]^{1-d_i} \tag{22}
\]

The log-likelihood function for the tobit model is:

\[
\ln L = \sum_{i=1}^{N} \left\{ d_i \left[ -\ln \sigma + \ln \phi \left( \frac{y_i - X_i \beta}{\sigma} \right) \right] + (1-d_i) \ln \left[ 1 - \Phi \left( \frac{X_i \beta - \tau}{\sigma} \right) \right] \right\} \tag{23}
\]

The overall log-likelihood is made up of two parts. The first part corresponds to the classical regression for the uncensored observations, while the second part corresponds to the relevant possibilities that an observation is censored.

Finally we then maximize equation (23) with respect to \( \beta \). Under the first condition we differentiate the log likelihood and equate the result to zero and solve for \( \beta^* \).
CHAPTER SIX

RESULTS AND DISCUSSION

This chapter presents the results and discussion of both the probit and tobit models.

Table 9: Probit models predicting the probability of borrowing

<table>
<thead>
<tr>
<th>Models</th>
<th>Probit model</th>
<th>Instrumental Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Marginal Effects</td>
<td>Marginal Effects</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable</td>
<td>Marginal Effects</td>
<td>Marginal Effects</td>
</tr>
<tr>
<td>Household size</td>
<td>0.005***</td>
<td>0.004***</td>
</tr>
<tr>
<td>Female head</td>
<td>-0.018*</td>
<td>-0.015**</td>
</tr>
<tr>
<td>Age</td>
<td>0.001</td>
<td>0.0005</td>
</tr>
<tr>
<td>Age squared</td>
<td>-0.00002*</td>
<td>-0.00001</td>
</tr>
<tr>
<td>Head education</td>
<td>0.013</td>
<td>0.095**</td>
</tr>
<tr>
<td>Total expenditure</td>
<td>-4.81e-07</td>
<td>-1.35e-06**</td>
</tr>
<tr>
<td>Remittances received</td>
<td>0.098***</td>
<td>0.099***</td>
</tr>
<tr>
<td>Residence</td>
<td>0.044***</td>
<td>0.046***</td>
</tr>
</tbody>
</table>

Wald test of exogeneity \( \chi^2 (1) \)

\[ \text{prob} > \chi^2 (1) = 1.05 \]

Smith-Blundell test of Exogeneity \( \chi^2 (1) \)

\[ \text{prob} > \chi^2 (1) = 0.20 \]

Note: * = Significant at the 10% level; ** = Significant at the 5% level; and *** = Significant at the 1% level. In the instrumental variables specification, the community income variable is used as an instrument for total expenditure. The exogeneity of the expenditure variable is validated by Smith-Blundell’s exogeneity test. NB: Employment was dropped automatically due to multicollinearity.
Table 10: Tobit models predicting the probability of borrowing

<table>
<thead>
<tr>
<th>Models</th>
<th>Tobit model Marginal Effects</th>
<th>Instrumental Variables Marginal Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household size</td>
<td><strong>0.040</strong>*</td>
<td><strong>0.0338</strong>*</td>
</tr>
<tr>
<td>Female head</td>
<td>-0.0146*</td>
<td><strong>-0.124</strong></td>
</tr>
<tr>
<td>Age</td>
<td><strong>0.012</strong></td>
<td><strong>0.005</strong></td>
</tr>
<tr>
<td>Age squared</td>
<td>-0.00002*</td>
<td>-0.00001*</td>
</tr>
<tr>
<td>Head education</td>
<td><strong>0.109</strong></td>
<td><strong>0.780</strong></td>
</tr>
<tr>
<td>Total expenditure</td>
<td>-3.92e-07</td>
<td><strong>-0.00001</strong></td>
</tr>
<tr>
<td>Remittances received</td>
<td><strong>0.680</strong>*</td>
<td><strong>0.695</strong></td>
</tr>
<tr>
<td>Location</td>
<td><strong>0.360</strong>*</td>
<td><strong>0.369</strong></td>
</tr>
</tbody>
</table>

Wald Test of Exogeneity

\[ \text{prob > } \chi^2(1) \]

<table>
<thead>
<tr>
<th></th>
<th>0.21</th>
</tr>
</thead>
</table>

Smith-Blundell Test of Exogeneity

\[ \chi^2(1) \]

<table>
<thead>
<tr>
<th></th>
<th>1.31</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th></th>
<th>prob &gt; \chi^2(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.24</td>
</tr>
</tbody>
</table>

Note: * = Significant at the 10% level; **= Significant at the 5% level; and ***= Significant at the 1% level. In the instrumental variables specification, the community income variable is used as an instrument for total expenditure. The exogeneity of the expenditure variable is validated by Smith-Blundell's exogeneity test. NB: Employment was dropped automatically due to multicollinearity.
The estimated coefficient for household size was positive and highly significant at the 1 percent level in both models (see table 9 and 10 above). This means increased household size makes it significantly more likely that a household demands credit. A possible explanation is that larger households are more exposed to shocks, such as illness, simply because of the higher number of household members. Hence, they may borrow more in the event that they are confronted with a calamity. This is in line with the findings by Bendig, et al., (2009) and Fanwell (2001). They found that the size of the household in Ghana and Malawi respectively increases the probability of borrowing.

As expected, the estimated coefficient for female headship was negative and significant at the 5 percent level in both models. This means female headship is negatively and significantly correlated with the demand for credit. This could be that more women in Zambia as compared to men lack the collateral to be able to borrow. Kedir (2000) also finds an absence of gender in loan allocations in Urban Ethiopia.

The estimated coefficient for age was positive but insignificant in the probit model. However, a significant positive effect of the coefficient of age at the 10 percent level and a negative coefficient in the quadratic term in the tobit indicate the presence of non-linear effects on the probability of borrowing. This is in line with the life-cycle model of consumption of Modigliani (1986) and Friedman (1957) and previous empirical works which propagate that young households and individuals are likely to have a high demand for credit because of their expectation of higher income and higher consumption in the future compared with their current low income. As their age increases, their income becomes higher which makes them less likely to borrow because they have enough income to support current consumption. As expected, there is a certain age threshold beyond which the desired credit will stop growing and start falling. Precisely, the turning point for credit demand is 33 years of age.
On the demand side of the credit market, education is one of the most important factors suggested by theory (Chen and Chivakul, 2008). Predictably, the estimated coefficient for education was positive and significant at the 5 percent level in both models. This is because from the lender’s point of view, what matters is the expected income in the future rather than current income. It is also expected that lenders would prefer higher-educated customers because they usually have lower income volatility and, therefore, smaller default risk. This is supported by empirical work done in Tanzania by Rweyemamu et al (2003) who find that low education levels are often correlated to less productive jobs and lower incomes, which, in turn, can be expected to reduce both access to credit.

In addition, the estimated coefficient for remittances received was positive and highly significant at the 1 percent level in both models. This implies that increased remittances received make it significantly more likely that a household demands credit since remittances represent an additional income source and collateral, enabling households to access products they could otherwise not obtain. This is in line with the findings by Bendig, et al., (2009). They find that households who received remittances had a higher probability of borrowing in Ghana than those who did not. However, it should be noted that remittances could actually prevent borrowing and the relationship would thus be negative, as remittances received would act as a substitute for household credit.

The estimated coefficient for residence was also positive and highly significant at the 1 percent level in both models. This means that households residing in urban areas are more likely to utilize credit services than those in rural areas. It is assumed that households in urban areas have close proximity to most commercial banks and have the ability to meet the high cost of opening and maintaining a bank account. This is corroborated by studies done in Ethiopia. Kedir (2000) found that compared to individuals in the urban area of Ethiopia,
individuals in the rural areas have significantly lower probability of borrowing and a higher probability of being credit constrained.

Finally, the results by Fanwell (2001) in Malawi and Rweyemamu et al (2003) in Tanzania indicate that credit demand is positively and significantly dependent on household expenditure. Their findings indicate that households with a higher level of consumption are more likely to demand more credit as they would want more income to meet their desired consumption. However, the estimated coefficient for total expenditure in the probit and tobit models was negative but significant at the 10 percent level. The negative coefficient on total expenditure could entail that households with a higher level of consumption have enough income to meet desired consumption and thus would borrow less.

**Summary of Results**

The results in both models tell a consistent story in terms of all the variables but for age. In both models the results indicate that the demand for credit is positively influenced by household size, Education, and remittances received, but negatively affected by gender and expenditure. However, the estimated coefficient for age in the probit model despite being positive was insignificant. On the other hand, the tobit model that takes into account the potential selectivity bias that arises due to the non-random choice of borrowing households found the estimated coefficient for age to be positive and significant at the 10 percent level as expected. This shows the importance of using both models in determining the demand for household credit when the dependent variable is a limited dependent variable.
CHAPTER SEVEN

CONCLUSION, POLICY IMPLICATIONS AND LIMITATIONS

This chapter presents the conclusion, policy implications and limitations of the study.

Conclusion and Policy Implications

This study has added value to the discussion about the demand for household credit in Zambia using household survey data from the Living Conditions Monitoring Survey (LCMS) V of 2006. Based on, the relevance of demographic and socioeconomic household characteristics, education, employment, expenditure, residence and information about remittances, a probit model and a subsequent tobit procedure was used. Potential endogeneity of the expenditure variable was controlled for by using a generated variable called community income as an instrument.

The results confirm several standard findings of earlier contributions on credit demand. The study reveals that education is one of the most important determinants of household credit demand. This is because from a lender's point of view, education is a good indicator of expected future income. Studies have shown that higher-educated customers usually have lower income volatility and, therefore, smaller default risks (Chen and Chivakul, 2008). This provides justification for government to focus on education policy to enhance employment opportunities and individuals’ future income.

Another interesting feature is the presence of gender discrimination in the demand for credit. As often is the case elsewhere, more male-headed households are served by commercial banks and micro-finance institutions than females. Statistics show that 0.8% of women have household credit, while
2.2% of men are able to access credit through a bank (Melzer, 2009). The role for government policy here is to implement policies that will reduce gender inequalities in the financial market. This has the potential to lead to economic empowerment and greatly contribute to economic development.

As it is the case in many countries, this study reveals that residence is one of the major determinants of credit demand in Zambia. Currently, there is limited access to credit by those who live in rural areas as compared to those who live in urban areas Melzer (2007). This is because most people in rural areas do not have close proximity to most commercial banks and do not have the ability to meet the high cost of opening and maintaining a bank account. As general credit policy, government may do well to focus on promoting basic infrastructure for financial sector development to enhance access to credit.

Following theory and previous empirical work, the study also shows that the relationship between the probability of credit demand and age follows an inverted U-shaped pattern. However, the relationship has the maximum point at around age 33. These people find it even more difficult to borrow when they retire at an approximate age of 55 years as they are considered a high risk. The role for government policy here is to implement credit schemes that target the elderly in Zambia. These schemes have been introduced in countries like Ethiopia and have been successful in stimulating household credit demand and reducing old age vulnerabilities (Kedir, 2000).

A general conclusion of the research is that in Zambia, as in other parts of Africa, household credit leads to welfare improvements and could lead to economic growth. Without household credit, the millions of cash-starved households will be unable to borrow in times of low income and therefore be exposed to economic shocks. Therefore, the government should promote
access to credit which remains a key ingredient of development strategies worldwide.

**Limitations**

Thorough analysis was hampered by the absence of household level data that could allow researchers to identify whether households borrowed from the informal or formal sector. This inhibited the study from indicating which between the two sectors plays a major role as a source of credit for households in Zambia.

Secondly, the literature above shows that one of the most significant determinants of household credit demand is the cost of borrowing in form of interest rate and net worth. However this could not be analyzed as the data set did not have the interest rate variable. Furthermore, net worth was at individual level while the rest of the variables were at household level and thus could not be merged with the rest of the data.

Finally, household survey data from the Living Conditions Monitoring Survey (LCMS) V of 2006 was used as it was the latest data set at the commencement of the study. The Central Statistical Office just recently released the latest data set that can be used to build on this study.

It is therefore the author’s feeling that the above three limitations will provide a strong basis for future research in determining the demand for household credit in Zambia.
REFERENCES


