Financial Sustainability of Rural Microfinance Institutions (MFIs) in Tanzania

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DECLARATION

I certify that this work has not been accepted in substance for any degree, and is not concurrently being submitted for any degree other than that of Ph.D. being studied at the University of Greenwich. I also declare that this work is the result of my own investigations except where otherwise identified by references and that I have not plagiarised another's work.

Signed:

Student ______________________________Date ____________________

Supervisor ___________________________Date ____________________

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ABSTRACT

An enduring problem facing microfinance institutions is how to attain financial sustainability. Several studies have been conducted to determine the factors affecting financial sustainability of microfinance institutions using large and well developed MFIs in various countries. However, no such study has been conducted in rural Tanzania where majority of MFIs are small, most of which are member-based (cooperatives). Consequently, the factors affecting their financial sustainability are not known. This study, therefore, was set to bridge this knowledge gap.

This study followed a quantitative research approach using panel data regression as the main data analysis technique. The study was based on four years primary and secondary data obtained from 98 sampled rural MFIs in Tanzania. We found that microfinance capital structure, interest rates charged, differences in lending type, cost per borrower, product type, MFI size, number of borrowers, yield on gross loan portfolio, level of portfolio at risk, liquidity level, staff productivity, and the operating efficiency affect the financial sustainability of rural microfinance institutions in Tanzania.

The study makes the following key contributions to knowledge in addition to determining factors affecting financial sustainability of rural microfinance institutions in Tanzania: First, the study reveals that there exists simultaneous causality relationship between financial sustainability and breadth of outreach. When this relationship is not considered in determining factors affecting financial sustainability there may be inconsistent evidence on the existence of mission drift. Second, it unveils the trade-off between financial sustainability and breadth of outreach with regards to the minimum loan size when group lending is used. That is, larger loan size, while improves profitability, reduces the breadth of outreach. Third, the study provides empirical evidence that the impact of a particular lending type on microfinance institution’s profitability will depend on the term to maturity and number of instalments reflected in its lending terms. Fourth, consistent with the institutionists’ view, the study provides empirical evidence that financial sustainability of microfinance institutions improves their breadth of outreach. Lastly, the study documents the applicability and limitations of previous studies to rural microfinance institutions in Tanzania.

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LIST OF ACRONYMS AND ABBREVIATIONS

BancoSol	–	Banco Solidario, S.A. (Bolivia)
BRAC	–	Bangladesh Rural Advancement Committee
BRI	–	Bank Rakyat Indonesia
CGAP	–	Consultative Group to Assist the Poor
FINCA	–	Foundation for International Community Assistance
FSS	–	Financial Self-sufficiency
GMM	–	Generalised Method of Moment
IFAD	–	International Fund for Agricultural Development
ILO	–	International Labour Organisation
KCB	–	Kilimanjaro Co-operative Bank
LIML	–	Limited-information Maximum Likelihood
MB-MFI	–	Member-based Microfinance institution
MEDA	–	Micro Enterprise Development Agency
MFI	–	Microfinance Institution
MIX	–	Microfinance Information Exchange
MKUKUTA	–	Mkakati wa Kukuza Uchumi na Kuondoa Umaskini Tanzania
NGO	–	Non Governmental Organisation
NGO-MFI	–	Non Governmental Organisation MFIs
NMB	–	National Microfinance Bank
NSGRP	–	National Strategy for Growth and Reduction of Poverty
OLS	–	Ordinary Least Square
POI	–	Poverty Outreach Index
PRIDE	–	Promotion of Rural Initiative and Development Enterprises
PTF	–	Presidential Trust Fund
RFSP	–	Rural Financial Services Program
ROA	–	Return on Asset
SACA	–	Savings and Credit Associations
SACCOs	–	Savings and Credit Cooperatives
SDI	–	Subsidy Dependency Index
SEDA	–	Small Enterprises Development Agency
TZS		Tanzania’s Currency (Shilling)
URT	–	United Republic of Tanzania
USD	–	United States of America’s Currency (Dollar)

PREFACE

This PhD thesis is the end product of PhD studies undertaken from October 2007 to September 2010 at the University of Greenwich in the UK. The idea to undertake this PhD research on financial sustainability of rural microfinance institutions in Tanzania emanated from the researcher's 4 years consulting and training experience in accounting for member-based microfinance institutions in Tanzania.

The researcher, Ganka Daniel Nyamsogoro, is a Senior Lecturer in the Department of Accounting and Finance at Mzumbe University in Tanzania. He is a holder of MSc International Banking and Finance since 2000 from the University of Greenwich; a Certified Public Accountant in Tanzania over 12 years; and a Certified International Accounting Standards (IAS) trainer by the Institute of Chartered Accountants of Scotland (ICAS). He has a good knowledge in econometric methods and application of STATA econometrics software. Ganka has consulting and training experience for over 10 years in Management Accounting, Financial Management, International Finance and Financial Accounting at both undergraduate and master's level. He has also undertaken several consultancy assignments in accounting and finance at national level and worked as external examiner for several institutions.

Ganka has worked as a visiting lecturer in Microfinance for International Development, a Masters Course at the University of Greenwich from January 2008 to September 2010. During this period, he supervised several Masters' dissertations in financial markets in Ghana, Nigeria, Bangladesh, India, and Sri Lanka. His research interests include: the applicability of accounting profitability theory to financial sustainability of microfinance institutions; quantitative impact assessment; financial performance; product costing; regulation of microfinance; and financial markets based research.

Ganka has published the following articles in refereed journals: "Investor Protection in Emerging Capital Markets", The Accountant, Vol.16(3), (2004); "Understanding Country Risk: A Guide to International Investors", The Accountant, Vol.15(4), (2003); "The Effects of Micro and Macro Structural Features on Attaining Market Objectives: A Comparative Analysis Between DSE and NSE," Uongozi Journal of Management Development, Vol.14 (2), (2002); "Mergers and Acquisitions: Is There any Net Benefit?" The Accountant, Vol.14 (4), (2002) with Godfrey Kasaro; "Portfolio Investment: Is There an Optimal Number of Assets for Better Diversification Results?" Uongozi Journal of Management Development, Vol.13 (2), (2001); and "Company Valuation in Emerging Markets: An Evaluation of Methods", Uongozi Journal of Management Development, Vol.13 (1), (2001).

CHAPTER 1
INTRODUCTION AND PROBLEM STATEMENT

"Unsustainable MFIs might help the poor now, but they will not help the poor in the future because the MFIs will be gone" (*Schreiner, 2000:425).*

1.0 INTRODUCTION

Throughout the world, financial sustainability of microfinance institutions has been one of the issues that have recently captured attention of many researchers due to its importance in the livelihood of microfinance institutions. The financial sustainability of microfinance institutions is a necessary condition for institutional sustainability (Hollis and Sweetman, 1998), and the most important requirement for any MFI (LOGOTRI, 2006).

The need for MFIs to be financially sustainable cannot be overemphasized. As it has been argued "unsustainable MFIs might help the poor now, but they will not help the poor in the future because the MFIs will be gone" (Schreiner, 2000:425). Moreover, they might not even help the poor now (Adam *et al*, 1984). It has been reported that it may be better not to have MFIs than having unsustainable ones. The unsustainable MFIs might hurt exactly those whom they are meant to help (Krahnen and Schmidt, 1994). This shows how important the sustainability of MFIs is, and studying factors that affect sustainability of MFIs and how MFIs can become financially sustainable becomes imperative if the objective of these MFIs should be achieved.

This study was meant to determine the factors affecting financial sustainability of rural microfinance institutions in Tanzania. These are also known as determinants of financial sustainability. Thus, in this study, we use factors affecting financial sustainability and determinants of financial sustainability interchangeably to mean one and the same thing.

1.1 BACKGROUND TO THE RESEARCH PROBLEM

Tanzania is one of developing countries in African continent classified as one of world poorest countries with a per capita income of $320 (URT, 2007). According to Rubambey (2005) 75 percent of the total population in Tanzania live in the rural areas and are largely dependent on smallholder farming, majority of whom earn less than one US dollar a day. One of objectives of Tanzania's National Strategy for Growth and Reduction of Poverty (NSGRP) also known as MKUKUTA in local language Kiswahili is promoting sustainable and broad based growth. This is done through among other things, empowering of Tanzanians to mobilize savings and investment, and promotion of investment in productive and services sectors with a view to increasing productivity (URT, 2005).

Demand for financial services in Tanzania is largely unmet (Cho-Béroff *et al*, 2000). According to an ILO (2001) study about 80 percent of the Tanzanian population is excluded from reliable banking services, most of which live in rural areas. In recent decades, as it has been in other developing countries in Africa and the world at large, microfinance institutions in Tanzania have evolved to address the financing gap that exists to the rural poor.

There are two categories of institutional providers of microfinance services in rural Tanzania: non-governmental organisations (these include the former governmental institution known as Presidential Trust Fund); and member-based microfinance institutions. Currently FINCA and SEDA are the largest NGO microfinance providers in rural areas. The key providers of microfinance services in rural areas among institutional providers in the country, however, are the Savings and Credit Cooperatives (SACCOs) and Savings and Credit Associations (SACAs). These are categorised among the member-based microfinance institutions (MB MFIs). The government supports the development of these member-based MFIs (SACCOs and SACAs) through its rural financial services program (RFSP). The long-term vision of these MFIs is to provide sustainable financial services to the economically-active poor who are unable to access these services from the mainstream financial services. They are aiming at empowering the rural poor economically through promoting financial intermediation in rural areas. Other MB-MFIs that operate in rural Tanzania are the village cooperative banks (ViCoBa) and low-level rotating savings and credit associations (ROSCAs). However, compared with the SACCOs and SACAs, the operations of these microfinance institutions are in small scales with limited geographical coverage.

Although few studies have reported negative impact of microfinance as being an increase in child labour (Maldonado and González-Vega, 2008); and women disempowerment (Garikipati, 2008) most studies indicate positive impacts. These include: MFI program participation has positive impacts on household income, production, and employment (Imai *et al*, 2010; Kumar and Newport, 2007; Hiatt and Woodworth, 2006; Kabeer, 2005; McKernan, 2002; Woller and Parsons 2002; Dunn, 2001; Khandker *et al*, 1998; Bolnick and Nelson, 1990). Others report that participation in MFI programs has increased participants' assets, environmental awareness and common pool resource stewardship (Anderson *et al*, 2002; Mosley, 2001) improved children's education and nutritional status (Hiatt and Woodworth, 2006; Chowdhury and Bhuiya, 2004); reduced income inequality and raised consumption levels (Mahjabeen, 2008; Hiatt and Woodworth, 2006); and alleviated small business financing constraints (Hartarska and Nadolnyak, 2008). Thus, microfinance is seen to be an effective development strategy (Mahjabeen, 2008; Kabeer, 2005) and an anti-poverty tool (Ahlin and Jiang, 2008).

Microfinance institutions need to be financially sustainable in order to provide sustainable microfinance facilities and contribute to poverty reduction (LOGOTRI, 2006; Schreiner, 2000; Hollis and Sweetman, 1998; Christel *et al*, 1995; Krahnen and Schmidt, 1994; Adam *et al*, 1984). It has been reported that only those MFIs which are financially sustainable stand a chance of reaching the vast of millions of the poor (Thapa *et al*, 1992). However, some studies indicate that majority of MFIs are not financially sustainable (Brau and Woller, 2004). The MFIs operating in rural Tanzania are not an exception to these observations.

1.2 STATEMENT OF THE RESEARCH PROBLEM

This study focused on the financial sustainability of microfinance institutions in rural Tanzania. The level of poverty in rural areas is wide and deep (Navajas *et al*, 2000). Given the incidence of rural poverty, improved financing (methods of financing, amounts and accessibility) is seen as crucial in achieving the pro-poor and poverty reduction goal (Mwenda and Muuka, 2004). Poverty is considered to be multifaceted (Zeller *et al*, 2006). The microfinance paradigm focuses on reduction of income poverty through improving access to finance and financial services. This is built on the premise that empowerment of the poor through creating income generating capacity enables the poor to access all the development requirements, and thereby to get out of the multifaceted dimensions of poverty and reduce their vulnerability to unexpected events (LOGOTRI, 2006; Davis *et al*, 2004; Demirquc-Kunt and Levine, 2004).

An enduring problem facing microfinance institutions, however, is how to attain financial sustainability (Dunford, 2003; Schreiner, 2000; Woller 2000; Hollis and Sweetman, 1998; Christen *et al*, 1995). This problem has attracted attention of numerous researchers in recent decades and, as a result many strategies have been put in place to ensure that MFIs are sustainable (Randhawa and Gallardo, 2003; Schreiner, 2000; Yaron, 1992).

In Tanzania, although the rural financial services programme (RFSP) that is assisting rural microfinance institutions has been reported to be successful in developing and empowering the rural MFIs (IFAD, 2005) one question is still apparent: what is the future of these MFIs when the program is over? As evaluators have observed, 'many project-related groups remain creatures of the projects themselves – their only raison d'être being the hope of getting donor money and when the project ends, so will they' (IFAD, 2001:20). Along this line Randhawa and Gallardo (2003:28) posit that 'it does not seem likely that most MFIs will be able to sustain their operations without continued donor support for funding and technical assistance'. This leaves the future of these MFIs in uncertainty. Thus, an important question here is what should be done to make these MFIs sustainable and hence ensure sustainable provision of microfinance services and sustainable poverty reduction through outreach. The first step in doing this is to understand the factors affecting their financial sustainability.

Several studies have been conducted to determine the factors affecting financial sustainability of microfinance institutions using large and well developed MFIs in various countries (Cull *et al* (2007; Woller and Schreiner 2002; Christen, 2000; Woller, 2000; Christen *et al*, 1995). The level of significance of these factors in affecting the financial sustainability of MFI, however, varies with studies. While some of the determinants are found to be significant in one economy or applicable to a set of microfinance institutions, some are not significant (Cull *et al*, 2007; Woller and Schreiner 2002; Christen *et al*, 1995). Moreover, no such study has been conducted in Tanzania where the majority of MFIs are small, and most of them are member-based. Consequently, the factors affecting the financial sustainability of these MFIs are not known. Besides, applicability or limitations of the findings from other studies to the rural MFIs in Tanzania have not been documented. This study, therefore, was set out to bridge this knowledge gap. Focusing on rural microfinance institutions in Tanzania, the study used the accounting profitability approach and the life cycle theory to determine the factors affecting the financial sustainability of rural MFIs in Tanzania.

1.3 OBJECTIVES OF THE STUDY

The main objective of this study was to determine factors affecting financial sustainability of rural MFIs in Tanzania. Specific objectives of the study were as follows:

(1) To determine the effects of MFIs outreach and other related factors on the financial sustainability of rural MFIs in Tanzania.
(2) To determine the effects of microfinance efficiency on the financial sustainability.
(3) To determine the effects of the financial sustainability on the Breadth of outreach.
(4) To explain the applicability and limitations of the findings from previous studies to the microfinance institutions in rural Tanzania on what affects the financial sustainability of microfinance institutions.
(5) To determine the effects of the determinants of financial sustainability on the sustainability of MFIs at their start-up and growth stages of development.

1.4 RESEARCH QUESTIONS

With the above research objectives in mind, this study was set forward to answer the following main question: What are the determinants of or factors affecting financial sustainability of rural MFIs in Tanzania? From this main research question, the following specific questions were addressed:

(1) Does the microfinance capital structure; interest rate; staff costs per dollar loaned; lending type as indicated by the number of instalments, minimum loan size, and term to maturity; cost per borrower; product type; MFI age; MFI type; depth of outreach; MFI size; gender of MFI clients; regulation status; number of borrowers; and the geographical location affect the financial sustainability of rural MFIs in Tanzania?

(2) Does the microfinance efficiency, as reflected in: the yield on gross loan portfolio; portfolio at risk; liquidity ratio; staff productivity; cost reduction; and amount of loan disbursed affect the financial sustainability of rural microfinance institutions in Tanzania?

(3) What are the effects of the financial sustainability on the breadth of outreach?

(4) What of the factors reported to be significantly affecting financial sustainability of microfinance institutions in other developing countries are also relevant in Tanzania rural MFIs

(5) What are the effects of the determinants of financial sustainability on the sustainability of MFIs at their start-up and growth stages of development?

1.5 SIGNIFICANCE OF THE STUDY

MFIs are principal providers of financial services in rural areas of Tanzania (Randhawa and Gallardo, 2003) where the majority of people are poor. Despite their important contribution to rural financial services, it has been reported that these MFIs only serve about 1 percent of the population (Cho-Béroff *et al*, 2000). This indicates how limited in breadth of outreach these microfinance institutions are. To attain larger number of customers and offer sustainable rural financial services, these MFIs need to be financially sustainable (LOGOTRI, 2006; Schreiner, 2000; Hollis and Sweetman, 1998; Christel *et al*, 1995; Krahnen and Schmidt, 1994; Adam *et al*, 1984).

Although there have been numerous studies on sustainability of microfinance in other countries where MFIs are relatively large and well developed compared to MFIs in Tanzania (Cull *et al* 2007; Schreiner, 2002; Woller and Schreiner 2002; Christen, 2000; Emerson, 2000; Woller, 2000; Christen *et al*, 1995) no such studies have been done in Tanzania. This study, as an attempt to assess the determinants of financial sustainability of rural MFIs in Tanzania, provides evidence on what affect their financial sustainability. Understanding factors affecting the financial sustainability of rural MFIs in Tanzania is a major stepping stone to enlighten what should be done if financial sustainability is to be achieved. This is particularly crucial in Tanzania where about 80 percent of the population (majority of which are in rural areas) are excluded from reliable banking services (Rubambey, 2005; ILO, 2001) leaving the MFIs to be principal providers of financial services (Randhawa, and Gallardo, 2003).

The study contributes to knowledge on the financial sustainability of rural microfinance institutions in developing countries. In so doing, the study bridges the existing knowledge gap in microfinance literature on sustainability of microfinance institutions in as far as the rural MFIs in Tanzania are concerned.

Key contributions made by this study in addition to determining factors affecting financial sustainability of rural microfinance institutions in Tanzania are: First, the study reveals that there exists simultaneous causality relationship between financial sustainability and breadth of outreach. When this relationship is not considered in determining factors affecting financial sustainability there may be inconsistent evidence on the existence of mission drift. Second, it unveils the trade-off between financial sustainability and breadth of outreach with regards to the minimum loan size when group lending is used. That is, larger loan size, while improves profitability, reduces the breadth of outreach. Third, the study provides empirical evidence that the impact of a particular lending type on microfinance institution’s profitability will depend on the term to maturity and number of instalments reflected in its lending terms. Fourth, consistent with the institutionists’ view, the study provides empirical evidence that financial sustainability of microfinance institutions improves their breadth of outreach. Lastly, the study documents the applicability and limitations of previous studies to rural microfinance institutions in Tanzania. It also discusses the implications of the conclusions made and identifies areas that need further research.

1.6 STRUCTURE OF THESIS

This thesis is divided into eight chapters. In this first chapter we introduce the research problem. We also explain the background to research problem, the objective of the study and main research questions guiding this study. The remaining chapters are arranged as follows: Chapter 2 provides an overview of microfinance industry in Tanzania; Chapter 3 presents a review of literature explaining theoretical considerations; Chapter 4 is on methodology. The chapter describes the data and the empirical model used for the analysis; Chapter 5 links microfinance outreach to their financial sustainability to determine the factors affecting financial sustainability; Chapter 6 is about microfinance efficiency and how it affects financial sustainability; Chapter 7 traces the effects of the determinants of financial sustainability on the start-up and growth stages of microfinance development. Lastly, Chapter 8 offers the conclusion and key contribution made by this thesis. It also highlights the areas for future research.

CHAPTER 2
AN OVERVIEW OF THE MICROFINANCE INDUSTRY IN TANZANIA

"The microfinance industry in Tanzania is nascent and still evolving. There is, therefore, a need for constant review of the framework in order to keep pace with new developments in the sector and to facilitate the sector's growth" (*Rubambey, 2005.16)*[1]

2.0 INTRODUCTION

This chapter provides an overview of the microfinance industry in Tanzania. The chapter covers among others, historical background of the microfinance industry in the country; the delivery methodology; the legal and regulatory frameworks; and financial and outreach performance trends of the microfinance industry.

2.1 HISTORICAL BACKGROUND

The history of current microfinance institutions in Tanzania is closely linked to emergence of Saving Associations and Credit Co-operatives Societies (SACCS) in early 1965. By that time, savings and credit cooperatives were associated with farming cooperative societies. In this regard, these SACCS were very prominent in areas where agriculture was the main economic activities. These member-based microfinance institutions of the time however, did not realise much of their pre established objectives. They suffered from serious funding problems and financial mismanagement. This was partly caused by political influence and interference. As a result, mainstream banking system was the only provider of financial services throughout the country although it could not provide small scale financial services demanded by majority, the poor. The scope of services and geographical coverage of mainstream banking system was also limited. This left the poor, who make the majority of Tanzanians, exposed to informal money lenders.

[1] Ms. Grace Rubambey is the Director of Microfinance at the Central Bank of Tanzania also known as Bank of Tanzania (BoT)

In the 1980s the Tanzanian government, like other developing countries, embarked on financial reforms. The financial reforms were aimed at, among others, improving access to financial services by all sectors previously excluded by financial service providers. The financial sector reform included, among others, liberalisation of interest rates, eliminating administrative credit allocation and strengthening the Bank of Tanzania's role in regulating and supervising financial institutions. The reforms were also meant to restructure state-owned financial institutions and to allow the entry of private financial institutions in the market (Nord *et al,* 2009). However, following the restructuring of state-owned financial institutions and privatisation of the National Bank of Commerce and the Cooperative and Rural Development Bank, there was closure of 78 branches throughout the country most of which were in rural areas (Satta, 2002; Steel *et al,* 1997) leaving them without any reliable financial services.

The evolution of MFIs, as financial intermediaries for the poor and their advocacy as a poverty reduction tool in the early 1990s around the globe, created a hope of having financial services in the rural areas of Tanzania. Inspired by microfinance success stories from other microfinance institutions like the Grameen Bank in Bangladesh, in 2000 the Tanzanian government in collaboration with the donor community started to implement a rural financial programme to reinstate the rural financial services. This gave rise to the current member-based microfinance institutions, now known as the Savings and Credit Cooperatives (SACCOs) and the Savings and Credit Associations (SACAs). All withstanding however, these MFIs were still limited in scope. Cho-Béroff *et al* (2000) indicate that these MFIs served only about 1 percent of the Tanzanian population, compared to 11 percent in Kenya, and 5 percent in Benin.

Informed of the microfinance services supply gap created by the formal banking system, Non-governmental organisations (NGOs) also started operating the microfinance business. Currently, the NGO-MFIs dominate the microfinance industry in urban and peri-urban areas. The reason for this could be that most NGO-MFIs are business oriented and, therefore, perceive the rural undertaking as having high transaction costs and more risky as the poorest of the poor are found in rural areas. Nevertheless, it has been reported that, member-based MFIs and several donor-assisted NGOs are the principal providers of microfinance services in Tanzania (Randhawa and Gallardo, 2003).

Recognising the importance of SACCOs and SACAs in rural finance, the government of Tanzania in collaboration with donor community have acted to facilitate introduction and empowerment of rural microfinance institutions through the Rural Financial Services Program (RFSP). The RFSP was initiated in 2001 by the Government of Tanzania, through a Loan Agreement between the Government of Tanzania and the International Fund for Agricultural Development (IFAD). The 10 year program, which is part of an overall Rural Development and Agricultural Sector Development Strategies, has an overall goal of achieving sustainable increase in income, assets and food security of poor rural households by enhancing the capacity of the rural poor to mobilize savings and invest in income generating activities through the development of a viable rural financial services systems (IFAD, 2005 and RFSP, 2002). The IFAD/World Bank supported RFSP is devoted to enhance the operating and financial sustainability of these MFIs.

The specific objectives of the RFSP are first, to support the design, development and implementation of sustainable rural financial services at the village or ward levels in the form of registered MFIs with emphasis placed on development of good governance; the introduction of appropriate financial accounting systems and development of savings and lending products. Second, to improve managerial capacity of registered grassroots organizations involved in micro finance activities and assist them through training at all levels in either, amalgamating and registered as recognized MFIs or further developing their operations. Third, to develop a sustainable rural financial network infrastructure, that is capable of linking MFIs to formal banking institutions and meeting the financial needs of the rural poor. Lastly is to empower poor rural households to benefit from Rural Financial services (RFSP, 2002).

The RFSP according to IFAD (2005) is very successful. Among the achievements in RFSP's first phase have been to assist more than 60 MFIs in registering legally as savings and credit associations (rural MFIs), mainstreaming some legal, regulatory, and supervisory framework in the MFIs, and encouraging MFIs to adopt microfinance best practice" (IFAD, 2005.5). Other achievements are: MFI members increased by 121 percent (from 8,500 to 18,800 members) just within the first three years of the program; and the capital base of MFIs also increased by 380 percent, from 270 million to 1.034 billion Tanzanian shillings (from about USD 270,000 to USD 1 million).

2.2 DELIVERY METHODOLOGY

Approaches used by microfinance institutions in Tanzania to deliver financial services to the poor are similar to those used in other countries where microfinance institutions operate. These approaches, as used by various microfinance institutions in Tanzania are described in the next section. The approach used depends on the nature and structure of the respective microfinance institution. The institutions providing microfinance services include: non-governmental organisations (NGOs); member-based microfinance institutions (SACCOs and SACAs); and formal financial institutions.

2.2.1 Non-Governmental Organisations (NGOs)

The NGO-MFIs mostly operate a group lending technology in which the group guarantees loan repayment. They also have few individual-based lending where collateral is needed. These NGO-MFIs are not allowed by law to mobilise savings. However, most of the MFIs require their clients to have some minimum savings as loan insurance funds. Although loans are given mostly for business purposes, these NGO-MFIs also have loans for other purposes like education. The business loans are meant to support the ongoing business. No loan is given to start a new business. Some of these NGO-MFIs are: the Foundation for international Community Assistance (FINCA); Promotion of Rural Initiative and Development Enterprises (PRIDE); Small Enterprises Development Agency (SEDA); Bangladesh Rural Advancement Committee (BRAC); and Micro Enterprise Development Agency (MEDA). Most of the NGO-MFIs have graduation scheme in which clients are allowed to graduate from small loans to larger loans depending on their repayment history on previous loans. Clients are allowed to change their group membership at the completion of the repayment cycle to join those whom they think they can comfortably form a new group at a reduced default risk.

2.2.2 Member-based Microfinance Institutions (MB-MFIs)

The MB-MFIs in Tanzania are mainly the SACCOs and the SACAs. Loans are mostly given to members only. Under very few circumstances, loans are given to non-members whose financial standing can be established. Collateral of some kind is normally required under such cases. The individual lending technology is prominently used by these types of microfinance institutions. Savings are compulsory before applying for a loan. Normally a client/member is given a loan of double proportion of his or her savings with the society. The savings in this case act as loan insurance fund. Some member-based MFIs also offer other products like special loans for emergence purposes. They also offer loans for education and for agricultural purposes. The nature of the loans determines their duration and interest charges due on the same. Equal instalments are commonly used during loan repayments.

2.2.3 Formal Financial Institutions

Some formal financial institutions offer small scale financial services. These include the National Microfinance Bank (NMB), Akiba Commercial Bank (ACB), CRDB Bank, and Community banks which include: the Dar es Salaam, Mufindi, Mwanga, and Mbinga Community Banks, and the Kilimanjaro Co-operative Bank (KCB). With the formal financial institutions both group and individual lending are used. The financial services include small scale savings and micro-loans. Their main microfinance clients are small savers and small and medium entrepreneurs. The banks also offer some credit facilities to employees of various organisations whose employers act as guarantors. Their terminal employment benefits are considered as loan insurance facility to be paid by employers in case of default of someone who ceases to be an employee of such organisations.

2.3 MICROFINANCE REGULATION

Microfinance institutions in Tanzania are mainly in three types: the non-governmental organisation (NGO-MFIs); the member-based (mainly SACCOs and SACAs); and the formal financial institutions (mainstream banks engaging in microfinance business). The nature of regulation depends on the type of microfinance institutions. The NGO-MFIs, for example, are not externally regulated and, therefore, they are not allowed by law to mobilise savings. They do, however, take a certain amount of customer savings that acts as security for the loans. Thus, the micro-credits (small scale loans) remain to be the main products offered by these types of microfinance institutions. Notwithstanding, however, these NGO-MFIs are required to be registered in order to be allowed to conduct the microfinance business.

The member-based microfinance institutions (SACCOs and SACAs) are generally governed by the country's Cooperative Societies Act 1991 as amended from time to time. The Cooperative Societies Act applies to all types of cooperatives in the country. Thus, all member-based MFIs are to be regulated and supervised by the ministry responsible for cooperatives.

The supervision and regulation of the member-based MFIs whose capital does not exceed TZS 800 million (about USD 613,355)[2] are normally done by the Registrar of Cooperatives under the Ministry of Cooperatives and Marketing. Additionally, the Savings and Credit Cooperative Union League of Tanzania (SCCULT) is undertaking the microfinance supervision role to its members. The SCCULT is the National Association of SACCOs in mainland Tanzania. Among the supervisory activities performed by the SCCULT is the auditing of these member-based MFIs.

Furthermore, from March 2005, the Savings and Credit Cooperative Societies Regulations and Financial Cooperative Societies Regulations of 2004 gives mandate to the central bank (BoT) to regulate and supervise all savings and credit associations whose capital exceed the TZS 800 million (about USD 613,355) threshold.

The Tanzanian government, through its central bank (Bank of Tanzania – BoT) under the provisions of the Bank of Tanzania Act (2006) applies prudential regulation to all formal financial institutions (mainstream banks) regardless of whether they will engage in microfinance business or not. These institutions are governed by the Banking and Financial Institutions Act of 1991 as amended from time to time. In addition to the Banking and Financial Institutions Act 1991, the 2001 National microfinance institutions policy guided the undertaking and legal framework of the microfinance activities in the country. Based on the National

[2] The exchange rate used here is 1 USD = TZS 1,304 as of 5th October 2009.

microfinance institutions policy, the Microfinance Companies and Micro Credit Activities Regulations (MCMCAR) were passed in 2004. The MCMCAR 2004 governs all companies dealing with microfinance business in the country. It gives the central bank of Tanzania the Microfinance institutions' licensing authority. It also gives the mandate to regulate and supervise deposit-taking institutions. This includes those institutions that operate the microfinance business.

2.4 TRENDS ON FINANCIAL PERFORMANCE AND OUTREACH

The trends on financial performance and outreach of microfinance institutions in Tanzania do differ from one microfinance institution to another. The trends also differ from one type of microfinance to another, although microfinance institutions from the same type appear to have generally similar trends. Generally, there has been a positive growth trend on both financial performance and outreach of the microfinance industry in the country. The next sections show these general growth trends with comparative figure for the three types of microfinance institutions in the country.

2.4.1 Financial Performance Trends

The financial performance trends of microfinance institutions in Tanzania are presented in this section with specific focus on: return on assets; total assets; total equity; cost per borrower and number of borrowers per staff. A comparative analysis among different types of microfinance institutions (NGO-MFIs, member-based MFIs, and formal financial institutions) is also made. Unless otherwise stated, all the performance indicators and trends quantities reported in this chapter for NGO-MFIs and formal financial institutions were extracted from the Microfinance Information Exchange (MIX) Market (MIX, 2009). The indicators for the MB-MFIs are from the survey data.

(a) Trends on total assets and Equity

Total assets of microfinance institutions indicate their size. It is one of the measures of growth. All things being equal, a growing MFI will indicate its growth through growth in its total assets. Since 2001 microfinance institutions in Tanzania have had a positive growth when measured by their total assets. This has been from around

USD 10 million in 2001 to USD 110 million in 2007[3]. This is about 1000% increase. That is, the total assets have increased for about ten times within six years. Moreover, all MFIs tend to have stiff growth in total assets from 2006 (See Appendix 1(a)). This is an indication that the MFIs are gaining popularity and recognition in the country.

Equity indicates owners' wealth in an MFI. Owners have increased their investments in MFIs in Tanzania since their inception. There has been a general positive trend in owners' equity as indicated in Appendix 1 (b). Owners' equity has increased from USD 10 million in 2001 to about USD 35 million in 2007. This is about 250% increase over a period of six years. That is 2.5 times the initial investment in 2001.

(b) Return on Assets (ROA)

An increase in total assets in itself may not indicate good performance. What these assets generate is a point of interest to investors. A measure indicating how much is earned for each dollar invested in total assets is known as return on assets.

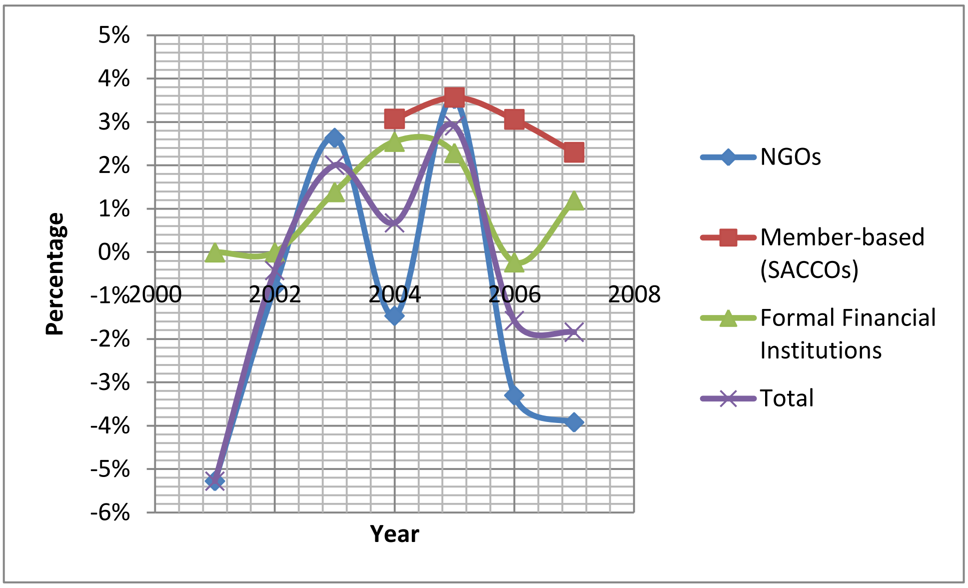
Trends on return on assets have been somewhat unstable over time. NGO-MFIs in Tanzania had a negative return on assets of about 5.4 percent in 2001 and about 1 percent in 2002. This was probably because they were starting business in a new environment. Since then, their ROA has been experiencing both positive and negative trends with a general down fall. The formal financial institutions had a return on assets of about zero in 2001 and 2002. They revamped the situation in 2003 to a ROA of about 3 percent, only to go down again in 2004 to a ROA of negative 1.5 percent.

Generally, there has been a declining trend in the ROA to all MFIs in Tanzania since 2005. The ROA for the member-based MFI however, has remained on top of all MFIs. This has been 3 percent in 2004 to 2.5 percent in 2007. Although the trends in Figure 2-1 suggest that the years 2001, 2004, and 2006 were possibly hard time for the sector as a whole, the declining trends on return on assets (ROA) raises concern

[3] The figures indicated here includes only MFIs whose data where obtained from the mixmarket. The actual figure could be more than that as there are many MFIs which are not included in the mixmarket data base.

about sustainability of these microfinance institutions in the country. Figure 2-1 below shows the trends on the ROA for all MFIs in Tanzania.

Figure 2-1: Trends on Return on Assets (ROA)

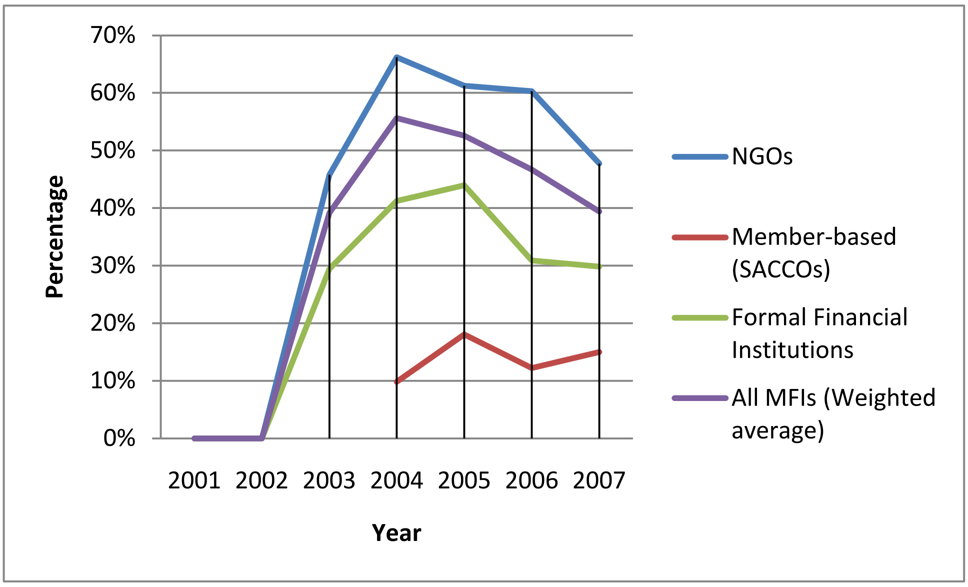


Source: Constructed from data obtain from MIX (2009)

(c) Yield on Gross Loan Portfolio

The yield on gross portfolio indicates the percentage that microfinance institutions earn as interest income from the gross loan portfolio. There has been a decreasing trend on the amount earned by MFIs in Tanzania from their gross loan portfolio since 2004 as indicated in Figure 2-2. On average the yield for the industry as a whole has been decreasing for about 5.7 percent per annum from 56 per cent in 2004 to 39 per cent in 2007. For MB-MFIs the yield on gross portfolio has been fluctuating with a general positive growth from around 10% in 2004 to around 15 per cent in 2007. The yield for the MB-MFIs however, has been relatively less compared to NGO-MFIs and FFIs. The reason for this could be the urban-based nature of the NGO-MFIs and the FFIs as they tend to have relatively well to do clients compared to rural clients. All withstanding however, the yield on gross loan portfolio has been declining since 2005 from 61 per cent and 43 per cent to 47 per cent and 30 per cent in 2007 for the NGO-MFIs and formal financial institutions respectively.

Figure 2-2: Yield on Gross Loan Portfolio



Source: Constructed from data obtain from MIX (2009)

(d) Efficiency and Productivity

Efficiency of microfinance institutions in Tanzania when measured by cost per borrower has been relatively stable. The cost per borrower indicates how much it costs to serve one loan client. It is expected that, all things being equal, the more an MFI is becoming efficient; the more it will reduce the cost incurred to serve one client (CGAP, 2003b). According to Makame and Murinde (2006) lower cost per borrower reflects higher operational efficiency of the MFI and sustainability potential in the long run.

In Tanzania, formal financial institutions have had the highest cost per borrower of about USD 280 per annum since 2003. The cost per borrower for the NGO-MFIs ranged between USD 60 in 2001 to USD 68 in 2007. The member-based MFIs had the lowest cost per borrower ranging from USD 9 in 2004 to USD 22 in 2007. The overall cost per borrower for the industry was fluctuating around USD 70 from 2004 to 2007. The cost per borrower trends is included in Appendix 1(c).

The performance of an MFI can also be measured by the number of borrowers per staff. This is a ratio of borrowers to staff indicating staff productivity. All things being equal the larger the number of borrowers a staff serves the higher will be his or her productivity (CGAP, 2003b).

Trends on the number of borrowers per staff for MFIs in Tanzania depend much on the type of an MFI. While there has been a general decrease in the number of borrowers per staff for the NGO-MFIs from about 250 borrowers to 240 borrowers per staff, the trends for formal financial institutions and member-based MFIs has been increasing. The number of borrowers per staff has increased from 50 in 2002 to 75 in 2007 and from 19 in 2004 to 63 in 2007 for formal financial institutions and member-based MFIs respectively. Thus, we would say over four years from 2004, the productivity of NGO-MFIs has decreased and the productivity of member-based and formal MFIs has increased. On average for all MFIs however, the number of borrowers per staff has been decreasing from 244 to 190 borrowers per staff in 2007. This, all things being equal, indicates inefficiency which has negative implications on the financial sustainability of these MFIs. Appendix 1(d) indicates these trends.

2.4.2 Outreach Trends

Outreach is one of and probably the major readily available measure of microfinance contributions in poverty alleviation[4]. Outreach is commonly measured by: the number of active borrowers; number of loans; gross loan portfolio; number and percentage of women borrowers; and the average loan size. Growth trends on these outreach aspects are presented in this section. In addition, a comparative trend analysis among different types of microfinance institutions (NGO-MFIs, member-based MFIs, and formal financial institutions) is also made, details of which can be seen in Appendix 1(e) to (g).

(a) Number of Active Borrowers and Number of Loans

The numbers of active borrowers who are clients and, therefore, beneficiaries to microfinance services have generally been increasing for all microfinance institutions in Tanzania as these MFIs gain popularity. This indicates growth of these MFIs when growth is viewed in terms of number of clients served during a period.

[4] Other measures of how microfinance has impacted the lives of its clients, such as how the loans were utilised and the impact of the same on poor people's lives are not readily available.

The number of borrowers who are active has grown from 77 thousand in 2001 to about over 300 thousand over a period of six years. This accounts for about 2.9 times or 290 percent growth. This however, is far below the 10 times increase in total assets.

Despite having less active borrowers, compared to the other MFIs, the formal financial institutions had the highest growth rate of active borrowers of about 400 percent (4 times) from 2002 to 2007. The NGO-MFIs had the highest number of active borrowers in the country but their number grew at about 108 percent over the six years from 2001 to 2007. The number of active borrowers for member-based MFIs grew at 160 percent over four years from 2004 to 2007. Out of these borrowers, the percentage of women borrowers has ranged between 76 percent in 2001 to 70 percent in 2007. Women borrowers have been around 82 percent for the NGO-MFI; 60 percent formal financial institutions; and 40 percent for member-based microfinance institutions. Growth trends on the number of active borrowers and percentage of women borrowers for these MFIs appear on Appendix 1(e) and 1(f) of this report respectively.

The growth in number of active borrowers went hand in hand with the growth in number of loans issued. The number of loans outstanding by the end of each period grew from 86 thousand in 2001 to about over 250 thousand for all microfinance institutions. This accounts for 198 percent growth over six years. See Appendix 1(g) for trends on number of loans outstanding.

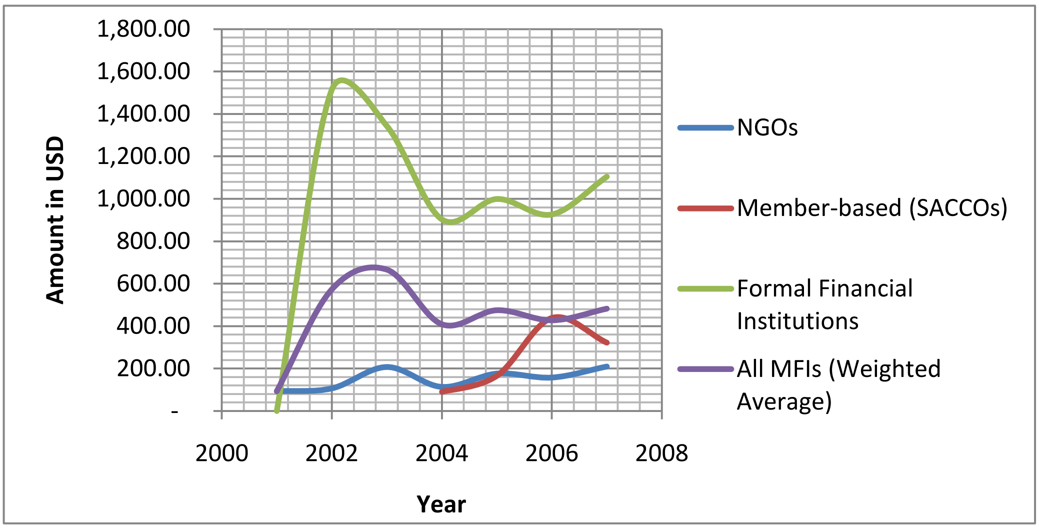
In addition to the active number of borrowers, for microfinance institutions operating in rural Tanzania the MB-MFIs served over 58 percent of the total number of clients, both borrowers and non-borrowers. The remaining clients were served by NGO-MFIs. None of the formal financial institution serves the rural market. Moreover, around 80 percent of total MFIs' clients are based in rural and peri-urban.

(b) Trends on Gross Loan Portfolio and Average Loan Size

Gross loan portfolio indicates the amount of loan issued and remained outstanding by the end of the period. Higher loan portfolio, other things being equal, indicates better microfinance outreach as more loans have been issued whose probable effect could be largely felt compared to just a small amount of loans. The average loan size has been used to indicate depth of outreach. A smaller loan size would indicate that microfinance institutions are reaching the poorer of the poor. The opposite is also true.

Over the six years since 2001 the gross loan portfolio of microfinance institutions in Tanzania has increased about 810 percent from USD 8 million to USD 73 million (see Appendix 1(h) of this thesis). This is a good sign that MFIs have increased their outreach. Increased gross loan portfolio has however, been accompanied by rising trends on the average loan size which could imply existence of graduation schemes where clients are given larger loans after paying off their loans. It could also imply an existence of a mission drift where microfinance institutions move away from poorer clients to poor and above poor clients.

Figure 2-3: Trends on Average Loan Size



Source: Constructed from data obtain from MIX (2009)

2.5 SUMMARY

Microfinance industry in Tanzania is still evolving. Currently, the MFIs serve only about 1 percent of the population. The vast majority of Tanzanian population who are yet to be reached by microfinance institutions provide potential growth opportunity for the industry.

There have been general increasing trends in performance of the MFIs in Tanzania for both outreach and financial indicators since 2002. While the returns on assets have been relatively unstable between 2004 and 2007, the equity has been increasing. The increase in equity has gone hand in hand with increase in the number of active borrowers and outstanding loan portfolios on one side, and a decrease in the yield on gross loan portfolio on the other. The percentage of women borrowers has remained relatively stable, between 60 and 70 percent for the same period.

Majority of Tanzanian population (about 70 percent) live in the rural areas and do not have access to financial services from formal financial institutions. Microfinance institutions are therefore the key providers of the financial services. The microfinance industry in Tanzania however, is dominated by the NGO-MFIs in urban and peri-urban areas while the Member-based MFIs dominate the rural area. Currently, although they are small in size, the MB-MFIs serve over 58 percent of the total MFI clients in the rural areas. The remaining clients are served by NGO-MFIs. No formal financial institution serves the rural market. Moreover, over 80 percent of MFIs' clients are based in rural and peri-urban areas.

Bearing in mind the importance of the MB-MFIs and NGO-MFIs in rural Tanzania, studying the factors affecting their financial sustainability need not be overemphasised. In this research, the study units included in our sample to study factors affecting financial sustainability of rural microfinance institutions in Tanzania comprised of 82 percent MB-MFIs and 18 NGO-MFIs' branches. A detailed sample composition is provided in methodology chapter, Chapter 4.

CHAPTER 3
THEORETICAL BACKGROUND

"What is not in books, is not in the world" anonymous

3.0 INTRODUCTION

This chapter presents theoretical background guiding this study. The chapter starts by explaining the meaning of key concepts, followed by the main theories used in this study to explain the determinants of financial sustainability of rural microfinance institutions in Tanzania. A theoretical framework is then developed based on the accounting theory and theoretical background presented as reviewed from available literature in microfinance.

3.1 CONCEPT OF MICROFINANCE

Microfinance is the provision of small scale financial services to low income or unbanked people (Kyereboah-Coleman and Osei, 2008; Karlan and Goldberg, 2007; Hartarska, 2005; Lafourcade *et al*, 2005; Schreiner, 2000; Ledgerwood, 1999; Hulme and Mosley, 1996). It is about provision of "a broad range of financial services such as deposits, loans, payments services, money transfers and insurance, to the poor and low-income households and their farm or non-farm micro-enterprises" (Mwenda and Muuka, 2004:145).

From the above definitions, microfinance is more than just provision of small loans also known as microcredit (Karlan and Goldberg, 2007). It is about provision of various small scale financial services. Thus for this study, consistent with the above definitions, we use the term microfinance to mean the provision of small scale loans, savings, deposits, and other financial services to the poor. Institutions that provide these small (micro) financial services are known as microfinance institutions (MFIs), also known as microfinance organisations (Mersland and Strøm, 2008).

Microfinance institutions are considered as a tool for poverty alleviation through improving access to finance and financial services. According to Basu *et al* (2004) MFIs complement effectively the formal banking sector in providing financial services to the poor. The rationale of improving finance comes from the premise that empowerment of the poor through creating income generating capacity enables the poor to access all the development requirements to get out of multifaceted dimensions of poverty and reduce their vulnerability to unexpected events (LOGOTRI, 2006; Davis *et al*, 2004; Demirgüç–Kunt and Levine, 2004). To this end, microfinance institutions help in mobilising financial resources through provision of savings facilities and loans.

Microfinance institutions have helped the poor to increase buying and investing capability (Hiatt and Woodworth, 2006) alleviate micro business funding constraint (Hartarska and Nadolnyak, 2008) and uplift them onto a higher economic status. According to Steel *et al* (1997) and Cull *et al* (2006) microfinance institutions help to mobilise considerable resources required for economic development. Moreover, most of mature MFIs provide diverse products, such as housing loans, and pension. They also frequently provide social and business development services such as literacy training, education on health issues, training on financial management or accounting (Hishigsuren, 2004).

However, studies suggest that these benefits of microfinance can only be realised as long as the poor continue to be clients of microfinance institutions (Ahlin and Jiang, 2008; Hiatt and Woodworth, 2006). Thus, it is suggested that microfinance institutions should consider further enabling the average borrower to graduate from continual dependence on them to enhance long-run development (Ahlin and Jiang, 2008). This will enable MFIs to be the anti-poverty strategy (ibid).

3.2 CONCEPT OF SUSTAINABILITY OF MICROFINANCE

Sustainability has been generally defined as permanence (Navajas *et al*, 2000), also the ability to repeat performance through time (Schreiner, 2000). It "allows the continued operation of the microfinance provider and the ongoing provision of financial services to the poor" (CGAP, 2004:1). This will depend on the sustainability of microfinance institutions themselves (also known as institution sustainability, CGAP 2004), sustainability of their market, sustainability of legal policy as an enabling environment, and sustainability of the impact they have on the poor.

The history of microfinance suggests that microfinance institutions did not start as business but rather as a means to alleviate poverty through helping the poor to create livelihoods for themselves (Harper, 2003). The microfinance services to the poor, therefore, were mainly offered by donor funded institutions. Between the 1970s and 1990, as microfinance evolved, the rooted doubt that the poor were not bankable was broken. Microfinance could reach millions of people (e.g. Grameen and Bank Rakyat Indonesia – BRI). Moreover, it seemed as if the poor were able to save and repay the loan even at unsubsidised rates of interest (Harper, 2003). One question however, was still apparent, what is the appropriate approach to reach the poor: financial system approach or poverty lending approach. While the financial system approach called for the need for microfinance institutions to sustain their operations without subsidy, the poverty lending approach was subsidy dependent, focusing on provision of cheap credit (Johnson, 2009; Robinson, 2001). Some microfinance institutions like BancoSol in Bolivia and BRI followed the financial system approach. Still others like Grameen followed the poverty lending approach and continued to depend on subsidy to operate (Hulme, 2008).

After the 1990s as more donor support became less reliable, most microfinance institutions started to think on how to sustain their operations without subsidy. This was only possible if they could earn more from their operations than their spending could require in absence of subsidy. Moreover, reaching the poorest within the framework of financial sustainability, as Johnson (2009) has put it, seemed impossible.

Following the perceived impossibility in reaching the poorest, around the year 2000 the Consultative Group to Assist the Poorest (CGAP), which has taken a leading role to professionalise microfinance, changed its name and its focus from the poorest to the poor. As a result of experienced difficulties in reaching the poorest and becoming sustainable, most MFIs focusing on the poor, started thinking of being more market oriented to credit and savings to the poor (Jackelen and Rhyne, 2003). Likewise, around 2001 and 2002 the Grameen bank, which was seen as the main advocate and promoter of poverty lending approach, following financial difficulties that the bank faced, changed its structure from Grameen I to Grameen II. While the original Grameen (Grameen I) followed the poverty lending approach, the Grameen II approach takes it closer to financial system approach (Hulme, 2008). According to Harper (2003) the issue on how to attain sustainability has received a great deal of attention, ever since it was perceived impossible to reach the poorest.

3.2.1 Dimensions of Sustainability

Sustainability of microfinance institutions (also known as institution sustainability) can be seen in several dimensions depending on user requirements. These dimensions are: mission sustainability; programme sustainability; human resource sustainability; and financial sustainability. The mission sustainability refers to Sustainability of microfinance in its mission. This will keep the organisation in its chosen path in the long-term (Mahajan and Nagasri 1999).

Programme sustainability occurs when customers (clients) perceive that the services that they receive are of sufficient importance and valuable and are willing to assume responsibility and ownership of them (Mahajan and Nagasri 1999). A good demand driven product design will make the programme sustainable. Microfinance institutions' product delivery should be supported by well qualified personnel who are capable of delivering the services (products) as required to meet the organisation mission. This is known as human resource sustainability (Mahajan and Nagasri 1999). The financial sustainability of microfinance institutions is explained in the next sub section.

3.2.2 Financial Sustainability

Financial sustainability of microfinance institutions is probably the key dimension of microfinance sustainability. It refers to the ability of an MFI to cover all its costs from its own generated income from operations (Thapa *et al*, 1992) without depending on external support (e.g. subsidies). The costs here include present costs incurred to support current operations and those incurred to support growth. Dunford (2003) defines financial sustainability as the ability to keep on going towards microfinance objective without continuing donor support. These definitions centre on one main point, that is, the ability to depend on self-operations. The definitions also imply the possibility of making profit out of the microfinance operations.

Due to its importance in microfinance performance, quite often, in microfinance literature the terms "financial sustainability" have been used to define institutional sustainability of microfinance institutions (Hollis and Sweetman, 1998). CGAP (2004:1) defines sustainability as the "ability of a microfinance provider to cover all of its costs. Achieving financial sustainability means reducing transaction costs, offering better products and services that meet client needs, and finding new ways to reach the unbanked poor".

Financial sustainability can be measured in two stages namely operational sustainability and financial self-sufficiency. According to Meyer (2002) operational sustainability refers to the ability of the MFI to cover its operational costs from its operating income regardless of whether it is subsidised or not. On the other hand, MFIs are financially self-sufficient when they are able to cover from their own generated income, both operating and financing costs and other forms of subsidy valued at market prices. That is, to cover its costs if its activities were not subsidised and if it raised capital at commercial rates (Balkenhol, 2007). The self-sustainability requires the MFIs to be able to cover at least opportunity cost of all factors of production and assets from self generated income (Chaves and Gonzalez-Vega, 1996). MFI self-sufficiency is a non profit equivalent of profitability (Woller and Schreiner, 2002).

The above definitions of financial sustainability imply that a loss making MFI (MFIs with poor financial performance) will not be classified as financially sustainable. Again, a profit making MFI, whose profitability is determined after covering some of the operating costs by subsidized resources or funds, will also not be considered as financially sustainable.

In the next sections we present an overview of the conceptual framework within which this study on determinants of financial sustainability of rural microfinance institutions in Tanzania was undertaken. This is done in part 3.5. However, before we present the conceptual research framework, we explain microfinance poverty reduction theories. These are also known as major approaches in which MFIs have been used as a tool to reduce poverty.

3.3 MICROFINANCE POVERTY REDUCTION APPROACH THEORIES

This section discusses two microfinance institutions' approaches to poverty reduction. As explained in the previous section, microfinance institutions are considered to be a tool for poverty alleviation through improving access to finance and financial services. The improved access to finance and financial services creates income generating capacity which may enable the poor to access all the development requirements to get out of multifaceted dimensions of poverty and reduce their vulnerability to unexpected events. Thus, the contribution of microfinance to this end has been measured through what is known as microfinance outreach. That is, the capacity of an MFI to reach the poorer of the economically active poor.

There are two competing views as to which goal of microfinance should be given higher priority in as far as poverty reduction is concerned. These are the institutionists (also known as financial system) and welfarists (poverty lending) approaches (Arun, 2005; Brau and Woller 2004).

3.3.1 Welfarists' Approach

The welfarists emphasize on poverty lending as measured by depth of outreach. That is, reaching not just a large number of clients (breadth of outreach) but a large number of poor clients also known as depth of outreach (Brau and Woller, 2004). It follows, therefore, that, welfarists view microfinance as established for poverty reduction, their objective being to empower the poorer of the economically active poor and thus, depth of outreach[5] should be given a higher priority. Microfinance institutions should be, in as far as possible, able to serve as many as possible poor clients, even when it may appear not profitable. The deficit in operations should be filled with donor and government support or social investors (Woller *et al*, 1999).

Taking the welfarists view aboard, many groups, especially NGOs argue that there is a trade-off between sustainability (profitability) and targeting the poor (outreach) because the poorest are cost ineffective to reach when profitability is considered and thus, donor support (to support MFIs) is required to this end (Paxton, 2002). Their

[5] A detailed explanation on how depth of outreach is measured is given in Chapter 5 under section 5.2.2

argument is that, to reach the poorest groups require small, exclusively focused programs which cannot be sustainable and require on-going donor funding (Rhyne, 1998; Morduch, 1999).

3.3.2 Institutionists Approach

Institutionists on the other hand focus mainly on financial sustainability of microfinance institutions. According to Woller *et al* (1999) the institutionists view financial deepening as the main objective of microfinance institutions. Here financial deepening refers to creating sustainable financial intermediation for the poor. Institutionists assert that the financial sustainability as measured by financial self-sufficiency (profitability) should be given higher priority by all MFIs (Brau and Woller, 2004). Their argument comes from the fact that in most cases donor dependence is not certain and thus, unless an MFI is able to sustain itself financially it will not be able to serve the poor in the long run.

Contrary to promoting financial sustainability, there is a potential tension that over emphasis on financial self sustainability may lead an MFI into moving away from its poverty reduction objective (Drake and Rhyne, 2002; Stack and Thys 2000). This is known as mission drift (Aubert *et al*, 2009; Copestake, 2007).

A close examination of the arguments put forward by institutionists and welfarists can reveal that it is a financing issue. On one hand, the institutionists would like to see MFIs meeting all their costs from self-generated funds with a possibility of making profit (without using any external funds). This is what they would call a sustainable MFI. On the other hand, welfarists are not concerned with where the funds come from. Provided the MFIs can continue with operations and thereby meet their social objectives they have attained sustainability. Their focus is on targeted depth of outreach rather than scale (breadth of outreach) or financial self-sufficiency (Brau and Woller, 2004; Conning, 1999). Thus, as Woller *et al* (1999) have argued, what matters is how subsidies are used and not whether they are used or not.

3.3.3 Subsidy and Poverty Reduction Approach Theories

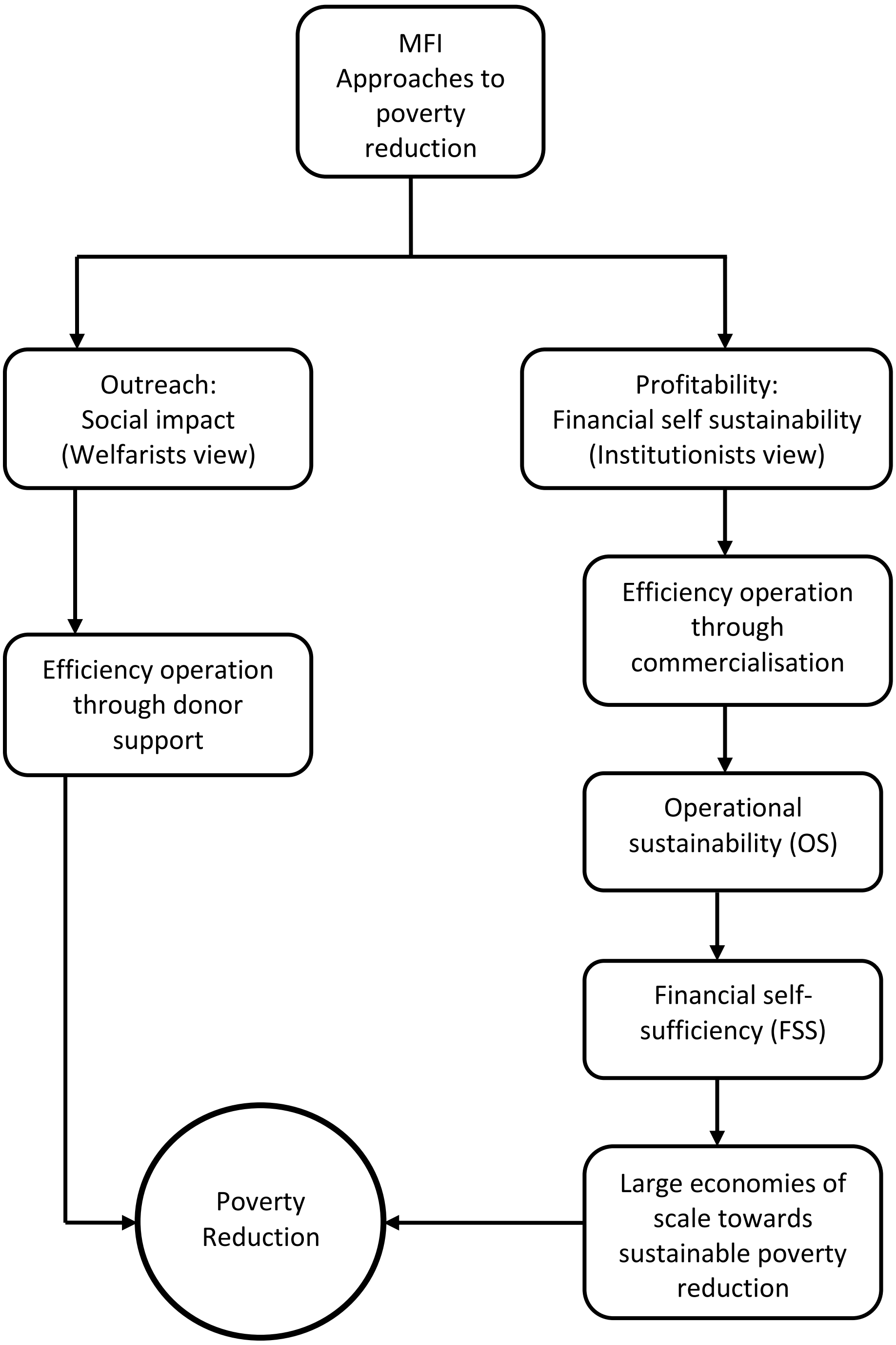
Subsidy refers to financial resources received by an MFI at below market prices (Woller *et al*, 1999). Subsidy (also known as donation) may be received in monetary terms or in-kind. The role of subsidy in reaching the vast majority of poor people is seen differently under the two competing poverty reduction approach theories: the institutionists' and welfarists' theories. The institutionists approach the sustainability of MFIs from the institution point of view. Their argument is that, institutional sustainability of an MFI will be attained when the MFI is financially self-sufficient. That is, be able to operate without subsidization. The emphasis here is that, for sustainability, an MFI should be able to cover its operating and financing costs with the program revenue (Brau and Woller, 2004).

Ideally, a financially viable financial program is one where all costs (delivery and post delivery) of credit, provision for loan losses, inflation, and return on investment are fully taken into account, and covered by the interest rates charged on loans (Thapa *et al*, 1992). With institutionists approach, MFIs should make profit to attract private capital because subsidies or donor funds may dry up any time and the microfinance institution may cease from its operations (CGAP, 1995).

Welfarists approach evaluates sustainability of MFIs based on MFIs' contribution to social welfare of the poor community. The argument is that, MFIs can achieve sustainability without achieving self-sufficiency. To welfarists, MFIs are sustainable when they are able to continue with operations, reaching the poorest of the poor, and thereby contributing to poverty alleviation regardless of whether they do that through subsidization or not. Their focus is on how the MFIs could have social impact to their clients, the poor. They support their argument by considering any subsidy to or finance injected in MFIs as equity invested by social investors who may not necessarily mean to make profit but to have social impact (Brau and Woller, 2004; Morduch, 2000; Woller *et al*, 1999). With the welfarists approach an assessment of MFIs sustainability is not based on whether they are financially self-sufficient but rather on social merits (Brau and Woller, 2004). Their argument is in harmony with the poverty alleviation objective of the MFIs. Figure 3-1 summarises the welfarists and institutionists poverty reduction approach theories.

Figure 3-1: Approaches to Attaining Poverty Reduction through MFIs

(*Welfarists and Institutionists Theories)*



According to Woller and Schreiner (2002) and Fruman and Paxton (1998) the perceived existence of trade-off between profitability and depth of outreach (social objective) may not necessarily be mutually exclusive. Figure 3-1 shows how the two objectives could lead to poverty reduction if followed consistently. It is possible to attain both simultaneously contingent of the adoption of "appropriate strategies, including charging real interest rates, making productive use of loan officers, paying appropriate salaries, and keeping administrative costs low and administrative efficiency high" (Woller and Schreiner (2002:25). Woller and Schreiner's argument follows the institutionists' approach to poverty reduction through MFIs. Moreover, recent studies indicate that the two goals can be attained simultaneously (Cull *et al,* 2007). This again is in support of the institutionists' theory.

With these two approaches of explaining sustainability of MFIs, one would wonder whether or not it makes any difference in as far as micro financing services are concerned. That is, whether or not the donor empowered MFIs performs better in sustainability than those which are not. As Morduch (2000:621) put it, "can financially sustainable programs achieve greater scale than subsidized programs? Can they make a bigger dent in poverty?" This could be partly answered by looking at the roles played by subsidy in helping MFIs meet their goals.

3.3.4 Roles of Subsidy on Microfinance Development

Once again, subsidy can be seen as the difference between what the MFIs receives (all resources) from donors minus what they pay back. It refers to what donors entrust to microfinance organizations at price below opportunity cost (Schreiner, 2000). Subsides may come to MFIs in financial or technical form (technical assistance), where MFIs are required either to pay back (considered as soft loan) or just as a donation (Karlan and Goldberg, 2007).

The subsidies are meant to enhance the capacity of MFIs. Technical assistance can empower a microfinance organization with tools, abilities, and incentives (Schreiner, 2000). According to Schreiner (2000) and Rhyne and Otero (1993) subsidies from donors should help infant MFIs to be able to survive in the market without funds from donors. Donor should focus on support that fosters movement to greater financial self-sufficiency as many programs require 5 – 10 years to become self-sufficient (CGAP, 1995). According to Von Pischke (2007) start-up subsidies have certainly led the microfinance institutions to change and establish a very robust basis for expansion and outreach. Study by Adongo and Stork (2006) found that donor involvement in providing start-up capital for loan portfolio was positively associated with financial sustainability. This supports the claim that at the start-up and growth stages microfinance institutions require some subsidisation until they have reached market maturity (Balkenhol, 2007).

To assess the performance of MFIs donors have increasingly been using the subsidy dependency index (SDI) as a measure of dependency to subsidy and, therefore, indicating how far from sustainability an MFI is. The Subsidy Dependence Index measures the degree to which an MFI relies on subsidies for its continued operations (Ledgerwood, 1999). The more SDI decreases, the better. According to Conning (1999) the SDI is one of the most heavily weighted factor upon which further access to donor funds is conditioned.

The SDI (developed by Jacob Yaron, 1992, at the World Bank) indicates the extent to which an MFI requires subsidy to earn a return equal to the opportunity cost of capital. It is expressed as a ratio that indicates the percentage increase required in the on-lending interest rate to completely eliminate all subsidies received during the year. The subsidy dependency index (SDI) is given by:

$$SDI = \frac{\text{Total annual subsidies received}}{\text{Average annual interest income}}$$

The subsidy dependence index answers a question on how MFIs would fare as commercial lenders by holding constant the lender's current business structure. However, assumption of lenders business structure being constant is unrealistic because in the process there might be changes in the nature of type of business received by client and how they will respond to the changes (Armendáriz and Morduch, 2007). Moreover, holding down the effects that changes in interest rate would bring to repayment rate is also unrealistic. The repayment rate and the loan amount are highly affected by the rate of interest that an MFI charges. They also largely affect the volume of interest income.

There are different types of MFIs whose differing nature and mission will determine the importance and duration of subsidy. According to Von Pischke (2007) microfinance is a child of subsidy. It is subsidy driven. As Woller *et al* (1999) have put it; the current innovations in microfinance industry have come from subsidised microfinance institutions. Without subsidy microfinance would be largely unknown. There are three types of MFIs namely: for profit MFIs; NGOs; and cooperatives (member-based). The next subsection discusses these MFIs and how they consider subsidies for their sustainability.

(1) For Profit MFIs

For profit MFIs seek to make profit and want to make the financial sector more efficient by taking a commercial approach. To these MFIs subsidy is used for start-up and network expansion and to accelerate growth. This is in harmony with infant industry theory which argues for the support of MFIs at their start-up stages.

Subsidy shortens the period in which a new MFI loses money otherwise this start-up period could be relatively longer such as 3 years or more (Von Pischke, 2007). However, as Von Pischke (2007) has put it, this type of MFIs view eventual independence from subsidy as essential to their missions. They continue to obtain subsidy, but only for new activities that will become self-sustaining. Their reason for this view is that subsidy is costly, fickle, and habit forming. That is, can an MFI even know if it is really efficient if it depends on perpetual subsidy? Governance issues are also important for 'for profit' MFIs because of their concern for ownership. Money should be employed wisely consistent with objectives.

(2) Non Governmental Organizations (NGOs) and Foundations

The mission of most of the NGOs and foundations is poverty alleviation by expanding services and enlisting more clients. At the beginning of their operations, many NGOs are not meant to be 'for-profit' organisations and, therefore, subsidy is viewed as more essential for survival. To ensure that they make impacts on poverty alleviation, the NGOs clients are mainly poor people. Their view is based on the assumption or observation that subsidies are required to alleviate poverty. Lending technology is mostly group based because poor people tend to be willing to work together in groups, at least when there are few other possibilities. Social interaction is also a value in building morale, solidarity and awareness that will help the poor improve their condition.

According to Von Pischke (2007) as these MFIs grow, they may adopt characteristics of ‘for profit’ MFIs. This is because their growth will call for growth in capital base which donors may not be able to support. Donors may also be concerned with efficiency and accountability on the part of the MFIs. As a result, the MFIs may become more concerned about pricing, to ensure that their services are able to pay for themselves and efficiency. To cope with the higher capital requirement posed by their growth, these NGO-MFIs may want to be regulated as banks or as institutions that can accept deposits and participate in formal payments system, and be able to mobilize large sources of funds from capital markets or venture capital. This could also be a result of donor-withdrawal pressure.

Although some NGOs have no intention of becoming commercial banks, the advantage of adopting commercialization strategy is that it would allow them to more easily obtain capital from market. However, it should be clear that, this would leave these NGOs to a board of directors whose main responsibility would have to be maximising commercial success (Armendáriz and Morduch, 2007). Outside owners will tend to disregard the average customers’ preference and concentrate instead on attracting the richer customers (Hart and Moore, 1998). In turn, this would undermine the organisation’s ability to balance its focus on reducing poverty and promoting social change (Armendáriz and Morduch, 2007) leading to mission drift (Woller 2002).

(3) Cooperatives (Member-based MFIs)

Cooperatives promote affiliation by recruiting members, offering more services and forming more and different types of cooperative organization. Goals include helping people and making markets more equitable and efficient. Lukhele (1990) argues that interdependence that exists among independent individuals' co-operation and mutual support is central to the cultural life of the people. Theoretical ground guiding the cooperatives is that people can achieve a better standard of living for themselves through pooling together their efforts.

The cooperatives include credit unions and other financial cooperatives. Their operations extend from non-commercial to commercial. The mission of these member-based MFIs is based on making cooperatives successful in ways that help members and benefiting society at large by making markets more efficient and/or more equitable from a social perspective. Realization of these objectives provides cooperatives and their members, greater leverage in the market place (Von Pischke, 2007 and Armendáriz and Morduch, 2007). In this type of MFIs, subsidy is used wherever useful (Von Pischke 2007).

Microfinance organizations are becoming more and more concerned with financial sustainability. International foundations and donors have recognised that efficiently run microenterprises and microcredit programs can cover a large portion of their costs, and are beginning to demand an increasing level of self-sufficiency from them (Thapa *et al*, 1992). This comes from the premise that unless MFIs are financially sustainable, their role of providing finance facility to SMEs and the poor will be jeopardised. In turn the contribution of SMEs in poverty alleviation may be impaired (Krahnen and Schmidt, 1994).

This study was set to determine the factors affecting the financial sustainability of MFIs. Financial sustainability here refers to ability of an MFI to meet its financial obligation (including covering costs) and maintain an acceptable level of microfinance services through its economic life. Although we tend to follow the institutionists' theory of financial sustainability, we maintain that MFIs should be able to cover their operating costs from their operations whether or not they receive subsidies. Subsidies have a role to play in bringing about sustainable MFIs. At start-up stage: in establishing a lending methodology and operational strategy for service delivery, at growth stage: on improving financial performance reporting, and improving financial indicators, and at maturity stage: helping them in smooth transition to full independency. A brief theoretical aspect on the microfinance stages of development and financial sustainability is presented in section 3.8. In the next section we show how microfinance financial sustainability can be explained using profitability theory.

3.4 PROFITABILITY THEORY AND FINANCIAL SUSTAINABILITY

This part presents profitability theory and how it relates to the concept of financial sustainability of microfinance institutions. We discuss the concept of profit from both economists' and accountants' views. We then link these concepts with financial sustainability. That is, how profitability of an MFI can be used to indicate its financial sustainability.

3.4.1 Economic Concept of Profit

From John Hicks' view of income (Hicks, 1946), economists view income (also known as profit or earnings) as what a firm could spend or distribute during the period, and still have the same amount it started with at the beginning (Bodie *et al*, 2009). This definition calls for recognition of unrealised gains or losses in the market value of assets and liabilities.

3.4.2 Accounting Concept of Profit

Contrary to economists' view of income, accountants' view of income ignores unrealised gains or losses in the market value of assets and liabilities (Bodie *et al*, 2009). Thus, in accounting only the book values (not the market values) are considered when determining income. Moreover, while economists view income, earnings, and profit to be the same (Bodie *et al*, 2009; Backer, 1966), the accountants make a distinction between income and profit or earnings. Stickney and Weil (2000) and Edmonds *et al* (2000), for example, define profit as the excess of revenue over expenses for a transaction. That is, profit is considered as a residual calculated as an excess of income over expenditure. Profits are what remain after costs of production have been paid for (Marriott *et al*, 2004; Porwal, 2001; Porter and Norton, 1998; McCullers and Schroeder, 1982). This is sometimes referred to as profit as a residual theory (Glautier and Underdown, 2001; McCullers and Schroeder, 1982). McCullers and Schroeder (1982) define profit as a residual from matching revenue (income) realised against costs (expenditure) consumed. Furthermore, the accountants make the difference between income and profit clearer by defining profit as a net income (Nikolai *et al*, 2009; Edmonds *et al*, 2000; Larson *et al*, 1999; Porter and Norton, 1998; Niddles *et al*, 1993; Smith *et al*, 1986; McCullers and Schroeder, 1982).

All withstanding however, when the capital maintenance concept and profit as a residual theory are considered, the only difference between the economic and accounting profit is how the unrealised gains or losses in the market value of assets and liabilities are being taken care of. While the economists would consider the unrealised gains or losses immediately, it often takes time for the accountants to recognise the changes, and when they do, they do it through revaluation of assets or liabilities, or accounting for price changes.

3.4.3 Profit and Financial Sustainability

Microfinance profitability is linked to their financial sustainability. According to Woller and Schreiner (2002:2) ‘financial self-sufficiency is the non profit equivalent of profitability’. All things being equal, profits can be considered to be a key variable in measuring a firm’s financial sustainability (Glautier and Underdown, 2001). The Hicks’ definition of income explained above is based on the capital maintenance concept. The capital maintenance concept requires that profit be considered as a residual available for distribution once provisions have been made for maintaining the value of capital intact (Nikolai *et al*, 2009; Glautier and Underdown, 2001; McCullers and Schroeder, 1982).

Considering profit as residual, Hicks’ definition of income has been incorporated in financial accounts (Harvey and Keer, 1983). Implementing the capital maintenance requirement, the development of accounting profession has gone hand in hand with recognising the changes in value of assets and liabilities (Nikolai *et al*, 2009; Glautier and Underdown, 2001; Porwal, 2001; Smith *et al*, 1986). Thus, with capital maintenance concept in mind, we can confidently link the financial sustainability of microfinance institutions with their profitability.

The economists' income (or accountants' profit) indicates, according to Hicks (1946) 'the amount which a firm can spend or consume without impoverishing themselves'. That reflects sustainability. According to Porwal (2001) the maintenance of capital by a firm is necessary in order to survive or become sustainable. Moreover, if profit is considered as a residual (Glautier and Underdown, 2001; McCullers and Schroeder, 1982) then profitability can be used as a proxy measure of financial sustainability as it considers covering all costs incurred in earning income plus any costs necessary to at least maintain the current level of operation. Likewise, Larson *et al* (1999:775) define profitability as "the ability to provide financial rewards sufficient to attract and retain financing". For microfinance institutions that depend solely on their own generated funds to keep their current level of operations, and yet be able to reach their desired level of growth, profitability can be considered as a measure of financial sustainability.

Previous studies in microfinance field have defined sustainability from profitability point of view. They consider profitability as a high standard measure of MFIs performance (Cull *et al*, 2007; Brau and Woller, 2004; Chaves and Gonzalez-Vega 1996). Using this approach, MFIs are considered sustainable if and only if they are able to cover all their operating and financing costs from their own generated revenue, mainly through interest rate charges. They further define sustainability as the stage of financial operations where all costs of the lender are fully met from the interest charges, and where such charges are not subsidised, partly or fully met from outside sources (Thapa *et al*, 1992).

In this study the accounting profitability and the related accounting measures are used to measure financial sustainability. Accounting measures however, are affected by accounting conventions for valuing assets and liabilities and for revenue and income recognition, changes in which may affect the reported financial performance. This has been the main drawback against using the accounting measures to assess performance. While this is true however, the accounting measures can still be considered more appropriate especially for the long-term studies. This is because, while managers can influence the reported financial performance by merely changing the accounting policy on the applicability of accounting conversions for a certain accounting period, their ability to manipulate statements for longer period is limited (Bhagat and Jefferie, 2002). Moreover, while we make use of the accounting profitability as a measure of financial sustainability, it is valuable to mention that using profitability as a measure of financial sustainability as used in microfinance literature and in this study strongly depends on the assumption that the microfinance institutions are going concerns, maintaining the same, or achieving higher performance. Without this assumption, using a one year or few years' profitability to measure long term sustainability may be at its outset inappropriate.

3.5 DETERMINANTS OF ACCOUNTING PROFITABILITY

In accounting, profitability is a state of an organisation's financial performance where income exceeds its total costs (Elliott and Elliott, 2008; Atrill and McLaney, 2004; Britton and Waterston, 2003; Wood and Sangster 1999). Thus, from profitability theory, profit is a function of income and expenses and, therefore, anything that affects income, and or expenses will eventually affect the resulting profit (Collier, 2006; Jones, 2006; Riahi-Belkaoui, 2004; Wood and Sangster 1999; Whitehead, 1997; Needles *et al,* 1993; Langdon, 1986; Myddelton, 1984; Magee, 1979).

Profit can be increased by either increasing income while holding expenses constant, or by holding income constant and reducing expenses, or both. It comes, therefore, that determinants of income and expenses are equally the determinants of profit (Collier, 2006; Riahi-Belkaoui 2004; Wood and Sangster, 1999; Needles *et al,* 1993). This follows the capital maintenance concept of profit (Larsen *et al,* 1999). With accounting profitability in mind, in this study, we view financial sustainability of microfinance institutions as the ability of an MFI to generate income that exceeds its total costs. Thus, a sustainable MFI, all things being equal, is the one whose income exceeds total costs incurred to earn the same. In the next subsections we discuss theoretical aspects of income and expenses based on what causes them in light of microfinance income and expenses and using the accounting profitability theory which is based on capital maintenance concept.

3.5.1 Microfinance Income

Income of a microfinance institution is made up of all of its own generated income including fees and charges, fines, and interest earned on loans (Armendáriz and Morduch, 2007, and Shankar, 2007). The interest rate earned on loans is the key source of self generated income to microfinance institutions (Tellis and Seymour, 2002). The total amount of interest income to an MFI will depend on the rate of interest charged, the amount of loan and the loan repayment rates. These are explained here under.

(a) Interest Rate

This is the rate charged by microfinance institutions on its outstanding loan portfolio. The higher the interest rate, the higher the microfinance income, and all things being equal, the higher the profit. Because the interest income is the major source of income to microfinance institutions, the interest rate should be set at a level where an MFI will be able to cover all its costs (both administrative and financing) and be able to earn a certain amount as target profit (Shankar, 2007; MicroSave, 2004; CGAP, 1996).

The amount of interest revenue and, therefore, all things being equal, the amount of profit will depend on the amount of loans made and the interest rate charged thereon. This means that the MFIs should charge interest high enough to cover their total costs to ensure that they earn profit. The higher the interest charged, all being equal, the higher the income and profitability of microfinance institutions. With this in mind, one may wonder why MFIs are not doing just that to attain sustainability. However, there exists a risk-return trade off. From economic theory, interest on loan is seen as a price for the loan. From normal price and demand relationship, more will be demanded at lower prices than at higher prices. Thus, one will expect lower demand of loans when interest charged are very high, and vice versa. Contrary to this, there have been mixed findings about how the price and demand for MFI loans relate especially where demand for loans exceeds supply.

Armendáriz and Morduch (2007) suggest that setting interest rate should be done with an incentive constraint in mind. That is, the interest rate charged should be an incentive in itself to induce borrowers' compliance. To be an incentive, the interest rate charged should be set at a level where, what the borrowers pay as interest is less than what they earn from investing the borrowed funds. This will help to mitigate the moral hazards (Armendáriz and Morduch, 2007). This calls for MFIs to have demand driven products and proper market research before setting their interest rates. How appropriate the interest rate is will determine MFI's financial performance and its likely success or failure in its respective stage of growth.

Unfair regulation and government policies may affect the amount of income to be realised by microfinance institutions from interest income. For example, where a government puts an interest rate cap, as the case in Ireland in the 1960s, MFIs became less competitive and later disappeared as a result of unfair interest cap set by the government (Seibel, 2003). Besides, inflation may also affect the real interest income.

(b) Amount of Loan

Amount of loan (outstanding loan portfolio) is the amount of loaned funds that remain unpaid at the end of the period on which the interest amount is charged. The loan amount is the function of loan size and number of borrowers (clients), all of which are parameters of microfinance outreach. The loan size reflects the nature of clients and their poverty level (Morduch and Haley, 2002; Woller, 2002a; Rhyne, 1998). It is generally assumed that, the smaller the loan size, the more poor clients will be reached by microfinance. The loan amount can be increased by either, increasing the loan size[6] or increasing the number of clients, or both.

Schreiner (2001) suggests seven aspects of loan size which have to be considered when measuring outreach. These are term to maturity; dollars per instalment; time between instalments; number of instalments; and dollar-years of borrowed resources in addition to dollars disbursed and average balance. Another aspect of loan that affects both outreach and sustainability is lending type, discussed in microfinance product delivery as dimension of outreach.

[6] However, it should be noted that increasing the loan size could end up making an MFI serving average poor and non poor clients as the poor may not afford the loan at the higher loan size.

1) Term to Maturity

Term to maturity refers to the time remaining for a loan to fall due. Instruments with longer maturity are more risky than whose with short maturity (Brake, 2000 and Hulchinson 1998). Schreiner (2001) comments that, longer loans signal greater profitability but less outreach. Longer maturity would mean higher profitability to lenders because usually lenders charge higher interests to reflect the risk associated with longer maturity. According to Conning (1999) longer loans signal shallower outreach because the most creditworthy (wealthier) clients usually get the longest loans. On the other hand, as Schreiner (2001) has asserted, longer loans are more risky and could lead into more delinquency costs.

2) Dollars Disbursed per Loan

The dollars disbursed is also an aspect of loan size used to measure depth of outreach. The larger the amount of dollars disbursed will represent the largest possible purchase from the loan proceeds. The dollars disbursed can affect both profitability and outreach. First, on profitability, the larger the amount disbursed would imply larger interest income. On the other hand, it means the maximum possible loss due to default.

The larger loans (all things being equal) would represent longer duration and lower average cost of evaluation and disbursement, as their costs are mostly fixed. Longer duration would also mean higher per-dollar variable costs because lenders take care due to greater risk exposure (Schreiner, 2001). Second, the dollars disbursed will also affect outreach. According to Schreiner (2001) smaller disbursements would imply greater average depth of outreach, as poorer borrowers are likely to take smaller loans than less-poor borrowers.

3) Average Balance

The average balance is another common measure of loan size. It measures the level of resources typically held in terms of loan, without consideration for length of the term to maturity. Poorer borrowers will have smaller average balances. All being equal, the loans with large average balances are more profitable but are associated with less depth of outreach (Schreiner, 2001). The average balance depends on the term to maturity, size, timing, and number of instalments. However, Schreiner (2001) argues that the computation of average balance ignores the term to maturity and other aspects of loan size, and so it is an imperfect measure.

4) Time Between Instalments and Number of Instalments

Time between instalments, also known as moratorium, may affect both outreach and profitability. Schreiner (2001) comments that more frequent instalments would mean less time to accumulate cash for repayment and thus, increase cost to borrowers. For lenders, frequency of repayment or instalments could have mixed results. On one end, as Schreiner (2001) argues, frequent instalments are associated with high possibility of default as borrowers can easily fall into arrears. It would also mean higher transaction costs as a result of frequent payment processing. All these mean reduced profitability. Moreover, poorer borrowers generally have fewer instalments as the number of instalments tends to increase the loan size. Thus, a shorter time between instalments could imply less profitability to lenders and also less outreach.

On the other end, Armendáriz and Morduch (2007) suggest that high frequency of repayment if matched with borrowers' timing for income or cash-inflows could lead to high repayment rates and, therefore, reduce default. The reduced defaults in turn would lead to an increased income and, therefore, profitability.

Term to maturity and number of instalment determines the time between instalments. The term to maturity and number of instalments were not used in previous studies because of unavailability of disaggregated data. This study, using disaggregated data directly obtained from MFIs, documents an empirical evidence of the effects of term to maturity and number of instalments on MFIs' profitability.

5) Dollars per Instalment

This is another measure of outreach in terms of loan size. The dollars per instalment is useful measure of outreach because poorer borrowers are less likely to be able to pay large instalments. On the other hand larger instalments would mean increasing profitability to the lender as it dilutes fixed costs of the cash transactions. Fewer dollars per instalment would mean higher depth outreach as this reflects poorer clients. The minimum loan and the number of instalments determine the dollars per instalment.

6) Dollar-years of Borrowed Resources

Schreiner (2001) asserts that the "dollar-years of borrowed resources" measure is probably the best summary measure of loan size. The dollar-years indicate the average balance that the borrower would obtain if the loan would have had a one year maturity. His assertion is based on the fact that "dollar-years of borrowed resources" accounts for time, and incorporates all other six aspects of loan size. The loan size increases with dollar-years of resources from a loan. It measures the "purchasing power provided by the loan and time through which borrowers control this purchasing power" (Schreiner, 2001:29). While more dollar-years mean higher profitability to lenders, it implies less depth of outreach as the same will have longer time to maturity, larger loan, and, therefore, larger loan size. Compared with the traditional measure of loan size, the dollar-years measure reports lower loan size as it takes, as numerator, the outstanding annual average of the loans.

The "dollar-years of borrowed resources" are obtained by dividing the average annual dollars outstanding by the number of loans disbursed in a year. The average in the annual dollars outstanding takes into account the average maturity. Its measurement is on dollar-years per loan instead of dollars per loan as used in the traditional average balance measure of outreach. It is better than the average balance measure in that the dollar-years considers the time to maturity and number of instalments all which affect the profitability and outreach.

The dollar-years measure of outreach however, still has average loan weakness in that it does not consider the composition of poorer clients in a portfolio. The measure is also inconsistent in that, while the numerator includes all current and previous loans the denominator only includes the number of loans disbursed in the year. This has an effect of overestimating the loan size. Although it claims to recognise the number of instalments in its computations, two loans of the same maturity and same loan amount but different number of instalments will end up reporting the same loan size. Moreover, as Schreiner (2001) has noted, the measure tends to overestimate the loan size when there is a growth in the loan portfolio. All withstanding, it is not easy to use the dollar-years measure as the data required for its computation (like maturity of each individual loan) may not be readily available to researchers who are external to an MFI.

(c) Loan Repayment Rate

Higher interest rates and large loan amount alone may not earn much interest income for microfinance institutions if the loan repayment rates are low. Thus, higher loan repayment rates are also required to earn higher income. According to Schreiner (2000) the sustainability of MFIs is linked to effective loan repayments and profitability. The repayment rate will depend on the nature of microfinance products, whether demand or supply driven, and its efficiency in implementing its collection policy (Evers *et al*, 2000).

The efficiency of microfinance institutions in collecting loans from its clients will lead to higher repayment rates and all things being equal, higher profitability (Schreiner, 2000). The repayment rate may be affected by the MFI's delinquency management policy, lending type, number of and efficiency of loan offices, clients' investment opportunities, and consideration of the incentive constraint in setting the interest rates (Armendáriz and Morduch, 2007). A detailed discussion on the efficiency of microfinance and its empirical theory is made in Chapter 6, which links the efficiency of microfinance institutions with their financial sustainability.

(d) Other Income

Microfinance institutions also earn income from other activities in their operations. The activities include, sale of passbooks, application forms, and return from other products or services offered by the microfinance institution. The amount of other income to be collected by an MFI will depend on its product diversity and return expected from these products. Microfinance institutions need to be creative in introducing demand driven products to increase income from these products. However, to do it effectively there should be an enabling operating environment set by the governments to enable the MFIs to introduce new products.

3.5.2 Microfinance Expenses

Microfinance expenses are the second item used to determine profitability and, therefore, financial sustainability. The MFIs' expenses can be categorised into three main categories namely: operating expenses; administrative expenses and financing expenses. These are explained in the next subsections.

(a) Operating Expenses

Operating expenses are costs required to run the daily operations of MFIs. The operating costs of microfinance institutions include transaction costs and loan losses as a result of bad debts. According to Shankar (2007) transaction costs are a function of a number of groups that an MFI serves, and field workers compensation. The transaction costs are affected by the cost per transaction and the number of transactions. The number of transactions may depend on the number of clients and or the repayment frequencies, all of which relate to microfinance outreach. While repayment frequencies may help to improve or increase repayment rates the same also increases the total transaction costs and, therefore, may reduce profitability (Armendáriz and Morduch, 2007; Evers *et al*, 2000). As there is a trade off between the two, microfinance institutions should strike a balance between costs and benefits of the increasing transaction costs and repayment rates. An appropriate product design and delivery methodology with flexible repayment schedules could help do this (Park and Ren, 2001; Ledgerwood, 1999).

The transaction costs may also be affected by the nature of costs and how they relate to changes in the number of clients (that is whether the costs are fixed costs or variable costs); type of clients (poor, average poor or non poor) and the loan size. The fixed costs are those which remain unchanged in total when the number of clients changes (Brock and Herrington, 2007; Horngren *et al*, 2006; Upchurch, 2002; Russell *et al*, 2001). The variable costs, on the other hand, represent the costs which remain unchanged per client, although they do change in total given the change in the number of clients (ibid). The way the microfinance product is designed, its delivery, and collections arrangements will affect the transaction. This is another area in which MFIs need to show their efficiency.

Another component of operating expenses is loan losses as a result of bad debts. According to Meyer (2001) loan losses could be a result of poor product design, inappropriate lending types, ineffective microfinance policy with regard to loan follow ups, inefficient and corrupt loan officers. Poor delinquency management is reported to be the major cause of high loan losses and low repayment rates (CGAP 2008; Frankiewicz, 2006; Churchill and CGAP, 2004b; Pantoja, 2002). Under few cases the loan losses are a result of poor targeting where MFIs target a certain geographical area only which eventually is struck by natural disasters (Pantoja, 2002).

Another reason which may lead to low repayment rate and, therefore, high loan losses is inconvenient repayment structure, for example, where borrowers are given a very long time to repay by which time they have spent almost everything they earned on their investments (Armendáriz and Morduch, 2007). Thus, matching clients earning time pattern with the repayment time and frequencies is crucial.

One of the possible causes of low repayment rate is moral hazard. This occurs when the borrower fails to meet the repayment commitment as agreed in contract because of either poor realisation of project income or just decides not to make repayment. Efficiency with which the MFIs select their customers and the use of appropriate lending technology (also known as lending type) will reduce exposure to moral hazards, and, therefore, reduce loan losses and overall operating expenses. It has been reported that group lending can mitigate the moral hazard (Armendáriz and

Morduch, 2007; Hermes *et al,* 2005; Bisin and Guaitoli, 2004; Ghatak, 1999). Incentive based lending approaches have been suggested to help improve repayment rates and thereby reduce the loan losses that result from defaults (Armendáriz and Morduch, 2007; Armendáriz and Morduch, 2000).

(b) Administrative Expenses

The second element or category of microfinance expenses is administrative expenses. These are expenses incurred in running the organisation. The expenses include staff salary, office running expenses, staff visits expenses, costs of running client training, transportation expenses, and costs incurred in setting-up and running a branch or collection centre. According to Woller and Schreiner (2002) salaries are the largest element of the administrative expenses. The administrative expenses or costs can be categorised as fixed and variable costs. Variable administrative costs are those varying in total with the number of clients (Horngren *et al,* 2006; Drury, 2005). That is, their increase or decrease depends on increase or decrease in number of clients respectively. For these kinds of costs the total costs will increase with the increase in microfinance outreach as measured by the number of clients.

Most of microfinance administrative expenses are fixed in nature. That is, their total volume does not depend on the number of clients (within a certain relevant range). Fixed costs of microfinance institutions may include staff salaries, office rent, and costs of running a branch. With these kinds of costs microfinance may increase the number of clients (outreach) at the same level of costs[7]. Thus, all things held constant, the MFI's outreach will increase profitability as total fixed costs remain constant while the marginal income increases[8].

[7] These costs however, may change in total given the changes in the total number of clients where an MFI exceeds a certain level of operations on which the fixed costs were set.

[8] However, this will depend on the difference between marginal income and marginal costs of each additional client joining the MFI.

(c) Financing Expenses

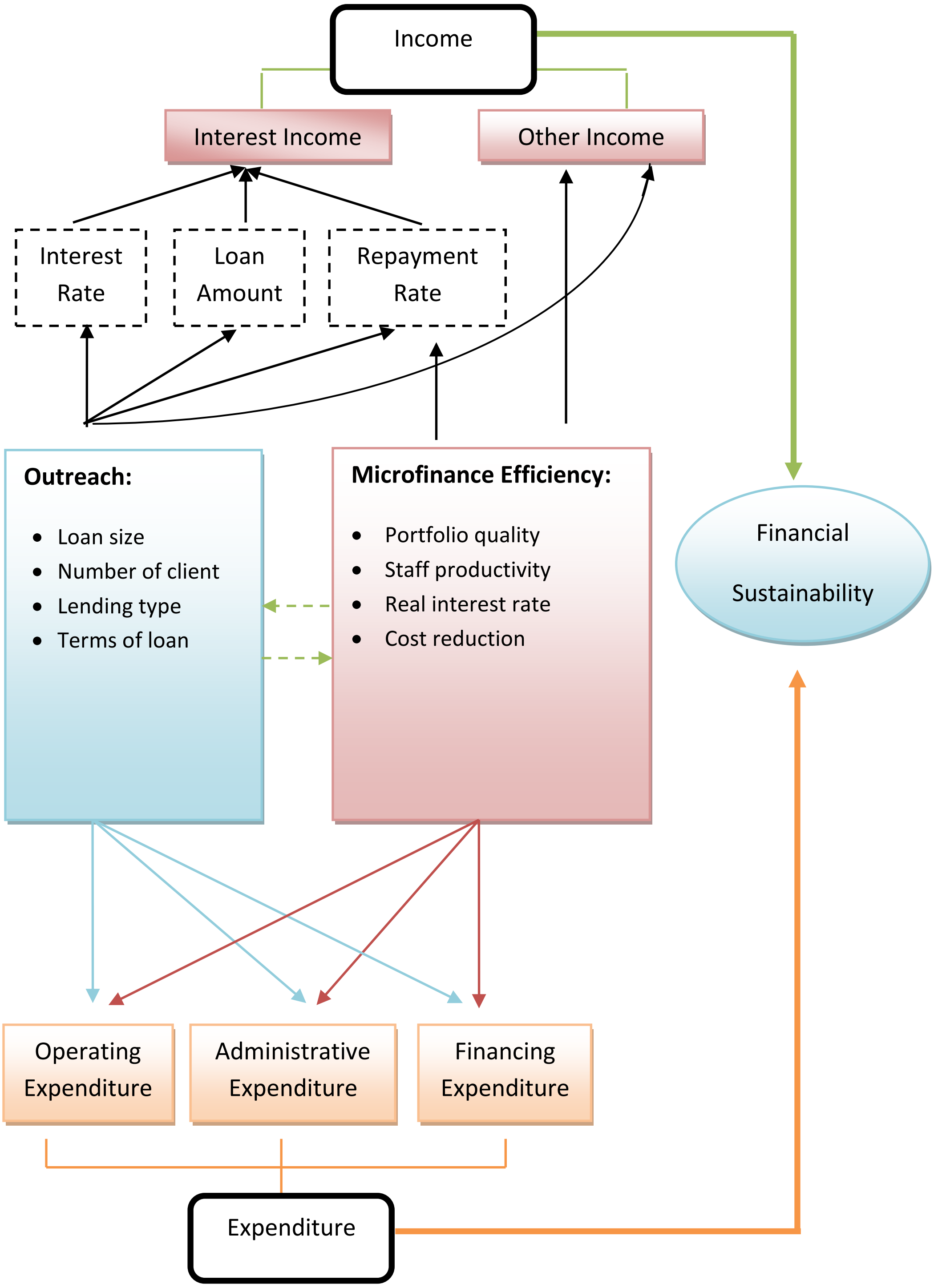
Microfinance institutions incur financing costs when sourcing their capital. The costs paid to providers of capital are known as costs of financing (Brealey *et al*, 2006; CGAP, 2003). Sources of capital for microfinance institutions include owners' shares (share capital), loans (both from capital market and concession loans), donations, and client savings and deposits. All factors held constant, higher financing costs, lead to lower profitability of an MFI.

A combination of cheap sources of capital will reduce the overall financing expenses and, therefore, increase profitability (Arun, 2005). However, this will depend on the existence of a legal and policy enabling environment. That is, whether MFIs are allowed to mobilise their capital from various sources of finance, and the costs related to complying with the rules and regulations in using these sources of funds. An efficient microfinance institution will operate at a reduced financing and overall MFI expenses. The same will also increase profitability and, therefore, lead to its financial sustainability.

3.5.3 Conceptual Framework on Financial Sustainability

In this study we develop a conceptual framework on financial sustainability of microfinance institutions from the accounting profitability theory. The framework expands on the key determinants of profitability: income and expenses. It is based on two microfinance performance parameters namely outreach and efficiency, which may affect their profitability. The outreach parameters may affect interest rate, loan amount, and repayment rates which are key determinants of interest income. They may also affect the volume of other income earned by microfinance institutions. The microfinance efficiency parameters include the quality of loan portfolio, cost reduction, and efficient use of microfinance human resources, all of which may affect the interest income and other income earned by microfinance institutions. Again, as indicated in the conceptual framework (Figure 3-2), both microfinance outreach and efficiency parameters may affect the volume of microfinance expenses, and, therefore, their profitability.

Figure 3-2: Conceptual Framework: Accounting Profitability Theory and Financial Sustainability of Microfinance Institutions



KEY:

Reduces average or total expenses

Increases marginal or total revenue

In the next section we explain the theoretical relationship between microfinance outreach and profitability or financial sustainability. We also present theoretical relationships between MFI efficiency and financial sustainability. Detailed discussion based on empirical theory and empirical approaches thereon on these relationships are presented in Chapters 5 and 6 which are on outreach and financial sustainability and efficiency and financial sustainability, respectively.

3.6 OUTREACH AND PROFITABILITY OF MICROFINANCE INSTITUTIONS

The long-term vision of MFIs is to provide sustainable financial services to the economically active poor who have lacked access to these services from the main stream of financial services (Satta, 2002). According to Baumann (2001) the main goal of rural MFIs is to provide sustainable microfinance facilities to the poor. In developing countries, microfinance institutions also offer loans and technical assistance on how to start and develop a business (Hartungi, 2007).

From the above definitions of microfinance two goals of microfinance can be seen. These are reaching the poor (outreach) also known as social impact goal and becoming sustainable, commonly referred to as profitability objective. According to Schreiner (2000) profits are necessary but not sufficient, for sustainability. Yaron (1994) asserts that a successful rural microfinance institution should have both profitability and outreach in its objective. This adds another parameter to be considered when judging the sustainability of the MFIs, the outreach.

Conning (1999) defines outreach as the ability of MFIs to reach the ever-wide audience (also known as breadth of outreach) and especially the poorest of the poor (depth of outreach). It is "the social value of the output of a microfinance organization in terms of depth, worth to users, cost to users, breadth, length, and scope" (Navajas *et al,* 2000:335) and a means to improved social welfare (Rhyne, 1998). According to Rhyne (1998) outreach is the only objective of MFIs; sustainability is but a means to achieve it[9]. Microfinance literature, however,

[9] While this may be true for microfinance institutions whose mission is poverty reduction, most microfinance institutions have dual goals: reaching the poor and profitability. Moreover, with current trends on microfinance business, various organisations are currently offering microfinance services

acknowledges the existence of the dual goals of microfinance: the outreach and profitability (Aubert *et al*, 2009; Armendáriz and Morduch, 2007; Copestake, 2007; Cull *et al,* 2007; Brau and Woller, 2004; Drake and Rhyne, 2002; Stack and Thys 2000; Ledgerwood, 1999; Hulme and Mosley 1996).

One interesting question that normally arises when the dual goals of microfinance are being considered is whether or not there is a trade-off between sustainability (profitability) and targeting the poor (outreach). Taking the institutionists position, CGAP and best practice literature say no. Sustainability is a means to reach expanded outreach. Their argument is that the more sustainable a microfinance institution is the more possible for it to reach more poor people (Cull *et al,* 2007; Brau and Woller, 2004).

CGAP's fourth key principle of microfinance states that 'financial sustainability is necessary to reach significant numbers of poor people. Most poor people are not able to access financial services because of the lack of strong retail financial intermediaries. Building financially sustainable institutions is not an end in itself. It is the only way to reach significant scale and impact far beyond what donor agencies can fund' (CGAP, 2004:1).

The arguments put forward imply that financial sustainability precedes outreach. In this study, however, we show that the two, outreach and financial sustainability depend on each other throughout the life period of microfinance institutions. Thus, in addition to the relationships between outreach and financial sustainability, and that of microfinance efficiency and financial sustainability (Chapter 5 and 6 respectively), in Chapter 7 we link the determinants of financial sustainability to microfinance life cycle or stages of development.

(small scale financial services) for profitability motive and thus, who uses their products and services is not their basic concern.

3.7 MICROFINANCE EFFICIENCY AND FINANCIAL SUSTAINABILITY OF MICROFINANCE

According to Woller (2000) there are two factors which affect MFIs self-sufficiency and, therefore, their financial sustainability. These are institutional efficiency and return on portfolio. These two form a major part in an MFI's financial performance. Efficiency refers to attaining more output at the same level of input. Thus, an MFI will be considered efficient if compared to other MFIs, at the same level of input, more output is achieved. In as far as MFIs are concerned; Woller (2000) defines efficiency as the most effective way of delivering small loans to the very poor. There are several indicators of MFIs' efficiency. These can be categorised into three main categories namely: asset and liability management; human resources management and loan portfolio quality. These measures of efficiency indicate that the more the output at a given level of input the better the contribution towards financial sustainability.

On the other hand, while MFIs are required to be efficient, they are also expected to earn a positive return from their operations. This is measured by the return on portfolio. The return on portfolio is commonly measured by portfolio yield and interest spread. The portfolio yield refers to effective interest rate. This is measured by total interest income over average loan portfolio. The interest spread indicates the extent to which an MFI is pricing its products to cover its total costs also known as administration costs (Woller 2000). That is, the extent to which the interest income covers costs incurred. The interest spread is obtained by taking the difference between portfolio yield and administration expenses to average portfolio ratio. The efficiency parameters of microfinance institutions are controllable by MFI management. We, therefore, refer to these factors as internal factors. Some factors are external to an MFI and, therefore, cannot be influenced by internal management. These are external factors. One of these factors is the regulatory framework of microfinance institutions. This represents the environment within which an MFI operates.

The roles of regulatory framework and how it may affect the efficiency of an MFI need to be considered when assessing the efficiency of an MFI. According to LOGOTRI (2006) if MFIs are to be financially sustainable they have to be registered under a suitable legal form to ensure a sufficient equity base. This means that MFIs need to be properly regulated.

Regulation refers to the set of government rules that apply to microfinance. The regulation of microfinance institutions may take any of the following forms: interest rate ceilings; foreign exchange controls; control over admitting new entrants into the market; as well as establishing reasonable capital requirements. Satta (2004) suggests that regulation of microfinance institutions strengthens their financial sustainability. Deregulations of interest rates has opened the way to alternative lending where interest rates can cover the higher transaction costs of micro-lending. Regulated interest rates (setting interest rate ceilings) on the other hand, restrict MFIs' available options and, as a result they might be unable to cover the transaction costs which will affect their financial sustainability.

Microfinance providers that take deposits need prudential regulation. This type of regulation protects their financial soundness to prevent them from losing small depositors' money and damaging confidence in the financial system. It involves monitoring and protecting the core health of an institution (Arun, 2005; CGAP, 2003).

The regulation of MFIs is meant to provide a fair playing ground and confidence to microfinance participants (Arun, 2005; RFSP, 2002). The ability of MFIs to exist and expand will depend on financial policies in a country in which it operates. That is, an enabling environment. Again, to mobilize savings effectively, an MFI needs to be in a country in which the financial sector has been liberalized. This includes abolishing interest rate ceilings and foreign exchange controls, admitting new entrants into the market, as well as establishing reasonable capital requirements.

Fair regulations will give an MFI better access to commercial and non-commercial sources of funds for equity and debt, better ways to achieve growth and outreach goals, improved standards of control and reporting, improved ability to offer products beyond micro credit, such as savings and transfers, and enhanced legitimacy in the financial sector and with clients. All these contribute positively towards attaining financial sustainability. On the other hand however, as Hartarska and Nadolnyak (2007) have argued, ambiguity in regulation leaves MFI vulnerable to regulatory discretion in the interpretation of the legal basis for lending activity.

3.8 MFI DEVELOPMENT STAGES AND SUSTAINABILITY

The development of microfinance can be seen in three stages namely start-up, growth, and maturity stages. The life cycle theory is used to explain the three stages of development of MFIs and their respective financing needs. The life cycle theory posits that the sources of MFIs' financing are linked to their respective stages of development and, thus, their sustainability (Farrington and Abrahams, 2002; Lapenu and Zeller, 2001). It is, therefore, reasonable to assess sustainability of microfinance institutions based on their respective stages of development.

In this study, using the life cycle theory of MFI development, we explain the effects of the determinants of financial sustainability on sustainability of microfinance institutions at start-up and growth stages. The life cycle here is not used to refer to a certain standard time of operation, but rather on the development stages themselves. We bear in mind that, although the actual timing may differ from one MFI to another given an MFI's background and operating environment, still all MFIs go through the same three developmental stages. We also recognise the possibility that MFIs development stages may not be linear. Thus, in this study, as detailed in Chapter 7, we focus on what affects financial sustainability at various stages of development using indicators of financial performance and sustainability at each of the development stages. The focus is not to explain whether the MFIs are in a certain stage but what affects their sustainability at different stages.

3.9 SUMMARY OF THEORETICAL LITERATURE REVIEW

Microfinance is the provision of small scale financial services to unbanked poor people. As microfinance is promoted as a poverty reduction tool, the mission of an MFI must be to serve the poor and contribute to poverty alleviation. Institutions providing microfinance services need to attain sustainability in order to be able to sustain themselves and reach a significant scale of outreach towards poverty reduction. Sustainability here refers to ability of a project to maintain an acceptable level of benefit flows through its economic life. To attain this, MFIs should be able to cover their costs from their operations, offer better products and services that meet client needs and finding new ways to reach the unbanked poor.

This study follows the institutionists’ paradigm of microfinance poverty reduction approach. That is, microfinance institutions can attain poverty reduction through creation of sustainable financial intermediation for the poor. The institutionists’ approach has been chosen because most of microfinance institutions operating in rural Tanzania are member-based microfinance institutions. These are not donor-funded and thus, their operations solely depend on their financial sustainability. It follows, therefore, that, creating sustainable financial institutions is key to the success of these rural microfinance institutions.

Based on the accounting profitability theory reviewed in this chapter, the reviewed literature indicates that several factors could affect the financial sustainability of microfinance institutions. These factors can be grouped into two: those related to microfinance outreach and those related to microfinance efficiency. Detailed discussions on both empirical theory and empirical findings to this study are made in Chapter 5 (which links microfinance outreach and financial sustainability) and Chapter 6 (which indicates how microfinance efficiency could affect its financial sustainability). Finally, Chapter 7 traces the determinants of financial sustainability to different stages of microfinance institutions development. In the next chapter we present the research methodology used in this study.

CHAPTER 4
RESEARCH METHODOLOGY

Devising new approaches and methodologies, and changes in perception on evaluation of familiar data could lead to discovery of new knowledge (*Kuhn, 1996).*

4.0 INTRODUCTION

This chapter presents research methodologies and design of the study. The research design is the framework or plan for a study used to collect and analyse data (Churchill and Iacobucci, 2005). The chapter starts by presenting a review of various research methodologies used in previous studies, followed by description of methodologies used in this study. The third part of the chapter introduces the research design that was used in this study. The last section in this chapter presents the econometric analysis approaches used in Chapter 5, 6 and 7.

4.1 METHODOLOGIES USED IN PREVIOUS STUDIES

Several empirical studies have attempted to assess the performance of MFIs and explain the determinants of financial sustainability. All studies in the reviewed literature used quantitative data analysis approach to determine factors affecting financial sustainability. For example, Christen *et al* (1995) conducted a study on eleven successful MFIs using several simple regression (one independent variable) models with eleven observations each. This study, however, was biased in that it examined only successful MFIs. The number of observations was also too small to achieve statistically reliable conclusions and, therefore, generalizability is questionable[10]. Moreover, by using a simple regression model it ignored the simultaneous effect of other relevant determinants of financial sustainability.

Woller (2000) studied factors driving the financial self-sufficiency of nine village banks. He used financial ratio analysis and a series of bivariate correlations between financial self-sufficiency and nine indicators of financial self-sufficiency in the sampled institutions. The methodological weakness of this study is that, the simple

[10] Hair *et al* (2006) suggest that for results to be generalizable a ratio of between 15 to 20 observations is required for each independent variable used.

correlation just indicates whether or not two variables move together in the same or opposite direction. It does not necessarily mean that one should be causing the other (Mcclave, 2008; Sincich, 2008; Whitehead and Whitehead, 1992; Dietman, 1991; Mendenhall and Sincich, 1989). Two variables may be positively correlated just because a third variable causes them to behave that way.

Christen (2000) modified the methodology from simple to multiple regression model to determine factors influencing financial sustainability of MFIs using financial parameters on Micro Banking Bulletin (MBB) data. Following this trend, Schreiner (2002) expanded the outreach variable to what he called 'seven aspects of outreach' by integrating the financial and social parameters in microfinance financial sustainability.

Woller and Schreiner (2002) examined determinants of financial self-sufficiency using thirteen village banks (FINCA 8 countries and other MFIs 5 countries). This study improved on the previous methodology by adding the number of institutions to thirteen and time period of study to three years, and focusing on aspects of outreach proposed by Schreiner (2002). However, differences in institutional background and operations may lend this study to be FINCA biased as more than 60 percent of the studied MFIs were representing FINCA which uses a village banking model, a model different from other microfinance institutions studied.

Olivares-Polanco (2005) focused his study on commercialization and outreach on 28 Latin American MFIs. The study used OLS multiple regression analysis to investigate whether there exists trade-off between depth of outreach and financial sustainability by exploring the determinants of loan size. The methodological weakness of this study is that the analysis did not have multi-period observations and was dominated by a simple regression approach. It included only one observation from each MFI for two different years.

The study by Makame and Murinde (2006) was set to explain cognitive dissonance around microfinance outreach and sustainability. Specifically, the study was meant to show how the microfinance outreach and their sustainability levels are explained by commercialisation factors. Their study was built on the work by Olivares-Polanco (2005). Instead of a single period cross-section analysis they introduced a balanced panel analysis to overcome the methodological weaknesses in Olivares-Polanco (2005). Their study was based on data obtained mainly from microfinance information exchange (mix) organisation for 33 MFIs in five East African countries. The study, therefore, excluded MFIs which are non members of the market mix which could have enriched it.

Cull *et al* (2007) as with Woller and Schreiner (2002) have used multiple regressions model with a relatively large sample compared to previous studies. Their sample size was 124 MFIs made up of large MFIs from 49 countries. This study, however, focused most on financial performance and outreach, using three dependent variables (financial self-sufficiency, operational self-sufficiency, and return on Asset), one at a time, with a limited number of independent variables.

A recent study by Kyereboah-Coleman and Osei (2008) examined how governance indicators impact on microfinance institutions' outreach and profitability performance measures. This study used a panel data analysis based on secondary data obtained from 52 'conveniently sampled' MFIs operating in Ghana for at least ten years. This study however, focused only on the role of governance on profitability and outreach of microfinance institutions. Thus, other factors that could impact on outreach and profitability were not covered in this study. In the next section we present the methodologies used in our study.

4.2 METHODOLOGIES USED IN THIS STUDY

In this study, we tested the applicability of existing theories (what is already known as found in other studies) to MFIs in rural Tanzania, by analysing the cause and effects relationships between variables. The study followed a quantitative research approach. The quantitative research approach is useful where quantitative data are generated from large samples to test applicability of the existing theory using statistical analysis (Collis and Hussey 2003). The study builds on the methodology used in previous studies in microfinance (Kyereboah-Coleman and Osei, 2008; Cull *et al*, 2007; Makame and Murinde, 2006; Woller and Schreiner, 2002), which used multiple regression to study some aspects of financial sustainability of microfinance institutions. Building on Woller and Schreiner's study, this study links outreach and financial sustainability of rural microfinance institutions in Tanzania. The study also extends on the study by Kyereboah-Coleman and Osei (2008). We use measures of outreach (including number of outreach as in Kyereboah-Coleman and Osei, 2008) to measure their effect on profitability of rural microfinance institutions in Tanzania. This is done in Chapter 5. Chapter 6, which links microfinance efficiency and financial sustainability, builds on the methodology used in Cull *et al* (2007) and Makame and Murinde (2006).

Building on previous studies (Kyereboah and Osei, 2008; Cull *et al,* 2007; Makame and Murinde, 2006; Olivares-Polanco, 2005; Schreiner, 2002; Woller and Schreiner, 2002; Christen, 2000; Woller, 2000; Christen *et al,* 1995) this study added more explanatory variables and used a larger number of observations, which were expected to add to the explanatory power of the equations. The study used the accounting profitability theory approach to study the determinants of financial sustainability of rural microfinance institutions in Tanzania. It also adopted the decomposition of lending type, cost per borrower, and NGO-MFIs. The decomposition was meant to provide a clearer explanation of the factors affecting the financial sustainability.

Previous studies focused on, among other things, how outreach affects financial sustainability (Bogan *et al*, 2007; and Hartarska and Nadolnyak, 2007; Adongo and Stork, 2006; Khandker *et al*, 1995). This study tested the conclusions in the reviewed studies and thereon explains the scenario in Tanzania. In addition to this, this study attempted to show how the financial sustainability affects microfinance outreach. Moreover, following the life cycle theory (Chapter 7), the study attempted to explain the effects of the determinants of financial sustainability on the sustainability of MFIs at their early stages of development. This came from the theoretical claim that sustainability needs to be built from an initial or start-up stage (CIDA, 1999).

The selection of the methodology that was used in this study followed Thomas Kuhn's assertion that devising new approaches and methodologies, and changes in perception on evaluation of familiar data could lead to discovery of new knowledge (Kuhn, 1996). Although this study does not bring about a paradigm shift, the Kuhn's assertion was useful to enlighten the design of this study. We adopted a new methodological approach where the accounting profitability theory was used to determine the factors that theoretically relate to profitability. We then used these factors to analyse the determinants of financial sustainability. We also applied the life-cycle theory to trace the effects of the determinants of financial sustainability on the start-up and growth stages of microfinance development.

Following a change in perception on evaluation of familiar data we adopted NGO-MFI decomposition to capture branch specific features which are linked to their performance. With MFI decomposition, clear cause-effect relationships could be easily analysed and identified as the specific MFIs' activities and features are specifically linked to their financial performance than when no decomposition is made. Some of the branch specific features that were captured by this study are lending type, product offered, and customer economic activities. We also decomposed the microfinance lending type and cost per borrower to gain more insight into the relationships between the variables under study. The decomposition of the MFIs lending type was adopted to capture specific factors that make individual lending and group lending to be different. These are: the minimum loan size, number of instalments, and term to maturity. The cost per borrower was decomposed to explain the effects of each item making-up the cost per borrower.

4.3 RESEARCH DESIGN

This study attempts to determine the factors affecting financial sustainability of rural MFIs in Tanzania. It will also establish whether factors found to be significantly affecting financial sustainability of large MFIs in other developing countries, with highly developed MFIs, are also equally significant to Tanzania's small rural MFIs. We use quantitative data analysis approaches to establish the cause-effect relationships based on factors reported in previous studies as explained in theoretical background (Chapter 3) and empirical theory (Chapters 5 and 6).

The study makes use of a survey research design involving the collection of longitudinal data for four years from 98 rural MFIs. The survey is selected because of its appropriateness in obtaining the required quantity of data in running quantitative analysis (Hair *et al,* 2006). According to Saunders *et al* (1997) survey method allows the collection of large amount of data from a sizable population in a highly economical way. Surveys are also standardized, allowing for easy comparison. It is an 'effective tool for getting cause-and-effect relationships' (Ghauri and Grønhaug, 2005:124) which is the main focus in this study.

The use of longitudinal data (panel data) enhances tracking changes in constructs (measured variables) and relationships overtime (Hair *et al*, 2006). It allows us to control for certain unobserved characteristics of individual firms (MFIs) and facilitates causal inference in situations where inferring causality would be very difficult in case we had only one year (single cross section) data. Moreover, the use of longitudinal data allows us to study the importance of lags in behaviour or the results of decision making, as in longitudinal or panel data, both the values and the ordering of the data points have meaning (Wooldridge, 2006; Verbeek, 2004). By studying the repeated cross-section of observations, panel data are better suited to studying dynamic changes (Gujarat, 2003). Although the age of the majority of MFIs studied is more than four years, the four year period is selected because it is the period within which relevant data can be obtained.

4.3.1 Sample

According to Collis and Hussey (2003) in a survey, a sample of subjects is drawn from a population and studied to make inferences about the population. In this study, a sample of rural MFIs in Tanzania was studied using analytical survey approach. The analytical survey is used where the intention is to determine whether there is any relationship between different variables (Collis and Hussey, 2003). A study sample was used in this study to make inferences about the population because it is time consuming and expensive to collect data about every individual in the population. However, where the selected sample can reliably represent the population the sample can still be used to make inferences about the population (Ghauri and Grønhaug, 2005; Collis and Hussey, 2003).

The study used a sample of 98 MFIs, from a sample frame of 1,027[11] rural MFIs (BoT, 2005). The 98 MFIs sample was made up of 95 member-based (or 96.9 percent) and 3 NGO-MFIs (3.1 percent). The MB-MFIs considered in this study are the SACCOs and SACAs as these are the principal providers of financial services in

[11] This figure has been extracted from a directory of all registered MFIs maintained by the Central Bank of Tanzania (BoT) by 2005.

rural areas in Tanzania. The NGOs include a former governmental organization (PTF) which is now an NGO. It should be noted that, the three (3) NGO-MFIs have branches across the country while the MB-MFIs do not have branches. The approach used in this study as explained before was to decompose the NGO-MFIs and recognise their branches as independent and standalone financial units. This decision was taken on the ground that the branches are autonomous, maintaining separate branch accounting information and are located in different geographical locations from each other. The branches have different lending approaches, different staff, different products from each other, different client base, different client per staff ratio, and, therefore, their performance could be attributed to these differences. All these branch specific features were key variables in our study. Thus, the NGO-MFIs decomposition was meant to help in capturing these branch specific features that could help to explain factors affecting their financial sustainability. As a result, clear cause-effect relationships could be easily analysed and identified as the specific MFIs activities and features are specifically linked to their financial performance than when no decomposition is made. For example, staff productivity indicates the efficiency of MFI staff by relating the number of borrowers served by one staff. It is logical to relate the number of borrowers in a branch against the number of staff in the same branch, and how the same affect the financial sustainability of that branch than taking aggregate figures from the head office. Moreover, as CIDA (1999) suggests, branch analysis is useful where an institution is having multiple branches. This will reveal specific problems experienced by a branch. Furthermore, other studies in microfinance have used branches as units of study to capture branch specific variables (Hartarska and Nadolnyak, 2008).

The decomposition of these 3 NGO-MFIs gave us 21 branches. Counting these as independent financial units or MFIs for analysis purposes, we obtained 116 study units for our sample (95 MB-MFIs and 21 from 3 NGO-MFIs). It is interesting to note that, not only are NGO-MFIs larger than the member-based MFIs, but also their branches. The planned sample was 126 financial units (98 MB-MFIs and 28 NGO-MFIs branches of 4 NGO-MFIs) while the actual sample was 116. One NGO-MFI did not provide the financial statements and therefore was dropped from the study. Table 4-1 provides a detailed sample composition by MFI type. We call these 116 study units financial units or MFIs for data analysis purposes. Thus, when the 116

MFIs are referred to in this study we refer to the 116 financial units, which were also our study units.

Table 4-1: Sample Composition

S/N	MFI IDENTIFICATION	MFI Type	Planned sample (Study Units)	Actual sample (Study Units)
1.	RFSP – Northern zone	MB MFIs	24	24
2.	RFSP - Central zone	MB MFIs	33	33
3.	RFSP – Southern zone	MB MFIs	41	38
4.	SEDA	NGO	6	6
5.	MICRO – SACS	NGO	5	0
6.	FINCA – TANZANIA	NGO	10	10
7.	Presidential Trust Fund (PTF)	NGO	7	5
	Total Sample Size		126	116

(a) Sample Size

The sample size was determined after considering the purpose of using the sample and variables under study. The purpose of using the sample was to make inference about the population also known as generalization (Ghauri & Grønhaug, 2005; Collis & Hussey, 2003). To achieve this, we considered the general rule of thumb that for generalizability, a ratio of number of observations to number of variables should never fall below 5:1. That is, five observations are made for each independent variable in the variate (Hair *et al*, 2006). The variate refers to a set of independent or explanatory variables that determine or explain the changes in the dependent variable. Moreover, although the minimum is 5:1, “the desired level is between 15 to 20 observations for each independent variable”, at which level as Hair *et al* (2006) have put it, “the results should be generalizable if the sample is representative” (Hair *et al*, 2006: 196).

To meet required ideal ratio we considered the number of variables under study. Our study was divided in three main topics: outreach and financial sustainability (Chapter 5); microfinance efficiency and financial sustainability (Chapter 6); and microfinance stages of development and financial sustainability (Chapter 7). The outreach and financial sustainability had 20 independent variables, which was the highest.

Applying the general rule of thumb at a desirable level (that is, between 15:1 and 20:1) this required the number of observations to be between 300 and 400. With four years data from each MFI, the above required a minimum of 75 study units (financial units or microfinance institutions). The planned sample of 126 study units was relatively large. This was done to ensure that even when the response rate falls below 100 percent or even under cases where there could be missing values in the data set, the remaining observations would still be enough to warrant reliable statistical analysis and enhance generalization. The actual sample size was 116 study units as explained above. Moreover, compared to previous studies, the sample in this study is relatively larger with 464 observations. For example, a study by Woller and Schreiner (2002) had a sample size of 13 MFIs with 39 observations, while Cull *et al* (2007) had a sample of 124 MFIs with 124 observations (equal to about 18 observations per independent variable).

(b) Sample Selection

The sample selection criteria were influenced by two factors. First was to have representation of the population for generalizability, and second, variables under study, which had to be fulfilled. These are the geographical location, type of MFIs, and the age of the MFIs, which had to be at least 4 years in operation (as this represents the majority of MFIs.

The sample was selected using stratified sampling techniques. According to Ghauri and Grønhaug (2005) in stratified sampling the population is divided into mutually exclusive and exhaustive subsets. MFI ownership structure, as one of the variables under study, was used to divide the population into two exclusive and exhaustive subsets. This was done to ensure that each type of MFI by ownership structure is properly represented. MFIs making up the sample were categorised in two ownership-based strata namely: the member-based and the non-governmental organisation microfinance institutions (NGO-MFIs). The NGO-MFIs included the former governmental MFIs which were later transformed into NGOs. Although all the microfinance institutions included in our study sample are not owned by the government of Tanzania, in this study we categorise the cooperative-based MFIs (SACCOs and SACAs) as member-based MFIs and the non cooperative MFIs as NGO-MFIs.

Variability and thus, standard error of estimates are reduced with stratified sampling (Ghauri and Grønhaug, 2005). The group members are given a higher chance of being selected within the same group rather than when they are put together in a population. Thus, stratified sampling is appropriate in a study like this which focuses on specific issues (like MFI types, and the environment in which an MFI operates), which need fair representation by group members, that other quantitative sampling techniques like simple random selection may not be able to do. For this reason, as Ghauri and Grønhaug (2005) have explained, high precision can be achieved in stratified sampling with the same sample size or same precision with smaller sample size. Moreover, the stratified sampling can give separate results for each stratum

The 126 planned study units sample was thus, made up of two: 98 (77.8%) member-based MFIs and 28 (22.2%) branches of 4 NGO-MFIs. A simple random sample was then chosen independently from each stratum (Ghauri and Grønhaug, 2005) as explained below. Four years (2004 to 2007) information was requested from each microfinance institution in our sample. This helped to meet the microfinance age variable requirement. The four years data from the actual sample makes a maximum of 464 observations for the study. As explained earlier, the number of observations is enough for generalizability of the results. However, after considering the effects of missing values in the data set, the actual number of observations for each variable varies in the data set. These are indicated in respective chapters (Chapters 5, 6, and 7).

NGO-MFIs stratum - In Tanzania, most of the NGO-MFIs operate in urban areas. Only few of these have branches in rural areas. Thus, our sample, from this stratum, included all of those MFIs that had branches in rural areas that meet our study requirements of at least four years in operation. Moreover, these branches are located in the three different locations and, are therefore, capable of being classified in their respective geographical locations.

The member based MFI strata was further divided into three sub-strata representing three main geographical locations. The geographical location was one of the variables under study whose requirement needed to be fulfilled. The MB-MFIs are under the Rural Financial Services Programme (RFSP). The RFSP is currently operating in 22 districts in the country. Out of these, twelve (12) have MFIs that have been in operation for at least four years and from which information required for our study could be obtained. Thus a population from which our sample was drawn was made up of 140 existing MFIs with at least four years in operation. The twelve districts have been categorised by the Rural Financial Services Programme (RFSP) in three zones: northern which had 34 MFIs; central with 47 MFIs; and southern zones with 59 MFIs. The twelve districts are Moshi rural, Same, Mwanga, and Rombo for northern zone; Mpwapwa, Kondoa, and Dodoma rural, for Central zone; and Mbeya rural, Rungwe, Mbarali, Mufindi, and Njombe for Southern zone. Due to difficulties in logistics Same and Mwanga were not contacted to provide the data. Thus, the study covered only ten districts out of twelve in the RFSP programme area zones. However, the characteristics of Same and Mwanga can be equally represented by Moshi rural and Rombo as these are in the same zones, sharing relatively similar microfinance operating characteristics like level of clients' education, geographical environment and economic activities.

Following the RFSP categorisation, the three zones make three different strata for our study purposes on which the stratified sampling techniques was used to compose a sample of 98 member-based MFIs. Categorisation of the member-based MFIs in strata is important because the three zones have different characteristics in terms of geographical and economic activities, which could make a difference in MFI's performance. These are: the northern zone, containing relatively well educated people, business men and women. It is possible to find these educated people even in rural areas as opposed to other zones. The southern zone is an agricultural area, and the central zone is a relatively dry area. Thus, the activities of MFI clients in these three zones are not expected to be the same and, therefore, their need for microfinance services. For example, while people in a business zone may need loans for their business, those in an agricultural area may need the same for agricultural activities, still those in dry areas where both agriculture and business may be difficult may need the loan for consumption smoothing.

For each of the MFI type (by ownership), the sample selection criteria were first, an MFI should be operating in rural areas as the rural MFIs were the focus of this study. Second, the MFI should have been in operation for at least four (4) years (as this is the maximum time possible for most of rural MFIs in our population within which the required data could be obtained. The respective MFIs were consulted and indicated their willingness to cooperate in providing the data for the study.

4.3.2 The Data

This study was meant to determine factors affecting financial sustainability of rural MFIs in Tanzania. It also confirms and contradicts the reported findings from previous studies on factors responsible for financial sustainability. Based on the reviewed literature and the conceptual framework developed, the data required for both dependent and independent variables included outreach and financial performance related data as recorded by the microfinance institutions in financial statements and other official documents. Specific data required and their respective measurements are explained in each of the key topics under study (in Chapter 5, 6 and 7).

4.3.3 Research Ethics Requirements

The University of Greenwich, in promoting a 'high quality research and enterprise culture, with the highest possible standards of integrity and practice' requires all University researchers, including the postgraduate, to act ethically. To this end an approval should be obtained from the University's Research Ethics Committee (UREC) prior to undertaking, among others, any research that involves human participants. The aims for this requirement are, among others, to minimise risk of harm to participants and researchers, to maintain the participants' dignity, and ensure 'confidentiality of information supplied by research participants and anonymity of respondents' (UGREP, 2007). To this end, a voluntary informed consent was obtained from the participants.

The data collection in this research was approved by the UREC having met the UREC requirements. MFIs' active participation was initiated with freely obtained and informed consent. Briefing sessions were conducted to explain what the research was all about and the importance of obtaining the data from the respective MFIs. These were mostly done in Kiswahili, a national language. The researcher communicated to the respondents (MFI staffs) the objectives of the study and the research problem, and potential benefits for their participation.

While the participants were informed of the possible publication and dissemination of research results, they were also assured of the researchers' responsibility in maintaining high confidentiality on their identity. Moreover, to ensure that the questionnaires were easily understood, the English questionnaire was translated into Kiswahili and, therefore, the main language used by the member-based MFIs. Moreover, the participants were informed that they had the right to withdraw themselves from participating in this study at any time they feel to do so. Finally, while some participants gave their voluntary informed consent verbally, some gave their consent in writing using the consent form provided in Appendix 2.

4.3.4 Data Collection

This study focused on testing the existing theory based on available tools and data collected. No detailed information using informal or qualitative tools (e.g. peoples' perception) was collected. The study was based on reported behaviour not observed behaviours. The field visit for data collection was done between August and December 2008. Data were collected based on their significance in determining financial sustainability as predicted in the reviewed literature. Thus, the questionnaires used were prepared based on factors affecting financial sustainability as reported in the reviewed literature. Table 4-2 provides a detailed timeline for various data collection activities.

Table 4-2: Data Collection Timeline

		Date																																			
		April 2008				May 2008				June 2008				July 2008				August 2008				September 2008				October 2008				November 2008				December 2008			
S/N	Activity	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	Preparing questionnaires																																				
2	Liaising with MFIs practitioners in Tanzania and improving the questionnaires																																				
3	Research ethics committee approval																																				
4	Pre-testing the questionnaires																																				
5	Briefing Meetings with RFSP staff (research assistants)																																				
6	Actual data collection																																				

Questionnaires were used to collect the data for dependent and independent or explanatory variables, and any information not explicitly indicated in the financial statements. Questionnaires are generally used when each person is asked the same set of questions in pre-determined order. 'The questionnaire provides an efficient way of collecting data from a large sample prior for quantitative analysis' (Saunders *et al*, 1997:244). When used in explanatory studies like this study, questionnaire analysis will enable the researcher to explain cause and effects relationships between variables.

As the information required for the study are those mainly kept by the accounting departments of the MFIs, each MFI was requested to select one or two staff, or as they deemed appropriate, to fill the questionnaire. The data required were mainly historical and thus, only appropriate responsible staff could be able to trace the records required to fill the questionnaire.

The questionnaires were delivered by hand to each MFI and collected four weeks later. With the delivery and collection questionnaires, the researcher was able to check who had answered the questions. This is very important in determining reliability of the respondents (Saunders *et al*, 1997). In addition to this, financial statements for the period under study were also collected from each MFI. These were also used to establish the reliability of the information provided in the questionnaires. Moreover, triangulation was done where some information in the financial statements were compared with information in the questionnaires.

Four weeks time was allowed to provide the respondents with enough time to work on the questionnaire as some of the questions needed time to search from previous records (especially where an MFI had poor record keeping system). The 4 weeks time was also meant to reduce pressure on the part of respondents. That is, to work on their daily routine and the questionnaire at the same time. Moreover, the 4 weeks time was provided for after considering the number and details of questions asked to collect the data and characteristics of the respondents from which data were collected (Saunders *et al*, 1997). To some MFIs extensions were given where the four weeks time appeared not enough given the pressure of work they had during that time. Some MFIs also took shorter time to complete the questionnaire.

The questionnaires for non-governmental organisations and former governmental organisations (now NGOs) were delivered by the researcher. Because of the relatively large number of the member-based MFI (98 MFIs) and bearing in mind that these MFIs are geographically dispersed, 10 RFSP staffs (1 from each district), were used as research assistants to deliver and collect the questionnaires. This was done because the RFSP staffs are local staffs to the MFIs and could be easily contacted through the RFSP zone offices. The locality and familiarity of the RFSP staff to these MFIs as argued by Saunders *et al* (1997) ensured high response rate through enhanced respondent participation.

Before the actual delivery of the questionnaires by the RFSP staffs, the researcher conducted a briefing meeting with the employed RFSP staffs to explain the purpose of the study, briefing about the questionnaires and its purposes, and thus, the need to have fully completed questionnaires from respondents as far as possible. The meeting also agreed on the uniformity in approach during the delivery and collection of the questionnaires. The researcher paid for transport and other data collection related costs as agreed by both researcher and the employed research assistants (RFSP staffs).

Before the actual questionnaire administration, draft questionnaires were sent to three MFIs practitioners (one from each MFI type) and their comments were used to improve the questionnaire actually used (see Table 4-2 and Appendix 3). This was done to ensure common understanding of terms used in the questions, and that the questionnaires really addressed the data required for the study. The Swahili questionnaires were pre-tested before actual questionnaire administration to the MB-MFIs. The English questionnaires were administered to those MFIs that use English language as their formal business language. These are FINCA, SEDA, MICRO-SACS and PTF. Moreover, before the actual data collection, the questionnaires were pilot-tested to ensure that they were interpreted the same way by all respondents (Churchill and Iacobucci, 2005, and Saunders *et al*, 1997). After data collection, to ensure consistency, the Kiswahili questionnaires were afterward translated back into English by the researcher.

4.3.5 The Conceptual Model

The study makes use of panel data models to explain the relationship between dependent and independent (explanatory) variables. Panel data or longitudinal data are data sets containing repeated observations of the same individuals (MFIs) collected over a number of periods (Johnson and Dinardo, 2007; Baum, 2006; Wooldridge, 2006). In essence, panel data is a combination of cross-section and time series data (Gujarat, 2003). That is, cross-section data collected from the same individuals over a time.

Panel data relates to individuals (MFIs) over time, and, therefore, is bound to be heterogeneous in these individuals. The techniques in panel data estimation can take such heterogeneity explicitly into account by allowing for individual-specific (MFI specific) variables (Gujarat, 2003). In this study where it was expected to establish the relationships between dependent and independent variables with specific focus on individual specific characteristics like MFI type, lending type, MFI zone, and so on, a panel data model was an ideal one for consideration.

The panel data model was selected because it can better detect and measure effects that simply cannot be detected in pure cross-section or pure time series data (Wooldridge, 2006; Greene, 2003; Gujarat, 2003). Moreover, panel data give “more informative data, more variability, less collinearity among variables, more degree of freedom, and more efficiency” (Gujarat, 2003:637). The conceptual or general panel data regression model used is of the form:

$$Y_{it} = \alpha_i + \beta' X_{it} + \varepsilon_{it}$$

Where: Y_{it} is the value of dependent variable (measure of financial sustainability) for cross-section unit i at time t, where i = 1... n and t = 1, ..., T; α_i is a heterogeneity or individual effect. It contains a constant term and set of individual or group specific variables which may be observed, such as type of MFIs, lending type, MFI zone, and so on, or unobserved such as MFI specific characteristics (like skills of MFI personnel or preference and so on), which are taken to be constant over time (Greene, 2003); β measures the partial effect of X_{it} in period t for the unit i; X_{it} represents the jth explanatory variable for unit i at time t. There are K explanatory variables indexed by j = 1... K and, therefore, X_{it} is a K – dimensional vector; and ε_i

is the error term (Verbeek, 2004; Greene, 2003). Specific or operational models used in this study are indicated in Chapter 5, 6, and 7.

In fixed effect model, the individual effect α_i is correlated with explanatory variable X_{it}, while in random effect model, the individual effect α_i is uncorrelated with explanatory variable X_{it} and thus, the error term becomes ($\mu_i + \varepsilon_{it}$), where μ_i is a group specific random element, similar to ε_{it} except that for each group, there is but a single draw that enters the regression identically in each period.

4.3.6 Data Analysis

Survey data collected from MFIs were rearranged and organised in one format to enable inter-MFI comparison and entered in a spread sheet before analysing them using STATA econometric computer software. The rearrangement was necessary because these MFIs had different reporting formats. Thus, the rearrangement facilitated easy tracking of key variable information required for this study. However, this was carefully done as not to affect the original financial performance results.

The STATA software was selected following its ability to help researchers to analyse research easily and efficiently (Baum, 2006). Moreover, the STATA software has a range of advanced tool for panel analysis that a researcher needs to organise and manage their data and then obtain and analyse statistical results (ibid). These tools were required in this study as explained in the panel data model above. The STATA software is user-friendly. It has online technical support and learning resources which make its use more convenient. As commented by Gujarat (2003) user-friendly software package such as STATA makes the task of implementing panel data regression quite easy. Moreover, the researcher is familiar with this software and has a full time access to it and, hence, convenient.

The analysis was set to indicate, first, which of the factors reported in the literature are relevant to Tanzania's rural microfinance institutions and, second, what are specific factors that significantly affected financial sustainability of microfinance institutions. Specific variables description and measurements are done in each of the three major topics in this study. These are outreach and financial sustainability (Chapter 5), microfinance efficiency and financial sustainability (Chapter 6), and microfinance stages of development and financial sustainability (covered in Chapter 7). Specific data analyses are also done in these respective chapters.

4.3.7 Dealing With Omitted Variables Bias

Coefficients derived from ordinary multiple regression models may be subject to omitted variables bias. This is when some variables which were not included in the model affect the dependent variable and, therefore, estimating the coefficients without controlling for these variables lead to omitted variable bias (Hsiao, 2007; Woodridge, 2006; Greene, 2003; Gujarati, 2003).

Dealing with omitted variables bias one needs to control for unobserved effect of these omitted variables. How the control is done will depend on the nature of the omitted variables. That is, whether they are constant or changing over time and whether they are constant or changing over cases. These are also known as the time specific and individual (case) specific effects of unobservable or omitted variables (Hsiao, 2007). Econometric literature suggests two common methods of dealing with these omitted variables. These are the fixed effect and random effect (Hsiao, 2007; Johnson and Dinardo, 2007; Woodridge, 2006; Baltagi, 2005; Verbeek, 2004; Green, 2003, Gujarati, 2003).

According to Greene (2003) the fixed effect model assumes that the difference across case or MFI as used in this study can be captured in differences in the constant term. The fixed effect model allows the unobserved individual case effect to be correlated with included variables (Hsiao, 2007; Johnson and Dinardo, 2007; Woodridge, 2006; Verbeek, 2004; Green, 2003). Thus, the changes in variables over time (as a result of unobservable effect of omitted variable), can be utilised to estimate the effects of the independent variables on the dependent variable., therefore, the fixed effect model is appropriate when you want to control for the omitted variables that differ across case (MFI) but are same or constant over time (ibid).

The between effects model is used when you want to control the effect of omitted variable that are same or constant across case but differ over time. In essence, when you consider the nature of the effects of omitted variables, the between effect is the opposite of the fixed effect model. The between effect model is not however, commonly used in practice as it involves loss of information as the regression is based on the mean values of each variable from each case (Dougherty, 2006).

When however, the effect of some omitted variables differ across case but are same over time (as in fixed effect model), and yet still the effect of other omitted variables are the same across case but differ over time, the random effect model is the appropriate model to be used (Hsiao, 2007; Dougherty, 2006; Green, 2003). The random effect model applies when the individual specific (differ across case) effects are strictly uncorrelated with the included independent variables. It is appropriate when the sample is believed to be randomly selected and, therefore, is representative of the population (Hsiao, 2007; Greene, 2003; Gujarati, 2003). The next sections present the econometric analysis approaches used in each of the three chapters where detailed study findings are discussed.

4.4 ECONOMETRIC ANALYSIS APPROACHES

This section presents the econometric analysis approaches used to analyse the relationship between outreach and financial sustainability in Chapter 5, the relationship between microfinance efficiency and financial sustainability in Chapter 6, and the effects of the determinants of financial sustainability on the sustainability of microfinance institutions at their start-up and growth stage in Chapter 7.

4.4.1 Microfinance Outreach and Financial Sustainability

This section explains the econometric analysis approaches used in Chapter 5 which links microfinance outreach and financial sustainability to determine the factors affecting financial sustainability. It covers the correlation analysis and variable selection, model specification, the choice between random effect and fixed effect models, and the choice between random effect and pooled OLS.

(a) Correlation Analysis and Variable Selection

Before running the regression analysis, we performed pairwise correlation analysis. The analysis was meant to first, indicate whether variables were correlated or not. If variables were not correlated then using several simple regressions or one multiple regression model could give the same results (Dougherty, 2006). We found that the variables were correlated thus; using several simple regressions would have been inappropriate as we could not have obtained the partial effect of individual variables. Second, the correlation analysis helped to determine variables which are highly correlated and that could cause multicollinearity problem in our model.

Multicollinearity condition exists where there is high, but not perfect, correlation between two or more explanatory variables (Cameron and Trivedi, 2009; Johnston and Dinardo, 2007; Wooldridge, 2006). According to Churchill and Iacobucci (2005) when there is multicollinearity, the amount of information about the effect of explanatory variables on dependent variables decreases. As a result, many of the explanatory variables could be judged as not related to the dependent variables when in fact they are (ibid). Other effects of multicollinearity condition in the data include: small change in data produces wide swing in parameter estimates; coefficients may have high standard errors and low significance level; coefficients could also have wrong signs (Greene, 2003). Thus, as Churchill and Iacobucci (2005) have argued, multicollinearity condition reduces the efficiency of the estimates.

How much correlation causes multicollinearity however, is not clearly defined. While Hair *et al* (2006) argue that correlation coefficient below 0.9 may not cause serious multicollinearity problem, Kennedy (2008) suggests that any correlation coefficient above 0.7 could cause a serious multicollinearity problem leading to inefficient estimation and less reliable results. Contrary to Hair *et al* (2006) and Kennedy (2008), Wooldridge (2006.102) argue that there is “no absolute number that we can cite to conclude that multicollinearity is a problem”. He adds, what determine whether or not the problem exists is the total sample variation (SST) and the variance (δ^2) of respective variables that are highly correlated (ibid).

Following Wooldridge (2006) we did a pairwise correlation analysis (see Appendix 4(a)) to detect early signs of existence of collinearity among the variable before testing whether the multicollinearity problem really exist in our data. As in Kennedy (2008) we considered correlation coefficient above 0.7 to be high enough to warrant further investigation. The pairwise correlation analysis revealed that the number of borrowers was highly correlated with MFI type and MFI size at -0.7989; and 0.8447 correlation coefficients respectively. Other strong correlations were the term to maturity for individual and group lending technologies (0.7826); MFI type and MFI regulation (0.7378); and number of installments for individual lending and group technology (0.8076).

We further computed the variance inflation factor (VIF) for each coefficient as diagnostic statistics test to indicate how serious the multicollinearity problem could be. The VIF shows the increase in variance that can be attributed to multicollinearity (Greene, 2003). Again, there seems to be no consensus about how much VIF is harmful. For example, while Greene (2003) claims that the VIF values in excess of 20 suggest existence of multicollinearity problem, Hair *et al* (2006) and Gujarat (2003) suggest that VIF above 10 indicates the existence of multicollinearity problem.

Back to our data, of all the variables in the model, MFI type had the highest VIF (12.14) while female clients' variable had the lowest (1.27). The mean VIF for all variables however, was 4.01 (see Appendix 5 (a) for detailed VIF information). Although the mean VIF was within the threshold for non existence of multicollinearity[12], taking the cut-off suggested by Hair *et al* (2006), the VIF value for the MFI type indicated collinearity problem. The collinearity condition of this variable could be caused by the nature of MFIs under this study. Although they are two different types of MFIs, they have relatively similar characteristics like lending type, product type, and the only main distinctive feature is their size.

Econometric literature suggests some ways of dealing with multicollinearity problem in the data set. These are: do nothing; increase the sample size or obtain more data, as multicollinearity may not be a problem in large sample above 100 observations (Hsiao, 2007; Churchill and Iacobucci, 2005; Gujarat, 2003) and or omit one or more of the variables causing it (Hair *et al*, 2006; Churchill and Iacobucci, 2005; Verbeek, 2004). Another available solution is to perform variable transformation (Hair *et al*, 2006).

With these solutions in mind, our sample size was relatively large (over 300

[12] The lower VIF threshold is considered to be 5 while the highest is 10.

observations compared to 100 observations, which is considered to be a large sample). We considered dropping the type of MFI variable. However, this could cause an even worse problem of model specification bias if the MFI type variable actually belonged to the model (Hair *et al,* 2006; Wooldridge, 2006; Verbeek, 2004; Greene, 2003; Gujarat, 2003). The effect of dropping a relevant variable from the model is to have biased estimates of the remaining variables (Greene, 2003).

Considering the above discussed ways of dealing with multicollinearity problem in the data set, in the context of this study we adopted the “do nothing” strategy. The “do nothing” strategy was adopted because inclusion of this variable would not affect the estimation of other variables than when dropped (Wooldridge, 2006; Greene, 2003; Gujarat, 2003) as the MFI type variable is one of key variables that were considered in this study as reviewed in the empirical literature review. Additionally, as O’brien (2007) has found, the values of the VIF of 10, 20, 40, or even higher do not, by themselves, discount the results of regression analyses. Furthermore, our sample size was sufficiently large, and we applied panel data analysis which gives more data points that reduces the effect of multicollinearity (Cameron and Trivedi, 2009; Mersland and Strøm, 2008; Hsiao, 2007).

(b) Model Specification

Multiple regressions are based on a set of assumptions that have to be met before running the regression analysis and some tests have been done before interpretation of the result is made. This is required to ensure that the results are what they appear to be. In this section we explain how the model was constructed and specified.

The assumptions underlying the multiple regression are: normality, referring to the shape of the data distribution; homoskedasticity, which requires that dependent variables exhibit equal levels of variance across the range of explanatory variables; linearity association between variables; and absence of correlated errors (Hair *et al*, 2006).

Test for *normality* – we tested the distribution of each of the variables in our study using visual plot for each variable. From the visual plot it was evident that the distribution of some variables was not normal. It was skewed. These are: staff cost per dollar loaned; number of installments for group lending; cost per borrower; average outstanding loan size; MFI size; number of borrowers; number of clients and, term to maturity. To remedy this problem we adopted variable transformation suggested in the econometric literature (Cameron and Trivedi, 2009; Hair *et al*, 2006; Wooldridge, 2006; Verbeek, 2004; Greene, 2003). We transformed the variables to their natural log. The log transformed variables also help to attain linearity in parameter which is a requirement for regression analysis (ibid). The visual plot output indicating the distributions (kernel estimates) before and after the transformation is indicated in Appendix 6(a).

We tested for *serial correlation* in error term using Wooldridge test[13] for autocorrelation in panel data. For this regression assumption, we tested the null hypothesis that there is no first-order autocorrelation. The p-values of the test statistics for the three models: the determinants of financial sustainability; IV regression for FSS and IV regression for breadth of outreach are statistically significant (see Appendix 7 (a) to (c)). We, therefore, reject the null hypotheses because the test statistics are significant indicating the presence of serial correlation.

We further tested for existence of *heteroskedasticity* across the range of explanatory variables using Breusch-Pagan test[14], which tests the null hypothesis that there is no heteroskedasticity (that is there is constant variance or homoskedasticity) across the range of explanatory variables. The p-value of the test statistic for the FSS without instrumental variable (IV) model was statistically significant and, therefore, we reject the null hypothesis of constant variance (see Appendix 8 (a)). We also tested for heteroskedastic errors in IV models using the Pagan-Hall Test for IV Heteroskedasticity. The test statistics were significant indicating the presence of heteroskedasticity across the range of explanatory variables (see Appendix 8 (b) and (c)).

[13] The Wooldridge test for autocorrelation in panel data is executed by the following syntax command **xtserial *depvar indepvars***

[14] We applied ‘hettest’ syntax to execute the Breusch-Pagan / Cook-Weisberg test for heteroskedasticity after running the regression without vce(robust) option.

Regression analysis further requires that the values of dependent variable for two different periods are independent of each other. That is they are stationery. When, however, the value of the current period equals last period's value plus a certain time dependent amount (disturbance) this is called a unit root process (Wooldridge, 2006). When a regression is run in the presence of unit root, the resulting estimates are spurious. That is, results have no economic meaning.

To check for stationarity in the dependent variable we tested for the existence of a *Unit root* in the dependent variable (FSS) based on the Fisher Test[15] for panel unit root using an augmented Dickey-Fuller (ADF) test. We tested the null hypothesis that there is unit root. The p-value (Prob > chi2 = 0.0000) of the test statistic (chi2 (212) = 1248.7472) is statistically significant and we, therefore, rejected the null that there is unit root. The Fisher test combines information from individual unit root tests. According to Verbeek (2004) the measure is attractive because it allows the use of different ADF tests and different time-series length per unit. Bearing in mind that there are serial correlations as indicated above, we employed further a test proposed by Im, Pesaran and Shin (2003) (ipshin[16]) which allows different orders of serial correlation (Verbeek, 2004). The test results indicated a t-bar of -2.788 and W[t-bar] of -7.784 with p-value of 0.0000 which is statistically significant indicating that there is no unit root.

We could not, however, obtain reliable estimates for many lags due to data limitation as we only have four years data. As Wooldridge (2006) has argued, the more lags we introduce in our test the more initial observations we lose. Thus, our results should be interpreted within this limitation. However, as Arellano (2003) has argued, unit roots are not properties of data but rather properties of the model that may or may not be of interest depending on the objective of the study. Thus, for example, the presence of unit root in our model would indicate that the value of the measure of financial sustainability (FSS) is time dependent which also is a good parameter to explain the determinants of FSS. This becomes one of the future research interest areas where the large number of time periods could be used to study not only the presence of unit root

[15] The Fisher test for panel unit root is executed by syntax 'xtfisher *depvar*' after running a regression.

[16] The syntax use is "ipshin *depvar*, lags(_)

but also to explain how large it is in relation to stationary component. Moreover, of all the previous studies in this area, none has tested the presence of unit root. Thus, as data permits, this could be a good research area in the future.

(c) Instrumental Variables Approach

The second objective of our study was to determine the effects of MFIs' financial sustainability on their Breadth of outreach. As mentioned in theoretical background chapter microfinance institutions' breadth of outreach and financial sustainability depend on each other. This relationship creates a simultaneity endogeneity problem whose solution requires the use of simultaneous equation models. In condition where simultaneity endogeneity exists ordinary least squares (OLS) becomes inconsistent estimator due to biasness caused by correlation between regressors and error term (Cameron and Trivedi, 2009; Stock and Watson, 2007; Wooldridge, 2006). According to Wooldridge (2006) the leading method for estimating simultaneous equation models is the method of instrumental variables. It is a general way to obtain a consistent estimator when regressors are correlated with the error term (Stock and Watson, 2007). Thus, the model used was the instrumental variables regression for panel data.

A common instrumental variable regression method is two-stage least squares (Stock and Watson, 2007). Two simultaneous equations were estimated using two-stage least square (2SLS) regression. In Equation 1 where FSS is dependent variable the number of borrowers' variable is one of the explanatory variables. In Equation 2, where number of active borrowers' variable is dependent, one of the explanatory variables is the FSS. The instrumental variables (instruments) were used to estimate the value of the endogenous variables FSS and number of active borrowers in First-stage of the 2SLS regressions before using the same as regressors in the second-stage. Variables used as instruments were selected based on expert judgement. The judgement was based on the first regression output on determinants of FSS. Variables that appeared to be insignificantly affecting the FSS were given first priority of being considered as instruments for outreach (see Appendix 13 (a)).

A first step in model diagnostic when IV is used is to check for instrumental validity. Instrumental validity is required to ensure that consistent estimates are obtained. It requires that both instrument relevance and instrument exogeneity be met (Stock and Watson, 2007). The more the variation in X is explained by the instrument the more the information is available for use in IV regression and, therefore, the relevant the instrument (Stock and Watson, 2007). Instruments that explain little of the variation in X are called weak instruments. Weak instruments can provide poor guide to actual finite-sample distributions (Cameron and Trivedi, 2009). The instruments also need to be exogenous. A variable is exogenous within a particular causal model if its value is not determined within the model. That is, its value does not depend on any of the variables that are determined within the model. When the instruments are not exogenous the 2SLS regression is inconsistent.

Ensuring instrumental relevance is obtained, we investigated for existence of weak instrumental variable (IV) problem in Equation 1 and 2 using F statistic for joint significance of the instruments, a test suggested by Staiger and Stock (1997). The F statistic in a first-stage regression of the endogenous regressor of less than 10 indicates weak instruments. This is a widely used rule of thumb (Cameron and Trivedi, 2009; Stock and Watson, 2007). The F statistics for the FSS instruments was 7.95 (see Appendix 9(a)), while the one for the breadth of outreach instruments was 219.32 (see Appendix 9(d)). Applying the rule of thumb, the F statistics indicated that the instruments for the FSS were weak while the ones for the breadth of outreach were not.

With weak FSS instruments, the properties of the general case of IV estimator (2SLS) can be very poor, and the estimator can be severely biased (Verbeek, 2004). Econometrics literature suggests that in situation where instruments are weak the generalised method of moment (GMM) estimator and limited-information maximum likelihood (LIML) estimator are more reliable than 2SLS (Cameron and Trivedi, 2009; Verbeek, 2004; Greene, 2003). These two estimators are asymptotically equivalent to 2SLS but they have better finite-sample properties than 2SLS. Thus we used the GMM estimator to analyse the effect of FSS on the breadth of outreach using FSS instruments. We further compared the results from the GMM and LIML estimators and found that, although they slightly differ in coefficients and t-statistics, the level of significance on how the independent variables affect the dependent variable are exactly the same (see Appendix 9(g)). Moreover, the F-statistic for weak identification test in the GMM estimator was 14.183, which is above 10, and therefore, the FSS instruments passed the weak test under the GMM estimator (see Appendix 9(b)).

Further checking for instrumental validity, we used over-identifying restrictions to test for instrument exogeneity where there is heteroskedasticity. We tested the null hypothesis that the excluded instruments were valid instrument. The test statistic for variables excluded in FSS and outreach models were not statistically significant (see Hansen J statistic in Appendix 9 (b) and Sargan-Hansen statistic in Appendix 9 (d) for FSS and outreach instruments respectively). We concluded that the instruments are exogenous and therefore valid instruments.

Finally, having confirmed that the instruments were valid instruments, we tested whether endogenous regressors' effects on the estimates are meaningful. That is, whether or not the FSS and outreach variables are really endogenous. We tested the null hypothesis that regressors were exogenous using the Wu-Hausman F test and Durbin-Wu-Hausman Chi-sq test. The p-values of the test statistics were statistically significant (see Appendix 9 (c) and (f)) indicating that the FSS and outreach are endogenous variables and that the simultaneous equation models were the appropriate model to be used.

(d) Random Effect versus Fixed Effect Model

This study used panel data models where the random effect and fixed effect models could be used to estimate the relationships among variables and thereby taking care of the omitted variables. Deciding on whether the random effect (RE) model or fixed effect model (FE) was an appropriate model for this study depended on whether the individual effect were fixed or random. According to Cameron and Trivedi (2009) if the effects are fixed the random effect model estimators are inconsistent and fixed effect model should be used and vice versa.

To check which of the two (RE and FE) models provided consistent estimates; we employed the standard Hausman test suggested in the econometric literature (Hsiao, 2007; Baltagi, 2005; Greene, 2003; Gujarati, 2003). The Hausman test tests the null hypothesis that RE provides consistent estimates compared to FE model. The test results for the two models, FSS without IV and, FSS with IV were not statistically significant (at 5% significance level). Thus, we could not reject the null hypothesis that RE provides consistent estimates (see Appendix 10 (a) and (b)) for detailed Hausman test results).

(e) Random Effects versus Pooled OLS Model

We further checked for the appropriateness of using the RE model as opposed to pooled OLS. The advantage of using pooled OLS as opposed to the RE model especially when there are no random effects is that we are not "attempting to allow for non-existent within-group autocorrelation" and we can take advantage of "finite-sample properties of OLS instead of having to rely on asymptotic properties of random effects" (Dougherty, 2006:416). We applied the Breusch and Pagan Lagrangian multiplier test for random effects[17]. The test statistics for both models namely the FSS without IV and FSS with IV were statistically significant which indicated existence of random effects (see Appendix 11 (a) and (b) for detailed test results). We, therefore, rejected the null hypotheses that there were no random effects. This indicated that the pooled OLS regression would have not been appropriate (Cameron and Trivedi, 2009; Dougherty, 2006; Verbeek, 2004). Thus, we concluded using the RE panel models.

Finally, we estimated the regression models to explain the determinants of financial sustainability and the cause effect relationships between outreach and FSS. The three models in Chapter 5 namely: the FSS without IV; FSS with IV; and breadth of outreach model, were estimated using heteroskedastic and autocorrelation consistent standard errors[18] as suggested in econometric literature (Cameron and Trivedi, 2009; Wooldridge, 2006; Verbeek, 2004). This was done to remedy the heteroskedasticity and autocorrelation problems explained above.

[17] We applied "xttest0" syntax after the xtreg command which execute the LM test for random effects (Cameron and Trivedi, 2009).

[18] We used vce(robust) option in the normal xtreg command, and vce(bootstrap) for xtivreg. (see Cameron and Trivedi, 2009)

4.4.2 Microfinance Efficiency and Financial Sustainability

In Chapter 6 we link the microfinance efficiency to their financial sustainability. This section explains the econometric analysis approaches used in Chapter 6. The section covers the correlation analysis and variable selection, model specification, the choice between random effect and fixed effect models, and the choice between random effect and pooled OLS.

(a) Correlation Analysis and Variable Selection

Again in this section, pairwise correlation analysis was done to facilitate the selection of variables to be included in the model used in Chapter 6. The analysis shows no strong correlation among the variables. The highest correlation coefficient is 0.7418 for administrative cost per borrower and cost per client. The cost per client also has the highest variance inflation factor (VIF) of 3.43, and the mean VIF is 1.93. Using our previous threshold of highest VIF of 10, this indicates that there is no variable to cause the multicollinearity problem. The detailed pairwise correlations are in Appendix 4(b) and the VIFs are included in Appendix 5 (b).

(b) Model Specification

This sub section explains the model specification approach used in Chapter 6 which links microfinance efficiency and financial sustainability. As we did for Chapter 5, we checked to ensure that our model meets the basic regression assumption of normality. On this we established the distribution of each variable using visual plot for each variable. We observed from the visual plot that most of the variables did not meet the *normality assumption* and *linearity*. These are: the liquidity ratio; number of borrowers per staff; staff cost per borrower; administrative expenses per borrower; financing expenses per borrower; cost per client; operating expenses ratio; and the average disbursed loan size. Again, to remedy this we adopted variable transformation using log transformation. The log transformed variables also help to attain the linearity in parameters which is a requirement for the regression analysis (Cameron and Trivedi, 2009; Hair *et al*, 2006; Wooldridge, 2006; Verbeek, 2004; Greene, 2003). The distribution of these variables before and after the transformation can be seen in Appendix 6(b).

In addition to normality and linearity check, we checked for serial autocorrelation in error term using the Wooldridge test for autocorrelation in panel data. We tested the null hypothesis that there is no first order autocorrelation. The test statistic was statistically significant (see Appendix 7(d)). We, therefore, could not reject the null that there was no first order autocorrelation.

We also tested for the existence of constant variance (homoskedasticity) assumption. We used the Breusch-Pagan test, which tests the null hypothesis that there is no heteroskedasticity across the range of explanatory variables. The test statistic was statistically significant and, therefore, we rejected the null (see Appendix 8(d)) for detailed test results. Again, to remedy the autocorrelation and heteroskedasticity, we ran our model with autocorrelation and heteroskedasticity consistent errors. Moreover, because in Chapter 6 the dependent variable is FSS as in Chapter 5, we did not recheck for the unit root as we had done it in the previous sections.

(c) Random Versus Fixed Effect Models

Choosing between random effect (RE) and fixed effect (FE) models we employed Hausman test which compares the coefficients of two estimators where one is considered consistent under null hypothesis (Cameron and Trivedi, 2009). We tested the hypothesis that RE provides consistent estimates compared to FE model. The Hausman test statistic was not significant (see Appendix 10 (c)) and, therefore, we could not reject the null. This indicated that the RE model gives consistent result.

(d) Random Effects versus Pooled OLS Model

We further checked for the appropriateness of using the RE as opposed to pooled OLS using the Breusch and Pagan Lagrangian multiplier test for random effects as we did for models used in Chapter 5. The test results indicated the p-value of the test statistic to be statistically significant (see Appendix 11 (c)) which indicated an existence of random effects. We, therefore, rejected the null hypothesis that there were no random effects. Once again, this indicated that the pooled OLS regression wouldn't have been appropriate. Thus, we used the RE model.

4.4.3 Determinants of Financial Sustainability and Stages of Development

In Chapter 7 we trace the effects of the determinants of financial sustainability of microfinance institutions to their sustainability at start-up and growth stages, using the indicators of financial sustainability at each of the stages. This section explains the econometric analysis approaches used for the data analysis in Chapter 7. The section covers the correlation analysis and variable selection, model specification, the choice between random effect and fixed effect models, and the choice between random effect and pooled OLS.

(a) Correlation Analysis and Variable Selection

We conducted the correlation analysis for variables used in Chapter 7, as we did for Chapter 5 and 6. We found that the average outstanding loan size and staff cost per borrower were highly positively correlated with a correlation coefficient of 0.7737 (earnings ratio model). Other high correlations were between: the term to maturity for group and individual lending, correlated at 0.7826 (cost per loan model) and the number of instalment for individual and group lending at 0.8076 (financial productivity model). No other variables had higher correlation coefficients to alarm for multicollinearity problem. We then estimated the variance inflation factor (VIF) to establish existence of multicollinearity problem and found none. The mean VIF of all models were less than 5. Thus, we concluded that multicollinearity was not a problem for variables used in this chapter. The detailed pairwise correlation analyses are in Appendix 4 (c) to 4(g), while the VIFs for the variables used in Chapter 7 are included in Appendix 5(c) to 5(i).

(b) Model Specification

This section spells out the procedures used in the model specification. The section covers the function form and the test for basic regression assumption and the choice between random and fixed effects models.

We checked if the variables used in Chapter 7 met the basic regression assumptions. We focused our attention on variables that had not been used in our previous Chapters 5 and 6. These variables which are new are earnings ratio, cost per loan, financial productivity, and Operational Self-sufficiency. We adopted variable transformation for variables which did not meet the basic normality assumption. These are earning ratio, cost per loan and, financial productivity. The visual plot output indicating the distributions (kernel estimates) before and after the transformation of these variables is indicated in Appendix 6(b)

We also tested for homoskedasticity assumption using Breusch-Pagan test, which tests the null hypothesis that there is no heteroskedasticity. That is, there is constant variance or homoskedasticity across the range of explanatory variables, and existence of the autocorrelation in our models. For all the models: the determinants of earnings; the determinants of liquidity; portfolio at risk; cost per loan; and financial productivity; and OSS, the test results indicated the existence of heteroskedasticity across the range of explanatory variables. Moreover, the results also indicated that except for the determinants of PAR model, autocorrelation also existed in other remaining models. See Appendix 7(e) to 7(k) for autocorrelation results and Appendix 8(e) to 8(k) for heteroskedasticity results. Thus, we ran the model with heteroskedasticity and autocorrelation robust standard errors as suggested in econometric literature (Cameron and Trivedi, 2009; Wooldridge, 2006; Verbeek, 2004).

(c) Random Versus Fixed Effect Models

Finally we tested for the appropriateness of the random effect or fixed effects models to be used for data analysis in Chapter 7. We applied the standard Hausman test to test the hypothesis that RE provides consistent estimates compared to FE model. For the *determinants of earnings ratio* model; the *determinants of portfolio at risk* (*PAR)* model; and the *determinants of Operational Self-sufficiency models* (both outreach and efficiency related variables), the Hausman test statistic was not significant indicating that RE model provided more consistent estimates than the FE model (see Appendix 10(d), 10(f), 10(i) and 10(j)). Thus, for these, we used the RE models. However, for the remaining models namely the *determinants of liquidity model;* the *determinants of cost per loan* and the *determinants of financial productivity* the Hausman test statistics were statistically significant (see Appendix 10 (e), (g), and (h)), which indicated that RE wouldn't have provided consistent estimates than the FE. We, therefore, used the FE models.

(d) Random Effects versus Pooled OLS Model

We applied the Breusch and Pagan Lagrangian multiplier test for random effect to check whether or not we should use RE instead of pooled OLS. We tested the null hypothesis that there were no random effects and thus, the pooled OLS was appropriate. For all of the models where the RE were selected instead of the FE, the Breusch and Pagan Lagrangian multiplier tests statistics were statistically significant indicating existence of random effects, in which case, using the pooled OLS was not appropriate (see Appendix 11 (d) to 11(g)). We, therefore, decided to use the RE models.

CHAPTER 5
OUTREACH AND FINANCIAL SUSTAINABILITY

"Two objectives are paramount for a rural financial institution to be successful: financial self-sufficiency and substantial outreach to the target rural population" (*Yaron, 1994:49).*

5.0 INTRODUCTION

"Many microfinance organizations are inefficient because they think only in terms of outreach, not in terms of both outreach and sustainability" Gonzalez-Vega, 1998:5). Outreach and sustainability relate to each other. That is, while outreach may bring about sustainability, the sustainability enhances outreach (Navaajas *et al*, 2000). According to Chetan (2007) and Woller and Schreiner (2002) profitability and outreach objectives are not mutually exclusive. Copestake (2004) asserts that profitability is necessary to sustain both breadth and length of outreach in search of improving poor people's access to financial services.

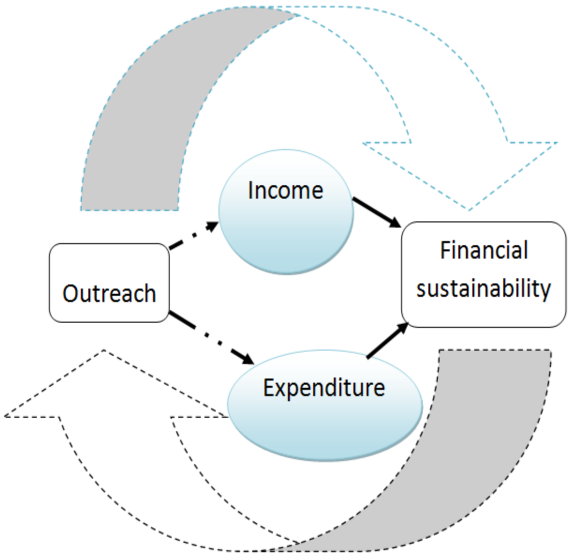
This chapter links outreach and financial sustainability, based on the accounting profitability theory as explained in Chapter 3 in order to study factors affecting financial sustainability of rural microfinance institutions in Tanzania. The accounting profitability theory is used to explain various factors that can affect the number and riskiness of clients, the income and expenses of an MFI and, therefore, their profitability. First, we investigate what of the factors reported in previous studies as significantly affecting the financial sustainability of microfinance institutions also apply to rural MFIs in Tanzania. Second, we link financial sustainability to outreach in search of identifying causality and dependability between the two. We attempt to show how not only the microfinance breadth of outreach affects the financial sustainability but also how the financial sustainability affects the breadth of outreach.

The chapter is structured as follows: We begin the chapter by explaining the conceptual framework for outreach and sustainability. This is the first part in this chapter. Part two of this chapter presents the empirical theory based on the literature reviewed on outreach and financial sustainability thereby indicating the linkage and interdependence between the two. The third part of the chapter presents the specific research questions identified as gaps in the reviewed literature. They are the main focus of this study. Part four describes the variables and their measurement. This is followed by the descriptive results. The last section presents the econometric results.

5.1 CONCEPTUAL FRAMEWORK FOR OUTREACH AND SUSTAINABILITY

From the accounting profitability theory presented in Chapter 3, we summarise the relationship between outreach and financial sustainability in the following conceptual framework.

Figure 5-1: Outreach and Financial Sustainability Conceptual Framework



The conceptual framework in Figure 5-1 indicates two way relationships between outreach and financial sustainability. While outreach could lead to financial sustainability, the financial sustainability enhances the microfinance institutions' outreach. Factors that affect outreach may affect both income and expenses and, therefore, profitability of a MFI. These factors are size of microfinance, microfinance product delivery methodology, and dimensions of outreach. The dimensions of outreach are: depth of outreach (measured by loan size); breadth of outreach (measured by number of clients reached); cost of outreach (interest rate and other transaction related costs); Scope of outreach (types of products), and length of outreach (time frame within which a client enjoys the product or service). The empirical theory indicating the relationships between outreach and financial sustainability is presented in the next section.

5.2 EMPIRICAL THEORY

Studies indicate contradicting relationship between outreach and sustainability. On one hand, there are studies that indicate an existence of a trade-off between making profit (financial objective) and reaching the poorest also called social objective (Hermes *et al*, 2008; Hermes and Lensink, 2007; Makame and Murinde, 2006; Olivares-Polanco 2005; Conning, 1999; Paxton and Cuevas, 1998; Hulme and Mosley, 1996; Von Pischke, 1996). A debate on the trade-off between profit and outreach is based on whether MFIs should pursue the financial objective (profitability) instead of social objective (outreach) or otherwise. Moreover, whether the MFIs should target the poor or the very poor has been an issue of debate in recent years. It has been argued that a MFI that abandons the poor by selling big loans and big deposits is not a sustainable MFI because it no longer supplies microfinance (Schreiner, 2000). Without the poor, a supposed MFI is no longer different from a bank (Hulme and Mosley, 1996).

On the other hand, however, there are studies which indicate non-existence of trade-off between outreach and sustainability (Paxton, 2003; and Woller and Schreiner, 2002; Navajas *et al*, 2000; Schreiner, 2000). It has been reported that sustainability affects outreach (Navajas *et al*, 2000) and the market for microfinance cannot be saturated if MFIs are not making profits (Schreiner, 2000). The argument put forward is that without profits MFIs will be unable to sustain their operations (Schreiner, 2000). Moreover, a study by Woller and Schreiner (2002) has revealed that outreach and sustainability depend on each other indirectly. This further suggests the non-existence of trade-off between outreach and the financial sustainability of microfinance institutions.

Contributing to a debate as to whether there exist trade-offs between outreach and sustainability, Paxton (2003) suggests the Poverty Outreach Index (POI) as a meaningful measure to capture how outreach varies with poverty measures. Her argument is that, the way poverty indices are set could affect the results in determining whether or not a trade-off between outreach and sustainability does exist. POI measures the impact of MFI's programme in providing access to financial services. It does not however, consider the different levels of poverty among clients. Thus, in this study where the focus is not to assess the impact of MFIs in providing access to financial services but rather to determine the factors affecting financial sustainability, the POI becomes less useful[19].

The next sections discuss the dimensions of outreach developed by Schreiner (2002) which are used to study the relationship between outreach and profitability. These are: breadth of outreach; depth of outreach; cost of outreach; scope of outreach (types of products), and length of outreach. Schreiner's dimensions of outreach have also been used in other studies to explain determinants of financial sustainability (Mersland and Strøm 2008; Woller 2006; Woller and Schreiner, 2002). The same aspects are also used by the USAID when evaluating the performance of microfinance institutions (Mersland and Strøm 2008).

5.2.1 Breadth of Outreach

The breadth of outreach refers to the number of poor served by a microfinance institution (Hishigsuren, 2004; Woller and Schreiner, 2002; Navajas *et al*, 2000; Ledgerwood, 1999). Various studies have used either the number of borrowers or number of clients as measures of microfinance breadth of outreach (Mersland and Strøm, 2009; Hermes *et al*, 2008; Kyereboah-Coleman and Osei, 2008; Mersland and Strøm, 2008; Hartarska, 2005; Hishigsuren, 2004; Woller and Schreiner, 2002; Woller 2000). It is generally assumed that the larger the number of borrowers or clients the better the outreach. According to LOGOTRI (2006) the number of borrowers is the biggest sustainability factor. Thus, larger numbers of clients would lead an MFI to become more sustainable. However, this argument may be strong if and only if all other things are held constant. Otherwise, the volume in itself may lend no big impact on sustainability. To substantiate this, one would need to consider the Grameen bank[20] with a very broad client base but it has not yet attained self-

[19]For weaknesses of POI see Ledgerwood (1999:225)

[20] This refers to Grameen bank before it was restructured to form Grameen II. Thus, the statement refers to Grameen I.

sufficiency (Conning, 1999) although it remains to be among the best examples in the microfinance industry.

The study by Woller (2000) on nine village banks found that the number of borrowers and cost per borrower were among the variables most highly correlated with financial self-sufficiency. However, in another study, Woller and Schreiner (2002) report that the number of borrowers had no significant impact on financial self-sufficiency. This finding is supported by a finding by Hartarska (2005). The difference in findings between Woller and Schreiner (2002) and Woller (2000) could be attributed to methodological differences in the two studies. While Woller (2000) used a bi-variate correlation, studies in Hartarska (2005) and Woller and Schreiner (2002) used multiple regression analysis approach. The two should not necessarily give the same result. These findings indicate that the number of borrower may or may not affect the financial sustainability of an MFI. This study analysed the relationship between the number of borrowers and the financial sustainability in Tanzanian context to explain whether or not the number of borrowers affect the financial sustainability.

5.2.2 Depth of Outreach

The depth of outreach refers to the value the society attaches to a net gain of a given client (Navajas *et al*, 2000). Hulme and Mosley (1996) assert that without the poor, a supposed MFI is no longer different from a bank. Their argument is that, outreach should not be measured by just total number of clients but it should rather be based on the number of poor clients. This is because, in the total number of microfinance clients there could be some who are non poor. According to Ledgerwood (1999) the number of clients as a measure of outreach considers only the total number of clients served from various products of an MFI without their relative level of poverty. Microfinance's loan size (average loan size) has been used as a proxy measure of depth of outreach (using relative level of poverty). Smaller loans indicate poorer customers (Mersland and Strøm, 2009; Cull *et al*, 2007; Adongo and Stork 2006; Hartarska, 2005; Woller and Schreiner 2002; Schreiner, 2001).

While the average loan size is widely used as a measure of depth of outreach (Cull *et al,* 2007; Adongo and Stork, 2006; Hartarska, 2005; Woller and Schreiner 2002;

Hulme and Mosley, 1996), Woller *et al* (1999) suggested the use of variability in loan size or for median loan size which they consider to be superior measures to average loan size. Their argument was that the average loan size is crude and flawed. That is, it does not consider the relative number of the poorest with small loan sizes. Moreover, the majority of microfinance clients may be average poor or non poor whose loan sizes are relatively large and, therefore, could easily influence the computed average loan size figure. However, using variability in loan size or median loan size requires disaggregated data which may not be readily available. Under such circumstances, still researchers use average loan size as proxy measure of depth of outreach. As Woller (2002b:19) has asserted the average loan size is "both generally accepted and widely available, so it is the best we have to work with ..." In addition to this, this study attempts to use initial minimum loan size as a measure of poor client. The study assumes that, the smaller the loan size, the poorer the clients will be targeted and all being equal, reached, which indicates the depth of outreach.

According to Woller and Schreiner (2002) the relationship between depth of outreach and financial self-sustainability is multidimensional. Each relates to the other indirectly. In their study, Woller and Schreiner (2002) found that depth outreach (as measured by average loan size) has a positive relationship with financial self-sufficiency. Woller and Schreiner's finding as they put it, is evidence against a wide spread belief that small loans are highly-risky and associated with lower financial sustainability. Contrary to the findings by Woller and Schreiner (2002) the study by Adongo and Stork (2006) reports that both loan size and number of loans are positively associated with financial sustainability.

Although delivering small loans to the poor and the relatively hard-to-reach clientele is 'inherently' costly (Conning, 1999 and Hulme and Mosley, 1996), a recent study by Cull *et al* (2007) indicates that institutions that make smaller loans are not less profitable on average compared to those making bigger loans (Cull *et al,* 2007). Moreover, it has been reported that there is a negative correlation between the depth of outreach and the subsidy dependency index (Fruman and Paxton, 1998). This indicates that profitability and the depth of outreach can be attained simultaneously.

The loan size, however, should be used with caution. As Woller and Schreiner (2002:12) have put it, ‘the average loan size may not measure what we think it measures’ because there is no evidence to support it apart from the current evidence that only non poor apply for larger loans (Dunford, 2002; Woller and Schreiner 2002). Moreover, when there is varying term to maturity as asserted by Schreiner (2001), the average loan size will lead to misleading conclusion. This comes from the fact that the finance is the exchange of resource through time, and thus, measures of loan size should account explicitly for the passage of time.

This study follows the previous studies’ approach of using average loan size as a measure of the depth of outreach by applying the Schreiner’s (2001) aspects of loan size as a measure of breadth of outreach which appears to be more comprehensive. In addition to this, the study introduces the use of initial minimum loan size as a measure of the depth of outreach. We understand that most clients’ loan size will be above the minimum initial loan size especially where loan graduation scheme is followed. That is, clients are given large loans after fulfilling repayment requirements on smaller loans. However, when this is the case, the same implies positive impact on clients and microfinance profitability. The smaller minimum initial loan size, all things being equal, ensures that even the poorest of the poor can have access to borrow from an MFI. Thus, we consider it to be a positive indicator of microfinance outreach when targeting the poor is considered.

5.2.3 Cost of Outreach

The cost of outreach to an MFI client refers to interest rate paid and other related costs as a result of receiving financial services from an MFI. It is a cost of loan to a borrower. According to Navajas *et al* (2000) the cost of outreach is the highest amount the borrower would agree to bear to get the loan. It follows, therefore, that, the less the cost of outreach the more clients will be willing to join the microfinance (all things being equal). Interest charges could be used as a measure of cost to clients (Mersland and Strøm, 2008). The difference between this cost to borrower and the benefits received from the loan is known as incentive constraint (Armendáriz and Morduch, 2007). The higher the incentive constraint, the more incentive to the borrowers to repay, all things being equal, the larger the number of clients will be.

To the lender (microfinance) the higher the incentive constraint would mean less income to an MFI if it decides to charge low interest rate.

Financial sustainability is the ability of MFI to cover all its operating and financing costs from program revenue. A major part of revenue is return from loans portfolio (Tellis and Seymour, 2002 and Thapa *et al*, 1992). The amount of return will depend on the interest rates charged and the volume of loan outstanding. The latter will depend on average loan and the number of loans remaining outstanding. This would mean that, all things being equal, the more clients MFIs have that take loans, at the same or higher interest rates the higher the revenue.

From finance point of view, the determinant of how much financing should be done is not based only on how much is the cost of capital but also how much contribution will the same finance add to shareholders' wealth (Brealey and Myers, 2000; Vanhorn and Wachowitz, 1995). This means that, the level of interest in itself may not be the sole determinant of the amount of loan that will be demanded. It comes, therefore, that, the investment opportunities will, among other things, determine the amount of loan required given that the return from investments are higher than the interest rate (Morduch, 2000 and Rosenberg, 1996).

The above argument assumes that the sole purpose of loan demand is investment. There is, however, evidence that poor households who also are clients of these MFIs are borrowing not for investment purposes but just to meet short-term consumption needs (Karlan and Goldberg, 2007). According to Adongo and Stork (2006) any credit advanced to these poor people will most probably be consumed rather than invested in something that generates a return sufficient to repay the debt.

The cost of outreach from the lenders' perspective means the costs incurred by a microfinance institution to reach the poor. This includes the transaction costs. The higher the costs required to be paid by clients would mean reduced number of clients, and increased income to an MFI. On the other side the higher the cost incurred to serving its clients would mean a reduced profitability to an MFI.

Studies have reported that MFIs that target the poorest borrowers have "higher staff costs per dollar loaned" which implies reduced profitability Conning (1999:51).

These MFIs also generate revenue sufficient to cover just 70 percent of their full cost (Morduch, 2000). This implies that in order to achieve sustainability, the MFIs that target poorer borrowers 'must charge higher interest rates' (Conning, 1999:51). Charging higher interest rates, which could lead to profitability, may however, price the poorest out of the microfinance services and thereby adversely affecting the attainment of the social objective of the MFIs (Morduch, 2000). This implies that charging higher interest rate may be necessary but not sufficient condition to attain financial sustainability. This study attempts to explain how the cost of outreach affects the financial sustainability of rural microfinance institutions in Tanzania.

5.2.4 Scope of Outreach (MFIs Product Ranges)

In addition to the depth of outreach, MFIs should think of enhancing the attainment of sustainability by providing a broader range of financial services to the poor. These may include savings, credit, insurance cover, and house loans (LOGOTRI, 2006) depending on economic environment and customer needs. The larger the number of types of products the larger the number of clients (breadth of outreach) will be expected to be served by the microfinance institution. It has been reported that the demand for saving facilities far exceeds the demand for loans (Woller 2002). Savings and deposits to microfinance institutions, especially member based MFIs, make a larger and most reliable source of capital to these MFIs. Moreover, non-loan products like savings and deposits could be more useful to poor clients as these products do not need demonstration of credit worthiness.

Researchers suggest that the main determinants of microfinance sustainability are proper or demand driven products and proper product delivery methodology incorporating clients' cash flow patterns and timing (Armendáriz and Morduch, 2007; Chetan, 2007). As Morduch (2000) has put it, mechanisms clearly matter. Morduch was referring to the cheaper ways to deliver the financial services to the poor. This calls among others, proper product pricing, cost effective accounting system and management structure, and emphasis on demand driven product. Morduch's argument is consistent with MkNelly and Dunford (1996), which reports that other MFI programs such as the village banks found substantial benefits in bundling financial services with client education. That is, broader mix of financial products and services at more favourable interest rates has also made MFIs to expand their outreach to more low- and middle-income clients (Richardson and Lennon, 2001). Good MFIs staff and customer relationships are also important. Navajas *et al* (2000) argue that the scope of outreach strengthens the length of outreach and sustainability. Thus, we considered the scope of outreach to be one of the factors that could affect the financial sustainability of rural microfinance institutions in Tanzania.

5.2.5 Length of Outreach

To serve the poor, the microfinance institutions have to exist for a reasonable long period of time. MFIs can attain this through either subsidization as it is with the welfarists' view or sustainability (institutionists' view). With loan graduation scheme, where borrowers move from relatively small loans to larger loans amounts, the length of outreach serves in promoting higher repayment rates on the part of the borrowers. This is because if borrowers feel that the microfinance institution will not continue to give loan they will not have any incentive to repay their current loans.

According to Navajas *et al* (2000) financial sustainability also ensures that employee' employment contracts are secure. Woller (2002b) claims that commercialization of microfinance institutions (adoption of commercial principles to MFIs) could lead an MFI to making profit which transforms to financial sustainability and higher ability to reach large number of the poor (breadth of outreach) and length of outreach. However, as the length of outreach relates to sustainability, more length in short term requires more profit. This would mean higher costs to clients and, therefore, reduced number of clients (Navajas *et al,* 2000). Whether or not an MFI will exist long enough to serve its clients is a sustainability issue and, therefore, it cannot be used as an explanatory variable to explain financial sustainability.

5.2.6 Size of an MFI

Another factor that can affect the level of outreach of an MFI is its size. The size of an MFI is measured by the value of its assets (Mersland and Strøm, 2009; Hermes *et al,* 2008; Mersland and Strøm, 2008; Bogan *et al,* 2007; Hartarska, 2005; Lafourcade *et al*, 2005). According to Cull *et al* (2007) the size of an MFI is significantly positively linked to its financial performance. Large micro banks on average have lower measures of outreach (Cull *et al*, 2007). This is probably due to scaling up of institutions whereby most institutions, motivated by higher profit motives, just focus on wealthier clients, leaving the poorest financial needs unattended (Christen, 2000 and Woller, 2002). This is consistent with the worry that the move towards financial self-sufficiency could lead to mission drift, where the poorest are not served.

Cull *et al* (2007:110) suggest that 'whether or not large institutions serve an absolutely greater number of the poor can be well answered with disaggregated data'. Getting disaggregate data, however, has not been an easy task. As a result, studies have used the number of borrowers to measure the relationship between outreach (number of borrowers reached) and profitability (Mersland and Strøm, 2009; Hermes *et al*, 2008; Kyereboah-Coleman and Osei, 2008; Mersland and Strøm, 2008; Lafourcade *et al*, 2005; Hishigsuren, 2004; Schreiner, 2000; Woller 2000). They have also used the number of borrowers to measure whether the size of microfinance affects its outreach (Mersland and Strøm, 2009; Hermes *et al*, 2008; Mersland and Strøm, 2008; Lafourcade *et al*, 2005).

While Hartarska (2005) found that the size of an MFI did not significantly affect its financial sustainability, recent studies by Mersland and Strøm (2009) and Bogan *et al* (2007) have reported that the size of a microfinance institution is associated with its financial sustainability. Furthermore, the size of microfinance could also imply that large microfinance institutions have larger capital and, therefore, can reach a relatively bigger number of clients than small microfinance institutions. A study by Kyereboah-Coleman and Osei (2008) supports this. In their study on outreach and profitability of microfinance institutions in Ghana Kyereboah-Coleman and Osei (2008) found that the size of an MFI had significant positive impact on profitability. This study investigates the effects of the size of an MFI on its financial sustainability. The study also uses the number of borrowers as a measure of microfinance outreach to study how the financial sustainability and outreach depends on each.

5.2.7 MFIs Capital Structure

The composition of the various sources of capital to an MFI is known as capital structure (Bodie *et al,* 2009; Brealey *et al,* 2006; Martin *et al,* 1991; Puxty *et al,* 1990). That is, the different sources of capital make a capital structure of an MFI. According to Amidu (2007) the size of microfinance institutions will determine their capital structure. Robinson (2001) asserts that a large number of clients depend on microfinance commercial sources of funds, which in turn depends on institutional sustainability. This suggests that microfinance institutions with higher capital are expected to have more clients than those with less capital. Apart from the volume of capital, that is, the amount of capital of an MFI, the combination of various components of the capital could also affect profitability and, therefore, sustainability of microfinance institutions.

There are different sources of capital from which an MFI may tap. These include loans, savings, deposits, and shares (Bogan *et al*, 2007; Kyereboah-Coleman, 2007; Fehr and Hishigsuren, 2006; Farrington and Abraham, 2002; Woller and Schreiner 2002). Woller and Schreiner (2002) perceives saving to be a more stable source of long-term capital than donation and, that its demands exceeds that of loans.

Studies have been conducted to explain whether the capital structure determines the sustainability of microfinance institutions (Bogan *et al,* 2007; Kyereboah-Coleman, 2007). Kyereboah-Coleman (2007) for example, found that the capital structure affects the outreach of an MFI. He also found that highly leveraged microfinance institutions' have higher ability to deal with moral hazards and adverse selection than their counterparts with lower leverage ratios. Bogan *et al* (2007) conducted a study to ascertain whether capital structure affects the financial sustainability of an MFI. They found that microfinance institutions' capital structures were associated with their financial sustainability. With these findings in mind, this study seeks to analyse and explain the relationship between capital structure and the financial sustainability of rural microfinance institutions in Tanzania.

5.2.8 MFIs Ownership

The MFIs' capital structure may also explain the ownership of the microfinance institution especially where the providers of capital are not donors but investors. For example, owners of a member-based MFI will be members while the government will be the owner of a governmental microfinance institution. Whether MFIs' ownership can affect its performance and financial sustainability has been a question of concern among researchers. Mersland and Strøm (2008) for example, conducted a study to explain whether shareholder owned MFIs perform better than non-governmental MFIs. In their study, they found that ownership had minimal effect on the performance of a microfinance institution.

On the other hand, studies indicate that non-governmental microfinance institutions perform better in outreach and poorly in profitability when compared with other MFIs (Mersland and Strøm, 2009; Hartarska and Nadolnyak, 2007). This study analyses the relationship between ownership structure and sustainability and explain whether the ownership structure, captured by MFI type, affects the financial sustainability of the MFIs in Tanzania.

5.2.9 Age of an MFI

Sustainability could also relate to the age of MFIs. The age refers to the period that an MFI has been in operation since its initial inception. Studies indicate that the MFIs' age relates to their efficiency and growth in terms of outreach especially in the early years of operations (CGAP, 2009; Cull *et al*, 2007; Gonzalez, 2007). Basing on Micro-banking Bulletin data (MBB), Robinson (2001) found that experienced microfinance institutions (those with age above six years) were 102 percent financially self sufficient. Those which were in 3 to 6 years of age were 86 percent financially self sufficient, while it was 69 percent for those in operation for less than 3 years. The findings by Robinson (2001) imply that the age of microfinance can affect its financial sustainability level. Robinson (2001) also reports that mature MFIs can achieve substantial outreach to the poor. Moreover, Bogan *et al* (2007) and Cull *et al* (2007) also found that the age of a microfinance institution relates to its financial sustainability.

In contrast to the findings by Bogan *et al* (2007); Gonzalez (2007); and Robinson (2001) a study by Kyereboah-Coleman and Osei (2008) reports that the age of an MFI is insignificant in determining the level of outreach. The contradiction between these studies pose a knowledge gap as to whether for rural microfinance institutions in Tanzania the age of microfinance is relevant in determining its outreach or not, and how the same affects its sustainability.

5.2.10 Geographical Location of an MFI

The geographical location of an MFI is another factor that can affect its outreach (Hartarska, 2005; Woller and Schreiner 2002; Woller 2002b; Navajas *et al*, 2000). A study by Navajas el al (2000) found that rural lenders had deeper outreach than urban lenders. This indicates that geographical and economic area may affect the number of poor clients served by an MFI. That is, an area with relatively more poor people tends to have more MFIs clients. The reason for this could be the above-poor clients can have access to more alternative providers of financial services than the poor ones. Moreover, different geographical location would also mean different investment opportunity and, therefore, difference in worth to users (Navajas *et al*, 2000). Investment opportunities are important to generate repayment capacity (Gonzalez-Vega, 1998).

Whether the geographical location of an MFI can affect how it attains financial sustainability remains to be a question of concern to researchers. On one hand, for example, Bogan *et al* (2007) report that region differences are not significantly affecting how microfinance institutions attain financial sustainability. On the other hand, however, Woller *et al* (1999) explaining the findings by Bennet *et al* (1996) claim that financial sustainability is very difficult to be attained by microfinance institutions operating in harsh socio-economic conditions and geographically isolated communities. Moreover, Woller (2002b) claims that it is expensive to deliver financial services to the poor in geographically isolated places. Hartarska (2005) found that improved infrastructures are positively related to financial sustainability of an MFI. This implies that the geographical location of an MFI may affect how it attains its financial sustainability.

In this study, no attempt is made to explain how and why geographical location would mean difference in worth to users as in Navajas *et al* (2000). This will be a good avenue for future studies. We also understand that, geographical location is a proxy for some differences which may not be clearly specified and hence calling for future research. This study, however, documents whether or not the geographical location could affect the performance of microfinance institutions in terms of outreach and financial sustainability.

5.2.11 Microfinance Product Delivery Methodology

The ways loans are given is referred to as lending type (Mersland and Strøm, 2009). There are three types of lending also known as liability structure of MFI loans. These are group based, individual based, and institutional based. The group lending involves few members (commonly 5 members) in which each group member guarantees the other members repayment. In individual lending type, an individual guarantees himself or herself to pay through collateral of some sort. The last type of lending is the institutional lending. This is an extension of group lending concept to a larger group like village banking, who are responsible for managing the loan provided by MFIs (Karlan and Goldberg, 2007).

While the study by Hartarska (2005) found that MFI's lending type did not influence its financial sustainability, other studies have shown that lending type may affect both the number of clients and operating costs of an MFI (Mersland and Strøm, 2009; Armendáriz and Morduch, 2007; Cull *et al,* 2007; Navajas *et al,* 2003; Navajas *et al,* 2000). Navajas *et al* (2000) found that group lending technology had more potential for deeper outreach because of the joint liability (as security) that replaces physical collateral. The findings on their study based on five Bolivian lenders found that group lenders reached the poor better than individual lenders.

A recent study by Mersland and Strøm (2009) indicates that, outreach, as measured by the number of borrowers, is reduced with individual lending methodology. The findings by Mersland and Strøm (2009) are similar to the findings by Cull *et al* (2007) that microfinance institutions using group lending technology have higher outreach, as measured by the number of poor clients, than those using individual lending technology. On the other hand, however, joint liability has high transaction and cash costs to borrowers especially where they are required to pay for a defaulting member. This may affect the number of non-risky potential clients (Armendáriz and Morduch, 2007).

The concept of group lending suggest that, group lending should be positively influencing financial sustainability for MFIs because the peer pressure that group members exert on each other should lead to lower default rates. Although delivery to a group is often less expensive than delivery to an individual, (CIDA, 1999:65), group lending suffers from high monitoring costs, and high default risk from inherent group formation problems (Marr, 2006)[21]. A study by Adongo and Stork (2006) found that group lending was negatively associated with financial sustainability. Moreover, for customers who are less poor, and, therefore, are willing to invest in large business, and, therefore, requiring large amount of loans, the group lending method becomes cumbersome (Cull *et al*, 2007).

On individual lending, Cull *et al* (2007) found the following: first, financing costs were associated with reduced profitability; that is financing costs were negatively correlated with profitability. Second, institutions that employed individual lending methods were performing better in profit while performing least in outreach. Their profit was the highest than other lending types.

Again, as depicted in finance theory, there is a trade off between risk and return (McLaney, 1994; Van Horn and Wachowitz, 1995; Fabozzi, and Modigliani, 1996; and Brealey and Myers 2000). Higher returns are associated with higher risks. A portfolio risk will increase when MFIs charge higher interest rates especially for microfinance institutions that charge higher interest rates (Cull *et al,* 2007). The increased portfolio risk in individual lending conforms to moral hazard and adverse selection theories. Moreover, low risk with group lending gives evidence on how, other things being equal, group lending can mitigate the effects or moral hazard and adverse selection (Guttman, 2008; Cassar *et al*, 2007; Hermes *et al*, 2005). In this study, we examine whether the MFIs' lending type affect their financial sustainability. Moreover, we decompose the lending type in an attempt to explain

[21] See Marr (2006) for detailed explanation on the limitations of group-based microfinance and ways to overcome them.

what makes difference in the two lending types. We consider differences between the two lending types in terms of minimum loan, number of instalments, and term to maturity.

The above discussion (subsection 5.2.1 to 5.2.11) indicates how sustainability and outreach depends on each other and, therefore, making outreach an important variable of study under financial sustainability studies like this one. Outreach is particularly crucial in Tanzania where about 80 percent of the population is excluded from reliable banking services (Rubambey, 2005) leaving the MFIs to be principal providers of financial services (Randhawa, and Gallardo, 2003). The next section presents, in addition to the above factors, the regulation of microfinance institutions and how it may affect both outreach and financial sustainability.

5.2.12 Regulation of Microfinance Institutions

CGAP defines regulation of microfinance institutions as a "set of government rules that apply to microfinance" (CGAP, 2003:1). The regulations are meant to protect MFI clients, bring about fair play in the microfinance business, and enhance the public's overall confidence in the financial sector. They are also meant to be enabling environment for the operation, development and growth of the microfinance industry. It has been argued that the regulation of microfinance institutions will speed the emergence of sustainable MFIs (Arun, 2005).

According to Robinson (2001) microfinance institutions can deliver services profitably to the economically active poor when there is macroeconomic, political, legal, and regulatory enabling environment. The regulation of microfinance institutions may affect their sustainability positively or negatively depending on whether or not the benefits outweigh the costs of being regulated (Christen and Rosenberg, 2000 and Arun, 2005).

It has been claimed that the move towards regulating microfinance institutions will enable MFIs to increase their capital from collected deposits and borrowing from the capital market (CGAP, 2003). Bogan *et al* (2007) assert that unregulated microfinance institutions have limited options of finance, that is, limited sources of capital. Experience from Ghana and the Philippines indicates that the financial performance and sustainability profiles of regulated microfinance institutions have differed significantly (comparing the pre and post regulation performance), the reasons being, among others, higher base of unimpaired capital and ability of owners to step forward with additional capital (Gallardo, 2001).

Access to capital will enable microfinance institutions to increase the loanable funds and may in turn enhance financial sustainability (Arun, 2005; Campion and White, 1999). Increased capital base may lead institutions to large-scale outreach (Robinson, 2001) and length of outreach (Arun, 2005). Conversely, however, a study by Makame and Murinde (2006) found that outreach and microfinance regulations were negatively correlated implying that regulating a microfinance institution would reduce its focus to serving the poorer, that is, the depth of outreach. This means that, while regulation of microfinance increases a capital base and, thus, a possibility of increased number of clients reached (large-scale outreach) the same could shift the microfinance focus from poorer clients to average poor and non poor clients and, therefore, reducing the depth of outreach (number of poorer served).

A recent study by Hartarska and Nadolnyak (2007) on whether regulated MFIs achieve better sustainability and outreach than unregulated MFIs reports that, regulatory status (and regulatory power) has no direct impact on the financial sustainability of MFI. Their results, however, also indicate that outreach is affected by the level of deposits (savings), suggesting indirect effect of regulation on outreach if regulation is the only way for MFIs to attract savings. Another study by Mersland and Strøm (2009) has found that regulation of microfinance has no impact on the financial and outreach performance of microfinance institutions. The study was based on 278 microfinance institutions from 60 countries.

Moreover, as we have seen before, regulated interest rates (setting interest rate ceilings) may restrict MFIs' available options and as a result they might be unable to cover the transaction costs. A recent study on factors influencing financial sustainability of microfinance institutions in Namibia indicates that interest rate ceilings in Namibia cause MFIs to be unsustainable (Adongo and Stork, 2006). This is so because the ceilings are below the required interest rates that MFI requires to break-even. This supports the idea by Christen and Rosenberg (2000) that the rush to regulate may lead to some expectations to be inflated and, therefore, harm the growth of microfinance institutions (Christen and Rosenberg, 2000). Likewise, Gonzalez-Vega (1998) asserts that repressive regulation stunts innovation in microfinance. Robinson (2001:59) confirms Gonzalez-Vega's assertion. She reports that annual interest rates set by the Indonesian government at 12 percent for loans and 15 percent for most deposits discouraged BRIs unit desas from active savings mobilization.

The contradiction between these studies makes it of more concern to study whether or not the regulation status makes any difference with regard to the financial sustainability of rural microfinance institutions in Tanzania. The next section presents the specific research questions addressed in this chapter. This is followed by the empirical approach that this study followed to explain how outreach and financial sustainability relates and thereon identify key determinants of financial sustainability of rural MFIs in Tanzania.

5.3 RESEARCH QUESTIONS

This chapter links outreach and financial sustainability. The reviewed empirical literature in this chapter provides mixed results on what affects the financial sustainability of microfinance institutions. Some factors that were found to be significantly affecting the financial sustainability in one economy or applicable to a set of microfinance institutions in some studies, were not significant in others, thus, making it unclear about what factors specifically apply to the rural MFIs in Tanzania. In an attempt to fill this knowledge gap, the data analysis and the discussion of the findings in this chapter are focused to answer the following specific research questions as introduced in Chapter 1:

(i) Does the microfinance capital structure; interest rate; staff costs per dollar loaned; lending type as indicated by the number of instalments, minimum loan size, and term to maturity; cost per borrower; product type; MFI age; MFI type; the depth of outreach; MFI size; gender of MFI clients; regulation status; number of borrowers; and the geographical location affect the financial sustainability of rural MFIs in Tanzania?

(ii) What are the effects of the financial sustainability of the rural MFIs in Tanzania on their breadth of outreach?

5.4 VARIABLE DESCRIPTION

As explained earlier in the methodology chapter this study used a panel regression model to explain the relationship between variables and, therefore, determinants of financial sustainability. This section describes the variables used as dependent and independent (explanatory) variables in this study. The study used variable measurement as used in the reviewed literature and in previous studies. The measurement also conforms to MFI consensus guidelines issued by the Consultative Group to Assist the Poor (CGAP, 2003). The detailed econometric approaches for the data analysis done in this chapter were discussed in part 4.4.1 of the methodology chapter. Table 5-1 and Table 5-2 below summarises these variables and their definition / measurement as used in this study.

Table 5-1: Variable Description (dependent Variable)

Variable Name	*Measurement (Formula)*
Financial Self Sufficiency (FSS)	$$\frac{\textit{Adjusted Financial Revenue}}{\textit{operating expenses + financial expenses + Loan loss provision expenses + Expense adjustment}}$$

The financial sustainability also known as the financial self-sufficiency (FSS) as indicated in Table 5-1, is the ratio of adjusted operating revenues to adjusted operating expenses. The expense adjustments made were to deduct the amortised amount of subsidies as adopted by MFIs surveyed. The adjustments are meant to indicate whether or not the microfinance institutions are able to cover their costs without any subsidisation also assuming that the capital is raised at commercial rates (Balkenhol, 2007; CGAP, 2003). The effects of taking off the subsidies however were very small due to the fact that most of MFIs surveyed did not have substantial amounts of subsidies during the period under which the study was undertaken. Moreover, the concessional loan amounts were also not substantial making the effect of cost of capital adjustment not to be felt. Table 5-2 presents the description of the independent or explanatory variables used in this study. Some variables appear in log form for regression purposes as explained in methodology chapter under section 4.4.1.

Table 5-2: Variable Description (Independent Variables)

S/ N	*Variable standard name*	*Description*	*Variable name in Regression model*	*Variable description as used in regression model*	*Expected effect on FSS*
1.	Capital structure	Various sources of fund making up the capital structure of an MFI	*capstruc*	*Equity as a percentage of total capital*	+
2.	Cost per borrower	Operating expenses/average number of active borrowers	*lncostpbor*	*Natural log of the cost per borrower*	-
3.	Average loan size	It is a ratio of outstanding loan portfolio over number of active borrowers	*lnavoutloan*	*Natural log of the average loan size*	+
4.	Minimum loan size for individual loan	The minimum or smallest loan size that an MFI lends to individual borrower	*minloanindi*	*Minimum loan amount for individual lending*	-
5.	Minimum loan size for group loan	The minimum or smallest loan size that an MFI lends to a borrower with group lending	*minloangr*	*Minimum loan amount for group lending*	+
6.	Instalments for individual lending	Number of instalments per a given loan for individual lending	*instalind*	*The number of instalment for individual lending*	+/-
7.	Instalments for group lending	Number of instalments per a given loan when group lending is used	*lninstalgr*	*Natural log of the number of instalment for group lending*	+/-
8.	Term to maturity for individual lending	The maximum time period that the loan is allowed to remain outstanding. It is the duration within which the loan should be paid.	*lnT2matind*	*Term to maturity for loans given to individuals*	+
9.	Term to maturity for group lending	The maximum time period that the loan is allowed to remain outstanding. It is the duration within which the loan should be paid.	*lnT2matgr*	*Term to maturity for loans given to groups*	+

S/N	*Variable standard name*	*Definition / measurement*	*Variable name as used in Regression model*	*Variable description as used in regression model*	*Expected effect on FSS*
10.	Borrowers	Number of individuals who currently have an outstanding loan balance with an MFI.	*lnborrowers*	*Natural log of the number of borrowers*	+
11.	Interest rate	The rate of interest charged on outstanding loan	*intrate*	*Rate of interest charged by an MFI*	+
12.	MFI size	The size of MFI is measured by value of its assets	*lnmfisize*	*Natural log of total assets of an MFI*	+
13.	MFI age	Years since its establishment to when the evaluation is considered. It also measures the length of outreach	*mfiage*	*Age of an MFI*	+
14.	Geographical location (southern area)	Geographical location of an MFI	*agrlarea*	*Dummy variable: 1 if agricultural area; 0 if Dry area (central zone)*	+/-
15.	Geographical location (northern area)	Geographical location of an MFI	*educarea*	*Dummy variable: 1 if northern zone; 0 if Dry area (central zone)*	+/-
16.	Type of MFI	Type of MFI by ownership: Member-based (MB-MFIs) and NGOs	*mfitype*	*Dummy variable: 1 if MB-MFI; 0 if NGO*	+
17.	Female	Percentage of female clients served by an MFI	*female*	*Percentage of female clients served by an MFI*	+
18.	Microfinance products	Types of products offered by an MFI	*prodtype*	*Dummy variables: 1 if loan only; 0 if loan and savings*	+
19.	Staff cost per dollar loaned	Staff salaries divided by the amount of loan disbursed	*lnstcostpdol*	*Natural log of the staff cost per dollar loaned*	+/-
20.	regulated	Microfinance regulation status	*reguted*	*Dummy variables: 1 if regulated; 0 if not*	+/-

5.5 DESCRIPTIVE RESULTS

In this section we present the results based on the descriptive statistics for both dependent variable, the financial self-sufficiency (FSS), and independent variables over 4 years. The independent variables were explained in Table 5-2, descriptive statistics of which are detailed in Table 5-4.

5.5.1 Dependent Variable

The financial self-sufficiency (FSS) is a ratio of microfinance income to their total expenses. The ratio above 1 indicates sustainability while the ratio below 1 indicates incapability of the MFIs to pay all of their expenses from their own generated income, and, therefore, not financially sustainable. Table 5-3 below indicates the descriptive statistic for the FSS variable.

Table 5-3: Descriptive statistics for dependent variable

Variable	Obs	Mean	Std. Dev.	Min	Max
FSS	424	1.566226	.8717998	.16	7.39

The financial sustainability (FSS) indicates the ability of an MFI to cover all of its operating costs and costs of capital without depending on subsidies. It is a ratio of total microfinance income from operations over total costs incurred to earn the same. Thus, a ratio above 1 will indicate financial sustainability. From Table 5-3, the mean FSS is 1.566 (156.6 percent) indicating financial sustainability. The standard deviation for this variable is very high (0.872), an indication of the existence of dispersion in the sustainability of microfinance institutions studied. In total, we had 424 observations out of which 337 (79.5 %) indicated sustainable MFIs and the remaining 87 observations (20.5%) the MFIs were not financially sustainable. From the 424 observations, 340 (80.2%) were member-based MFIs of which 265 (77.9%) were financially sustainable and 75 observations (22.1%) were not sustainable. The remaining 84 observations (19.8%) were NGO-MFIs' branches of which 72 observations (85.7%) were financially sustainable and only 10 observations (14.3%) were not sustainable. These statistics tend to suggest that MB-MFIs were less sustainable than NGO-MFIs. However, the test for mean difference between MB-

MFI and NGO-MFI's sustainability was not statistically significant. Thus, the two were not statistically significantly different. The next section presents the descriptive statistics for the independent variables.

5.5.2 Independent Variables

A total of twenty independent variables are described in Table 5-4. Among these variables are the three measures of outreach namely: the average loan size; number of borrowers; and MFI product type. Except for variables which are proxies of lending type, and regulation variables, all other variables have 424 observations. Proxies of lending type are the number of instalments, minimum loan size, and term to maturity. For the individual lending type they all have 400 observations while for the group lending type they have 340 observations. The regulation variable has 419 observations.

Table 5-4: Descriptive statistics for independent variables

Variable	Obs	Mean	Std. Dev.	Min	Max
capstruc	424	.3385009	.2115779	-.1965643	.9918442
intrate	424	.2709623	.1018711	.1	.576
stcostpdol	424	.0764173	.1271058	.0002716	1.393947
instalind	400	3.6525	2.85607	1	12
instalgr	340	4.858824	4.849117	1	26
costpborr	424	33784.47	49318.78	93.88715	555331
prodtype	424	.3207547	.4673181	0	1
minloanind	400	141279.6	245884.8	5000	1500000
minloangr	340	118757.8	224738.7	5000	2500000
mfiage	424	5.613208	4.808524	1	25
mfitype	424	.8018868	.3990488	0	1
avoutloan	424	214119.3	409781	407.5235	6070508
mfisize	424	1.87e+08	3.95e+08	400090	2.61e+09
female	424	.400675	.1988968	0	1
reguted	419	.7661098	.4238092	0	1
borrowers	424	725.0778	1281.674	10	8484
educarea	424	.2830189	.4509977	0	1
agrlarea	424	.4339623	.4962053	0	1
T2matind	400	128.99	90.44479	7	360
T2matgr	340	126.8706	81.95765	7	360

The average loan size indicates the depth of outreach. The mean for this variable is TZS 214,119 (equal to USD 164.2[22]). The highest average loan size TZS 6,070,508 (equal to USD 4,655.3) is an indication of serving relatively non poor clients. The mean average loan for the NGO-MFI is TZS 245,615.3 (equal to USD 188.36) while

[22] Exchange rate applied is 1 USD = TZS 1304 as of 5th October 2009.

the mean for the MB-MFIs is TZS 206,337.9 (equal to USD 158.23). These statistics tend to suggest that MB-MFIs perform better in the depth of outreach (lower loan size) than their counterpart. However, the test statistics for mean difference indicates that the difference between two types of MFIs is not statistically significant.

The female clients are 40 percent of total clients. The mean **number of borrowers** (*borrowers)* is 725. From the statistics we observe that, the mean number of borrowers for the NGO-MFIs' branches is 2703 while that of MB-MFIs is 236. Again, from these statistics, it appears that NGO-MFIs achieve more breadth of outreach than MB-MFIs. The test of mean difference indicates that the difference between the two MFI types is statistically significant at 1 percent significance level. Thus, the statistics support that NGO-MFIs have higher breadth of outreach than their counterparts. This meets our expectation. The finding confirms the findings by Mersland and Strøm (2009) and Hartarska and Nadolnyak (2007), which indicated that NGO-MFIs performed better in breadth of outreach than other MFIs.

This, however, must be interpreted carefully. The difference in the number of clients here may not necessarily indicate good or bad performance. The same could imply the difference in organization ownerships and client targets. For example, the MB-MFIs are owned by members and the same members are the clients of these MFIs. Thus, becoming a borrower of a MB-MFI one has to be a member. Some MB-MFIs are even work related, like cashew nuts growers. Thus, anyone who is not a cashew nuts grower will not be a member and, therefore, he or she will not qualify to be a client of this type of MFIs. The NGO MFIs, on the other hand, are owned by donors who are in most cases not clients. Thus, NGO-MFIs tend to have large capital to attract more clients. The fact that with this kind of MFIs one does not need to be a member to be a client helps to explain why NGO-MFIs have more clients than MB-MFIs.

The descriptive statistics also indicate that 32.07% (136 observations) of microfinance institutions have loan as the only **product** while 67.93% (288 observations) have non loan products too. Moreover, as explained above, 80 percent of the MFIs were member-based with 340 observations and NGO MFIs 84 observations (20% of all observations). Out of the 340 observations for the MB-

MFIs, 55 (16.18%) were for MFI with loan as the only product and 285 observations (83.82%) for MFIs with both loan and non loan products. For the NGO-MFIs, out of 84 observations, 81 (96.4) observations indicated loan as the only product and 3 (3.6%) observations for MFIs with multiple products. These statistics show that MB-MFIs have more multiple products than the NGO-MFIs. The test for the mean difference for the two types of MFIs indicated that the difference between the two groups was statistically significant.

The mean capital structure (*capstruc)* is 33.85% equity. It is interesting to note that some MFIs are not financially sustainable to the extent that they have eroded their capital (negative capital structure). The mean interest rate (*intrate)* is 27.1% with the highest interest rate being 57.6%. The mean cost per dollar loaned is 7 cents (0.07 dollars). The descriptive statistics indicate differences in lending type proxies. For example, while number of installments for individual lending is 3.65 for group lending it is 4.86. On average, the group lending appears to have relatively lower minimum loan size than individual lending, and the term to maturity for individual lending is relatively longer than the one for the group lending. The descriptive statistics show that the cost per borrower ranges between TZS 93.89 (USD 0.07) to TZS 555,331 (USD 425.87) with the mean cost per borrower of TZS 33,784.47 (USD 25.91).

Finally, it appears that the MFIs serve 28.3 percent of clients from northern areas (*educarea)* of the country, 43.4 percent from southern part of the country (agricultural areas) and the remaining clients (28.3 percent) are from the central part of the country (dry areas). It is not surprising to note that the majority of clients are from the agricultural areas as this is the main economic activity for rural Tanzanians. This also meets our expectation.

5.6 ECONOMETRIC RESULTS

In this section we present the econometric results on factors affecting the financial sustainability of rural microfinance institutions in Tanzania. The effects of financial sustainability on the breadth of outreach are explained. We also present the reinvestigation result of the factors affecting the financial sustainability when the endogeneity relationships between financial sustainability and the breadth of outreach are considered.

5.6.1 Determinants of Financial Sustainability

This section presents the empirical findings from the econometric results on the factors affecting the financial sustainability of rural microfinance institutions in Tanzania. The section covers the operational panel data regression model used and the results.

(a) Operational Model

The specific or operational panel regression model used to study the determinants of financial sustainability was:

$$FSS_{it} = \alpha_i + \beta_1\, capstruc_{it} + \beta_2\, intrate_{it} + \beta_3\, lnstcostpdol_{it} + \beta_4\, instalind_{it} + \beta_5\, lninstalgr_{it} + \beta_6\, lncostpborr_{it} + \beta_7\, prodtype_{it} + \beta_8\, minloanind_{it} + \beta_9\, minloangr_{it} + \beta_{10}\, mfiage_{it} + \beta_{11}\, mfitype_{it} + \beta_{12}\, lnavoutloan_{it} + \beta_{13}\, lnmfisize_{it} + \beta_{14}\, female_{it} + \beta_{15}\, reguted_{\ it} + \beta_{16}\, lnborrowers_{it} + \beta_{17}\, educarea_{it} + \beta_{18}\, agrlarea_{it} + \beta_{19}\, lnT2matind_{it} + \beta_{20}\, lnT2matgr_{it} + \varepsilon_{it}$$

Where: FSS is the financial self-sufficiency, which is the dependent variable; α_i is a constant term; β_{is} measure the partial effect of independent or explanatory variables in period t for the unit i (*MFI*); X_{its} are the independent variables as described in Table 5-2; and ε_i is the error term. The variables, both dependent and independent, are for cross-section unit i at time t, where i = MFIs (1 to n), and t = 1 to 4.

(b) Results

The econometric result indicates that the overall Wald statistic is statistically significant at 1 percent significance level leading us to reject the hypothesis that all coefficients are equal to zero. The r-squared (R-sq) values indicate that the proportion of variance in the dependent variable which can be explained by the independent variables is higher between MFIs than within the same MFI. This could imply low explanatory power within MFI. That is, about 64 percent of the variations in the dependent variable are not explained by the independent variables used. However, for panel data, the r-squared above 0.2 is still large enough for reliable conclusions (Cameron and Trivedi, 2009; Hsiao, 2007). The results and comments for each of the individual independent variables are given here below. The econometric results are given in Table 5-5, details of which are in Appendix 13(a).

The results from the econometric analysis indicate that the combination of various sources of capital **(capital structure**) of microfinance institutions does not improve their financial sustainability. This variable has a positive coefficient and it is strongly statistically significant at 1 percent significance level. The capital structure variable here represents the percentage of equity to total long-term capital. Thus, the positive coefficient indicates that the more an MFI is equity financed compared to other sources of finance, the more the improvements in its sustainability. In other words, although how the capital has been structured affects the financial sustainability (Bogan *et al*, 2007) having different sources of capital do not improve the financial sustainability. For rural microfinance institutions in Tanzania, this could be caused by the fact that the owners, especially for the member-based MFIs, benefit not from dividends but rather from loans given to them. This makes equity a relatively cheap source of finance and, therefore, improves financial sustainability. The situation may, however, change where the microfinance institution starts to pay dividends to owners.

Table 5-5: Econometric Results for Determinants of Financial Sustainability

Variable	Coefficient	Robust Std. Err.	P>z
capstruc	1.181608	0.2886894	0.000***
intrate	2.307532	0.5348477	0.000***
lnstcostpdol	-0.132459	0.0830875	0.111
instalind	-0.0604238	0.0275941	0.029**
lninstalgr	0.3224072	0.1226166	0.009***
lncostpborr	-0.5329855	0.0994273	0.000***
prodtype	0.2697155	0.122511	0.028**
minloanind	-0.000000378	0.000000282	0.894
minloangr	0.000000539	0.000000296	0.069*
mfiage	-0.0068888	0.0171268	0.688
mfitype	0.0368451	0.3868853	0.924
lnavoutloan	0.3665772	0.0912158	0.000***
lnmfisize	0.2904573	0.1227293	0.018**
female	0.1238016	0.2311057	0.592
reguted	0.2107572	0.1537695	0.170
lnborrowers	-0.2632589	0.1214094	0.030**
educarea	0.0606136	0.1365182	0.657
agrlarea	0.1684016	0.1199252	0.160
lnT2matind	0.2891489	0.1269456	0.023**
lnT2matgr	-0.2592084	0.1324246	0.050**
R-Sq	Within = 0.3523	Between = 0.5785	Overall = 0.4531

***significant at 1%; ** significant at 5%; * significant at 10%

The sustainability of microfinance depends on how much interest income they earn from their operations. The income depends on the amount outstanding and the **interest rate** applied. The econometric result on the relationships between both interest rate and the amount outstanding (measured by the average loan outstanding) indicate that both interest rate and outstanding loan are significantly affecting the financial sustainability. They both have positive coefficients and are strongly statistically significant at 1 percent significance level.

The finding on the effects of interest rate confirms the findings by Conning (1999) that the financial sustainability is associated with higher interest rates. Higher profitability, however, could lead MFIs to selling larger size loans which is an indication of a mission drift. However, comparing the coefficients of the two variables, the one for average outstanding loan is nearly 2 times larger than the one for interest rate indicating that the interest rate is less important than the amount on which it is being applied. The comparison here is based on the beta coefficients which measures the relative strength of various predictors within the model (UCLA, 2007). That is, while the coefficients for these variables are 0.3665772 and 2.307532, their beta coefficients are 0.5683568 and 0.2998656 for average loan size and interest rate respectively. Thus, this indicates that relatively, the amount outstanding improves financial sustainability more than the interest rate.

The **average loan size** also measures the depth of outreach. The coefficient for the average loan size is positive and statistically significant. This indicates that, microfinance profitability is associated with higher loan sizes. This finding confirms the claims in Morduch (2000) on mission drift where MFIs serve relatively non poor clients. The finding is also in line with Adongo and Stork (2006) that profitability relates to selling bigger loans. However, the finding contradicts the one by Cull *et al* (2007) that institutions that make smaller loans are not less profitable on average compared to those making bigger loans. This also provides evidence that profitability and the depth of outreach cannot be attained simultaneously. It also confirms the findings by Gonzalez (2007) and Gregoire and Tuya (2006) that larger loans are associated with higher cost efficiency and, therefore, profitability.

All withstanding, however, the interpretation of this variable should be done with caution. Although the average loan size has been used to measure the depth of outreach as explained in the previous sections, the same is affected by repayment rate, which could affect the results without changing the economic status of the borrowers. For example, all things being equal, higher repayment rates will lead to low outstanding loan portfolio. As a result, small loan size which in turn could be interpreted as serving poorer clients (depth of outreach) even if only the well to do clients were served, and the same influenced higher repayment rates! The opposite could also be true when the MFIs are serving only poorer clients with very low repayment rates, leading to higher outstanding amounts and larger average loan size of the outstanding portfolio. Thus, we suggest the comparison between the effects of the average loan size to be done with reference to loan repayment rates. Moreover, this calls for researchers to not only consider outreach and sustainability relationships, but also microfinance efficiency.

The econometric results indicated that the **staff cost per dollar loaned** (*lnstcostpdol)* reduces the financial sustainability of the microfinance. This conforms to the accounting theory that costs reduce profitability. It also confirms the findings by Conning (1999) that MFIs with higher staff costs per dollar loaned are less profitable and, therefore, less financially sustainable. However, for rural microfinance institutions in Tanzania, this relationship is not statistically significant even at 10 percent significance level. Staff cost per dollar loaned is one of the measures of microfinance efficiency. Thus, a detailed analysis on the relationships between microfinance efficiency and financial sustainability is covered in Chapter 6.

We also measured the partial effect of **cost per borrower** on the financial sustainability of microfinance institution in rural Tanzania. The results from the analysis indicate that the increase in cost per borrower reduces the financial sustainability of microfinance institutions. This variable has a negative coefficient which is strongly statistically significant at 1 percent significance level. The cost per borrower measures the MFI effectiveness in cost reduction given the number of borrowers they are serving. This implies the role of cost reduction in improving the financial sustainability.

Microfinance institutions are not only meant to provide loans. They also provide small scale financial services, including loans. In this study, we studied the relationships between various products of microfinance such as loans, savings and deposits in order to explain whether or not the more products an MFI has the better could be its financial sustainability. The **MFI product** variable takes on the value of 1 if loan only and 0 if an MFI has both loan and other products such as savings and deposits.

The econometric result indicated that MFI with loan only products are better in financial sustainability than those having both loan and non loan products. The coefficient for this variable is positive and statistically significant at 5 percent significance level. This finding, however, is not in line with microfinance literature, which suggests that having different product types that is, loan and non loans could improve financial sustainability of MFIs (Navajas *et al*, 2000). The reason for this deviation from the MFI theory could partly be first, the non loan products like savings for MFIs in rural Tanzania, are used solely as determinants of how much loan one should be given based on his or her savings in the MFIs. Normally, the loans given out are twice as much as the customer savings. For the NGO-MFIs, savings are used as loan security. Second, compared to the amount of loan, the savings and deposits amounts are relatively small to have recognisable impact on the financial sustainability. Moreover, for most of the rural MFIs in Tanzania no interest is paid on savings or deposits, and no follow-up costs on the part of the MFIs are incurred and the transaction costs are negligible to have effects on financial sustainability. The finding implies that the benefits of using savings and deposits as sources of capital are less compared to the income generated from loaned funds.

MFI **lending type** was captured by three variables as proxies. These are the number of instalments, minimum or initial loan, and the term to maturity. The analysis was made to differentiate the relationships between these variables and financial sustainability with reference to individual and group lending types. The econometric results show that while the increase in the **number of instalments** for individual lending (*instalind)* does not improve financial sustainability (negative coefficient), with group lending (*instalgr),* the larger the number of instalments the borrower is required to pay the better the sustainability. The coefficients for the number of instalments for both individual lending and group lending are statistically significant at 5 percent significance level.

The **minimum or initial loan** amount for individual lending is negatively related to the financial sustainability while for group lending it is positively related. This indicates that, to improve financial sustainability, with individual lending (*minloanind),* the minimum loan should be as small as possible while for group lending (*minloangr)* the initial loan size should be large. This is in harmony with the theoretical claim that group lending helps to mitigate moral hazards and adverse selection (Guttman, 2008; Armendáriz and Morduch, 2007; Hermes *et al*, 2005;

Navajas *et al*, 2003; Navajas *et al*, 2000). Thus, even with large loans, the group lending technology will guarantee less default and, therefore, higher profitability than individual lending. However, the relationships between the financial sustainability and minimum or initial loan size for individual lending is not statistically significant even at 10 percent significance level, the one for group lending is significant at 10 percent significance level.

The econometric results for **Term to maturity** variables indicate that the effects of the loan duration (term to maturity) depend on lending type used by an MFI. The coefficient for the term to maturity for the individual lending (*lnT2matind)* is positive indicating that the longer duration (term to maturity) for the individual loan relates to higher profitability. The relationships between the term to maturity for individual lending and microfinance profitability is statistically significant at 5 percent significance level. While for higher profitability, the individual loans need longer durations, the one for the group lending (*lnT2matgr)* needs relatively shorter duration. The coefficient for the term to maturity for the group lending is negative and statistically significant at 10 percent significance level.

The variations between the number of instalments, minimum or initial loan size, and the term to maturity between individual and group lending indicate that **MFI lending technology** affect their financial sustainability. This finding, although it contradicts Hartarska (2005), is in line with Mersland and Strøm (2009); Armendáriz and Morduch (2007); Cull *et al* (2007); Navajas *et al* (2003); and Navajas *et al* (2000).

All things being equal, we expect mature MFIs to be more sustainable than younger ones. We tested how this applies to rural MFIs in Tanzania using the MFI age variable. The econometric results indicated that the age of an MFI is negatively related to its financial sustainability indicating that **MFI age** does not improve its financial sustainability. However, this relationship is not statistically significant even at 10 percent significance level. This finding does confirm the previous study by Bogan *et al* (2007); Cull *et al* (2007) and Robinson (2001).

While the MFI age does not improve their financial sustainability, their size does. The econometric result indicates positive relationship between **MFI size** and their financial sustainability. This relationship is statistically significant at 5 percent significance level. While contradicting the findings by Hartarska (2005), it is in line with Mersland and Strøm (2009); Kyereboah-Coleman and Osei (2008); Bogan *et al* (2007); Cull *et al* (2007); and Robinson (2001).

We also tested whether the ownership structure could affect the financial sustainability of MFIs. The variable **MFI type** was used to capture the MFI ownership structure. The econometric results revealed that the member-based MFI are more likely to become financially sustainable than their counterparts NGO-MFIs. This contradicts the findings presented in the descriptive results under section 5.5. The finding on how the MFI type may affect the financial sustainability tends to follow the findings by Mersland and Strøm (2009) and Hartarska and Nadolnyak (2007). The findings by these studies reported that NGO-MFIs perform poorly in profitability compared to other MFIs. However, the relationship between MFI type and financial sustainability in our study is not statistically significant as found by Mersland and Strøm (2008). Moreover, the change in coefficient sign in regression model (positive sign) compared with the descriptive statistics (negative sign) could indicate a multicollinearity problem caused by this variable. Thus we drop this variable under Section 5.6.3 when we reconsider determinants of FSS with endogeneity.

MFI literature suggests that female clients relate to higher repayment rate (Makombe *et al*, 2005; Premchander, 2003; Kabeer, 2001; Mayou, 1999) and, therefore, financial sustainability. We analysed this relationship to establish whether the more **female clients** an MFI has the better it will perform in financial sustainability. The result tends to suggest that female clients are positively related to financial sustainability. However, the relationship is not statistically significant even at 10 percent significance level.

Whether regulated MFIs perform better in financial sustainability than unregulated ones was one of the questions of interest in this study. We analysed the relationships between **MFI regulation** and financial sustainability and found that although they are positively related, the regulated MFIs do not perform better than unregulated ones. The econometric results indicated the relationships to be statistically insignificant. This finding confirms the findings by Mersland and Strøm (2009) and Hartarska and Nadolnyak (2007).

Geographical location of an MFI may affect its financial sustainability. The coefficients for the geographical location variables were positive indicating that, both northern and southern parts of Tanzania are positively related to the financial sustainability. The northern part represents the area with relatively, highly educated people while the southern part of the country represents the agricultural areas. Compared to the central zone, which mainly represents the dry areas, the MFIs in the two zones, northern and southern, are positively related to financial sustainability. The MFIs in the central zone are negatively related to financial sustainability. Although confirming the theoretical claims that geographical location of MFIs may affect their financial sustainability (Hartarska 2005); Woller 2002b; Navajas *et al* 2000), the coefficients of the geographical location variables are not statistically significant even at 10 percent level. This indicates that the geographical location of an MFI does not affect its financial sustainability. This finding is in harmony with the finding by Bogan *et al* (2007) that regional differences are not significantly affecting how microfinance institutions attain financial sustainability.

Finally, the **number of borrowers** which measures the breadth of outreach does not improve the financial sustainability of microfinance institutions. The econometric result for this variable indicates negative relationships between the number of borrowers and MFIs' financial sustainability. The relationship was statistically significant at 5 percent significance level. Contrary to the findings by LOGOTRI (2006) that reports the large number of borrowers as the biggest sustainability factor, the findings in this study indicates that increased number of borrower in itself does not improve financial sustainability of microfinance institutions. The reason for this could be increased inefficiency as a result of increased number of borrowers. Section 6.7 in Chapter 6 gives further explanations from econometric results on how microfinance staff efficiency affects profitability in as far as number of borrowers is concerned.

The significant coefficient for this variable, however, contradicts the findings by Hartarska (2005) and Woller and Schreiner (2002) who report that the number of borrowers had no significant impact on financial sustainability.

Ranking the effects of outreach on financial sustainability based on beta coefficients, we found that the depth of outreach has higher effects than breadth of outreach on financial sustainability. The coefficients for these variables are 0.3665772 and -0.2632589, while their beta coefficients are 0.5683568 and -0.4172096 for depth and breadth of outreach respectively. The beta coefficients which are used to measure the relative strength of various predictors within the model are measured in standard deviations instead of unit of variables (UCLA, 2007). The next section presents the econometric results on how the financial sustainability and breadth of outreach affect each other.

5.6.2 The Effects of Financial Sustainability on Breadth of Outreach

In the previous section we indicated the determinants of financial sustainability. One of these determinants was the breadth of outreach as measured by the number of borrowers. The reviewed literature indicates that outreach and sustainability depends on each other. Their relationship is two way with each one of them determining the other (Cull *et al*, 2007; Woller and Schreiner, 2002; Fruman and Paxton, 1998).

In this section we determine the effects of financial sustainability on the breadth of outreach, which was the third objective of the study. This is followed by a reinvestigation of the determinants of FSS when endogeneity between FSS and the breadth of outreach is considered, with specific focus on the breadth and depth of outreach. The next subsection presents the operational models used for analysis in this section and for the reinvestigation.

(a) Operational Models

The relationship between financial sustainability and the breadth of outreach creates a simultaneity endogeneity problem whose solution requires the use of simultaneous equation models. According to Wooldridge (2006) the leading method for estimating simultaneous equation models is the method of instrumental variables. Thus, model used in this section is the instrumental variables regression for panel data as detailed in section 4.4.1(c) of the methodology chapter. The two simultaneous equations (EQ.1 and EQ.2) estimated were as follow:

EQ.1: $lnborrowers_{it} = \alpha_i + \beta_1 FSS_{it} + \beta_2\ minloanind_{it} + \beta_3\ minloangr_{it} + \beta_4\ mfiage_{it} + \beta_5\ reguted_{\ it} + \varepsilon_{it}$

EQ.2: $FSS_{it} = \alpha_i + \beta_1\ lnborrowers_{it} + \beta_2\ capstruc_{it} + \beta_3\ intrate_{it} + \beta_4\ lnstcostpdol_{it} + \beta_5\ instalind_{it} + \beta_6\ lninstalgr_{it} + \beta_7\ lncostpborr_{it} + \beta_8\ prodtype_{it} + \beta_9 lnavoutloan_{it} + \beta_{10}\ lnmfisize_{it} + \beta_{11}\ lnT2matind_{it} + \beta_{12}\ lnT2matgr_{it} + \varepsilon_{it}$

Where: lnborrowers is the natural log of the number of borrowers, which is the dependent variable in Equation 1, and FSS is the financial self-sufficiency, which is the dependent variable in Equation 2; α_i is a constant term; β_{is} measure the partial effect of independent or explanatory variables in period *t* for the unit *i* (*MFI)*; X_{its} are explanatory variables as described in Table 5-2; and the ε_i is the error term. The variables, both dependent and independent, are for cross-section unit *i* at time *t*, where *i* = MFIs (1 to n), and *t* = 1 to 4.

The instruments for the FSS are the repayment rate (*reprate)* and risk cover ratio (*riskcoverratio).* The *reprate* indicates the loan repayments as a percentage of the amount outstanding. The risk cover is a ratio of the loan-loss reserve and the portfolio at risk. The instruments for the breadth of outreach are: the minimum loan amount for both individual and group loans (*minloangr* and *minloangr* respectively*)*; MFI age (*mfiage)*; and MFI regulation status (*regulated)* as described in Table 5-2.

(b) Results

The econometric results based on the first equation (*EQ.1*) on how FSS affect the breadth of outreach indicate that, the overall Wald statistic for the outreach model is statistically significant at 1 percent significance level. Thus, we reject the hypothesis that all coefficients are equal to zero. The results are summarised in Table 5-6, details of which are in Appendix 13 (c). The results reveal positive statistically significant relationships between breadth of outreach and microfinance profitability (FSS) implying that an MFI that is financially sustainable will perform better in breadth of outreach than an MFI, which is not. That is, the more profitable the MFI becomes, the higher it will achieve the breadth of outreach. This confirms the institutionists' view that financial sustainability will lead MFIs to operate at larger economies of scale and enable them reach more clients (Brau and Woller, 2004).

Table 5-6: Econometric Results on the Effect of FSS on the Breadth of Outreach

Variable	Coefficient	Robust Std. Err.	P>z
FSS	0.8255423	0.40576280	0.042**
minloanind	0.0000187	0.00000633	0.003***
minloangr	-0.0000155	0.00000084	0.065*
mfiage	0.0760564	0.03920290	0.052*
reguted	-1.0248550	0.39948910	0.010**
R-Sq	Centered = 0.2069	Uncentered = 0.9471	

***significant at 1%; ** significant at 5%; * significant at 10%

Other factors that affect the breadth of outreach as indicated in the econometric results are: the minimum loan size for individual loans and the age of an MFI, which were positively related to the breadth of outreach and the minimum loan size for group loans and MFI regulation, which were negatively affecting the breadth of outreach. These factors were not significantly affecting the FSS when the endogeneity was not considered (see Table 5-5).

Interestingly, the minimum loan for group lending appears to affect both FSS and breadth of outreach at the same level of statistical significance. While the increase in loan size for group lending will increase the FSS as shown in Table 5-5, the same will decrease the breadth of outreach as indicated in Table 5-6. This again, as explained before, reveals the benefits and limitations of group lending. Larger loan sizes while improves profitability, increases the level of risks to be borne by group members in case of defaults of one or more members, which could discourage their participation in the MFI. The next section presents the reinvestigation results on the determinants of FSS after considering the endogeneity between FSS and the breadth of outreach using the IV approach.

5.6.3 Determinants of Financial Sustainability with Endogeneity

The econometric results based on the second equation (*EQ.2*) on how breadth of outreach affects the financial sustainability indicate that, the overall Wald statistic for the FSS with endogeneity, or instrumental variables (IV) model is statistically significant at 1 percent significance level. Thus, we reject the hypothesis that all coefficients are equal to zero. The results are summarised in Table 5-7, details of which are in Appendix 13 (c).

Table 5-7: Econometric Results for Determinants of FSS with Endogeneity

Variable	Coefficient	Robust Std. Err.	P>z
lnborrowers	-0.9435438	0.4321179	0.029**
capstruc	1.6250980	0.4490070	0.000***
intrate	2.1851210	0.6337234	0.001***
instalind	-0.0941095	0.3336270	0.005***
lninstalgr	0.3759829	0.1370775	0.006***
lncostpborr	-0.7168825	0.1305175	0.000***
prodtype	0.4083109	0.1948695	0.036**
lnavoutloan	0.1019614	0.2075333	0.623
lnmfisize	0.8789847	0.3680283	0.017**
lnT2matind	0.2799212	0.1075181	0.009***
lnT2matgr	-0.1853205	0.1118050	0.097*
lnstcostpdol	-0.959501	0.0776769	0.217
R-Sq	Within = 0.2927	Between = 0.4185	Overall = 0.3505

***significant at 1%; ** significant at 5%; * significant at 10%

The findings indicate similar results on how the breadth of outreach affects the financial sustainability. The coefficient of the breadth of outreach variable (*lnborrowers)* is negative and statistically significant at 5 percent significance level. This indicates that, the positive change in the number of borrowers will reduce the level of financial sustainability. This situation can be well understood especially where the increase in the number of borrowers is not matched with the increase in staff productivity. When MFI staffs are inefficient, the increase in the number of borrowers will reduce loan repayment rates, increase default rates and, as a result, the operating costs become higher compared to the benefits brought about by the increase in the number of borrowers. Thus, although, the FSS affects positively the breadth of outreach as a result of enjoying the economies of scale and creating a broader capital base, the increase in number of borrowers, if not matched with the increase in staff productivity, will reduce the financial sustainability.

Moreover, contrary to the findings presented in Section 5.6.1 when endogeneity problem was not considered, we could not find any evidence of mission drift. The average loan size variable (*lnavoutloan)*, a measure of depth of outreach and, therefore, an indicator of mission drift is positive as before but statistically insignificant. The positive coefficient of depth of outreach tends to support the findings by Gonzalez (2007) and Gregoire and Tuya (2006) that larger loans are associated with higher cost efficiency and, therefore, profitability. However, its insignificance in affecting the FSS contradicts (Adongo and Stork, 2006; Morduch, 2000) that profitability relates to selling bigger loans. The finding is in line with Cull *et al* (2007) that institutions that make smaller loans are not less profitable on average compared to those making bigger loans.

The coefficients of other variables have the same sign after considering the endogeneity problem. A detailed comparison of the coefficients, standard errors, and their significance of the determinants of the financial sustainability with and without instrumental variables are provided in Appendix 13(d).

5.7 CONCLUSION

Based on the findings reported above, we conclude that microfinance capital structure, interest rates, difference in lending type as indicated by the number of instalments, and loan repayment plan as reflected in the term to maturity, cost per borrower, product type, microfinance size, and the number of borrowers affect the financial sustainability. The results for these variables were statistically significant at 5 percent significance level. Other factors reported to be significant in other studies were not significantly affecting the financial sustainability of rural microfinance institutions in Tanzania. These are: the staff costs per dollar loaned; minimum loan sizes; MFI age; MFI type; percentage of female borrowers; the microfinance regulation status; and geographical location. We also conclude that the financial sustainability and breadth of outreach affect each other. While the financial sustainability improves the breadth of outreach, the breadth of outreach reduces the financial sustainability where MFIs are inefficient. Moreover, when endogeneity relationships between financial sustainability and the breadth of outreach are not considered, there may be inconsistent evidence on the existence of mission drift.

CHAPTER 6
MICROFINANCE EFFICIENCY AND FINANCIAL SUSTAINABILITY

"The desire for sustainability matters much as a locus of incentive for efficiency."(*Gonzalez-Vega, 1998:5)*

6.0 INTRODUCTION

According to Gonzalez-Vega (1998) to be efficient there should be a reason acting as an incentive of why one should. One of the reasons, and probably the main one, is to attain financial sustainability. There could be other reasons as well. International foundations and donors have recognised that efficiently-run microenterprises and efficient microcredit programs can cover a large portion of their costs, and are beginning to demand an increasing level of financial sustainability from them (Thapa *et al*, 1992).

This chapter links efficiency of microfinance institutions to their financial sustainability. We use the accounting profitability theory model presented in Chapter 3 to show how efficiency in MFIs operations relates to their sustainability. The chapter is meant to determine the effects of microfinance efficiency on the financial sustainability. This was the third objective of this study.

The chapter is divided into eight interrelated parts: the first part (6.1) presents the conceptual framework guiding the study on efficiency of microfinance institutions and financial sustainability. The second part (6.2) discusses the various measures of microfinance efficiency while part three (6.3) explains the empirical theory on the relationship between efficiency and financial sustainability. In the fourth part (6.4) we present the main research question addressed in this chapter, while the fifth part (6.5) provides the descriptions of the variables used in this chapter. Part six (6.6) and seven (6.7) presents descriptive and econometric results respectively. The last part is conclusion.

6.1 MICROFINANCE EFFICIENCY AND FINANCIAL SUSTAINABILITY: CONCEPTUAL FRAMEWORK

Efficiency refers to the ability to produce maximum output at a given level of input (Chua and Llanto, 1996). Woller (2000) defines efficiency as the most effective way of delivering small loans to the very poor. This involves among others, cost minimisation at a given level of operation. MFIs can reduce their total expenses at a given level of operations or increase income at the same level of operation or both. This is what we refer to as efficiency in as far as microfinance income and expenses are concerned. According to Glautier and Underdown (2001) profit can be used to measure efficiency of an organisation. This is particularly true under competitive condition and, therefore, fairly applicable to MFIs in Tanzania which operates under perfect competition condition[23].

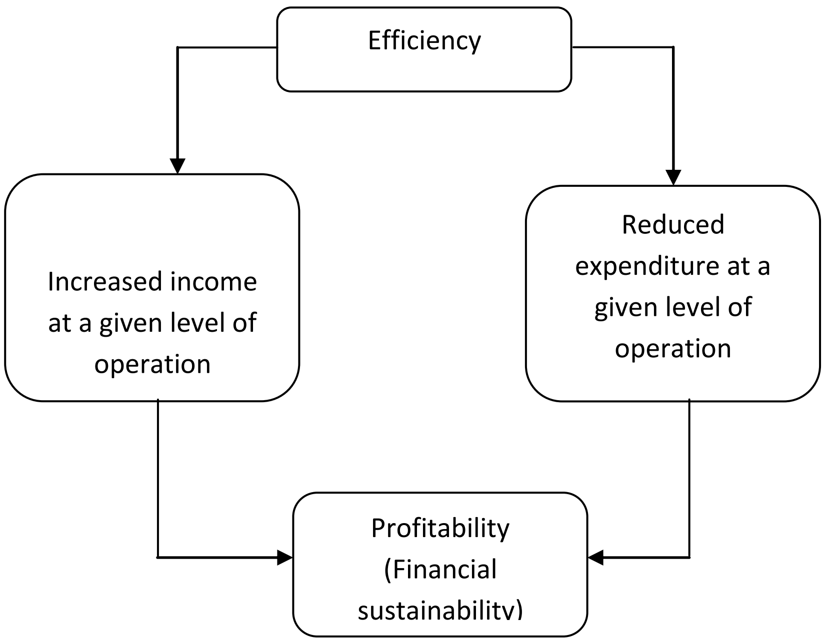
The expenditure (costs) and income (revenue) of the microfinance institutions can be affected by either internal factors or external factors or both. The level of the impact that these factors cause on profitability may vary from one factor to another regardless of whether they are internal or external factors. The internal factors are those internal to the MFI and, therefore, are controllable within the MFI. These include: the number of staff, amount of loan disbursed, and the volume of costs and revenue of the MFIs. Anything that management of an MFI does to influence these factors will have an impact on the overall profitability of an MFI.

There are also other factors that may drive the level of income or expenditure of microfinance institutions, which are not controllable within the microfinance institutions. We call them external factors. Examples of the external factors are where the government through its regulating body sets interest rate caps beyond which MFIs are not allowed to charge the interest rates; and where the government has set high wage and salary levels that some small MFIs may not be able to employ a qualified personnel without significantly affecting its overall operating expenses and, therefore, its sustainability as measured by its profitability.

[23] It should be noted however, that, with imperfect competition and monopoly condition, profit may not be equated with efficiency.

In this chapter, we cover the internal factors as they are the ones indicating whether management has been efficient in their operations or not. Some of the external factors were covered in Chapter 5 which linked microfinance outreach and their financial sustainability. Figure 6-1 depicts the relationships between efficiency and profitability. It indicates that, efficiency of microfinance institutions in managing their liabilities and assets, including loan portfolio, and efficient utilization of human, that is, loan officers and other staff in general, will lead into increased income and reduced expenditure. The increased income and reduced expenditure will improve the profitability, which transforms to financial sustainability.

Figure 6-1: Conceptual Framework on Efficiency and Financial Sustainability



6.2 MEASURES OF MICROFINANCE EFFICIENCY

The measures of efficiency of microfinance institutions can be categorised into three: assets and liabilities management; portfolio quality; and human resource productivity. The measures under these three main categories capture how efficient the microfinance institutions are in utilising their assets (both monetary valued assets, including loan portfolio, and human resource or MFI staff) and the MFI's liabilities. The results from the efficient utilisation of assets and management of liabilities leads an MFI to increase income at given level of operation and reduce expenditure at the same level. In the next subsections we discuss these measures, both theoretically and empirically. Definitions and formulas used in this section follow the 2003 Microfinance Consensus Guidelines issued by the Consultative Group to Assist the poor (CGAP).

6.2.1 Asset and Liability Management Measures

The assets and liability management measures indicate how well the microfinance institutions' management manage liabilities, and how they manage the assets to generate income towards financial sustainability. Current assets are the working capital for the microfinance institutions. They make a higher proportion of the total assets of the microfinance institutions. The current assets of an MFI are made up of cash, loans to clients or members, and other short-term investment. The liabilities of microfinance institutions are made up of trade creditors, short-term loans, and other creditors. The measures under the assets and liabilities management are: the yield on gross loan portfolio; current ratio; yield gap; funding-expenses ratio; and cost-of-funds ratio.

(a) Yield on Gross Loan Portfolio

The yield on gross loan portfolio indicates the ability of an MFI to utilize the short-term assets to generate cash financial revenue. The cash revenue could be from interest on loan, fees, penalties, and commissions. According to CGAP (2003) the yield on gross loan portfolio does not include any unpaid revenue. That is, even if the revenue has accrued, it is not included in this computation as long as it has not yet been received in cash by the MFI. This is because, part of MFIs accrued interest revenue never get received as the borrowers default.

The yield on gross loan portfolio measure is a ratio of cash financial revenue from loan portfolio to average gross loan portfolio. The higher the ratio the better the MFI is, indicating the efficiency with which the MFI has utilised its resources in generating cash revenue.

(b) Current Ratio

An MFI's current ratio is a ratio of its current assets to current liabilities. The current ratio indicates the dollar value of current assets, also known as short-term assets, available to meet each one dollar short-term obligation, also known as short-term liabilities or current liabilities (Brealey *et al,* 2006). Thus, it is called liquidity ratio. It measures the efficiency with which an MFI matches its assets and liabilities (Barrow, 2006; Brealey *et al,* 2006; Collier, 2006; Atrill and Mclaney, 2004; CGAP, 2003).

(c) Yield Gap

The yield on gross loan portfolio measure above did not include any unpaid revenue because some of the called up or accrued microfinance revenue never get received as they turn to be bad debts. The yield gap measure compares an MFI's actually received revenue and what was expected to be received from the loan contract. A small gap of less than ten percent is common to most of microfinance institutions (CGAP, 2003). That indicates a repayment rate of over ninety percent. All things being equal, the larger the gap between the actual revenue and what was contracted for, the inefficient the MFI in making collection and promoting repayment (ibid). A yield gap measure is computed as 1minus a ratio of cash revenue from loan portfolio to net loan portfolio multiplied by expected annual yield. That is, a difference between expected yield and cash yield.

(d) Funding-Expenses Ratio

Microfinance institutions use various sources of fund to make up their capital structure. Payment to the providers of capital is what is known as financing or funding expenses (Bodie *et al,* 2009; CGAP, 2008b; Brealey *et al*, 2006; Ledgerwood and White, 2006; CGAP, 2003; Ledgerwood, 1999). The funding expenses are expected to be paid out of the revenue generated by an MFI from its loan portfolio. The funding-expenses ratio, therefore, shows the proportion of these funding expenses to the average loan portfolio. According to CGAP (2003) the ratio can be compared with the yield on gross portfolio to determine the interest margin. The funding-expenses ratio is computed by dividing interest and fee expenses on funding liabilities divide by average gross loan portfolio. The higher funding-expenses ratio would indicate, other things being equal, inefficiency in combining sources of capital. This is so because; a higher proportion of the fund will be paid back as interest or in terms of charges to providers of funds.

(e) Cost of Funds Ratio

The cost of funds ratio is a ratio of cost of all sources of capital to average funding liabilities. It shows the proportion of the cost of fund to the funds (liabilities). The cost of funds ratio is computed by dividing interest and fee expenses on funding liabilities by average funding liabilities. The funding liabilities exclude the interest payable or interest on loans to finance fixed assets (CGAP, 2003). The lower the ratio, the better, indicating that less is paid as cost on the borrowed funds. All things being equal, an efficient microfinance institution will have lower cost of funds ratio.

6.2.2 Portfolio Quality Measures

The portfolio quality measures are generally a part of asset management measures with specific emphasis on how management makes and manages the loan portfolio. That is, among others, how they select customers to minimise the effects of adverse selection, and how they make repayment follow-ups to enhance higher repayment rates, and, therefore, reduce the effects of ex-post and ex-ante moral hazards. The adverse selection refers to a situation where lender may make wrong risk estimation about the borrower and thus, ends up selecting a risky borrower (Hermes and Lensink, 2007; Tirole, 2006; Laffont and Guessan, 2000; Ghatak, 1999).

Armendáriz and Morduch (2007) define ex-ante moral hazard as the action taken by the borrower after loan disbursement but before realization on project returns, which may affect the probability of getting good return. While the ex-ante moral hazard occurs after the loan disbursement but before realization of project returns, the ex-post moral hazard, as the name suggests, occurs after realising the project returns. In this case, the borrower may claim that his or her project was not successful, and thus, ask for extension or just disappear with the money (Armendáriz and Morduch, 2000 and Armendáriz and Morduch, 2007). That is, the borrower may not turn up to repay the loan. The effects of both ex-post and ex-ante moral hazards are reflected in the quality of an MFI's portfolio.

The portfolio quality measures are: the portfolio at risk (PAR) ratio; write-off ratio; and risk coverage ratio.

(a) Portfolio at Risk

According to CGAP (2003) the portfolio at risk is probably the most acceptable measure of portfolio quality. Microfinance literature indicates that, interest from loan is the main source of income to microfinance institutions (Fernando, 2006; Tellis and Seymour 2002; CGAP, 1998). The amount of interest income to be received from loans will depend on the quality of loan portfolio. The quality of a loan portfolio indicates, among other things, the loan principal and interest repayment performance (Godquin, 2004). It is, therefore imperative that, the management of a loan portfolio should be one of the key daily tasks of an MFI's management.

The longer the loan remains unpaid, the higher the risk that the same will not be repaid, thus, known as loan at risk. CGAP (2003:11) defines portfolio at risk as the "outstanding amount of all loans that have one or more instalments of principal past due by certain number of days". The portfolio at risk measure is given by the value of the portfolio at risk, at a given number of days, divided by gross loan portfolio. The higher portfolio at risk will indicate poor collection policy, and or that an MFI is not efficient in making collection. Sometimes the poor collection is an indication of adverse selection and or moral hazards (Armendáriz and Morduch, 2007).

(b) Write-off Ratio

Some loans never get repaid and thus, they are written-off as bad debts. The written-off ratio represents the proportion of loans that have been removed from the balance of gross loan portfolio because they appeared unlikely to be repaid (CGAP, 2003). When these debts are identified, they are written off as unrecoverable amount. The policy to write-off debts differs from one microfinance institution to another. The debts written-off as bad form part of the operating expenses of an MFI and, therefore, reduce its profitability. The written-off ratio is given by the value of loans written-off divide by average gross loan portfolio (ibid). An inefficient MFI will have high volume of unpaid debts and thus, higher write-off. That is, higher write-off indicates laxity of an MFI in debt collection. This could be a result of many factors among which are: poor loan payment and follow-up policies; untrustworthy personnel; and wrong loan assessment, all of which reflect a condition of an inefficient MFI.

(c) Risk Coverage Ratio

Microfinance institutions need to take caution to cover any loss as a result of bad debts. The risk coverage ratio indicates how an MFI is prepared for such losses. Normally MFIs set aside part of their profits for this purpose to cover any unpaid amount beyond a certain period. Again, this differs from one MFI to another depending on the level of risk they are facing in the unpaid amount. The amount set aside for this purpose is known as loan-loss reserves (CGAP, 2003). The longer the loan is unpaid, the higher will be the amount set aside to cover the loss when it happens. The risk coverage ratio is computed by dividing loan-loss reserve by the amount of portfolio at risk beyond a certain period set by an MFI from their loan losses experience.

6.2.3 Productivity Measures

The productivity measures indicate how well an MFI utilises its assets and staff in general, and loan officers in particular in influencing loan repayment, enhancing increase in income, and reduction in overall microfinance expenditure. According to CGAP (2003) the productivity measures indicate how efficient an MFI is in using its resources. Efficiency of microfinance staff has a role to play in bringing about profitability and, therefore, sustainability of microfinance institutions. To measure staff efficiency, the following staff productivity measures are commonly used: loan officer productivity; personnel productivity; average disbursed loan size; average outstanding loan size; operating expenses ratio; cost per borrower or client; and other expenses ratios.

(a) Loan Officer Productivity

Loan officers of an MFI are regularly involved directly in revenue generating activities of microfinance institution. Duties of the loan officers vary from one microfinance institution to the other. However, to most microfinance institutions, loan offices are the ones involved with finding clients, screening and selecting clients, and when loan is granted, making follow-ups for loan repayment. Their efficiency in this task then deserves to be measured.

The loan officer productivity measure is computed by dividing number of active borrower by number of loan officers (CGAP, 2003). The loan officer productivity measure indicates that, all things held constant, the larger the number of clients served by a loan officer, the efficient is the microfinance in utilising the loan officers. However, this efficiency in utilizing the loan officers needs to be compared to what this large number of borrowers means to the overall revenue of an MFI.

(b) Personnel Productivity

Apart from using loan officer's productivity measure alone, some microfinance institutions compute the productivity ratio based on total number of personnel. This is because some of duties of loan officers and other microfinance staff duties tend to overlap. According to CGAP (2003) the personnel productivity ratio measures how efficient an MFI is in utilising its total human resources in managing its clients and thereby contributing to income for the microfinance institution.

The personnel productivity ratio is computed by dividing either number of active borrowers or number of active clients as numerator, by the number of personnel as denominator. When personnel productivity ratio is used, according to the Microfinance Consensus Guideline issued by CGAP (2003) most MFIs use the number of clients as numerator. This is probably because some of the staff may not be directly involved with borrowers; they may rather be involved with savers or clients for other services. Again, all things held constant, the higher the number of clients per staff would indicate microfinance efficiency in utilising its staff.

(c) Average Disbursed Loan Size

Although microfinance institutions have various products, the loan product is the most common one to most of them. The more loans are disbursed, all things being equal, the better the microfinance business or services. The average disbursed loan size measures the average loan size that is disbursed to clients (CGAP, 2003). The average disbursed loan size is computed by dividing the value of loans disbursed in a period by total number of loans disbursed during the same period. All things being equal, the large the size of average disbursed loan, the efficient the MFI in selling loans.

(d) Average Outstanding Loan Size

Microfinance institutions also use the average outstanding loan size to measure their efficiency. The average outstanding loan size is computed by dividing gross loan portfolio by number of loans outstanding. The average outstanding loan size ratio is expected to be significantly less than the average disbursed loan size (CGAP, 2003). That is, the average outstanding loan size of an efficient microfinance institution will be significantly less than its average disbursed loan size. This indicates that, an MFI is efficient in making collections, as on average, what was disbursed is less than what is outstanding. The opposite of that will indicate inefficiency on part of an MFI.

(e) Operating Expenses Ratio

According to CGAP (2003) the operating expenses ratio is the most commonly used measure of microfinance efficiency. It measures how an MFI’s management has been efficient in reducing costs of operation at a given level of operation. The level of operation is measured by the average gross loan portfolio. The lower the operating expenses ratio will indicate efficiency in microfinance institutions’ cost reduction strategy. That is, an MFI is operating at lower cost, which means, all things being equal, efficiency.

The operating expenses ratio is computed by dividing operating expenses by average gross loan portfolio. The operating expenses include all administrative and staff expenses. CGAP (2003) suggests the average total assets to be an appropriate denominator for microfinance institutions which have other products other than loan. This is because, when an average gross loan portfolio is used as denominator, comparative between loan-only MFIs and MFIs with other products like savings and deposits becomes biased and unfavourable.

(f) Cost Per Borrower and Cost per Client Ratios

Cost reduction is one of the efficiency parameter of an MFI. The cost per borrower and the cost per client ratio measure the efficiency of microfinance institutions in serving their client. They determine the average cost of maintaining a borrower or a client. The lower the cost per borrower or client will indicate the microfinance efficiency. This will also mean higher profitability and, therefore, financial sustainability. Cost per borrower ratio is computed by dividing operating expenses by average number of borrowers (CGAP, 2003). Again, when an MFI has other non loan products, the appropriate denominator is the average number of clients. This indicates the cost per client as a measure of how much it costs an MFI to maintain a client.

(g) Other Expenses Ratio

Apart from the above expenses ratios, microfinance institutions may compute the expense ratios based on other expenses to allow them track the growth or decline of a particular expense over time or across a group (CGAP, 2003). Ratios that can be computed under this category include: a ratio of administrative expenses as percentage of average loan portfolio; a ratio of salary expenses as a percentage of average loan portfolios; a ratio of total administration expenses over number of borrowers, indicating cost per borrower; staff costs per client, and administrative cost per client. Staff cost per borrower for example will indicate how efficient an MFI is in reducing staff costs at a given level of operation (number of borrowers). When the staff costs per borrower ratio is used, the lower the ratio the efficient will be the microfinance institution. For MFIs with other clients other than loan clients the appropriate denominator is number of clients.

6.3 EMPIRICAL THEORY

As we have just explained, profitability is highly linked to sustainability. In other words, profitability is a stepping stone to financial sustainability (Schreiner, 2000). It has also been widely used as a measure of financial sustainability (Armendáriz and Morduch, 2007; Cull *et al*, 2007; Gonzalez, 2007; Adongo and Stork, 2006; CGAP, 2003; Woller and Schreiner 2002; Von Pischke, 1996). Gonzalez-Vega (1998) argues that, many microfinance institutions are inefficient because they think in terms of levels of speed of collections, not in terms of operational costs. Cost reduction is thus, as important as increasing revenue. This is what we have referred to as microfinance efficiency.

Reviewing microfinance literature that we have to-date one would say there is but few (if any) systematic study which focuses specifically on how microfinance institutions' efficiency affects their financial sustainability. Few studies that we know have indicated the relationship between efficiency and financial sustainability by looking at various cost and revenue elements (Cull *et al*, 2007; Christen, 2000; Woller, 2000; Rosenberg, 1996; Christen *et al*, 1995). Some studies have also used the personnel productivity measures as part of their analysis (Woller and Schreiner, 2002; Christen *et al*, 1995). Other studies have linked microfinance efficiency with commercialization (Hishigsuren, 2007; Christen and Drake, 2002; Woller 2002; Richardson and Lennon, 2001) and still some relate it with microfinance best practice (Woller 2000; Woller *et al*, 1999; Gonzalez-Vega, 1998; CGAP, 1996). In the next section we explain each of these.

6.3.1 Cost and Revenue Elements

Interests from loan are the major source of revenue to most MFIs (Tellis and Seymour, 2002). Studies indicate that there is no relationship between the amount of loans made and the amount of interest charged. Demand for loans appears to be inelastic because the demand for loans is higher compared with supply of the same (Rosenberg, 1996). This means that MFIs can increase interest rates (charge higher interest rates) without affecting the amount of loan demanded and thus, increase revenue and profitability.

Studies have reported that interest rates affect profitability of MFIs. Christen *et al* (1995) for example, using cross country comparison data, for 11 successful MFIs from 9 countries found that the real interest rates charged on loans are significant determinant of profitability (self-sufficiency). Subsequent studies by Christen (2000) and Woller and Schreiner (2002) also found the real interest rates to be significant determinants of profitability. Woller and Schreiner's study was examining determinants of financial self-sufficiency using thirteen village banks.

All withstanding however, MFIs cannot continue raising interest rates indefinitely. Recent study on financial performance and outreach of leading micro banks, by Cull *et al* (2007) has shown that raising interest rates to very higher level while it improves profitability where group lending is used, it does not ensure greater profitability for individual lending. This is because the higher the interest rates, the heavier the repayment burden, and, therefore, the lower will be the level of compliance (Conning, 1999). This is consistent with the theory of moral hazard and adverse selection (Robinson, 2001; Stiglitz and Weiss, 1981).

While considering increasing interest rates MFIs need to also consider the possible effect of their decision. Experience from bank lending business shows that higher interest rates leads to moral hazard and adverse selection problems as a result of asymmetric information between borrower and lender (Robinson, 2001). This happens when one party to a transaction has more information about the transaction than the other. Adverse selection also known as negative selection refers to a situation where bad or untrustworthy customers are more likely to be selected. Moral hazard on the other hand refers to a situation where borrowers become untrustworthy because of the high payment burden pressed on them as a result of higher interest rates (Armendáriz and Morduch, 2007). Both adverse selection and moral hazard increase the likelihood of default in an MFI's loan portfolio.

Moreover, it has been reported that, "the ability to pay high interest rates depends on the amount of capital used as well as the amount of all other inputs available. It cannot be inferred that because one group of poor households can pay high rates then every poor household can pay those high interest rates as well" (Morduch, 2000:621). A recent study by Cull *et al* (2007) investigated, among others, whether or not raising interest rates could lead to agency problems as detected by lower repayment rates and less profitability. The Cull *et al* (2007) study has provided evidence that MFIs can raise interest rates without undermining repayment rates, especially where group lending technology is being used, and thereby achieving both profit and substantial outreach to poorer population, and staying true to initial social missions even when aggressively pursuing commercial goals. Their findings were consistent with Woller and Schreiner (2002) suggesting that MFIs can successfully pursue all goals, financial and social.

6.3.2 Staff productivity

Studies also have used in addition to cost and revenue elements, staff or personnel productivity measures to indicate whether or not efficient utilization of MFI's personnel could affect their profitability (Woller and Schreiner 2002; Christen *et al*, 1995). Christen *et al* (1995) for example, found that average salary levels relative to GDP and real interest rates to be significant determinant of financial sustainability. The staff productivity measures were found not to be associated with the financial sustainability as determined by profitability. In another study, Christen (2000) based on numerous regressions on Micro-Banking Bulletin data, found that administrative expenses ratio and real portfolio yield are significant determinants of profitability.

Woller (2000) conducted a study on financial viability of village banking to reassess the past performance and future prospects of village banking. He found that interest spread, the spread between yield and administrative expenses ratio, and portfolio yield are among the variables most strongly correlated with financial sustainability. The findings were consistent with Christen (2000). Additionally, the number of borrowers and cost per borrower was also found to be among the variables most highly correlated with financial sustainability. Later Woller and Schreiner (2002) examined the determinants of financial self-sufficiency using thirteen village banks. It was found that the interest rates, administrative efficiency, loan officer productivity, and staff salary were significant determinant of profitability.

Empirical theory presented above indicates that one variable which is relevant to MFI operating at one area may not be equally applicable to other places. Thus, to determine what among these factors are also relevant to rural MFIs in Tanzania was the main focus of this chapter.

6.3.3 Commercialization, Efficiency and Financial Sustainability

The term commercialization refers to the adoption by MFIs of market-based principles in their microfinance activities regardless of whether they are under prudential or non-prudential government regulations (Christen and Drake 2002). It is the adoption of commercial approaches like: introduction of cost-saving technologies; gathering, disseminating and using market intelligence; the introduction and market testing of new products and services, typically – but not necessarily – in response to market forces (Woller, 2002a). Commercialisation could lead to efficiency and, therefore, financial sustainability because adopting the market approach implies principles such as professionalism and sustainability, in the provision of financial services.

The commercialization of microfinance is attracting increasing attention as potential means for narrowing the persistent demand-supply gap for demand-driven, sustainable microfinance products and services. There is a growing realization that commercialization offers greater opportunity for MFIs to fulfil their social objectives of providing the poor with increased access to different types of demand-driven microfinance products and services, including not only credit but also savings, insurance, utility and other payments, and money transfers (Woller, 2002a; Richardson and Lennon, 2001). According to Hishigsuren (2007) commercialization and adopting licence to operate as a regulated financial institution allow MFIs to increase their capital base through mobilization of public deposits and access to private sources of capital. This in turn could help MFIs to serve a wider client base, also known as breadth of outreach.

While the commercialization move is getting more supporters, the same move appears to be a threat to MFIs' poverty reduction objective. The assumption is that, commercialization could lead into engagement of larger, wealthier clients and, therefore, diverting money intended for the poor to those who are a bit better off (Woller, 2002a). As Von Pischke (2007) has put it, commercialization may lead to one of the following three possibilities. The mission stability, mission enhancement, and mission drift.

Mission stability refers to a condition where an MFI will continue with provision of limited range of services to the poor. The mission enhancement on the other hand looks at engaging larger, wealthier clients as one way to enhance MFIs mission. This can be done through cross-subsidization where wealthier clients are charged higher interest rates than the poorest clients (Armendáriz and Morduch, 2007). Through this new services are offered, new target group engaged, while the original group continue to be served, often better (Von Pischke, 2007).

According to Von Pischke (2007), mission enhancement is consistent with the objective of servicing those who have not had prior access to formal finance or to certain financial instruments. Mission enhancement makes financial sector more efficient, as indicated by finer spreads, lower risk premium, new products, lower transportation costs, more participants, and service to an expanded array of clients. It is meant to make financial sector more efficient by continuing to engage those beyond the frontier of formal finance and by catering to the others not well served by main stream finance. The last possibility is mission drift. This happens when an MFI, which served better the poor, moves up-market, abandoning the poor. Over emphasising financial self-sufficiency will lead MFIs to engage wealthier clients to earn higher profits as a means of moving towards attaining financial self-sufficiency (Armendáriz and Morduch, 2007; Woller, 2002a).

Outreach to the poor is measured by loan size. The smaller the loan size, the more the outreach (poor clients) an MFI will attain. Larger loan size, therefore, would indicate mission drift. According to Christen (2000b) commercialization could also mean larger loans. However, as he has put it, larger loan sizes are not necessarily an indication of mission drift and could be a function of different factors, including the "generational factor". The extent, to which a microfinance institution was initially part of the pioneering group or first generation of microcredit NGOs, or whether it is part of new entrants into the sector, that seems to influence the market segment currently served.

Studies, however, indicate contradicting results on the impact of commercialization on MFIs' mission drift. On one hand, CGAP (2002) reports that MFIs in Indonesia, Nepal, Cambodia and, the Philippines have not suffered from such "mission drift" as a result of commercialization. On the other hand, the study by Christen (2000b) indicates that the commercial approach to microfinance in Latin America seems to have left poorer clients behind, which could support the argument that mission drift is an inevitable consequence of the push for financial sustainability.

All withstanding, if an MFI should become financially sustainable, adopting the market principles such as sustainability, professionalism, and efficiency, in the provision of financial services cannot be overemphasised. As Richardson and Lennon (2001) have reported, commercialization has transformed some of the credit unions into commercially vibrant, highly efficient microfinance institutions that often reach many low and middle-income clients with a broader mix of financial products and services at more favourable interest rates than do many leading MFIs of the world. Moreover, recent studies by Mersland and Strøm (2009) and Bogan *et al* (2007) have reported that the size of microfinance institutions is associated with their efficiency and financial sustainability.

6.3.4 MFIs Best Practice and Financial Sustainability

According to Woller *et al* (1999) microfinance best practice refers to practice that improves institutional efficiency and effectiveness in all aspects of operations. These include accounting and finance, marketing, product design and delivery, and management of microfinance. MFIs with exemplary performance like Grameen Bank of Bangladesh (formally with group lending approach), BancoSol of Bolivia (with individual lending approach), and FINCA (with village banking model) have been the basis from which to draw the best practices in the microfinance field. Literature has been written on what comprises of 'best practice to be followed by MFIs for good result. Donors have argued MFIs to follow the best practices in the microfinance field.

Microfinance best practice literature requires that for MFIs to achieve financial self-sufficiency they should: 'drive down' administration costs (including salary) per unit of output costs (as measured by loans or borrowers); drive up 'staff productivity'; achieve 'significant' scale (number of borrowers); and charge 'appropriate' high interest rates CGAP, 1996 and Woller, 2000). According to Gonzalez-Vega (1998) everything else equal, the more efficient a microfinance institution is, the less the gap between its actual practice and best practice.

There has been a move to copying and applying the best practice throughout the world advocated by donors and the World Bank (Cho-Béroff *et al*, 2000). While this is good, it has to be done with caution. Some of the factors found useful in one economy and being practiced by large, most successful MFIs, may not hold the same level of relevance to MFIs operating in different economies. Study by Woller and Schreiner (2002) reveals this. Their study was examining the determinants of financial self-sufficiency among thirteen village banking institutions. They found, consistent with the 'best practice requirement', that lower administration costs, higher loan officer productivity, lower average salary, high real interest rates were associated with higher level of financial self-sufficiency. However, contrary to best practice requirement, no other staff productivity indicators were found to have a significant association with financial self-sufficiency, and the number of borrowers had no significant impact on financial self-sufficiency.

Furthermore, studies indicate that there have been departures from standard models for betterment. Morduch (2000) reports that replication of standard models like Grameen Bank Model and FINCA's village banking model in other economies do far better in terms of outreach than financial sustainability. Additionally, the replication should not substitute the innovative skills of MFIs. As Zeller (2000) has put it, replicating the best practice is far than enough. The innovation is also needed given the particular environment in which the MFIs are operating (Imady and Seibel, 2003; Conning, 1999; Woller *et al*, 1999).

Based on a study by Rutherford (1997), Morduch (2000) reports that Bangladesh's ASA departed from Grameen's model and developed a simple management structure and accounting system that resulted in substantial cost reduction, "making it possible to approach financial sustainability without imposing excessively high costs on clients" (Morduch, 2000:619). Again, drawing from successful deposit mobilization experiences from Indonesia, Safesave departed from standard models in Bangladesh and created flexible and safe savings account which included the possibility of daily savings (Morduch, 2000).

However, this experience cannot be taken for granted as workable in rural MFIs in Tanzania. As Armendáriz and Morduch (2007) have commented, some contexts, such as rural Africa and Latin America, are inherently more costly to work in than rural Bangladesh. Moreover, as Woller (2000) has argued, "... we have been inhibited in our search by a conception of best practice that pays too little attention to crucial differences in institutional characteristics and that as a result, attempt to apply standards that are not always relevant" Woller, 2000:8). Moreover, the 'best practice' needs not to be best for everyone (Dunford, 2000).

6.4 RESEARCH QUESTION

In light of the above discussions on the empirical literature review on how the microfinance efficiency relates to their financial sustainability, the data analysis and discussions of the findings in this chapter were focused to answer the following research question: Does the microfinance efficiency, as reflected in: the yield on gross loan portfolio; portfolio at risk; liquidity ratio; staff productivity; cost reduction; and amount of loan disbursed affect the financial sustainability of rural microfinance institutions in Tanzania?

6.5 VARIABLE DESCRIPTION

Table 6-1 and Table 6-2 describe the dependent and independent (explanatory) variables that are used for analysis in this chapter. Their meaning and measurement is as explained in the previous sections following the CGAP (2003b) definitions and measurements as has been used in other studies reviewed in this chapter.

(a) Dependent Variable

The dependent variable in this chapter is the financial self-sufficiency (FSS), which is a measure of financial sustainability. A measure above one indicates that an MFI is financially sustainable while a measure below one would indicate an unsustainable MFI. Table 6-1 below indicates how this variable is measured adopting the standard measures provided by the Consultative Group to Assist the Poor (CGAP, 2003).

Table 6-1: Dependent Variable

Variable Name	*Measurement (Formula)*
Financial Self Sufficiency (FSS)	$\dfrac{\textit{Adjusted Financial Revenue}}{\textit{operating expenses + financial expenses + Loan loss provision expenses + Expense adjustment}}$

(b) Independent Variables

The variables used as independent or explanatory variable are those reviewed in this chapter as indicators of microfinance efficiency. An analysis was carried out to identify the cause-effect relationships between these variables and indicators of financial sustainability for the rural microfinance institutions in Tanzania. Some indicators of microfinance efficiency discussed in theoretical part were not included under independent variables due to lack of sufficient data required for a multiple regression analysis given the number of independent variables. These are written-off ratio and risk coverage ratio. Moreover, funding expenses, cost of funds ratio, and other expenses ratios were also not used because they are components of the overall operating expenses ratio and, therefore, they appeared to cause multicollinearity. The staff productivity was used to represent the loan officer productivity because there seemed to be no differences in their duties and the data to facilitate their separation was not obtained. Further, the average outstanding loan portfolio was not used because it is meant to indicate the effect of loan repayment on sustainability which has already been taken care of with the portfolio at risk as a proxy of loan repayment. The independent variables used in this chapter are described in Table 6-2. Some variables appear in log form for regression purposes as explained in methodology chapter under section 4.4.2.

Table 6-2: Independent Variables

S/N	*Variable standard name*	*Variable name as used in regression model*	*Variable description as used in regression model*	*Expected Effect on financial sustainability*
1.	Yield (yield on Gross Loan Portfolio)	*yield*	*Yield on gross loan portfolio*	+
2.	Portfolio at Risk (PAR)	*PAR*	*Portfolio at risk*	(-)
3.	Liquidity ratio (Current Ratio)	*lnliqratio*	*Natural log of liquidity*	(+/-)
4.	Number of borrowers per staff	*lnborrpstaff*	*Natural log of number of borrowers per staff*	(+/-)
5.	Administrative expenses per borrowers	*lnaepborr*	*Natural log of administrative expenses per borrower*	(-)
6.	Staff costs per borrower	*lnstcospbor*	*Natural log of staff cost per borrower*	(-)
7.	Cost Per client	*lncostpclie*	*Natural log of cost per client*	(-)
8.	Operating Expenses Ratio	*lnoeratio*	*Natural log of operating expenses ratio*	(-)
9.	Average disbursed loan size	*lnavdisbloan*	*Natural log of the average disbursed loan size*	(+)

6.6 DESCRIPTIVE RESULTS

This section presents the results based on the descriptive statistics for both dependent and independent variables over 4 years. The dependent variable is the financial self-sufficiency (FSS) as in Chapter 5. The descriptive results for this variable are presented in Table 6-3 followed by the descriptive statistics for explanatory variables (independent variable). The independent variables are explained in Table 6-2, of which the descriptive statistics are detailed in Table 6-4.

Table 6-3: Descriptive statistics for dependent variable

Variable	Obs	Mean	Std. Dev.	Min	Max
FSS	424	1.566226	.8717998	.16	7.39

The mean ratio of the financial sustainability measure (FSS) for the rural MFIs is 1.566 indicating profitable and, therefore, sustainable MFIs. In total we had 424 observations out of which 337 (79.5 %) indicated sustainability and the remaining 87 observations (20.5%) indicated that the MFIs were not financially sustainable. From the 424 observations, 340 (80.2%) were member-based MFIs of which 265 (77.9%) were financially sustainable and 75 observations (22.1%) were not sustainable. The remaining 84 observations (19.8%) were the NGO-MFIs of which 72 observations (85.7%) were financially sustainable and only 10 observations (14.3%) were not sustainable.

The above statistics, as we saw in Chapter 5, tend to suggest that the MB-MFIs are less sustainable than the NGO-MFIs. However, the test for mean difference between the MB-MFI and the NGO-MFI's sustainability was not statistically significant leading us to conclude that the two are not statistically significantly different. Table 6-4 indicates the descriptive statistics for explanatory variables used in this chapter, explanations of which follow after the table. Further descriptive statistics used in this chapter for each of the types of MFIs are included in this thesis as Appendix 12.

Table 6-4: Descriptive statistics for independent variables

Variable	Obs	Mean	Std. Dev.	Min	Max
yield	424	.1624349	.0922478	0	.4173244
yieldgap	424	.1085274	.0789755	.000189	.5051864
PAR	424	.2670321	.2190385	.0012695	.9674952
liqratio	424	7.960213	29.69224	.7296336	326.696
borrpstaff	424	109.1185	152.2688	4.75	1026.5
aepborr	423	7930.802	13069.06	7.807465	136851.8
fepborr	424	3449.377	8200.727	0	74411.39
stcospbor	424	13320.94	25140.72	0	372645
costpclie	424	22363.52	39387.6	93.88715	418266.6
oeratio	424	.2129245	.2775142	0	2.35
avdisbloan	424	520164.1	673442.8	5200	3212295

The **Yield on gross loan portfolio** indicates the ability of an MFI to utilize the short-term assets to generate cash financial revenue. It indicates the efficiency with which an MFI has utilised its resources in generating cash revenue. The higher the ratio, the better, is indicating microfinance efficiency. Descriptive statistics for this variable show that rural MFIs in Tanzania generate 16.24 cents cash for each 1 shilling in the outstanding loan portfolio. While some few MFIs generate nothing, some efficient MFIs generate up to 41.73 percent cash revenue out of their loan portfolio.

The mean yield on gross portfolio for the MB-MFIs (340 observations) was 16.21 percent while for the NGO-MFIs (80 observations) was 16.37 percent. The test for mean difference indicated that the difference was not statistically significant. Thus, we could not find any evidence on differences in the level of efficiency between the two types of MFIs in as far as the yield on gross portfolio is concerned. Moreover, we discovered that in 2007 the yield ratio for the rural MFIs in Tanzania was 16.46 percent which compared poorly with 26.8 percent for MFIs in Asia as a whole (Llanto and Badiola, 2009); yield of 22.30 percent for MFIs in India; 23.26 percent for MFIs in Bangladesh; 51.19 percent for MFIs in Uganda; and 29.15 percent for MFIs in Kenya (MIX, 2010).

While the yield on gross portfolio shows the efficiency in generating cash revenue from the gross portfolio, the **yield gap** indicates the difference between the interest rate and what is actually earned (interest income) as a percent of outstanding gross portfolio. That is, the difference between what was expected from the loan contract against what was actually received. It is a measure of loan recovery. Thus, the yield gap takes into consideration the borrowers' repayment rate on the outstanding interest amounts. The smaller the gap, the better, indicates an efficient MFI. The higher the yields gap the higher the portfolio at risk (PAR). Thus, in this study, we used the PAR as proxy of repayment rate and yield gap. The mean yield gap for all rural MFI in Tanzania was 10.85 percent. The yield gap for the MB-MFIs was 10.8 percent while the one for the NGO-MFIs was 11.06 percent.

According to CGAP (2003) a small gap of less than 10 percent is common to most MFIs. Again, the test for mean difference for this variable indicated that the difference between the two means was not statistically significant. The yield gaps for rural MFIs in Tanzania compared fairly well with the yield gaps for the MFIs in Bangladesh where MFIs are dominant. According to the Asian Development Bank (2008) the yield gap for MFIs in Bangladesh in 2007 was 37.63 percent while for 2006 it was 28.55 percent. This shows that, all factors held constant, comparatively, MFIs in Tanzania are more efficient in loan recovery than their counterparts in Bangladesh.

Portfolio at risk (PAR) is another variable which indicates microfinance efficiency. The portfolio at risk as explained in theoretical framework in Chapter 3 measures the efficiency of an MFI in making collections. The higher PAR will indicate inefficiency in making collections, an indication of poor repayment rates. From the descriptive statistics indicated in Table 6-4 the mean PAR for rural MFIs in Tanzania was 26.7 percent, with the highest PAR being 96.75 percent. The MB-MFIs had PAR of 29.17 percent while the NGO-MFIs had PAR of 16.73. Comparatively, the NGO-MFI appeared to have higher repayment rate (low PAR ratio) than MB-MFIs. The test statistic of mean difference indicated that the difference was statistically significant.

The **liquidity ratio** measures the ability of MFIs to meet their short-term obligations when they fall due. The descriptive statistics for this variable indicates that, on average, for rural MFIs in Tanzania, the value of the current assets were 7.9 times the value of their short-term liabilities (obligations). Only in 14 observations (3.3%) out of 424 MFIs had liquidity ratio of less than 1. All things being equal, this is a good indication of good working capital (current assets) management. Again, for the MB-

MFIs, the mean liquidity ratio was 7.55 times while for the NGO-MFIs was 9.61 times. The test for mean difference however, indicated no significant difference between the two.

Very high liquidity ratios could indicate idle short-term resources. However, given the nature of institutions, the microfinance institutions, sometimes it may be reasonable to have higher liquidity to meet any unplanned resource requirement. Moreover, as opposed to banks, that treat savings and deposits as short-term liabilities, for most MFIs, especially MB-MFIs the savings and deposits are considered as part of capital and, therefore, categorized as part of long-term liabilities and capital.

Number of borrowers per staff is another indicator of microfinance productivity and, therefore, efficiency. All things being equal, the higher number of borrowers per staff would indicate efficiency of MFI staff, as they comparatively handle more borrowers. From the descriptive statistics in Table 6-4, the mean number of borrowers per staff for rural MFIs in Tanzania was 109. The minimum number of borrowers per staff was 5 while the maximum was 1026 borrowers per staff. A comparison of the mean difference for the MB-MFIs and NGO-MFI indicated insignificant difference. MB-MFIs had mean of 109 while NGO-MFIs had a mean of 108 borrowers per staff. The number of borrowers per staff in 2007 for all MFIs compared poorly with other global MFIs where the number of borrowers per staff was 218 in India; 128 in Bangladesh; and 170 in Kenya[24] (MIX, 2010).

In this study we adopted the decomposition of **cost per borrower** to explain the contribution of efficiency in reducing each of the individual components of cost per borrower namely, administrative expenses, financial expenses, and staff or personnel related expenses. The mean **administrative cost per borrower** for all MFIs was TZS 7930 (equal to USD 6.08) while the maximum was TZS 136,851 (USD 104.95). For member based MFIs the mean cost was TZS 5,373 (USD 4.12) and for the NGO MFIs it was TZS 18,254 (USD 14). These figures indicate that the MB-MFIs operated at lower administrative costs than the NGO-MFIs. The test for the mean difference was strongly statistically significant (at 1 percent significance level).

[24] Number of borrowers per staff in Uganda was 95.

Financing expenses per borrower is another item making up the cost per borrower. The financing expenses are all expenses related to acquiring and servicing the finance. The lower the financing expenses per borrower, all things being equal, the more efficient the MFI would be. The descriptive statistics indicated that the mean finance expenses per borrower for all MFIs were TZS 3,449.4 (USD 2.65) while the maximum was TZS 74,411.4 (USD 57.06). For the MB-MFIs, the mean financing expenses per borrower was TZS 2,495 (USD 1.91) and for the NGO-MFIs was TZS 7,312 (USD 5.61). The mean difference for this variable for the two MFI types was statistically significant indicating that the NGO-MFIs operate at relatively higher financing costs per borrower than the MB-MFIs. The possible cause for this is the different nature of these MFIs. For the MB-MFIs, the main source of finance is the members' contributions including savings and deposits, which at the moment nothing is being paid on the same. Thus, in this respect, the MB-MFIs have cheap source of finance compared to NGO-MFIs which comparatively, uses higher loan funds than their counterparts. Moreover, due to the fact that more than a half of the MFIs studied do not have the financing cost elements; we left out the financing expenses per borrower in our regression to avoid possible bias in the results. This also helped to make use of the available observations for the MFIs which did not have the financing costs element.

Lastly, on the decomposed cost per borrower are the **staff expenses**. The descriptive statistics for this variable indicated higher deviations on staff costs per borrower among MFIs. The standard deviation was TZS 25,140.72 (USD 19.28) while the mean was TZS 13,320 (USD 10.2) and the maximum was TZS 372,645 (USD 285.77). Once again, the t-test of the mean difference indicated that the difference between the mean for the MB-MFIs (TZS 8,474.6) and NGO-MFIs (TZS 32,937.08) was statistically significant. These descriptive statistics show that the MB-MFIs operate at relatively lower costs per borrowers than their counterparts. Thus, all being equal, the MB-MFIs are more efficient in cost reduction than the NGO-MFIs.

Apart from the decomposed cost per borrower, we also used the **cost per client,** including borrower and other non loan clients, to get the whole picture of efficiency with which the MFIs operate. The cost per client indicates the total cost involved in serving one MFI client regardless as to whether the same is a borrower or a client for other MFI's products or services.

The lower cost per client, all things being equal, indicates microfinance efficiency in cost reduction. That is, efficiency in operating at relatively low costs. The descriptive statistics for this variable indicated high deviations among MFIs. The mean cost per client was TZS 22,363.52 (USD 17.15) while the minimum was TZS 93.88 (USD 0.07) and maximum was TZS 418,266.6 (USD 320.75). For the MB-MFIs, the mean cost per client was TZS 8,214.15 (USD 6.3) while for the NGO-MFIs it was TZS 79,634.78 (USD 61.06). The t-test for the mean differences among these types of MFIs for this variable was statistically significant. This again, all things being equal, indicates that the MB-MFIs are more efficient in cost reduction than their counterparts. The mean cost per client for rural MFIs in Tanzania in 2007 (USD 24.53) compared poorly with MFIs in Bangladesh whose cost per client was USD 14; USD 12 in India; and other Asian MFIs at around USD 15 (MIX, 2010). However, the cost per client compared favourably with USD 78 and USD 157 for MFIs in Kenya and Uganda respectively (ibid).

The last cost related variable is the **operating expenses ratio**. This is the ratio of the overall operating expenses of the MFIs to their outstanding loan portfolios. It shows how much it costs the microfinance institutions in lending. Again, with other costs related variables, the lower the operating cost ratio, the more efficient the MFI will be. The lower operating expenses ratio also, other things being equal, will indicate higher profitability and, therefore, financial sustainability. The descriptive statistics for this variable indicate that on the overall, MFIs in rural Tanzania operate at mean operating expenses ratio of 21.29 percent of their outstanding portfolio. This ratio for the MB-MFIs was 16.92 percent while for the NGO-MFIs it was 39 percent, which is an indication that the NGO-MFIs operate at relatively higher costs than their counterparts. The test statistic for the mean difference for this variable was strongly statistically significant.

The **average disbursed loan size** indicates the efficiency of microfinance institutions in selling the loans. Loans are the main product of most microfinance institutions. Thus, all things held constant, the more loans are sold the better for profitability and financial sustainability. The descriptive statistics for this variable show that the mean average disbursed loan for rural MFIs in Tanzania was TZS 520,164.1 (USD 398.9). Compared with the mean average outstanding loan size of TZS 210,096.5 (USD 161.12) this shows that, all things being equal, around 60 percent of the loans disbursed were paid back within the same year. Only 40 percent remained outstanding, out of which, according to the portfolio at risk statistics in Table 6-4, 26.7 percent of total outstanding portfolio (or 10.7 percent of the amount that remain unpaid in the year when the loan was disbursed) are at risk.

Comparing the MB-MFIs and the NGO-MFI on this variable we discovered that 63 percent of the amounts disbursed were repaid within the same year for the MB-MFIs while only 48 percent was repaid within the same year for the NGO-MFIs. Statistics for the portfolio at risk shows that of the unpaid amount within the same year 10 percent becomes at risk for the MB-MFIs while for the NGO-MFI it is 12.7 percent. While the mean differences for average outstanding loan size was statistically significant, the difference for portfolio at risk was not significant.

To sum up our discussion on the descriptive statistics, we observed that while the MB-MFIs and NGO-MFIs were performing equally on income and productivity related variables, the MB-MFIs performed better in cost related variables. The MB-MFIs were more efficient than their counterparts in that they operated at relatively lower costs. The differences between these two types of MFIs in as far efficiency in cost reduction is concerned were strongly statistically significant. Finally, we would like to note that there may be some limitations in comparing efficiency of microfinance institutions in different countries as it has been reported that there are country effects that affect their efficiency (Hermes *et al*, 2009; Gutiérrez-Nieto *et al*, 2007). The country effects include the operating and regulatory environment (Balkenhol, 2007).

6.7 ECONOMETRIC RESULTS

Considering the microfinance efficiency indicators discussed in Chapter 3 and the empirical theory part of this chapter, this section presents the econometric results on which of these factors affect the financial sustainability of rural microfinance institutions in Tanzania. The section covers the operational model and results.

6.7.1 Operational Model

The specific or operational panel regression model used to study the effects of microfinance efficiency on the financial sustainability was:

$$FSS_{it} = \alpha_i + \beta_1\, yield_{it} + \beta_2\, PAR_{it} + \beta_3\, lnliqratio_{it} + \beta_4\, lnborrpstaff_{it} + \beta_5\, lnstcospbor_{it} + \beta_6\, lnaepborr_{it} + \beta_7\, lncostpclie_{it} + \beta_8\, lnoeratio_{it} + \beta_9\, lnavdisbloan_{it} + \varepsilon_{it}$$

Where: FSS is the financial self-sufficiency, which is the dependent variable; α_i is a constant term; β_{is} measure the partial effect of independent or explanatory variables in period *t* for the unit *i* (*MFI*); the X_{it} are the explanatory variables as explained in Table 6-2; and ε_i is the error term. The variables, both dependent and independent, are for cross-section unit *i* at time *t*, where *i* = MFIs (1 to n), and *t* = 1 to 4.

6.7.2 Results

The econometric results indicate that the overall Wald statistic is statistically significant at 1 percent significance level leading us to reject the hypothesis that all coefficients are equal to zero. Summary of econometric results on how the microfinance efficiency parameters affect the financial sustainability are presented in Table 6-5, details of which are in Appendix 13 (e).

Table 6-5: Econometric Results for the Determinants of Financial Sustainability (Efficiency Parameters)

Variable	Coefficient	Robust Std. Err.	P>z
yield	4.869958	0.7170055	0.000***
PAR	-0.46002	0.1573824	0.003***
lnliqratio	0.1710332	0.0661661	0.010**
lnborrpstaff	-0.145104	0.0389201	0.000***
lnaepborr	0.019158	0.029039	0.509
lnstcospbor	-0.0355257	0.0651731	0.586
lncostpclie	-0.1167503	0.0615061	0.058*
lnoeratio	-0.6179029	0.0756633	0.000***
lnavdisbloan	0.0082543	0.036585	0.821
R-Sq	Within = 0.3932	Between = 0.5604	Overall = 0.4652

***significant at 1%; ** significant at 5%; * significant at 10%

The yield on gross outstanding loan portfolio (*yield)* indicates the efficiency of microfinance institutions in generating cash revenue from their outstanding portfolios. The higher yield on gross outstanding loan portfolio ratio, other things being equal, indicates efficiency. The econometric results in Table 6-5 show strong positive relationship between this variable and financial sustainability of the microfinance institutions. This provides evidence that the efficiency of microfinance institutions in generating cash revenue will positively affect their financial sustainability.

The **portfolio at risk** (PAR) measure indicates how efficient an MFI is in making collections. The higher the PAR implies low repayment rates, an indication of inefficient MFI. The higher the PAR, the more inefficient the MFI will be and, therefore, the less financially sustainable. The econometric results indicate a negative relationship between PAR and financial sustainability. This shows that, the less efficient the MFI is (higher PAR) the less will be its financial sustainability. The coefficient for the PAR variable was statistically significant at 1 percent level of significance.

Apart from being able to influence higher repayment rates, microfinance institutions should also have enough resources (working capital) to meet their outstanding short-term obligations including disbursing loans and repay clients' savings and deposits. The ability to pay short-term obligations when they fall due is determined by the **liquidity ratio** (*lnliqratio)*. All things being equal, the higher the liquidity ratio the better, an indication of microfinance efficiency. The econometric result in Table 6-5 above confirms this. The coefficient for the liquidity ratio variable is positive and statistically significant at 5 percent significance level. This indicates that, the microfinance liquidity level affects their financial sustainability, and that holding all factors constant, the higher the liquidity the more financially sustainable MFI will be.

The efficiency of microfinance institutions also can be measured by their staff productivity. The **number of borrowers per staff** (*lnborrpstaff)* variable measures the efficiency with which MFIs utilize their staff to serve and manage a certain number of borrowers. All things being equal, the higher the number of borrowers per staff means efficiency utilization of microfinance staff. However, the econometric result indicated that the number of borrowers per staff was negatively and strongly statistically significantly related to the financial sustainability. This shows that the increase in number of borrowers per staff affected negatively the financial sustainability of rural MFIs in Tanzania.

The negative relationship between staff productivity and financial sustainability in this study implies that the more numbers of borrowers is required to be served by a staff the less financially sustainable the microfinance will be. That is, microfinance staffs for rural MFIs are not efficient as a result they fail to manage the borrowers when their number grows causing the microfinance institutions to suffer poor repayment rates and, therefore, become less financially sustainable as revealed in Chapter 5. Although contradicting the findings by Christen *et al* (1995) that staff productivity is not associated with financial sustainability, the findings in this study are in line with the findings by Woller and Schreiner (2002) and Christen (2000). The findings in our study also confirm the finding by Hermes *et al* (2008) and Gregoire and Tuya (2006) that outreach and efficiency are negatively correlated.

Microfinance institutions are expected to operate at relatively low costs to be able to maximize their profit and become financially sustainable. The c**ost per borrower** variable measures this. In this study we decompose the cost per borrower to gain more insight into the effect of each of the individual components of the cost per borrower on financial sustainability. These are the administrative costs per borrower (also known as operating costs), and staff related costs per borrower. The lower the cost per borrower element, all things being equal, would indicate microfinance efficiency.

The coefficient for the **administration expenses per borrower** (*lnaepborr)* in Table 6-5 is positive but not significant even at 10 percent significance level. The positive coefficient of this variable indicates that the higher the amount spent in managing the portfolio, all things being equal, the higher will be the repayments. The higher repayments would lead to relatively higher profitability and, therefore, financial sustainability. This relationship although contradicting the accounting profitability theory that higher costs, all things being equal, reduce profitability, it helps to explain the nature of microfinance business. With microfinance institutions, the more you invest in customer monitoring, including field visits, the higher repayments will be. This finding should, however, be interpreted with caution. The focus here should be to spend more on managing the loan portfolio and less on other activities which may be less related to the main business. This caution comes from the findings by Woller and Schreiner (2002) and Christen (2000) that higher administrative expenses affect negatively the financial sustainability.

Another component of the cost per borrower considered in our study was the **staff costs per borrower** (*lnstcostpborr).* The coefficient for this variable was negative but statistically insignificant. The insignificant effects of the staff costs per borrower on the financial sustainability is contrary to the findings by Woller and Schreiner (2002) and Christen *et al* (1995), which shows that salary levels significantly determine financial sustainability of microfinance institutions. The finding in our study also contradicts Cull *et al* (2007), which shows that to achieve profitability MFIs should invest heavily in staff costs. The possible explanation for this deviation can be based on the nature of most MFIs studied, especially the MB-MFIs, where the staff-pay is not based on their efficiency, the possible case with Cull *et al* (2007) findings. Thus, higher staff-pay, all things remaining constant, could lead them into more leisure than in doing more work for the MFIs' main business especially where facilitation for field visits is low. This can also help to explain why possibly the administrative expenses are positively related with financial sustainability.

Moreover, the findings in Chapter 5 on the depth of outreach, measured by loan size, confirm that the higher the loan size, the more profitable and, therefore, financially sustainable the microfinance will be. We also found that, the higher the staffs cost per borrower, the better the outreach. This also is in line with Hartarska (2005) that lower wages worsen microfinance outreach. This refers to a case where the staffs are motivated to ensure that they reach the lowest class of the clients (the poor), as measured by lower loan size. Thus, the negative coefficient for the staff costs per borrower confirms that, if higher staff costs improves depth of outreach (lower loan size), which is associated with lower profitability, then the higher the staff costs per borrower, all things being equal, means less profitability and, therefore, less financial sustainability.

While we decomposed the cost per borrower to explain the effects of each cost component, we also used the overall **cost per client** (*lncostpclie)* variable to assess the effects of microfinance efficiency (measured by the overall cost reduction) on the financial sustainability. The results show that the efficiency in reducing overall costs affects the financial sustainability of rural MFIs in Tanzania. The coefficient for this variable was negative, statistically significant at 10 percent level, as expected indicating that higher cost reduction (low cost per client) improves financial sustainability.

On expenses related variables, we finally assessed the effects of the **operating expenses ratio** (*lnoeratio)* on financial sustainability of microfinance institutions in rural Tanzania. The operating expenses ratio is the ratio of total operating costs to outstanding loan portfolio. The lower the ratio, all things being equal, will imply efficiency. The econometric result for this variable suggests that the operating expenses ratio strongly affect the financial sustainability of microfinance institutions. The coefficient for operating expenses ratio variable was negative and statistically significant at 1 percent significance level. This indicates that, the more MFIs are efficient in reducing the operating costs at a given level of outstanding loan portfolio the more profitable they become and, therefore, financially sustainable.

The last variable that we focused on in this chapter on how efficiency relates to financial sustainability was the **average disbursed loan amount** (*lnavdisbloan)*. As explained under the descriptive statistics, this variable measures the efficiency of microfinance institutions in selling loans. The coefficient for this variable was positive but statistically insignificant even at 10 percent significance level. A possible explanation for this variable's coefficient sign is that, all things being equal, the higher the volume of loans sold would mean higher interest income which leads to higher profitability and, therefore, sustainability.

However, without higher repayments, the higher volume of loans may not contribute positively to the financial sustainability of microfinance institutions. With rural MFIs in Tanzania, as revealed in the descriptive statistics in Table 6-5 above, the PAR is over 26 percent which translates into less than 74 percent repayment rates.

6.8 CONCLUSION

Based on the descriptive statistics presented above, we observed that while both types of MFIs performed equally in income related variables, the MB-MFIs performed better in cost related variables. Thus, we would say that all things being equal, the MB-MFIs are more efficient in reducing the operating costs than their counterparts. From the econometric results we observed that the following efficiency indicators of microfinance institutions significantly affected their financial sustainability: the yield on gross loan portfolio; the level of portfolio at risk, the liquidity level; the number of borrowers per staff; and the operating efficiency. Moreover, selling higher volumes of loans alone does not improve financial sustainability. The same should be accompanied by effective follow-ups to ensure higher repayment rates. We generally conclude that the efficiency of microfinance institutions affects their financial sustainability. The findings in this chapter support the microfinance theory that links efficiency to the financial sustainability. Thus, to become financially sustainable, MFIs should strive to operate at relatively low costs while keeping the staff productivity and repayment rates higher.

CHAPTER 7

MICROFINANCE DEVELOPMENT STAGES AND FINANCIAL SUSTAINABILITY

"As the institution begins to grow, it becomes more important to monitor trends to ensure key financial performance conditions are heading in the right direction. In particular, is the operation moving toward the targets set for the timeframe of the project? Is it becoming more efficient and sustainable?" (CIDA, 1999:64)

7.0 INTRODUCTION

This chapter is about how financial sustainability of microfinance institutions relate to their stages of development. We linked the determinants of financial sustainability found in Chapter 5 and 6 to start-up and growth stages of development also known as microfinance life cycle. The aim was to answer the following research question posed in Chapter 1: what are the effects of the determinants of financial sustainability on the sustainability of microfinance at their start-up and growth stages of development? The chapter covers the relationship between the MFI age and their life cycle; the indictors of sustainability at various development stages; description of variables used in this chapter; and, the results, both descriptive and econometric results. The last part is conclusion.

7.1 MFI AGE AND THE LIFE CYCLE

The general standard benchmark for life cycle definition is: 0 – 4 years for start-up stage; 5 – 8 years for growth stage; and above 8 years for mature stage (Robinson, 2001). With the life cycle theory, MFIs are expected to attain operational sustainability at their growth stage. That is between 5 and 8 years from their initial operations. They are also expected to become financially sustainable at their maturity stage 8 years after their initial operation.

Studies however, indicate different timing for the MFIs to attain certain levels of sustainability. Von Pischke (2007) for example reports that the start-up stage takes 3 years or more. According to CGAP (2005) it takes an average of 5 – 10 years for an

MFI to attain operational sustainability. Johnson and Rogaly (1999) suggest that it takes 7 to 10 years after their initial operation for MFIs to attain operational sustainability. Moreover, while branches of Grameen Bank could take five (5) years to attain operational sustainability (Khandker *et al*, 1995) branches of ASA network (in the same country) could take eight (8) months to attain the same level of sustainability (Rutherford, 1995). The difference between the two lies on how well an MFI mobilizes its members (clients) and their savings, and proper interest charges.

The above timing differences in attaining sustainability reveal that years or age of an MFI is neither a significant determinant of financial sustainability nor it is a key determinant of stage of growth. This is in line with our findings in Chapter 5 that the age of an MFI, although significantly positively affecting the breadth of outreach, it does not affect the financial sustainability. Our findings also support the findings in previous studies that the age of microfinance institutions does not affect their financial sustainability (Bogan *et al*, 2007; and Cull *et al*, 2007; Robinson, 2001). Moreover, while the age of majority of the MFIs studied in our study (71.7 percent) is between 4 years and 6 years, 85.8 percent had attained operational self-sufficiency and 79.5 percent were already financially self-sufficient (FSS). With this in mind it appears inappropriate to set a certain time line for the three stages of microfinance development. All withstanding however, we expect an MFI to attain financial sustainability as it grows. But how long that should be will depend on the nature of an MFI, its operation environment, and its efficiency.

In this chapter, we analyse and attempt to explain the effects of the determinants of financial sustainability on the sustainability of microfinance institutions at their start-up and growth stages. This was the fifth objective of our study. Bearing in mind the limitations we had in setting appropriate timing for the stages of microfinance development as explained above, and that age cannot reliably be used to indicate stage of development, we did not use the age of MFIs to determine their stages of development. We attempted to classify the MFIs in stages of development regardless of their age based on whether or not they have attained a certain level of profitability. For example, all MFIs whose earnings were not sufficient to cover financing expenses and loan loss provisions we classified them as being at start-up stage; MFIs whose earnings could cover financing expenses and loan loss provisions but not without subsidies we classified them as being in growth stage. The remaining MFI we considered them to be at maturity stage. However, out of 424 observations, 337 (equal to 79.5 percent) were for MFIs that had already attained financial self-sufficiency and therefore could reliably be considered matured MFIs. The remaining 87 observations (which are for MFIs at start-up and growth stages) were not enough to warrant meaningful statistical analysis. Thus, we decided to use the performance indicators at each of the stages (CIDA, 1999) as proxies of financial sustainability at these stages. This was done in assumption that, while the timing may be different, all microfinance institutions pass through the same stages of development. This approach follows previous studies where indicators of financial performance were used as proxies of financial sustainability (Cull *et al,* 2007; Woller and Schreiner, 2002).

Moreover, because the proxies for sustainability are much more complex to develop (Makame and Murinde, 2006) studies in microfinance have used indicators of performance at various stages of development as proxies of financial sustainability at respective stage. For example, Mersland and Strøm, (2009); Hartarska and Nadolnyak (2007); Cull *et al* (2007); Makame and Murinde (2006); and Hartarska (2005) used OSS, an indicator of financial performance at growth stage, as a proxy of financial sustainability while Woller and Schreiner (2002) used FSS, an indicator of financial performance at maturity, as proxy of financial sustainability. This study goes down one step and uses earnings ratio (ER) as a proxy of financial sustainability at start-up stage. In addition, various indicators of performance at start-up and growth stages are also used as proxies of financial sustainability at respective stages.

7.2 MICROFINANCE LIFE CYCLE AND INDICATORS OF PERFORMANCE

CIDA (1999) sets up the flow of various indicators of performance and sustainability by stage of maturity, also known as stages of development. The framework is progressive indicating that, indicators that are relevant in earlier stages of MFIs development continue to be relevant at subsequent stages. Additional indicators are added as an MFI evolves. The indicators are added when an institution should begin to track a performance indicator, not when the institution should have achieved the indicator (CIDA, 1999). The indicators provided consider the three levels of MFI development and the fact that it is difficult for the MFIs to attain full financial self-sufficiency immediately after their introduction. Thus, the measures of financial sustainability will apply depending on respective development stage of an MFI. Figure 7-1 indicates the flow of various indicators at a given stage of an MFI development.

Figure 7-1: Flows of Indicators by Stage of development

Start-up	**Growth**	**Mature**
Basic performance data ---->	------------------>	------------------>
Basic self-sufficiency ratio ------>	------------------>	------------------>
	Operational Self-sufficiency (OSS) ---->	------------------>
	------------------>	**Financial self-sufficiency (FSS)** ->
Liquidity ------>	------------------>	------------------>
Portfolio quality -->	------------------>	------------------>
	Operating efficiency---->	------------------>
	Financial solvency----->	------------------>
		Profitability---------->

Source: CIDA (1999:56)

According to CIDA (1999) for start-up institutions, the indicators most appropriate are simple ones such as: earning revenue; covering operating costs; performance of the loan portfolio; and liquidity. For more advanced groups, the trends should begin to capture the extent to which the operation is moving in positive direction in terms of productivity and financial performance, which are the key factors towards financial sustainability. A broader range of financial indicators is important at maturity stage for assessing and tracking since they will reveal the extent, to which an MFI is at, or moving towards, financial self-sufficiency.

7.2.1 Sustainability at Start-up Stage

The start-up stage covers the first few years of operation, to some slow growing MFIs it could take even several years (CIDA, 1999). During this period, the MFIs will experience higher operating expenses associated with preliminary expenses from capital investment and lower productivity and higher cash outlay requirements. As a result, earnings will be low as start-up costs will have higher impacts than normal.

According to CIDA (1999) financial performance during this period should focus on absolute values of the indicator. Trends may also be considered in as far as the data permits. CGAP (1995) recommends that in the start-up stage donor support should focus on helping programs to establish an efficient operation. This includes establishing a lending methodology and operational strategy for service delivery. The financial sustainability at this stage is measured in terms of basic self-sufficiency ratio. The basic self-sufficiency ratio include: earnings ratio; liquidity ratio; and loan portfolio quality.

(a) The Earnings Ratio

The earnings ratio is the ratio of financial income to operating expenses. The financial income will include all income earned from interest on current and restructured loan, interest on investment, and loan fees. The operating expenses represent the expenses directly related to managing and delivering financial services. The expenses cover salaries, administration costs, travel expenses, depreciation and other expenses such as training costs for staff.

(b) Liquidity Ratio

At start-up stage MFIs should, at least, be able to pay short-term obligations as they fall due with immediate accessible assets such as cash or convertible investments (CIDA, 1999). The ability to pay short-term obligations is measured by the liquidity ratios (Atrill and Mclaney, 2004). One of the liquidity ratios commonly used by MFIs is current ratio, a ratio of current assets over current liabilities. The current assets, which are the working capital of the MFIs, include: cash, debtors, interest bearing deposits and liquid investments. The current liabilities on the other hand represent what is owed by the MFI to others and currently due such as short-term borrowing, interest on clients deposit, and client savings (Brealey *et al*, 2006; Emery *et al*, 1998).

Liquidity is important at this stage as cash-flow may be strained during this period where initial outlays are required before revenue are realized, and new loans are disbursed. The current ratio must exceed 1 to ensure commitments can be met (Brealey *et al*, 2006; Atrill and Mclaney, 2004; CIDA, 1999; Wenston and Copeland, 1989). However, the liquidity ratio should be interpreted with caution. While it is used as an indicator of financial performance, in itself the liquidity ratio (in this case the current ratio) is not a strong indicator of the financial sustainability. This is because it only indicates the resources available to meet the short-term obligation. It has nothing to do with whether what the microfinance earns are enough to cover their related costs. For example, while there may be a big difference in profitability between two MFIs one with higher repayment rates and another with very low repayment rates, all things being equal, and especially when the write-offs of bad loans are delayed, the two may still record the same liquidity ratio. Thus, the cash ratio, which considers only the cash, is preferred instead. In the cash ratio, any outstanding or items which cannot be easily turned into cash are excluded.

(c) Loan Portfolio Ratio

Another important aspect of sustainability at start-up stage is how MFIs maintain quality loan portfolios. The quality of loan portfolio indicates the ability to recover principal and generate interest. As CIDA (1999) has put it, the ability to recover principal and generate income is the basis of a sustainable MFI. This is so because the failure to recover principal will lead to erosion of capital. Any significant erosion of capital and revenue source, which occurs as a result of default, can threaten the growth and sustainability of the institution. The same can also lead to a significant decrease in outreach for the program, as fewer individuals will have access to the funds. If an MFI should become sustainable, it should be able to identify and correct problems with the loan portfolio at an early stage.

Quality of loan portfolio will depend on how well an MFI undertakes delinquency management and how it deals with the loans which are overdue and expected to be recovered (Brealey *et al*, 2006; Emery *et al*, 1998). Delinquent refers to something that has been made payable and is overdue and unpaid, thus, indicating tendency to default. One of the measures of delinquency management is portfolio in arrears ratio. The **portfolio in arrears ratio** measures the value of payments, which are at risk in relation to the overall portfolio. Payment in arrears, in additional to potential losses from default threaten the cash-flow and ability of an MFI to grow, and thus, affecting its sustainability (CIDA, 1999; Emery *et al*, 1998). The portfolio in arrears ratio is a ratio of the amount of payment past due over the value of loans outstanding. By focusing on past dues amount only, the portfolio in arrears measure tends to underestimate the overall risk. This is because, it is not easy for someone who fails to pay second and third instalments to be able to pay fourth instalment. Hence a better measure is required which takes care of this possibility of loss. This is known as portfolio at risk measure.

The **portfolio at risk** (PAR) estimates the total risk to loan portfolio by considering not only the amount of payment past due (say second and third instalments) but the total (including instalments not called up) value of loans which have payments in arrears. The portfolio at risk is given by the value of outstanding balances of loans in arrears divided by the value of loans outstanding. According to CGAP (1995) the portfolio at risk (PAR) should be below 10 percent once an MFI loan portfolio is operating efficiently. The ratio however, may be slightly higher especially at start-up stage where the portfolio is not operating efficiently and an MFI has yet stabilized its delinquency management. Again, for self-sufficiency and if an MFI should grow, the PAR should be monitored throughout.

Delinquency management as we have seen deals with loan in arrears and the ratios are used to determine the risk level of the loan portfolio (both overdue and undue). The assumption is that, though risky, the loans may still be recovered. In practice, however, some of these loans will never be recovered. Unless an MFI does something about these unrecovered loans, they affect the sustainability of loan provisions. To deal with this kind of problem, MFIs usually make provisions for loan losses to take care of loans whose recovery is uncertain. This is known as loan loss reserve. Two ratios are normally used to deal with loans not expected to be recovered. The loan loss and loan loss reserve ratios.

The **loan loss reserve** ratio indicates the percentage of outstanding loan which is not expected to be recovered. The loan loss reserve ratio is a ratio of reserves provided for loan losses over the value of loans outstanding. The loan loss reserve indicates the status of the current portfolio. It is calculated by taking percentage of outstanding balance of loans in arrears based on risk of not receiving the full loan amount (Atrill and Mclaney, 2004; CIDA, 1999; Emery *et al*, 1998). The percentage will depend on MFIs experience with defaulters. According to CIDA (1999) it is important that this risk is factored in the operational capacity of an MFI and the probability of the loss is identified in order to accurately reflect the quality of the portfolio. The loan loss reserve ratio is higher at start-up stage. The ratio will eventually decrease at growth and mature stages if MFIs are tracking the variables well (CIDA, 1999).

Another useful ratio is the **loan loss ratio** which is computed to assess whether overtime the loan recovery is improving or not. It takes into account the loans which were actually written off during a period. It indicates the trends on performance on loan recovery. The loan loss ratio is a ratio of amount written off in the period over average loan portfolio outstanding for the period. The average loan portfolio outstanding is obtained by taking the value of loans outstanding at the end of current period (a month) plus the value of the loans outstanding for the same period one year prior, divided by two.

7.2.2 Sustainability at Growth Stage

According to CIDA (1999) two factors are particularly important as the institution gains experience and moves into a growth stage. First, there should be improvements in the main operations. The improvements include decreasing the costs associated with making loans, and increasing the productivity of staff members. Second, is solvency, to ensure that growth is not stifled by capital inadequacy. Institutions which intend to grow must eventually rely on savings, investments and equity funds. The ability to access financing becomes more relevant at this stage. According to CGAP (1995) donor support at the growth stage where institutions are committed to tapping other sources of fund should be focused on improving financial performance reporting, tapping commercial funding sources, mobilizing savings, and demonstrating sustained improvements in financial indicators.

Several indicators are used to assess the efficiency in operations that an MFI has achieved at growth stage. These are: loan portfolio per loan officer; cost per loan; operating efficiency; financial productivity; leverage ratio; and Operational Self-sufficiency ratio.

(a) Loan Portfolio per Loan Officer Ratio

Loan portfolio per loan officer measures the productivity of a loan officer in terms of number of active loans handled by him/her. The loan portfolio per loan officer is given by the number of active loans divided by number of loan officers. According to CIDA (1999) as staff members gain experience, the ratio should increase to a standard which does not compromise quality of client relations or credit assessment and monitoring. All things being equal, the larger the loan portfolio per loan officer, the more efficient the staff is considered to be. However, it should be remembered that too many loans per loan officer can decrease the overall efficiency and portfolio quality. Moreover, CIDA mentions about the standard at which quality is not compromised. What this standard is however is not specified. Further, there might be some variations among staffs even within the same MFI on the size of the loan portfolio that one can handle without compromising the quality. This makes it difficult to use the loan portfolio per loan officer ratio as a key measure of financial sustainability at growth stage.

(b) Cost Per Loan and Operating Efficiency

During this growing period and as an MFI moves towards maturity, lending is expected to be more cost effective. This will be indicated by a decreasing cost per loan. The cost per loan is given by operating expenses for the period over number of loan made during the period. The decrease in the cost per loan may be a result of either decrease in the operating expenses or increase in the number of loans or both. The opposite is also true. The increase in the cost per loan will indicate, all things being equal, the overall inefficiency in cost reduction. Moreover, as an MFI grows, the growth is expected to lead towards economies of scale. The efficiency with which it operates its loan portfolio should be measured and monitored. The cost of operating the loan portfolio should be minimized.

The operating efficiency ratio is the ratio of operating expenses for the period divided by the average loan portfolio. An operating efficiency ratio greater than 1 indicates that the costs incurred in operating the loan portfolio is higher than the amount invested in the same loan portfolio which indicates inefficiency. On the other hand, the cost per loan is mainly determined by the number of loans and the total operating expenses. The number of loans made during the period is further influenced by the lending terms. That is, the cost of borrowing as measured by the interest rate paid on loans; number of instalments; minimum loan size; and the term to maturity. Other factors that may affect the number of loans are the age of an MFI and MFI size. Additionally, the volume of operating expenses will also determine the cost per loan. The volume of operating expenses may be influenced by the efficiency of microfinance institutions in reducing PAR; average loan size; both disbursed and outstanding loan sizes; and staff productivity.

While the cost per loan measure relates the operating expenses to number of loans, the operating efficiency relates the operating expenses to the outstanding loan portfolio. The operating efficiency ratio indicates the ability of an MFI to service a large loan portfolio with the same resources. According to Balkenhol (2007) the operating efficiency ratio is one of the key ratios in assessing efficiency of microfinance institutions. Both cost per loan and operating efficiency indicate the MFI’s efficiency in cost reduction. The operating efficiency ratio should decrease as at this growth stage, an MFI is expected to be able to service a large loan portfolio with the same resources (CIDA, 1999:65).

(c) Financial Productivity

While the cost per loan is expected to decrease at the growth stage, the financial productivity of an MFI is also expected to increase, indicating improvement in financial performance, and leading to self-sufficiency. Financial productivity is measured by comparing income from operations with the value of the average outstanding loan portfolio. It indicates the yield generated by loan portfolio. The financial productivity ratio is a ratio of financial income over average loan portfolio. The financial income may be influenced by the capital structure; interest rate; cost reduction (both staff and administrative); and the staff efficiency. The average loan portfolio may be influenced by the outreach related factors. These are: the interest rate; number of instalments; minimum loan size; MFI age; number of borrowers; and term to maturity.

(d) Leverage Ratio

Institutional growth is indicated by its operating efficiency and financial Operational Self-sufficiency. According to CIDA (1999) the ability to generate earnings for re-investment is important during the growth of an organisation. Apart from internally generated earnings, during growth stage, an MFI's financial performance should be able to attract investment capital from outside. The extent to which an MFI can borrow funds relative to its equity is known as leverage (Atrill and Mclaney, 2004; Emery *et al*, 1998). The leverage ratio is used to assess the leverage of an MFI. It is obtained by dividing assets (both current and non-current) by equity (including total loan fund capital).

Commercial banks usually operate with a ratio of approximately 12.5 times. This is also recommended as the maximum leverage by regulatory agencies (CIDA, 1999: 65). MFIs usually have to have better performance to leverage outside funds since they are often seen as being higher risk operations. For this study however, this indicator of financial performance is not used due to lack of sufficient data to warrant reliable statistical analysis. Moreover, most of the MFIs are the MB-MFIs to which the loans are relatively small and have negligible impact to their total capital.

(e) Operational Self-sufficiency Ratio

The Operational Self-sufficiency ratio indicates whether an MFI is moving towards self-sufficiency or not. The ratio is given by financial income over a total of operating expenses. The financial income at this stage represents the operating income. The financial costs include interest paid on debt and interest paid on deposits. Compared to the earnings ratio in start-up stage, the Operational Self-sufficiency ratio takes into consideration two other cost elements namely the financial costs and loan loss provision. The assumption here is that, at this growth stage, an MFI is accessing loans and savings to expand its lending program. Both financial costs and loan provision have an impact on self-sufficiency.

7.2.3 Sustainability at Maturity Stage

At maturity stage, an MFI is expected to rely substantially on own operations as opposed to external support. Profitability at this stage is critical to sustain the operations over the long-term and attracting investors and clients. According to CIDA (1999) the ability to cover costs from financial revenue only (without donor support) provides an identification of increasing self-reliance. Thus, key factors at maturity stage are financial self-sufficiency and profitability. CGAP (1995) recommends that donor support at this stage, if any, should consider helping in the transition to full independency.

Financial self-sufficiency ratio indicates the ability to cover all costs including the erosion of assets due to inflation. It includes calculations to adjust a cost of capital for inflation and subsidies. That is, it addresses the issue of the impact of inflation on equity and compares the cost of accessing commercial loans as opposed to concessional funding from donor. The financial self sufficiency ratio is a ratio of financial income over a total of operating expenses, financial costs, Loan loss provision, and cost of capital. The cost of capital here represents the adjustments which need to be made to equity to take into account inflation and subsidies.

The financial self-sufficiency (FSS) shows whether the MFIs earnings are enough to cover all costs as well as maintain the value of its equity. As CIDA (1999:68) has put it, only with 100 percent financial self-sufficiency can an organisation maintain the value of its long-term funds (and assets) against inflation, as well as decrease the need to rely on donor funding. That is, an MFI should make profit out of its operations if it should become self-sufficient.

Apart from the FSS, other measures of microfinance profitability are the return on equity (ROE) and return on assets (ROA). The return on equity ratio measures the ability of an MFI’s management to maintain and increase the organisation’s net worth or value. It reflects efficiency operations and proper portfolio management in relation to equity. The return on asset indicates the ability to maintain and increase the institution’s return on its assets. The focus of this study was to determine the factors affecting financial sustainability as measured by the FSS. Other measures of profitability like the ROA and ROE were not considered in this study as they depend much on the level of profitability as measured by the FSS, which was the key focus in Chapter 5 and 6.

In summary, as we have noted earlier on, the framework for evaluating sustainability of MFIs is progressive indicating that, indicators that are relevant in earlier stages of MFIs development continue to be relevant at subsequent stages. This implies that, if an MFI fails to meet the sustainability requirement in an earlier stage, meeting the sustainability requirements at higher stage will be difficult. Thus, MFIs aiming at attaining financial self-sufficiency should not loosen their emphasis on key performance indicators found in earlier development stages.

7.3 VARIABLE DESCRIPTION

This section describes the variables, both dependent and independent or explanatory variables, as used in this chapter. The variable measurements are also given. The empirical findings and conclusions made are presented in the last part of this chapter.

7.3.1 Dependent Variables

Based on the life cycle theory explained under literature review in Chapter 3, different indicators of financial sustainability at each of the microfinance development stages also known as life cycle, (Farrington and Abrahams, 2002; Lapenu and Zeller, 2001) are used as dependent variables. The three MFIs' development stages are: start-up; growth; and maturity stages. Tables 7.1 and 7.2 provide the description and measurement of the dependent variables at the start-up and growth stages of microfinance growth stages. Factors affecting financial sustainability of rural microfinance institutions in Tanzania at the maturity stage were thoroughly dealt with in Chapter 5 and 6. Thus, this chapter deals with how these determinants of financial sustainability affect the sustainability at start-up and growth stages of microfinance development. A detailed description by stages of growth is given in the next section.

(a) Start-up Stage

The variables at the start-up stage of microfinance institutions are the basic self-sufficiency ratios which include: earnings ratio; liquidity ratio; and loan portfolio quality. The dependent variables at this stage are presented in Table 7-1. The earnings ratio is the ratio of financial income to operating expenses. The liquidity ratio indicates the ability of an MFI to pay short-term obligations as they fall due with immediate accessible assets such as cash or convertible (Brealey and Myers, 2000). One of the liquidity ratios commonly used by MFIs is the current ratio (CIDA, 1999), a ratio of current assets over current liabilities. The loan portfolio quality shows the ability to recover the principal and generate interest. It is mainly determined by the portfolio at risk (CGAP, 2008b; CGAP, 2003b).

Table 7-1: Variable Description – Dependent Variables at Start-up Stage

S/N	*Variable Name*	*Measurement (Formula)*
1.	Earnings Ratio	$\frac{\textit{Financial income}}{\textit{Operating expenses}}$
2.	Liquidity Ratio (current ratio)	$\frac{\textit{Current Assets}}{\textit{Current Liabilities}}$
3.	Portfolio at risk	$\frac{\textit{Value of outstanding balances of loans in arrears}}{\textit{Value of loans Outstanding}}$

(b) Growth Stage

As detailed in literature review, two variables are particularly important as the institution gains experience and moves into a growth stage. First, there should be improvements in the main operations, and second is solvency. At this stage, the sustainability indicators are used to assess the efficiency in operations that an MFI has achieved at growth stage. These are: cost per loan; financial productivity; and Operational Self-sufficiency ratio as indicated in Table 7-2 below. Other indicators of performance at growth stage were left out. These are the operating efficiency and leverage ratio. The operating efficiency measure was not used as its effects can be equally taken care of by the cost per loan. The leverage ratio was also left out to avoid possible biasness as majority of MFIs studied did not have loan capital.

Table 7-2: Variable Description – Dependent Variables at Growth Stage

S/N	Variable Name	*Measurement (Formula)*
1.	Cost Per Loan	$\dfrac{\textit{Operating expenses for the period}}{\textit{Number of loan made during the period}}$
2.	Financial Productivity	$\dfrac{\textit{Financial Income}}{\textit{Average Loan Portfolio}}$
3.	Operational Self-sufficiency	$\dfrac{\textit{Operating revenue}}{\textit{operating expenses + financial expenses + Loan loss provision expenses}}$

7.3.2 Independent (Explanatory) Variables

The second group indicates the explanatory (independent) variables. That is factors affecting financial sustainability of microfinance institutions. These are the factors that were found significantly affecting the financial sustainability of the MFIs in Chapter 5 and 6. Again, in this chapter the main focus is to explain the effects of the determinants of financial sustainability on the sustainability of MFIs at their start-up and growth stages. Thus, we use the findings in Chapters 5 and 6 to analyze and study the relationships in this chapter.

The descriptions of the independent variables used in this chapter were made in Chapter 5 and 6. The independent variables used are: the microfinance capital structure; interest rate; staff costs per dollar loaned; number of installments; cost per borrower; type of MFIs' products; minimum loan sizes; MFI age; MFI type; average loan size of outstanding loan portfolio; percentage of female clients; size of MFIs; regulation status; geographical location; and term to maturity. Others are: the yield from gross loan portfolio; portfolio at risk; liquidity; number of borrowers per staff; staff costs per borrower; administrative expenses per borrower; cost per client; operating expenses ratio; and the average disbursed loan size.

7.4 DESCRIPTIVE RESULTS

This section presents the results based on descriptive statistics for the dependent variables for both, start-up and growth stages. The statistics are presented in Table 7-3 and 7-4 below for both start-up and growth stage respectively. The descriptive statistics for the independent variables were presented in Chapter 5 and 6 for outreach and efficiency related variables respectively.

Table 7-3: Descriptive statistics for dependent variables at Start-up Stage

Variable	Obs	Mean	Std. Dev.	Min	Max
ER	424	1.41694	1.417695	0	19.02299
liqratio	424	7.960213	29.69224	.7296336	326.696
PAR	424	.2670321	.2190385	.0012695	.9674952

At start-up stage, the indicators of financial sustainability of microfinance are the earnings ratio, liquidity ratio, and the portfolio at risk. The **earnings ratio** as explained before is the ratio of financial income to operating expenses. It measures the ability of an MFI to generate enough earnings to cover for the operating costs. The definition of earnings ratio meets the basic financial sustainability components – the ability to cover the operating costs. Thus, the earnings ratio can be used as a measure of financial sustainability at start-up stage of the microfinance development. The ratio above 1 indicates that the earned income is higher than the operating expenses and, therefore, all things being equal, profitability and financial sustainability.

From the descriptive statistics in Table 7-3 above, the mean earnings ratio is 1.42, which is above one, indicating sustainability. While some MFIs earned nothing at start-up, to some higher stages of growth some MFIs recorded earnings to 19 times higher than their operating expenses. Further analysis of the earnings ratio indicates that, while the mean earnings ratio for the MB-MFIs was 1.26, the one for the NGO-MFIs was 2.04. The t-test statistic for the mean difference between these two types of MFIs was significant indicating that the NGO-MFIs at start-up stage earn higher than their counter parts.

The second key indicator of financial performance and, therefore, sustainability at start-up is the **liquidity ratio**. The liquidity ratio indicates the ability of an MFI to pay its short-term obligations when they fall due. The higher the ratio (above one), the higher will be the ability of the MFIs to pay their obligation, an indication of good financial performance and, therefore, prospects for financial sustainability even at start-up stage. From the statistics presented in Table 7-3 above, the mean liquidity ratio for rural MFIs in Tanzania is 7.96. The mean liquidity ratio for the MB-MFIs is 2.62 while the one for the NGO-MFIs is 29.58. The mean difference between these two was statistically significant indicating that the NGO-MFIs perform better in liquidity than the MB-MFIs. Moreover, the statistics also indicate the minimum liquidity ratio of 0.73 which is less than 1, an indication of illiquidity and, therefore, all things being equal, poor financial performance leading into unsustainable microfinance operations. Further analysis revealed that, 14 (3.3 percent) out of 424 observations were for MFIs with less than 1 liquidity ratio, all of which were from the MB-MFIs.

Finally at start-up stage we measured financial sustainability as indicated by the quality of loan portfolio, as measured by the **portfolio at risk** (PAR). The higher the PAR the less sustainable the MFIs become. From the descriptive statistics presented in Table 7-3 above the mean PAR is 26.7 percent. The table shows a minimum PAR of less than 1 percent which is a good indicator of sustainability. As opposed to this minimum PAR, however, the maximum PAR of 96 percent signals lack of sustainability. The mean PAR for the MB-MFIs was 29.17 percent while the one for the NGO-MFIs was 16.73 percent.

As we explained before, the portfolio at risk should be below 10 percent once an MFI loan portfolio is operating efficiently. The ratio however, may be slightly higher especially at start-up stage where the portfolio is not operating efficiently and an MFI has yet stabilized its delinquency management (CGAP, 1995). Further analysis revealed that, in 150 out of 424 observations the MFIs had PAR above 25 percent. That is, over 35 percent of MFIs (31.4 percent MB-MFIs and 4.6 percent NGO-MFIs) in rural Tanzania had PAR above 25 percent. These statistics show that the MB-MFIs perform worse in portfolio quality than their counterparts. The difference is statistically significant. Moreover, the statistics generally suggest that the MFIs in rural Tanzania are inefficient in making corrections. Table 7-4 presents the descriptive statistics for indicators of financial sustainability at growth stage.

Table 7-4: Descriptive statistics for dependent variables at Growth Stage

Variable	Obs	Mean	Std. Dev.	Min	Max
costploan	424	100052.6	242635.7	417.4102	2183687
finprod	424	.2159088	.2389777	0	1.950604
OSS	424	1.877849	1.484029	.1700284	19.20392

One of the indicators of microfinance sustainability at growth stage is the **Cost per loan.** As the MFIs grow, lending is expected to be cost effective and thus, the cost per loan decreases. The descriptive statistics for the cost per loan indicated in Table 7-4 show the mean cost per loan of TZS 100,052.6 (USD 76.73). This appears to be on the higher side compared to the USD 2 (TZS 2,608) used as a cut-off point to define who is and who is not a poor person. Further analysis of cost per loan indicated that only 15 observations (3.5 percent of MFIs) had cost per loan equal of less than the USD 2. It also indicated an increasing cost per loan by about 2.74 times over four year period from TZS 63,547.12 (USD 48.73) in 2004 to 173,775.9 (USD 133.26) in 2007. The increase in cost per loan was caused by an increase in the mean operating costs by about 244% (from TZS 18,100,000 in 2004 to 62,400,000 in 2007) compared to low increase in number of loans by about 62% (from 224 loan in 2004 to 363 loans in 2007). This shows that, all things being equal, rural MFIs in Tanzania are becoming less cost effective, which could make attaining sustainability more difficult. It also helps to explain why, as found in Chapter 5, the increase in the number of borrowers was negatively affecting the FSS.

Financial productivity (*finprod)* is a ratio of microfinance income from operations divided by its average outstanding loan portfolio. The higher the financial productivity, all things being equal the better will be the financial performance. The increase in financial productivity will depend on either, the increase in income from operations or decrease in average outstanding loan portfolio, or both. The descriptive statistics summarized in Table 7-4 indicates the mean financial productivity for all MFIs to be 21.59 percent. That is, the income from the operations was 21.59 percent of the average outstanding loan portfolio. The mean financial productivity for the

NGO-MFIs was 49.72 percent while for the MB-MFIs was 14.64 percent. The test statistic for the mean difference was statistically significant indicating that the NGO-MFIs perform better in financial productivity than their counterparts. Further analysis revealed that the MFIs in northern parts of the country performed better in financial productivity (27.42%) than their counterparts whose financial productivity was 19.29 percent. The mean difference was also statistically significant.

Finally, there is the **Operational Self-sufficiency** (*OSS)* which is a ratio of operating income over operating expenditure. At growth stage, microfinance institutions should be able at least to cover all their operating costs from the operating income. No adjustments are made on the income or expenditure to recognize the effects of subsidy as with FSS. Thus, the subsidies form part of the operating income. The OSS above 1 (100 percent) will indicate attainment of financial sustainability at growth stage. The descriptive statistics in Table 7-4 indicate a mean OSS for all MFIs of 1.8778 (187.78 percent). Further analysis indicated that, 85.8 percent of the MFIs had attained the operational self-sufficiency. Of all the MB-MFIs, 83.8 percent had attained operational self-sufficiency, while 94 percent had attained the same level for the NGO-MFIs.

The mean OSS for the NGO-MFIs was 202.9 percent while the one for the MB-MFIs was 184.03 percent. This indicates that the NGO-MFIs perform better in OSS than their counterparts. However, the test of mean difference revealed that the difference was not statistically significant. The next section presents the econometric results on how the determinants of financial sustainability affect the financial performance and, therefore, sustainability at the start-up and growth stages.

7.5 ECONOMETRIC RESULTS (START-UP STAGE)

In this section, we present the econometric results on how the determinants of financial sustainability at maturity stage affect the sustainability at start-up stage. We used the indicators of financial performance at start-up stage as proxies of sustainability at this stage. These are: the earnings ratio; liquidity ratio; and portfolio at risk.

7.5.1 Earnings Ratio

As explained before, the earnings ratio measures the ability of an MFI to generate enough earnings to cover for the operating costs. This section presents the econometric results for the relationships between the determinants of financial sustainability and the earnings ratio as one of the indicators of financial performance at start-up stage. The next subsection presents the operational model for earnings ratio followed by the results.

(a) The Operational Model

The operational model used to analyze the effects of the determinants of financial sustainability on the earnings ratio was:

$$lner_{it} = \alpha_i + \beta_1\, PAR_{it} + \beta_2\, lnborrpstaff_{it} + \beta_3\, lnaepborr_{it} + \beta_4\, lnstcospbor_{it} + \beta_5\, lnoeratio_{it} + \beta_6\, lnavoutloan_{it} + \beta_7\, intrate_{it} + \varepsilon_{it}$$

Where: lner is the natural log of the earnings ratio, which is the dependent variable; α_i is a constant term; β_{is} measure the partial effect of independent or explanatory variables in period t for the unit i (*MFI)*; the X_{it} are the explanatory variables as explained in Tables 5.2 and 6-2; and ε_i is the error term. The variables, both dependent and independent, are for cross-section unit i at time t, where i = MFIs (1 to n), and t = 1 to 4.

(b) Results

The econometric results indicated in Table 7-5 show that among the factors that affect microfinance financial sustainability, only the portfolio at risk (PAR), staff productivity; staffs cost per borrower; microfinance operating efficiency; and the interest rates charged on microfinance loans affects their earnings ratio.

Table 7-5: Econometric Results for the Determinants of Earnings Ratio

Variable	Coefficient	Robust Std. Err.	P>z
PAR	-0.5640912	0.1806952	0.002***
lnborrpstaff	0.1509014	0.0444891	0.001***
lnstcospbor	0.0866928	0.0495279	0.080*
lnoeratio	-0.5301923	0.0780132	0.000***
intrate	2.7298170	0.4623361	0.000***
R-Sq	Within = 0.4555	Between = 0.5899	Overall = 0.5144

***significant at 1%; * significant at 10%

The **Portfolio at risk** (PAR) is the key indicator of portfolio quality. The higher the PAR the higher the yield gap will be, the lower the repayment rates, and most importantly, the poorer the quality of the loan portfolio. The econometric result for this variable indicates that the PAR is negatively related to the earnings ratio. This confirms that, the higher the PAR and, therefore, the poorer the quality of the loan portfolio, the lower the earnings ratio will be. The effects of PAR on the earnings ratio is two way. First, the PAR reduces the earnings (what would have been earned). Second, it increases the costs as a result of write-offs when defaults occur.

The staff productivity as measured by **number of borrowers per staff** (*lnborrpstaff)* also affects the microfinance earnings. The econometric result shows positive statistically significant relationships between earnings ratio and the number of borrowers per staff. That is, the higher the number of borrowers per staff, all things being equal, implies higher staff productivity, which affects the earnings ratio in two ways. First, it would imply higher repayment rates, which improve the earnings, and second, low costs as a result of reduced default. The opposite is also true when the staff productivity is low.

Apart from the staff productivity, the **staff cost per borrower** is significantly affecting the earnings ratio of microfinance institutions. The coefficient for this variable is positive and statistically significant. This indicates that, during the start-up period, the more is invested in staff, the harder they work to influence loan repayment and reduce defaults, which case improves the earnings ratio. The microfinance staffs are the ones who can effectively promote higher repayments through thorough loan follow-ups and careful loan application screening, and appropriate delinquency management. These are very much important at start-up stage to set-up a loan repayment culture. If they are not properly motivated the effect could be low repayment rates, possible defaults, and, therefore, less earnings ratio.

While this works with earnings ratio as one of key indicators of financial performance at start-up stage, the same does not work at maturity stage. At maturity stage, as revealed in section 6.7.2 in Chapter 6, the more money is invested in staff costs the more they may seek for leisure, and, therefore, the less productive (less efficient) they become. That is, when the pay does not depend on their efficiency in influencing repayments. This will negatively affect the profitability of the MFI. It could also indicate that, the staff efficiency has its optimal point beyond which, more pay will not improve it.

At start-up stage, the microfinance financial sustainability is also measured by the **operating efficiency**. This is the ability to operate at as low a cost as possible. The econometric result for the operating efficiency shows that the efficiency of the microfinance institutions in cost reduction will improve their earnings ratio. The operating efficiency ratio had strong negative relationship with the earnings ratio. Thus, this makes cost reduction and especially efficiency in operations a necessity even at start-up stage of the microfinance development.

Lastly, as it was for the determinants of financial sustainability discussed in Chapter 5, the **interest rate** is strongly positively related with the earnings ratio. This shows that, all things being equal, the higher the interest rate, the more the earnings the microfinance institution will make relative to the costs incurred to earn the same. Thus, making higher interest rates, all factors held constant, worth considering even at start-up stage.

The remaining factors that were considered to explain the determinants of earnings were not statistically significantly affecting the change in the earnings ratio. These are administrative expenses per borrower and depth of outreach, which were positively related with the percentage change in the earnings ratio but were statistically insignificant even at 10 percent level. The positive coefficient for the depth of outreach suggests that, the more, well to do clients an MFI is servicing, the higher its earnings ratio will be. Further details on econometric results for these variables are included in Appendix 13 (f).

7.5.2 Liquidity Ratio

The liquidity ratio as explained before measures the ability of an MFI to meet its financial obligation in short-term as they fall due. At start-up stage, the liquidity ratio is one of the indicators of financial sustainability. The higher liquidity, all things being equal would mean sustainable MFI. The operational model used for analysis is presented in the next subsection followed by the results.

(a) The Operational Model

The operational model used to analyze the effects of the determinants of financial sustainability on the liquidity ratio was:

$$\begin{aligned} lnliqratio_{it} = {} & \alpha_i + \beta_1\, capstruc_{it} + \beta_2\, instalind_{it} + \beta_3\, lninstalgr_{it} + \beta_4\, lncostpborr_{it} \\ & + \beta_5\, prodtype_{it} + \beta_6\, minloanind_{it} + \beta_7\, minloangr_{it} + \beta_8\, lnavoutloan_{it} \\ & + \beta_9\, yieldgap_{it} + \beta_{10}\, lnborrpstaff_{it} + \varepsilon_{it} \end{aligned}$$

Where: lnliqratio is the natural log of the liquidity ratio, which is the dependent variable ; α_i is a constant term; β_{is} measure the partial effect of independent or explanatory variables in period t for the unit i (*MFI)*; the X_{it} are the explanatory variables as explained in Table 5.2 and 6-2; and ε_i is the error term. The variables, both dependent and independent, are for cross-section unit i at time t, where i = MFIs (1 to n), and t = 1 to 4.

(b) Results

The econometric results summarized in Table 7-6 indicate that, the **capital structure** (*capstruc)* of MFI microfinance strongly affects its liquidity ratio. The relationship is positive indicating that the more an MFI adds equity in its capital structure as opposed to other sources, the higher its liquidity. This conforms to the fact that, to microfinance institutions, the savings and deposits form part of the sources of capital. These sources however, are considered as short-term liabilities to an MFI. Thus, the more they are included in the capital the higher the value of the short-term liabilities and, therefore, the lower the liquidity ratio. Their exclusion in the capital improves liquidity.

Table 7-6: Econometric Results for the Determinants of Liquidity

Variable	Coefficient	Robust Std. Err.	P>z
capstruc	1.550069	0.3653259	0.000***
lncostpborr	0.1265189	0.070733	0.077*
minloangr	1.59e-07	8.85e-08	0.076*
yieldgap	1.443176	0.5634158	0.012**
R-Sq	Within = 0.3218	Between = 0.3958	Overall = 0.3458

***significant at 1%; ** significant at 5%; * significant at 10%

Cost per borrower (*lncostpborr)* also affects the liquidity level of an MFI. The higher the cost per borrower will cause an MFI to have more liquid (current) assets to meet the borrowers related costs. The higher costs per borrower may be caused by either the increase in total operating costs or the decrease in number of borrowers or both. The relationship between cost per borrower and liquidity implies more of an outcome than the cause and effect relationship. That is, when the costs per borrower are high the microfinance institutions will tend to keep higher level of liquidity to ensure that there are enough resources to meet these obligations.

The **minimum loan size** when group lending (*minloangr)* is used also affects the changes in the liquidity level of the microfinance institutions. A positive coefficient for this variable indicates that, the higher the minimum loan size, the higher the increase in the liquidity ratio will be. This finding, however, needs to be interpreted with caution as it may indicate both good and bad financial performance. All things being equal, the relationship can be seen in two dimensions. First, when the higher loan sizes relate to high repayment rates, the level of cash will increase and, therefore, the liquidity ratio. Second, when the higher loan size is associated with lower repayment rates, and, therefore, more outstanding loans, the level of current assets as a result of outstanding loan will increase.

Lastly is the yield gap. The **yield gap** which is the gap between what the MFIs earn and what they were expected to be earned is positively related to the level of microfinance liquidity. Larger yield gap indicates that less is earned than expected. This could indicate that, while less is earned, still more loans are outstanding, especially where write-offs of bad loans are delayed, causing the current assets level to be high and thus, the liquidity ratio.

The econometric results further indicated that other factors were not affecting the changes in the liquidity level of rural MFIs in Tanzania. These are: number of installments for both individual and group lending; depth of outreach; and staff productivity. These were negatively related with the change in liquidity. However, the relationships were not statistically significant. Other variables are: the product type and minimum loan size when individual lending is used which were positively related with the percentage changes in liquidity but the relationship was not statistically significant.

7.5.3 Portfolio at Risk

Portfolio at risk (PAR) is the third indicator of financial sustainability at start-up stage of microfinance development. The next subsection presents the operational model for the PAR followed by the results.

(a) The Operational Model

The operational model used to analyze the effects of the determinants of financial sustainability on the portfolio at risk (PAR) was:

$$PAR_{it} = \alpha_i + \beta_1\ capstruc_{it} + \beta_2\ intrate_{it} + \beta_3\ instalind_{it} + \beta_4\ lninstalgr_{it} + \beta_5\ prodtype_{it} + \beta_6\ minloanind_{it} + \beta_7\ minloangr_{it} + \beta_6\ mfiage_{it} + \beta_9\ lnavoutloan_{it} + \beta_{10}\ lnmfisize_{it} + \beta_{11}\ female_{it} + \beta_{12}\ reguted_{it} + \beta_{13}\ educarea_{it} + \beta_{14}\ agrlarea_{it} + \beta_{15}\ lnT2matind_{it} + \beta_{16}\ lnT2matgr_{it} + \beta_{17} + lnborrpstaff_{it} + \varepsilon_{it}$$

Where: PAR is the portfolio at risk measure, which is the dependent; α_i is a constant term; β_{is} measure the partial effect of independent or explanatory variables in period t for the unit i (*MFI)*; the X_{it} are the explanatory variables as explained in Table 5.2 and 6-2; and ε_i is the error term. The variables, both dependent and independent, are for cross-section unit i at time t, where i = MFIs (1 to n), and t = 1 to 4.

(b) Results

The econometric results for the factors affecting the portfolio at risk are indicated in Table 7-7 below.

Table 7-7: Determinants of Portfolio at Risk

Variable	Coefficient	Robust Std. Err.	P>z
capstruc	-0.1925362	0.0793533	0.015**
lnavoutloan	-0.0737119	0.0203458	0.000***
lnborrpstaff	-0.0576842	0.0248465	0.020**
R-Sq	Within = 0.1350	Between = 0.2969	Overall = 0.2065

***significant at 1%; ** significant at 5%

The econometric results indicate that among the determinants of financial sustainability found in Chapters 5 and 6, only the MFIs' capital structure, depth of outreach, and staff productivity were significantly related to the level of portfolio at risk. Other factors were not significantly related to the PAR. Moreover, the overall results indicate that, the independent variables considered account only for about 21 percent of the variations in the PAR. Further details for the econometric results indicating the relationships between the determinants of financial sustainability and the PAR are included in this thesis as Appendix 13(h).

The **capital structure** (*capstruc)* variable indicates the proportion of equity as percentage of total capital. The coefficient for this variable was negative and statistically significant, which indicates that, the more capital is made up of equity, the less at risk will the portfolio be. The possible reason why the capital structure variable appeared to be significantly affecting the PAR is that, most MFIs studied were member-based MFIs (MB-MFIs). With the MB-MFIs, the clients are mostly the MFIs members and, therefore, the owners. Thus, the sense of belonging to an MFI could affect how serious they take the repayment issue, as opposed to NGO-MFIs whose clients are not members or owners. The members and, therefore, the clients of the MB-MFIs mostly live in the same community, mostly doing relatively the same sort of activities, and probably spending most of their productive time together, and, therefore, strong social ties. Thus, this finding may imply the importance of social capital in reducing the PAR.

As indicated above, the **depth of microfinance outreach** affects their portfolio at risk. The econometric result shows strong negative relationship between the depth of outreach and the PAR. This may also confirm why microfinance institutions may be drifting away from their initial poverty reduction mission (Copestake, 2007 and Aubert *et al,* 2009). The negative coefficient indicates that, the more less-poor clients (higher loan size) the microfinance has, the less risky will their portfolio be. Thus, all things held constant, the more poor the clients an MFI has, the higher risk in its loan portfolio it should expect. No wonder why microfinance that targets the poorest had to charge higher interest rates to cover for the related risks (Conning, 1999).

Moreover, the effects of staff efficiency can be well understood by considering the relationship between staff productivity as measured by **number of borrowers per staff** and the PAR. The coefficient for the staff productivity was negative and statistically significant. This indicates that all things being equal, if the increase in number of borrowers is also associated with increase in staff efficiency, the PAR may be reduced. The staff efficiency may improve repayment rates which reduce the amount of portfolio that is at risk.

Other variables which were considered are: the interest rate; number of installments when individual lending is used; minimum loan for group lending technology; MFI age; percentage of female clients; and term to maturity when individual lending is used. The coefficients for these variables were positive and statistically insignificant. The remaining variables appeared to relate negatively to the PAR. These are: number of installments when group lending is used; type of MFI product; minimum loan size when individual lending is used; size of an MFI; MFI regulation status; MFI geographical location; and the term to maturity when group lending technology is used.

7.6 ECONOMETRIC RESULTS (GROWTH STAGE)

In this section we present the econometric results on the effects of the determinants of financial sustainability on sustainability at growth stage. We used indicators of financial performance at growth stage as proxies of sustainability. These are: the cost per loan; financial productivity; and Operational Self-sufficiency.

7.6.1 Cost per Loan

The cost per loan is one of the three indicators of financial performance at growth stage. This section presents the results on the effects of the determinants of financial sustainability on the cost per loan. The section begins with the presentation of the operational model used followed by the results.

(a) The Operational Model

The operational model used to analyze the effects of the determinants of financial sustainability on the cost per loan was:

$$\begin{aligned} lncostploan_{it} = {} & \alpha_i + \beta_1\, intrate_{it} + \beta_2\, lnstcostpdol_{it} + \beta_3\, lninstalind_{it} + \beta_4\, lninstalgr_{it} \\ & + \beta_5\, minloanind_{it} + \beta_6\, minloangr_{it} + \beta_7\, mfiage_{it} + \beta_8\, lnavoutloan_{it} \\ & + \beta_9\, lnmfisize_{it} + \beta_{10}\, lnT2matind_{it} + \beta_{11}\, lnT2matgr + \beta_{12}\, PAR_{it} + \beta_{13} \\ & lnborrpstaff_{it} + \beta_{14}\, lnavdisbloan_{it} + \varepsilon_{it} \end{aligned}$$

Where: lncostploan is the natural log of the cost per loan, which is the dependent variable; α_i is a constant term; β_{is} measure the partial effect of independent or explanatory variables in period t for the unit i (*MFI)*; the X_{it} are the explanatory variables as explained in Table 5.2 and 6-2; and ε_i is the error term. The variables, both dependent and independent, are for cross-section unit *i* at time *t*, where *i* = MFIs (1 to n), and *t* = 1 to 4.

(b) Results

The econometric results reveal that, among the determinants of financial sustainability at maturity stage, the factors that significantly affect the cost per loan are: staff cost per dollar loaned; age of an MFI; staff productivity; and the average disbursed loan. Table 7-10 presents a summary of econometric results for these variables.

Table 7-8: Econometric Results for the Determinants of Cost per Loan

Variable	Coefficient	Robust Std. Err.	P>z
lnstcostpdol	0.4886812	0.0690336	0.000***
mfiage	0.1641467	0.0496242	0.001***
lnborrpstaff	-0.3051742	0.1254243	0.017**
lnavdisbloan	0.6700995	0.0683262	0.000***
R-Sq	Within = 0.6384	Between = 0.5841	Overall = 0.5962

***significant at 1%; ** significant at 5%

The econometric results in Table 7-8 indicate that **Staff costs per dollar loaned** (*lnstcostpdol)* is positively and strongly significantly affecting the cost per loan. This indicates that an increase in the staff cost per dollar loaned will cause an increase in the cost per loan, in which case, all things being equal, will reduce profitability. This finding is also in line with our previous finding in Chapter 5 that staff costs per dollar loaned are negatively affecting the financial sustainability of microfinance institutions.

The cost per loan also significantly depends on the **MFI age** (*mfiage)*. The econometric result reveals that older MFIs have higher cost per loan than the younger ones. This also is in line with the finding in Chapter 5 that the MFI age is negatively related to its financial sustainability. Thus, the insignificant relationship between the MFI age and the financial sustainability as revealed in Chapter 5 can be expressed here that the relationship is not a direct one. That is, the age affects the costs before the same (costs) affects the profitability, which depends on both costs and revenue. The positive coefficient of the MFI age variable suggests that, all things held constant, as MFIs grow, their efficiency in cost reduction is reduced, as result cost per loan increases. This could be partly because of inefficiency in handling the increased number of borrowers. As revealed in the descriptive results (section 7.4), while the number of borrowers increase by 62 percent over four years, the operating costs increased by 244 percent during the same period.

The staff productivity as measured by the **number of borrowers per staff** (*lnborrpstaff)* is also significantly affecting the cost per loan. The more borrowers a staff has, all things being equal, the more efficient the staff is. The staff efficiency will increase repayment rate and reduce default rate, which in turn will reduce the total costs. On the other hand, all things being equal, the staff efficiency may also increase the number of loan, the effects of which is to reduce the overall cost per loan. Thus, the negative coefficient for the staff productivity variable implies that the staff efficiency will reduce the cost per loan. However, where there are inefficiencies, the increase in number of borrowers per staff will increase the portfolio at risk, and the cost per loan.

Lastly, the **average disbursed loan size** (*lnavdisloan)* significantly affects the cost per loan. The econometric results for this variable indicates a positive and significant coefficient which means, the increase in the average disbursed loan size contributes to the increase in the cost per loan. This is a possible indication of presence of few loans of large sizes which make the number of loans to be less and, therefore, the cost per loan high. It may also imply that the largest part of the costs is fixed costs. That is, they do not vary with the number of loans, such that when the number of loan decreases, the cost per loan will increase.

The remaining factors were not significantly affecting the cost per loan. These are: the interest rate; number of installments for both individual and group lending; minimum loan when individual lending is used; depth of outreach as measured by average loan size of the outstanding loan portfolio; MFI size; and the term to maturity for both the individual and group lending. These variables were negatively related to cost per loan but their relationship was not statistically significant. Other factors are: minimum loan size when group lending is used and the portfolio at risk, which were positively statistically insignificantly related to the cost per loan. Further details on the econometric results for the factors affecting the cost per loan are in Appendix 13(i). The next section presents the econometric results for the factors affecting financial productivity among the determinants of financial sustainability at maturity stage.

7.6.2 Financial Productivity

The financial productivity is another indicator of financial performance that was used in this study as a proxy of financial sustainability at the growth stage of microfinance development. This section presents the results on the effects of the determinants of financial sustainability on the financial productivity. We first present the operational model used followed by the results.

(a) **The Operational Model**

The operational model used to analyze the effects of the determinants of financial sustainability on the financial productivity was:

$$\begin{aligned} finprod_{it} = {} & \alpha_i + \beta_1\, capstruc_{it} + \beta_2\, intrate_{it} + \beta_3\, instalind_{it} + \beta_4\, lninstalgr_{it} \\ & + \beta_5\, minloanind_{it} + \beta_6\, minloangr_{it} + \beta_7\, mfiage_{it} + \beta_8\, lnborrowers_{it} \\ & + \beta_9\, lnT2matind_{it} + \beta_{10}\, lnT2matgr_{it} + \beta_{11}\, lnborrpstaff_{it} + \beta_{12}\, lnstcospbor_{it} \\ & + \beta_{13}\, lnaepborr_{it} + \varepsilon_{it} \end{aligned}$$

Where: finprod is the financial productivity ratio, which is the dependent variable; α_i is a constant term; β_{is} measure the partial effect of independent or explanatory variables in period t for the unit i (*MFI)*; the X_{it} are the explanatory variables as explained in Table 5.2 and 6-2; and ε_i is the error term. The variables, both dependent and independent, are for cross-section unit i at time t, where i = MFIs (1 to n), and t = 1 to 4.

(c) Results

The econometric results reveal that, among the determinants of financial sustainability at maturity stage, those that significantly affect the financial productivity are: the microfinance capital structure; interest rate; number of borrowers; term to maturity when the group lending is used; number of borrowers per staff; staff costs per borrower; and the administrative expenses per borrower. A summary of econometric results for these variables is presented in Table 7-9. Other factors were not significantly affecting the financial productivity.

Table 7-9: Econometric Results for the Determinants of Financial Productivity

Variable	Coefficient	Robust Std. Err.	P>z
capstruc	0.3062504	0.0995506	0.003**
intrate	0.6241673	0.1372286	0.000***
lnborrowers	0.6637261	0.1350184	0.000***
lnT2matgr	-0.1014892	0.0432067	0.021**
lnborrpstaff	-0.6625587	0.1327404	0.000***
lnstcospbor	0.0171250	0.0086003	0.050**
lnaepborr	0.0258373	0.0101433	0.013**
R-Sq	Within = 0.6176	Between = 0.4463	Overall = 0.3803

***significant at 1%; ** significant at 5%

The econometric result summarized in Table 7-9 indicates that the microfinance institutions' **capital structure** (*capstruc)* affects their financial productivity. The coefficient for this variable is positive indicating that the more the microfinance capital is made up of equity the higher the financial productivity. This finding once again, depicts the nature of microfinance studied. With the MB-MFIs for example, the members and, therefore, the owners, are the clients. Thus, the sense of ownership could, all things being equal, influence them to have higher repayment rates and less PAR all of which increase the financial productivity. This also helps to explain why, the capital structure was found to be strongly positively affecting the financial sustainability.

The microfinance **interest rate** (*intrate)* and number of borrowers, all factors held constant, will determine the volume of their expected income. The econometric result reveals positive significant relationship between interest rate and the financial productivity. This indicates that, all held constant, higher interest rate is associated with higher financial income and, therefore, higher financial productivity. The same also affects the financial sustainability as explained in Chapter 5. The results also reveal that the increase in **number of borrowers** will improve the financial productivity. Comparing the effects of increase in the number of borrowers on financial productivity and on the financial sustainability (as revealed in Chapter 5), we discover that, while it improves the financial productivity, the same does not improve financial sustainability. The reason for this is that, the financial productivity measure does not consider the costs incurred to earn the respective financial income. Thus, considering how much is spent on earning the same, as with the profitability measure (FSS), we discover that an increase in the number of borrowers if accompanied with higher increase in costs reduces the profitability of microfinance institutions. It also reveals that the increase in number of borrowers is more associated with higher increase in costs than with income.

We also considered the effects of lending type on financial productivity. One of the proxies of lending type used was the term to maturity. We considered the effects of the loan duration on the financial productivity, using the **term to maturity** (*lnT2matgr)* measure. The result shows that, the longer term to maturity will decrease the financial productivity of an MFI that applies the group lending technology. It also helps to explain why the longer term to maturity, as found and explained in Chapter 5, reduces the financial sustainability of microfinance institution. All things being equal, longer maturities may be associated with low repayment rates, which results into higher outstanding loans, as a result low financial productivity.

Staff inefficiency as a result of increase in **number of borrowers per staff** strongly reduces the financial productivity. The coefficient for the number of borrowers per staff (*lnborrpstaff)* variable is negative and statistically significant, indicating that the more borrowers one staff is required to serve, the low financial productivity as a result of inefficiency. The staff inefficiency may lead to low repayment rates and higher outstanding loans all of which reduces the financial productivity of an MFI.

This also is in line with the findings in Chapter 6 that the increase in number of borrowers per staff reduces the financial sustainability.

Another variable that was also considered to explain the factors affecting the financial productivity is the **staff costs per borrower** (*lnstcospbor)*. The microfinance staffs are the ones responsible for clients screening and selection together with client monitoring once the loans have been given. Thus, motivating staffs may improve their performance. The econometric result indicates that the higher the staff costs per borrower is, the better the financial productivity. This implies the situation where higher staff pays are related to higher productivity in influencing repayment and reducing the possibility of the outstanding loans to be at risk. The financial productivity indicator however, does not take into account the costs incurred to earn the same. Thus, although they may influence higher financial productivity, when compared with the related costs, the costs may outweigh the benefits as a result, there may be a reduction in the financial sustainability as was discovered in Chapter 6. The findings in Chapter 6 revealed that the increase in staff costs per borrower in fact does reduce the financial sustainability.

The last variable that is significantly affecting the level of financial productivity is the **administrative expenses per borrower** (*lnaepborr)*. The coefficient for this variable is positive and statistically significant indicating that the more the MFIs invest in managing the loan portfolio, which is the main MFIs' business, the more it will improve their financial productivity. Moreover, when the benefits (increased financial productivity) outweigh the costs (increased administrative expenses) the microfinance profitability will increase. This finding supports the positive relationships between administrative expenses and financial sustainability reported in the findings in Chapter 6.

For the remaining variables except for the minimum loan size variable when group lending is used, which was negatively related to the financial productivity, all other variables were positively related to the financial productivity. These are: number of installments for both group and individual lending; minimum loan size when individual lending is used; term to maturity when the individual lending is used; and the MFI age, which are positively related to the financial productivity. Detailed econometric results for the financial productivity indicator are in Appendix 13(j).

The next subsection presents the effects of the determinants of financial sustainability on the sustainability of microfinance at their growth stage. It contains the analysis on the effects of both outreach and efficiency related variable, as in Chapter 5 and 6 respectively, on the sustainability at growth stage as measure by the operational self-sufficiency.

7.6.3 Operating Self-sufficiency and Outreach related Factors

The operational self-sufficiency (OSS) is one of, and probably the major indicator of financial sustainability at growth stage. The indicator utilizes both microfinance income and expenditure variables. In this subsection we explain how the outreach related factors analyzed in Chapter 5 affect the OSS. We first present the operational model used for analysis followed by the results.

(a) Operational Model

The specific or operational panel regression model used to study how the outreach related determinants of financial sustainability at maturity stage affect the operational self-sufficiency (OSS) was:

$$\begin{aligned} OSS_{it} = {} & \alpha_i + \beta_1\, capstruc_{it} + \beta_2\, intrate_{it} + \beta_3\, lnstcostpdol_{it} + \beta_4\, instalind_{it} \\ & + \beta_5\, lninstalgr_{it} + \beta_6\, lncostpborr_{it} + \beta_7\, prodtype_{it} + \beta_8\, minloanind_{it} \\ & + \beta_9\, minloangr_{it} + \beta_{10}\, mfiage_{it} + \beta_{11}\, mfitype_{it} + \beta_{12}\, lnavoutloan_{it} \\ & + \beta_{13}\, female_{it} + \beta_{14}\, reguted_{it} + \beta_{15}\, lnborrowers_{it} + \beta_{16}\, educarea_{it} \\ & + \beta_{17}\, agrlarea_{it} + \beta_{18}\, lnT2matind_{it} + \beta_{19}\, lnT2matgr_{it} + \varepsilon_{it} \end{aligned}$$

Where: OSS is the operational self-sufficiency, which is the dependent variable; α_i is a constant term; β_{is} measure the partial effect of independent or explanatory variables in period *t* for the unit *i* (*MFI)*; X_{its} are the independent variables as described in Table 5-2; and ε_i is the error term. The variables, both dependent and independent, are for cross-section unit *i* at time *t*, where *i* = MFIs (1 to n), and *t* = 1 to 4.

(b) Results

The Operational Self-sufficiency (OSS) ratio indicates whether an MFI is moving towards self-sufficiency or not. It is a ratio of financial income over a total of operating expenses, which includes the loan loss provisions. The only difference between OSS and FSS is the inclusion of, in its computation, the amortized subsidized capital. Table 7-10 presents a summary of the factors that significantly affect the OSS, details of which, and of other factors not significantly affecting the OSS are in Appendix 13 (k).

Table7-10: Econometric Results for the Determinants of OSS (Outreach)

Variable	Coefficient	Robust Std. Err.	P>z
capstruc	1.01746	0.3634733	0.005***
intrate	4.116412	0.8002648	0.000***
lnstcostpdol	-0.5437545	0.2708412	0.045**
instalind	-0.0868214	0.0374291	0.020**
lninstalgr	0.4102216	0.1798107	0.023**
lncostpborr	-0.4246061	0.1467885	0.004***
prodtype	0.4671373	0.2097579	0.026**
minloangr	8.06e-07	3.78e-07	0.033**
lnavoutloan	0.5269036	0.1347048	0.000***
reguted	0.5696007	0.2248678	0.011**
lnT2matind	0.6066238	0.2293004	0.008***
lnT2matgr	-0.592102	0.2299987	0.010***
R-Sq	Within = 0.3706	Between = 0.4302	Overall = 0.3844

***significant at 1%; ** significant at 5%

The econometric results indicated some interesting findings. All factors, except for the staff costs per dollar loaned (*lnstcostpdol)* and microfinance regulation status (*regulated)*, appeared to be statistically significantly affecting both the OSS and FSS in the same direction. These are: the capital structure (*capstruc)*; interest rate (*intrate)*; number of installment when group lending is used (*lninstgr)*; product type (*prodtype)*; minimum loan size for group lending technology (*minloangr)*; depth of outreach, as measured by the average outstanding loan size (*lnavoutloan)*; and the term to maturity for individual lending (*lnT2matind)*. These factors were positively related to both, the OSS and FSS. Other factors were significantly and negatively related to both OSS and FSS. These are: the number of installments for individual lending (*lninstalind)*; cost per borrower (*lncostpborr)*; and the term to maturity for group lending (*lnT2matgr)*.

The possible cause for the relatively similar results on factors affecting the OSS and the FSS is the nature of MFIs studied where the subsidies and concession loan capital are but a small proportion of capital and, therefore, their impact cannot be easily felt. Moreover, in addition to the factors that significantly affect the FSS, the staff cost per dollar loaned (*lnstcostpdol)* and the microfinance regulation status (*regulated)*, which were not significantly affecting the FSS, they were significantly affecting the OSS. This indicates a possibility of the staff costs per dollar loaned and the microfinance regulation status being highly related with the subsidies and concession loan capital, the introduction of which, make these variables to be insignificantly affecting the financial sustainability.

The remaining factors neither do they affect the FSS nor OSS. These are: the minimum loan size for individual lending (*minloanind)*; MFI age (*mfiage)*; MFI type (*mfitype)*; percentage of female clients (*female)*; number of borrowers (*lnborrowers)*; and geographical location (*educarea* and *agrlarea)*.

7.6.4 Operating Self-sufficiency and Efficiency related Factors

In this subsection we explain how the efficiency related factors analyzed in Chapter 6 affect the OSS. We first present the operational model used for analysis followed by the results.

(a) Operational Model

The specific or operational panel regression model used to study the effects of microfinance efficiency on the operational self-sufficiency (OSS) was:

$$OSS_{it} = \alpha_i + \beta_1\, yield_{it} + \beta_2\, PAR_{it} + \beta_3\, lnliqratio_{it} + \beta_4\, lnborrpstaff_{it} + \beta_5\, lnstcospbor_{it} + \beta_6\, lnaepborr_{it} + \beta_7\, lncostpclie_{it} + \beta_8\, lnoeratio_{it} + \beta_9\, lnavdisbloan_{it} + \varepsilon_{it}$$

Where: OSS is the operational self-sufficiency, which is the dependent variable; α_i is a constant term; β_{is} measure the partial effect of independent or explanatory variables in period t for the unit i (*MFI)*; the X_{it} are the explanatory variables as explained in Table 6-2; and ε_i is the error term. The variables, both dependent and independent, are for cross-section unit i at time t, where i = MFIs (1 to n), and t = 1 to 4.

(b) Results

The econometric results indicate that, except for the PAR, all of the remaining efficiency indicators that affected the financial sustainability (FSS) also affected the OSS, in the same direction. That is, the yield on gross loan portfolio (*yield)* and the liquidity ratio (*lnliqratio)* were positively and significantly related with both OSS and FSS, while the number of borrowers per staff (*lnborrpstaff)* and the operating efficiency ratio (*lnoeratio)* were negatively and significantly related with both the OSS and the FSS. Table 7-11 presents a summary of results on factors that significantly affect the OSS. More details on the econometric results for all variables that were considered are provided in Appendix 13(l).

Table7-11: Econometric Results for the Determinants of OSS (Efficiency)

Variable	Coefficient	Robust Std. Err.	P>z
Yield	9.77241	1.846199	0.000***
lnliqratio	0.3978878	0.1435736	0.006***
lnborrpstaff	-0.2285884	0.0682701	0.001***
lnstcospbor	-0.3325225	0.1758107	0.059*
lnoeratio	-1.295836	0.2278683	0.000***
R-Sq	Within = 0.4959	Between = 0.6229	Overall = 0.5482

***significant at 1%; * significant at 10%

The econometric results further indicate that, the staff cost per borrower, which did not significantly affect the FSS, appeared to affect the OSS. The relationship was significant at 10 percent significance level. The remaining variables: the administrative expenses per borrower (*lnaepborr)* cost per client (*lncostpclie)*; and average disbursed loan size (*lnavdisbloan)* were neither affecting the OSS nor the FSS. Detailed econometric results are included in Appendix 13 (l).

The differences in the significance with which the PAR and staff costs per borrower affect the OSS and FSS suggest that the portfolio at risk (PAR) and the staff cost per borrower variables are highly affected by the level of subsidization. Thus, when the subsidies are not deducted from income (a case with the OSS), the effects of staff costs per borrower is more felt than when they are excluded (a case with FSS). The opposite is also true for the PAR indicating why subsidized MFIs may not be efficient in reducing PAR as it is not felt. For example, further analysis of these variable reveals that the subsidies are positively related with the staff cost per borrower (see Appendix 13 (m)). That is, staff costs increase with subsidies. Thus, when they are excluded from income (a case with FSS), its impact is reduced, as a result, the effects of the staff cost per borrower on FSS becomes insignificant. This is in line with the findings in Chapter 6. Moreover, the subsidy and cost of capital were negatively related with PAR (see Appendix 13(n)). This implies that, where there are more subsidies, there is also more staff costs, as a result, fewer portfolios at risk. Thus, the inclusion of subsidies in microfinance income (as with the OSS), while increasing the staff costs (staff pay), reduces the effects of PAR as a result the impact of PAR on OSS becomes insignificant.

The findings in this section may also imply that, when indicators of financial performance at different development stages are used as proxies of financial sustainability there may be inconsistent findings as to what affects the financial sustainability.

7.7 CONCLUSION

This chapter was meant to explain how the determinants of financial sustainability (as found in Chapter 5 and 6) affect the sustainability of microfinance institutions at their start-up and growth stages. Based on the evidence obtained from the econometric analysis on the determinants of financial sustainability, and using the indicators of financial performance at the start-up and growth stages as proxies of sustainability at respective stages, we generally conclude that factors affecting the financial sustainability at maturity stage also affect the sustainability at early stages of development. The determinants of financial sustainability that affect the sustainability at start-up stages are: the level of portfolio at risk; staff productivity;

operating expenses ratio; the interest rate, and the depth of outreach.

The sustainability at growth stage is affected by the staff costs per dollar loaned; age of microfinance institutions; staff productivity; average disbursed loan size; interest rate; number of borrowers; terms to maturity; staff costs per borrower; staff productivity; and the administrative expenses per borrower. These affect both the cost per loan and financial productivity of microfinance institutions at this stage (growth stage). These factors are significant at 5 percent level of significance. Moreover, factors affecting the financial sustainability when FSS is used also affect the financial sustainability at growth stage when OSS is used to measure financial sustainability.

Finally, we would like to note that, in this chapter we have assumed that the microfinance institutions studied were in their respective start-up and growth stages and used indicators of financial performance as proxies of financial sustainability. This assumption was made, in line with previous studies, following the limitations in using microfinance institutions' age to determine their development stages. However, in a situation where this assumption is not met, and the indicators of financial performance are used as proxies of financial sustainability there may be inconsistent findings as to what affects financial sustainability. Thus, the conclusions made in this chapter should be understood within this limitation.

CHAPTER 8
CONCLUSIONS

8.0 INTRODUCTION

This chapter presents the key conclusions made in this study, their implications, and the areas for future research. The conclusions are presented in four sections with reference to the main research objectives. The first section (8.1) presents both the outreach and, efficiency related factors that affect the financial sustainability of rural MFIs in Tanzania. The effects of the financial sustainability on breadth of outreach are presented in the second section (8.2). The third section (8.3) is about the applicability and limitations of the findings from previous studies to the rural MFIs in Tanzania. The fourth section (8.4) is about the effects of the determinants of financial sustainability on the sustainability of MFIs at their start-up and growth stages of development. The four conclusion sections are followed by: the implications of the conclusion made (8.5); a summary of key contributions to knowledge made by this study (8.6); and finally, the areas for future studies (8.6).

8.1 FACTORS AFFECTING THE FINANCIAL SUSTAINABILITY OF RURAL MICROFINANCE INSTITUTIONS IN TANZANIA

This section presents the factors affecting the financial sustainability of rural microfinance institutions in Tanzania. The factors are grouped into two, the outreach and efficiency-related factors.

8.1.1 Outreach Related Factors

Based on the empirical evidence from the econometric analysis provided in Chapter 5, we conclude that factors affecting the financial sustainability of rural microfinance institutions in Tanzania are: the capital structure; interest rates charged; differences in lending type as indicated by number of instalments, and loan repayment plan as reflected in the term to maturity; cost per borrower; product type; MFI size; and number of borrowers. The p-values of these variables were significant at 5 percent level of significance. Additionally, contrary to when endogeneity relationships between financial sustainability and the breadth of outreach were not considered, we could not find any evidence of mission drift. This indicates that, there may be inconsistent evidence on the existence of mission drift when the depth of outreach variable is used to explain the financial sustainability without considering the endogeneity relationships that exist between the financial sustainability and the breadth of outreach.

8.1.2 Efficiency Related Factors

From the empirical evidence obtained from the econometric results in Chapter 6, we generally conclude that microfinance efficiency affects the financial sustainability. Specific efficiency related factors that affect the financial sustainability of rural MFIs in Tanzania are: the yield on gross loan portfolio; level of portfolio at risk; liquidity level; number of borrowers per staff; and the operating efficiency. The p-values of the coefficients of these variables were statistically significant at 5 percent significance level.

8.2 THE EFFECTS OF THE FINANCIAL SUSTAINABILITY ON THE BREADTH OF OUTREACH

The econometric results presented in this study revealed positive statistically significant relationships between the financial sustainability and the breadth of outreach. This implies that an MFI that is financially sustainable will perform better in breadth of outreach than an MFI, which is not. That is, the more profitable the MFI becomes, the higher it will achieve the breadth of outreach. We therefore conclude that, financial sustainability improves the breadth of outreach. This conclusion confirms the institutionists' view that financial sustainability will lead MFIs to operate at larger economies of scale and enable them reach more clients (Brau and Woller, 2004). Moreover, this study provides empirical evidence that the microfinance breadth of outreach and the financial sustainability affect each other.

8.3 THE APPLICABILITY AND LIMITATIONS OF THE FINDINGS FROM PREVIOUS STUDIES

Comparison between the findings in this study and in previous studies yields mixed results, with some factors appearing significant while others are not. The comparisons presented here are for both outreach and, efficiency related factors.

8.3.1 Outreach Related Factors

The applicability and limitations of the findings from previous studies to microfinance institutions in rural Tanzania on what affects the financial sustainability of microfinance institutions are summarised as follows: the effects of capital structure confirm the findings by Bogan *et al* (2007); the effects of staff cost per dollar loaned and, interest rate effects on financial sustainability are in line with Conning (1999); the insignificant effects of MFI age do confirm the previous studies by Bogan *et al* (2007), Cull *et al* (2007) and Robinson (2001); the findings on the effects of MFI size are in line with Mersland and Strøm (2009), Kyereboah-Coleman and Osei (2008), Bogan *et al* (2007), Cull *et al* (2007), and Robinson (2001).

Moreover, the effects of MFI lending type on financial sustainability are in harmony with the theoretical claim that group lending helps to mitigate moral hazards and adverse selection (Mersland and Strøm, 2009; Guttman, 2008; Armendáriz and Morduch, 2007; Cull *et al*, 2007; Hermes *et al*, 2005; Navajas *et al*, 2003; Navajas *et al*, 2000); the finding that MFI type does not affect its financial sustainability is in line with Mersland and Strøm (2008); how the MFI type may affect the financial sustainability also tends to follow previous findings by Mersland and Strøm (2009) and Hartarska and Nadolnyak (2007); the finding that MFIs regulation status does not affect their financial sustainability follows Mersland and Strøm (2009) and Hartarska and Nadolnyak (2007); and finally, the insignificant effect of geographical location to financial sustainability confirms the findings by Bogan *et al* (2007).

The limitations of the previous findings to MFIs in rural Tanzania are: the finding on the effects of MFI products however, is not in line with microfinance literature, which suggest that having different product types (loan and non loans) could improve financial sustainability of MFIs (Navajas *et al*, 2000). Likewise, the findings on the effects of MFI size on the financial sustainability contradict the findings by Hartarska (2005).

Additionally, the insignificant effect of female clients on financial sustainability contradicts the MFI literature that suggest that female clients relate to higher repayment rate (Makombe *et al*, 2005; Premchander, 2003; Kabeer, 2001; Mayou, 1999) and, therefore, financial sustainability; the insignificant effects of the geographical location of an MFI on the financial sustainability contradicts the theoretical claims in Hartarska (2005), Woller (2002b), and Navajas *et al* (2000) that geographical location of MFIs may affect their financial sustainability. Finally, the findings on the effects of the number of borrowers disagree with the findings by Hartarska (2005) and Woller and Schreiner (2002).

Finally, we observed some inconsistencies in the applicability and limitations of the findings from previous studies on the effects of depth of outreach on the financial sustainability. For example, when endogeneity relationships between the financial sustainability and the breadth of outreach were not considered, the depth of outreach was significantly affecting the financial sustainability, an indication of mission drift. Although this was contradicting the findings by Cull *et al* (2007) and Woller and Schreiner (2002), it was consistent with previous studies by Gonzalez (2007), Adongo and Stork (2006), Gregoire and Tuya (2006), and Morduch (2000) that profitability relates to selling bigger loans and, therefore, mission drift. However, when the endogeneity relationships between the financial sustainability and the breadth of outreach were considered, the applicability and limitations of the findings in the mentioned studies are reversed. This could be a result of inconsistencies in estimates due to biasness caused by correlation between regressors and error term when the ordinary least squares (OLS) is used in condition where simultaneity endogeneity exists (Cameron and Trivedi, 2009; Stock and Watson, 2007; Wooldridge, 2006).

8.3.2 Microfinance Efficiency Related Factors

The applicability and limitations of the findings from previous studies to rural MFIs in Tanzania on which of the MFIs' efficiency factors affect their financial sustainability are as follow: although contradicting the findings by Christen *et al*

(1995) that staff productivity is not associated with financial sustainability, the findings in this study are in line with the findings by Woller and Schreiner (2002) and Christen (2000). On the effects of the increase in number of borrowers on efficiency, the findings in this study confirm the finding by Hermes *et al* (2008) and Gregoire and Tuya (2006) that outreach and efficiency are negatively correlated. Moreover, the findings also confirm the findings by Woller and Schreiner (2002) and Christen (2000) that higher administrative expenses affect financial sustainability. Additionally, the insignificant effects of the staff costs per borrower are contrary to Woller and Schreiner (2002) and Christen *et al* (1995) that salary levels significantly determine financial sustainability of microfinance institutions. Moreover, the findings in this study also contradict Cull *et al* (2007) that to achieve profitability, MFIs should invest heavily in staff costs.

The summaries of the applicability and limitations of the findings from previous studies to rural MFIs in Tanzania reveal that, no study's findings had a 100 percent application to rural MFIs in Tanzania. This conclusion calls for a need to thoroughly study for the factors affecting certain MFIs within a certain area of interest before attempting to replicate the findings and, therefore, the practice of one or some microfinance institutions to others. Moreover, those advocating the replications of the success stories as the best practice, need to be aware of the possible limitations of the intended replication.

8.4 SUSTAINABILITY AT START-UP AND GROWTH STAGES OF DEVELOPMENT

Based on the evidence obtained from the econometric analysis we conclude that factors affecting financial sustainability at maturity stage also affect the sustainability at early stages of development. The determinants of financial sustainability that affect the sustainability at start-up stage were: the level of portfolio at risk; staff productivity; operating expenses ratio; the interest rate, capital structure, and the depth of outreach. The sustainability at growth stage was affected by: the staff costs per dollar loaned; age of microfinance institutions; staff productivity; the average disbursed loan size; capital structure; interest rate; number of borrowers; terms to maturity; staff costs per borrower; and administrative expenses per borrower. These affected both the cost per loan and the financial productivity of microfinance institutions. Moreover, almost all factors that did affect the financial self-sufficiency (FSS) also affected the Operational Self-sufficiency (OSS) in the same direction.

The conclusions on how the determinants of financial sustainability affect the sustainability of microfinance institutions at start-up and growth stages have two significant landmarks in the microfinance literature. First, assuming that the microfinance institutions studied were in their respective start-up and growth stages, then the findings help to indicate which, among the factors that affect the financial sustainability at maturity stage also affect the financial sustainability of microfinance institutions at their early ages. However, we also understand and, therefore, admit that not all MFIs may be at their early development stages. That is, the above assumption may not hold true, in which case, there may be inconsistent findings as to what affects the financial sustainability. Thus, the conclusions made in Chapter 7 on the effects of determinants of financial sustainability on the sustainability of microfinance institutions at early stages should be understood within this limitation. Second, even when the above assumption is not true, the conclusions in this study, where the determinants of financial sustainability are related to the indicators of financial performance, still help to unveil the nature of the relationships, and clearly depict what affects the financial sustainability and how.

8.5 IMPLICATIONS OF THE CONCLUSIONS MADE

The conclusions made in this chapter imply that, to be financially sustainable, rural microfinance institutions in Tanzania should first, charge interest rates high enough to enable them to cover not only the operating costs but also to cover for the possible losses as a result of loan default. This however, should be done with caution considering the impact of increasing the interest rate on repayment and breadth of outreach. Second, they should utilise the differences in lending terms brought about by the differences in lending type. That is, when individual lending is used, less number of instalments, smaller minimum loan size, and relatively longer maturity are preferred to promote financial sustainability. On the other hand, when the group lending is used, higher number of instalments, larger minimum loan size, and shorter term to maturity are preferred, to take advantage of the collective responsibility of the group that promotes financial sustainability.

Third, selling higher volumes of loans alone may not improve financial sustainability. It should be accompanied by effective follow-ups to ensure higher repayment rates. This means, microfinance institutions should keep their yield from the gross portfolio higher, strive to keep low the portfolio-at-risk, all things equal, have high liquidity level to meet any outstanding obligations to support smooth running of the operations, ensure that staff productivity goes in hand with the increase in number of borrowers, and strive to operate at relatively lower operating costs.

Fourth, the microfinance institutions should understand the effects of the minimum loan for group lending on both the breadth of outreach and the financial sustainability and act accordingly. For example, while the increase in loan size for group lending will increase the FSS, the same will decrease the breadth of outreach. That is, larger loan sizes, while improving profitability, increase the level of risk to be borne by group members in case of defaults of one or more members, which could discourage their participation in the MFI. The MFIs should strive to strike the balance between the two.

Fifth, as implied in the findings and the conclusions there from, attaining financial sustainability is not a one shot event. The level of sustainability today will affect the sustainability tomorrow regardless of where the microfinance institution stands in its life cycle or development stage. The factors that affect financial sustainability at start-up and growth stage, affects even more the sustainability at maturity stage. Thus, financial sustainability needs to be monitored and striven for throughout the life time of microfinance institutions.

Sixth, while these are being done however, microfinance institutions should be aware of what all these imply to their initial mission. This is because, the econometric results indicated (an evidence) that the profitability of these rural microfinance institutions had been growing hand in hand with the average loan size of the outstanding loan portfolio, implying less depth of outreach, which indicates early signs of mission drift. Although we did not find any evidence for existence of a mission drift, ensuring that their profitability growth goes with their objectives becomes imperative if the MFIs still have to make their initial mission sustainable.

Moreover, for policy makers and those advocating the replications of the ‘microfinance best practice’ the findings in this study imply the need for scrutinising what is applicable and what is not before embarking on the replications. In addition to this, the simultaneity endogeneity relationships between the financial sustainability and the breadth of outreach are worth considering before ruling out a mission drift.

Finally, the conclusions made on how the determinants of financial sustainability affect the sustainability at early stages of development imply the following for the sustainability of microfinance institutions at start-up stage: for higher earnings ratio, microfinance institutions in rural Tanzania should strive to keep lower the portfolio at risk, improve staff productivity, strive to operate at relatively lower costs, and charge interest rates high enough to cover the operating costs, maintain higher liquidity to meet short-term obligations as they fall due and for the smooth running of the microfinance institution. The conclusions also call for a proper combination of the poor and relatively average poor clients in the loan portfolio. This is because, the earnings ratio is positively related with higher loan sizes, which while promoting higher earnings ratio, could lead the MFIs into mission drift problem.

For the growth stage, the conclusions imply: the need for the microfinance institutions to promote higher staff productivity and to reduce staff costs per dollar loaned together with low cost per loan as the microfinance grows. To combat the high cost per loan associated with higher average disbursed loan size, the microfinance should promote higher repayments to reduce higher defaults, and introduce loan graduation scheme to minimise the initial costs associated with loan screening. This may help the loan size to keep on growing in relation to their repayment rates. The conclusions also imply that the MFIs have to: charge interest rates high enough to cover for the total operating costs; improve breadth of outreach; introduce shorter term to maturity for both individual and group lending type; adopt proper staff motivation with respect to how they influence loan repayments, and invest more in managing the loan portfolio to influence its performance. Moreover, how successful the start-up stage is will influence the success in the growth and maturity stages. This implies that sustainability needs to be built from an initial stage (start-up stage).

8.6 CONTRIBUTION TO KNOWLEDGE MADE BY THIS STUDY

The key contributions to knowledge made by this study are: First, this is a first attempt to determine factors affecting financial sustainability of rural microfinance institutions in Tanzania. Applying the accounting profitability theory, the study has determined that both outreach and efficiency related factors affect the financial sustainability of rural microfinance institutions in Tanzania. Second, the study reveals that there exists simultaneous causality relationship between financial sustainability and breadth of outreach. When this relationship is not considered in determining factors affecting financial sustainability there may be inconsistent evidence on the existence of mission drift. Third, it unveils the trade-off between financial sustainability and breadth of outreach with regards to the minimum loan size when group lending is used. That is, larger loan size, while improves profitability, reduces the breadth of outreach. Fourth, the study provides empirical evidence that the impact of a particular lending type on microfinance institution's profitability will depend on the term to maturity and number of instalments reflected in its lending terms. Lastly, consistent with the institutionists' view, the study provides empirical evidence that financial sustainability of microfinance institutions improves their breadth of outreach.

Other contributions to knowledge include: First, the study documents the applicability and limitations of previous studies to MFIs in rural Tanzania. Second, applying the microfinance life cycle theory, the study confirms that sustainability needs to be built from an initial stage. In this respect, the findings in this study help to unveil the nature of the relationships, and clearly depict what affects the financial sustainability and how. This works even when the assumption of the MFIs being in certain stages of development does not hold. It also helps to highlight that; there may be inconsistent findings as to what affects financial sustainability when indicators of performance at different stages of development are used as proxies of financial sustainability. For example, staff costs while appeared to improve financial sustainability at start-up when measured by the earnings ratio, reduce financial sustainability when measured by FSS. Finally, the study provides the evidence that decomposing the MFIs lending type and MFIs costs help to better explain the determinants of financial sustainability.

8.7 AREAS FOR FUTURE STUDIES

In this study we attempted to determine factors affecting financial sustainability of rural microfinance institutions in Tanzania. The research design, therefore, was specifically focused to address this specific rural microfinance institutions problem. Thus, the findings in this study may not apply to other microfinance institutions in other countries, or even to apply to microfinance institutions in Tanzania that operates in urban areas. The areas that were not at the centre of this study's design are good avenues for future research. These are, among other: first, the applicability of the findings in this study to urban MFIs in Tanzania. Second, in this study it was revealed that staff productivity affect the financial sustainability. Thus, future studies may focus on what affects the staff productivity. Third, in this study we adopted the lending type decomposition. As a result, we were able to isolate the effects of different parameters of lending type on the financial sustainability. One question however, remains to be answered. What is it that highly affects the financial sustainability between these parameters of lending type and theoretically suggested social capital in group lending and how does the two interact? Thus, future studies may aim at isolating the effects of social capital from the parameters of lending type decomposed in this study and the effects of interactions between the two.

Fourth, this study used four years data to determine factors affecting the financial sustainability. However, the four years period is too short to allow some detailed econometric analysis. For example, we were not able to perform the unit root tests at two and more lags due to fewer observations that we had. More observations, given longer study period would have helped to isolate the time effects on profitability even before explaining the determinants of financial sustainability. Thus, future studies may consider taking longer study period. The longer study period may help to unveil what was probably not unveiled in this study.

Fifth, in this study we attempted to explain the effects of the microfinance geographical locations on financial sustainability. Although the results were insignificant, the implied differences between northern, southern, and central parts of Tanzania may call for future research. The focus could be to determine what specifically in these areas causes the differences in performance, be it economic activities, infrastructure, and any other factor that the future researcher may deem fit to include. Moreover, this study has documented the applicability and limitations of the findings from previous studies to rural MFIs in Tanzania. One question however, is still apparent: what causes different studies with similar methodologies to report different findings on factors affecting the financial sustainability. This is also a good avenue for future studies:

Lastly, in this study we used the indicators of financial performance at start-up and growth stages as proxies of financial sustainability. However, as we noted above, the results may be biased if the microfinance institutions are not in the stages of development we have assumed them to be. Thus, future studies may focus on, among others, to explain the determinants of stages of development. This will help to apply appropriate indicators to relevant MFIs.

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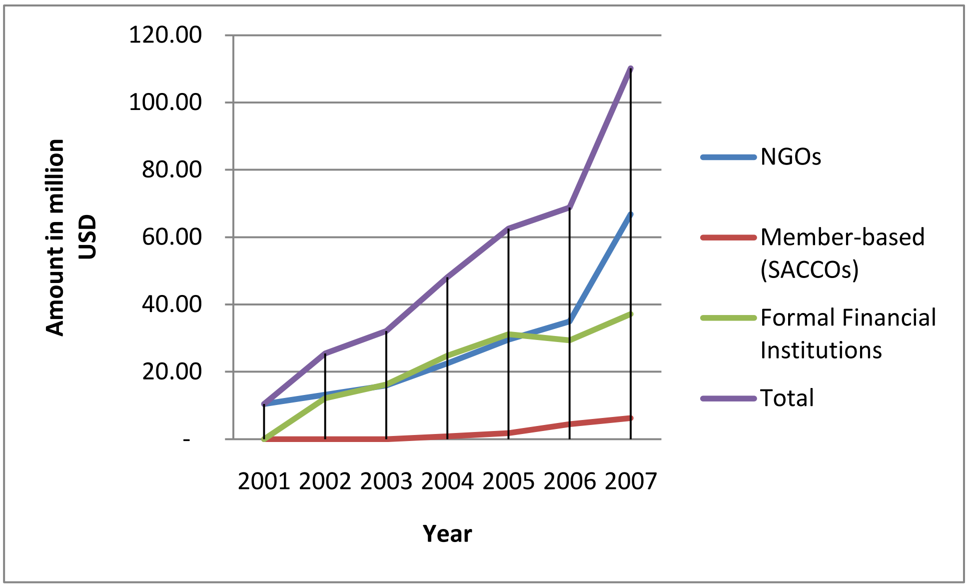
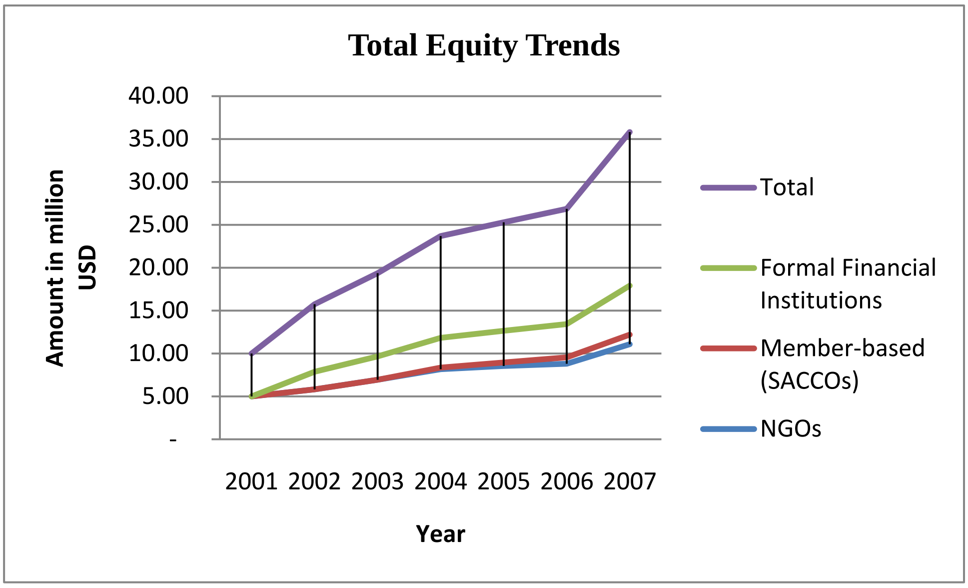
Appendix 1: Trends on Financial and Outreach Performance

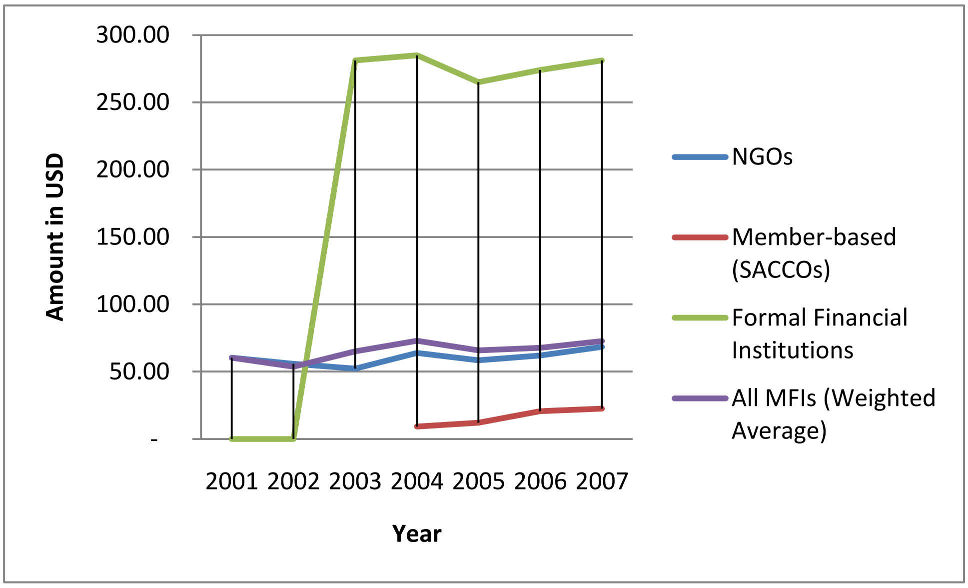
(A) Trends on Total Assets



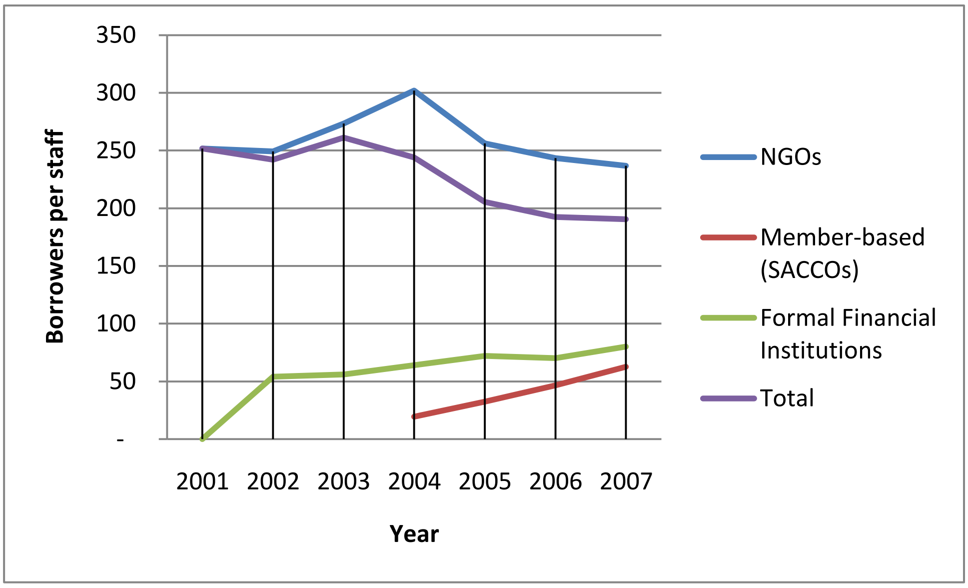
(B) Total Equity



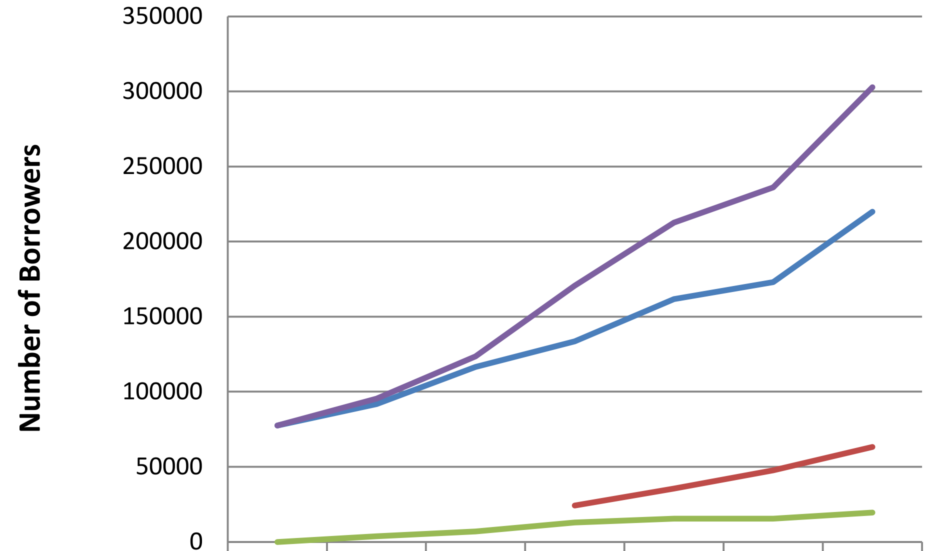
(C) Cost per Borrower Trends



(D) Number of Borrowers per Staff

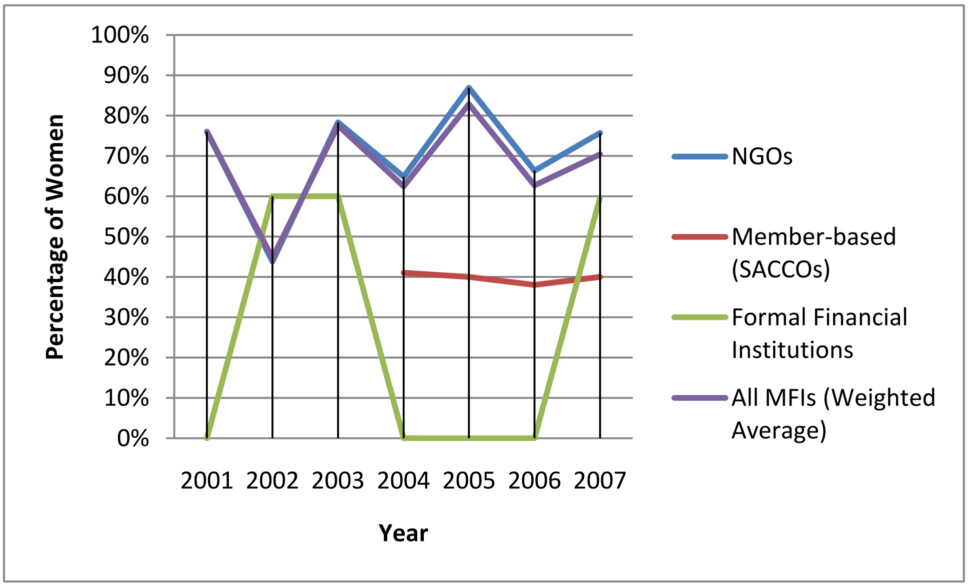


(E) Growth Trends on number of Active Borrowers

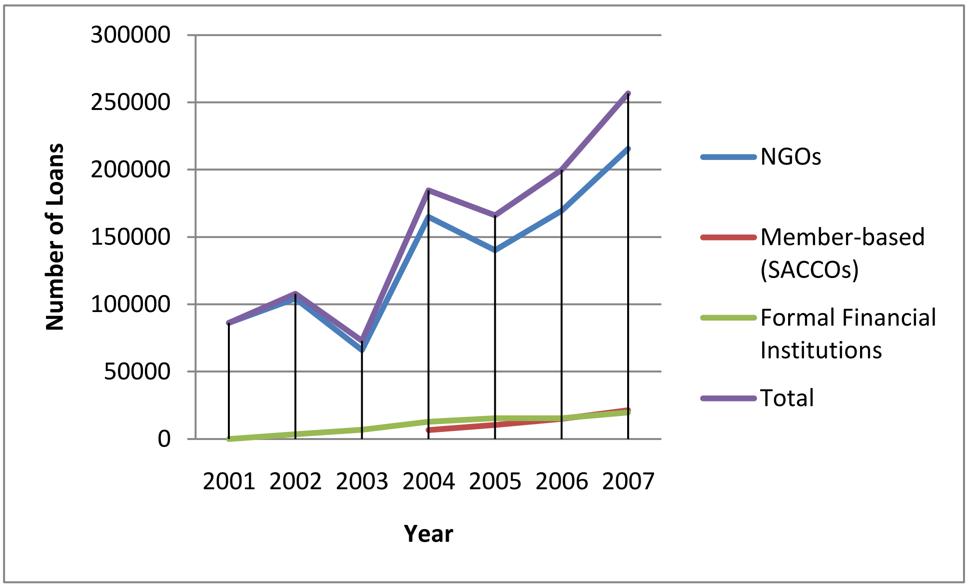


	2001	2002	2003	2004	2005	2006	2007
NGOs	77546	91860	116566	133622	161630	172883	219965
Member-based (SACCOs)				24113	35482	47614	63296
Formal Financial Institutions	0	3643	6936	12903	15507	15531	19603
Total	77546	95503	123502	170638	212619	236028	302864

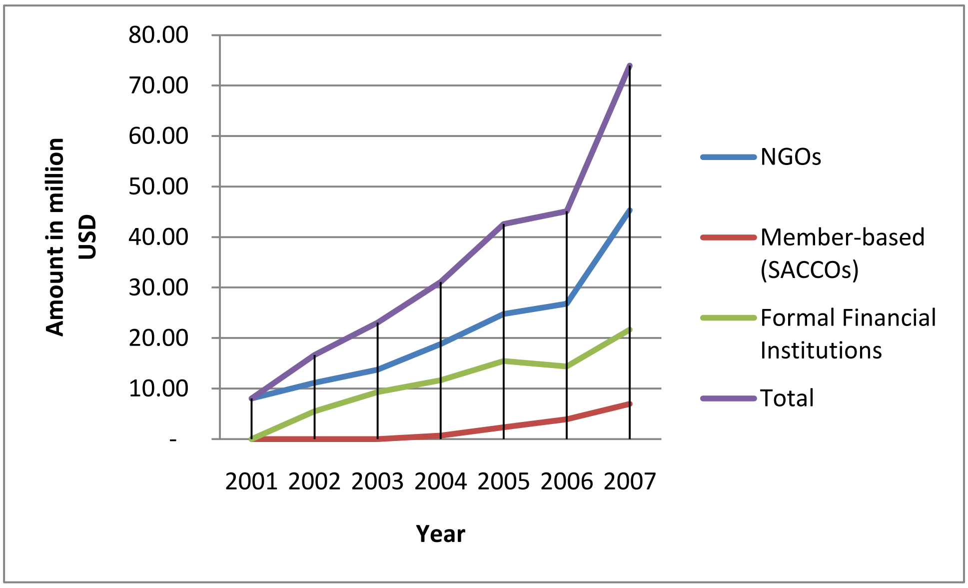
(F) Percentage of Women Borrowers



(G) Trends on Number of Loans



(H) Trends on Gross Loan Portfolio



Appendix 2: Participants Consent Form

Title of Research: FINANCIAL SUSTAINABILITY OF RURAL MICROFINANCE INSTITUTIONS (MFIs) IN TANZANIA:	
Investigator's name: GANKA DANIEL NYAMSOGORO	
To be completed by the participant	
1. Have you read the information sheet about this study?	YES/NO
2. Have you had an opportunity to ask questions and discuss this study?	YES/NO
3. Have you received satisfactory answers to all your questions?	YES/NO
4. Have you received enough information about this study?	YES/NO
5. Which researcher/investigator have you spoken to about this study?	………….
6. Do you understand that you are free to withdraw from this study:	
• at any time?	YES/NO
• without giving a reason for withdrawing?	YES/NO
7. Do you agree to take part in this study?	YES/NO
Signed	Date
Name in block letters:	
Position:..	
Name of Organisation:	
Address:	
Signature of researcher	Date

APPENDIX 3 (A) QUESTIONNAIRE

For Researcher's Use Only					
MFI Code:		**Region:**		**Region Code:**	

A: SUMMARY INFORMATION

1. MFI Name: ....

2. Is your MFI registered? Yes ☐ No ☐

3. Date of Registration: ....

4. Ownership Type (Tick as appropriate)

A. Member-based (MB-MFI) ☐

B. Non Governmental (NGO) ☐

C. Government (GO) ☐

5. Physical Address: ....

....

6. District: ....

7. Contact (telephone) Number: ....

8. Email address: ....

9. Number of staff ☐

10. Is your MFI regulated?

A. Yes ☐

B. No ☐

11. Key Mission (tick as appropriate)

A. Social (Poverty Reduction) ☐

B. Business (Profitability) ☐

C. Both ☐

12. What is your MFI's Vision? ....

....

B: MEMBERS/CUSTOMER SERVICES INFORMATION

1. How many Clients/Members did you have?

	2004	2005	2006	2007
A. Male				
B. Female				
C. Total				

2. What Types of Products/services do you offer? (tick as appropriate)

A.	Loan	
B.	Savings	
C.	Deposit	
D.	Other (please specify)	
	....	

3. What Lending type do you use?

A.	Individual lending	
B.	Group Lending	
C.	Both (Group & individual)	
D.	Other (please specify)	

....

	2004	2005	2006	2007
4. How many non-loan customers did you have:				
A. Savers				
B. Depositors				
C. Other (please specify)............................				
5. How many loan (Credit) customers did you have?				
6. How many loan Officers did you have?				

C: LOAN PORTFOLIO INFORMATION

	2004	2005	2006	2007
1. How much loan amount was disbursed (TZS)?				
2. How many (number of) Loans were disbursed?				
3. How many loans were active?				
4. How much was the value of outstanding loan portfolio?				
5. How much loan payment was overdue (in arrears)? (TZS)				
6. How much was the value of outstanding balances of loan in arrears (overdue)?				
7. How much were Loan Loss provisions?				
8. How much loan was written off as bad?				

D: SUBSIDY, INTEREST RATES AND CHARGES

	2004	2005	2006	2007
1. How much Subsidy did you receive				
A. Monetary				
B. In-kind (Training and others)				
C. Concession loan				
2. How much were interest rates (%) charged on loans?				

	2004	2005	2006	2007
3. How much interest rates (in percentage) did you pay on:				
A. Customer Savings?				
B. Customer Deposit?				
C. Other service? (please specify)				
....				
....				

E: ASPECTS OF LOAN (TERMS OF LOAN)

1. How much was the initial (minimum) loan size?

	2004	2005	2006	2007
A. Individual lending				
B. Group lending				

2. How long was the repayment period (term to maturity) for the initial loan size?

	2004	2005	2006	2007
A. Individual lending				
B. Group lending				

3. How many instalments were required for each of the minimum loan?

	2004	2005	2006	2007
A. Individual lending				
B. Group lending				

4. How much was the TZS value of each instalment of the minimum loan?

	2004	2005	2006	2007
A. Individual lending				
B. Group lending				

THANK YOU VERY MUCH FOR YOUR TIME

APPENDIX 3(B) DODOSO (KISWAHILI QUESTIONNAIRE)

Kwa matumizi ya Mtafiti tu					
MFI Code:		**Mkoa:**		**Namba ya Mkoa:**	

A: TAARIFA FUPI ZA ASASI

1. Jina la Asasi (MFI): ....

2. Je, Asasi yako imeandikishwa? Ndiyo ☐ Hapana ☐

3. Tarehe ya kuandikishwa: ....

4. Mmiliki mkuu wa asasi ni nani? (Weka tiki)

- A. Wanachama ☐
- B. Taasisi zisizo za kiserikali (NGO) ☐
- C. Serikali (GO) ☐

5. Anuani: ....

....

6. Wilaya: ....

7. Namba ya simu: ....

8. Emeili (barua pepe): ....

9. Idadi ya wafanyakazi ☐

10. Je asasi yako inadhibitiwa na chombo kingine?

- A. Ndiyo ☐
- B. Hapana ☐

11. Dhima (Mission) – (weka tiki)

- A. Kusaidia kupunguza umaskini (poverty reduction) ☐
- B. Biashara (kupata faida) ☐
- C. Vyote (Biashara na kupunguza umaskini ☐

12. Ni nini dira kuu (main vision) ya Asasi yenu? ....

....

B: TAARIFA ZA WANACHAMA NA WATEJA

1. Mlikuwa na wanachama au wateja wangapi?

	2004	2005	2006	2007
D. Wa jinsia ya kiume				
E. Wa jinsia ya kike				
F. Jumla ya wote				

2. Ni aina gani ya hudumu mtoazo kwa wateja wenu (weka tiki)

A.	Mikopo (loan)	
B.	Kuweka akiba (Savings)	
C.	Kuweka amana (Deposit)	
D.	Nyinginezo (elezea)	

3. Aina gani ya ukopeshaji mnaotumia?

A.	Wa mtu mmoja mmoja	
B.	Vikundi (group Lending)	
C.	Vikundi na mtu binafsi	
D.	Nyinginezo (elezea)	

4. Mlikuwa na wateja wangapi kwa hudumu zifuatazo:

	2004	2005	2006	2007
A. Kuweka akiba				
B. Kuweka amana				
C. Nyinginezo (elezea)				
5. Mlikuwa na wateja wangapi wa mikopo?				
6. Mlikuwa na maafisa mikopo wangapi?				

C: TAARIFA ZA MIKOPO KUFUATIA AINA ZA UKOPESHAJI

		2004	2005	2006	2007
1.	Kiasi gani cha mikopo kilitolewa kwa: (sh.)				
2.	Idadi gani ya mikopo ilitolewa?				
3.	Mikopo mingapi ilikuwa hai (active loan)?				
4.	Onyesha thamani ya mikopo iliyokuwa kalisaji				
5.	Onyesha kiasi cha malipo ya mikopo kilichopita muda wa kulipwa				
6.	Onyesha thamani ya mikopo yenye kiasi kilichopita muda wa kulipwa (chechefu)				
7.	Kiasi gani kilitengwa kukabili hasara ya mikopo?				
8.	Kiasi gani cha mikopo kilifutwa kama madeni mabaya (bad debts?)				

D: RUZUKU (SUBSIDY), RIBA NA TOZO (CHARGES)

	2004	2005	2006	2007
1. Kiasi gani cha ruzuku mlipokea:				
A. Ruzuku za kifedha				
B. Ruzuku zisizo za kifedha (mfano mafunzo n.k)				
C. Mikopo nafuu (Concession loan)				
2. Kiasi gani cha riba (%) kilitozwa kwenye mikopo iliyotolewa?				

	2004	2005	2006	2007
3. Kiasi gani cha riba (%) mlilipa kwa:				
A. Wateja wa akiba				
B. Wateja wa amana				
C. Wateja wengine (eleza)				
....				
....				
....				

E: MASHARTI YA MIKOPO

1. Kiwango cha chini cha mkopo kilikuwa:

	2004	2005	2006	2007
A. Mikopo ya mtu mmoja mmoja				
B. Mikopo ya vikundi				

2. Mda wa kulipwa mkopo wa kiwango cha chini ulikuwa:

	2004	2005	2006	2007
A. Mikopo ya mtu mmoja mmoja				
B. Mikopo ya vikundi				

3. Mkopo wa kiwango cha chini hulipwa kwa mikupuo (instalments) mingapi kwa:

	2004	2005	2006	2007
A. Mikopo ya mtu mmoja mmoja				
B. Mikopo ya vikundi				

4. Mkupuo mmoja wa malipo ya mkopo wa kiwango cha chini ni kiasi gani?

	2004	2005	2006	2007
A. Mikopo ya mtu mmoja mmoja				
B. Mikopo ya vikundi				

ASANTE SANA KWA MUDA WAKO

Appendix 4: Pairwise Correlation Coefficients

(a) Outreach Related Variables (Chapter 5)

	capstruc	intrate	stcost~l	instal~d	instalgr	costpb~r	prodtype
capstruc	1.0000						
intrate	0.3325	1.0000					
stcostpdol	0.2377	0.2849	1.0000				
instalind	0.3537	0.2857	0.1305	1.0000			
instalgr	0.2034	0.0536	-0.0154	0.8076	1.0000		
costpborr	0.0789	0.1811	0.3865	0.1752	0.0209	1.0000	
prodtype	0.3218	0.3279	0.3524	0.2963	0.0659	0.1838	1.0000
minloanind	0.3926	0.3455	0.1497	0.4456	0.2188	0.2382	0.4256
minloangr	-0.1390	-0.0359	-0.1155	-0.0135	0.0328	-0.0983	-0.0993
mfiage	-0.0137	0.1512	0.1103	0.2803	0.1333	0.3156	0.1681
mfitype	-0.4934	-0.5761	-0.3833	-0.4890	-0.1643	-0.3724	-0.6802
avoutloan	-0.2282	-0.1692	-0.0695	-0.0474	-0.0408	0.6739	-0.1390
mfisize	0.1784	0.3749	0.2081	0.3088	0.0789	0.3624	0.4623
female	0.1076	0.0749	0.1944	0.0868	0.0683	0.1145	0.1385
reguted	-0.4520	-0.4164	-0.2587	-0.5352	-0.3003	-0.2309	-0.5126
borrowers	0.3177	0.4812	0.3254	0.3178	0.0819	0.2405	0.5762
educarea	0.1467	0.1973	0.1229	0.2859	0.1770	0.0655	0.1873
agrlarea	-0.2365	-0.1404	-0.0141	-0.2651	-0.2640	0.0990	-0.0461
T2matind	0.2671	0.2783	0.1220	0.6779	0.4994	0.1248	0.2441
T2matgr	0.0589	0.0984	-0.0399	0.4482	0.5405	-0.0132	0.0090

	minloa~d	minloa~r	mfiage	mfitype	avoutl~n	mfisize	female
minloanind	1.0000						
minloangr	0.3522	1.0000					
mfiage	0.3813	-0.0597	1.0000				
mfitype	-0.6624	0.1476	-0.3891	1.0000			
avoutloan	-0.0261	0.0423	0.1130	0.0734	1.0000		
mfisize	0.3135	-0.0859	0.2881	-0.6421	0.1344	1.0000	
female	0.2898	0.0706	0.1093	-0.1940	-0.0932	-0.0992	1.0000
reguted	-0.4151	0.1665	-0.2017	0.7378	0.1199	-0.4815	-0.0996
borrowers	0.4309	-0.1150	0.3001	-0.7989	-0.0716	0.8447	0.0450
educarea	0.3156	0.1208	0.2306	-0.2498	-0.0352	0.3090	0.0463
agrlarea	-0.2807	-0.1778	-0.0655	0.0949	0.1639	-0.0946	0.0055
T2matind	0.5355	0.2365	0.2587	-0.4166	-0.0818	0.2371	0.1159
T2matgr	0.2576	0.2334	0.0894	-0.0868	-0.0603	0.0201	0.0892

	reguted	borrow~s	educarea	agrlarea	T2matind	T2matgr
reguted	1.0000					
borrowers	-0.5533	1.0000				
educarea	-0.1622	0.3257	1.0000			
agrlarea	0.1702	-0.1539	-0.5656	1.0000		
T2matind	-0.3764	0.2509	0.2732	-0.2953	1.0000	
T2matgr	-0.0780	0.0183	0.1348	-0.2452	0.7826	1.0000

(b) Microfinance Efficiency Variables (Chapter 6)

	yield	PAR	liqratio	borrps~f	stcosp~r	aepborr	costpc~e
yield	1.0000						
PAR	-0.2174	1.0000					
liqratio	0.2612	-0.0911	1.0000				
borrpstaff	0.3727	-0.1715	0.3757	1.0000			
stcospbor	0.2047	-0.1065	0.1061	-0.0041	1.0000		
aepborr	0.1841	-0.0521	0.1419	0.0146	0.6308	1.0000	
costpclie	0.3499	-0.0954	0.2604	0.1544	0.5688	0.7418	1.0000
oeratio	0.3356	0.1563	0.1769	0.0839	0.2302	0.3071	0.4892
avdisbloan	0.4237	-0.2713	0.3636	0.5392	0.3000	0.1521	0.4221

	oeratio	avdisb~n
oeratio	1.0000	
avdisbloan	0.1797	1.0000

(c) Variables for Earnings Ratio Model (Chapter 7)

	PAR	borrps~f	aepborr	stcosp~r	oeratio	avoutl~n	intrate
PAR	1.0000						
borrpstaff	-0.1715	1.0000					
aepborr	-0.0521	0.0146	1.0000				
stcospbor	-0.1065	-0.0041	0.6308	1.0000			
oeratio	0.1563	0.0839	0.3071	0.2302	1.0000		
avoutloan	-0.1274	-0.0980	0.4126	0.7737	-0.1407	1.0000	
intrate	-0.1231	0.3436	0.2131	0.1821	0.3060	-0.0990	1.0000

(d) Variables for Liquidity Ratio Model (Chapter 7)

	capstruc	instal~d	instalgr	costpb~r	prodtype	minloa~d	minloa~r
capstruc	1.0000						
instalind	0.3537	1.0000					
instalgr	0.2034	0.8076	1.0000				
costpborr	0.0789	0.1752	0.0209	1.0000			
prodtype	0.3218	0.2963	0.0659	0.1838	1.0000		
minloanind	0.3926	0.4456	0.2188	0.2382	0.4256	1.0000	
minloangr	-0.1390	-0.0135	0.0328	-0.0983	-0.0993	0.3522	1.0000
avoutloan	-0.2282	-0.0474	-0.0408	0.6739	-0.1390	-0.0261	0.0423
yieldgap	0.0375	-0.0617	-0.1237	-0.0195	-0.0649	-0.0175	0.0413
borrpstaff	0.1714	0.1975	-0.0040	0.0141	0.5145	0.2189	-0.0942

	avoutl~n	yieldgap	borrps~f
avoutloan	1.0000		
yieldgap	-0.0523	1.0000	
borrpstaff	-0.1083	0.0266	1.0000

(e) Variables for Portfolio at Risk Model (Chapter 7)

	capstruc	intrate	instal~d	instalgr	prodtype	minloa~d	minloa~r
capstruc	1.0000						
intrate	0.3325	1.0000					
instalind	0.3537	0.2857	1.0000				
instalgr	0.2034	0.0536	0.8076	1.0000			
prodtype	0.3218	0.3279	0.2963	0.0659	1.0000		
minloanind	0.3926	0.3455	0.4456	0.2188	0.4256	1.0000	
minloangr	-0.1390	-0.0359	-0.0135	0.0328	-0.0993	0.3522	1.0000
mfiage	-0.0137	0.1512	0.2803	0.1333	0.1681	0.3813	-0.0597
avoutloan	-0.2282	-0.1692	-0.0474	-0.0408	-0.1390	-0.0261	0.0423
mfisize	0.1784	0.3749	0.3088	0.0789	0.4623	0.3135	-0.0859
female	0.1076	0.0749	0.0868	0.0683	0.1385	0.2898	0.0706
reguted	-0.4604	-0.4204	-0.5392	-0.3039	-0.5194	-0.4077	0.1789
educarea	0.1467	0.1973	0.2859	0.1770	0.1873	0.3156	0.1208
agrlarea	-0.2365	-0.1404	-0.2651	-0.2640	-0.0461	-0.2807	-0.1778
T2matind	0.2671	0.2783	0.6779	0.4994	0.2441	0.5355	0.2365
T2matgr	0.0589	0.0984	0.4482	0.5405	0.0090	0.2576	0.2334
borrpstaff	0.1714	0.4206	0.1975	-0.0040	0.5145	0.2189	-0.0942

	mfiage	avoutl~n	mfisize	female	reguted	educarea	agrlarea
mfiage	1.0000						
avoutloan	0.1130	1.0000					
mfisize	0.2881	0.1344	1.0000				
female	0.1093	-0.0932	-0.0992	1.0000			
reguted	-0.2107	0.1180	-0.4864	-0.0902	1.0000		
educarea	0.2306	-0.0352	0.3090	0.0463	-0.1517	1.0000	
agrlarea	-0.0655	0.1639	-0.0946	0.0055	0.1646	-0.5656	1.0000
T2matind	0.2587	-0.0818	0.2371	0.1159	-0.3737	0.2732	-0.2953
T2matgr	0.0894	-0.0603	0.0201	0.0892	-0.0735	0.1348	-0.2452
borrpstaff	0.1666	-0.1083	0.4578	-0.0403	-0.4850	0.2042	-0.0002

	T2matind	T2matgr	borrps~f
T2matind	1.0000		
T2matgr	0.7826	1.0000	
borrpstaff	0.1534	-0.0526	1.0000

(f) Variables for Cost per Loan Model (Chapter 7)

	intrate	stcost~l	instal~d	instalgr	minloa~d	minloa~r	mfiage
intrate	1.0000						
stcostpdol	0.2849	1.0000					
instalind	0.2857	0.1305	1.0000				
instalgr	0.0536	-0.0154	0.8076	1.0000			
minloanind	0.3455	0.1497	0.4456	0.2188	1.0000		
minloangr	-0.0359	-0.1155	-0.0135	0.0328	0.3522	1.0000	
mfiage	0.1512	0.1103	0.2803	0.1333	0.3813	-0.0597	1.0000
avoutloan	-0.1692	-0.0695	-0.0474	-0.0408	-0.0261	0.0423	0.1130
mfisize	0.3749	0.2081	0.3088	0.0789	0.3135	-0.0859	0.2881
T2matind	0.2783	0.1220	0.6779	0.4994	0.5355	0.2365	0.2587
T2matgr	0.0984	-0.0399	0.4482	0.5405	0.2576	0.2334	0.0894
PAR	-0.1134	0.1078	-0.1372	-0.0946	-0.2263	-0.0250	-0.1795
borrpstaff	0.4206	0.1747	0.1975	-0.0040	0.2189	-0.0942	0.1666
avdisbloan	0.4113	0.1537	0.3828	0.1400	0.5666	-0.0904	0.4119

	avoutl~n	mfisize	T2matind	T2matgr	PAR	borrps~f	avdisb~n
avoutloan	1.0000						
mfisize	0.1344	1.0000					
T2matind	-0.0818	0.2371	1.0000				
T2matgr	-0.0603	0.0201	0.7826	1.0000			
PAR	-0.1133	-0.1874	-0.1032	-0.0286	1.0000		
borrpstaff	-0.1083	0.4578	0.1534	-0.0526	-0.2167	1.0000	
avdisbloan	0.1083	0.6213	0.3067	0.0745	-0.2869	0.6033	1.0000

(g) Variables for Financial Productivity Model (Chapter 7)

	capstruc	intrate	instal~d	instalgr	minloa~d	minloa~r	mfiage
capstruc	1.0000						
intrate	0.3321	1.0000					
instalind	0.3534	0.2855	1.0000				
instalgr	0.2027	0.0533	0.8076	1.0000			
minloanind	0.3977	0.3477	0.4478	0.2207	1.0000		
minloangr	-0.1350	-0.0344	-0.0122	0.0347	0.3481	1.0000	
mfiage	-0.0171	0.1504	0.2799	0.1324	0.3875	-0.0542	1.0000
borrowers	0.3167	0.4810	0.3175	0.0814	0.4342	-0.1129	0.2990
T2matind	0.2693	0.2791	0.6788	0.5004	0.5348	0.2346	0.2614
T2matgr	0.0610	0.0991	0.4491	0.5416	0.2558	0.2311	0.0920
borrpstaff	0.1703	0.4203	0.1972	-0.0045	0.2215	-0.0921	0.1652
stcospbor	0.0529	0.1213	0.1480	0.0280	0.2029	-0.0849	0.2540
aepborr	-0.0103	0.1507	0.0686	-0.0227	0.0165	-0.0451	0.2439

	borrow~s	T2matind	T2matgr	borrps~f	stcosp~r	aepborr
borrowers	1.0000					
T2matind	0.2521	1.0000				
T2matgr	0.0194	0.7823	1.0000			
borrpstaff	0.6508	0.1544	-0.0516	1.0000		
stcospbor	0.1833	0.0933	-0.0215	-0.0047	1.0000	
aepborr	0.1730	0.0758	0.0110	0.0122	0.6340	1.0000

Appendix 5: Variance Inflation Factors (VIF)

(a) Microfinance Outreach Related Variables (Chapter 5)

Variable	VIF	1/VIF
mfitype	12.14	0.082357
borrowers	7.82	0.127828
instalind	7.70	0.129916
T2matind	6.98	0.143230
instalgr	5.45	0.183525
mfisize	5.00	0.199844
T2matgr	4.85	0.205975
costpborr	4.21	0.237582
minloanind	4.18	0.239221
avoutloan	3.22	0.310452
reguted	2.91	0.343732
prodtype	2.05	0.488419
minloangr	1.93	0.517758
agrlarea	1.88	0.532940
educarea	1.78	0.562791
stcostpdol	1.77	0.563463
capstruc	1.76	0.568276
intrate	1.70	0.587125
mfiage	1.54	0.649599
female	1.27	0.786576
Mean VIF	4.01	

(b) Microfinance Efficiency Related Variables (Chapter 6)

Variable	VIF	1/VIF
costpclie	3.43	0.291379
aepborr	2.94	0.340596
avdisbloan	2.07	0.484171
stcospbor	1.88	0.531879
borrpstaff	1.63	0.612702
oeratio	1.51	0.660930
yield	1.46	0.685164
liqratio	1.26	0.796740
PAR	1.18	0.844073
Mean VIF	1.93	

(c) Variables for Earnings Ratio Model (Chapter 7)

Variable	VIF	1/VIF
lnavoutloan	9.32	0.107348
lnstcospbor	5.26	0.189970
lnoeratio	4.44	0.225301
lnaepborr	2.94	0.340349
intrate	1.43	0.701515
lnborrpstaff	1.27	0.784947
PAR	1.17	0.855844
Mean VIF	3.69	

(d) Variables for Liquidity Ratio Model (Chapter 7)

Variable	VIF	1/VIF
instalind	2.87	0.347969
lncostpborr	2.81	0.355973
lnavoutloan	2.63	0.380286
lninstalgr	2.44	0.409656
minloanind	2.42	0.413079
prodtype	1.68	0.595931
capstruc	1.57	0.634933
minloangr	1.52	0.656821
lnborrpstaff	1.42	0.704558
yieldgap	1.05	0.948487
Mean VIF	2.04	

(e) Variables for Portfolio at risk (PAR) Model (Chapter 7)

Variable	VIF	1/VIF
lnmfisize	8.09	0.123594
lnT2matind	7.43	0.134563
lnT2matgr	6.16	0.162280
lnborrpstaff	4.44	0.225468
lnavoutloan	4.19	0.238875
instalind	4.05	0.247104
lninstalgr	3.20	0.312896
minloanind	2.87	0.348996
reguted	2.42	0.413843
agrlarea	2.10	0.476584
prodtype	1.98	0.506150
educarea	1.80	0.555290
capstruc	1.80	0.555743
mfiage	1.79	0.559085
minloangr	1.67	0.597723
intrate	1.61	0.619703
female	1.17	0.857152
Mean VIF	3.34	

(f) Variables for Cost per Loan Ratio Model (Chapter 7)

Variable	VIF	1/VIF
lnmfisize	8.35	0.119712
lnT2matind	7.06	0.141575
lnT2matgr	5.79	0.172695
lnborrpstaff	4.31	0.232080
instalind	3.88	0.257506
lnavoutloan	3.84	0.260435
lnavdisbloan	3.05	0.328369
lninstalgr	2.96	0.337710
minloanind	2.40	0.416757
mfiage	1.69	0.591219
intrate	1.50	0.666261
minloangr	1.48	0.674526
lnstcostpdol	1.42	0.706600
PAR	1.24	0.806952
Mean VIF	3.50	

(g) Variables for Financial Productivity Model (Chapter 7)

Variable	VIF	1/VIF
lnborrowers	8.81	0.113468
lnborrpstaff	7.37	0.135631
lnT2matind	7.26	0.137796
lnT2matgr	5.88	0.170055
instalind	3.88	0.258020
minloanind	3.14	0.318761
lninstalgr	3.03	0.329598
lnstcospbor	2.20	0.454089
lnaepborr	1.87	0.534713
capstruc	1.66	0.601045
mfiage	1.64	0.609341
minloangr	1.61	0.620404
intrate	1.53	0.653888
Mean VIF	3.84	

(h) Variables for OSS Model – Outreach Related Variables (Chapter 7)

Variable	VIF	1/VIF
mfitype	11.98	0.083463
lnT2matind	8.07	0.123966
lnT2matgr	6.51	0.153548
lncostpborr	5.24	0.190847
lnavoutloan	4.42	0.226345
instalind	3.98	0.251557
minloanind	3.85	0.259872
lnborrowers	3.59	0.278395
lninstalgr	3.20	0.312693
reguted	3.07	0.325556
prodtype	2.22	0.450348
agrlarea	2.18	0.458463
minloangr	2.05	0.488471
lnstcostpdol	2.00	0.499399
educarea	1.86	0.537163
capstruc	1.83	0.545874
intrate	1.78	0.560553
mfiage	1.76	0.569001
female	1.19	0.839750
Mean VIF	3.73	

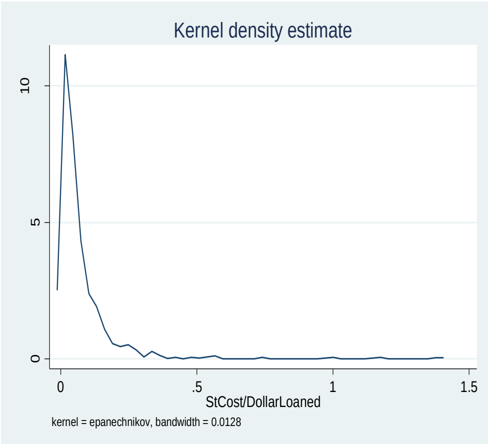
(i) Variables for OSS Model – Efficiency Related Variables (Chapter 7)

Variable	VIF	1/VIF
lncostpclie	4.06	0.246040
lnstcospbor	3.20	0.312894
lnaepborr	2.10	0.475836
yield	1.83	0.545420
lnborrpstaff	1.76	0.568224
lnavdisbloan	1.76	0.569601
lnoeratio	1.70	0.589668
lnliqratio	1.68	0.596375
PAR	1.22	0.819771
Mean VIF	2.14	

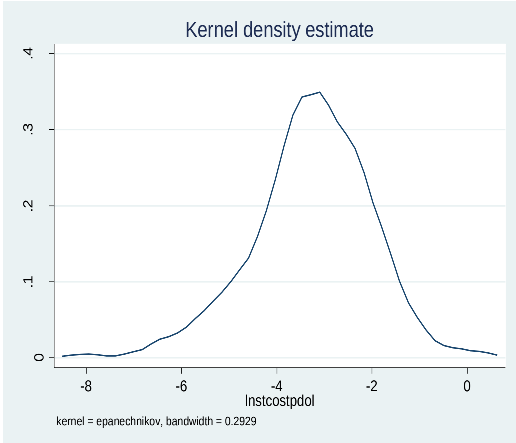
Appendix 6: Kernel Density Estimates for before and after Variable Transformation in chapter 5

(a) Outreach Related Variables

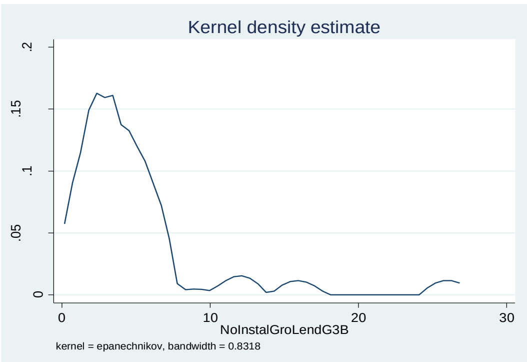
Staff Cost Per dollar loaned before transformation



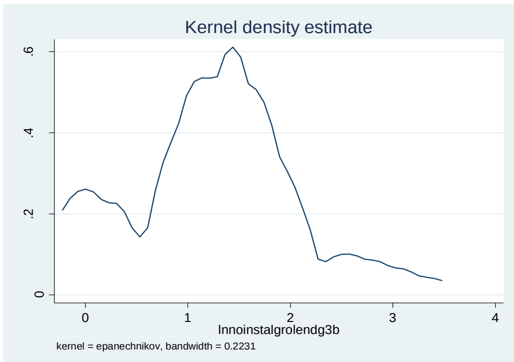
Staff Cost Per dollar loaned After transformation



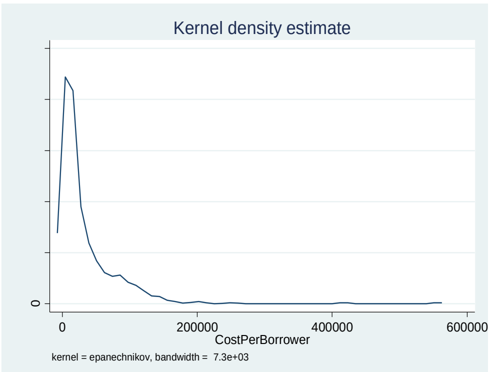
Number of Installments (Group lending) before Transformation



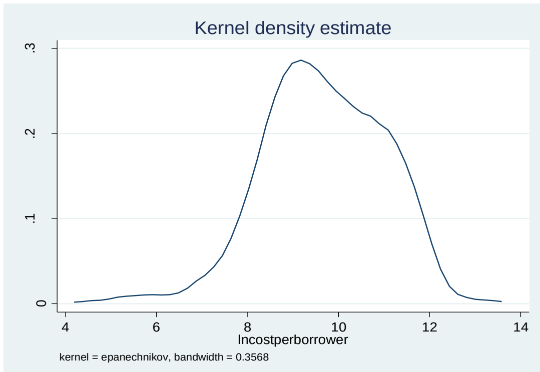
Number of Installments (Group lending) after Transformation



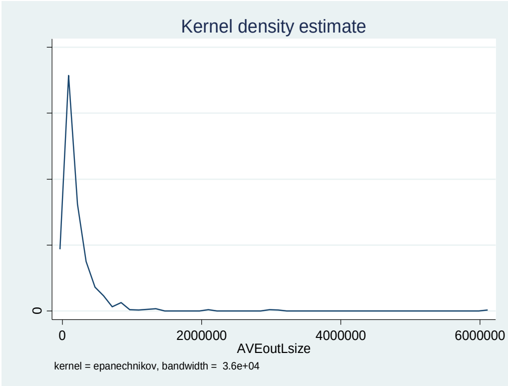
Cost per Borrower before Transformation



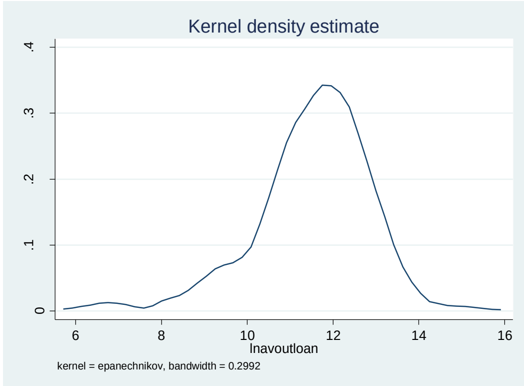
Cost per Borrower after Transformation



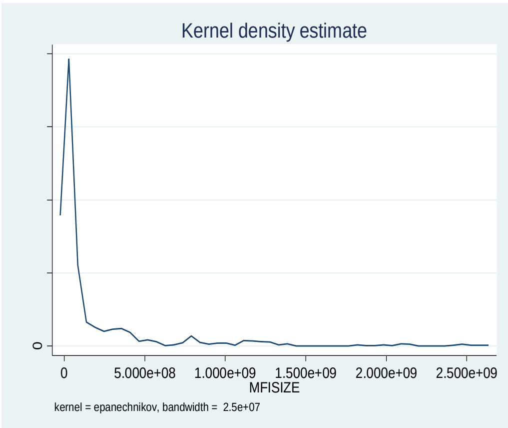
Average Loan Size Before Transformation



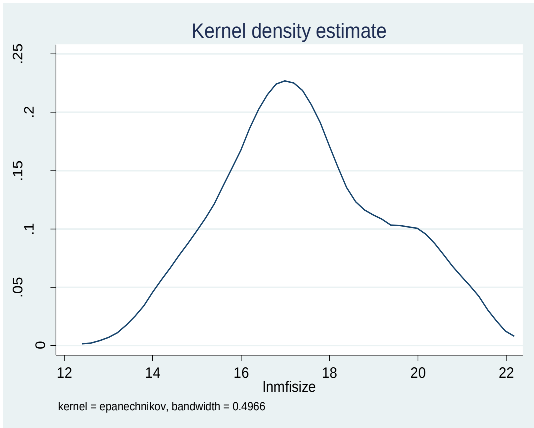
Average Loan Size after Transformation



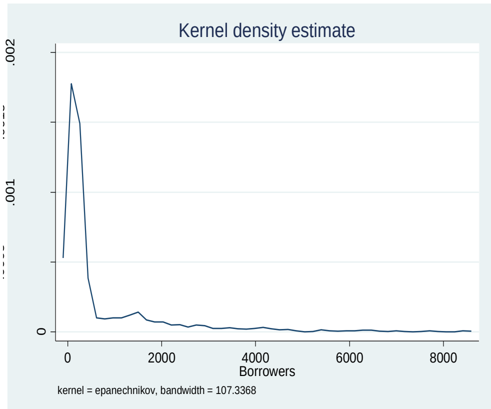
MFI Size Before Transformation



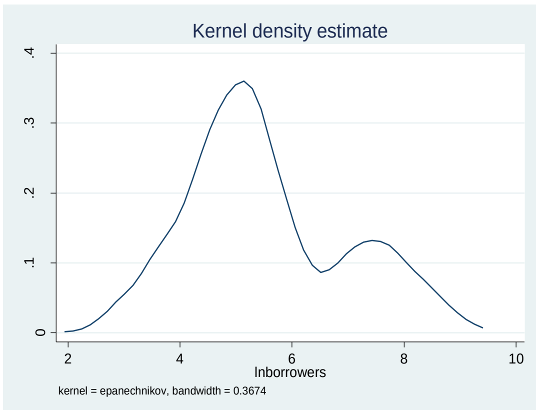
MFI Size After Transformation



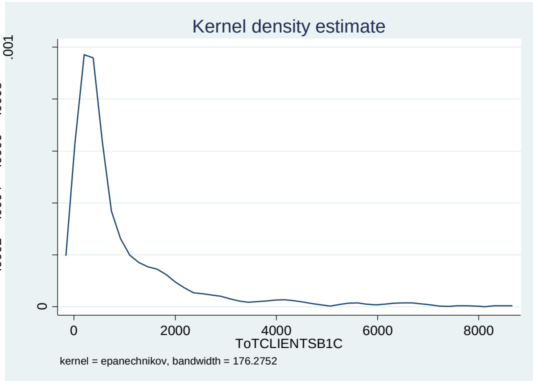
Number of Borrowers before Transformation



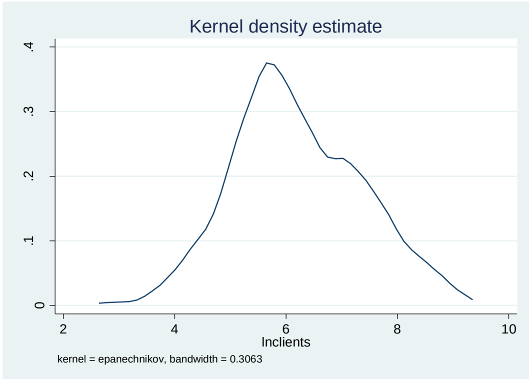
Number of Borrowers after Transformation



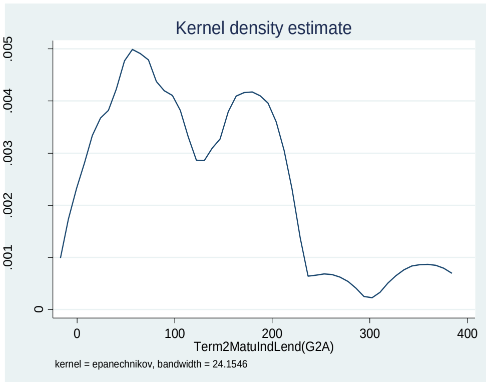
Number of clients before transformation



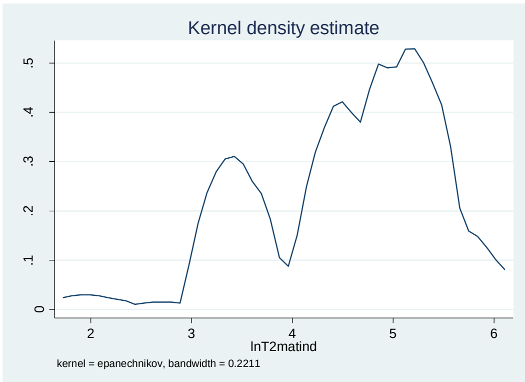
Number of clients after transformation



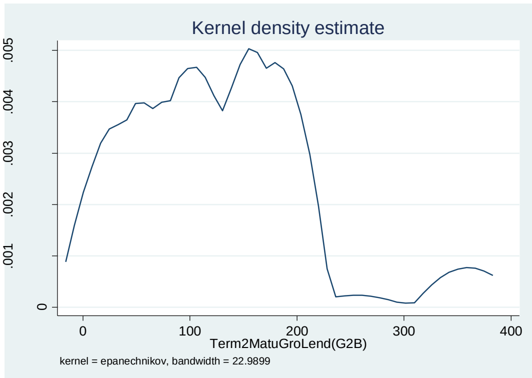
Term to maturity (individual lending) before Transformation



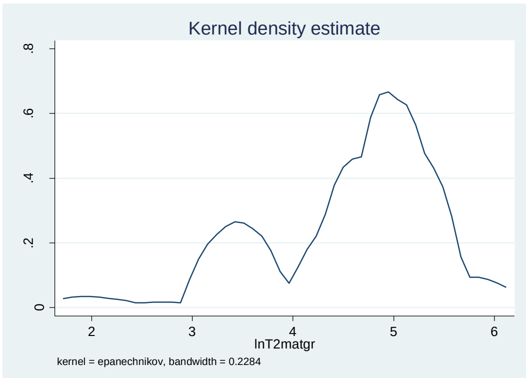
Term to maturity (individual lending) after Transformation



Term to maturity (group lending) before Transformation

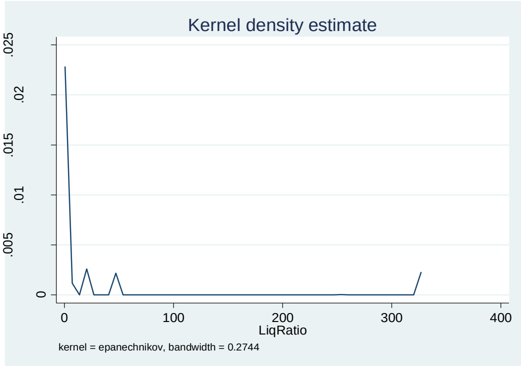


Term to maturity (group lending) after Transformation

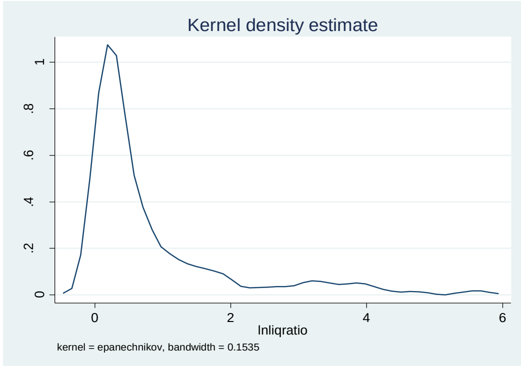


(b) Efficiency Related Variables

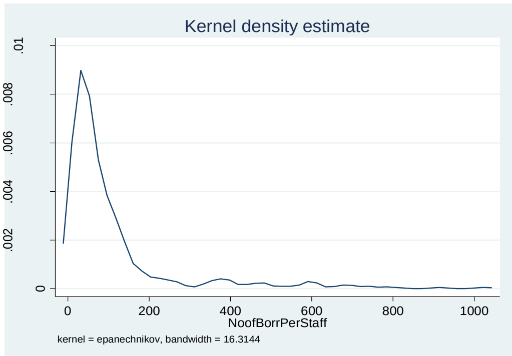
Liquidity ratio before Log Transformation



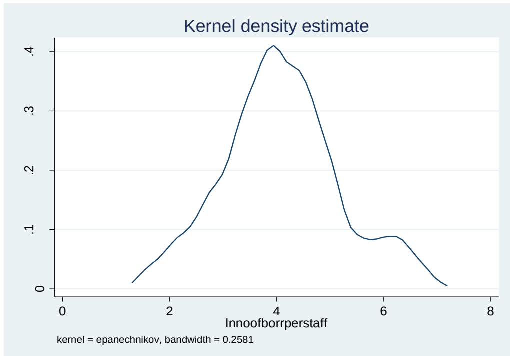
Liquidity ratio after Log Transformation



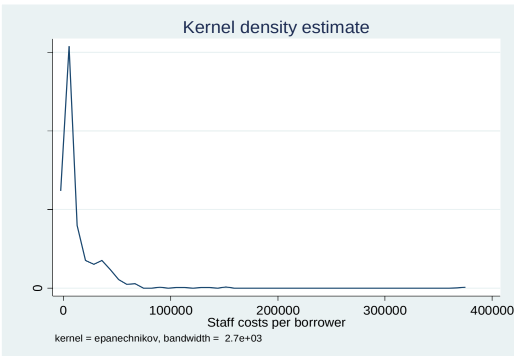
Number of Borrowers per Staff before Log Transformation



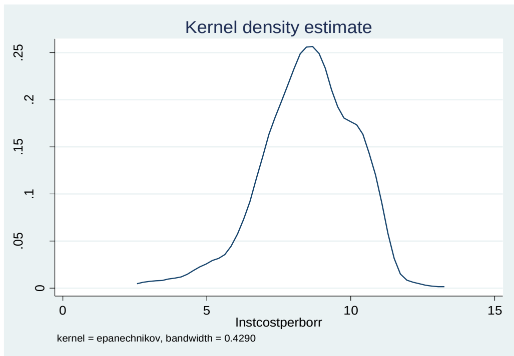
Number of Borrowers per Staff after Log Transformation

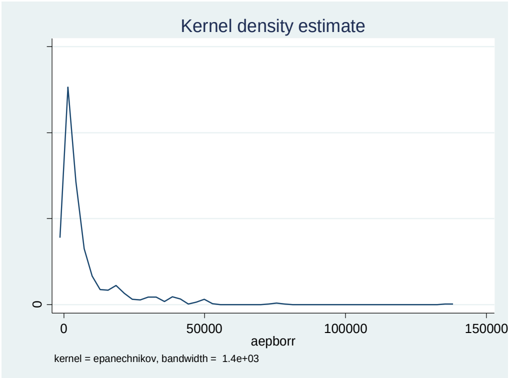
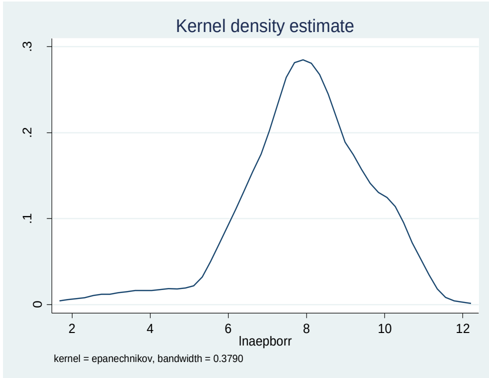
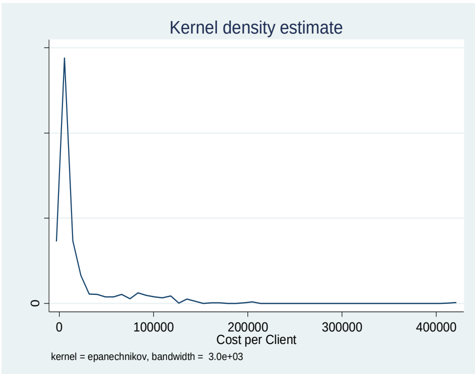
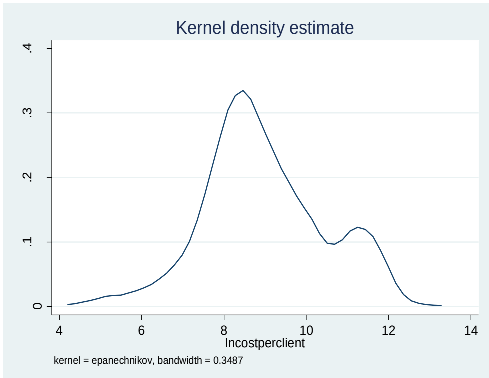
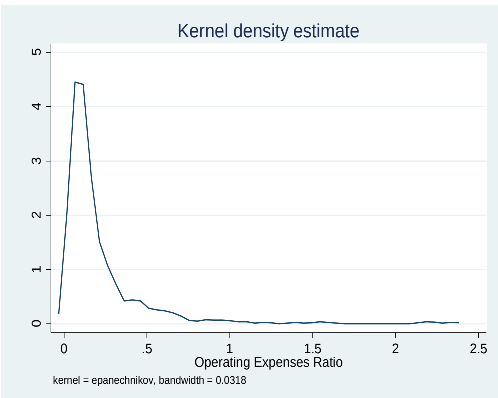
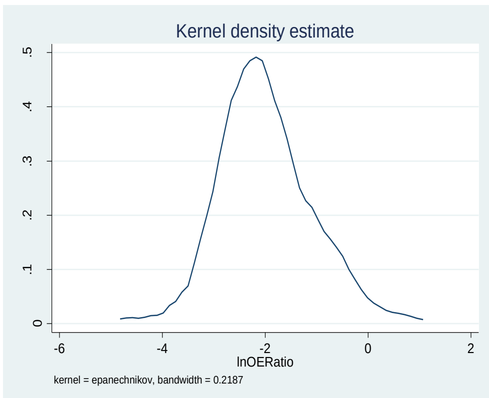


Staff costs per borrower before Log Transformation

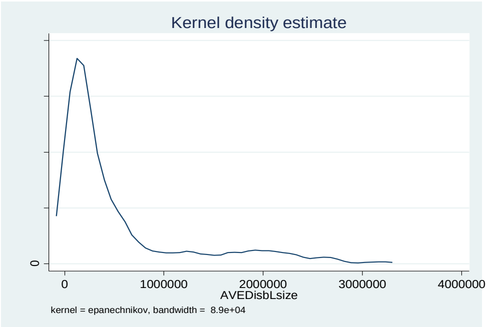


Staff costs per borrower after Log Transformation

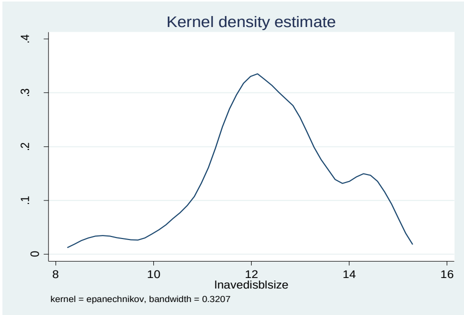


Administrative Expenses per Borrower Before Log Transformation	Administrative Expenses per Borrower After Log Transformation
	
Costs per Client before Log Transformation	Costs per Client after Log Transformation
	
Operating expenses ratio Before Log Transformation	Operating expenses Ratio After Log Transformation
	

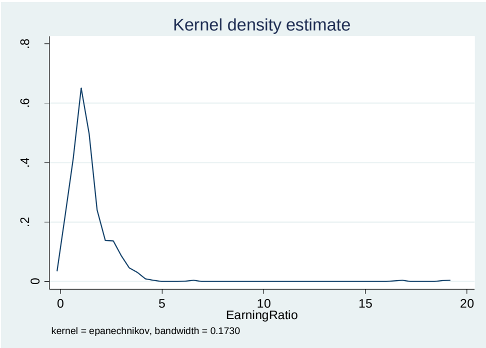
Average disbursed Loan Size before Log Transformation



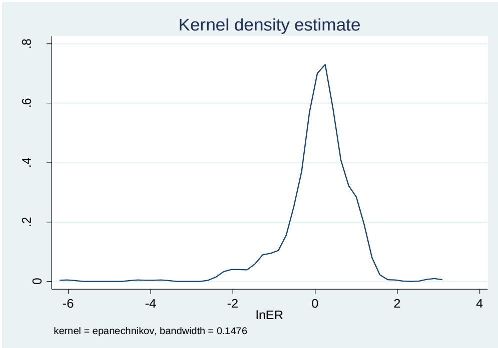
Average disbursed Loan Size after Log Transformation



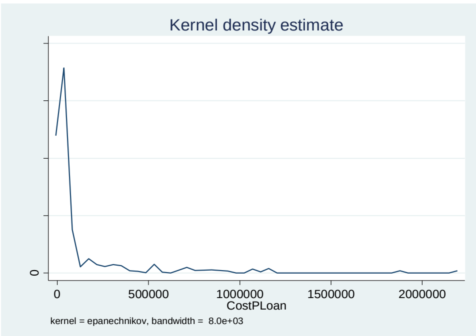
Earnings Ratio before Log Transformation



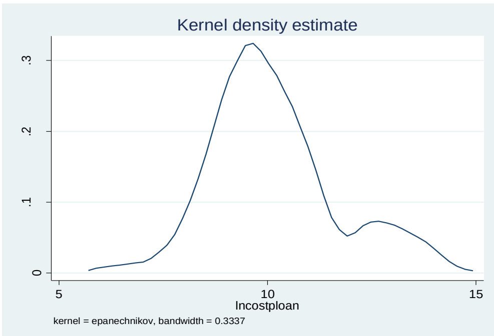
Earnings Ratio after Log Transformation



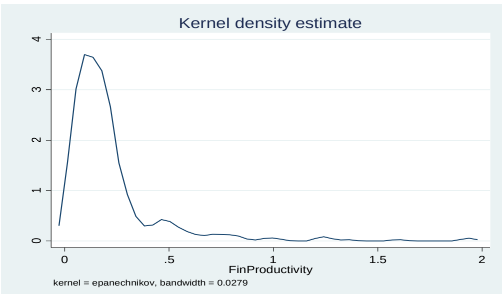
Cost per loan before Log Transformation



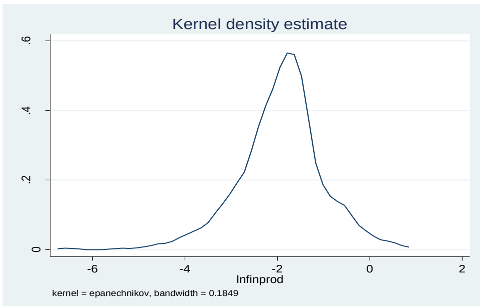
Cost per loan after Log Transformation



Financial Productivity before Log Transformation



Financial Productivity after Log Transformation



Appendix 7: Autocorrelation Test Results

(a) Determinants of FSS Model

```
. xtserial FSS capstruc intrate lnstcostpdol instalind lninstalgr lncostpborr prod
> type minloanind minloangr  mfiage mfitype lnavoutloan lnmfisize female reguted l
> nborrowers educarea agrlarea lnT2matind lnT2matgr

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      77) =     16.354
           Prob > F =      0.0001
```

(b) Determinants of Breadth of outreach Model

```
. xtserial  lnclients FSS capstruc intrate  instalind lninstalgr  prodtype minloan
> ind minloangr mfiage lnmfisize female lnT2matind lnT2matgr lnstcostpdol

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      77) =     15.198
           Prob > F =      0.0002
```

(c) Determinants of Depth of Outreach Model

```
. xtserial   lnavoutloan FSS capstruc intrate instalind lninstalgr prodtype  minlo
> anind minloangr  mfiage mfitype lnmfisize female reguted  educarea agrlarea lnT2
> matind lnT2matgr lnstcostpdol

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      77) =     18.485
           Prob > F =      0.0000
```

(d) Determinants of FSS (Efficiency Related Variables Model)

```
. xtserial FSS yield PAR  lnliqratio lnborrpstaff lnstcospbor lnaepborr lncostpcli
> e lnoeratio  lnavdisbloan

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,     100) =      5.053
           Prob > F =      0.0268
```

(e) Determinants of Earnings Ratio (Chapter 7) Model

```
. xtserial lnER PAR lnborrpstaff  lnaepborr lnstcospbor lnoeratio lnavoutloan
> intrate  capstruc

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      99) =      5.252
           Prob > F =      0.0240
```

(f) Determinants of Liquidity Ratio Model (Chapter 7)

```
. xtserial lnliqratio capstruc instalind lninstalgr  lncostpborr prodtype minloani
> nd minloangr  lnavoutloan yieldgap lnborrpstaff

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      77) =     12.782
           Prob > F =      0.0006
```

(g) Determinants of Portfolio at Risk Model (Chapter 7)

```
. xtserial PAR capstruc intrate  instalind lninstalgr prodtype minloanind minloang
> r mfiage  lnavoutloan lnmfisize female reguted educarea agrlarea lnT2matind lnT2
> matgr  lnborrpstaff

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      77) =      0.771
           Prob > F =      0.3827
```

(h) Determinants of Cost per Loan Model (Chapter 7)

```
. xtserial lncostploan intrate lnstcostpdol instalind lninstalgr minloanind minloa
> ngr  mfiage lnavoutloan lnmfisize lnT2matind lnT2matgr PAR lnborrpstaff lnavdisb
> loan

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      77) =     31.987
           Prob > F =      0.0000
```

(i) Determinants of Financial Productivity Model (Chapter 7)

```
. xtserial  finprod capstruc intrate instalind lninstalgr minloanind minloangr  mf
> iage lnborrowers lnT2matind lnT2matgr lnborrpstaff lnstcospbor lnaepborr

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      73) =      4.389
           Prob > F =      0.0396
```

(j) Determinants of OSS Model – Outreach Related Variables (Chapter 7)

```
. xtserial OSS capstruc intrate lnstcostpdol instalind lninstalgr lncostpborr prod
> type minloanind minloangr  mfiage mfitype lnavoutloan female reguted lnborrowers
>  educarea agrlarea lnT2matind lnT2matgr

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      77) =     78.903
           Prob > F =      0.0000
```

(k) Determinants of OSS Model – Efficiency Related Variables (Chapter 7)

```
. xtserial OSS yield PAR  lnliqratio lnborrpstaff lnstcospbor lnaepborr lncostpcli
> e lnoeratio  lnavdisbloan

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,     100) =     87.861
           Prob > F =      0.0000
```

Appendix 8: Heteroskedasticity Test Results

(a) Determinants of FSS (Outreach Related Variables) Model

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of FSS

         chi2(1)      =   156.27
         Prob > chi2  =   0.0000
```

(b) Pagan-Hall Test for IV Heteroskedasticity (FSS Model)

```
. ivhettest
IV heteroskedasticity test(s) using levels of IVs only
Ho: Disturbance is homoskedastic
    Pagan-Hall general test statistic   :  27.270  Chi-sq(15) P-value = 0.0266
```

(c) Pagan-Hall Test for IV Heteroskedasticity (Outreach Model)

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of lnavoutloan

         chi2(1)      =    53.17
         Prob > chi2  =   0.0000
```

(d) Determinants of FSS (Efficiency Related Variables) Model

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of FSS

         chi2(1)      =    96.61
         Prob > chi2  =   0.0000
```

(e) Determinants of Earnings Ratio Model (Chapter 7)

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of lnER

         chi2(1)      =    64.74
         Prob > chi2  =   0.0000
```

(f) Determinants of Liquidity Ratio Model (Chapter 7)

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of lnliqratio

         chi2(1)      =    88.06
         Prob > chi2  =   0.0000
```

(g) Determinants of Portfolio at Risk Model (Chapter 7)

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of PAR

         chi2(1)      =    15.13
         Prob > chi2  =   0.0001
```

(h) Determinants of Cost per Loan Model (Chapter 7)

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of lncostploan

         chi2(1)      =    27.96
         Prob > chi2  =   0.0000
```

(i) Determinants of financial Productivity Model (Chapter 7)

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of finprod

         chi2(1)      =   344.80
         Prob > chi2  =   0.0000
```

(j) Determinants of OSS Model – Outreach Related Variables (Chapter 7)

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of OSS

         chi2(1)      =  1170.54
         Prob > chi2  =   0.0000
```

(k) Determinants of OSS Model – Efficiency Related Variables (Chapter 7)

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of OSS

         chi2(1)      =  1170.54
         Prob > chi2  =   0.0000
```

Appendix 9: Instrumental Variables Tests

(a) Instrumental Relevance - FSS Instruments

```
First-stage regressions
-----------------------

      Source |       SS       df       MS              Number of obs =     316
-------------+------------------------------           F(  6,   309) =    7.95
       Model |  31.8807359     6  5.31345598           Prob > F      =  0.0000
    Residual |  206.645679   309  .668756241           R-squared     =  0.1337
-------------+------------------------------           Adj R-squared =  0.1168
       Total |  238.526414   315  .757226712           Root MSE      =  .81778

------------------------------------------------------------------------------
         FSS |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  minloanind |  -2.88e-07   2.32e-07    -1.24   0.217    -7.45e-07    1.70e-07
   minloangr |   9.59e-07   2.34e-07     4.09   0.000     4.98e-07    1.42e-06
      mfiage |  -.0079758   .0147369    -0.54   0.589    -.0369731    .0210216
     reguted |  -.0114385   .1245912    -0.09   0.927     -.256593     .233716
     reprate |   1.107334   .2096769     5.28   0.000     .6947587    1.519909
riskcoverr~o |  -.0443877   .0957744    -0.46   0.643    -.2328402    .1440649
       _cons |   .7658065   .1953363     3.92   0.000     .3814489    1.150164
------------------------------------------------------------------------------
```

(b) Instrumental Relevance and Exogeneity - FSS Instruments

```
2-Step GMM estimation
---------------------

Estimates efficient for arbitrary heteroskedasticity and clustering on mficode
Statistics robust to heteroskedasticity and clustering on mficode

Number of clusters (mficode) = 80                     Number of obs =      316
                                                      F(  5,    79) =    14.95
                                                      Prob > F      =   0.0000
Total (centered) SS     =  684.3894893                Centered R2   =   0.2069
Total (uncentered) SS   =  10267.51843                Uncentered R2 =   0.9471
Residual SS             =  542.7570345                Root MSE      =    1.311

------------------------------------------------------------------------------
             |               Robust
 lnborrowers |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         FSS |   .8255423   .4057628     2.03   0.042     .0302618    1.620823
  minloanind |   1.87e-06   6.33e-07     2.95   0.003     6.28e-07    3.11e-06
   minloangr |  -1.55e-06   8.42e-07    -1.84   0.065    -3.20e-06    9.80e-08
      mfiage |   .0760564   .0392029     1.94   0.052    -.0007798    .1528927
     reguted |  -1.024855   .3994891    -2.57   0.010    -1.807839   -.2418704
       _cons |   4.470338    .826894     5.41   0.000     2.849656    6.091021
------------------------------------------------------------------------------
Underidentification test (Kleibergen-Paap rk LM statistic):             23.475
                                                   Chi-sq(2) P-val =    0.0000
------------------------------------------------------------------------------
Weak identification test (Kleibergen-Paap rk Wald F statistic):         14.183
Stock-Yogo weak ID test critical values: 10% maximal IV size             19.93
                                         15% maximal IV size             11.59
                                         20% maximal IV size              8.75
                                         25% maximal IV size              7.25
Source: Stock-Yogo (2005).  Reproduced by permission.
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.
------------------------------------------------------------------------------
Hansen J statistic (overidentification test of all instruments):         2.143
                                                   Chi-sq(1) P-val =    0.1432
------------------------------------------------------------------------------
Instrumented:         FSS
Included instruments: minloanind minloangr mfiage reguted
Excluded instruments: reprate riskcoverratio
------------------------------------------------------------------------------
```

(c) Variable Endogeneity Test – FSS

```
. ivendog

Tests of endogeneity of: FSS
H0: Regressor is exogenous
    Wu-Hausman F test:                   11.18055  F(1,309)    P-value = 0.00093
    Durbin-Wu-Hausman chi-sq test:       11.03457  Chi-sq(1)   P-value = 0.00089
```

(d) Instrumental Relevance F-test (Outreach Instruments)

First-stage regressions

Source	SS	df	MS
Model	627.194792	15	41.8129862
Residual	57.1946968	300	.190648989
Total	684.389489	315	2.17266505

Number of obs	316
F(15, 300)	219.32
Prob > F	0.0000
R-squared	0.9164
Adj R-squared	0.9123
Root MSE	.43663

lnborrowers	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
capstruc	.6905382	.1533062	4.50	0.000	.3888465	.99223
intrate	-.2342329	.3017695	-0.78	0.438	-.828086	.3596202
instalind	-.0489014	.0156471	-3.13	0.002	-.0796933	-.0181095
lninstalgr	.1040382	.0634639	1.64	0.102	-.0208525	.2289289
lncostpborr	-.2786819	.0424792	-6.56	0.000	-.3622768	-.1950871
prodtype	.1203602	.0751807	1.60	0.110	-.0275882	.2683085
lnavoutloan	-.4206499	.0396572	-10.61	0.000	-.4986914	-.3426085
lnmfisize	.8883748	.0248559	35.74	0.000	.8394607	.9372889
lnT2matind	-.0639342	.0729421	-0.88	0.381	-.2074772	.0796088
lnT2matgr	.1055988	.0717056	1.47	0.142	-.0355108	.2467085
lnstcostpdol	.0478416	.0271551	1.76	0.079	-.005597	.1012801
minloanind	5.61e-07	1.51e-07	3.71	0.000	2.64e-07	8.58e-07
minloangr	-3.67e-07	1.39e-07	-2.65	0.009	-6.40e-07	-9.43e-08
mfiage	-.0119158	.0093873	-1.27	0.205	-.030389	.0065575
reguted	-.3130702	.0859535	-3.64	0.000	-.4822183	-.143922
_cons	-2.383878	.4160703	-5.73	0.000	-3.202664	-1.565092

(e) Instrumental exogeneity Test – Outreach Instruments

```
. xtoverid

Test of overidentifying restrictions:
Cross-section time-series model: xtivreg g2sls  robust cluster(mficode)
Sargan-Hansen statistic   1.986  Chi-sq(3)    P-value = 0.5753
```

(f) Variable Endogeneity Test – Breadth of Outreach

```
. ivendog

Tests of endogeneity of: lnborrowers
H0: Regressor is exogenous
    Wu-Hausman F test:                 5.47510  F(1,302)    P-value = 0.01994
    Durbin-Wu-Hausman chi-sq test:     5.62690  Chi-sq(1)   P-value = 0.01769
```

(g) GMM and LIML Estimators Comparison

	GMM	LIML
FSS	0.826*	0.960*
	(2.03)	(2.19)
minloanind	0.00000187**	0.00000196**
	(2.95)	(3.06)
minloangr	-0.00000155	-0.00000154
	(-1.84)	(-1.77)
mfiage	0.0761	0.0709
	(1.94)	(1.79)
reguted	-1.025*	-1.027*
	(-2.57)	(-2.56)
_cons	4.470***	4.253***
	(5.41)	(4.87)
rmse	1.311	1.369

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Appendix 10: Hausman FE and RE Test Results

(a) Determinants of FSS Without IV (Outreach Related Variables) Model

	(b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	Coefficients			
capstruc	1.503106	1.181608	.3214984	.2540833
intrate	1.689774	2.307532	-.6177579	.6097661
lnstcostpdol	-.1399638	-.132459	-.0075048	.0326529
instalind	-.0671204	-.0604238	-.0066966	.0689299
lninstalgr	.7648519	.3224072	.4424447	.3262997
lncostpborr	-.4534604	-.5329855	.0795251	.0511221
prodtype	.2282461	.2697155	-.0414694	.2215121
minloanind	1.13e-06	-3.78e-08	1.17e-06	5.16e-07
minloangr	2.01e-07	5.39e-07	-3.37e-07	2.43e-07
mfiage	-.1255527	-.0068888	-.1186639	.0595277
lnavoutloan	.3648392	.3665772	-.001738	.0587775
lnmfisize	.3695524	.2904573	.079095	.0764761
female	.2869216	.1238016	.1631201	.2537821
lnborrowers	-.1735134	-.2632589	.0897455	.0989638
lnT2matind	.0827172	.2891489	-.2064318	.2112599
lnT2matgr	-.3122724	-.2592084	-.053064	.2975241

```
                 b = consistent under Ho and Ha; obtained from xtreg
  B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                 chi2(14) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       10.88
                Prob>chi2 =      0.6957
```

(b) Determinants of FSS With IV (Outreach Related Variables) Model

```
. hausman fe re
```

	(b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	Coefficients			
lnborrowers	-.8471121	-.9435438	.0964317	.
capstruc	1.62935	1.625098	.0042515	.
intrate	1.853848	2.185121	-.3312732	.6550063
instalind	-.0259535	-.0941095	.068156	.0716777
lninstalgr	.4027511	.3759829	.0267682	.3670642
lncostpborr	-.6436415	-.7168825	.0732411	.0534288
prodtype	.4508667	.4083109	.0425558	.2114523
lnavoutloan	.1604483	.1019614	.058487	.
lnmfisize	.7475817	.8789847	-.131403	.
lnT2matind	.1574858	.2799212	-.1224353	.2285007
lnT2matgr	-.0472169	-.1853205	.1381036	.3445401
lnstcostpdol	-.1088423	-.0959501	-.0128923	.0342635

```
                 b = consistent under Ho and Ha; obtained from xtivreg
  B = inconsistent under Ha, efficient under Ho; obtained from xtivreg

    Test:  Ho:  difference in coefficients not systematic

                 chi2(12) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =        4.85
                Prob>chi2 =      0.9627
                (V_b-V_B is not positive definite)
```

(c) Determinants of FSS (Efficiency Related Variables) Model

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
yield	4.609123	4.869958	-.2608353	.277176
PAR	-.4925687	-.46002	-.0325487	.0981699
lnliqratio	.2022488	.1710332	.0312156	.0604015
lnborrpstaff	-.1195734	-.145104	.0255306	.0511652
lnstcospbor	-.063933	-.0355257	-.0284073	.0321908
lnaepborr	-.0121538	.019158	-.0313118	.0322206
lncostpclie	-.0653925	-.1167503	.0513579	.075404
lnoeratio	-.5298128	-.6179029	.0880901	.040913
lnavdisbloan	.0727419	.0082543	.0644876	.04076

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

```
    chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B)
            =        9.46
  Prob>chi2 =      0.3956
```

(d) Determinants of Earnings Ratio Model (Chapter 7)

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
PAR	-.6513033	-.5640912	-.0872121	.0899243
lnborrpstaff	.1370536	.1509014	-.0138478	.0443885
lnaepborr	.0631937	.0013485	.0618451	.0310267
lnstcospbor	.1436685	.0866928	.0569756	.0256825
lnoeratio	-.6143257	-.5301923	-.0841334	.0586362
lnavoutloan	-.0402511	.0620869	-.102338	.0554573
intrate	3.319243	2.729817	.5894264	.4141401

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

```
    chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
            =       11.27
  Prob>chi2 =      0.1271
```

(e) Determinants of Liquidity Ratio Model (Chapter 7)

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
capstruc	1.550069	2.213632	-.6635622	.1258797
instalind	-.0288405	.0317964	-.060637	.0416469
lninstalgr	-.0516797	-.0892017	.037522	.1911994
lncostpborr	.1265189	.2246611	-.0981422	.0225735
prodtype	.0426964	.550189	-.5074927	.1259459
minloanind	4.65e-08	-2.32e-08	6.97e-08	3.38e-07
minloangr	1.59e-07	-3.79e-08	1.97e-07	1.52e-07
lnavoutloan	-.0873403	-.0668289	-.0205113	.0220234
yieldgap	1.443176	1.805644	-.3624687	.1979476
lnborrpstaff	-.0084244	.2015133	-.2099377	.0305432

```
                     b = consistent under Ho and Ha; obtained from xtreg
      B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test:  Ho:  difference in coefficients not systematic

              chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                      =       61.99
            Prob>chi2 =      0.0000
```

(f) Determinants of PAR Ratio Model (Chapter 7)

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
capstruc	-.249938	-.1925362	-.0574018	.0755293
intrate	-.0377298	.0845721	-.1223019	.1780283
instalind	-.0042616	.0058255	-.0100872	.0203258
lninstalgr	-.0026015	-.0359972	.0333956	.0963363
prodtype	-.0015459	-.03887	.0373241	.0646365
minloanind	1.07e-07	-3.54e-08	1.42e-07	1.59e-07
minloangr	-2.63e-08	6.81e-09	-3.31e-08	7.56e-08
mfiage	.0259157	.0035344	.0223813	.0165085
lnavoutloan	-.1074907	-.0737119	-.0337788	.0164414
lnmfisize	-.0048959	-.00187	-.0030259	.0263642
female	.0132248	.0201658	-.0069411	.0748367
lnT2matind	-.0910244	.0111931	-.1022175	.0625083
lnT2matgr	.1288911	-.0075199	.1364109	.0889704
lnborrpstaff	-.0828259	-.0576842	-.0251418	.0243728

```
                     b = consistent under Ho and Ha; obtained from xtreg
      B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test:  Ho:  difference in coefficients not systematic

             chi2(12) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                      =       12.32
            Prob>chi2 =      0.4200
```

(g) Determinants of Cost per Loan Ratio Model (Chapter 7)

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
intrate	-.1254485	.8589859	-.9844344	.4247611
lnstcostpdol	.4886812	.5909597	-.1022785	.0226043
instalind	-.0185083	-.013726	-.0047823	.0487983
lninstalgr	-.0155486	-.0845062	.0689577	.2295608
minloanind	-4.39e-07	2.90e-07	-7.29e-07	3.99e-07
minloangr	1.81e-07	-5.31e-07	7.13e-07	1.90e-07
mfiage	.1641467	.0250008	.1391458	.0367919
lnavoutloan	-.1210322	-.134061	.0130288	.0450011
lnmfisize	-.003347	.1302289	-.1335759	.0573764
lnT2matind	-.114857	.1486318	-.2634889	.1533163
lnT2matgr	-.1806074	.0627495	-.2433569	.220214
PAR	.1754758	.2375788	-.062103	.0690048
lnborrpstaff	-.3051742	-.158883	-.1462913	.0584681
lnavdisbloan	.6700995	.7716054	-.1015059	.0311888

```
                          b = consistent under Ho and Ha; obtained from xtreg
           B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(12) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                           =       47.71
                Prob>chi2 =      0.0000
```

(h) Determinants of Financial Productivity Model (Chapter 7)

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
capstruc	.3062504	.3317579	-.0255075	.0532048
intrate	.6241673	.54084	.0833273	.1470551
instalind	.0112516	-.0085455	.0197971	.0170293
lninstalgr	.0574303	.0208967	.0365336	.077941
minloanind	8.69e-09	-1.82e-07	1.90e-07	1.29e-07
minloangr	-1.35e-08	3.20e-08	-4.55e-08	6.18e-08
mfiage	.020162	.0030306	.0171314	.012027
lnborrowers	.6637261	.150103	.5136232	.0651463
lnT2matind	.0283077	.1011961	-.0728884	.0513721
lnT2matgr	-.1014892	-.0775174	-.0239718	.0734795
lnborrpstaff	-.6625587	-.123673	-.5388858	.0606133
lnstcospbor	.017125	.0367052	-.0195802	.0075665
lnaepborr	.0258373	.0368387	-.0110014	.0073551

```
                          b = consistent under Ho and Ha; obtained from xtreg
           B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(11) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                           =      102.06
                Prob>chi2 =      0.0000
```

(i) Determinants of OSS Model – Outreach Related Variables (Chapter 7)

	(b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
capstruc	.9070863	1.01746	-.1103742	.4620086
intrate	3.237715	4.116412	-.8786964	1.209375
lnstcostpdol	-.6491757	-.5437545	-.1054212	.0645893
instalind	-.0906793	-.0868214	-.0038579	.1353474
lninstalgr	.8009965	.4102216	.3907749	.6370318
lncostpborr	-.2948188	-.4246061	.1297874	.1042506
prodtype	.4522629	.4671373	-.0148744	.4371544
minloanind	7.94e-07	-7.55e-07	1.55e-06	1.01e-06
minloangr	5.09e-07	8.06e-07	-2.96e-07	4.79e-07
mfiage	-.1266047	-.0194315	-.1071732	.1135321
lnavoutloan	.5044339	.5269036	-.0224697	.099345
female	-1.445719	-.7734373	-.6722817	.4912549
lnborrowers	.1100996	.0786102	.0314894	.1807715
lnT2matind	.1744261	.6066238	-.4321977	.4155442
lnT2matgr	-.1591338	-.592102	.4329682	.5828666

```
                 b = consistent under Ho and Ha; obtained from xtreg
  B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test:  Ho:  difference in coefficients not systematic

          chi2(13) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                   =       16.86
        Prob>chi2 =      0.2056
```

(j) Determinants of OSS Model – Efficiency Related Variables (Chapter 7)

	(b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
yield	9.44786	9.77241	-.3245494	.5119084
PAR	.2821086	.2390981	.0430105	.1823612
lnliqratio	.3159066	.3978878	-.0819813	.1044802
lnborrpstaff	-.2665015	-.2285884	-.0379131	.0900952
lnstcospbor	-.505523	-.3325225	-.1730005	.0578169
lnaepborr	-.057628	.0315233	-.0891513	.0574599
lncostpclie	.3696599	.0890558	.2806041	.1315899
lnoeratio	-1.236541	-1.295836	.0592946	.073731
lnavdisbloan	.1843159	.0504621	.1338538	.0721528

```
                 b = consistent under Ho and Ha; obtained from xtreg
  B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test:  Ho:  difference in coefficients not systematic

           chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                   =       14.72
        Prob>chi2 =      0.0990
```

Appendix 11: Breusch and Pagan Lagrangian Multiplier Test for Random Effects

(a) Determinants of FSS without IV (Outreach Related Variables) Model

```
Breusch and Pagan Lagrangian multiplier test for random effects

        FSS[mficode,t] = Xb + u[mficode] + e[mficode,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                     FSS |   .7572267       .8701877
                       e |   .3675328       .6062448
                       u |   .0868964       .2947819

        Test:   Var(u) = 0
                             chi2(1) =     6.04
                         Prob > chi2 =     0.0140
```

(b) Determinants of FSS with IV Model

```
Breusch and Pagan Lagrangian multiplier test for random effects

        FSS[mficode,t] = Xb + u[mficode] + e[mficode,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                     FSS |   .7572267       .8701877
                       e |    .384833       .6203491
                       u |   .0789046       .2808996

        Test:   Var(u) = 0
                             chi2(1) =     8.40
                         Prob > chi2 =     0.0038
```

(c) Determinants of FSS (Efficiency Related Variables) Model

```
Breusch and Pagan Lagrangian multiplier test for random effects

        FSS[mficode,t] = Xb + u[mficode] + e[mficode,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                     FSS |   .7668347        .875691
                       e |   .3311792       .5754817
                       u |   .0917063       .3028305

        Test:   Var(u) = 0
                             chi2(1) =    21.79
                         Prob > chi2 =     0.0000
```

(d) Determinants of Earnings Ratio Model (Chapter 7)

```
Breusch and Pagan Lagrangian multiplier test for random effects

        lner[mficode,t] = Xb + u[mficode] + e[mficode,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                    lner |   .6936043       .8328291
                       e |   .2781488       .5273981
                       u |   .0616084       .2482104

        Test:   Var(u) = 0
                             chi2(1) =    16.51
                         Prob > chi2 =     0.0000
```

(e) Determinants of Portfolio at Risk Model (Chapter 7)

```
Breusch and Pagan Lagrangian multiplier test for random effects

        PAR[mficode,t] = Xb + u[mficode] + e[mficode,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                     PAR |   .0535358        .231378
                       e |     .03375       .1837117
                       u |   .0124073       .1113882

        Test:   Var(u) = 0
                             chi2(1) =    19.66
                         Prob > chi2 =     0.0000
```

(f) Determinants of OSS Model – Outreach Related Variables (Chapter 7)

```
Breusch and Pagan Lagrangian multiplier test for random effects

        OSS[mficode,t] = Xb + u[mficode] + e[mficode,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                     OSS |   2.563287       1.601027
                       e |   1.402781       1.184391
                       u |   .2545113       .5044911

        Test:   Var(u) = 0
                             chi2(1) =     5.86
                         Prob > chi2 =     0.0155
```

(g) Determinants of OSS Model – Efficiency Related Variables (Chapter 7)

```
Breusch and Pagan Lagrangian multiplier test for random effects

        OSS[mficode,t] = Xb + u[mficode] + e[mficode,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                     OSS |   2.242512       1.497502
                       e |   .9190246       .9586577
                       u |   .1049259       .3239227

        Test:   Var(u) = 0
                             chi2(1) =     4.32
                         Prob > chi2 =     0.0377
```

Appendix 12: Further Descriptive Statistics for Independent Variables in Chapter 6

(a) **Member-Based MFIs**

Variable	Obs	Mean	Std. Dev.	Min	Max
yield	340	.138028	.0814512	0	.4173244
yieldgap	340	.1042896	.0826919	.000189	.5051864
PAR	340	.2916736	.2182451	.0013794	.9674952
liqratio	340	2.067626	6.626381	.7296336	121.1815
borrpstaff	340	69.31737	92.79046	4.75	769.5
aepborr	339	5372.804	8163.923	7.807465	74541.16
fepborr	340	2494.997	7563.055	0	73625.26
stcospbor	340	8474.602	23668.48	0	372645
costpclie	340	8214.146	10933.35	93.88715	96375.9
oeratio	340	.1691765	.2323775	0	2.23
avdisbloan	340	288620.1	361822.8	5200	2684674

(b) **NGO MFIs**

Variable	Obs	Mean	Std. Dev.	Min	Max
yield	84	.2612244	.0628856	.1356	.3943
yieldgap	84	.1256804	.0590503	.0111	.2844
PAR	84	.1672923	.1934365	.0012695	.6625714
liqratio	84	31.81116	59.9652	1.707805	326.696
borrpstaff	84	270.2184	224.1476	43.15	1026.5
aepborr	84	18254.15	21503.71	480.7307	136851.8
fepborr	84	7312.345	9501.84	0	74411.39
stcospbor	84	32937.08	21154.81	20.9	132376.4
costpclie	84	79634.78	57258.9	3466.899	418266.6
oeratio	84	.39	.3638251	.01	2.35
avdisbloan	84	1457366	817366.2	118326.8	3212295

Appendix 13: Detailed Econometrics Results

(a) Determinants of Financial Sustainability (Outreach Variables)

```
Random-effects GLS regression                   Number of obs      =       316
Group variable: mficode                         Number of groups   =        80

R-sq:  within  = 0.3523                         Obs per group: min =         2
       between = 0.5785                                        avg =       4.0
       overall = 0.4531                                        max =         4

Random effects u_i ~ Gaussian                   Wald chi2(20)      =    137.41
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

                                (Std. Err. adjusted for clustering on mficode)
```

FSS	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
capstruc	1.181608	.2886894	4.09	0.000	.6157868	1.747428
intrate	2.307532	.5348477	4.31	0.000	1.25925	3.355814
lnstcostpdol	-.132459	.0830875	-1.59	0.111	-.2953075	.0303896
instalind	-.0604238	.0275941	-2.19	0.029	-.1145072	-.0063404
lninstalgr	.3224072	.1226166	2.63	0.009	.0820831	.5627313
lncostpborr	-.5329855	.0994273	-5.36	0.000	-.7278594	-.3381115
prodtype	.2697155	.122511	2.20	0.028	.0295984	.5098327
minloanind	-3.78e-08	2.82e-07	-0.13	0.894	-5.91e-07	5.16e-07
minloangr	5.39e-07	2.96e-07	1.82	0.069	-4.14e-08	1.12e-06
mfiage	-.0068888	.0171268	-0.40	0.688	-.0404566	.026679
mfitype	.0368451	.3868853	0.10	0.924	-.7214361	.7951263
lnavoutloan	.3665772	.0912158	4.02	0.000	.1877976	.5453568
lnmfisize	.2904573	.1227293	2.37	0.018	.0499123	.5310024
female	.1238016	.2311057	0.54	0.592	-.3291572	.5767604
reguted	.2107572	.1537695	1.37	0.170	-.0906255	.5121399
lnborrowers	-.2632589	.1214094	-2.17	0.030	-.501217	-.0253008
educarea	.0606136	.1365182	0.44	0.657	-.2069572	.3281844
agrlarea	.1684016	.1199252	1.40	0.160	-.0666475	.4034507
lnT2matind	.2891489	.1269456	2.28	0.023	.0403402	.5379577
lnT2matgr	-.2592084	.1324246	-1.96	0.050	-.5187559	.0003391
_cons	-3.266127	1.082192	-3.02	0.003	-5.387184	-1.145071
sigma_u	.29303622					
sigma_e	.60799305					
rho	.18850794	(fraction of variance due to u_i)				

(b) Determinants of Financial Sustainability (IV Approach)

```
. xtivreg FSS capstruc intrate instalind lninstalgr lncostpborr prodtype lnavou
> tloan lnmfisize  lnT2matind lnT2matgr lnstcostpdol (lnborrowers = minloanind
> minloangr mfiage reguted), re vce(bootstrap, reps(80))
(running xtivreg on estimation sample)

Bootstrap replications (80)
----+--- 1 ---+--- 2 ---+--- 3 ---+--- 4 ---+--- 5
..................................................    50
..............................

G2SLS random-effects IV regression              Number of obs      =       316
Group variable: mficode                         Number of groups   =        80

R-sq:  within  = 0.2927                         Obs per group: min =         2
       between = 0.4185                                        avg =       4.0
       overall = 0.3505                                        max =         4


                                                Wald chi2(12)      =     89.82
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

                                (Replications based on 80 clusters in mficode)
------------------------------------------------------------------------------
             |   Observed   Bootstrap                         Normal-based
         FSS |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
 lnborrowers |  -.9435438   .4321179    -2.18   0.029    -1.790479   -.0966083
    capstruc |   1.625098    .449007     3.62   0.000     .7450609    2.505136
     intrate |   2.185121   .6337234     3.45   0.001     .9430462    3.427196
   instalind |  -.0941095   .0333627    -2.82   0.005    -.1594992   -.0287197
  lninstalgr |   .3759829   .1370775     2.74   0.006      .107316    .6446498
 lncostpborr |  -.7168825   .1305175    -5.49   0.000    -.9726922   -.4610729
    prodtype |   .4083109   .1948695     2.10   0.036     .0263738     .790248
 lnavoutloan |   .1019614   .2075333     0.49   0.623    -.3047964    .5087192
   lnmfisize |   .8789847   .3680283     2.39   0.017     .1576625    1.600307
  lnT2matind |   .2799212   .1075181     2.60   0.009     .0691896    .4906527
   lnT2matgr |  -.1853205    .111805    -1.66   0.097    -.4044544    .0338133
lnstcostpdol |  -.0959501   .0776769    -1.24   0.217     -.248194    .0562938
       _cons |  -4.880493    1.52676    -3.20   0.001    -7.872888   -1.888097
-------------+----------------------------------------------------------------
     sigma_u |  .34017392
     sigma_e |  .64516187
         rho |  .21753517   (fraction of variance due to u_i)
------------------------------------------------------------------------------
Instrumented:   lnborrowers
Instruments:    capstruc intrate instalind lninstalgr lncostpborr prodtype
                lnavoutloan lnmfisize lnT2matind lnT2matgr lnstcostpdol
                minloanind minloangr mfiage reguted
------------------------------------------------------------------------------
```

(c) Determinants of Breadth of Outreach (IV Approach)

```
2-Step GMM estimation
---------------------

Estimates efficient for arbitrary heteroskedasticity and clustering on mficode
Statistics robust to heteroskedasticity and clustering on mficode

Number of clusters (mficode) = 80                     Number of obs =      316
                                                      F(  5,    79) =    14.95
                                                      Prob > F      =   0.0000
Total (centered) SS     =  684.3894893                Centered R2   =   0.2069
Total (uncentered) SS   =  10267.51843                Uncentered R2 =   0.9471
Residual SS             =  542.7570345                Root MSE      =    1.311

------------------------------------------------------------------------------
             |               Robust
 lnborrowers |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         FSS |   .8255423   .4057628     2.03   0.042     .0302618    1.620823
  minloanind |   1.87e-06   6.33e-07     2.95   0.003     6.28e-07    3.11e-06
   minloangr |  -1.55e-06   8.42e-07    -1.84   0.065    -3.20e-06    9.80e-08
      mfiage |   .0760564   .0392029     1.94   0.052    -.0007798    .1528927
     reguted |  -1.024855   .3994891    -2.57   0.010    -1.807839   -.2418704
       _cons |   4.470338    .826894     5.41   0.000     2.849656    6.091021
------------------------------------------------------------------------------
Underidentification test (Kleibergen-Paap rk LM statistic):             23.475
                                                   Chi-sq(2) P-val =    0.0000
------------------------------------------------------------------------------
Weak identification test (Kleibergen-Paap rk Wald F statistic):         14.183
Stock-Yogo weak ID test critical values: 10% maximal IV size             19.93
                                         15% maximal IV size             11.59
                                         20% maximal IV size              8.75
                                         25% maximal IV size              7.25
Source: Stock-Yogo (2005).  Reproduced by permission.
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.
------------------------------------------------------------------------------
Hansen J statistic (overidentification test of all instruments):         2.143
                                                   Chi-sq(1) P-val =    0.1432
------------------------------------------------------------------------------
Instrumented:         FSS
Included instruments: minloanind minloangr mfiage reguted
Excluded instruments: reprate riskcoverratio
------------------------------------------------------------------------------
```

(d) Model Comparison

	(1) FSS Without IV	(2) FSS With IV
capstruc	1.182***	1.625***
	(4.09)	(3.62)
intrate	2.308***	2.185***
	(4.31)	(3.45)
lnstcostpdol	-0.132	-0.0960
	(-1.59)	(-1.24)
instalind	-0.0604*	-0.0941**
	(-2.19)	(-2.82)
lninstalgr	0.322**	0.376**
	(2.63)	(2.74)
lncostpborr	-0.533***	-0.717***
	(-5.36)	(-5.49)
prodtype	0.270*	0.408*
	(2.20)	(2.10)
lnavoutloan	0.367***	0.102
	(4.02)	(0.49)
lnmfisize	0.290*	0.879*
	(2.37)	(2.39)
lnborrowers	-0.263*	-0.944*
	(-2.17)	(-2.18)
lnT2matind	0.289*	0.280**
	(2.28)	(2.60)
lnT2matgr	-0.259	-0.185
	(-1.96)	(-1.66)
_cons	-3.266**	-4.880**
	(-3.02)	(-3.20)
R-Sq: Within	.3523	.2927
Between	.5785	.4185
Overall	.4531	.3505

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

(e) Determinants of Financial Sustainability (Efficiency Variables)

```
Random-effects GLS regression                   Number of obs      =       414
Group variable: mficode                         Number of groups   =       106

R-sq:  within  = 0.3932                         Obs per group: min =         3
       between = 0.5604                                        avg =       3.9
       overall = 0.4652                                        max =         4

Random effects u_i ~ Gaussian                   Wald chi2(9)       =    143.33
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

                             (Std. Err. adjusted for clustering on mficode)
------------------------------------------------------------------------------
             |               Robust
         FSS |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       yield |   4.869958   .7170055     6.79   0.000     3.464653    6.275263
         PAR |   -.46002    .1573824    -2.92   0.003    -.7684838   -.1515562
  lnliqratio |   .1710332   .0661661     2.58   0.010       .04135    .3007163
 lnborrpstaff|   -.145104   .0389201    -3.73   0.000    -.2213861   -.0688219
  lnstcospbor|  -.0355257   .0651731    -0.55   0.586    -.1632627    .0922114
   lnaepborr |    .019158    .029039     0.66   0.509    -.0377574    .0760734
 lncostpclie |  -.1167503   .0615061    -1.90   0.058    -.2373002    .0037995
   lnoeratio |  -.6179029   .0756633    -8.17   0.000    -.7662003   -.4696055
 lnavdisbloan|   .0082543    .036585     0.23   0.821    -.0634509    .0799595
       _cons |   1.208514   .4688377     2.58   0.010      .289609    2.127419
-------------+----------------------------------------------------------------
     sigma_u |  .30283045
     sigma_e |  .57548167
         rho |  .21685846   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

(f) Determinants of Earnings Ratio (Chapter 7)

```
Random-effects GLS regression                   Number of obs      =       413
Group variable: mficode                         Number of groups   =       106

R-sq:  within  = 0.4555                         Obs per group: min =         3
       between = 0.5899                                        avg =       3.9
       overall = 0.5144                                        max =         4

Random effects u_i ~ Gaussian                   Wald chi2(7)       =    204.89
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

                             (Std. Err. adjusted for clustering on mficode)
------------------------------------------------------------------------------
             |               Robust
        lner |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         PAR |  -.5640912   .1806952    -3.12   0.002    -.9182472   -.2099352
 lnborrpstaff|   .1509014   .0444891     3.39   0.001     .0637044    .2380984
   lnaepborr |   .0013485   .0321073     0.04   0.966    -.0615806    .0642777
  lnstcospbor|   .0866928   .0495279     1.75   0.080    -.0103802    .1837658
   lnoeratio |  -.5301923   .0780132    -6.80   0.000    -.6830954   -.3772892
  lnavoutloan|   .0620869   .0732647     0.85   0.397    -.0815093    .2056832
     intrate |   2.729817   .4623361     5.90   0.000     1.823655    3.635979
       _cons |  -3.656562   .4369031    -8.37   0.000    -4.512876   -2.800247
-------------+----------------------------------------------------------------
     sigma_u |  .24821041
     sigma_e |   .5273981
         rho |  .18133071   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

(g) Determinants of Liquidity Ratio (Chapter 7)

```
Fixed-effects (within) regression               Number of obs      =       316
Group variable: mficode                         Number of groups   =        80

R-sq:  within  = 0.3218                         Obs per group: min =         2
       between = 0.3958                                        avg =       4.0
       overall = 0.3458                                        max =         4

                                                F(10,79)           =      7.76
corr(u_i, Xb)  = 0.3378                         Prob > F           =    0.0000

                                (Std. Err. adjusted for 80 clusters in mficode)
```

lnliqratio	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
capstruc	1.550069	.3653259	4.24	0.000	.8229064	2.277232
instalind	-.0288405	.0274958	-1.05	0.297	-.0835696	.0258885
lninstalgr	-.0516797	.1299622	-0.40	0.692	-.3103631	.2070037
lncostpborr	.1265189	.070733	1.79	0.077	-.0142717	.2673094
prodtype	.0426964	.0845109	0.51	0.615	-.1255183	.210911
minloanind	4.65e-08	1.60e-07	0.29	0.772	-2.72e-07	3.65e-07
minloangr	1.59e-07	8.85e-08	1.80	0.076	-1.70e-08	3.35e-07
lnavoutloan	-.0873403	.0549572	-1.59	0.116	-.1967299	.0220493
yieldgap	1.443176	.5634158	2.56	0.012	.3217244	2.564627
lnborrpstaff	-.0084244	.0398409	-0.21	0.833	-.0877258	.070877
_cons	.1526539	.5009903	0.30	0.761	-.8445423	1.14985
sigma_u	.97896834					
sigma_e	.39049286					
rho	.86273323	(fraction of variance due to u_i)				

(h) Determinants of Portfolio at Risk (Chapter 7)

```
Random-effects GLS regression                   Number of obs      =       316
Group variable: mficode                         Number of groups   =        80

R-sq:  within  = 0.1350                         Obs per group: min =         2
       between = 0.2969                                        avg =       4.0
       overall = 0.2065                                        max =         4

Random effects u_i ~ Gaussian                   Wald chi2(17)      =     76.39
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

                                 (Std. Err. adjusted for clustering on mficode)
```

PAR	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
capstruc	-.1925362	.0793533	-2.43	0.015	-.3480658	-.0370066
intrate	.0845721	.1817137	0.47	0.642	-.2715803	.4407244
instalind	.0058255	.0102607	0.57	0.570	-.0142851	.0259362
lninstalgr	-.0359972	.0402559	-0.89	0.371	-.1148972	.0429028
prodtype	-.03887	.0421914	-0.92	0.357	-.1215636	.0438235
minloanind	-3.54e-08	8.75e-08	-0.40	0.686	-2.07e-07	1.36e-07
minloangr	6.81e-09	6.06e-08	0.11	0.911	-1.12e-07	1.26e-07
mfiage	.0035344	.0068999	0.51	0.608	-.0099891	.017058
lnavoutloan	-.0737119	.0203458	-3.62	0.000	-.113589	-.0338349
lnmfisize	-.00187	.0213988	-0.09	0.930	-.0438108	.0400708
female	.0201658	.0679038	0.30	0.766	-.1129231	.1532548
reguted	-.0341586	.0592651	-0.58	0.564	-.150316	.0819988
educarea	-.0107471	.0458745	-0.23	0.815	-.1006594	.0791652
agrlarea	-.0025172	.0473616	-0.05	0.958	-.0953443	.0903099
lnT2matind	.0111931	.0416193	0.27	0.788	-.0703791	.0927654
lnT2matgr	-.0075199	.0429238	-0.18	0.861	-.0916489	.0766092
lnborrpstaff	-.0576842	.0248465	-2.32	0.020	-.1063824	-.0089859
_cons	1.450948	.2380577	6.09	0.000	.9843632	1.917532
sigma_u	.1113882					
sigma_e	.18371171					
rho	.26880525	(fraction of variance due to u_i)				

(i) Determinants of Cost per Loan Model (Chapter 7)

```
Fixed-effects (within) regression               Number of obs      =       316
Group variable: mficode                         Number of groups   =        80

R-sq:  within  = 0.6384                         Obs per group: min =         2
       between = 0.5841                                        avg =       4.0
       overall = 0.5962                                        max =         4

                                                F(14,79)           =     21.91
corr(u_i, Xb)  = 0.0794                         Prob > F           =    0.0000

                                (Std. Err. adjusted for 80 clusters in mficode)
```

lncostploan	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
intrate	-.1254485	.4227276	-0.30	0.767	-.9668668	.7159697
lnstcostpdol	.4886812	.0690336	7.08	0.000	.3512732	.6260891
instalind	-.0185083	.0507192	-0.36	0.716	-.1194624	.0824457
lninstalgr	-.0155486	.1859054	-0.08	0.934	-.385584	.3544868
minloanind	-4.39e-07	4.11e-07	-1.07	0.289	-1.26e-06	3.79e-07
minloangr	1.81e-07	2.30e-07	0.79	0.433	-2.76e-07	6.39e-07
mfiage	.1641467	.0496242	3.31	0.001	.0653721	.2629212
lnavoutloan	-.1210322	.1002978	-1.21	0.231	-.3206699	.0786055
lnmfisize	-.003347	.1441704	-0.02	0.982	-.290311	.2836169
lnT2matind	-.114857	.1269623	-0.90	0.368	-.3675692	.1378551
lnT2matgr	-.1806074	.1754395	-1.03	0.306	-.5298109	.1685962
PAR	.1754758	.1519237	1.16	0.252	-.1269208	.4778723
lnborrpstaff	-.3051742	.1254243	-2.43	0.017	-.554825	-.0555234
lnavdisbloan	.6700995	.0683262	9.81	0.000	.5340996	.8060994
_cons	6.77016	1.476534	4.59	0.000	3.831193	9.709128
sigma_u	.93378583					
sigma_e	.45665382					
rho	.80700148	(fraction of variance due to u_i)				

(j) Determinants of Financial Productivity Model (Chapter 7)

```
Fixed-effects (within) regression               Number of obs      =       308
Group variable: mficode                         Number of groups   =        80

R-sq:  within  = 0.6176                         Obs per group: min =         2
       between = 0.4463                                        avg =       3.9
       overall = 0.3803                                        max =         4

                                                F(13,79)           =     20.34
corr(u_i, Xb)  = -0.9157                        Prob > F           =    0.0000

                                (Std. Err. adjusted for 80 clusters in mficode)
```

finprod	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
capstruc	.3062504	.0995506	3.08	0.003	.1081	.5044009
intrate	.6241673	.1372286	4.55	0.000	.3510206	.897314
instalind	.0112516	.0106707	1.05	0.295	-.0099879	.0324911
lninstalgr	.0574303	.0443104	1.30	0.199	-.0307673	.145628
minloanind	8.69e-09	4.49e-08	0.19	0.847	-8.07e-08	9.80e-08
minloangr	-1.35e-08	2.54e-08	-0.53	0.598	-6.41e-08	3.71e-08
mfiage	.020162	.0153005	1.32	0.191	-.0102929	.0506169
lnborrowers	.6637261	.1350184	4.92	0.000	.3949787	.9324735
lnT2matind	.0283077	.0528223	0.54	0.594	-.0768324	.1334478
lnT2matgr	-.1014892	.0432067	-2.35	0.021	-.1874901	-.0154883
lnborrpstaff	-.6625587	.1327404	-4.99	0.000	-.926772	-.3983455
lnstcospbor	.017125	.0086003	1.99	0.050	6.50e-06	.0342435
lnaepborr	.0258373	.0101433	2.55	0.013	.0056474	.0460271
_cons	-1.267423	.2459078	-5.15	0.000	-1.75689	-.7779561
sigma_u	.45303057					
sigma_e	.12438738					
rho	.92989762	(fraction of variance due to u_i)				

(k) Determinants of OSS Model – Outreach Related Variables (Chapter 7)

```
Random-effects GLS regression                   Number of obs      =       316
Group variable: mficode                         Number of groups   =        80

R-sq:  within  = 0.3706                         Obs per group: min =         2
       between = 0.4302                                        avg =       4.0
       overall = 0.3844                                        max =         4

Random effects u_i ~ Gaussian                   Wald chi2(19)      =     94.49
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

                                 (Std. Err. adjusted for clustering on mficode)
```

OSS	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
capstruc	1.01746	.3634733	2.80	0.005	.305066	1.729855
intrate	4.116412	.8002648	5.14	0.000	2.547922	5.684902
lnstcostpdol	-.5437545	.2708412	-2.01	0.045	-1.074593	-.0129156
instalind	-.0868214	.0374291	-2.32	0.020	-.160181	-.0134618
lninstalgr	.4102216	.1798107	2.28	0.023	.0577992	.7626441
lncostpborr	-.4246061	.1467885	-2.89	0.004	-.7123063	-.136906
prodtype	.4671373	.2097579	2.23	0.026	.0560193	.8782553
minloanind	-7.55e-07	5.46e-07	-1.38	0.167	-1.83e-06	3.16e-07
minloangr	8.06e-07	3.78e-07	2.13	0.033	6.41e-08	1.55e-06
mfiage	-.0194315	.0233588	-0.83	0.405	-.065214	.026351
mfitype	-.8878262	.8581833	-1.03	0.301	-2.569834	.7941821
lnavoutloan	.5269036	.1347048	3.91	0.000	.2628871	.7909202
female	-.7734373	.5779957	-1.34	0.181	-1.906288	.3594135
reguted	.5696007	.2248678	2.53	0.011	.128868	1.010333
lnborrowers	.0786102	.0772486	1.02	0.309	-.0727943	.2300148
educarea	.2628506	.2557502	1.03	0.304	-.2384107	.7641118
agrlarea	.2552435	.179517	1.42	0.155	-.0966034	.6070903
lnT2matind	.6066238	.2293004	2.65	0.008	.1572034	1.056044
lnT2matgr	-.592102	.2299987	-2.57	0.010	-1.042891	-.1413128
_cons	-3.536494	1.382899	-2.56	0.011	-6.246926	-.8260627
sigma_u	.50449113					
sigma_e	1.1843906					
rho	.15357055	(fraction of variance due to u_i)				

(l) Determinants of OSS Model – Efficiency Related Variables (Chapter 7)

```
Random-effects GLS regression                   Number of obs      =       414
Group variable: mficode                         Number of groups   =       106

R-sq:  within  = 0.4959                         Obs per group: min =         3
       between = 0.6229                                        avg =       3.9
       overall = 0.5482                                        max =         4

Random effects u_i ~ Gaussian                   Wald chi2(9)       =     92.49
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

                                 (Std. Err. adjusted for clustering on mficode)
```

OSS	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
yield	9.77241	1.846199	5.29	0.000	6.153925	13.39089
PAR	.2390981	.2991166	0.80	0.424	-.3471597	.825356
lnliqratio	.3978878	.1435736	2.77	0.006	.1164888	.6792869
lnborrpstaff	-.2285884	.0682701	-3.35	0.001	-.3623954	-.0947814
lnstcospbor	-.3325225	.1758107	-1.89	0.059	-.6771051	.0120601
lnaepborr	.0315233	.0459315	0.69	0.493	-.0585008	.1215474
lncostpclie	.0890558	.0947854	0.94	0.347	-.0967202	.2748319
lnoeratio	-1.295836	.2278683	-5.69	0.000	-1.74245	-.8492223
lnavdisbloan	.0504621	.0617902	0.82	0.414	-.0706444	.1715686
_cons	-.6048753	.7846161	-0.77	0.441	-2.142695	.932944
sigma_u	.3239227					
sigma_e	.95865772					
rho	.10247167	(fraction of variance due to u_i)				

(m) Staff costs per Borrowers / Subsidy and cost of capital relationship (Chapter 7)

Source	SS	df	MS
Model	290.714323	1	290.714323
Residual	549.118489	343	1.60092854
Total	839.832812	344	2.44137445

Number of obs	=	345
F(1, 343)	=	181.59
Prob > F	=	0.0000
R-squared	=	0.3462
Adj R-squared	=	0.3443
Root MSE	=	1.2653

lnstcospbor	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnsubscap	.3382377	.0251001	13.48	0.000	.2888683	.3876071
_cons	4.238136	.3316979	12.78	0.000	3.585719	4.890554

(n) PAR / Subsidy and cost of capital relationship (Chapter 7)

Source	SS	df	MS
Model	1.1880363	1	1.1880363
Residual	15.6295143	348	.044912398
Total	16.8175506	349	.048187824

Number of obs	=	350
F(1, 348)	=	26.45
Prob > F	=	0.0000
R-squared	=	0.0706
Adj R-squared	=	0.0680
Root MSE	=	.21193

PAR	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnsubscap	-.0213242	.0041461	-5.14	0.000	-.0294787	-.0131696
_cons	.539547	.0546046	9.88	0.000	.4321505	.6469435