

**ADDIS ABABA UNIVERSITY  
COLLEGE OF BUSINESS AND ECONOMICS  
DEPARTMENT OF ACCOUNTING AND FINANCE**

**DETERMINANTS OF LONG-TERM SUSTAINABILITY AND  
EFFICIENCY OF ETHIOPIAN MICROFINANCE INSTITUTIONS**

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Addis Ababa, Ethiopia

June 2015

# **DETERMINANTS OF LONG-TERM SUSTAINABILITY AND EFFICIENCY OF ETHIOPIAN MICROFINANCE INSTITUTIONS**

A Thesis submitted to Addis Ababa University in partial fulfillment of the requirements for the Degree of Masters of Science in Accounting and Finance

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Addis Ababa University

June 2015

## School of Graduate Studies

This is to certify that the thesis prepared by Muhidin Shifa, entitled: “Determinants of Long-Term Sustainability and Efficiency of Ethiopian Microfinance Institutions” submitted in partial fulfillment of the requirements for the award of Master of Science in Accounting and Finance complies with the regulations of the university and meets the accepted standards with respect to originality and quality.

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## ABSTRACT

*Excessive reliance on subsidies, coupled with uncertainties in the macroeconomic environment in which MFIs operate, has become an increasingly prominent issue in the world of microfinance. While earlier studies in Ethiopia, on MFIs' performance, focused mostly on their internal characteristics, analysis of sustainability and efficiency have not been dealt sufficiently within the context of a joint analysis of funding structures, firm specific characteristics and macroeconomic environments. In an effort to fill this gap this study is made to independently identify the influence of funding sources, firm characteristics and macroeconomic variables on both sustainability and efficiency of MFIs in Ethiopia. It employs the most common indicators for microfinance sustainability and efficiency and introduces new evidence and possible explanations from an explicit perspective that might be relevant in the context of subsidies, deposit mobilization, scale of operation, gender, age and macroeconomic variables.*

*It is found that increased dependence on donor funds erodes sustainability while maintaining higher percentage of deposits as a percent of loans, increased commercialization, helped MFIs to improve their sustainability. High proportion of women is also found to erode MFIs' sustainability due to perceived reason of their small size of loans and high administrative costs. Consistent with theories and most empirical evidences, the experience of MFIs and GDP growth rate is revealed to enhance their sustainability.*

*On the cost efficiency side having grants as a larger percent of assets significantly erodes MFIs' efficiency in Ethiopia by increasing their cost per borrower. On the other hand larger loan size is found to decrease cost per borrower significantly. The study further revealed that, during the study period, older Ethiopian MFIs were less efficient as a result of their failure to take advantage of (and lack of focus on) innovations, technology and economies of scale.*

*The study recommends that, to realize financial sustainability and cost efficiency, MFIs should resort to commercialization of their operation rather than relying on grants and soft loans. They are required to maintain a higher level of deposits to loan ratio and a lower level of grants to asset ratio. Poorly performing and highly subsidized MFIs should give much regard for operational costs and subsidies and pay attention to any inefficiency in operations. Visa Vis their deposits level MFIs should also maintain a significant level of gross loan size to enhance efficiency by decreasing their cost per borrower.*

**Key words:** MFIs, sustainability, efficiency

## ACKNOWLEDGMENTS

I wish to express my sincere gratitude to my advisor Gebremedihn Gebrehiwot (Ato) for his constructive comments, valuable suggestions and excellent guidance throughout this thesis.

I am very much indebted to my mother, Elfinesh Hamid for her unconditional support during my project and my life. She has sacrificed her life and given me all the necessary support she could possibly have done. Thanks again for giving me the chance to prove and improve myself through all my life. Brothers and sisters too, your support and encouragement can never be replaced. My special thanks go to my beloved wife Ahlam Mohammed for her unlimited and kindly support during my study. Thank you for your courage, strength and patience. I am blissful and extremely auspicious to have you in my life. I just could not manage without you.

Relatives and friends, the likes of Nesredin Yasin and Nasir Biza, I really thank you for the support you have given to me in my life and during my research. Nesredin, you are always in my side in difficult times. My Aunt Almaz Abdul Hamid, I really appreciate the good things you have done to me in the course of the research. Subsequently, my sincere thanks go to officials of the National Bank of Ethiopia who helped me so much when I was under time pressure in carrying out my duties in the organization and officials of AEMFI who have provided me the necessary information about the MFI institutions.

This paper is dedicated to my late father, Shifa Shikur

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**List of Acronyms**

ACCION	Americans for Community Cooperation in Other Nations
ACSI	Amhara Saving and Credit Institution
AdCSI	Addis Credit and Saving Institution
AEMFI	Association of Ethiopian Microfinance Institutions
CGAP	Consultative Group to Assist the Poor
CPB	Cost per Borrower
DECSI	Dedebit Credit and Saving Institution
DER	Debt to Equity Ratio
DW	Durbin Watson
FSS	Financial Self Sufficiency
GDP	Growth Domestic Product
GLP	Gross Loan Portfolio
MFI	Microfinance institutions
MIX	Microfinance Information Exchange
MoFED	Ministry of Finance and Economic Development
NBE	The National Bank of Ethiopia
NGO	Non-Governmental organizations
OCSSCO	Oromia Credit and Saving Share Company
PAR	Portfolio at Risk
PEACE	Poverty Eradication and Community Empowerment
ROA	Return on Asset
ROE	Return on Equity
SFPI	Specialized Financial and Promotional Institution

## CHAPTER ONE

### 1 INTRODUCTION

#### 1.1 Background

Aghion and Morduch (2005) noted that the modern use of microfinance has its roots in the 1970s when Muhammad Yunus, an economics professor at a Bangladesh university, started to make a small loan of US\$27 to a group of 42 families as start-up money under the Grameen Bank project so that they could make items for sale, without the burdens of high interest under predatory lending. Yunus & Abed (2004) and Khandker (2003) claimed that, being an innovative approach targeting the poor, microfinance industry has become a vital tool for poverty reduction in many parts of the world (Thapa, 2007).

There were growing needs for financial services among the poor communities especially from those who were financially constrained and vulnerable but have feasible and promising investment ideas. In order to reach its full potential and further grow as a credible development tool, MFIs should be financially sound, sustainable and efficient from long term perspective. A number of studies indicated that a sustainable and efficient MFI management should cover at least all administrative costs, loan losses, and financing costs from operating income within the organization. However from the going concern perspectives scholars argued that MFIs should maintain a financial self-sufficiency ratio of 100% so that they could be able to cover administrative costs, loan losses, and financing costs from the revenues. Mbeba (2009), Stephens et al (2009), Morduch (2005), Morduch & Haley (2002) stated that the strength and sustainability of MFIs keep in touch with ability to meet long-term expenses and obligations as well as absorb unanticipated future commitments.

While earlier studies made on the triggers of the sustainability of microfinance industry is varied among jurisdiction, all those studies revealed that drivers of sustainability are related to the MFIs' financing structure, firm characteristics and macroeconomic variables. Studies undertaken by Bogan (2009), Magali (2013) and Sekabira (2013) underscored the negative impact of grants on sustainability. They recommended that MFIs must reduce dependence on grants and resort to

accumulating share capital for long-term sustainability. The factors that affect sustainability go beyond funding structures to include a number of firm specific characteristics and other external variables. A number of studies including those of Bogan (2009), Hermes (2008), Nawaz (2012) and Vingo (2012) underscored the importance of firm specific characteristics such as scale of operation, portfolio at risk, gender, age and macroeconomic variables such as GDP and inflation.

On the efficiency side, in several countries competition among MFIs has increased which led to lower cost and increased efficiency. Reaching the poor and providing them with credit may be very costly. Making very small loans involves high transaction costs, in terms of screening, monitoring and administration costs, per loan. Several authors therefore argued that the unit transaction costs for small loans to the poor are high as compared to unit costs of larger loans (Hulme and Mosley, 1996; Conning, 1999; Paxton and Cuevas, 2002; Lapenu and Zeller, 2002). The increased interest from commercial players may have also raised the need for MFIs to become financially efficient. Rhyne and Otero (2006) observed that recently, there seems to be a shift from a subsidizing MFIs institution to a focus on efficiency of MFIs. This goal stresses the importance of being able to cover the cost of lending money out of the income generated from the outstanding loan portfolio and to reduce these costs as much as possible. Like with sustainability, despite the impact and significance of the factors on efficiency varied among empirical studies, all those studies revealed that funding structures (such as subsidies and savings), firm specific characteristics (such as loan portfolio quality, size, age, gender) and macroeconomic variables (such as GDP, GNI and inflation) have a bearing on efficiency of MFIs.

Few studies made by Kereta (2007), Kidane (2007), Yirsaw (2008), Duressa (2009), Ejigu (2009), Asnakew (2012) and Yenesew (2014) are worth to consider. However these studies were unable to explore a comprehensive analysis of financing structure, firm characteristics and macroeconomic variables on sustainability and efficiency. The use of these proxies of ROA and ROE by Kereta (2007) and ROA by Yenesew (2014), for example, for sustainability measurement were contrary to proxies suggested by Microbanking Bulletin and MixMarket and used by prominent researchers on MFIs sustainability such as Bogan (2009); Gibson, Albert, and Bernard (2012); Kimando and Kihoro (2012); Qayyum and Ahmed (2010); Abdurrahman and

Mazlan (2014) and other scholars who used financial self-sufficiency ratio as proxy for sustainability.

One of the most prominent studies made on Ethiopian MFIs sector was a study by Duressa (2009) when he conducted an in-depth examination into the entire MFI sector in Ethiopia. While he did not directly test the influence of funding sources (such as grants and deposits), firm specific characteristics (such as the proportion of women borrowers) and macroeconomic variables on MFIs' cost efficiency (cost per borrower), among others, his remarkable studies were related to assessment of the sustainability of Ethiopian MFIs and analysis of outreach of MFIs and their relationship with clients.

The works of Tamene (2012) is also worth to mention here. While he did not consider a separate analysis of drivers of efficiency at all, his analysis of MFIs sustainability entirely focused on internal factors such as loan size and number of active borrowers. He did not consider the impact of macroeconomic variables and other external factors such as GDP growth rate and inflation rate. From the internal factors he did not consider the influence of some components of financing structures (such as the effect of subsidies) on sustainability which were found to be crucial in many studies around the world.

While the objectives addressed in previous studies on Ethiopian MFIs were different and involved mostly of internal characteristics, to the best knowledge of this researcher empirical studies on the Ethiopian microfinance industry exclusively focused on sustainability and efficiency of MFIs are not available. Thus, this study is intended to undertake a comprehensive analysis of the effect of financing structures, firm-characteristics and macroeconomic variables on sustainability and efficiency of Ethiopian MFIs.

## 1.2 Statement of the problem

Several studies have been conducted to determine factors affecting financial sustainability and cost efficiency of MFIs using large and developed MFIs in various countries. The level of significance of these factors in affecting the financial sustainability and efficiency of MFIs, however, varies with studies (Cull et al., 2007 & Christen et al., 1995). However as scholars argued, drivers of both sustainability and efficiency are pertaining to financing structures (reliance on grants, deposit mobilization and leverage); firm characteristics (such as scale of operations, gender, age of MFIs and portfolio quality) and macroeconomic variables (such as GDP growth rate and inflation). To the best knowledge of the author, no such study has been conducted empirically in Ethiopia exclusively focused on drivers of sustainability and efficiency of Ethiopian MFIs. While studies conducted by Kereta (2007), Kidane (2007), Duressa (2009), Ejigu (2009), Asnakew (2012), Yirsaw (2008), Tamene (2012) and Yenesew (2014) are worth to mention, most of these studies focused on limited internal characteristics and failed to consider the influence of subsidies, deposit mobilization, gender and economic growth as components of funding sources, firm characteristics and macroeconomic environment which has rigorously been investigated in many studies in the global microfinance industry.

As an element of MFIs' financing structure, subsidies constituted a certain percentage of total capital of MFIs which makes them in a high risk of dependency and unsustainability particularly when the continuity of donated capital is uncertain and if they are inefficient. On the other hand while many believe also that microfinance plays an important role in empowering women, who are deprived of access to microfinance in many countries, the effect of women borrowers on MFIs' sustainability and cost efficiency is still a topic of intense debate. After all, to this study's best knowledge, the influence of gender on MFIs' sustainability and efficiency has not been dealt with econometrically in Ethiopia so far. Earlier studies in Ethiopia also failed to explore the effect of macroeconomic variables which are empirically found to be important in many countries. Such analysis of sustainability and efficiency can help managers of MFIs and decision makers in the microfinance sector to improve resource allocation, create competitive institution and improve sector performance. Hence this study is made to identify the influence of funding sources, firm characteristics and macroeconomic variables on sustainability and efficiency of MFIs in Ethiopia.

### 1.3 Objectives of the study

The general objective of this study is to empirically test the influence of funding, firm characteristics and macroeconomic variables towards long term sustainability and efficiency of Ethiopian MFIs. The specific objectives are:

- To empirically test the effect of funding sources on financial sustainability of Ethiopian MFIs.
- To identify the effect of firm specific characteristics on financial sustainability of Ethiopian MFIs.
- To empirically test the effect of macroeconomic characteristics on financial sustainability of Ethiopian MFIs.
- To analyze the effect of funding sources on cost efficiency of MFIs in Ethiopia.
- To empirically test the effect of firm specific characteristics on cost efficiency of MFIs in Ethiopia.
- To identify the effect of macroeconomic characteristics on cost efficiency of MFIs in Ethiopia.
- To draw conclusions and forward recommendations to MFIs, government, donors and regulators.

### 1.4 Scope of the study

This study was restricted to analyze the determinants of sustainability and cost efficiency of 13 selected Ethiopian MFIs from the years 2003 to 2012. The study is limited to key areas of funding sources (grants to asset ratio, deposits to loan ratio and leverage), firm specific characteristics (percent of female borrowers, gross loan size, MFIs' age, and portfolio quality) and macroeconomic variables (country level GDP growth rate and inflation rate).

### 1.5 Significance of the study

Measuring MFI sustainability and efficiency calls for proper management and take advantage of grants, deposit mobilization, leverage, gender analysis, experience, portfolio quality and macroeconomic variables. Such analysis can help managers of MFIs, donors and other decision makers in the microfinance sector to improve resource allocation, improve sector performance, and to enhance competitive in the microfinance sector. Given limited domestic studies exclusively on

sustainability and efficiency determinants, the study was conducted to bridge the information gap in the measurement and drivers of sustainability and cost efficiency of MFIs in Ethiopia. The study will also provide recommendations to the regulator of MFIs in Ethiopia, the National Bank of Ethiopia, to set sound standards of MFIs' operations, to facilitate financial infrastructures and to create sustainable and competitive microfinance sector. The MFI practitioners, donors and the academic industry are also expected to benefit from this study.

### **1.6 Research methodology**

The study used the latest available audited data, predominantly quantitative secondary data, effectively constituted 10 years data collected from 13 microfinance institutions covering the years 2003 to 2012 (but issued by AEMFI from years 2005 to 2014). A total of 130 observations are considered based on availability of data and the need for the quality of resulting estimates. While information related to Ethiopian MFIs' financing structure and firm characteristics are collected from AEMFI and MixMarket database, data on macroeconomic variables (GDP growth rate and inflation) were collected from NBE, MoFED and the World Bank web site. To help in comparison of Ethiopian MFIs with other jurisdiction, additional data are collected from different sources of theoretical literatures and empirical studies.

To measure the predictor variables of financial sustainability of MFIs in Ethiopia, the dependent variable (financial self-sufficiency ratio) takes on seven proxies as explanatory variables. The variables used were grants to asset ratio, deposits to loan ratio, gender (female borrowers' proportion), MFIs' experience, portfolio quality, GDP growth rate and inflation rate. On the efficiency side cost per borrower is taken as a proxy for MFIs efficiency. The explanatory variables to be tested against cost per borrower are: grants to asset ratio, deposits to loan ratio, debt to equity ratio, scale of operation (loan size), gender (female borrowers' proportion), MFIs' experience and GDP growth rate.

The collected panel data are regressed and interpreted by using descriptive statistics, correlation analysis and fixed effect regression model. The purpose of using fixed effect estimation is to enhance the robustness of the model and to control the cross section effects of the intercepts.

The analytical models and variables used in this study are based on theoretical reviews and on suggestions from empirical evidences of the most popular studies discussed in this study.

### **1.7 Structure of the study**

This paper is divided into five chapters. The first chapter sets out the introduction of the study. The second chapters draw related studies and literatures on the topics under discussion. The methodology of the research is presented in chapter three. Findings and discussions are presented in chapter four. Chapter five outlined concluding remarks and recommendations. References and appendices are attached at the end of the document.

### **1.8 Limitations of the study**

The author understood that from the review of relevant documents and empirical evidences he could obtain a fine understanding of the topic under discussion. While commissioning extensive research endeavor on the area is beyond the reach of this study, he strictly focused on the objectives of the study.

## CHAPTER TWO

### 2 LITERATURE REVIEW

#### 2.1 Theoretical review

##### 2.1.1 Concepts of microfinance

Microcredit or microfinance is based on the premise that the poor have skills which remain unutilized or underutilized. It is definitely not the lack of skills which make poor people poor. Charity is not the answer to poverty (Yunus, 2003). He argued that charity only helps poverty to continue and creates dependency and takes away the individual's initiative to break through the wall of poverty. He further emphasized that unleashing of energy and creativity in each human being is the answer to poverty. Thus this demands banking the unbankables, bringing credit, savings and other essential financial services within the reach of millions of people who are too poor to be served by regular banks, in most cases because they are unable to offer sufficient collateral. In general, banks are for people with money, not for people without (Yunus, 2003; Maanen, 2004).

Many argued that initially the term microfinance was closely associated with microcredit which is very small loans to unsalaried borrowers with little or no collateral. This view is shared by Dehejia et al (2005) when they contended that there is a misconception in the minds of many that microfinance and micro-credit are synonymous. They comprehended that while microfinance refers to an array of financial services that include credit, savings, and insurance, micro-credit is the provision of credit by non-bank financial intermediaries or commercial banks which is usually used as capital for small business. They further noted that MFIs are known to charge very high (30% - 60%) nominal interest rates to cushion themselves from perceived risks due to the target client's lack of collateral as a guarantee against default.

Ramath & Preethi (2014) understood that the definition of microfinance varied with time, region and among scholars. In some regions, for example Southern Africa, microfinance is used to describe the supply of financial services to low-income employees, which is closer to the retail finance model prevalent in mainstream banking. In India it is considered as a powerful tool to

alleviate poverty and defined microfinance as a provision of thrift, credit and other financial services and products of very small amounts to the poor in rural, semi urban or urban areas for enabling them to raise their income and improve living standards(Ahmed and Kumar, 2014). For the International Labor organization (ILO), microfinance is a way to promote economic development, employment and growth through the support of micro-entrepreneurs and small businesses. Still for some, microfinance is a movement whose object is a world in which as many poor and near-poor households as possible have permanent access to an appropriate range of high quality financial services, including not just credit but also savings, insurance and fund transfers (Barreto et al ,2014).MicrofinanceGateway-CGAP provided a more compressive definition of microfinance. It defined microfinance as the provision of financial services to low-income people. It refers to a movement that envisions a world where low-income households have permanent access to high-quality and affordable financial services to finance income-producing activities, build assets, stabilize consumption and protect against risks. From these definitions we can understand that microfinance has evolved to include a range of financial products, such as savings, insurance, payments and remittances.

### **2.1.2 Development of microfinance**

The history of microfinance traced back as far as the middle of the 1800s, when the theorist Lysander Spooner was writing about the benefits of small credits to entrepreneurs and farmers as a way of getting people out of poverty. Independently of Spooner, Friedrich Wilhelm Raiffeisen founded the first cooperative lending banks to support farmers in rural Germany(Kannan and Panneerselvam, 2013).

In the early 1900s, according to Global Envision (2006), various adaptations of what we call today “microfinance” began to appear in parts of rural Latin America. While the goal of such rural finance interventions was usually defined in terms of modernizing the agricultural sector, they usually had two specific objectives: increased commercialization of the rural sector, by mobilizing “idle” savings and increasing investment through credit, and reducing oppressive feudal relations that were enforced through indebtedness. In most cases, these new banks for the poor were not owned by the poor themselves, but by government agencies or private banks. Over the years, these institutions became inefficient and at times, abusive. During this period many of

these institutions transformed themselves into formal financial institutions in order to access and on-lend client savings, thus enhancing their outreach (<http://cgap.org>, cited in [www.kiva.org](http://www.kiva.org)).

Between the 1950s and 1970s, governments and donors focused on providing agricultural credit to small and marginal farmers, in hopes of raising productivity and incomes. These efforts to expand access to agricultural credit emphasized supply-led government interventions in the form of targeted credit through state-owned development finance institutions, or farmers' cooperatives in some cases, that received concessional loans and on-lent to customers at below-market interest rates. These subsidized schemes were rarely successful. Rural development banks suffered massive erosion of their capital base due to subsidized lending rates and poor repayment discipline and the funds did not always reach the poor, often ending up concentrated in the hands of better-off farmers (<http://en.wikipedia.org/wiki/microfinance>).

The modern use of the expression "micro financing" has roots in the 1970s when organizations, such as Grameen Bank of Bangladesh with the microfinance pioneer Muhammad Yunus, were starting and shaping the modern industry of micro financing. Through Grameen Bank, the modern microfinance pioneer, Yunus, was able to offer access to very small amounts of capital with no collateral requirements and at a very low interest rate, which was almost unheard of when the loan is provided to the poor (Armendáriz and Morduch, 2010).

Meanwhile, experimental programs in Bangladesh, Brazil and a few other countries extended tiny loans to groups of poor women to invest in micro-businesses. This type of microenterprise credit was based on solidarity group lending in which every member of a group guaranteed the repayment of all members. These "microenterprise lending" programs had an almost exclusive focus on credit for income generating activities (in some cases accompanied by forced savings schemes) targeting very poor (often women) borrowers (Global Envision, 2006). Since the mid-1990s, as Global Envision (2006) underscored, the term "microcredit" began to be replaced by a new term – "microfinance" – that emerged to include not only credit, but also savings, insurance, payments, remittances and other financial services.

In referring to studies on Ethiopian microfinance industry, the delivery of financial services in Ethiopia through microfinance has increased in a brief period of time (Amha, 2013). As a result the number of microfinance institutions now stands at 31 with a remarkable outreach of over 3 million clients typically in the low income bracket. By the end of 2013/14, their overall performance was encouraging as their total capital and total asset increased by 24.6 and 38.6 percent and reached Birr 5.6 billion and Birr 24.5 billion, respectively. At the same time, their deposit mobilization and credit provision have expanded remarkably. Compared to last year, deposit mobilization of MFIs went up by 54.8 percent and reached Birr 11.8 billion while their outstanding credit rose by 31.9 to reach Birr 16.9 billion percent indicating their expanded outreach (NBE, 2014). However the MFI industry in Ethiopia seemed to be dominated by few numbers of MFIs which demands analysis of long-term survival and efficiency of the entire sector.

Today, globally, microcredit and microfinance have received extensive recognition as a strategy for poverty reduction and for economic empowerment. They comprise a wide range of institutions, from credit unions and cooperatives to NGOs, government agencies, private companies and commercial banks. Currently there are more than 10,000 MFIs globally and around 1.2 billion adults with no banking account indicating significant potential. Despite this tremendous growth only around 500 of these MFIs are self-sustaining in economic terms and this has led to a greater focus on the financial sustainability of MFIs (ResponsAbility, 2014).

While much progress has been made in developing a viable, commercial microfinance sector in the last few decades, several challenges remain that need to be addressed before the industry be able to satisfy massive worldwide demand as: lack of emphasis on sustainability, MFI inefficiency, in appropriate use of grants, poor portfolio quality, high cost of microfinance loans and mission drifts. Mission drift the phenomenon through which MFIs increasingly try to cater to customers who are better off than their original customers(Sharma, 2000; CGAP, 2004; Nawaz, 2010; Ruchi and Asha, 2012; Armendáriz & Morduch 2005). Inadequate emphasis on financial sustainability is the most serious problem of microfinance institutions which is prevailed among many NGOs, government directed microcredit programs, state-owned banks and cooperatives providing microfinance services. As a result, only few microfinance institutions

are sustainable; most are neither moving toward sustainability nor reducing subsidy dependence. Sustainability is important from an equity perspective because only viable institutions can leverage funds in the market to serve a significant number of clients (Sharma, 2000).

Institutional inefficiency resulted from improper utilization of grants has also led to question the role of donors. A large proportion of the money they spend is not effective, either because it gets hung up in unsuccessful and often complicated funding mechanisms (for example, a government apex facility), or it goes to partners that are not held accountable for performance. In some cases, poorly conceived programs have retarded the development of inclusive financial systems by distorting markets and displacing domestic commercial initiatives with cheap or free money (CGAP, 2004).

### **2.1.3 Financial sustainability in MFIs**

Diverse literatures noted that sustainability is one of the areas that we need to look at to assess microfinance establishments. In the early days when MFI started they were financed by donor funds that have a poverty eradication goal. This brought the need for MFIs to be measured on how much MFI reach to the poor and how far the lives of those who get financial services are changing as compared to those who don't get these services. But as the MF industry grows in size, the need for increased financing coupled with unpredictability of donor funds trigger the issue of building a sustainable MFIs that stand on their own leg. Meyer (2002) also stated that the financial unsustainability in the MFI arises due to un-materialization of funds promised by donors or governments. Hence MFIs shall start covering their own cost of operation from their program revenues. Thus we can loosely define sustainability as the ability of an MFI to cover its operating and other costs from generated revenue and provide for profit. It is an indicator which shows how the MFI can run independent of subsidies. This change in emphasis has created a different perspective on the analysis of performance of the MFIs (Basu and Woller, 2004). Sustainability in simple terms refers to the long-term continuation of the microfinance program after the project activities have been discontinued (Ahlin and Lin, 2004).

Brand and Gerschick (2000) noted that the continued commercialization of the microfinance industry and the market forces it has unleashed are powerfully impacting the field and the

priorities of the relevant players. More specifically, increased competition, discriminating customers, growth and institutional development demands, regulation and donor fatigue are placing new pressures on MFIs. The number of institutions serving the once-neglected microfinance market is increasing, as is the quantity and sophistication of clients served. Neither competitors nor knowledgeable customers tolerate complacency. Hence MFIs must better leverage their scarce resources to survive let alone succeed. This pressure is particularly acute for MFIs operating in market sectors that are highly competitive or particularly challenging to reach such as poorer clients or rural areas.

In measuring sustainability, Meyer (2002) noted that there are two kind of sustainability that we could observe in assessing MFIs sustainability: Operational self- sustainability and financial self-sustainability. Operational self-sustainability is when the operating income is sufficient enough to cover operational costs like salaries, supplies, loan losses, and other administrative costs. Financial self-sustainability on the other hand is when MFIs can also cover the costs of funds and other forms of subsidies received when they are valued at market prices. A more popular definition of financial self-sustainability was suggested by MicroBanking Bulletin, CGAP, MixMarket and others by which financial sustainability is defined as total adjusted revenue as a percent of total adjusted expenses such that the result should be greater than or equal to 100%. Thus financial sustainability is MFIs' ability to cover all costs on adjusted bases and indicate its capability to operate without ongoing subsidies including soft and grants (AEMFI, 2014; CGAP, 2003). The adjustment goes to inflation, loan loss provisioning and cost of capital. Mayer believed that financial self-sufficiency is a high standard measure of sustainability and brings long term perspectives for MFI operations than operational self-sufficiency. According to him the poor needed to have access to financial service on long-term basis rather than just a one-time financial support. Short-term loan would worsen the welfare of the poor.

According to Ledgerwood (1999) on the other hand, the sustainability of MFI is measured in many parameters. This includes among others: Financial viability indicators and profitability indicators. He indicated that common indicators of financial viability include Financial Self Sustainability (FSS) financial spread, Operational Self Sustainability (OSS) and Subsidy Dependence Index (SDI). A related measurement of sustainability was presented by Hulme and

Mosely (1996) and Mayer (2002) when they pointed out that loan repayment, measured by default rate, could be another explanatory factor for financial sustainability of MFIs; because, low default rate would help to realize future lending. CGAP (2003), too, provided a related measurement when it showed that portfolio quality can be used as a measurement tool because portfolio quality ratios provide information on the percentage of non-earning assets, which in turn decrease the revenue and liquidity position of MFIs. On the other hand Rutherford (2000) claimed that financial sustainability is to charge an interest rate that is high enough to cover operating costs, loan losses and interest and adjustment expenses. However, MFIs must operate efficient enough that reasonable, affordable and competitive interest rates can be charged to cover these costs. Therefore, long term sustainability requires MFIs to manage delinquency, keep their cost of capital low by mobilizing savings, rotate their portfolio efficiently, keep operating costs to the minimum and most importantly, set interest rates to cover all these costs.

Leverage and capital adequacy ratios and scale and depth of outreach indicators are also considered by many scholars as proxies of microfinance sustainability. Ledgerwood (2009) defined leverage as to the extent to which a MFI borrows money relative to its amount of equity. In other words, it answers the question of how many additional dollars can be mobilized from commercial sources for every dollar worth of funds owned by the MFI. The most widely used measure of leverage is the debt equity ratio. Capital adequacy refers to the amount of capital an MFI have relative to its assets. Capital adequacy means there is a sufficient level of capital required to absorb potential losses while providing financial sustainability. The measure used for capital adequacy is the ratio of capital to risk weighted assets.

Scale and depth of outreach indicators are non-financial indicators of performance. Scale of outreach indicate the scale of MFIs activities as measured by the number of clients served with different type of instruments such as saving and credit. Depth of outreach measures the type of clients served and their poverty level. The proxy for depth of outreach used in various studies is average loan size per GNI per capita, the percentage of women borrowers and percentage of rural clients (Ledgerwood, 1999).

#### 2.1.4 Cost efficiency in MFIs

Recently there seems to be a shift from subsidizing MFIs institutions to a focus on cost efficiency of these institutions. This goal stresses the importance of being able to cover the cost of lending money out of the income generated from the outstanding loan portfolio and to reduce these costs as much as possible. Among other things, this increased focus on MFI efficiency is due to a number of developments the microfinance business has been recently confronted with, such as the increasing competition among MFIs, the commercialization of microfinance (i.e. the interest of commercial banks and investors to finance MFIs), technological change that has become available for and implemented in microfinance liberalization and regulation policies of the government (Rhyne and Otero, 2006). These developments have induced microfinance institutions to change their behavior and to broaden their services and activities.

The study of efficiency of MFIs is relevant because it can shed light on knowing and addressing their weaknesses as a key to moving past them (MixMarket,2009).Through addressing efficiency,MFIs can adopt to become more competitive over time. MixMarket (2009) underlined that as MFIs can guarantee expanding the access to financial services to the millions of currently underserved microenterprises, in-depth investigation of MFI efficiency is relevant since it can help managers of MFIs and decision makers in the microfinance sector to improve resource allocation and improve sector performance. Until recently most microfinance research focused on whether access to finance is beneficial for economically poor entrepreneurs and families. While efficiency studies are common in banking, such research on MFI is still in its infancy.

Many recognized that the industry has now grown big and MFIs serve hundreds of millions of clients.This requires MFIs to measure how well the available resources are utilized to maximize output. Thereforemany argued that the unit transaction costs for small loans to the poor are high as compared to unit costs of larger loans (Hulme and Mosley, 1996and Lapenu and Zeller, 2001). Reaching the poor and providing them with credit may be very costly because making very small loans involves high transaction costs, in terms of screening, monitoring and administration costs, per loan. Thus, there may be a trade-off between efficiency and outreach, implying that the shifting focus towards increasing efficiency reduces the scope for the more traditional aim of many MFIs, which is lending to the poor.

In measuring efficiency Ledgerwood (1999) emphasized that efficiency ratios provide information about the rate at which the MFI generate revenue to cover their expense. On the other hand productivity refers to the volume of business that is generated (output) for a given resource or asset (input). Common measures of productivity include the number of active loans per credit officer, and average portfolio outstanding per credit officer. Efficiency refers to the cost per unit of output. Common efficiency ratios includes cost per borrower ,operating cost ratio, salaries and benefits to average portfolio outstanding, average credit officer salary as a multiple of per capita GDP, cost per unit of currency lent and cost per loan made.

Smirlok (1985) on the other hand considered market share as a proxy for efficiency. He noted that the efficiency hypothesis prevails when a significant positive correlation between market share and profitability is signaled. This method implicitly assumes that a higher market concentration is the main source of market power. It is difficult to hold the assumptions of this theory in microfinance industry as we cannot assume a correlation between MFI profitability and market concentration for efficiency to exist .Evidences showed that efficiency in MFIs does not always achieved as a result of market power, rather it is influenced by funding sources (subsidies vs. commercialization), the specific characteristics of MFIs and microeconomic environment.

However the most popular measure of efficiency is cost per borrower. Because smallloan are inherently expensive, this ratio uses the borrower as the reference unit. That is as this ratio count clients rather than amounts, these indicators have the advantage of not prejudicing MFIs which offer smaller loans and savings accounts.An MFI is usually regarded as having become more efficient when it lowers this indicator. If one wishes to benchmark an MFI's cost per client against similar MFIs in other countries, the ratio should be expressed as a percentage of per capita GNI, which is used as a rough proxy for local labor costs (CGAP, 2009).

## 2.2 Determinants of MFIs' sustainability and efficiency: Theoretical reviews

### 2.2.1 MFIs' financing structure: Funding sources

Financing structure is a financial tool that helps to govern how firms choose their funding structure. Most MFIs in the world started off as NGOs and had built substantial supply side competencies which makes funding structure had no relevance. However, with development and commercialization, MFIs are spanned off to become fully independent, the enigma of funding structure that will ensure sustainability becomes relevant. During any time of financial or banking crisis, when bailout aid is available, questions of capital structure become more salient. What is the best mix of grant, debt and equity funding which will ensure solvency and self-sufficiency? The question of optimal capital structure for MFIs, particularly ones with access to grant funding, is an open and weighty question (Bogan, 2009 and Olufemi et al, 2013)

**Grants as an element of MFIs' funding sources:** Bogan (2009) noted that existing research places the evolution of MFI funding sources within the context of an institutional life cycle theory of MFI development. According to this framework of analysis, most MFIs start out as NGOs with a social vision, funding operations with grants and concessional loans from donors and international financial institutions that effectively serve as the primary sources of risk capital for the microfinance sector. Thus, the literature on microfinance devotes considerable attention to this process of "NGO transformation" as a life cycle model outlining the evolution of a microfinance institution (Helms, 2006). Generally, the life cycle theory posits that the sources of financing are linked to the stages of MFI development. Donor grants and "soft loans" comprise the majority of the funding in the formative stages of the organization. As the MFI matures, private debt capital becomes available but the debt structures have restrictive covenants and/or guarantees. In the last stage of MFI evolution, traditional equity financing becomes available (Fehr & Hishigsuren, 2004). Farrington and Abrams (2002) provide evidence that supports the life cycle theory, noting an increase in competition in MFIs as they increase in number and documenting a spread in regulation facilitating a change in the capital structure of the industry.

In recent years, there has been increasing internal and external pressure for the MFIs to decrease dependence on subsidized or grant funding. For example, ACCION International, an organization designed to support MFIs, helps MFIs obtain equity financing, debt financing, and other commercial funding instruments. By enabling MFIs to link directly with investors and

commercial banks, ACCION strives to help them become independent of donor funds. Over the past decade, ACCION has been highly influential in encouraging donors to subsidize start-up costs only and pushing for MFIs to have a commercial focus (Armendariz de Aghion & Morduch, 2004). Since donor funds are limited in amount, reliance on donor funding limits the ability of MFIs to expand to meet rising demand for services. There is also a question as to whether reliance on donor funds allows MFIs to avoid pressures to operate efficiently. Commercially-funded MFIs respond to the profit incentive, working to increase revenues and decrease expenses so that they can have revenues sufficient to cover all operating expenses. MFIs with access to donor funds may not respond to these pressures to operate efficiently or may deliberately choose outreach over efficiency by serving poorer or rural clients with higher delivery costs (Armendariz de Aghion & Morduch, 2005). Concerns over the dangers of excessive subsidization in microfinance have been prevalent since the 1980s and as a result, the goal of serving the poor has been twinned with the goal of long-term financial self-sufficiency for some time (Morduch, 2005).

Bogan (2009) noted that despite keen interest in possible links between funding sources and sustainability and in studies of relative profitability of individual institutions, there have been no systematic studies for a large group of MFIs that provide robust evidence of how variations in funding or institutional structure affect MFI performance. This paper aims to analyze the impact of donor fund on MFIs' sustainability and cost efficiency.

**Deposit mobilization:** Sustainability of MFIs depends on their saving mobilizing capacity. Deposit to loan ratio is an important indicator for MFIs that mobilize deposits. Deposit to loan ratio measures that portion of the MFIs' portfolio funded by deposits. The higher the ratio the greater is the MFIs' capability to fund its loan portfolio from its deposits and enhances commercialization of microfinance operation. Thus higher ratio brings down the cost of funds and helps MFIs to rely on internal funding. Deposit mobilization has now becoming more important in Ethiopia as commercial banks seem to be reluctant to fund MFIs' portfolio through their debt. Some commercial banks lent to MFIs, with strong third party guarantee (AEMFI, 2014).

**Leverage:** Debt to equity ratio is the simplest measure firm leverage and believed as the drivers of MFIs sustainability and efficiency. Although maintaining best mix of debt and equity is still the subject of intense debate among scholars, three popular theories are emerged to define the appropriate mix of equity and debt so as to enhance firms' return and efficiency. In 1958 Modigliani and Miller published a seminal work in capital structure where they concluded to the broadly known theory of "capital structure irrelevance" where the capital structure is irrelevant to firm performance in perfect capital markets. This view is further supported by Berk & DeMarzo (2007) when they argued that the law of one price implied that leverage would not affect the total value of the firm. Instead, it only changes the allocation of cash flows between debt and equity, without changing the total cash flows of the firm. The Modigliani and Miller theorem holds true under the assumption of a perfect capital market, which means: individuals and firms trade at the same, no taxes exist and no transaction costs exist. However this scenario are unlikely to happen in real world particularly in the MFI sector under which all these assumption cannot be hold true and less straight-forward. The basic MM principles are applicable to MFIs, but only after accounting for the fundamental differences in how MFIs and corporations operate (Cohen, 2003). The manner in which revenues are generated and the nature of regulation for an MFI are markedly different from that of a corporate firm. Consequently, the theoretical notion of an optimal capital structure for MFIs' to become solvent and sustainable is not very well-defined. The issue of grant money adds another layer of complication to the capital structure question for MFIs. Does grant money create moral hazard or incentive issues with respect to MFI towards sustainability? Thus, within the context of the MFIs capital structure discussion, one is required to consider issues similar to the grant versus concessional loan debate in the foreign aid literature (Bogan, 2009).

On the other hand the pecking order theory of capital structure is emerged as one of the most influential theories of corporate finance. The pecking order theory is popularized by Myers and Majluf (1984) when they argued that equity is a less preferred means to raise capital because when managers issue new equity, investors believe that managers think that the firm is overvalued and managers are taking advantage of this over-valuation. As a result, investors will place a lower value to the new equity issuance. The order of preferences reflects the relative costs of the various financing options. In reference to this theory Mayer (2001) noted that the pecking

order theory explains why the bulk of external financing comes from debt. It also explains why more profitable firms borrow less: not because their target debt ratio is low but because profitable firms have more internal financing available. Less profitable firms require external financing, and consequently accumulate debt. However in reference to pecking order theory many MFIs in Africa may represent an interesting scenario since retained earnings are zero and perhaps following the pecking order MFIs may opt for debt since quite a number of them have no access to capital market. If we find evidence that is consistent with the pecking order theory then our results should highlight a negative relationship between leverage and MFI sustainability (James, 2003).

The monotonic increase of debt for higher tax shield increases bankruptcy cost especially when profitability of the firm is low and fluctuating. This leads to trade off theory of capital structure that postulates an optimum debt level or target level, where the marginal increase of present value of tax saving is just offset by the same amount of bankruptcy cost. The tradeoff theory says that the firm will borrow up to the point where the marginal value of tax shields on additional debt is just offset by the increase in the present value of possible cost of financial distress. According to Myres (2001) financial distress refers to the costs of bankruptcy or reorganization, and also to the agency costs that arise when the firm's creditworthiness is in doubt (Myers, 2001). Although we may not be able to determine the exact debt target level objectively in microfinance, because of MFIs industrial organization, trade off theory explains that there is a limit to debt financing and the target debt may vary from MFI to MFI depending on profitability, among a host of other factors. Consistently, profitable MFIs with lot of tangible asset that can be offered as collateral for debt may have a higher target debt ratio. Simply put high proportion of fixed interest capital to equity would imply that the MFI is highly indebted and therefore risks becoming insolvent increases. On the other hand highly leveraged MFIs may perform better by enjoying scale economies, enhancing their ability to boost profitability (James, 2003).

### 2.2.2 Firm specific characteristics

**Scale of operation:** In commercial microfinance, scale of operation refers to the scale of financial products and services provided to the poor by MFIs. The quality and the level of financial products and services are likely to be adapted to meet the demands of the poor which ensures that the right financial products and services are provided to the right people (Vingo, 2012). MicroBanking Bulletin (2009) provided criteria for defining MFIs' scale of operation based on their gross loan size. Accordingly MFIs having gross loan portfolio of greater than \$8 million can be considered into large scale MFIs, medium MFIs do have gross loan size of \$2million to \$ 8million and small scale MFIs do have gross loan size less than \$2 million. Vingo (2012) too used gross loan size as proxy to measure MFIs' scale of operation. He suggested that gross loan portfolio was positively related to sustainability, as well as profitability. According to him an increase in outstanding loans (scale of operation) tends to help MFIs achieve higher self-sufficiency. However, he noted that due to diseconomies of scale, large scale operation could lead to an increase in the unit cost and there is also a limit of scale due to bounded rationality.

**Gender in Microfinance:** The focus on women within microfinance has been widely documented in the literature (Yunus, 2002). Empowering women is one of the important objectives for microfinance (Swain and Wallentin, 2007, Vingo, 2012). Among many, Morduch (1999) argues that one of the main reasons for the success of microfinance in the public eye is the targeting of women. Microfinance has generally targeted poor women by providing chances to access financial services (Yunus, 1999; Cheston and Kuhn, 2002; Vingo, 2012).

Various arguments that relate to both supply and demand for microcredit can explain the targeting of women by microfinance organizations (Armendariz and Morduch 2005; Mayoux 1999). Firstly, demand for microfinance services is probably higher among women for a number of reasons. In many countries, women are more credit constrained than men. They are more restricted in their access to finance and control over land (Agarwal 1994) and capital (Fletschner 2009). Consequently they are considered less creditworthy by traditional banks. Lower education levels, as well as limited time and mobility also prevent them from engaging with the complex and lengthy procedures usually requested by the formal banking sector (D'Espallier et al, 2009). Through microcredit, women can achieve multiple productive activities and diversify their sources of income more than men. Thus, a higher percentage of female borrowers also indicate

more depth of outreach, because lending to women generally is related to lending to the poor (Hermes and Lensink, 2007). Secondly, a growth in the numbers of women in self-employment and entrepreneurial activities explain increased demand for microcredit (Armendariz and Morduch 2005; Kevane and Wydick, 2001). Moreover, women are more likely to pay the high interest rates required by many MFIs since they are more restricted in their access to the formal labor market (Emran et al. 2006). As far as supply is concerned, three main arguments are usually put forward by donors or practitioners in favor of targeting women: gender equality, poverty reduction and efficiency (Mayoux 2001).

With the growing commercialization of microfinance, however, it remains to be seen whether women will continue to be the main focus of microfinance in the future. A growing number of nonprofit MFIs have shifted towards commercialization of their serves. However, the focus on commercialization and self-sustainable MFIs has triggered serious debate within the field. Some argue, commercialization might lead to a ‘mission drift’, where MFIs turn to more profitable customers, while others argue that female targeting and financial sustainability are perfectly compatible, since female targeting within microfinance has often been attributed to increased efficiency through high female repayment rates (Armendariz and Morduch, 2005). Hence, the connection between female targeting and microfinance performance is highly controversial and unsolved.

**Portfolio quality:** This is the most revealing of the performance areas. An MFI must have the ability to collect loans for its success: if delinquency is not kept to very low levels, it can quickly spin out of control (Rosenberg, 2009, Cited in Vingo, 2012). Furthermore, loan collection has proved to be a strong proxy for general management competence. Long experience with evaluating microfinance has shown that very few successful projects have bad repayment, and very few unsuccessful projects have good repayment. More than any other indicator, this one deserves special care to ensure meaningful and reliable reporting. Therefore, this aspect of performance tends to be indirectly investigated by examining efficiency. Vingo (2012) underscored that MFIs have used a range of ratios that measure very different things and terminology and calculation methods are not always consistent. Ratios can obscure rather than clarify performance if they are not calculated according to international standards. Therefore,

whenever any measure of loan repayment, delinquency, default, or loss is reported, the numerator and denominator of the ratio should be explained very precisely. The common indicator is portfolio at risk (PAR) beyond a specified number of days. When any full or partial payment is past due, the whole outstanding balance of the loan is at higher than normal risk of non-repayment.

Recovery rate is another parameter used to portfolio quality. According to CGAP (2009) as the microfinance movement matures, both microcredit practitioners and the donors who fund them are focusing more consistently on the importance of portfolio quality: how well are MFIs recovering the money they lend? Loan recovery is, after all, the most basic ingredient of long-term sustainability. MFIs use dozens of ratios to measure delinquency. Depending on which of them is being used, a “98 percent recovery rate” could describe a safe portfolio or one on the brink of meltdown.

CGAP (2009) also acknowledged that portfolio at risk ratio is the most widely accepted measure of portfolio quality and it showed the portion of the portfolio that is “contaminated” by arrears and therefore at risk of not being repaid. The older the delinquency rate, the less likely that the loan will be repaid. Many pretended that any portfolio at risk exceeding 10% should be cause for concern, because unlike commercial loans, most microcredits are not backed by bankable collateral. The same source informed that Finaciera Visión, FinAmerica, BancoSol, Caja los Andes and FIE is the exceptions to this rule, as all have lowered their risk by backing loans with commercial assets at a greater rate than the rest of the industry. In those cases, a higher portfolio at risk ratio does not necessarily translate into expected losses for the institution.

### **2.2.3 Macro-economic environment**

The previous empirical studies suggested that macroeconomic variables are based primarily upon an economic tradition, emphasizing the importance of external market factors in determining a firm’s success. These typically include inflation, GDP growth rate, GDP per capita, GNI per capital, population, unemployment rate and interest rate differentials. Vingo (2012) indicated that the common approach has been to study the impact of macroeconomic factors by investigating

the impact of GDP growth and inflation on performance. The inflation indicator refers to a rise in the general level of prices of goods and services in an economy over a period of time.

When the general price level rises, each unit of currency buys fewer goods and services. Most economists favor a low and steady rate of inflation. In order to be worth the same amount, the income or savings and investments are expected to increase by at least the rate of inflation each year to avoid losing value in real terms. It is common sense that the rate of interest earned from savings is greater than the rate of inflation, in order for money to actually be growing. If the interest rate on savings is lower than the inflation rate, the poor find it difficult, or even impossible, to beat inflation. Therefore, the inflation rate becomes one of the most common indicators in investigating the effects of macroeconomic factors on sustainability and efficiency. Inflation is measured at time  $t-1$  annual percentage change of the GDP deflator at market prices for each country where the MFI is located for each year (Vingo, 2012).

## 2.3 Empirical evidences on drivers of sustainability and hypothesis development

Following the theoretical reviews, the sections below provides the empirical results on the determinants of financial sustainability revealed from various studies and established research hypotheses accordingly. As stated in the previous section the proxy for measuring sustainability is the financial self-sufficiency ratio of MFIs suggested by MicroBanking Bulletin, CGAP and MixMarket and applied by studies discussed in this study.

### 2.3.1 MFIs' financing structure and sustainability

**Grants and deposit mobilization:** Many studies made around the world underscored the importance of financing structure or funding sources on sustainability. Studies made by Matu (2008), Bogan (2009) and Magali (2012) underscored the negative role grants on MFIs' viability. Bogan (2009) claimed that the negative effect of grants were a particularly meaningful result given that it is consistent with a growing view that MFIs should rely less on grants, soft loans and other types of donor funds. Sekabira (2013), too, hypothesized that grants and debts erode sustainability whereas share capital and assets improve it and found the same result as predicted. Sekabira argued that government policy must limit MFIs access to grants and debts. This study recommended that terrible financial need by small holders must only be solved through direct aid to the needy such as food stamps, universal education, health care and others. The same author concluded that banking policy must premier share capital accumulation by MFIs and their close monitor by central banks. However, the author argued that if terms and conditions under which grants are disseminated change to optimal level, grants may have a positive influence on MFI sustainability, though changing grant's terms may seriously jeopardize short term objectives and intended purposes of grants.

However, many understood that, the negative impact of subsidies was more recognized when many MFIs faced liquidity problems during the financial crises. As rising financial costs and the fluctuations of exchange rates affects MFIs who rely on external finance, many of the MFIs have started to fund at least part of their lending activity by using local savings. This was indeed supported by Deutsche Bank (2012) when it found that many institutions were able to achieve high growth rates by retaining profits and by attracting additional funds from commercial sources rather than subsidies. The Deutsche Bank claimed that over time, an increasing share of

institutions no longer depended on donations to expand their business, although many MFIs still benefit from them. This has indeed led to the importance of savings on MFI sustainability.

In appreciating the impact of savings on sustainability, Morduch and Haley (2002) also argued that savings help MFIs to achieve independence from donors and investors, which is particularly important in periods of liquidity. On the other hand Ravicz and Cluster (1998) claimed that microfinance initiatives can reduce, and even eliminate the need for subsidies if they achieve a significant volume of business so that they can be sustainable.

Vingo (2012) gave reference to Gozalez and Meyer (2009); Wright and Elser et al., (1999) and understood that deposits are more than half of the total assets reported by financial institutions that have deposit mobilizations because depositors enjoy certain benefits, such as access to loans constraints. This makes savings a relatively low cost of funds and hence increasing sustainability. This view is also appreciated by Vingo (2012) when he argued that deposits are a relatively stable and low-cost source of funds. He concluded that profitable and regulated microfinance institutions which take on considerably more commercial funds are shown to have higher sustainability which in turn emphasizes the negative impact of subsidies on sustainability. Contrary to this Janner (2012) found that the control variables of MFIs' savings to assets in Asia do not have any statistically significant effect in any of the models.

Therefore these empirical evidences and theoretical reviews (with few empirical exceptions) point to the fact that while subsidies could erode sustainability deposit mobilization support loans and could enhance sustainability. Hence, the two hypotheses are proposed as follows:

*HA1: Grants to asset ratio has a significant negative effect on sustainability of Ethiopian MFIs.*

*HA2: Deposits to loan ratio has a significant positive effect on sustainability of Ethiopian MFIs.*

### **2.3.2 Firm characteristics and sustainability**

**Women borrowers' proportion:** Several empirical evidences claimed that a focus on female has often been attributed to enhanced efficiency through low default rate (D'Espallier et al, 2009; Armendariz and Morduch, 2005; Mayoux, 1999). Mayer (2002) noted that women often face

greater problems than men in accessing financial services so number of women served is often measured as another criterion. This view is supported by Hermes and Lensink (2007) when they showed that a higher percentage of female borrowers indicate more depth of outreach, because lending to women generally is related to lending to the poor. They argued that through microcredit, women can achieve multiple productive activities and diversify their sources of income more than men. Ruchi and Asha (2012) also contended that woman should be the primary focus of service delivery and hence increasing sustainability.

Evidences showed that women are less likely to default on their loans than men. MFIs have expanded the frontiers of institutional finance and have brought the poor, especially poor women, into the formal financial system by enabling them to access credit in order to fight poverty (Bogan, 2009). Microfinance empowers women by providing loans and giving chances to earn an independent income and contribute financially to their households and communities (Sujatha, 2011).

According to a study by Cull et al (2007) from 49 developing countries the percentage of women borrowers is found to be 64.9% which in turn contributes to sustainability of MFIs. Khandker (2003) and Onumah and Acquah (2011) noticed that the outreach of the inventory credit program (ICP) in Ghana in terms of percentage of women clients expanded from 20-39% respectively. In their study, they found that access to microfinance contributes to poverty reduction, particularly for women participants, and to overall poverty reduction at the village level of all states. This focus on women is questioned sometimes however.

Contrary to this, Vingo (2012) too, revealed that there were negative relationships between share of lending to women and sustainability which were also, according to his claim, consistent with the results of the comprehensive review in his study.

Although quite few studies still showed the negative effect of the size of women borrowers on MFIs' sustainability, much of the findings and theoretical reviews discussed so far point to the fact that higher proportions of women borrowers enhances financial sustainability of MFIs. Therefore, the research hypothesis of this study would be:

*HA3: Size of female borrowers has a significant positive impact on sustainability of Ethiopian MFIs.*

**Experience:** Results on the effect of MFI maturity on sustainability indicated a mixed attribution on MFIs' sustainability. Kipsha (2013) and Megali (2013) indicated that age of MFIs has a positive impact on the profitability of MFIs' and rural SACCOS reviewed in Tanzania. The result indicated that the growth of such institutions is expected to increase with the age of the institutions as results of experience, innovations, technology as well economies of scale. Ayayi and Sene (2009) discovered that the age of MFIs have a positive but lesser impact on attainment of financial sustainability. However contrary to earlier studies Abdurrahman & Mazlan (2014) found that age of MFIs has a negative effect on financial self-sufficiency ratio of MFIs in Bangladesh. On the other hand Nyamsogoro (2010) by using correlation and multiple regression models found out that age of MFI didn't promote financial sustainability at all in Tanzania. Supporting this view Janner (2012) also found that the control variables, age of MFIs, does not have any statistically significant effect in any of the models.

Thus based on the evidences indicated above, there is no consensus among studies on the influence of MFIs' maturity on their sustainability. However taking the enhancing role of MFIs' experience, this study formulated the following hypothesis:

*HA4: The age of MFIs has a significant positive effect on MFIs' sustainability in Ethiopia.*

**Portfolio at Risk (PaR):** Quality of the portfolio as an indicator of credit risk measures how well the MFI are collecting their loans. A loan is considered to be at risk if the payment on it is more than 30 days late and therefore has a risk of not being repaid. This will have an effect on the earnings of the MFI, and therefore it may also have a negative effect on their performance (CGAP, 2006; Mersland, 2011). Janner (2012) too, indicated that portfolio quality has a negatively significant effect on sustainability signaling that sustainability will decrease due to a marginal increase in portfolio at risk

Gwasi and Ngambi(2014) predicted indeterminate result to their hypothesis that performance can be explained by MFIs specific factors and found evidence to support that increased exposure to credit risk is associated with lower MFI sustainability, given that credit granting is the principal source of revenue for these institutions. According to them this negative relationship attests that a higher portfolio at risk would block good financial results. Hence, MFIs should endeavor to

improve the quality of their portfolio at risk in order to ensure their sustainability. This finding is consistent with Peter (2012), Richman and Aseidu (2012), Soltane (2012) which identified credit risk as the biggest risk faced by the MFIs globally.

Therefore on a ground of these, there is a negative relationship between financial sustainability and portfolio at risk. Hence, this study established the following hypothesis:

*HA5: Portfolio at risk is negatively related to sustainability of Ethiopian MFIs.*

### **2.3.3 Macroeconomic variables and sustainability**

**GDP and Inflation:** The previous empirical studies, Hansen and Wernerfelt (1989), Bogan (2009) and Vingo (2012), suggested that macroeconomic variables are based primarily upon an economic tradition, emphasizing the importance of external market factors in determining a firm's success. Bogan (2009) informed that the common approach is to study the impact of macroeconomic factors by investigating the impact of GDP growth and inflation on performance. According to a study from 49 developing countries, which involved investigation of average loan size per GNI per capita on MFIs' performance, indicated that macroeconomic variables are significant contributors of performance. In their empirical study Gwasi and Ngambi (2014) also tested the influence of macroeconomic indicators (GDP growth and inflation) on the sustainability of MFIs. Although statistically not significant, their result showed a negative impact of inflation and a positive impact of GDP growth on the sustainability of MFIs. According to them a positive result of GDP indicated that improving macroeconomic performance raises overall income level and business performance which ultimately improves clients repayment ability and hence sustainability of MFIs. They noted that the negative impact of inflation on sustainability indicated that repayment levels are usually weak and low in the presence of higher inflation rates.

The negative effect of inflation was consistent with the findings of Weele and Markowich (2001) and Vingo (2012). The results from the application of inflation, as Vingo (2012) pointed out, may point to the fact that high inflation may increase the costs of capital and other MFIs' expenses, while borrowers have trouble with the repayment of loans since prices have increased but not wages.

All these evidences emphasized that while GDP growth rate has an enhancing role on sustainability, inflation rate slowdown it. On the ground of these, the study formulated the following research hypothesis:

*HA6: GDP growth rate in Ethiopia positively affect sustainability of Ethiopian MFIs.*

*HA7: Inflation rate in Ethiopia negatively affectsustainability of Ethiopian MFIs.*

## 2.4 Empirical evidences for drivers of efficiency and hypothesis development

Following the theoretical reviews, the sections below provides the empirical results on the determinants of cost efficiency of MFIs revealed from various studies and established research hypotheses accordingly. As stated in the previous section the proxy for measuring cost efficiency is the cost per borrower of MFIs suggested by MicroBanking Bulletin, CGAP and MixMarket and applied by researchers discussed in this paper.

### 2.4.1 MFIs' financing structure and efficiency

**Grants, deposits and leverage:** The effect of subsidies on efficiency is a topic of intense debate in academic and policy circles. The main concerns are that subsidies undercut both scale and efficiency within the MFI, and distort the market by favoring more inefficient institutions (<https://ideas.repec.org/p/sol/wpaper>). Armendariz and Morduch (2005) have stressed the enhancing (efficiency) role of "smart subsidies" that allow MFIs to build their infrastructure and develop the knowhow. However many argued that by offering deposit accounts, rather than relying on grants, MFIs benefit from a relatively low-priced and stable source of funding.

Bogan (2009) tested the connection between capital structure and efficiency (cost per borrower) to address the concern that grants as a percent of assets was serving as a proxy for servicing more costly, lower-income borrowers. He found that grants as a percent of assets is positively related to cost per borrower and is significant at the 5% level. Bogan (2009) argued that the positive relationship between cost per borrower and grant reinforces the view that the long-term use of grants may be related to inefficient operations due to lack of competitive pressures associated with attracting market funding. This supports the idea that reliance on donor funds eliminates the motivation for MFIs to operate efficiently and provides evidence that MFIs are not currently realizing efficiencies due to economies of scale. This evidence by and large, in line with most other empirical evidenced. For example Nawaz (2010) also indicated the implications of subsidization on the cost efficiency measured by cost per borrowers of MFIs. He claimed that the subsidy dependent MFIs are less efficient because of the higher costs associated with granting loans. This in turn means that poorly performing and highly subsidized MFIs can continue operations with little regard for operational costs and subsidies, therefore allowing them to overlook any inefficiency in operations.

On the other hand concerning the effect of leverage on efficiency, Vingo (2012) found that, the effect of financial leverage on cost per borrower was positive for regulated MFIs. This result indicates that regulated MFIs that employ more debt may have higher costs per borrower and are less efficient. However regulated MFIs in Ethiopia currently have an average debt to equity ratio of 250% which is below the international standard of a debt to equity ratio of 500% for MFIs. Thus this study expected that when the source of grants are drying up and deposit mobilization are becoming weak and at the same time when they are required to meet cost efficiency to meet the demands of their clients and to cope up with the increasing pressure of other MFIs, debt to equity ratio may play a positive role in minimizing cost per borrower by providing funds to scale up operations.

Therefore on the ground of the above analysis, research hypotheses are developed as below:

*HB1: Grants to asset ratio has a significant positive effect on cost efficiency of Ethiopian MFIs.*

*HB2: Deposits to loan ratio has a negative effect on cost efficiency of Ethiopian MFIs.*

*HB3: Leverage ratio negatively affects cost efficiency of Ethiopian MFIs.*

#### **2.4.2 Firm characteristics and efficiency**

**Scale of operations:** The loan portfolio of an organization is considered a key determinant of an organization's operating costs and hence is indicative of the organization's size. The inclusion of this variable provides useful insights regarding the economies of scale and reveals whether larger institutions are associated with smaller operating expense ratios and therefore more efficiency (Basharat et al, 2014). Gregoire & Tuya (2006) noted that the cost efficiency of MFIs is affected by loan size. Very small loans are more expensive to make than large ones (Hulme and Mosley, 1996 and Lapenu and Zeller, 2002). Using a sample of more than 1,300 observations, Hermes et al (2008) also found convincing evidence that average loan size is negatively related to cost efficiency of MFIs. More specifically, they found that MFIs that have lower average loan balances, which are a measure of the depth of outreach, are also less efficient.

However few studies revealed contrary results. Vingo (2012) showed that gross loan portfolio was positively related to cost per borrower due to the fact that MFIs may face diseconomies of scale in business expansion which leads to an increase in the unit cost of nonfinancial operating

expenses, such as personnel and administrative expenses. Nawaz (2010) to show that an increase in the loan size raises the cost per borrower thus suggesting well-off customers having larger loans require higher and better level of services which leads to higher costs.

These empirical evidences and theoretical reviews discussed so far underscored that loan sizes can affect efficiency by either lowering down or increasing cost per borrower of MFIs. Thus study establishes the research hypothesis as follows:

*HB4: Gross loan size has a significant effect on cost efficiency of Ethiopian MFIs.*

**Female borrower's proportion:** Many contended that MFIs should focus on women if they want to deepen their services to the poorest of the poor and to become efficient. However still the financial efficiency of female targeting is far from obvious. Armendariz and Morduch, (2005), Mayoux (1999) and D'Espallier et al (2009) argued that female targeting within microfinance has often been attributed to increased efficiency through high female repayment rates. Contrary to these, Hermes et al (2008) found evidence showing that MFIs that have more women borrowers as clients are less efficient. Moreover, Vingo (2012) argued that targeting women is more costly for various reasons: They borrow smaller amounts, they are less mobile and less educated, and they need additional services like health, education, literacy and child care. Hence these makes commercial funders to avoid intentionally focusing on the lending methodologies and lending to women in order to give MFIs more room for innovation and efficiency. Vingo (2012) emphasized that deliberately focusing on lending to women leads MFIs to additional activities which could increase their operating expenses and therefore making them less efficient.

The above analysis showed that while few empirical evidences suggested that percent of female borrowers could increase cost per borrower of MFIs, many still believe that size of female borrowers enhances efficiency. Taking the latter's view the research hypothesis is formulated as below:

*HB5: Size of female borrowers is negatively related to cost per borrower of Ethiopian MFIs.*

**Experience:** Qayyum and Ahmed (2006), Gonzalez (2008), CGAP (2009) and Nawaz (2010) noted that age of MFIs helps microfinance institutions achieve higher efficiency. When a microfinance market starts to mature and MFIs have to compete for clients, price competition on interest rates will usually push MFIs to become more efficient. Young or fast-growing MFIs will look less efficient by either of these measures, because those MFIs are paying for staff, infrastructure and overheads and are not yet producing at full capacity. Nawaz (2010) indicted that with experience, MFIs learn to reduce cost per borrowers as depicted by significant negative age coefficient in his study. Contrary to this Hermes et al (2008) found that the coefficient for the variable AGE is positive and significant, indicating that older MFIs are less efficient.

Because most writers support the negative relationship between cost per borrower and MFIs' experience, the hypothesis suggested in this study is that:

*HB6: The age of MFIs has a significant negative effect on MFIs' cost efficiency in Ethiopia.*

### **2.4.3 Macroeconomic variables and efficiency**

**GDP growth rate:** While a study on the relationship of macroeconomic variables and efficiency is rare, Ahlin and Lin (2006) and Bogan (2009) asserted that macroeconomic variables could have an effect on MFI efficiency. Nawaz (2010) indicted that MFIs operating in high income per capita countries do incur higher costs per borrower because of the lower outreach. Vingo (2012) too revealed that cost per borrower tends to increase with the increasing income of households, since the financial products and services of the MFIs may not be appropriate for their financial demands. Therefore, the poor tend to move to commercial banks after being lifted out poverty causing MFIs to left with lower demand of loans.

In spite of these, this study believed that high economic growth can help MFIs to benefit from improved repayment rate and can mobilize large volume of savings due to improved household income so that they can reduce the cost acquiring debts and meet the demands of larger loans which ultimately results in reduced cost per borrower. Therefore the hypothesis of this study is formulated as:

*HB7: GDP growth rate in Ethiopia negatively affects cost efficiency of Ethiopian MFIs.*

## 2.5 Earlier studies in Ethiopia

While the objectives addressed in previous studies on Ethiopian MFIs are different, to the best knowledge of this researcher the quality of literatures on the Ethiopian microfinance industry exclusively focused on sustainability and efficiency of MFIs are not available. For the Ethiopian case, there are few studies undertaken in relation to MFIs.

One of the most notable studies made on Ethiopian MFIs was a study by Duressa (2009). While determinants of cost efficiency (cost per borrower) were not explicitly under the purview of his study, he conducted an in-depth examination into the entire MFI sector in Ethiopia. That is he did not directly test the influence of funding sources (such as grants and deposits), firm specific characteristics (such as the proportion of women borrowers) and macroeconomic variables on MFIs' cost efficiency (cost per borrower). As a remarkable work in Ethiopian MFIs sector, his analyses were related to assessment of the operational and financial sustainability of Ethiopian MFIs and analysis of the scale and depth of outreach of MFIs and their relationship with clients. He also evaluated institutional viability of MFIs in terms of ownership, governance structure, institutional design and management of financial information systems.

The study by Kereta in (2007), Kidane (2007), Ejigu (2009), Asnakew (2012), Yirsaw (2008), Tamene (2012) and Yenesew (2014) are worth mentioning. However with few exceptions most of these studies focused on MFI profitability, outreach and sustainability excluding the efficiency side. Moreover these studies were unable to explore a comprehensive analysis of financing structure, firm characteristics and macroeconomic variables in their MFI study. Kereta (2007) studied the industry's outreach and financial performance using descriptive analysis, using graphs and percentage growth rates. The result of his study showed that in terms of breadth of outreach, MFIs are serving an increasing number of clients in each year from 2003-2007. The same study noted that MFIs are operationally sustainable as measured by ROA and ROE and the industry's profit performance is improving overtime.

The use of these proxies (ROA and ROE) by Kereta (2007) for measurement of sustainability were contrary to proxies used in earlier studies made on MFIs sustainability such as Bogan (2009); Gibson (2012); Kimando and Kihoro (2012); Qayyum and Ahmed (2010);

Abdurrahmanand Mazlan (2014); and other scholars who used financial self-sufficiency ratio suggested by CGAP, MixMarket ,MicroBanking Bulletin.They suggested that financial self-sufficiency ratio, which is adjusted revenue as a percent of adjusted expenses better explains financial sustainability than ROE and ROA due to its long term perspective in measurement of sustainability.

The study by Kidane (2007) ,on one of the largest MFIs in Ethiopia Amhara Credit and Saving Institution (ACSI), showed that ACSI has served more than half a million clients. Over 1.6 million loans have been disbursed worth Birr 1.5 billion. By 2005, the institution was operationally and financially self-sufficient at 119.9% and 115.3% respectively. The same study revealed that ACSI had a high portfolio quality, as delinquency rates are around 1.9%. However given the dominance of ACSI, it is not appropriate to infer the results of this study to the entire microfinance industry which was a composed of a number of small companies.

Asnakew (2012) made a study on financial sustainability of MFIs in Ethiopia. Among his remarkable findings, breadth of outreach and depth of outreach were found to affect the financial sustainability of microfinance institutions in Ethiopia. While he solely focused on sustainability of MFIs, his paper did not address an independent review of the drivers of cost efficiency of MFIs at all. Crucial components like the impact of deposit mobilization, the influence of gender and the impact of macroeconomic environments were not dealt with at all.

The works of Tamene (2012) showed that while a separate analysis of the drivers of MFIs' efficiency, in contrast to this study, was not included in his study at all , his excellent analysis of MFIs by using proxy of financial and operational sustainability conforms to MixMarket's definition. However he entirely focused on internal factors such as loan size and number of active borrowers leaving crucial variables in the case of Ethiopia such as the influence of some components of MFIs' funding sources (subsidies) and gender analysis. He did not consider the impact of macroeconomic variables such as GDP and inflation.

Yenesew (2014) studied determinants of financial performance on selected microfinance institutions in Ethiopia and tried to incorporate different variables from different perspective which is wider analysis of the MFIs performance than the earlier ones. However he solely focused on profitability rather than sustainability by taking ROA as a dependent variable which is contrary to proxies used by prominent researchers and critical components such as subsidies and gender were not considered at all as drivers of sustainability. He also did not make an independent review of efficiency of MFIs at all.

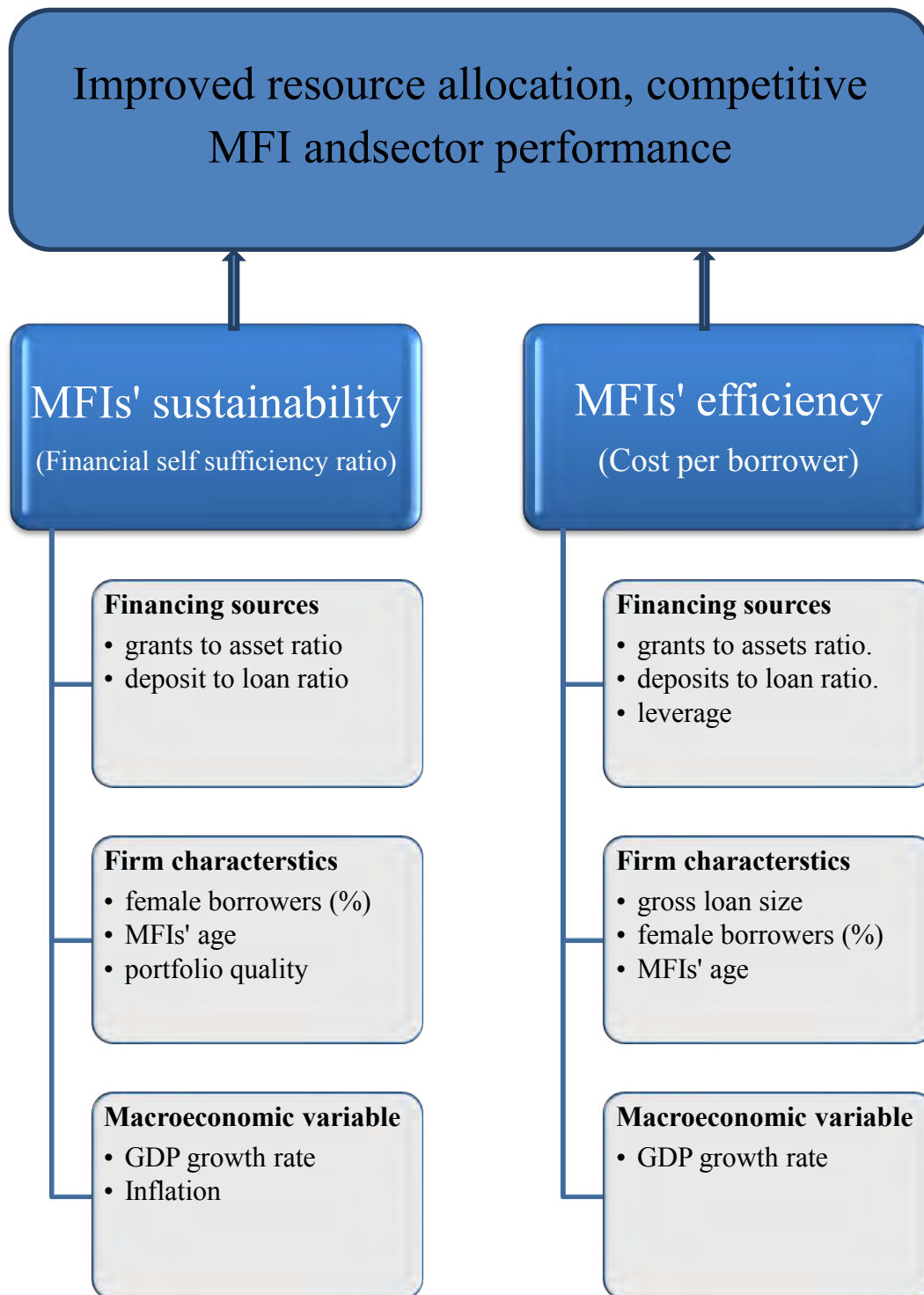
## 2.6 Research gap

As an element of financing structure of MFIs, subsidies constituted a certain percentage of total capital which in turn makes MFIs in a high risk of dependency and unsustainability particularly when the continuity of donated capital is uncertain and if they are loss making. Moreover earlier Ethiopian studies also failed to explore the effect of macroeconomic variables such as GDP and inflation rate on sustainability and efficiency which are empirically found to be important in many studies. The excessive reliance on subsidies and a focus on commercialization of MFIs operation must be analyzed from the stand point of MFIs sustainability and efficiency. The influence of gender, deposit mobilization and leverage should be investigated adequately. Available empirical evidences against this variable in Ethiopian MFIs sector are not adequate, if not nonexistent.

While analysis of sustainability had not been dealt with adequately and, to the author's best knowledge, drivers of efficiency had not been explored separately at all from both the internal and external perspectives. Such analysis of sustainability and efficiency can help managers of MFIs and decision makers in the microfinance sector to improve resource allocation and improve sector performance. Hence this study is made to independently identify the influence of funding sources, firm characteristics and macroeconomic variables on both sustainability and efficiency of MFIs in Ethiopia.

## 2.7 Conceptual Framework

The conceptual framework in Figure 2.1 indicated that the ultimate objectives of maintaining sustainability and efficiency of MFIs is to improve resource allocation, enhance competitiveness in the MFI sector and improve sector performance. The variable used to explain the dependent variable (financial self-sufficiency ratio) include funding sources (grants to asset ratio and deposits to loan ratio), firm specific characteristics (female borrowers' proportion, MFI's experience and portfolio quality) and macroeconomic environments (GDP growth rate and inflation rate). On the efficiency side, cost per borrower is taken as a proxy for MFIs' cost efficiency. The explanatory variables tested against cost per borrower are funding sources (grants to asset ratio, deposits to loan ratio and debt to equity ratio), firm specific characteristics (gross loan size, female borrowers' proportion and MFIs' experience) and macroeconomic environments (GDP growth rate).

**Figure 2.1: Conceptual framework of sustainability and efficiency of MFIs.**

Sources: Own design, 2015

## CHAPTER THREE

### 3 RESEARCH DESIGN AND METHODOLOGY

This chapter presents the research approach, target population, sample size and sampling technique, source of data and data collection techniques, variable definition, model specification and data analytical tools.

#### 3.1 Research approach

With the aim of assessing determinants of financial sustainability and efficiency of MFIs in Ethiopia, this study employed quantitative research approach and used panel data to realize to analyze the resulting estimates so that stated objectives and hypothesis are addressed accordingly. As noted by prominent scholars, a quantitative panel data give more informative data, more variability, less linearity among variables, more degrees of freedom and more efficiency. Moreover repeated cross section of observations over a range of years are better suited to study the dynamics of change, can better detect and measure effects that simply cannot be observed in pure cross-section or pure time series data. All this indeed minimize the bias that might result if individuals or firms are aggregated into broad aggregates.

#### 3.2 Source of data and data collection techniques

The data on MFIs are taken from annual reports of the Association of Ethiopian Micro Finance Institutions (AEMFI), the National Bank of Ethiopia (NBE), Ministry of Finance and Development (MoFED), MixMarket and the website of World Bank. While information related to Ethiopian MFIs' financing structure and firm characteristics are collected from AEMFI, data on macroeconomic variables (GDP growth rate and inflation) were collected from NBE, MoFED and the World Bank web site. To help in comparison of Ethiopian MFIs with other jurisdiction, MFI data are collected from different sources of theoretical literatures and empirical evidences. To enhance the quality of econometric estimates and to preserve consistency, only the most available MFIs' audited data are collected from the fiscal years 2003 to 2012 (but issued from 2005 to 2014 respectively) which are available in the annual reports of AEMFI and effectively constituted 10 years data. Data MFIs' grants which are not available from any of the above

sources are collected from MixMarket database, a global web-based microfinance information platform.

### 3.3 Sample size and sampling technique

While the target population for this particular study was all the MFIs currently operating in the country, a sample of 13 MFIs is taken from the total population of 31 MFIs over 10 years period covering calendar years from 2003 to 2012 but issued from 2005 to 2014 to provide for 130 observations (13MFIs \* 10 years) which is well enough to operate fixed effect regression techniques in which case a minimum of 95 observations is recommended by many researchers.

A variety of ‘rules of thumb’ exist regarding minimum sample sizes, the most common being that you should have at least 10-15 data points per predictor parameter in a model; e.g. with three predictors such as PaR, debt to equity ratio and grants to total assets, you would need 30 to 45 experimental units (Field *et al.*, 2012). Green (1991) on the other hand for regression models (Eviews, ANOVA, GLM, etc.), where you have  $k$  predictors, the recommended minimum sample size should be  $50 + 8k$  to adequately test the overall model, and  $104 + k$  to adequately test each predictor of a model. Hence the number of observations, 130, provided in this study is well above the minimum required of 130 ( $50 + 8 * 7$  independent variables = 106) observations for each dependent variable according to the model  $50 + 8K$ . Moreover it is time consuming and expensive to collect data about every individual institution in the population. Thus it requires sample sizes to be judged for availability and quality of the resulting estimates. The sample size includes ACSI, ADCSI, Buusaa Gonofaa, AVFS, DECSI, Meklit, OCSSCO, OMO, Vision, PEACE, Gasha, SFPI and Wasasa.

### 3.4 Variable definition

#### 3.4.1 Dependent variable for sustainability

This study utilized Financial Self-Sufficiency (FSS) ratio introduced by Christen et al (1995) as proxy to measure financial sustainability which in turn is measured by adjusted revenues as a percent of adjusted expenses. The adjustments to this ratio pertain to inflation, loan loss provisioning and cost of funds. The approach is being applied by many regulators and MFIs’

associations around the world including AEMFI in the assessment of their MFI's performance in their jurisdiction.

### **3.4.2 Dependent variable for efficiency**

The dependent variable for efficiency is the cost per borrower of MFIs which is well applied by prominent studies (Bogan, 2009; Nawaz, 2010; Hudon and Traca, 2008 and Cull et al, 2007). It is measured by operating expense as a percentage of average number of active borrowers. Considering cost constitutes a significant proportion of loans, the variable is seen to be a suitable proxy for efficiency. Cost per borrower also provides a meaningful measure of efficiency for an MFI, by determining the average cost of maintaining an active borrower or client. Because MFIs count clients rather than amounts, these indicators have the advantage of not prejudicing MFIs which offer smaller loans and savings accounts.

### **3.4.3 Independent variables for both sustainability and efficiency**

To measure the predictor variables of financial sustainability of MFIs in Ethiopia, the dependent variable (financial self-sufficiency) takes on seven proxies as explanatory variables based on theoretical reviews and empirical evidences discussed so far. The explanatory variables used to predict financial self-sufficiency ratio of MFIs were grants to asset ratio, deposits to loan ratio, proportion of female borrowers, experience of MFIs, portfolio quality, GDP growth rate and inflation rate. The explanatory variables tested against cost per borrower are grants to asset ratio, deposits to loan ratio, debt to equity ratio, scale of operation (gross loan size), proportion female borrowers, experience of MFIs and GDP growth rate.

**Table 3.1: Summary of explanatory variables for MFIs' financial sustainability.**

Variable	definition	Expected result
GAR	Grants to asset ratio	-
DLR	Deposits to loan ratio	+
FBP	Size of female borrowers (in %)	+
AGE	№. of years in operation	+
PaR>30	O/S loan size past due 30 days	-
GDP	GDP growth rate	+
INF	Inflation	-

*Source: adapted from different theoretical reviews and empirical evidences*

**Table 3.2: Summary of explanatory variables for MFIs' cost efficiency**

Variable	definition	Expected result
GAR	Grants to assets ratio	+
DLR	Deposits to loan ratio	-
DER	Debt to equity ratio	-
InGLP	log <sub>e</sub> gross loan portfolio	-/+
FBP	Size of female borrowers (in %)	-
AGE	№ of years in operation	-
GDP	GDP growth rate	-

*Source: adapted from different theoretical reviews and empirical evidences*

### 3.5 Model specification

This study applied descriptive and two separate multiple regression models to analyse the sustainability and efficiency of MFIs in Ethiopia. Many econometricians argued that one of the most useful aspects of a multiple regression model is its ability to identify the independent effects of a set of variables on a dependent variable. The study tests the impact of funding, firm characteristics, and macroeconomic variables on sustainability and efficiency. Hence this study involves two dependent variables and seven independent variables that are expected to be tested against each of these two dependent variables. The study uses balanced data set. Many econometricians suggested that balanced data is preferred over unbalanced panels, because

it allows an observation of the same unit in every time period, which reduces the noise introduced by unit heterogeneity.

### 3.5.1 Model estimation for sustainability

To examine whether the financial sustainability of MFIs varies significantly based on the differences in funding, firm characteristics, and macroeconomic variables, the following regression model is estimated to carry out industry wide analysis.

$$FSS = \sum_{i=1}^2 \beta_i FSV_i + \sum_{j=3}^5 \beta_j FCV_j + \sum_{k=6}^7 \beta_k MEV_k$$

Where

FSS	Represents the dependent variable which is financial self-sufficiency ratio of MFIs in Ethiopia.
FSV	Represents MFIs' financing structure variables spanning from $i = 1$ to $2$ including, $X_1$ =grants to asset ratio, $X_2$ =deposits to loan ratio.
FCV	Represents firm characteristics variables spanning from $j = 3$ to $5$ including, $X_3$ =female borrowers' proportion, $X_4$ =age of MFIs and $X_5$ =portfolio at risk outstanding for more than 30 days.
MEV	Represents country level macroeconomic variables spanning from $k = 6$ to $7$ including, $X_6$ =GDP growth rate and, $X_7$ =inflation rate.

The model can be further broken down into the following formula:

$$FSS_{it} = \beta_0 + \beta_1 GAR_{it} + \beta_2 DLR_{it} + \beta_3 FBP_{it} + \beta_4 AGE_{it} + \beta_5 PAR>30_{it} + \beta_6 GDP_{it} + \beta_7 INF_{it} + \varepsilon_{it}$$

Where  $FSS_{it}$  is the observed financial self-sufficiency of an MFI  $i$  at year  $t$ ,

$GAR_{it}$  is grants to assets ratio of an MFI  $i$  at time  $t$ ,

$DLR_{it}$  is the deposits to loans ratio of an MFI  $i$  at time  $t$ ,

$FBP_{it}$  is the female borrowers' proportion of an MFI  $i$  at time  $t$ ,

$AGE_{it}$  is age of an MFI  $i$  at time  $t$ ,

$PAR>30_{it}$  is the portfolio at risk, outstanding for more than 30 days, of an MFI  $i$  at time  $t$ ,

$GDP_{it}$  is the GDP growth rate of Ethiopia assigned to an MFI  $i$  at time  $t$ ,

$INF_{it}$  is the rate of inflation of Ethiopia assigned to an MFI  $i$  at time  $t$ , and  
 $\beta_s$  are the partial effect of independent variables in period  $t$ .  
 $i_s$  the error term of an MFli at time  $t$

### 3.5.2 Model estimation for cost efficiency

To examine whether cost efficiency of MFIs varies significantly based on the differences in funding, firm characteristics, and macroeconomic variables, the following regression model is estimated to carry out industry wide analysis.

$$InCPB = \sum_{i=1}^3 \beta_i FSV_i + \sum_{j=4}^6 \beta_j FCV_j + \sum_{k=7}^7 \beta_k MEV_k$$

Where;

InCPB	Represents the dependent variable which is the natural logarithm of cost per borrower of MFIs in Ethiopia.
FSV	Represents MFIs' financing structure variables spanning from $i = 1$ to 3 including, $X_1$ =grants to asset ratio, $X_2$ =deposits to loan ratio and $X_3$ =debt to equity ratio.
FCV	Represents firm characteristics variables spanning from $j = 4$ to 6 including, $X_4$ =natural logarithm of gross loan portfolio, $X_5$ =female borrowers' proportion and $X_6$ =age of MFIs.
MEV	Represents country level macroeconomic variables spanning from $k = 7$ to 7 including, $X_7$ =GDP growth rate

The model can be further breakdown into the following formula:

$$InCPB_{it} = \beta_0 + \beta_1 GAR_{it} + \beta_2 DLR_{it} + \beta_3 DER_{it} + \beta_4 InGLP + \beta_5 FBP_{it} + \beta_6 Age_{it} + \beta_7 GDP_{it} + \varepsilon_{it}$$

Where  $InCPB_{it}$  is an observed natural logarithm of cost per borrower of an MFli at year  $t$ ,

$GAR_{it}$  is grants to total assets ratio of an MFli at time  $t$ ,

$DLR_{it}$  is the deposits to loans ratio of an MFli at time  $t$ ,

$DER_{it}$  is the debt to equity ratio of an MFli at time  $t$ ,

$\ln GLP_{it}$  is the natural logarithm of gross loan size of an MFli at time t

$FBP_{it}$  is the female borrowers' proportion of an MFli at time t,

$AGE_{it}$  is age of an MFli at time t,

$GDP_{it}$  is the GDP growth rate of Ethiopia assigned to an MFli at time t,

$\beta_s$  are the partial effect of independent variables in period t.

$i_t$  the error term of an MFli at time t.

### 3.6 Data Analysis and Technique

The collected panel data are analyzed and interpreted by using descriptive statistic, correlation analysis and multiple regression estimation method. To enhance the robustness of the models and to control the cross section effects of the intercepts the study employed fixed effect regression technics. The simplest types of fixed effects models allow the intercept in the regression model to differ cross-sectionally (Brooks, 2008). The fixed-effects model controls for all time-invariant differences between the individuals, so the estimated coefficients of the fixed-effects models cannot be biased because of omitted time-invariant characteristics. The study checked whether the proposed empirical model is free from autocorrelation, multicollinearity, heteroskedasticity and normality. If any one of those phenomenon turns out to be present, this would be a violation of a key assumption of OLS regression. Redundant fixed effect (likelihood ratio) test is also made to ensure that a fixed effect regression technique is appropriate. The results of all assumptions tests and robustness checks ensured that they are not violated. To conduct this, the researcher used Eviews 7 software as recommended by Brooks (2008) due to its ability to help researchers to analyze research easily and efficiently.

## CHAPTER FOUR

### 4 DATA ANALYSIS AND DISCUSSION

#### 4.1 Descriptive statistics

In this section the study presents the descriptive statistic results for dependent variables, Financial Self-Sufficiency (FSS) and Cost per Borrower (CPB) and the independent variables discussed in the earlier chapters.

##### 4.1.1 Descriptive statistics for the dependent variables

**MFIs' Sustainability (Financial Self Sufficiency):** As described in the earlier chapters financial sustainability is defined as the MFIs' ability to cover all costs on adjusted bases and indicates MFIs' ability to operate without ongoing subsidy (i.e. including soft loans and grants) .Sa-Dhan (2014) and KDID portal (2015) noted that unless FSS ratio of 100% is reached, the long-term provision of credit services is undermined by the impact of inflation and the continued necessity to rely on donor funds.

Analysis of descriptive statistic from Table 4.1 revealed that the mean values, the maximum values, the minimum values and the standard deviations of MFIs' FSS observations are 94%, 176%, 10% and 32% respectively. Given the international requirement of an FSS ratio of 100%, the mean score of 94% indicated that most of Ethiopian MFIs are not financially self-sufficient. It is difficult for these MFIs, with an FSS ratio below 100%, to cover all costs and to operate without ongoing subsidy. In this case, equity will be reduced by losses, forced them to rely on grants or concessional loans from external sources. On the other hand the most successful MFIs with maximum score of 176% could minimize the need for subsidies and concessional loans of low interest rates from donors.

The standard deviation (32%) revealed in this study was very low as compared to related findings around the world and related studies in Ethiopia. For example, in Bogan's (2009) study FSS ratios of MFIs had standard deviation of just above 45%. Lower standard deviation is a good indication that most of the observations are concentrated around the mean

Comparison of Ethiopian MFIs' FSS ratio with the FSS ratio of MFIs in the entire continent of Africa indicated, as revealed by MixMarket (2011), that the mean FSS score of the African MFIs was 98% which is marginally higher than the mean score of Ethiopian MFIs. The same source indicated that MFIs operating in eastern African and southern African regions had a mean score of an FSS ratio of 99.1% and 97.6% respectively and indicating that they are out-performing Ethiopian MFIs. However on the average none of the MFIs in these regions are financially self sufficient as their mean score was marginally below 100%.

**Table 4.1: Descriptive statistics for dependent variables.**

	<b>Financial Self Sufficiency ratio</b>	<b>Cost per borrower in Birr</b>
Mean	94%	153.88
Median	91%	133.00
Maximum	176%	929.00
Minimum	10%	36.00
Std. Dev.	32%	116.49

Source: Eviews descriptive statistics output for dependent variables, 2015.

**MFIs' efficiency (cost per borrower):** The dependent variable, cost per borrower, provides a meaningful measure of efficiency, showing the average cost of maintaining an active borrower of an MFI. As demonstrated so far cost per borrower, the most popular measure of MFIs efficiency, is calculated by dividing all expenses related to the operation of MFIs (including all administrative and salary expenses, depreciation and board fees) by average number of active borrowers. Since the size of the loans is not the part of the denominator, institutions with larger loans do not automatically appear to be more efficient. For example if the cost per borrower ratio takes loan amounts rather than average number of active borrowers, it could bias smaller MFIs which offer smaller loans and savings accounts to appear less efficient (AEMFI, 2014; CGAP, 2003).

While cost per borrowers used in the efficiency regression model are transformed to their natural logarithm value, the analysis of its descriptive statistic is made based on its actual values. The

descriptive statistic in Table 4.1 revealed that the mean value, the maximum value and the minimum values of the cost per borrower were found to be Birr 153.88, Birr 929, Birr 36. This indicated that the average MFIs incurred a cost of Birr 153.88 to maintain a single borrower. While the most efficient MFIs incurred a cost per borrower of Birr 36, inefficient MFIs incurred a cost per borrower as high as Birr 929 during the study period.

The mean, maximum and minimum scores of MFI's cost per borrower in Ethiopia which were Birr 153, Birr 929 and Birr 36 are changed to their dollar values of \$13<sup>1</sup>.93, \$84.14 and \$3.26 respectively to make comparison against empirical evidences. A handful of studies indicated that the average Ethiopian MFIs appeared to look more cost efficient than MFIs in the rest of the world. For example Nawaz (2010) has found that the mean score of cost per borrower of 179 MFIs worldwide was \$131. The maximum score of cost per borrower of Ethiopian MFIs revealed in this study was also well below the maximum score revealed in Nawaz's study (\$1694).

On the other hand Bogan (2009) operated panel data on MFIs in Africa, East Asia, Eastern Europe, Latin America, the Middle East and South Asia during the year 2003 through 2006 and revealed that the mean score of cost per borrower of MFIs in these regions was \$178 indicating that Ethiopian MFIs on the average are more efficient than MFIs in these regions. MixMarket (2011) also revealed the same story that Ethiopian MFIs are more efficient than MFIs in the rest of Africa. MixMarket revealed that the average cost per borrower for MFIs in Central Africa, Eastern Africa, Southern Africa, Western Africa and the whole Africa were found to be \$150, \$149, \$182, \$103 and \$137 respectively making Ethiopian MFIs more efficient in maintaining a single borrower. Lower cost per borrower for Ethiopian MFIs may point to the fact that the difference in macroeconomic environment among regions may also play an important role. For example clients of MFIs in countries of higher GNI per capital may require better, quality and additional services which could increase operating expenses.

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<sup>1</sup> Calculated by dividing "cost per borrower of Ethiopian MFIs" by "average exchange rate" during the study period. According the National Bank of Ethiopia, the average exchange rate during the study period was Birr 11.04 (NBE Annual reports from 2003 to 2012).

#### 4.1.2 Descriptive statistics for the explanatory variables

The following section illustrates the descriptive statistics for the explanatory variables for both sustainability panel and efficiency panel observations extracted from Eviews descriptive statistics output.

**Table: 4.2: Descriptive statistics for explanatory variables**

	GAR	DLR	DER	GLP	FBP	AGE	PAR	GDP	INF
Mean	23%	24%	204%	299.8mln	51%	9	5%	11%	17%
Median	17%	24%	134%	45.3mln	51%	9	3%	11%	13%
Max	90%	70%	112%	3,007mln	82%	15	26%	13%	36%
Min	1%	1%	13%	1.8mln	11%	2	1%	9%	3%
Std. Dev.	20%	17%	187%	541.4mln	19%	3	5%	1%	11%

**Source:** Eviews descriptive statistics output for explanatory variables, 2015.

**Grants to Asset Ratio (GAR):** As indicated in Table 4.2, the mean score of GAR showed that average MFIs in Ethiopia maintained donated equity of 22% in its total assets. This is higher than the mean value of the same ratio revealed in Bogan's (2009) study in which case the ratio was 13.61. This indicated that the assets of the average Ethiopian MFIs are relatively financed more by subsidies than commercial sources. On the other hand highly subsidized MFIs in Ethiopia maintained grants as high as 90% of their total assets. This will make Ethiopian MFIs in state of high dependency risk as the availability of funds becoming uncertain. Table 4.2 further depicted that only 20% of GAR observations deviate from the mean. The standard deviation of Ethiopian MFIs for GAR is lower than the departures observed for MFIs in Bogan's study (28%) indicating that much of the GAR observations of Ethiopian MFIs are concentrated around the mean.

**Deposit to Loan Ratio (DLR):** Deposit mobilization represented by deposits as a percent of loan measures the portion of the MFIs portfolio funded by deposits. The higher the ratio, the greater is the MFIs' capability to fund its loan portfolio from deposits. The mean value of 24% showed that Ethiopian MFIs financed every birr of their loan portfolio by 24 cents of deposits. This indicated that 76 % of the loan portfolio is financed by other means such as borrowing, soft loans

and grants. Comparison of this ratio with other jurisdiction indicated that MFIs in Central Africa, Eastern Africa, Southern Africa, Western Africa and the entire continent of Africa have mean score of DLR 154.8%, 48.6%, 30.5%, 59.5% and 154.8% respectively indicating that MFIs in these regions have mobilized higher commercial sources (savings) to finance their loan than MFIs in Ethiopia (MixMarket, 2011). This enables these Subs Saharan African MFIs to mobilize a cheaper source of funds than debts to finance their loans so that they can reduce the need of subsidies.

**Debt to Equity Ratio (DER):** Debt to equity ratio is the simplest and best known measure of capital adequacy because it measures the overall leverage of the institution (AEMFI, 2014). The mean value of DER of Ethiopian MFIs stood at 204% during the study periods. Moreover, as AEMFI (2014) pointed out, traditionally MFIs' ability to borrow from commercial lenders has been somehow limited. The average score of DER attained by MFIs of Central Africa, Eastern Africa, western Africa and the entire continent of Africa 400%, 314%, 215% and 241% (MixMarket, 2011). Given the average DER scored by these sub African regions, Ethiopian MFIs appeared to score normal DER but still managed to score above the recommended threshold of 150% (AEMFI, 2012). However the maximum DER score of Ethiopian MFIs (112%) appeared to look very high. Those MFIs scoring maximum DER should be vigilant because theories suggest that higher DER bound to exert pressure on profit margin (sustainability and efficiency).

**Gross Loan Portfolio (GLP):** As a measurement of MFI's scale of operation, the mean, the maximum and the minimum scores of gross loan in the industry stood at Birr 299.7million, Birr 3billion and Birr 1.8million. On the average Ethiopian MFIs provided nearly Birr 300million loans to their clients while some largest MFIs provided Birr 3billion during the study periods. Comparison of gross loan portfolio with other jurisdiction has revealed that on average Ethiopian MFIs provided a gross loan size of \$27<sup>2</sup>million. This is much higher, as reported by MixMarket (2011), than the mean score of African MFIs (\$4.4). However loans in Ethiopia were backed by relatively low volume of deposits as compared to MFIs in other regions. On the other hand according to a study by D'Espallier et al (2009), the average MFI in the globe has a total loan

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<sup>2</sup> Own computation by using the average exchange rate of USD against Ethiopian Birr of the periods covered in this study.

portfolio of \$ 4.1million. Thus Ethiopian MFIs on the average can be categorized in to large scale MFIs<sup>3</sup>.

**Female Borrowers' Proportion (FBP):** The impact of gender on financial sustainability in this study was measured by the proportion of female borrowers. The descriptive statistics indicated that female borrowers do have a mean value of 50% while the maximum and the minimum values were 82% and 10%. Dispersion of a set of data values from the mean was 18.5%. In Nawaz's study of worldwide MFIs the scores of the same ratios were 64.7%, 100% and 80% respectively. According to MixMarket (2011) the mean value of Africa was (62.0%). The mean, maximum and minimum scores of Ethiopian MFIs indicated that they are performing relatively poorly in deepening their services to serve the most vulnerable (unbankables) sector of the society (women).This is also an indication of mission drifts where by Ethiopian MFIs appeared to serve towards commercially feasible sector of the society.

**Experience:** For the life cycle definitions ,this study utilized standard benchmarks applied by Bogan (2009),that is for new (0-4 years), young (5-8 years), and mature (>8 years) MFIs. Thus according to this benchmark on the average Ethiopian MFIs can be considered mature with the mean score of 9 years. Mature MFIs in Ethiopian have a maximum age of 15 years and young MFIs have a minimum age of two years during the study period.MFIs in Central Africa, Eastern Africa and western Africa region have an average age of 13,11 and 12 years indicating that the MFI sector in those region is older than the MFI sector in Ethiopia(MixMarket,2011) .

**Portfolios atRisk, loans outstanding past due 30 days(PAR>30):** Loan portfolio is the dominant asset of MFIs. Portfolio quality reflects the risk of loan delinquency, determines future revenues and an institution's ability to increase outreach and serve existing clients. A higher ratio brings higher risk to the portfolio. As indicated above the portfolio quality is low as PAR>30 stood at a mean score of 21%.This is much higher than the mean score of east Africa region and west Africa region were the ratios was were at 8.3% and 5.9% respectively. Generally speaking any portfolio at risk (PAR>30) exceeding 10% should be cause for concern (AEMFI, 2011). Hence, much attention should be given to loan delinquency by Ethiopian MFIs.

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<sup>3</sup> according to MicroBanking bulletin criteria (2009) MFIs having gross loan portfolio of greater than \$8 million can be considered large scale MFIs, medium MFIs do have gross loan size of \$2million to \$ 8million and small scale MFIs do have gross loan size less than \$2 million.

**GDP and inflation:** The mean value of GDP and inflation were found to be 10.9% and 16.7% and both are higher than the average of the entire African continent which was 3.8% and 9% in MixMarket's report (2011). The growth in GDP during the last 10 years intuitively believed to help MFIs to display extraordinary expansionary rates. However the inflationary environments displayed by double digit trends were reflected in MFIs performance indicators (AEMFI, 2009). The increased inflationary trends may have a negative effect by eroding the real value of MFIs' equity.

## 4.2 Correlation analysis

Table 4.3 and Table 4.4 is correlation matrix tables for some of the variables used in the analysis of sustainability and efficiency of Ethiopian MFIs respectively. The correlation coefficient indicates the strength of a linear relationship between two variables. The purpose of undertaking correlation analysis is to check whether there is multicollinearity problem in the model and to indicate whether or not the variables move to gather in the same direction. As illustrated so far in the earlier sections the study carried out a test of multicollinearity and found no evidence of multicollinearity in both models. Now before estimating the regression model, this section looks into the direction of the variables used in both models. The correlation coefficient will vary from -1 to +1. A -1 indicates perfect negative correlation, and +1 indicates perfect positive correlation. If the correlation is 0, the movements of the variables are said to have no correlation; they are completely random.

### 4.2.1 Correlation analysis of MFIs' financial sustainability

Table 4.3, which indicated the correlation of some the independent variables and the financial self-sufficiency (FSS), showed that grants to asset ratios (GAR), female borrowers' proportion (FBP) and portfolio at risk (PAR) of MFIs in Ethiopia are negatively correlated to MFIs' FSS ratio. This indicated that MFIs with higher proportion of female borrowers, higher grants as a percent of assets and higher PAR do have lower sustainability ratio. On the other hand, consistent with theories and many empirical evidences, deposit mobilization (DLR) and age of MFIs are positively related to MFIs sustainability. However it should be noted that the correlation analysis does not indicate one variable should cause the other to change in the same direction or have an inverse direction.

**Table 4.3: Correlation analysis of MFIs' financial sustainability**

Covariance Analysis: Ordinary

Date: 06/15/15 Time: 18:44

Sample: 2003 2012

Included observations: 130

Correlation	FSS	GAR	DLR	FBP	AGE	PAR	GDP	INF
FSS	1.000000							
GAR	-0.342139	1.000000						
DLR	0.394183	-0.296175	1.000000					
FBP	-0.067954	0.301902	-0.077126	1.000000				
AGE	0.217134	-0.310738	0.542510	-0.071878	1.000000			
PAR	-0.320186	-0.020828	-0.050638	-0.233889	-0.013855	1.000000		
GDP	-0.018837	0.274059	-0.358177	-0.079158	-0.729542	-0.045399	1.000000	
INF	0.064385	-0.201977	0.251375	0.044523	0.504660	0.040017	-0.668334	1.000000

Source: Eviews output, 2015

**4.2.2 Correlation analysis of MFIs' cost efficiency**

Grants to Asset Ratio (GAR) and natural logarithm of Cost per Borrowers (LnCPB) move in the same direction. The positive relationships between female borrowers' proportion, grants to asset ratio and cost per borrower from the correlation matrix showed that MFIs with higher percentage of grants to asset ratio and higher proportion of women had higher cost per borrower during the study period. The negative relationship between female borrowers' proportion and gross loan portfolio may probably indicated the presence of mission drifts in MFIs operation in is that those MFIs having larger proportion of gross loan portfolio may tend to focus on relatively richer clients by systematically discriminating women borrowers in their credit services.

**Table 4.4: Correlation analysis of MFIs' cost efficiency**

Covariance Analysis: Ordinary

Date: 06/15/15 Time: 19:02

Sample: 2003 2012

Included observations: 130

Correlation	LNCPB	GAR	DLR	DER	LNGLP	FBP	AGE	GDP
LNCPB	1.000000							
GAR	0.415310	1.000000						
DLR	-0.113564	-0.296175	1.000000					
DER	-0.341022	-0.400673	0.205533	1.000000				
LNGLP	-0.347255	-0.621186	0.531291	0.315925	1.000000			
FBP	0.425016	0.301902	-0.077126	-0.365646	-0.343262	1.000000		
AGE	0.280878	-0.310738	0.542510	0.205373	0.578323	-0.071878	1.000000	
GDP	-0.356462	0.274059	-0.358177	-0.060862	-0.375796	-0.079158	-0.729542	1.000000

Source: Eviews output, 2015

### 4.3 Regression results from MFIs' sustainability estimation model

This section presents the regression results on the determinants of financial sustainability (financial self-sufficiency ratio) of microfinance sector in Ethiopia. Model diagnosis and robustness checks are made to enhance the quality of the econometric estimates followed by presentation of regression results on the effect of financing structures, firm specific characteristics and macroeconomic variables on MFIs' sustainability.

#### 4.3.1 Model diagnosis

**Heteroskedasticity:** It has been assumed that the error terms are homoscedastic. That is it assumed that the error terms have a constant variance; otherwise they are said to be heteroskedastic. The presence of heteroskedasticity makes the standard errors wrong and hence any inferences made could be misleading. This requires validation of the null hypothesis that the error terms are homoscedastic. The most popular method, a white's test has to be made, to ensure that this assumption is no longer violated. Brooks (2008) recommended that not to reject the null hypothesis, the p-value of the F- and  $\chi^2$  ( $\_LM'$ ) versions of the test statistic and the p-value of the Scaled Explained SS must be higher than 0.05. The detail of this test is provided in the appendix at the end of the paper.

**Table 4.5: Heteroskedasticity test for Ethiopian MFIs' sustainability**

Heteroskedasticity Test: White

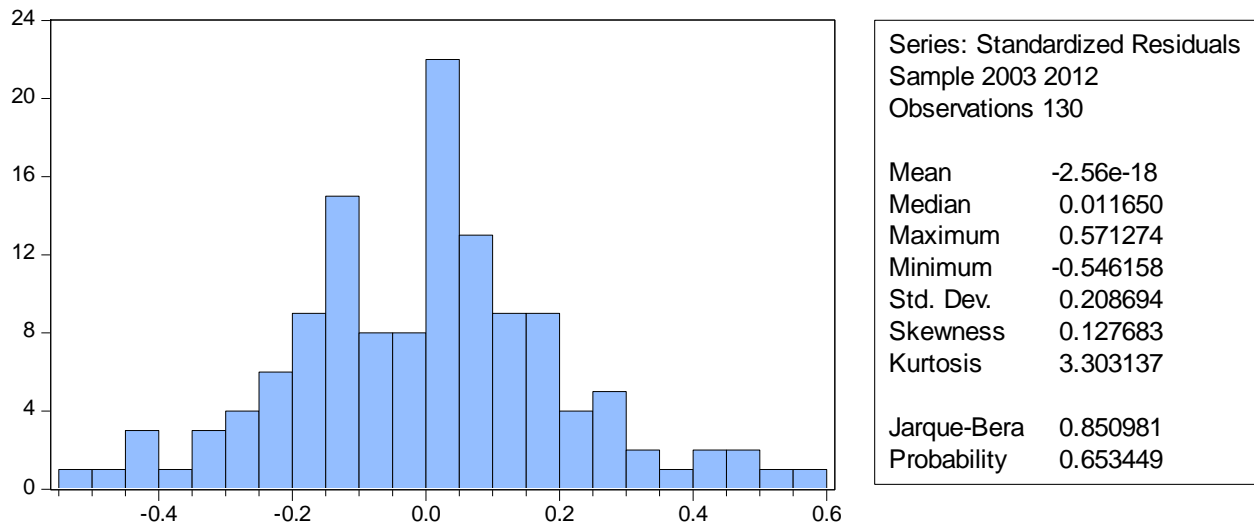
F-statistic	1.986168	Prob. F(7,122)	0.0623
Obs*R-squared	13.29927	Prob. Chi-Square(7)	0.0651
Scaled explained SS	10.90796	Prob. Chi-Square(7)	0.1427

Source: Eviews output, 2015

Eviews in Table 4.5 presents three different types of tests for heteroskedasticity indicating that both the F- and  $\chi^2$  ( $\_LM'$ ) versions of the test statistic give the same conclusion that there is no evidence for the presence of heteroskedasticity, since the p-values are higher than 0.05. The third version of the test statistic,  $\_Scaled\ explained\ SS'$ , as the name suggests is based on a normalized version of the explained sum of squares, suggested also that there is no evidence of heteroskedasticity as its p-value is considerably higher than 0.05.

**Autocorrelation:** It is assumed that the distribution errors are uncorrelated with one another and that the errors are linearly independent of one another. If the errors are not uncorrelated with one another, it would be stated that they are ‘autocorrelated’ or that they are ‘serially correlated’ (Brook, 2008). Therefore a test of this assumption is therefore required to validate the null hypothesis that the covariance between the error terms over time is zero. This study utilized the Durbin and Watson test recommended by Brook (2008). The Durbin-Watson test statistic value in the main regression above is 2.09. With 130 observations and 7 explanatory variables (excluding the constant term), the DW test critical values were used. Then relevant critical lower and upper values for the test are  $dL = 1.487$  and  $dU = 1.711$  respectively. The values of  $4 - dU = 4 - 1.711 = 2.289$ . Brook (2008) recommended that not to reject the null hypothesis of no autocorrelation, the DW test statistic should be in the non-rejection region of the upper limit ( $d_u$ ) and  $4 - d_u$ . Thus the DW test statistic of 2.09 is between the upper limit ( $dU$ ) which is 1.711 and the critical value of  $4 - dU$  i.e. 2.289 indicating that there is no evidence for the presence of autocorrelation.

**Normality test:** Brooks (2008) noted that if the residuals are normally distributed, the Jarque-Bera statistic would not be significant meaning disturbance to be normally distributed the mean. This study establishes a null hypothesis for residual normality and an alternate hypothesis for non-normal distribution error. Testing the normality assumption required that, not to reject the null of normality at the 5% level, the  $p$ -value given at the bottom of the normality test screen should be bigger than 0.05. Figure 4.1 indicated that distribution of the sustainability panel observation is symmetric about its mean. The Jarque-Bera statistic has a  $P$ -value of 0.65 implies that the  $p$ -value for the Jarque-Bera test for the model is greater than 0.05 which indicates that the errors are normally distributed. Based on the statistical result, the study failed to reject the null hypothesis of normality at the 5% significance level.

**Figure 4.1 Normality test for Ethiopian MFIs' sustainability**

Source: Eviews output for normality test, 2015

**Multicollinearity (Covariance matrix estimation):** Testing the assumption of multicollinearity is made to ensure that the explanatory variables are not correlated with one another (Brooks, 2008). This is because, a problem occurs when the explanatory variables are highly correlated with each other making it difficult to estimate all of the coefficients in the model. Since the two variables are perfectly related to one another; together they contain only enough information to estimate one parameter, not two. Hailer et al (2006) noted that multicollinearity could only be a problem if the pair-wise correlation coefficient among regressors is above 0.90. On the other hand, if a correlation coefficient matrix demonstrates correlations of .75 or higher among explanatory variables, there may be multicollinearity (ResearchConsultation.com, 2015). On the ground of these, the pair-wise correlation coefficient between regressors from covariance matrix estimation table showed that there is no evidence of multicollinearity in the model.

**Table 4.6: Covariance matrix estimation for regressors of sustainability**

Covariance Analysis: Ordinary

Date: 05/12/15 Time: 23:52

Sample: 2003 2012

Included observations: 130

Correlation	GAR	DLR	FBP	AGE	PAR	GDP	INF
GAR	1.000000						
DLR	-0.296175	1.000000					
FBP	0.301902	-0.077126	1.000000				
AGE	-0.310738	0.542510	-0.071878	1.000000			
PAR	-0.020828	-0.050638	-0.233889	-0.013855	1.000000		
GDP	0.274059	-0.358177	-0.079158	-0.729542	-0.045399	1.000000	
INF	-0.201977	0.251375	0.044523	0.504660	0.040017	-0.668334	1.000000

Source: Eviews output, 2015

**Redundant Fixed Effects Tests:** The pooled regression assumes that the intercepts are the same for each firm. This may be an inappropriate assumption, and Brooks (2008) recommended that we could instead estimate a model with firm fixed effects, which will allow for latent firm-specific heterogeneity. The simplest types of fixed effects models allow the intercept in the regression model to differ cross-sectionally. To determine whether the fixed effects are necessary or not, this study run a redundant fixed effects test as recommended by Brooks (2008) and others. The results of the test are summarized in the following Table. The detail of this test is provided in the appendix at the end of the paper.

**Table 4.7 Redundant fixed effect test for MFIs' financial sustainability**

Redundant Fixed Effects Tests

Equation: EQ01

Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	5.297647	(12,110)	0.0000
Cross-section Chi-square	59.294401	12	0.0000

Source: Eviews output, 2015

From Table 4.7 we can conclude that, the  $p$ -values associated with the test statistics are zero to 4 decimal places, indicating that it is better to employ the fixed effect model than a simple pooled regression model.

#### 4.3.2 Regression results: MFIs' sustainability

Based on the regression result on Table 4.8 the study found that the estimated result of multiple regression analysis is at a fairly satisfactory level where R-squared is 58% and Adjusted R-squared value is 51%, respectively. The value of Adjusted R-squared revealed that there are good relationships between dependent and independent variables where all independent variables can explain about 51% of the financial self-sufficiency. While the remaining 49% of the change in sustainability regression model is explained by other factors which are not included in the regression line, both R-squared and Adjusted R-squared values in this study are found to have more explanatory power than the previous results found in Ethiopia and in other jurisdictions made on related studies. Moreover for panel data, R-Squared greater than 20% is still large enough for reliable conclusions (Cameron Trivedi, 2009; Hsiao, 2007, cited in Nyamsogoro, 2010).

**Table 4.8: Regression results for the determinants of financial sustainability**

Dependent Variable: FSS ratio

Method: Panel Least Squares

Date: 05/10/15 Time: 23:22

Sample: 2003 2012

Periods included: 10

Cross-sections included: 13

Total panel (balanced) observations: 130

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.586751	0.500901	-1.171392	0.2440
GAR	-0.489708	0.252229	-1.941526	0.0548
DLR	0.535465	0.180575	2.965330	0.0037
FBP	-0.461371	0.209729	-2.199843	0.0299
AGE	0.036898	0.014587	2.529536	0.0128
PAR	-0.968274	0.541926	-1.786726	0.0767
GDP	13.06715	3.419400	3.821473	0.0002
INF	0.188660	0.240661	0.783924	0.4348

## Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.584638	Mean dependent var	0.942569
Adjusted R-squared	0.512894	S.D. dependent var	0.323815
S.E. of regression	0.226000	Akaike info criterion	0.004076
Sum squared resid	5.618365	Schwarz criterion	0.445235
Log likelihood	19.73508	Hannan-Quinn criter.	0.183333
F-statistic	8.148923	Durbin-Watson stat	2.091587
Prob(F-statistic)	0.000000		

Source: Eviews output, 2015

Overall reliability and validity of the model was further enhanced by the Prob (F-statistic) value (0.000) which indicates strong statistical significance. Thus the null hypothesis of the overall test of significance that all coefficients are equal to zero was rejected as the p-value was sufficiently low (less than 0.05).

The dependent variable being explained is financial sustainability which is measured by financial self-sufficiency ratio (FSS). The variables of financing structures (Grants to Total Assets Ratio-GAR and Deposits to Loan Ratio-DLR), firm specific characteristics (female borrower's proportion-FBP and experience-AGE) and macroeconomic variables (GDP) are found to be significant regressors of MFIs sustainability in Ethiopia. Grants to total asset ratio and the proportion women borrowers each affected MFIs' sustainability negatively and are statistically significant at 5% each. On the other hand deposits to loans ratio, age and GDP growth rate positively affected sustainability and are significant at 1%. Inflation and portfolio at risk are not statistically found to affect MFIs' sustainability in Ethiopia. The following section demonstrates the impact each explanatory variables on sustainability.

#### 4.3.2.1 The financing structure

**Grants to Asset Ratio (GAR):** Consistent with the expectation, the coefficient of the Grants to Asset Ratio (GAR) is negative (-0.4897) and statistically significant at 5% indicating that having grants as a larger percent of assets decreases the financial self-sufficiency of Ethiopian MFIs for the study period. That is increasing GAR by one percent causes MFIs' FSS ratio to fall nearly by 0.5%. While the result is consistent with the findings of Bogan (2009) and Magali (2013), it is an important result which calls for the need for Ethiopian MFIs to focus on commercialization of their operation than strive for subsidies. This result supported Bogan's (2009) statement that the negative effects of grants were a meaningful result given that it is consistent with a growing view that MFIs should rely less on grants, soft loans, and other types of donor funds.

**Deposit to loan ratio (DLR):** Deposit mobilization of Ethiopian MFIs indicated a positive coefficient of 0.5355 and significant at 1% which further showed that a one percent increase in this ratio causes MFIs' FSS ratio to rise by 0.54%. Considering the findings on grants above, this result further indicated that while grants erode sustainability, commercially available sources

(savings) enhanced sustainability during the study period. This leads to acceptance of the original hypothesis (HA2) that deposits to loan ratio has a significant positive effect on sustainability of Ethiopian MFIs. This result is again consistent with the claims of Ravicz and Cluster (1998), Bogan (2009) and Magali (2013) that sustainable MFIs can reduce, and even eliminate the need for subsidies if they achieve a significant volume of business in the form of deposits.

#### 4.3.2.2 Firm characteristics

**Female borrowers' proportion (FBP):** Surprisingly, female borrowers' proportion (FBP) indicated a negative coefficient of -0.4614 and significant at 5%. Thus the finding is at odd with the hypothesis (HA3) that size of female borrowers has a significant positive impact on sustainability of Ethiopian MFIs. While the negative impact of gender may call for further investigation of the issue, as many agreed this relationship could happen due to the fact that in many developing countries female clients borrower in small sizes but featured by high administrative costs. This result supported the findings of Ruchi and Asha (2012) and Vingo (2012), who revealed that there were negative relationships between share of lending to women and sustainability. The result questioned the findings of Cull et al (2007), Khandker (2003) and Onumah and Acquah (2011) who claimed that number of women borrowers contributed positively to sustainability of MFIs.

**MFIs experience (AGE).** The maturity of MFIs is found to affect sustainability of Ethiopian MFIs with a coefficient level of (0.0369) and significant at 1%. The result supported the expectation (HA4) that the age of MFIs has a significant positive effect on MFIs' sustainability in Ethiopia. When other things being constant, a marginal increase in MFI's age leads nearly to a 4% increase in their FSS ratio indicating that the older the institution the more likely it is to be sustainable. The result supported the findings of Kipesha (2013) and Megali (2013) that firm experience has a positive impact on the profitability of MFIs and rural SACCOS. The positive coefficient of age may be an expected result, as agreed by many authors and regulators, due to the fact that with experience the growth of MFIs is expected to increase as a result of better marketing and may be business reputation which could lead to increased supply of funds in the form of deposits and increased revenues from loans provided. However whether mature MFIs' are benefited from innovations, technology and economies scale or not the study analyses the influence their age on their efficiency (cost per borrower) in the next sections. But this study

rejected the claims of Abdurrahman & Mazlan (2014) who claimed that the experience of MFIs erode sustainability, and statistically at odd with the claims of Nyamsogoro (2010) who found that age of MFI didn't significantly promote financial sustainability at all.

**Portfolio at risk, outstanding past due 30 or more days (PAR >30):** Although empirically portfolio at risk, a measure of credit risk, was found to reduce the probability of MFI survival, the P-value of PAR>30 (0.0767) from the regression result means that portfolio at risk does not have a significant impact on Ethiopian MFIs at least at 5% significance level. However, with its negative coefficient (-0.9682), PAR>30 was found to erode sustainability at 10% significance level and consistent with the hypothesis that portfolio at risk is negatively related to sustainability of Ethiopian MFIs. Hence with its negative coefficient level the result supported the findings of Miller and Noulas (1997), Cooper et al., (2003) and Gwasi and Ngambi (2014) who claimed that PAR>30 is negatively related to MFI sustainability. However, statistically the result is inconsistent with the findings of these studies who claimed credit risk as a significant contributor of MFIs' sustainability.

#### 4.3.2.3 Macroeconomic Variables

**GDP:** It is generally believed that a stable macroeconomic environment is necessary for the viability of MFIs. This study tested the influence of macroeconomic indicator (GDP growth rate) on the sustainability of MFIs. Expectedly, the result showed a positive impact of GDP growth on the sustainability of MFIs in Ethiopia with a coefficient level of 13.07 and statistically significant at 1%. This is due to, as theoretically believed, the fact that improving macroeconomic performance raises overall income level and business performance which ultimately improves client's repayment ability and hence leading to enhanced MFIs' viability.

**Inflation (INF):** Weele and Markowich (2001) indicated that repayment levels are usually weak and low in the presence of higher inflation rates. However the regression result above indicated that inflation is not statistically significant in the model and does not have a bearing on MFIs sustainability in Ethiopia. This may be due to the fact that MFIs' clients (who took loan for business purpose) may easily pass-on rising prices to their customers so that their repayment rate remains unaffected. This study further believed that the insignificant effect of inflation may also

point to the fact that MFIs' regulations and policies adopted by the regulator may play an important part in creating a favorable environment for the sector to resist inflationary pressures.

Now we can regenerate the operational model based the above findings. The operational model for sustainability of Ethiopian MFIs presented in chapter three was:

$$FSS_{it} = \beta_0 + \beta_1 GAR_{it} + \beta_2 DLR_{it} + \beta_3 FBP_{it} + \beta_4 AGE_{it} + \beta_5 PAR>30_{it} + \beta_6 GDP_{it} + \beta_7 INF_{it} + \varepsilon_{it}$$

Where  $FSS_{it}$  is the observed financial self-sufficiency of an MFli at year t,

$GAR_{it}$  is grants to assets ratio of an MFli at time t,

$DLR_{it}$  is the deposits to loan ratio of an MFli at time t,

$FBP_{it}$  is the proportion of female borrowers of an MFli at time t,

$AGE_{it}$  is age of an MFli at time t,

$PaR>30_{it}$  is the portfolio at risk, outstanding for more than 30 days, of an MFli at time t,

$GDP_{it}$  is the GDP growth rate of Ethiopia assigned to an MFI i at time t,

$INF_{it}$  is the rate of inflation of Ethiopia assigned to an MFI i at time t, and

$\beta_s$  are the partial effect of independent variables in period t.

$\varepsilon_{it}$  the error term of an MFli at time t.

Based on the regression results presented in Table 4.8, the model of this study can be written as follows:

$$FSS = -0.5868 - 0.4897*GAR + 0.5355*DLR - 0.4614*FBP + 0.0369*AGE - 0.9683*PAR + 13.0671*GDP + 0.1887*INF + \varepsilon.$$

The following table summarizes the impact of explanatory variables on sustainability from the main sustainability regression model in Table 4.8.

**Table 4.9: Summary of significant results from MFIs' sustainability regression model**

Variable	Definition	hypothesis	Regression result	Statistically significant at
GAR	Grants to asset ratio	-	-	5%
DLR	Deposits to loan ratio	+	+	1%
FBP	Size of female borrowers (in %)	+	-	5%
AGE	№. of years in operation	+	+	1%
GDP	GDP growth rate	+	+	1%

Source: Own summary of sustainability regression output, 2015.

Table 4.9 summarizes only those variables from the main regression, Table 4.8, which are statistically revealed to affect sustainability of MFIs at a maximum of 5% significance level. It is summarized that MFIs' financing structures (grants to loan ratio and deposit to loan ratio), firm characteristics (female borrowers' proportion and number of years in operation) and macroeconomic variables (GDP growth rate) are statistically significant factors that determine sustainability of MFIs in Ethiopia.

#### 4.4 Regression results from MFIs' cost efficiency estimation model

This section presents the regression results on the determinants of cost efficiency (cost per borrower) of microfinance sector in Ethiopia. Similar tests, as with the sustainability model, were made for the efficiency model to enhance the quality of the econometric estimates followed by presentation of regression results on the effect of financing structures, firm specific characteristics and macroeconomic variables on MFIs' cost efficiency.

##### 4.4.1 Model diagnosis

**Heteroskedasticity:** The presence of heteroskedasticity has been checked for the efficiency model to ensure that the standard errors are not wrong and any inferences made could not be misleading. It is assumed that the errors are homoskedastic or their variance is constant. The null hypothesis is the error terms are homoskedastic. A white' test has been made, to ensure that this assumption is no longer violated. Not to reject the null hypothesis the p-value of both the F- and  $\chi^2$  ( $\_LM'$ ) versions of the test statistic and the p-value of Scaled explained SS must be higher than 0.05. The detail of this test is provided in the appendix at the end of the paper.

**Table 4.10: Heteroskedasticity test for Ethiopian MFIs' efficiency**

Heteroskedasticity Test: White

F-statistic	1.961147	Prob. F(7,122)	0.0658
Obs*R-squared	13.14868	Prob. Chi-Square(7)	0.0686
Scaled explained SS	12.79027	Prob. Chi-Square(7)	0.0774

Source: Eviews output, 2015

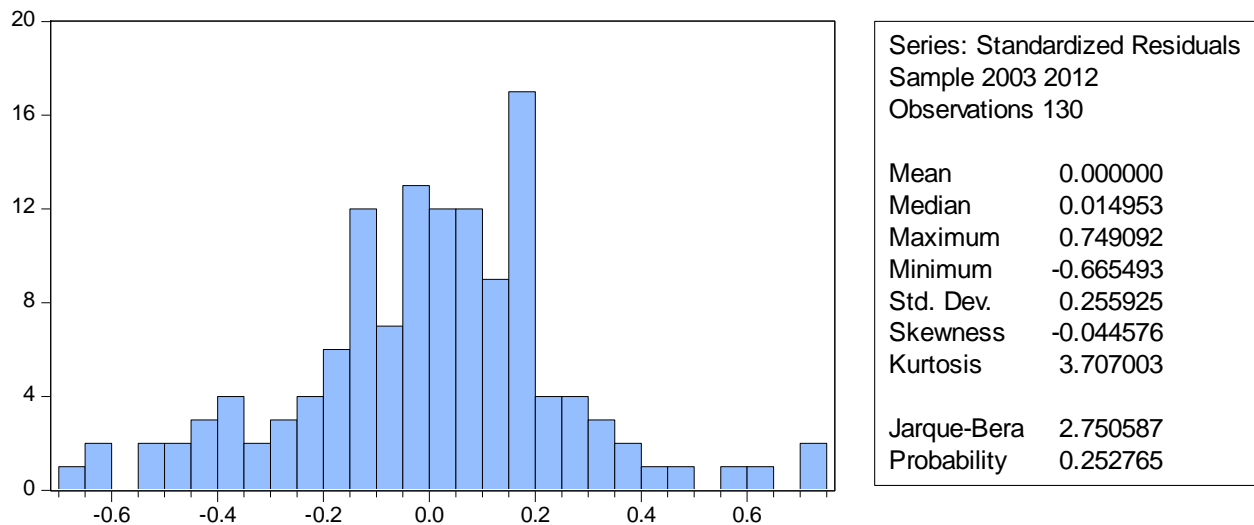
Eviews in Table 4.10 displayed three different types of tests for heteroskedasticity. In this case, both the F- ,  $\chi^2$  ( $\_LM'$ ) and  $\_Scaled$  explained SS' versions of the test statistic give the same conclusion that there is no evidence for the presence of heteroskedasticity, since the p-values are in excess of 0.05.

**Autocorrelation:** It is assumed that the distribution errors are uncorrelated with one another and that the errors are linearly independent of one another. This study utilized the Durbin and Watson test recommended by Brook (2008). The Durbin-Watson test statistic value in the main regression result in Table 4.13 is 1.797. With 130 observations and 7 explanatory variables excluding the constant term, then relevant critical lower and upper values for the test are  $dL=$

1.487 and  $dU=1.711$  respectively. The values of  $4 - dU = 4-1.711=2.289$ . Thus the Durbin-Watson test statistic of 1.797 is between the upper limit ( $d_u$ ) which is 1.711 and the critical value of  $4- dU$  i.e.2.289 indicating that there is no evidence of the presence of autocorrelation.

**Normality test:** Brooks (2008) noted that the Jarque-Bera statistic would not be significant for disturbance to be normally distributed around the mean. Figure 4.2 indicated that distribution of the panel observation is symmetric about its mean. The Jarque-Bera statistic has a P-value of 0.25 implies that the p-value for the Jarque-Bera test for models is greater than 0.05 which indicates that the errors are normally distributed. Hence the study failed to reject the null hypothesis of normality at the 5% significance level.

**Figure 4.2: Normality test for Ethiopian MFIs' cost efficiency**



Source: Eviews output, 2015

**Multicollinearity (Covariance matrix estimation):** Testing the assumption of multicollinearity is made to ensure that the explanatory variables are not correlated with one another (Brook, 2008). The maximum pair-wise correlation coefficient among regressors, which is less than 0.75, from covariance matrix estimation table showed that there is no evidence of multicollinearity.

**Table 4.11: Covariance matrix estimation for regressors of cost efficiency**

Covariance Analysis: Ordinary

Date: 05/15/15 Time: 14:50

Sample: 2003 2012

Included observations: 130

Correlation	GAR	DLR	DER	InGLP	FBP	AGE	GDP
GAR	1.000000						
DLR	-0.296175	1.000000					
DER	-0.400673	0.205533	1.000000				
InGLP	-0.621186	0.531291	0.315925	1.000000			
FBP	0.301902	-0.077126	-0.365646	-0.343262	1.000000		
AGE	-0.310738	0.542510	0.205373	0.578323	-0.071878	1.000000	
GDP	0.274059	-0.358177	-0.060862	-0.375796	-0.079158	-0.729542	1.000000

Source: Eviews output, 2015.

**Redundant Fixed Effects Tests:** To determine whether the fixed effects are necessary or not this study run a redundant fixed effects test as recommended by brooks (2008) and others. The result of the test is presented in the following Table. The details of the test are attached in appendix.

**Table 4.12 Redundant fixed effect test for MFI cost efficiency**

Redundant Fixed Effects Tests

Equation: EQ01

Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	8.452565	(12,110)	0.0000
Cross-section Chi-square	84.944249	12	0.0000

Source: Eviews output, 2015

From Table 4.12 we can conclude that, the  $p$ -values associated with the test statistics are zero to 4 decimal places, indicating that it is better to employ the fixed effect model than a simple pooled regression model.

#### **4.4.2 Regression results: MFIs' cost efficiency**

It is desirable to have some measure of how well the regression model actually fits the data. Based on the regression result on Table 4.13 below, both the R-squared and the Adjusted R-squared values indicated that 80% and 77% of the total variation in MFI's cost efficiency is explained by the independent variables respectively showing the apparent fit of the model to the data. While the remaining 20% and 23% of the change is explained by other factors which are not included in the model, both the R-squared and the Adjusted R-squared values in this study are found to be sufficient enough to infer that the fitted regression line is very close to all of the data points taken together (has more explanatory power).

**Table 4.13: Regression results for the determinants of MFIs efficiency**

Dependent Variable: InCPB

Method: Panel Least Squares

Date: 05/15/15 Time: 08:47

Sample: 2003 2012

Periods included: 10

Cross-sections included: 13

Total panel (balanced) observations: 130

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.235527	1.093196	5.703943	0.0000
GAR	0.999544	0.316817	3.154961	0.0021
DLR	-0.384470	0.224546	-1.712214	0.0897
DER	-0.042901	0.024812	-1.729019	0.0866
InGLP	-0.162542	0.061782	-2.630910	0.0097
FBP	0.437416	0.258454	1.692434	0.0934
AGE	0.162574	0.026761	6.074918	0.0000
GDP	-2.034471	3.747162	-0.542936	0.5883

## Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.802977	Mean dependent var	4.855086
Adjusted R-squared	0.768946	S.D. dependent var	0.576574
S.E. of regression	0.277148	Akaike info criterion	0.412107
Sum squared resid	8.449204	Schwarz criterion	0.853266
Log likelihood	-6.786965	Hannan-Quinn criter.	0.591365
F-statistic	23.59533	Durbin-Watson stat	1.796626
Prob(F-statistic)	0.000000		

Source: Eviews output, 2015

Overall reliability and validity of the model was enhanced further by the Prob (F-statistic) value (0.000) which indicated strong statistical significance. Thus the null hypothesis of the overall test of significance that all coefficients estimates are equal to zero was rejected as the p-value was sufficiently low (less than 0.05).

The dependent variable being regressed is efficiency of MFIs which is measured by cost per borrower. The explanatory variables of financing structures (grants as a percent of total assets-GAR), firm specific characteristics (scale of operation which is the natural logarithm of gross loan portfolio and MFIs' experience) are found to be a significant regressors of MFIs' cost efficiency in Ethiopia. While grants to total assets and age of MFIs positively affected cost per borrower to erode their efficiency and are statistically significant at 1%. On the other hand the natural logarithm of gross loan portfolio has improved their efficiency by lowering down cost per borrower and is statistically significant at 1%. Thus the study claimed that efficiency of MFIs enhanced with increasing scale of operation. The following section presents the impacts of each explanatory variable on Ethiopian MFIs.

#### 4.4.2.1 The financing structures

**Grants to Asset Ratio (GAR):** The coefficient of the Grants to Assets Ratio (GAR) is positive (0.9995) and statistically significant at 1% indicating that having grants as a larger percent of assets erodes efficiency by increasing MFIs' cost per borrower for the study period. That is, other things being constant, a marginal increase in GAR causes MFIs' cost per borrower to increase nearly by Birr 1.00. This is consistent with the research hypothesis (HB1) that grants to asset ratio has a significant positive effect on cost efficiency of Ethiopian MFIs and congruent with the findings of Nawaz (2010) who claimed the same finding. This showed that the subsidy dependent MFIs are less efficient because of the higher costs associated with granting loans. This in turn means that poorly performing and highly subsidized MFIs can continue operations with little regard for operational costs and subsidies, therefore allowing them to overlook any inefficiency in operations. The result of this study also agreed with the remarks of Bogan (2009) that reliance on donor funds eliminates the motivation for MFIs to operate efficiently and provides evidence that MFIs are not currently realizing efficiencies due to economies of scale.

**Deposit to Loan Ratio (DLR):** Although deposit mobilization was not a statistically significant predictor of efficiency during the study period, a negative coefficient of (-0.3845) means that a marginal increase in savings as a percent of loans leads to an increase in cost per borrower by Birr 0.38. With its negative coefficient of DLR, the result accepted hypothesis (HB2) that deposit to loan ratio has a negative effect on cost efficiency of Ethiopian MFIs. Still at a significant level of 10%, the result supports the idea that a significant volume of business in the form of deposits enhances efficiency by decreasing cost per borrower so that MFIs can reduce the need for subsidies.

**Debt to Equity Ratio (DER):** While empirical evidences on the effect of leverage on cost efficiency are still blurred one if not non-existent, this study found a negative coefficient of leverage suggesting that leverage enhances efficiency by lowering down cost per borrower. With its negative coefficient level of leverage, the study supported the hypothesis that leverage ratio negatively affects cost efficiency of Ethiopian MFIs. However the result was not statistically significant.

#### 4.4.2.2 Firm characteristics

**Scale of operation, natural logarithm of gross loan size (InGLP):** The study considered gross loan size as a measure of scale of operation. As recommended by Brooks (2008), to reduce the size effect of variables, the ratio is transformed into its natural logarithm form. . Expectedly, increasing gross loan size is found to decrease cost per borrower, the result is statistically significant at 1% and accepted the hypothesis that gross loan size has a significant effect on cost efficiency of Ethiopian MFIs. The coefficient of InGLP (-0.1625) indicated that other things being constant a marginal increase in loan portfolio leads to a decline in MFIs cost per borrower (improving efficiency) by 16 cents. This suggested that MFIs with higher scale of operation achieve higher efficiency than smaller ones .The result supported the findings of Hermes et al (2008) who claimed that larger MFIs achieve higher efficiency than smaller ones. However the result of this study is inconsistent with the findings of Nawaz (2010) who claimed that larger loan sizes raises cost per borrower as well-off customers with larger loan size need better and quality services.

**Female borrowers' proportion (FBP):** Although not statistically significant, Ethiopian MFIs with larger proportion of female borrower had higher cost per borrower thus eroding their efficiency during the study period. With FBP's positive coefficient the result is at odd with the hypothesis (HB5) that size of female borrowers is negatively related to cost efficiency of Ethiopian MFIs. This result is consistent with the findings of Hermes et al (2008) and Vingo (2012) that MFIs that have more women borrowers are less efficient. This study believed that the positive relationship between share of women borrowers and MFIs cost efficiency may point to the fact that women in Ethiopia may probably borrow in small size and featured by high administrative costs. This study accepted Vingo's (2012) argument that targeting women is more costly for various reasons: they borrow smaller amounts, they are less mobile and less educated, and may need additional monitoring. The positive impact of percent of female borrowers on cost efficiency may tempt Ethiopian MFIs to discriminate female borrowers and may tend to focus on males or relatively richer borrowers. This leads to a situation of mission drifts where by MFIs tend to focus on commercially viable customers. The presence mission drifts is clearly indicated in Table 4.4 where gross loan size is negatively related to share of female borrowers in which case MFIs tend to discriminate female borrowers in order to have larger gross loan size. This finding is contrary to Armendariz and Morduch, (2005), Mayoux (1999) and D'Espallier et al (2009) who argued that female targeting within microfinance has often been attributed to increased efficiency through high female repayment rates.

**MFIs experience (AGE):** In contrast to the findings of Qayyum and Ahmed (2006), Gonzalez (2008), CGAP (2009) and Vingo (2012) who noted that age of MFIs helps microfinance institutions achieve higher efficiency, with experience Ethiopian MFIs do not appear to learn to reduce cost per borrowers as depicted by a positive coefficient level of AGE at a significant level of 1%. Rather young or fast-growing MFIs look efficient. The coefficient of age (0.1626) indicated that when other things being constant, a marginal increase in MFIs' age leads nearly to a Birr 0.16 increase in their cost per borrower. This leads to rejection of the original claim (HB6) that age of MFIs has a significant negative effect on MFIs' cost efficiency in Ethiopia. The result is consistent the findings of Hermes et al (2008) that older MFIs are less efficient. Agreed with their claim, the result supported the view that more recently established institutions profit from the knowledge with respect to microfinance practices that has been built-up during the past few decades. Based on the existing knowledge base young MFIs may beat older institutions in terms

of the efficiency of their activities. This calls for Ethiopian MFIs, with their experience, to learn to reduce their cost per borrower by taking advantage of and focusing on innovations, technology as well as economies of scale. One is that new technologies have been designed to assist MFIs take advantage of their scale of operation and should adopt them yet.

#### 4.4.2.3 Macroeconomic Variables

**GDP:** A stable macroeconomic environment is considered necessary for the viability and efficiency of MFIs. This study tests the influence of macroeconomic indicator (GDP growth rate) on the cost efficiency of MFIs. With its negative coefficient the study showed GDP could improve efficiency of MFIs by lowering down their cost per borrower and supported the presumption that GDP growth rate negatively affects cost efficiency of Ethiopian MFIs. However, the result is not statistically significant.

Now we can generate the operational model based on the above findings. The operational model for efficiency of Ethiopian MFIs presented in chapter three was:

$$\ln CPB_{it} = \beta_0 + \beta_1 GAR_{it} + \beta_2 DLR_{it} + \beta_3 DER_{it} + \beta_4 \ln GLP_{it} + \beta_5 FBP_{it} + \beta_6 AGE_{it} + \beta_7 GDP_{it} + \varepsilon_{it}$$

Where  $\ln CPB_{it}$  is an observed natural logarithm of cost per borrower of an MFI  $i$  at year  $t$ ,

$GAR_{it}$  is grants to assets ratio of an MFI  $i$  at time  $t$ ,

$DLR_{it}$  is the deposits to loan ratio of an MFI  $i$  at time  $t$ ,

$DER_{it}$  is the debt to equity ratio of an MFI  $i$  at time  $t$ ,

$\ln GLP_{it}$  is the natural logarithm of gross loan size of an MFI  $i$  at time  $t$

$FBP_{it}$  is the female borrowers' proportion of an MFI  $i$  at time  $t$ ,

$AGE_{it}$  is age of an MFI  $i$  at time  $t$ ,

$GDP_{it}$  is the GDP growth rate of Ethiopia assigned to an MFI  $i$  at time  $t$ ,

$\beta_s$  are the partial effect of independent variables in period  $t$ .

$\varepsilon_{it}$  is the error term of an MFI  $i$  at time  $t$ .

Thus based on the regression results presented in Table 4.11, the model of this study can be written as follows:

$$\ln CPB = 6.23552 + 0.99954 * GAR - 0.38447 * DLR - 0.042901 * DER - 0.162542 * \ln GLP + 0.43742 * FBP + 0.16257 * AGE - 2.03447 * GDP + \varepsilon_{it}$$

The following table summarizes the impact of explanatory variables on cost per borrower of Ethiopian MFIs from the main efficiency regression model in Table 4.11.

**Table 4.14: Summary significant results from MFIs' efficiency regression model**

Variable	definition	hypothesis	Regression result	Statistically significant at
GAR	Grants to assets ratio	+	+	1%
InGLP	$\log_e$ gross loan portfolio	-/+	-	1%
AGE	№ of years in operation	-	+	1%

Source: Own summary of cost efficiency regression output, 2015.

Table 4.14 summarizes only those variables from the main regression, Table 4.13, which are statistically revealed to affect cost efficiency of MFIs at a maximum of 5% significance level. It is summarized that MFIs' financing structures (grants to loan ratio) and firm characteristics (gross loan size and MFIs' age) are statistically significant factors that determine cost efficiency of MFIs in Ethiopia at 1% significance level.

## CHAPTER FIVE

### 5 CONCLUSION AND RECOMMENDATION

#### 5.1 CONCLUSION

This section draws conclusions from the results descriptive statistics, correlation analyses and regression analyses discussed in this study.

##### 5.1.1 Conclusions from descriptive statistics

During the periods covered in this study Ethiopian MFIs maintained an average Financial Self-Sufficiency (FSS) ratio of 94%. Given the international requirement of an FSS of 100%, the result is an indication of the fact that much of Ethiopian MFIs were not financially self-sufficient during the study period. The result below 100% means that it is difficult for Ethiopian MFIs to cover all costs and their obligations without ongoing subsidy. Comparison of Ethiopian MFIs' FSS with other countries indicated that MFIs operating in Eastern African and southern African regions had higher mean scores of an FSS ratio indicating that they out-performed Ethiopian MFIs.

The average Ethiopian MFIs incurred a cost per borrower with mean, maximum and minimum score of \$14, \$84 and \$3 respectively to maintain a single borrower. The average Ethiopian MFIs are appeared to look more cost efficient than most of MFIs in the rest of the world. Nawaz (2010) found that the average MFIs in the world incurred a cost per borrower of \$ 131 while the most inefficient MFIs incurred a cost per borrower of \$1694.

Ethiopia MFIs maintained donated equity of 22% in their total assets. Highly subsidized MFIs maintained grants as high as 90% of their total assets. The mean value in Ethiopia was higher than the mean value of the same ratio revealed in Bogan's (2009) study which is an indication of the fact that the MFI sector in Ethiopia is highly subsidized as compared to the MFIs sector in the rest of the world.

Ethiopian MFIs maintained an average deposit to loan ratio of 24% while MFIs in Central Africa, Eastern Africa, Southern Africa, Western Africa and the entire continent of Africa have mean score of DLR 154.8%, 48.6%, 30.5%, 59.5% and 154.8% respectively for the same ratio indicating that MFIs in these regions have mobilized higher commercial sources (savings) to finance their loan than MFIs in Ethiopia. This enables these Subs Saharan African MFIs to mobilize a cheaper source of funds than debts to finance their loans and can reduce the need of subsidies.

The average Ethiopian MFIs provided a gross loan size of \$27million .This is much higher, as reported by MixMarket (2011), than the mean score of African MFIs \$4.4million . On the other hand according to a study by D'Espallier et al (2009), the average MFI in the globe has a total loan portfolio of \$ 4.1million. Thus Ethiopian MFIs on the average can be categorized in to large scale MFIs.

Female borrowers do have a mean value of 50% while the maximum and the minimum values were 82% and 10%. In Nawaz's study of worldwide MFIs the scores of the same ratios were 64.7%, 100% and 80% respectively indicating that Ethiopian MFIs are performing relatively poorly in deepening their services to serve the most unbankables sector of the society (basically women).This is also an indication of mission drifts where by MFIs are inclined to serve commercially feasible sector of the society.

Ethiopian MFIs on the average found to be mature with their mean score of 9 years .While mature MFIs have a maximum age of 15 years, young MFIs have a minimum age of two years. However Ethiopian MFIs on the average are younger than average MFIs in Africa.

The portfolio quality of Ethiopian MFIs is low as their PAR>30 was stood at an average of 21% and is much higher than the mean score of MFIs in East Africa region and West Africa region whose ratio stood at 8.3% and 5.9% respectively. Generally speaking any portfolio at risk (PAR>30) exceeding 10% should be a cause for concern.

The growth in GDP during the last 10 years intuitively believed to help Ethiopian MFIs to display extraordinary expansionary rates.

## 5.1.2 Conclusions from correlation and regression analysis

### 5.1.2.1 MFIs' sustainability

The correlation of some the independent variables and the financial sustainability (FSS), showed that MFIs with higher proportion of female borrowers, higher grants as a percent of assets and higher PAR do have lower sustainability ratio.

The variables of financing structures (grants to loan ratio and deposits to assets ratio), firm specific characteristics (female borrowers' proportion and MFIs' age) and macroeconomic variables (GDP) are found to be significant regressors of MFIs sustainability in Ethiopia. Grants to assets ratio and the proportion women borrowers are found to erode MFIs' sustainability and are statistically significant each at 5%. On the other hand deposits to loan ratio, age and GDP growth rate positively affected sustainability of MFIs in Ethiopia at a significant level of 1%.

The negative effect of grants and the positive effect of deposit mobilization on sustainability in Ethiopian microfinance sector are consistent with a growing view that MFIs should rely less on grants, soft loans, and other types of donor funds. This in turn mean that commercially-funded MFIs are motivated to respond to profit incentive, working to increase revenues and decrease expenses so that they can have revenues sufficient to cover all operating expenses. This further suggests that sustainable MFIs can reduce, and even eliminate the need for subsidies if they achieve a significant volume of business in the form of deposits.

While the negative impact of gender may call for a further investigation of the issue, as many agreed, this may happen due to the fact that female client borrower in small size but featured by high administrative costs in Ethiopia.

This study claimed that older MFIs have higher probability of becoming sustainable as a result of profits earned from large volume of businesses emanated from the experience in better marketing efforts. The sustainability regression model supported the expectation that age positively affected MFIs' sustainability. The result supported the findings of Kipesha (2013) and Megali (2013) that age of firm experience has a positive impact on the profitability of MFIs. But this study is at odd with the findings of Abdurrahman & Mazlan (2014) who claimed that the experience of MFIs erode their sustainability.

The regression result shows a positive impact of GDP growth rate on sustainability of Ethiopian MFIs and accepted the research hypothesis that GDP has a positive impact on MFIs' sustainability in Ethiopia. This is due to, as theoretically believed, the fact that improving macroeconomic performance raises overall income level and business performance which ultimately improves clients repayment ability and hence sustainability of MFIs.

#### **5.1.2.2 MFIs' cost efficiency**

The positive correlations between female borrowers' proportion, grants to asset ratio and cost per borrower from the correlation matrix showed that MFIs with higher percentage of grants to asset ratio and higher proportion of women also had higher cost per borrower during the study period.

In estimation of MFIs cost efficiency the dependent variable being regressed is cost efficiency of MFIs which is measured by cost per borrower. The explanatory variables of financing structures (grants to asset ratio), firm specific characteristics (gross loan portfolio and MFI's experience) are found to be significant regressors of MFI's cost per borrower in Ethiopia.

Having grants as a larger percent of assets erode efficiency by increasing cost per borrower for the study period and is statistically significant at 1%. This in turn means that poorly performing and highly subsidized MFIs can continue operations with little regard for operational costs and subsidies, therefore allowing them to overlook any inefficiency in their operations.

Deposit mobilization was not statistically significant predictor of efficiency during the study period. However at a significant level of 10%, the result supports the idea that a significant volume of business in the form of deposits enhances efficiency by decreasing cost per borrower so that MFIs in Ethiopia can reduce, and even eliminate the need for subsidies.

In line with expectation of this study, MFIs' gross loan portfolio has improved efficiency by lowering down cost per borrower and is statistically significant at 1%. The study revealed that MFIs with higher scale of operation achieve higher efficiency than smaller ones. The result supported the findings of Hermes et al (2008) who claimed the same finding. However the result of this study is inconsistent with the findings of Nawaz (2010) who claimed that an increase in

the loan size raises cost per borrowers as well-off customers need better services and quality services.

Although statistically not significant, and consistent with its effect on sustainability, higher proportion of women borrowers is also found to erode MFIs' cost efficiency during the study period.

Contrary to the findings of Qayyum and Ahmed (2006), Gonzalez (2008) and CGAP (2009) who noted that age of MFIs helps microfinance institutions achieve higher efficiency, this study claimed that at 1% significant level, with experience Ethiopian MFIs did not appear to learn to reduce cost per borrowers. Rather young or fast-growing MFIs look efficient. Thus, the study rejected the research hypothesis that age of MFIs negatively affected their cost per borrower to enhance their efficiency.

## 5.2 Recommendations

### 5.2.1 Recommendations to findings of descriptive statistics

The mean score of Financial Self-Sufficiency (FSS) ratio of 94% means that the average Ethiopian MFIs were not financially self-sufficient out-performed by regional MFIs and hence should maintain a sufficient level of FSS ratio. Unless 100% FSS ratio is reached, the long-term provision of credit services is undermined by the impact of macroeconomic environments and the continued necessity to rely on donor funds. The high disparity between the maximum and minimum scores of FSS and cost per borrower ratios means that it should also call the attention of regulators so as to create a stable microfinance sector.

MFIs in Central Africa, Eastern Africa, Southern Africa, and Western Africa maintained a higher deposit to loan ratio than Ethiopian MFIs. Ethiopian MFIs should mobilize deposits sufficient enough to finance their loan portfolio so that they can be benefited from the cheaper source of fund (saving) and reduce the need for subsidies.

Highly leveraged MFIs should be vigilant because theories suggest that higher gearing bound to exert pressure on profit margin during bad economic situations.

In terms of loan size Ethiopian MFIs on the average can be categorized in to large scale MFIs and out-performing regional MFIs in gross loan size but the loan size in Ethiopia should be backed by high volume of deposits, not by excessive reliance on subsidies.

MFIs should avoid mission drifts as results from descriptive statistics showed that MFIs tend to discriminate female borrowers.

## 5.2.2 Recommendations to findings of correlation and regression analysis

### 5.2.2.1 MFIs' sustainability

MFIs should resort to commercialization of their operation rather than relying on grants and soft loans. They should maintain a higher level of deposits to loan ratio and a lower level of grants to asset ratio. The findings from grants and deposit mobilizations indicated that sustainable MFIs can reduce, if not eliminate, the need for subsidies if they can mobilize a significant volume of savings.

Although higher proportion of women borrowers found to erode MFIs sustainability, MFIs should maintain striking balance between their mission of serving the poor and their sustainability.

MFIs should utilize the opportunities of macrocosmic environment because improved macroeconomic performance raises overall income level which ultimately improves clients repayment ability and hence sustainability of MFIs.

### 5.2.2.2 MFIs' cost efficiency

Poorly performing and highly subsidized MFIs should give much regard for operational costs and subsidies and pay attention to any inefficiency in operations.

Visa vise deposit levels MFI should maintain a higher level of gross loan portfolio as it is also revealed to improve efficiency by lowering down cost per borrower. The study revealed that MFIs with higher scale of operation achieve higher efficiency than smaller ones. MFIs need to deepen their services by branching out to a large sector of the population to meet increasing loan demands from the poor and to mobilize a sufficient level of savings.

Although statistically not significant, higher proportion of women borrowers are found to erode MFIs' cost efficiency. However, consistent with recommendations to the findings of descriptive statistics and the findings of regression analysis, MFIs should avoid discriminating women in reaching the poor as this may result in violation of the principles of microfinance which is deepening their services to the poorest of the poor. The study indicated that MFIs with larger

loan size systematically discriminate women and tend to focus on relatively richer borrowers, which is a situation of mission drifts whereby they have been inclined to serve commercially feasible sector of the society. They should maintain striking balance between their mission and cost efficiency. This may be achieved by working to decrease the administrative costs associated with women borrowers, by further improving their delinquency rate at an acceptable level and at the same time maintaining a reasonable number of them.

With experience Ethiopian MFIs should learn to reduce cost per borrowers. This can be achieved by seeking better marketing of their services, endeavoring innovation, resort to technology and striving to create economies of scale.

### 5.2.3 Implications to government and donors:

**Subsidies:** Although the study recommended that government policy should limit access to grants and promotes commercialization of MFIs operations, governments and donors can promote microfinance in remote areas in Ethiopia where required initial start-up costs are high, and private firms are hesitant to enter the market. If these projects are not subsidized in their early years, they will be forced to charge high interest rates that clients could not pay. However, with the expansion in scale and commercialization (growth in savings and loans), subsidies can decline dramatically.

**Serving to female borrowers:** The fact that proportion of women borrowers found to erode sustainability and efficiency in this study mean that MFIs may not seek to attract female borrowers and might focus on male borrowers or on wealthier clients. Symptoms of mission drifts are observed when a negative relationship between gross loan portfolio and size of women borrowers is existed in the correlation matrix. One of the very principle of microfinance is to have deeper outreach to the poor basically women. The regulator must ensure that MFIs maintain a striking balance between their mission, sustainability and efficiency.

**Loan size and interest rates:** According to this study gross loan size is found to decrease cost efficiency that could have an important implications for the National Bank of Ethiopia. The central bank should not hesitate from setting interest rate ceilings fearing that higher costs associated with smaller loan sizes hurt first those MFIs that serve the poorest borrowers. Otherwise borrowers with small loan size could suffer from high interest rate.

**Promote innovations:** The study found that Ethiopian MFIs, with their age, were unable learn to reduce their cost efficiency ratio that could hammer the capacity of their outreach. Thus it is important for government and donors to support microfinance institutions and other financial institutions to expand the services by breaking barriers through pilot projects and other measures that aim at establishing linkages between MFIs and their existing and potential clients.

**Effective regulation and financial infrastructure:** The study further believed that MFIs can maintain sustainable commercial services on a permanent basis and expand their scope of operations and outreach only if they operate within sound legal framework and an appropriate financial infrastructure, such as information systems and training facilities.

### 5.3 Future research

This study has recommended that further investigation should be conducted why women borrowers appeared to erode both MFIs' sustainability and efficiency. This study has also recommended further investigation into important variables that have not been considered under the scope of this study due to insufficient data. Some of them are MFIs characteristics including management and board competence, interest rates, innovations and management information systems and introduction of new products and services. While GDP is found to be a significant contributor of Ethiopian MFIs' sustainability, inflation seemed unexplained both sustainability and efficiency of Ethiopian microfinance sector. Rigorous investigation into the impact of inflation on sustainability and efficiency of Ethiopian MFIs should be carried out by the regulator, MFIs and the academic world.

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## Appendices

### Appendix 1: Data input to sustainability and efficiency regression models

MFI id	Year	FSS	CPB	GAR	GLP	FBP	DER	PAR	Age	INF	GDP	DLR
1	2003	137.00%	51	7.23%	206,745,388	29.38%	1.60	1.70%	6	11%	12%	44.10%
1	2004	156.00%	50	4.58%	308,934,727	30.43%	2.00	0.50%	7	7%	13%	35.80%
1	2005	150.10%	59	11.18%	433,332,030	38.58%	2.10	1.10%	8	6%	12%	32.60%
1	2006	146.00%	58	8.53%	682,276,025	50.00%	2.30	0.80%	9	11%	12%	32.10%
1	2007	139.40%	69	5.99%	1,008,800,901	51.00%	2.70	0.50%	10	16%	11%	35.00%
1	2008	88.00%	73	4.07%	1,548,902,150	60.00%	2.20	2.00%	11	25%	10%	31.00%
1	2009	168.00%	91	3.52%	1,656,863,562	63.00%	2.80	4.00%	12	36%	10%	60.00%
1	2010	176.00%	50	3.25%	1,765,373,544	64.00%	2.60	3.50%	13	3%	11%	60.00%
1	2011	123.00%	134	2.51%	1,940,827,401	68.00%	2.59	1.46%	14	18%	9%	70.00%
1	2012	134.00%	148	2.24%	3,007,906,384	69.00%	2.58	1.00%	15	34%	10%	60.00%
2	2003	60.40%	101	8.70%	8,734,856	70.90%	0.22	7.80%	2	11%	12%	0.10%
2	2004	54.00%	86	2.74%	41,016,579	64.50%	0.13	20.60%	3	7%	13%	2.40%
2	2005	106.60%	76	1.42%	115,069,689	75.00%	0.43	0.90%	4	6%	12%	19.70%
2	2006	50.40%	89	2.60%	120,441,974	56.30%	0.40	3.50%	5	11%	12%	13.60%
2	2007	49.10%	93	1.93%	171,498,962	42.40%	0.50	0.00%	6	16%	11%	1.80%
2	2008	29.00%	99	1.66%	243,929,992	57.00%	0.43	3.00%	7	25%	10%	10.00%
2	2009	146.00%	72	1.28%	321,197,819	45.00%	0.40	4.00%	8	36%	10%	27.00%
2	2010	137.00%	82	0.05%	422,981,000	54.00%	0.54	4.60%	9	3%	11%	26.00%
2	2011	109.00%	123	0.01%	566,826,000	55.00%	1.03	3.78%	10	18%	9%	29.00%
2	2012	134.00%	155	0.01%	653,462,793	48.00%	1.60	2.50%	11	34%	10%	53.00%
3	2003	64.90%	174	36.88%	2,221,793	56.80%	0.76	11.60%	5	11%	12%	9.60%
3	2004	63.10%	124	29.15%	2,943,430	51.10%	0.56	2.30%	6	7%	13%	9.20%
3	2005	61.90%	120	36.76%	5,841,100	49.80%	0.61	3.30%	7	6%	12%	4.90%
3	2006	61.20%	141	43.68%	6,899,126	49.80%	0.70	4.30%	8	11%	12%	5.20%
3	2007	74.40%	172	32.72%	9,204,505	46.50%	0.60	5.40%	9	16%	11%	25.90%
3	2008	34.00%	139	37.99%	11,102,470	60.00%	0.61	10.00%	10	25%	10%	6.00%
3	2009	10.30%	182	45.66%	11,215,745	74.00%	0.60	9.00%	11	36%	10%	36.00%
3	2010	78.00%	255	35.52%	14,997,639	76.00%	0.80	3.60%	12	3%	11%	40.00%
3	2011	59.00%	123	5.24%	14,997,639	75.00%	0.80	7.39%	13	18%	9%	38.00%
3	2012	89.00%	155	3.89%	14,871,553	75.00%	0.81	1.00%	14	34%	10%	40.00%
4	2003	86.60%	141	90.31%	2,133,046	82.01%	0.20	5.80%	4	11%	12%	44.10%
4	2004	80.20%	153	80.54%	2,116,415	76.09%	0.30	3.90%	5	7%	13%	35.80%
4	2005	64.20%	192	72.27%	7,806,587	70.48%	0.50	0.40%	6	6%	12%	32.60%
4	2006	94.40%	148	66.63%	10,177,869	69.60%	0.50	1.20%	7	11%	12%	0.00%
4	2007	96.90%	153	39.27%	19,830,265	75.40%	1.30	1.30%	8	16%	11%	0.00%
4	2008	82.00%	142	31.76%	31,368,645	78.00%	1.22	2.00%	9	25%	10%	0.00%
4	2009	120.00%	172	22.66%	48,928,779	72.00%	1.00	2.00%	10	36%	10%	18.00%

4	2010	137.00%	201	29.42%	48,928,779	79.00%	1.02	1.60%	11	3%	11%	18.00%
4	2011	114.00%	185	25.65%	76,542,831	80.00%	0.90	0.68%	12	18%	9%	16.00%
4	2012	104.00%	313	23.31%	109,085,728	71.00%	1.15	0.60%	13	34%	10%	18.00%
5	2003	95.70%	38	25.38%	186,012,798	25.00%	1.30	6.20%	6	11%	12%	53.50%
5	2004	125.30%	39	17.56%	377,726,250	19.92%	1.90	2.30%	7	7%	13%	32.10%
5	2005	151.40%	39	10.18%	679,449,729	22.83%	3.30	0.00%	8	6%	12%	23.60%
5	2006	127.10%	44	5.52%	731,974,958	16.50%	3.70	0.00%	9	11%	12%	23.50%
5	2007	96.60%	65	6.47%	1,078,612,652	24.80%	3.90	0.50%	10	16%	11%	24.80%
5	2008	44.00%	78	5.56%	1,450,973,195	25.00%	4.01	2.00%	11	25%	10%	24.00%
5	2009	166.00%	89	5.32%	1,359,117,218	38.00%	1.60	5.00%	12	36%	10%	39.00%
5	2010	88.00%	61	5.27%	1,511,845,613	33.00%	3.13	6.70%	13	3%	11%	41.00%
5	2011	107.00%	91	4.23%	1,849,942,011	25.00%	3.16	2.16%	14	18%	9%	53.00%
5	2012	101.00%	244	4.06%	2,024,640,035	53.00%	3.06	4.50%	15	34%	10%	61.00%
6	2003	40.60%	190	43.83%	2,751,235	54.35%	0.70	18.60%	5	11%	12%	10.90%
6	2004	45.20%	158	33.86%	5,772,922	68.40%	1.50	4.60%	6	7%	13%	5.80%
6	2005	91.40%	157	36.60%	13,706,128	40.00%	1.30	8.10%	7	6%	12%	37.70%
6	2006	60.70%	188	40.75%	11,513,122	46.60%	1.40	12.10%	8	11%	12%	3.60%
6	2007	73.30%	186	38.41%	13,185,831	10.50%	1.20	15.60%	9	16%	11%	3.50%
6	2008	49.00%	162	34.37%	15,725,404	25.00%	3.00	26.00%	10	25%	10%	0.00%
6	2009	107.00%	252	29.91%	14,503,934	23.00%	3.00	24.00%	11	36%	10%	0.30%
6	2010	66.00%	585	34.20%	14,503,934	35.00%	1.10	14.00%	12	3%	11%	0.30%
6	2011	57.00%	650	30.17%	17,697,630	35.00%	1.34	11.06%	13	18%	9%	38.00%
6	2012	57.00%	210	27.06%	20,106,000	31.00%	2.23	12.00%	14	34%	10%	46.30%
7	2003	76.30%	93	0.92%	1,839,088	70.10%	1.20	9.70%	3	11%	12%	24.30%
7	2004	69.30%	94	0.62%	2,550,718	60.80%	5.30	17.70%	4	7%	13%	17.20%
7	2005	79.30%	126	0.44%	3,411,915	54.20%	5.50	7.00%	5	6%	12%	7.60%
7	2006	142.60%	155	16.83%	8,294,336	66.30%	2.00	2.91%	6	11%	12%	2.10%
7	2007	111.10%	147	11.03%	14,156,296	40.60%	2.50	2.90%	7	16%	11%	3.60%
7	2008	72.00%	119	9.52%	18,110,043	57.00%	2.27	4.04%	8	25%	10%	6.00%
7	2009	112.00%	158	8.59%	20,659,910	39.00%	2.80	16.00%	9	36%	10%	37.00%
7	2010	88.00%	177	7.71%	23,108,531	43.00%	3.42	23.80%	10	3%	11%	37.00%
7	2011	107.00%	234	7.20%	26,031,072	44.00%	2.63	21.33%	11	18%	9%	32.00%
7	2012	127.00%	393	6.10%	29,342,051	46.00%	1.98	10.20%	12	34%	10%	29.00%
8	2003	64.40%	109	15.73%	63,397,462	13.60%	0.60	7.80%	6	11%	12%	6.90%
8	2004	94.80%	91	14.53%	87,981,405	19.50%	0.90	5.00%	7	7%	13%	6.40%
8	2005	110.10%	79	12.45%	136,073,280	23.40%	0.90	5.30%	8	6%	12%	6.30%
8	2006	103.50%	73	9.95%	216,589,246	22.10%	1.30	0.20%	9	11%	12%	5.30%
8	2007	105.50%	83	12.10%	396,423,389	26.00%	2.50	0.00%	10	16%	11%	6.80%
8	2008	63.00%	71	8.31%	703,366,490	25.00%	3.48	3.00%	11	25%	10%	11.00%
8	2009	161.00%	107	7.22%	734,540,219	39.00%	3.10	7.00%	12	36%	10%	49.00%
8	2010	133.00%	108	4.69%	1,046,979,300	31.00%	3.14	4.60%	13	3%	11%	42.00%

8	2011	113.00%	134	3.85%	1,341,840,686	35.00%	2.80	3.52%	14	18%	9%	51.00%
8	2012	128.00%	143	2.94%	1,721,469,410	38.00%	2.47	3.20%	15	34%	10%	57.90%
9	2003	49.10%	57	30.29%	23,940,625	37.52%	4.80	11.40%	6	11%	12%	45.10%
9	2004	62.50%	61	23.13%	30,807,793	34.26%	6.00	5.50%	7	7%	13%	46.10%
9	2005	82.60%	64	12.52%	67,882,984	30.69%	9.90	1.20%	8	6%	12%	27.20%
9	2006	95.80%	72	10.63%	104,116,906	29.01%	9.10	2.90%	9	11%	12%	26.10%
9	2007	89.60%	89	5.99%	179,654,227	44.10%	7.10	2.00%	10	16%	11%	24.40%
9	2008	73.00%	87	3.17%	418,684,029	33.00%	11.15	5.00%	11	25%	10%	12.00%
9	2009	84.00%	36	2.54%	462,403,284	32.00%	9.40	7.00%	12	36%	10%	35.00%
9	2010	95.00%	88	0.20%	537,342,406	30.00%	2.66	6.60%	13	3%	11%	39.00%
9	2011	78.00%	91	0.17%	675,495,737	31.00%	3.09	15.16%	14	18%	9%	45.00%
9	2012	81.00%	161	0.37%	926,312,221	31.00%	4.62	9.40%	15	34%	10%	53.00%
10	2003	67.40%	183	54.40%	5,192,843	65.25%	1.30	0.20%	4	11%	12%	11.70%
10	2004	120.20%	171	46.62%	7,696,972	70.00%	1.30	0.10%	5	7%	13%	13.60%
10	2005	80.60%	132	29.02%	15,723,509	79.79%	2.60	0.10%	6	6%	12%	10.90%
10	2006	141.40%	106	21.17%	27,207,938	74.40%	2.73	0.67%	7	11%	12%	11.00%
10	2007	137.10%	115	18.26%	19,471,000	80.50%	2.19	0.50%	8	16%	11%	13.00%
10	2008	78.00%	163	17.39%	38,883,067	77.00%	1.92	0.00%	9	25%	10%	15.00%
10	2009	101.00%	253	14.99%	42,511,836	81.00%	2.10	6.00%	10	36%	10%	26.00%
10	2010	101.00%	266	16.15%	42,440,247	81.00%	1.67	0.40%	11	3%	11%	29.00%
10	2011	100.00%	337	18.56%	51,960,083	82.00%	1.25	0.34%	12	18%	9%	29.00%
10	2012	100.00%	392	19.50%	51,960,083	82.00%	1.00	0.10%	13	34%	10%	29.00%
11	2003	79.30%	140	59.17%	7,384,358	69.00%	0.91	0.90%	6	11%	12%	8.00%
11	2004	80.60%	131	52.50%	9,900,830	60.00%	1.03	1.50%	7	7%	13%	4.70%
11	2005	80.70%	121	52.17%	13,324,158	54.51%	0.81	4.30%	8	6%	12%	4.80%
11	2006	84.60%	136	47.92%	20,604,853	55.00%	0.90	3.10%	9	11%	12%	4.30%
11	2007	59.40%	135	36.43%	26,338,262	53.90%	1.80	1.80%	10	16%	11%	4.50%
11	2008	54.00%	139	35.29%	3,183,443	55.00%	1.17	4.00%	11	25%	10%	5.00%
11	2009	99.00%	182	40.36%	33,984,970	53.00%	1.30	3.00%	12	36%	10%	47.00%
11	2010	136.00%	90	39.87%	43,061,855	56.00%	1.23	3.20%	13	3%	11%	44.00%
11	2011	93.00%	199	38.65%	50,807,161	56.00%	1.16	5.99%	14	18%	9%	43.00%
11	2012	96.00%	307	36.71%	71,457,918	53.00%	1.34	2.70%	15	34%	10%	37.00%
12	2003	78.80%	102	57.29%	11,626,351	33.40%	0.80	5.30%	4	11%	12%	19.00%
12	2004	88.00%	189	69.03%	18,710,578	42.40%	1.10	3.50%	5	7%	13%	17.50%
12	2005	90.90%	188	57.25%	26,780,922	46.50%	1.50	3.30%	6	6%	12%	15.40%
12	2006	105.20%	179	35.54%	46,666,837	56.60%	1.10	4.70%	7	11%	12%	13.20%
12	2007	72.40%	229	34.42%	60,175,252	59.60%	1.70	2.70%	8	16%	11%	12.40%
12	2008	56.00%	243	42.41%	82,307,145	64.84%	1.25	3.85%	9	25%	10%	11.00%
12	2009	88.00%	339	44.23%	95,822,168	65.94%	1.30	4.95%	10	36%	10%	23.00%
12	2010	66.00%	365	48.17%	89,768,393	78.00%	0.77	6.94%	11	3%	11%	25.00%
12	2011	67.00%	249	51.07%	181,075,805	64.00%	1.08	2.11%	12	18%	9%	16.00%

12	2012	82.00%	929	48.80%	181,075,805	65.00%	1.10	1.40%	13	34%	10%	31.00%
13	2003	107.70%	105	53.94%	2,250,997	61.00%	0.40	5.90%	3	11%	12%	12.60%
13	2004	118.40%	108	28.97%	5,331,693	38.90%	0.90	0.10%	4	7%	13%	13.60%
13	2005	75.90%	101	35.41%	7,543,138	38.90%	1.10	7.60%	5	6%	12%	19.20%
13	2006	91.20%	114	27.96%	18,480,957	36.40%	1.10	0.88%	6	11%	12%	17.90%
13	2007	101.70%	98	23.82%	28,112,850	35.60%	1.20	1.70%	7	16%	11%	27.10%
13	2008	78.00%	92	20.84%	43,842,897	43.00%	1.97	2.00%	8	25%	10%	19.00%
13	2009	152.00%	86	16.18%	64,066,939	46.00%	2.20	1.00%	9	36%	10%	33.00%
13	2010	130.00%	73	14.45%	83,427,324	45.00%	2.19	4.10%	10	3%	11%	29.00%
13	2011	118.00%	151	15.65%	113,967,829	43.00%	1.88	2.25%	11	18%	9%	28.00%
13	2012	128.00%	197	12.39%	150,533,121	41.00%	2.08	1.30%	12	34%	10%	25.00%

Source: AEMFI's annual report (2005-2014), MixMarket database (2003-2013), NBE and MoFED<sup>4</sup> (2003-2012) and own computation.

<sup>4</sup> Only macroeconomic data are collected from NBE and MoFED

**Appendix 2: Heteroskedasticity Test: White, for sustainability model**

Heteroskedasticity Test: White

F-statistic	1.986168	Prob. F(7,122)	0.0623
Obs*R-squared	13.29927	Prob. Chi-Square(7)	0.0651
Scaled explained SS	10.90796	Prob. Chi-Square(7)	0.1427

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 05/20/15 Time: 23:57

Sample: 1 130

Included observations: 130

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.014954	0.087395	0.171113	0.8644
GAR^2	-0.119530	0.066734	-1.791140	0.0758
DLR^2	0.047713	0.103747	0.459899	0.6464
FBP^2	0.020062	0.046452	0.431890	0.6666
AGE^2	-0.000257	0.000244	-1.055555	0.2933
PAR^2	0.680423	0.710846	0.957202	0.3404
GDP^2	4.020809	5.624681	0.714851	0.4761
INF^2	0.649752	0.223582	2.906103	0.0043
R-squared	0.102302	Mean dependent var		0.068195
Adjusted R-squared	0.050795	S.D. dependent var		0.093430
S.E. of regression	0.091026	Akaike info criterion		-1.895776
Sum squared resid	1.010863	Schwarz criterion		-1.719312
Log likelihood	131.2254	Hannan-Quinn criter.		-1.824073
F-statistic	1.986168	Durbin-Watson stat		1.658758
Prob(F-statistic)	0.062253			

Source: Eviews output, 2015

**Appendix 3:Heteroskedasticity Test: White, for efficiency model**

Heteroskedasticity Test: White

F-statistic	1.961147	Prob. F(7,122)	0.0658
Obs*R-squared	13.14868	Prob. Chi-Square(7)	0.0686
Scaled explained SS	12.79027	Prob. Chi-Square(7)	0.0774

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 05/26/15 Time: 21:03

Sample: 1 130

Included observations: 130

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.25E-28	5.00E-28	-0.648789	0.5177
GAR^2	-1.52E-29	3.98E-28	-0.038223	0.9696
DLR^2	-1.89E-29	6.13E-28	-0.030842	0.9754
lnGLP^2	2.59E-29	1.07E-29	2.410470	0.0174
FBP^2	-1.50E-28	2.61E-28	-0.575689	0.5659
AGE^2	7.45E-31	1.44E-30	0.516652	0.6063
DER^2	-8.89E-31	2.61E-30	-0.340429	0.7341
GDP^2	2.41E-27	2.84E-26	0.084813	0.9325
R-squared	0.101144	Mean dependent var		3.39E-28
Adjusted R-squared	0.049570	S.D. dependent var		5.06E-28
S.E. of regression	4.93E-28	Sum squared resid		2.97E-53
F-statistic	1.961147	Durbin-Watson stat		2.389296
Prob(F-statistic)	0.065758			

Source: Eviews output, 2015

**Appendix 4: Redundant Fixed effect Tests for Sustainability model**

Redundant Fixed Effects Tests

Equation: EQ01

Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	5.297647	(12,110)	0.0000
Cross-section Chi-square	59.294401	12	0.0000

Cross-section fixed effects test equation:

Dependent Variable: FSS

Method: Panel Least Squares

Date: 06/04/15 Time: 21:44

Sample: 2003 2012

Periods included: 10

Cross-sections included: 13

Total panel (balanced) observations: 130

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.213484	0.525374	-0.406347	0.6852
GAR	-0.462491	0.135247	-3.419605	0.0009
DLR	0.590475	0.170102	3.471306	0.0007
FBP	0.008100	0.143202	0.056565	0.9550
AGE	0.015409	0.012367	1.245917	0.2152
PAR	-1.781384	0.459595	-3.875989	0.0002
GDP	9.396042	3.781538	2.484715	0.0143
INF	0.226313	0.286583	0.789694	0.4312
R-squared	0.344591	Mean dependent var		0.942569
Adjusted R-squared	0.306985	S.D. dependent var		0.323815
S.E. of regression	0.269568	Akaike info criterion		0.275571
Sum squared resid	8.865360	Schwarz criterion		0.452035
Log likelihood	-9.912119	Hannan-Quinn criter.		0.347274
F-statistic	9.163313	Durbin-Watson stat		1.297239
Prob(F-statistic)	0.000000			

Source: Eviews output, 2015

**Appendix 5: Redundant fixed effect test for MFIs' efficiency model**

Redundant Fixed Effects Tests

Equation: EQ01

Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	8.452565	(12,110)	0.0000
Cross-section Chi-square	84.944249	12	0.0000

Cross-section fixed effects test equation:

Dependent Variable: InCPB

Method: Panel Least Squares

Date: 06/04/15 Time: 21:48

Sample: 2003 2012

Periods included: 10

Cross-sections included: 13

Total panel (balanced) observations: 130

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.245927	0.743790	9.741905	0.0000
GAR	0.666197	0.220378	3.022970	0.0031
DLR	-0.558244	0.240382	-2.322314	0.0219
DER	-0.046502	0.019776	-2.351482	0.0203
InGLP	-0.127265	0.026989	-4.715485	0.0000
FBP	0.516907	0.199916	2.585623	0.0109
AGE	0.103721	0.017905	5.792984	0.0000
GDP	-11.38253	4.462154	-2.550905	0.0120
R-squared	0.621303	Mean dependent var		4.855086
Adjusted R-squared	0.599574	S.D. dependent var		0.576574
S.E. of regression	0.364851	Akaike info criterion		0.880909
Sum squared resid	16.24020	Schwarz criterion		1.057373
Log likelihood	-49.25909	Hannan-Quinn criter.		0.952612
F-statistic	28.59390	Durbin-Watson stat		1.087066
Prob(F-statistic)	0.000000			

Source: Eviews output, 2015