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MICROSAVINGS AND PERFORMANCE OF MICROFINANCE INSTITUTIONS

By

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ABSTRACT

This thesis investigates the effects of micro-saving on the performance of microfinance institutions (MFIs) using unbalanced panels that straddle the period 2000-2012. This issue is also examined in a country-specific case study of Vietnam. There are four important findings. First, we found that serving more *voluntary savers* is costly and curtails depth of microfinance outreach. Second, micro-savings, in terms of the total deposits and the number of deposit accounts per staff member have a positive and significant impact on financial sustainability, cost-efficiency and breadth of outreach of MFIs. Third, a trade-off between financial sustainability and depth of outreach was found for deposit-taking MFIs, compared with MFIs that do not offer micro-savings financial products. Fourth, the findings from the cross-country studies are consistent with the findings from Vietnam. Overall, these findings have important implications for policy makers, microfinance practitioners and researchers.

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LIST OF ACRONYMS

AF	Africa
CGAP	Consultative Group to Assist the Poor
CMEF	Consensus Statement of the Council of Microfinance Equity Funds
CU_Coop	Credit Union/Cooperatives
EAP	East Asia and the Pacific
EECA	Easter Europe and Central Asia
FE	Fixed Effects Model
GDP	Gross Domestic Products
GLPTA	Gross Loan Portfolio to Total Assets
GMM	Generalised Methods of Moments
GNI	Gross National Income
HI	High Intermediation
HT	Hausman-Taylor estimation
LAC	Latin America and the Caribbean
LI	Low Intermediation
MENA	Middle East and North Africa
MFI	Microfinance Institutions
MIX	Microfinance Information Exchange
NGO	Non-governmental Organization
NBFI	Non-Bank Financial Intermediation
OEA	Operating Expenses to Total Assets

OLS	Ordinary Least Square
OSS	Operational Self-Sufficiency
PAR 30	Portfolio At Risks more than 30 days
PCA	Principal Components Analysis
RE	Random Effects Model
ROA	Return of Assets
ROSCA	Rotating Savings and Credit Association
SA	South Asia
SCCs	Savings and Credit Cooperatives
SFA	Stochastic Frontier Analysis
SOM	Self-Organizing Maps
SPM	Social Performance Management
UN	United Nation
USAID	United States Agency for International Development
US$	United States Dollars
VBSP	Vietnam Bank for Social Policy
VIF	Variance Inflation Factor
WB	World Bank
WDI	World Development Indicator

CHAPTER 1

INTRODUCTION

1.1. Motivation

A major aim of microfinance is to alleviate poverty by providing financial and non-financial services to poor households and small companies who lack access to commercial financial intermediations (Nawaz, 2010). The last three decades have witnessed a rapid growth in the number and size of microfinance institutions (MFIs) around the world (Hardy *et al.*, 2003). Specifically, according to Ehbeck (2006), microfinance sectors have served approximately 40 million clients with an outstanding loan portfolio of US$ 17 million in mid-2006. The number of active borrowers has increased up to 101 million persons with gross loan portfolio of US$ 89 billion in 2014[1]. The expansion of the microfinance industry demonstrates a remarkable achievement taken in poverty reduction (Greeley, 2003; Brau et al, 2004). The positive contributions of microfinance in poverty reduction both at a micro level and a macro level have been proved by several studies (see, for example, Panjaitan-Drioadisuryo and Cloud, 1999; Littlefield *et al.*, 2003; Mann, 2003; Khandker and Pitt, 2005; Abed and Matin, 2007; Swain *et al.*, 2008; Aideyan, 2009; Imai *et al.*, 2010; Narwaz, 2010; Imai and Azam, 2012; Imai *et al.*, 2012; Lopatta and Tchikov, 2016; Lahkar and Pingali, 2016; Miled and Rejeb, 2016). Also, as noted in a critical survey of relevant theory, evidence, and policy by Green, Kirkpatrick, and Murinde (2006), the growth of micro and small enterprises (MSEs) can make a positive contribution in ending poverty. Nonetheless, the growth of MSEs is found to be mainly hindered by a paucity of access

[1] Available at: http://www.themix.org/mixmarket [Accessed: 1 November 2016]

to finance, among other factors. This implies an increasing need of microfinance services.

However, it has also been shown that microfinance is not the silver bullet to end poverty. Indeed, in a comprehensive literature survey, Morduch (1999) questions the "microfinance promise". Weiss and Montgomery (2005) survey their evidence of poverty reducing impact of microfinance in Asia and Latin America and they conclude that the evidence of reaching the core poor through microfinance instrument is very limited. Block (2013) argues that microfinance is problematic, and there may be other better ways for poverty reduction than this misbegotten scheme. Additionally, in a systematic review of the impact of microfinance in Sub-Saharan Africa, Rooyen *et al.* (2013) uncover that microfinance does good, as well as harm, to the livelihoods of the poor. Recent research also draws our attention to the mixed results associated by microfinance institutions, especially for Vietnam (Duong and Nghiem, 2014). On the whole, Milana and Ashta (2012) contend that microfinance "seems to be here to stay" in spite of continuous problems and malpractice instances. To reaffirm the significance of microfinance, Keveos and Randhawa (2004) conclude that "MFIs have not resulted in a poverty-free world, at least not yet. They have, however, gone a long way towards building hopes for such as world".

In line with the rapid growth of microfinance industry; over the last twenty years, microfinance has become a significant sub-field of development and research (Fouillet *et al.*, 2013). Research on microfinance not only highlights the impact of microfinance at macro and micro levels but also centres on performance of microfinance institutions. Recently, studies of microfinance performance have focused on three main dimensions: (i) financial performance, (ii) social performance or

outreach, and (iii) trade-offs between financial and social performance of MFIs and mission drift. Scholars have explored determinants of microfinance performance and microfinance trade-off/mission drift. Many factors have been found to have affected microfinance performance, such as capital structure, size, age (or experience), regulatory status, lending methodology in terms of group lending or individual lending, products and services, competition, corporate governance, leadership members, types, target clients, mission, and macroeconomic factors.

Much research has focused on micro-credit, an important product of microfinance. However, recent factors have made microsavings become more essential. Specifically, the competition in microfinance sectors, the recent global financial crisis, and the pressure of MFIs to do well both in terms of financial performance and social outreach have made micro-savings, "a forgotten half of microfinance"[2] to grab the attention of not only researchers but policy makers and practitioners as well. Yaron and Manos (2007) also highlight the increasing importance of savings facility in accordance with the evolution of microfinance industry. It is confirmed that poor people can save (Rutherford, 2000). Also, micro-savings can benefit MFIs and microfinance clients at a micro level as well as benefit societal welfare at a macro level (Karlan, 2014). On one hand, from a macro perspective, micro-savings are strongly predictive for future economic development. On the other hand, from a micro perspective, micro-savings can firstly better meet the demand of the poor by enhancing their well-being on the whole (Fiebig *et al.*, 1999; Zellar *et al.*, 2000; Ashe, 2002; Ashraf *et al.*, 2010; Hoos, 2010; Schicks and Rosenberg, 2011). As contended by Karland & Morduch (2010), micro-savings are essential for the poor; micro-savings are so essential for poor households

[2] Micro-savings was first considered as "the forgotten half" of rural finance by Vogel (1984)

that they are willing to pay for the service. They further add that this commitment to save has induced practitioners to draw a conclusion that micro-savings, rather than microcredits, are the more pragmatic strategy to develop, especially for the hard-core poor people. Moreover, taking micro deposit can enable MFIs to accomplish cost efficiency and financial sustainability (Hannig *et al.*, 1999; Wisniwski, 1999; Hirschland, 2005; Armendariz *et al*., 2005; Dokuliova *et al*., 2009; Abakaeva and Glisovic-Mezieres, 2009; El-Zoghbi, 2010). However, in reality, very few empirical studies have been undertaken to explore the linkages between offering micro-savings financial products and three main aspects of microfinance performance, namely financial performance; social outreach and microfinance trade-offs/ mission drift, respectively.

Our motivation for this research therefore emanates from the benefits of micro-savings to microfinance organizations and microfinance clients as well as the limited and mixed empirical evidence of micro deposit taking on microfinance performance. This study is believed to be a pioneer in filling the gaps in the current literature by examining the linkages between micro-savings and microfinance performance based on a cross-country analysis and a case study of Vietnam.

Vietnam is chosen to be the case study of our research for some reasons. First, to the best of our knowledge, no studies have been conducted to investigate the association between micro deposit taking and microfinance performance in the context of Vietnam. Second, Vietnam has attained achievements in poverty alleviation thanks to microfinance and it has moved from one of the poorest countries to a developing economy. By studying the case of Vietnam, we want to see whether micro-savings have a part in this achievement; accordingly, the success of Vietnam would be lessons for

other countries. Third, micro-savings is one of main financial services in Vietnamese MFIs.

1.2. Objectives of the research

Microsavings are one important component of financial structure of microfinance institutions[3]. Microsavings are considered to be a stable and cheap source of funds, helping MFIs to be independent of internal funding sources (Morduch and Haley, 2002). In accordance with the increasingly importance of microsavings, this thesis attempts to uncover the roles of micro-savings on microfinance performance including financial sustainability, cost efficiency, social outreach and trade-off/ or mission drift between financial and social performance. In order to attain this objective, we use an unbalanced panel data set covering thirteen years of operation between 2000 and 2012 across 1,936 MFIs in 79 countries, which is arguably the largest sample of MFIs ever used in the topic of micro-savings. We focus on the following issues. First, we undertake a comprehensive literature survey of microfinance industry. Second, we empirically examine the relationship between micro-savings and financial sustainability and cost efficiency of global MFIs. Thirdly, we empirically analyse the linkages between micro-savings and social outreach of global MFIs. Fourthly, we continue to empirically assess the role of micro deposit taking in trade-off/mission drift between financial performance and social outreach of global MFIs. And finally, we empirically test the impact of micro-savings on the financial and social performance of Vietnamese MFIs.

[3] The financial structures of MFIs contain two major elements, namely liabilities and equity. Liabilities have four parts: (1) Voluntary Savings, (2) Involuntary Savings, (3) Borrowings, and (4) Other liabilities

1.3.Research questions

Based on the motivation and objectives of the research, our research questions (RQ) are formulated as below:

RQ1: Does offering micro-savings affect financial performance in terms of financial sustainability and cost efficiency of microfinance institutions?

RQ2: Does offering micro-savings enable microfinance institutions to improve their social outreach including breadth of outreach and income-related depth of outreach?

RQ3: Does offering micro-savings financial products improve sustainability as well as outreach of microfinance institutions; thereby resolve the hypothetical trade-off between sustainability and outreach of MFIs?

RQ4: Does offering micro-savings have a role in the financial and social performance of MFIs in the context of Vietnam?

1.4. Contribution and limitations of the thesis

1.4.1 Contribution

The main contribution of this thesis is that it brings together empirical studies of the relationship between micro-savings and microfinance performance and works on the dimensions that have not yet been widely examined by the literature of micro-savings; i.e. the financial performance, social outreach and trade-off/mission drift between financial and social performance. Moreover, the combination of different econometric techniques increases the contribution of the study. Specifically;

- To the best of our knowledge, our study utilises the unique and biggest secondary dataset compared with previous research on microfinance in general and micro-savings in particular. Better dataset helps to provide more complete conclusions.
- Our study is the first in literature to use "net savers" as the proxy for micro-savings. Due to the impossibility in obtaining data on voluntary savings, the usage of this measurement is the best solution, which makes an important contribution of our thesis.
- We discover important and interesting findings. First, we found that serving more *voluntary savers* is costly and curtails depth of microfinance outreach. Second, micro-savings, in terms of the total deposits and the number of deposit accounts per staff member have a positive and significant impact on financial sustainability, cost-efficiency and breadth of outreach of MFIs. Third, a trade-off between financial sustainability and depth of outreach was found for deposit-taking MFIs, compared with MFIs that do not offer micro-savings financial products. Fourth, the findings from the cross-country studies are consistent with the findings from Vietnam. Due to limited time and budget of a PhD programme, we cannot implement Randomized Controlled Trial (RCT) Survey to get primary data. However, our findings based on secondary data may be able to form future research for survey.
- This thesis uses advanced econometric techniques including Hauman-Taylor and two-step system GMM techniques in examining the impact of offering micro-savings on financial sustainability, efficiency, social outreach and trade-

offs/mission drift in microfinance. This enables us to deal with endogeneity problems that has normally ignored in previous studies on microfinance.

- Our findings have important implications for policy makers, microfinance practitioners and researchers.

1.4.2. Limitations

The main limitations of this doctoral thesis are fourfold.

First, the dataset used for the analysis was extracted from the Mix Market platform. Although the Mix Market is the biggest microfinance data provider, a number of MFIs do not supply their up-to-date data of their financial and social performance to the Mix Market. This may create sample selection bias. To circumvent this limitation, we incorporate in our sample a wide diversity of MFIs with dissimilarities in types, experience, size, products and services, levels of financial intermediations, levels of transparency of data regions as well as context.

Second, microfinance is a young industry and data of microfinance has been submitted to the Mix Market since 1990s. However, the data focusing on micro-savings is more limited relative to that of micro-credit; further data relating to micro-savings is more available from 2000s.

Third, the data base available from the Mix Market website does not differentiate between voluntary savings and compulsory savings. Therefore, in order to tackle this issue, our research uses “the number of net savers” as a proxy for voluntary savings. We strongly believe that, at this development stage of microfinance, ‘the number of net savers’ is the most relevant proxy for voluntary savings as it demonstrates that clients deposit their cash holdings in MFIs on a voluntary basis rather

than as a collateral in order to get access to micro loans. In addition, in this thesis, we also use other proxies for micro-savings in attempt to examine thoroughly the effects of offering micro-savings on performance of microfinance institutions. These proxies include 'dummyDeposit-taking', 'total deposits' and 'the number of savings accounts per staff member'. In particular, 'dummyDeposit-taking' variable denotes whether the MFI offers micro-savings or not. 'Total deposits' variable reflects the scale of operations in terms of offering micro-savings. 'The number of savings accounts per staff member' represents the productivity of micro-savings. Data relating to these three proxies for micro-savings does not differentiate between voluntary savings and involuntary savings.

Further, due to limitations of data, we cannot obtain data of different types of deposits products. The usage of 'total deposits' demonstrate that all types of deposits are treated equally, that is, differences with respect to the terms of deposits (interest rates, transaction costs, term period, etc) do not matter for the impact these activities have on microfinance performance[4]. Put differently, in the analysis, it is assumed that all deposits have same terms, which does not hold in practice. Thus, the current approach on using total deposits is another limitation of the thesis.

For this matter, a further research should be explored in the future using most updated data when information of micro-savings is more available. Moreover, future research should use data on micro-savings that truly reflects voluntary savings in

[4] The literature on the design of MFI products has clearly shown how important specific design features are for the uptake and success of financial services offered. Specifically, low transaction costs and high level of access are evident examples in this respect. That is, clients are more willing to open deposits accounts when costs of opening an account are low and/or when they can easily (i.e. on a daily basis) carry out transactions.

microfinance industry. In addition, future research should seek to identify a more appropriate indicator to measure voluntary savings.

1.5. Structure of the thesis

This thesis consists of seven chapters including the Introduction. The rest of the thesis proceeds as follows.

Chapter two presents a selective literature survey on microfinance. The objective of this chapter is to take stock of existing knowledge in this huge research area and identify gaps that constitute promising research ideas, including the key ideas investigated in this thesis. The selected research includes both academic and practitioner-led research, which allows for a rich exploration of the issues.

Chapter three examines the relationship between micro-savings and financial performance of MFIs. This chapter will seek convincing explanation for research question 1 (RQ1). Using an unbalanced panel dataset of 1,936 MFIs active in 79 countries worldwide, we used advanced Hausman-Taylor estimator as a main regression approach to investigate the impact of micro-savings and other institutional specific control variables and macroeconomic control variables on the financial sustainability and cost efficiency – two significant aspects of microfinance performance.

Chapter four builds on the econometric framework developed in the previous chapter to examine the linkages between micro-savings and social outreach of microfinance. In particular, drawing on the same dataset of chapter three, we empirically examine the roles of micro-savings on breadth and income-related depth of

microfinance outreach while controlling for microfinance institutional-specific and macroeconomic factors. The findings help to answer the research question 2 (RQ2).

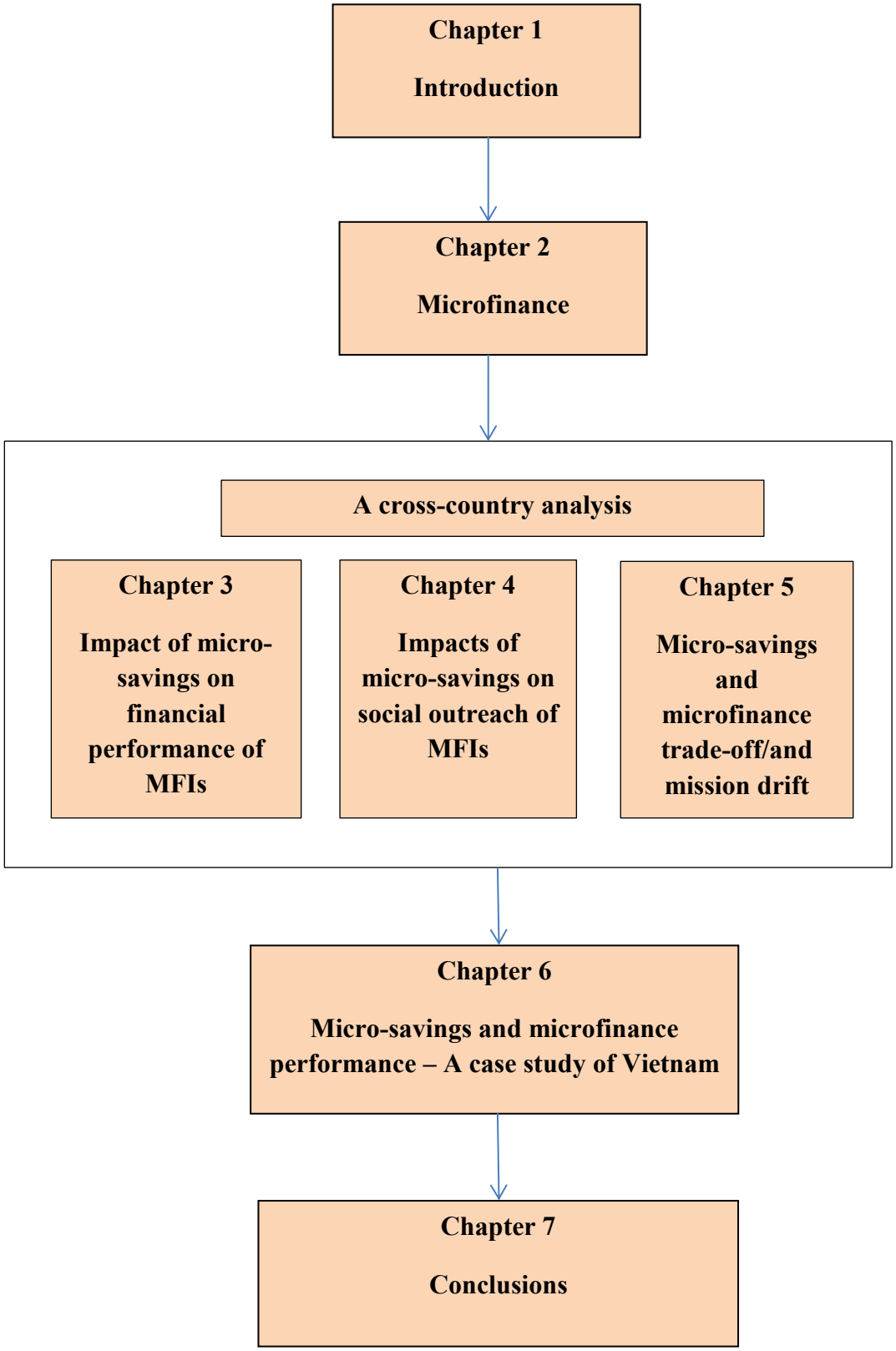
Chapter five examines whether a trade-off between financial performance and social outreach exists for MFIs that capture micro deposit. This chapter will seek the answer to the research question 3 (RQ3). To this end, we utilise the two-step system GMM estimation drawing upon a dynamic model of a dataset containing 1,233 MFIs from 79 countries over a period from 2000 to 2012.

Chapter six examines the effects of micro-savings on financial sustainability and social outreach of MFIs in Vietnam. We interpret the results while at the same time making comparisons and references to the cross-country analysis in previous chapters and early empirical studies. The findings of this chapter help to answer the last research question (RQ4).

Chapter seven concludes the thesis by summarising the key findings, offering some policy implications for policy makers and practitioners, and finally extending some ideas for further research.

The structure of the thesis is demonstrated in figure 1.

Figure 1.1: Structure of the thesis



CHAPTER 2
A SELECTIVE LITERATURE REVIEW ON MICROFINANCE

2.1. Introduction

The purpose of this chapter is to review existing literature on microfinance, including the performance of microfinance institutions. The idea is to take stock of existing knowledge in this huge research area and identify gaps that constitute promising research ideas, including the key ideas investigated in this thesis. The selected research includes both academic and practitioner-led research, which allows for a rich exploration of the issues.

In order to minimize possible duplication, the approach taken is to survey existing literature on the general areas of microfinance and the performance of microfinance institutions, paying attention to the main characteristics of microfinance in terms of financial products and lending methods, the impact of microfinance, and performance of microfinance, especially the trade-offs between sustainability and outreach. Accordingly, the big gaps and research ideas are generated, including the four main ideas pursued in this study. Indeed, for each of the four ideas, much more focused literature review is undertaken at the start of each chapter. Hence, there is a further relevant literature review focusing the question of whether offering micro-savings affects financial performance including financial sustainability and cost efficiency of microfinance institutions, in Chapter 3. In addition, the issue of whether offering micro-savings enables microfinance institutions to improve their social outreach

including breadth of outreach and income-related depth of outreach is further reviewed at the start of Chapter 4. Also, the question of whether offering micro-savings financial products improves profitability as well as outreach of microfinance institutions, thereby resolves the hypothetical trade-offs between outreach and profitability of MFIs, is briefly reviewed at the start of Chapter 5. Finally, the specific case of microfinance in Vietnam is further reviewed in Section 2 of Chapter 6. These literature components, which are included as Section 2 of Chapters 3, 4, 5 and 6 are also used for hypothesis development for each chapter, given that each one of these 4 chapters represents a stand-alone empirical paper.

In what follows, the remainder of this chapter is structured into four sections. Section 2.2 examines the characteristics of microfinance, including the financial products and services as well as the lending methods. The impact of microfinance is examined in Section 2.3 while the performance of microfinance institutions is discussed in Section 2.4. Section 2.5 offers the conclusions of the chapter.

2.2. The key characteristics of microfinance

There is no international accepted definition of microfinance. Broadly speaking, microfinance refers to a range of products covering savings, credit, insurance, remittance, and non-financial services extended to low-income or non-bankable clients and micro-enterprises (Balkenhol *et al.*, 2002; Elahi and Rahman, 2006; Armendariz and Labie, 2011; Leone and Porretta, 2014).

Microfinance is generally more popular in developing countries, focusing on rural areas where there is a higher rate of poor population. According to Brau and Woller (2004), there are two issues in client targeting, namely *poverty targeting* and

gender targeting. With regard to *poverty targeting*, microfinance targeted at low-income who often face external shocks such as illness, hunger, education deficiency. Hardy *et al*. (2003) contend that microfinance clients lack access to conventional financial products offered by commercial banks for some reasons. First, poor people not only have uncertain and low income but they are also more exposed to external shocks. Second, they are not well diversified. Third, they lack physical collateral which is an essential requirement for credit contracts and they are costly to serve (Harper, 2003).

G*ender targeting* is another fundamental feature of microfinance. Women, especially those in developing and less developed countries have more traditional roles and less education as well business opportunities outside their homes than men (Ledgerwood (1999). The bias in favour of woman is derived from two main reasons. First, enhancing access to microfinance services for female can lead to women empowerment. Additionally, Brau and Stock (2004) argue that women preference is based on the common belief that woman can use the loans more productively than men. Armendariz and Roome (2008) also give some specific reasonable arguments for this belief. First, women are more cautious, attentive and committed to planning their investment; they therefore are more inclined to repay the loans; which helps to lessen the agency cost of lenders. Second, women are more exposed to peer pressure and in case of payment arrears, they have fewer chances than men in gaining alternative sources of credits. Finally, women are presumed to be less contentious than men. This helps to reduce the transaction cost of the loans.

2.2.1. Microfinance products

2.2.1.1. Microcredit

Microcredit refers to small loans extended to very poor people, especially women to generate income through self-employment (Elahi and Danopoulos, 2004). Also, according to Karlan and Zinman (2011), microcredit is defined as small loans typically ranging from USD 100-500 provided to microenterprises.

As described by Noelle and Busse (2008), microcredit is characterized by "small loans", "small groups", "short terms", "frequent repayment", and "potentially in the future larger loans".

- *Small loans*: Loans are normally quite small to start with; typically they are in the range of US$ 100-500[5]. In reality, the average loan sizes differ in different countries. For instance, the average loan size per borrower in Bangladesh is US$ 92[6], in India US$ 133[7] and in Ethiopia US$ 150[8]. This displays a big contrast with average loan size per borrower of US$ 2,020 in Bosnia[9], US$ 1,590 in Kyrgystan[10], and US$ 1,286 in Ecuador[11] (Srinivasan, 2011).

- *Small groups*: In accordance with joint liability group lending method, loans are offered to small groups having the number of members of five or between five and ten members (Ledgerwood, 1999; Armendariz de Aghion and Morduch, 2000). Village banking organised borrowers, normally female clients, into groups of 20-40[12].

[5]See: 'Microfinance'. Available at: https://www.lendwithcare.org/info/about_us/about_microfinance [Accessed: 1 July 2015]
[6] BDT/US$ exchange rate: 70.4676 (As of 31st December 2010)
[7] INR/US$ = 44.728 (As of 31st December 2010)
[8] ETB/US$ = 16.636 (As of 31st December 2010)
[9] BAM/US$ = 1.500 (As of 31st December 2010)
[10] KGS/US$ = 46.800 (As of 31st December 2010)
[11] Ecuador's official currency is US$
[12] See: 'Credit'. Available online at: http://www.cgap.org/topics/credit [Accessed: 1July 2015]

- *Short terms*: Terms of microloans are less than twelve months in most instances[13]; the initial terms are from four to six months (Noelle and Busse, 2008).

- *Frequent repayment*: To prevent loan default, micro-lending methods require regular repayment on basis of daily, weekly or monthly (Adongo and Stock, 2005). As specified by Field and Pande (2008), weekly collection of repayment instalments is one of the key characteristics of microfinance as it is believed to mitigate default risk in the absence of collateral and to make credit to the poor viable.

- *Potentially larger loans in the futures*, also known as *repeat loans*: This means that the repayment of one loan can lead to another. New entrants to microfinance products can begin with small loans, and once they can complete the repayment, their loan sizes would be increased because borrowers have been able to prove their reliability and trustworthiness (Armendariz de Aghion and Morduch, 2004; Robinson, 2001).

Microcredit is also distinct from credit financial products offered by conventional formal financial intermediaries in terms of collateral and interest rate.

Collateral:

Normally, financial institutions require collateral which takes forms of marketable assets to reduce risks in lending business. MFIs would confront a dilemma in appraising collateral. Collateral ensures loans repayment from credit clients, which positively affects the sustainability of MFIs. Nonetheless, collateral may prevent the poor from

[13]See: 'Microfinance'. Available at: https://www.lendwithcare.org/info/about_us/about_microfinance [Accessed: 1 July 2015]

receiving micro-loans (Brau & Woller, 2004). MFIs; depending on their social mission or financial mission, decide their relevant instruments in assessing loans process. For instance, in socially oriented MFIs where poor and the hard-to-reach people are targeted, microcredit could be provided based on social collateral instead of traditional collateral. As elucidated by Besley & Coate (1995), these MFIs can accept social collateral or joint collateral via group-based lending as this approach enforces loan repayment through close interaction among group members. According to Adongo and Stock (2005), social collateral could also be the stature or credibility of a credit client in the community. In contrast, commercially oriented MFIs which tend to serve better off and easier-to-reach people would take into account an innovative collateral mechanism to ensure financial viability.

Interest rates

MFIs have high operational costs. To deal with this issue, they charge high interest rates for micro loans instead of requiring collateral from their clients[14]. Bearing high operational costs is one main feature of microsavings for some reasons. First, the target clients of microfinance are the poor and hard-core poor people who cannot get access to financial services of traditional commercial banks. As microfinance clients' poverty status, they reveal greater risks of defaults. Accordingly, they are costly to serve. Additionally, transaction costs are higher when supplying smaller loans compared to larger transactions. Operational costs vary depending on MFIs and countries. For instance, MFIs with productive staffs can reduce their operational costs. Further,

[14] See: 'Why do MFIs charge high interest rate for poor people?'. Available at: http://www.microfinancegateway.org/section/faq [Accessed: 25 February 2012]

operational costs may be higher for MFIs active in countries where inflation rates are high.

2.2.1.2. Micro-savings

As identified by Hulme *et al*. (2015), micro-savings are seen as savings deposited by those who have low income or who live in poverty; or "as small amount of savings"; or as savings kept at institutions focusing on micro-savings. Moreover, as defined by the MIX Market (2016), micro-savings are savings in very small increments, normally starting with just US$1 and followed with very small deposits[15]. As this thesis aims at examining the impact of micro-savings on performance of microfinance institutions, literature on micro-savings will be further surveyed and discussed in Section 2 of Chapter Three, Chapter Four and Chapter Five of this thesis.

2.2.1.3. Microinsurance

Micro-insurance enables low income people to manage unexpected risks in return for their regular payment. Specifically, micro-insurance can help clients to circumvent the risks of external vulnerability, including health issues or death (Noelle and Busse, 2008).

2.2.1.4. Money transfer

MFIs offer money transferring as a secure and useful method, especially when microfinance clients work in urban areas while their family lives in rural areas. To supply remittances services, it is essential that MFIs have an extensive branch network or connections with other banks (Ledgerwood, 1999; Noelle and Busse, 2008).

[15] See: 'Glossary of terms'. Available at: http://www.themix.org/about-microfinance/glossary-terms [Accessed: 25 April 2016]

2.2.1.5. Non-financial products and services

MFIs also offer non-financial products in order to better meet the demand of their clients; and accordingly, enhance their well-being. The availability of microfinance non-financial products is based on the belief that the poor lack capability and experience to manage a microenterprise effectively (Maes and Foose, 2006). Microfinance non-financial services range from "social intermediation" to establish social capital and basic skills for the microfinance clients, to "business development services" for entrepreneurs (Parker, 2002). In particular, social intermediation enables the poor to take advantages of economic opportunities through health education, literacy or basic financial skills training, and group capacity building. Business development services, on the other hand, concentrate on entrepreneurs and potential entrepreneurs through training, mentoring, and advisory services or providing market information, technology, production, finance or market linkage schemes (Edgcomb, 2002; Ledgerwood, 1999). According to Gray *et al.* (2011), by integrating non-financial services, MFIs can gain greater satisfaction and loyalty from their clients. As a result, MFIs offering non-financial services can become more competitive than those who do not supply non-financial services.

Figure 2.1: The microfinance non-financial services continuum (Parker, 2002)

SOCIAL INTERMEDIATION →				**BUSINESS DEVELOPMENT SERVICES**
Subsidized				***Fully Commercial***
• Health Education	• Literacy training • Group capacity building		• Business networks and linkages • Entrepreneur training and mentoring • Advisory services	• Provisions of market, technology, production, or finance information • Market linkage schemes

Note: The white area represents the blurred distinction between those non-financial services requiring at least a degree of subsidization and those that can be provided on a commercial basis.

2.2.2. Microfinance lending methods

Micro-loans are supplied to microfinance target clients on an individual (stand-alone) basis or as a part of a solidarity group (group-lending) basis (Sundaresan, 2008).

2.2.2.1. Individual lending

Individual lending refers to the delivery of credit to individuals based on their capability to demonstrate their guarantees of repayment (Ledgerwood, 1999). Following this approach, MFIs require collaterals for loans and utilise innovative monitoring procedures. These procedures integrate components from traditional credit technology with methods employed in group-based lending approach (Vigenina and Kritikos, 2004). In reality, individual lending is applied when the loan size is small and when microfinance market is becoming more extreme (Lehner, 2008).

2.2.2.2. Group lending

The group-based mechanism or joint liability lending, initially developed by the Grameen Bank of Bangladesh in 1970s has become the typical lending methodology of MFIs. Steps of group formation following model of Grameen Bank of Bangladesh are described by Khandker and Pitt (1995) as below.

- *Step 1:* Individuals organise themselves into groups of five. Members should have similarities in gender, location or economic backgrounds in order to guarantee close dynamics in the groups and to mitigate the asymmetric information issues;
- *Step 2:* Each group elects a leader and a secretary holding the term for one year;
- *Step 3:* Group meetings are held every week;
- *Step 4:* Two or three weeks after the group is formed, during which sm*all* savings deposits are contributed by all members and training programmes are conducted by

Grameen Bank officers, loans are supplied to individual group members. Initially, two members of a group are provided the loan and are monitored for one or two months. If they repay their weekly instalments and follow group disciplines and adhere to the bank's rules, further loans are supplied for next two members. Group leader is the last to obtain credit. In case any group member is unable to pay back the loans, the whole group would lose opportunities to receive loans from the bank.

Following these principles, this joint liability lending model has exhibited some pros. To be more specific, group-based lending can effectively handle the problems of adverse selection[16] and moral hazard[17]; and can find ways to enforce borrowers to repay the loan if they are unwilling to do so (Ghatak and Guinnane, 1999; Laffont & N'Guessan 2000). Group lending is different from individual-based lending with reference to collateral. In particular, group lending mechanism requires no collateral. Rather, they accept social collateral (Ledgerwood, 1999; Sinha, 2003).

2.3. The impact of microfinance

2.3.1. The impact of microfinance at a macro level

To highlight the fast growth of microfinance sector, Morduch (1990) states that microfinance movement has made encroachments all over the world. In 2014, there are approximately 10,000 MFIs all over the world[18]. The gradual expansion of microfinance

[16] Adverse selection is a facet of the agency problem relating to information asymmetry between principal and agent (Akerlof, 1970). Trading partners that encounter information asymmetry undergo pre-contractual uncertainty that jeopardizes efforts to set up efficient exchange relationship (Dahlstrom & Ingram, 2003).

[17] Moral harzard arises when one party gets involved in a risky event knowing that it is protected against the risk and the other party will incur the cost. This phenomenon is the consequence of asymmetrical information. (Avaiable at: http://economictimes.indiatimes.com/definition/moral-hazard [Accessed: 1 December 2016])

[18] See: Microfinance Market Outlook 2014: No "sudden stop": demand for microfinance soars. Available at: http://www.fgda.org/dati/ContentManager/files/Documenti_microfinanza/rA_Microfinance_Market_Outlook_2014_EN.pdf [Accessed: 1 May 2016]

is marked by its positive effects on poverty alleviation. According to the Nobel Committee, microfinance can help poor people to lift out of their poverty status, which, in turn, is seen as a significant precondition for long term development (Hermes and Lensink, 2007). As noted by Elser *et al.* (1999), at the level of the national economy, more savings lead to a rise in the amount of national resources and a decrease in the need to resort to foreign indebtedness so as to cover domestic investment and consumption demand.

Imai *et al.* (2012) implement an empirical study using cross-country data covering 48 countries in developing regions for 2007 to examine whether microfinance can mitigate poverty at the macro level. Their findings assert that a country with higher microfinance gross loan portfolio per capita is likely to have lower poverty. They further discover that microfinance not only lessens the prevalence of poverty but also reduces its severity.

Recently, Lopatta and Tchokov (2016) empirically investigate whether microfinance industry fulfils the promise of poverty alleviation and economic success. By using a multivariate approach based on a dataset of 2,382 global MFIs for the period 1995-2012, they find that performance of MFIs has a positive and significant impact on economic development and growth; and accordingly, contributes to poverty relief. In particular, their findings verify that microfinance has a direct impact on economic development through the value added to purchasing power by microfinance performance. Further, they also suggest that targeted development programmes as well as socially responsible investments can be applied in developing economies in order to boost their economic growth and reduce poverty.

For the findings concerning the impact of microfinance from a macro perspective, development NGOs and other social organizations have adopted microfinance as a core competency in their development strategies in poor and developing countries (Mawa, 2008).

2.3.2. The impact of microfinance at a micro level:

Economic impact:

Economic impact refers to an income-generating effect. In particular; according to Morduch, (1999), Bhatt and Tang (2001), Hermes and Lensink (2007), micro credit can make a positive contribution to a continuing enlargement of income through a growth in investment. Take the study of Hulme and Mosley (1996) as an example; their findings reveal a positive relationship between microfinance and income increment; and the magnitude of income-generating impact on lower-income clients appears to be more remarkable for lower-income participants. Quach and Mullineux (2007) also discover a link between microfinance and the welfare of households in rural Vietnam. Their analysis is based on a sample of 4,101 rural households extracted from the Vietnam Living Standards Survey in 1997/1998. Their findings show that credit has a positive albeit small impact on household welfare in rural Vietnam. In contrast, some research found mixed evidence of microfinance and financial outcomes. For instance, Dupas and Robinson (2013) do not find any effects of microfinance on income of business. It is also proved that microfinance enables households to accumulate more assets initially; however, this accumulation does not carry on with time (Adjei *et al.*, 2009; Brannen, 2010).

Socio-political or cultural impact:

With regards to socio-political impact, it is stated that microfinance could help poor clients to improve their social status via their growing incomes (Ledgerwood, 1999). Additionally, microfinance might also help to empower poor minority of ethnic group or to bridge the gaps of inequality between males and female. Plus, microfinance can mitigate the vulnerabilities due to economic shocks, illness or natural disasters, and enhance nutrition as well as education entrance for children (Hermes and Lensink, 2007).

Personal or psychological impact:

According to Ledgerwood (1999 microfinance can influence the sense of self of microfinance clients. First, microfinance can enable them to eliminate their financial burdens. Second, they can also attain confidence through changes in social status and empowerment, which can induce them to further positive changes in their lives and work.

2.4. Microfinance institutions and microfinance performance

2.4.1. Microfinance institutions

As defined by Hardy *et al.* (2003), a microfinance institution (MFI) is an organization that is committed to enhance access to financial products and services for poor households and small enterprises. A microfinance institution is a social enterprise who primarily aims at enhancing the lives of poor people by offering them a variety of services (Ahmed *et al.*, 2013). The term "microfinance institution" now touches on a wide range of organizations presented as follows.

Microfinance Information Exchange (MIX), the largest platform providing information and data of microfinance industry worldwide has categorised MFIs into different charter types as follows[19]:

- *Bank* is a licensed financial intermediary regulated by the supervision of a state bank. A bank may provide any of a number of financial services, including credits, deposits, payment services, and money remittances[20].
- *Credit Union/Cooperative* is unregulated and operating on a not-for-profit and member-based basis. It may supply a variety of financial products including credits and savings, for its members' benefits. A Credit Union/Cooperative may be supervised by regional or national cooperative council.
- *Non-bank financial institution (NBFI)* offers similar services to those of Bank, but is licensed under a separate category owing to lower capital requirements, to restrictions on services, or to supervision under a disparate state agency.
- *Non-government organisation (NGO)* is one form of MFI. It is registered as a non-profit or tax purposes or some other legal charter. The financial services of an NGO MFI are normally more limited, usually not involving deposit taking activities. NGOs microfinance providers are typically unregulated.
- *Rural Bank* is a banking institution that target at clients residing and working in non-urban areas and who are mostly involved in agricultural-related activities.

[19] See: "Glossary of Terms". Available at: http://www.themix.org/about-microfinance/glossary-terms [Accessed: 20 April 2016]

[20] The term "Bank" in this category denotes microbanks or microfinance banks that have functions and are active like local commercial banks in rural areas. They are, on the whole, similar to rural banks or credit union, but with dissimilar legal and charter status (Ngo, 2013).

In addition, Ledgerwood (1999) proposes another categorisation of MFIs based on their regulatory status. Specifically, MFIs are classified into three main types: formal institutions, semi-formal institutions and informal providers.

- *Formal institutions* are those that are subject both to general laws and to specific banking regulation and supervision. Formal institutions are development banks, savings and postal banks, commercial banks, and non-bank financial intermediaries. Formal suppliers may also be any registered legal organizations providing any kind of financial services.

- *Semiformal institutions* are registered entities subject to general and commercial laws but are not normally under bank regulation and supervision. For instance, semiformal institutions are financial NGOs, credit unions and cooperatives.

- *Informal financial providers* come in many forms and not always in one that can be called a financial institution. They are non-registered groups including rotating savings and credit associations (ROSCAs) and self-help groups.

According to O'Brien (2006), NGOs microfinance institutions have play an essential part in developing financial services for microfinance poor clients. Their effects have been greatest in: (i) pursuing a broader common vision, particularly towards the poorest; (ii) offering clients a larger range of products and services; (iii) better engaging with industry regulators; and (iv) advocating for microfinance generally and conducting research.

The managerial discretion typology of MFIs is described in Table 2.1 as below

Table 2.1: Managerial discretion typology of MFIs

NGOs	Cooperatives/Credit Unions	NBFIs	Banks
▪ Semi-formal ▪ Not-for-profit ▪ Normally unregulated; may be regulated in some markets[21] ▪ Non-distribution constraint ▪ Governance not tied to ownership ▪ Both social and financial objectives	▪ Semi-formal ▪ Not-for-profit ▪ Normally unregulated; may be regulated in some markets[22] ▪ Distribute profits to members ▪ Governance tied to members ▪ Both social and financial objectives	▪ Formal ▪ For-profit ▪ Partly regulated ▪ Distribute profits to owners ▪ Governance tied to ownership ▪ Financial objectives	▪ Formal ▪ For-profit ▪ Regulated ▪ Distribute profits to owners ▪ Governance tied to ownership ▪ Financial objectives

Source: Adapted from Ledgerwood (1999), and Galema *et al.* (2012)

2.4.2. Microfinance performance

Performance of MFIs is normally evaluated through their financial performance and social outreach, based on the framework proposed by Yaron (1994). In particular, financial performance reflects an MFI's ability to cover their operating expenses to be sustainable, while social outreach demonstrates the number as well as the poverty level of their active clients. Further, according to Goswami (2013), past studies on microfinance performance consider different important facets of microfinance performance, namely financial sustainability, social outreach, efficiency, productivity, governance and other institution-level characteristics. Moreover, many scholars and practitioners evaluate MFIs' performance either from a single aspect such as financial aspect, social aspect or combination of some of these dimensions.

Past studies have shown that microfinance performance is affected by various determinants. In this section, the survey of empirical evidence for those elements follows Gulli (1998) who identifies two types of factors, namely contextual and agent-

[21] Available at: http://www.mixmarket.org/about/faqs/glossary [Accessed: 1 January 2016]
[22] Available at: http://www.mixmarket.org/about/faqs/glossary [Accessed: 1 January 2016]

related factors. Contextual or country-level factors relate to macroeconomic environment, meanwhile agent-related factors refer to firm-level determinants. Next, we will have a closer look at elements affecting financial performance and social outreach both at a country-specific level and a firm-specific level.

2.4.3. Factors influencing financial performance of microfinance institutions

2.4.3.1. Contextual factors

Economic and political factors

Normally, socioeconomic status demonstrated by a wide range of indicators such as Gross National Income (GNI) per capita, Gross Domestic Product (GDP) growth rate, inflation rate, unemployment rate or poverty rate have been found to be related to microfinance performance (Patten and Johston (2001); Vogelgesang, 2003; Sriram and Kumar, 2005; Wesley; 2005; Ahlin *et al*., 2011; Vanroose, 2015). Vanroose (2008) contends that high inflation hinders clients from receiving more loans as they have to pay higher interest rates. Further, higher living costs stemming increasing inflation rates make more people become poor. Moreover, high inflation rates also hinder MFIs to scale up due to increasing operational expenses. In terms of country-level financial development, Hermes *et al.* (2009) assert that well-developed financial markets offer supporting environment for MFIs to operate efficiently. Recently, Vanroose (2015) unearths that higher GDP growth rate makes a positive contribution to the expansion of microfinance in Peru. They contended that higher economic development goes with better infrastructure; and it is easier for MFIs to deal with operating expenses in economically growing areas.

Ahlin *et al.* (2011) examine the effect of country-level context on microfinance. They employ data on 373 MFIs from around the world. Their findings exhibit a harmony between microfinance performance and the development of economy. Particularly, a rise in GDP growth induces cost efficiency of MFIs. MFIs operating in countries with well-developed financial sector appear to have low default and operating costs, and charge lower interest rates. They also find that more manufacturing and higher workforce involvement lead to a slower growth in both breadth and depth of microfinance outreach.

Based on a sample of 722 MFIs in 74 countries between 2000 and 2009, Wagner and Winkler (2013) find that microfinance performance in terms of credit growth has been negatively affected by the global financial crisis. Specifically, credit growth fell sharply in the global financial crisis. Plus, the crisis effects were more serious when MFIs had operated in exploiting domestic and international financial markets for funds and had been active in countries undergoing an acute post-crisis downturn.

Policy framework

Policy framework plays a significant part in the evolution of microfinance sector. Arun and Murinde (2010) investigate the relationship between regulation and social performance index (SPI) of MFIs in Africa. They presume that SPI reflects the social performance of MFI on *coverage* and *poverty-targeting*. In addition, the coverage can be examined in connection with the number of individuals/households/small business being served by MFIs, and the amounts of deposits and loans as a percentage of the national GDP. They find that NGOs microfinance providers in Nigeria can only transform into community banks whose regulatory and supervisory framework is not

friendly. In accordance with legislation in 2007, all community banks in Nigeria must be community micro-banks or state micro-banks. These banks are mostly private-owned and they lack resources to undertake regulatory reforms, which negatively affects microfinance outreach in this country. Indeed, less than 2 percent of Nigerian rural population obtain access to microfinance services. Dissimilar to Nigeria, Kenya reveals a better outreach of approximately 10 percent of small households and microenterprises. This can be ascribed to the fact that recent microfinance policy in Kenya is more focused on the deposit-taking MFIs.

Silva and Chávez (2015) examine whether microfinance performance is affected by country institutional and governance characteristics during the 2008-2009 global financial turmoil. Based on a dataset of 364 MFIs from 47 countries during the 2004-2011 period, they find a positive relationship between microfinance performance and institutional country features. MFIs active in countries with more effective governance appear to be less acutely influenced by the global financial turmoil.

Local infrastructure

The status of local infrastructure directly affects the growth of microfinance. The deficiency of infrastructure is disadvantageous to microfinance. In a recent research of Vanroose (2016), it is unearthed that the presence of MFIs in Peru is low in rural areas due to a lack of basic infrastructure. MFIs in Peru also find it more difficult to diversify their range of products in rural areas where represent most of the hard-core poor and socially excluded people.

Other contextual factors

Annim (2012) found that the social efficiency is negatively influenced by the bureaucracies in property registration and a deficiency of information. Burzynska and Berggren (2014) discover a significant relationship between social beliefs and microfinance performance based on analyses of 331 MFIs from 37 countries over the period of 2003-2011. Their findings show that MFIs can reduce operating and default costs and charge lower interest rates if they are active in countries with higher levels of faith and more collectivist culture. Hartarska and Mersland (2012) find that MFIs active in countries with higher level of corruption have worse breadth of outreach in terms of number of active clients, number of active borrowers and the volume of loans. They also discovered that in countries with more mature regulatory system, it is more difficult for MFIs to attract savers, perhaps because commercial banks capture the savings instead.

Nonetheless, Krauss and Walter (2009) argue that performance of MFIs is less affected by external environment such as global market movements. They further explain that MFIs employ various lending technologies, MFIs are normally active on a not-for-profit basis, and they serve more clients operating in the informal sector than do regular banks.

2.4.3.2. Agent-related factors

Types of microfinance institutions

Haq *et al.* (2010) study the performance of 39 MFIs for the year 2004 and their findings indicate that NGOs microfinance institutions achieve the highest cost efficiency under production approach. NGOs do well in terms both social outreach and financial

sustainability. Nonetheless, micro-banks perform better in the measure of efficiency under intermediation approach. Their results also imply that micro-banks may ultimately outperform NGOs.

Using a comprehensive longitudinal dataset straddling 15 years and covering 456 MFIs worldwide, Louis and Baesens (2013) see no significant association between for-profit registration and financial performance of MFIs. Nevertheless, their findings indicate that for-profit MFIs have a lower depth of outreach in terms of loan size and shorter outreach to female borrowers.

Barry and Tacneng (2013) examine the effects governance and institutional quality on financial and social performance of MFIs in Sub-Saharan Africa (SSA). Drawing upon a dataset of 200 MFIs located in 30 countries in SSA, they find that NGOs microfinance organizations operating a not-for-profit basis are more financially viable and have better social outreach than micro-banks and cooperatives. They affirm that NGOs are the best conduits of microfinance products and services in SSA. Gutierrez-Nieto *et al.* (2009) also found that NGOs are more socially efficient in terms of poverty level and female borrowers than other types of MFIs. Their analysis is based on a sample of 89 MFIs for the year 2003.

Mersland and Strom (2008) examine if the type of ownership of an MFI makes a difference to its performance. They make use of data on 132 NGOs and 68 shareholder owned firms (SHFs). SHFs in their data set consist of 13 banks and 55 NBFIs. As NGOs are more socially oriented, they are expected to have lower profitability compared with commercially oriented SHFs. The results of logit regressions indicate that the NGOs appear to have return on assets (ROA) equivalent to or higher than SHFs,

which implies that, inconsistent to the hypothesis of better SHF sustainability, NGOs should be as sustainable in the long run as SHFs.

Gender bias (Female borrowers)

Another aspect of microfinance is gender bias. Since the early stage of microfinance industry, women have been essentially targeting clients of MFIs as women have been found to be positively related to repayment (Gobbons and Kasim, 1990; Hulme, 1991; Khandker, Khali and Kahn, 1995). Recent empirical studies have confirmed this fact. Following the study of D'Espallier, Guerin and Mersland (2011), women are found to be better credit risks in microfinance than men on the whole. Their regression outputs indicate that MFIs have a lower portfolio risk, fewer write-offs, and fewer provisions. The magnitude is stronger for NGOs, individual-based lenders, and regulated MFIs. Their analysis is based on a global data set of 350 MFIs in 70 countries.

By drawing upon unique qualitative and quantitative data of 26 microfinance projects in 22 countries in Africa, Eastern Europe, Latin America and Asia; Boehe and Cruz (2013) unearth that serving more female clients of low literacy rates has a positive impact on microfinance performance. They argued that less educated females may have a higher incentive to fulfil their loan repayment as cooperative microfinance is most possibly considered to be one of the very few chances in their lives. Particularly, repayment reflects the openness of the "MFI door" in an institutional circumstance of few economic chances. In addition, female borrowers with low access to education can also be beneficial to MFIs in the sense that credit screening is more effective, the enforcement of social sanctions becomes more likely (Armendariz de Aghion and Morduch, 2005) and stronger bonds with the community enhance credence between

lending partners (Kenis and Knoke, 2002; Okten and Osili, 2004). Godquin (2004) find that female clients enable MFIs to improve their depth of outreach through offering smaller loan sizes. Omri and Chkoundali (2011) discover that female borrowers are positively related to financial sustainability.

The effect of women clients is also studied by D'Epasllier, Guerin and Mersland (2013). Based on a global dataset of 398 MFIs in 73 countries extracted from rating assessment reports collected by specialised rating agencies supported by Rating Fund, they find that serving more female clients helps to enhance repayment but does not improve the overall financial performance due to higher relative expenses. Their results also indicate that cost inefficiency results from smaller loans extended to females and from group lending methodologies carried out by MFIs that focus on female clients.

Regulatory supervision

Another potential thread of research is the study of the relationship between regulation and performance of MFIs. Hartarska and Nadolnyak (2007) seek to answer their research question if regulated MFIs can achieve better sustainability and outreach based on a sample of 114 MFIs in 62 countries. Their regression results demonstrate that regulatory environment does not directly influence the operational self-sustainability and outreach of MFIs. However, they contend that the higher number of credit clients in deposit-taking MFIs suggests that there may be indirect benefits from regulation, if regulation is the only way for MFIs to access savings.

Cull *et al.* (2011b) empirically examine whether regulatory supervision influences financial and social performance of MFIs. Using a dataset of 245 leading institutions, they found that regulated MFIs can still maintain the profit rates but both

the income-related and gender-related depth of outreach are curtailed. They also discover that MFIs with weaker financial orientation instead are prone to lessen profitability but perpetuate outreach.

Target market

Nwachukwu (2014) empirically tests whether target market influences financial self-sufficiency based on a dataset of 426 institutions in 41 developing countries. Their findings show that excluding the poorest clients in the low-end market is not statistically linked to microfinance profitability after controlling for other relevant covariates. The author comes to a conclusion that MFIs may not be forced to drift away from their original mission of serving the disadvantaged while striving for financial sustainability.

Omri and Chkoundali (2011) find that serving more poor clients does not affect the repayment default in terms of portfolio at risk more than 30 days but negatively influences financial profitability. Their analyses are drawn upon a sample of 10 Mediterranean MFIs over the 2001-2008 period.

Lending methodology

Drawing upon a sample of 135 MFIs rated between 2003 and 2008, Tchakoute-Tchuigoua (2012) finds that individual lending is not statistically related to loan condition and cost efficiency. Their findings also exhibit a significant association between group lending and the social outreach of MFIs. In particular, group lending helps MFIs to have a broader breadth of outreach and a lower depth of outreach. In other words, by applying group lending method, MFIs can increase their number of active borrowers and reduce their loan size. A negative link between individual lending and breadth of outreach is also verified in the study of Mersland and Strom (2009).

By studying 52 MFIs in Kenya, Kodongo and Kendi (2013) uncover that individual lending has higher default rates than those of group lending. They concluded that individual lending approach is not as effective as group lending approach in reducing the risk of default among MFI clients.

Capital structure

Bogan (2012) examines the linkages between capital structure in terms of debt relative to assets, grants as a percent of assets, shareholder capital as a percent of assets, and deposits relative to assets and microfinance performance. They find that grants as a percentage of assets is negatively related to financial sustainability. This variable is also observed to be positively associated with cost per borrower, indicating that depending on donor funds abolishes the stimulus for MFIs to perform efficiently and viably. Bogan (2012) finds no relationship between capital structure and social outreach.

Based on a dataset of 782 MFIs active in 92 countries from 2000 to 2007, Kar (2012) also examines whether capital structure affect the performance of MFIs. Their findings demonstrate that an increase in leverage improves profitability of MFIs. Further, a decrease in leverage leads to cost-inefficiency of MFIs. With respect to outreach, a negative and significant relationship is found between leverage and income-related depth of outreach.

Corporate governance

Mersland and Strom (2009) use a global dataset of 278 MFIs for the period 2000-2007 to examine the association between corporate governance and performance of MFIs. Their findings show that local directors, international board auditors, female (Chief Executive Officer) CEOs help to boost financial sustainability of MFIs. Further, larger

MFIs are more likely to achieve better financial performance and cost efficiency. With respect to social outreach, MFIs with CEO/chairman duality have larger breadth of outreach in terms of number of credit clients. Further, MFIs with individual lending approach tend to supply larger loans and serve less number of borrowers, indicating a curtailed depth of outreach and a reduced breadth of outreach, respectively. Besides, larger MFIs have better breadth of outreach but tend to exclude poorer and hard-to-reach clients. Their findings also display a significant and negative relationship between the age of MFIs and the income-related depth of outreach.

Also concerning the effect of female CEO on social outreach, Hartarska *et al.* (2014) estimate a stochastic frontier cost function and random effect model utilising a panel data of more than 250 MFIs from 1998-2009. They uncover that outreach efficiency improves with female CEOs. On the whole, their findings imply that both social and financial benefits can be gained by promoting gender diversity at the top levels of MFIs management.

Hartarska and Mersland (2012) seek to answer the research question: "Which governance mechanisms promote efficiency in reaching poor clients?". To this end, they employed a dataset of 278 rated MFIs from 60 countries from 2000 to 2007. Following a stochastic cost frontier (SCF) estimation and output measurement of the number of clients, they found that a board size of up to nine members is the threshold for MFIs to extend their breadth of outreach. Passing beyond that threshold, the number of active clients decreases. Their findings also indicate that MFIs in which the Chief Executive Officer (CEO) chairs the board and those with a larger proportion of employees and donors shorten their outreach.

Tchuigoua (2015) empirically investigates whether corporate governance influence microfinance performance based on a pooled cross-section sample comprising 178 MFIs rated by Planet Rating from 2001 to 2011. Their regression outputs exhibit a positive and significant association between better governance and breadth of outreach in terms of the number of active borrowers.

Mori *et al.* (2015) utilise a sample of 63 MFIs in three East African countries, namely Kenya, Tanzania and Uganda to empirically test the effect of board composition on social outreach of MFIs. Their findings demonstrate that MFIs can enhance their outreach when MFI boards have a higher share of independent, international, and/or women members. In summary, their results highlight the significant role of board composition in helping MFIs to fulfil their social mission of poverty reduction.

Competition

McIntosh *et al.* (2005) empirically test the effect of competition among MFIs. They employed a dataset of 780 lending groups in incumbent MFIs. Their sample was obtained from three sources: (i) group-level information supplied by Foundation for International Community Assistance (FINCA)/Uganda, (ii) individual surveys undertaken by the same FINCA groups; and (iii) district-level compiled from the District Resource Endowment Profile Survey (DREPS) conducted by the Uganda Bureau of Statistics and Development Consultants International in 1997. Their findings show that increasing competition leads to a reduction in repayment performance and savings deposited with the incumbent, indicating a rising multiple credit-taking by clients.

Hartarska and Mersland (2010) find that MFIs active on more competitive environment are likely to have short breadth of outreach in terms of the number of clients, the number of borrowers and the volume of loans. As explained by Gorton & Winton (2003) and McIntosh & Wydick (2005), lenders trust in long-term relationship to impose contracts, and when the value of the relationship is ruined by more lenders, MFIs have less number of clients and volume of loans. In other words, microfinance breadth of outreach is shrinking.

Based on a sample of 362 MFIs in 73 countries for the period 1995-2008; Assefa, Hermes, and Meester (2013) find a negative link between competition among MFIs and social outreach as well as repayment performance. The competition was measured by constructing a Lerner Index. To be more specific, their findings indicate that increasing competition in microfinance industry results in a decrease in the number of active borrowers and a rise in both portfolio at risk more than 90 days and writing-off ratio.

Other factors

Martin and Winker (2013) find evidence of the impact of *foreign ownership* on microfinance performance in Latin American microfinance institutions based on a unique dataset of 84 MFIs with a "five diamond" ranking rated by MIX Market in 15 countries for the period 2004-2009. In particular, their findings show that larger breadth and deeper depth of outreach are found for foreign-owned MFIs compared with domestic-owned MFIs.

Hudon and Traca (2011) discover a positive relationship between s*ubsidies* and efficiency, indicating that subsidized MFIs are more efficient compared to unsubsidized

ones. Their findings further demonstrate that the marginal effect on efficiency becomes negative if subsidization is beyond a certain threshold. Specifically, the authors imply that donors should be worried about the potential adverse incentive impacts when the subsidy intensity passes beyond 0.88. Also concerning the impact of subsidies, Hartarska, Caudill and Gropper (2006) find that presence of subsidies increases costs of MFIs in Eastern Europe and Central Asia.

D'Espallier *et al*. (2013) uncover that unsubsidized MFIs have worse gender-related depth of outreach by reducing percentage of female borrowers. Further, unsubsidized MFIs active in Eastern Europe and Central Asia tend to serve better off clients in terms of large loan sizes.

Most recently, Cuellar-Fernandez *et al.* (2016) explore the determinants of margin in microfinance institutions. In their study, the dependent variable – Net interest margin (NIM), is calculated as the difference between financial income and financial costs in relation to total assets. Their analysis is based on a 9-year panel data. Their findings firstly demonstrate that *operating costs* is the most determining factor. In particular, high operating costs reflect high margin; however, the effect is lower in the sub-sample of MFIs with average loan size less than US$ 300. This result has implications for the existence of a poverty penalty: MFIs serving more poor and hard-to-reach clients through offering small loans have high margins. In addition, they also observe that the oldest and largest MFIs and Credit Union appear to operate with the lowest margins. NBFIs, on the contrary, have high margin. Finally, it has been observed in this research that the margin is high for MFIs active in countries with a high level of accessibility of banking services.

As microfinance is considered as an instrument to reduce poverty in less developed and developing countries, many MFIs are operating with the intervention of international factors, including international initiator, international directorship, international debt, and international affiliation or networks. Mersland *et al.* (2011) empirically test how various dimensions of *international influence* impact financial performance and social outreach of MFIs. On the whole, their findings indicate that the internationalisation of micro-banks has a positive impact on social performance of MFIs but makes no differences on financial performance. Their analysis is based on a dataset of 379 micro-banks in 73 countries for the period 2001-2008.

Regional factors

In previous studies, the impact of regions is examined by two ways. First, some studies divide their sample into different sub-samples representing different regions and compare the results (see, for example, the study of Arnone *et al*., 2012). Second, other studies include regional factors as control variables (Louis and Baesen, 2013; Strom *et al.*, 2014)

2.4.3.3. Microsavings and microfinance performance

Compared to the abundance of research on the impacts of offering microcredit and other MFI-specific features on microfinance performance, the studies on the relationship between offering financial microsavings on financial and social performance of MFIs are very limited. To the best of of our knowledge, only three studies were carried out by Gingrich (2004), Bergsma (2011) and Rossel-Cambier (2012) to focus on examining the relationship between microsavings and microfinance performance. However, their studies suffer from limitations of data and methodologies. They used small sample and

simple econometric techniques. Few empirical studies incorporated variables relating microsavings as control variables (Hartarska and Nadolnyak, 2007; Caudill et al., 2009; Bogan, 2012; Muller and Uhde, 2013; Awaworyi et al., 2014). To avoid repetition, the discussion on these previous studies will be presented in detail in Section 2 of Chapter 3 and Chapter 4 of this thesis).

2.4.3.4. Trade-offs and mission drift in microfinance performance

The most recent debatable issues in microfinance relate to trade-offs between financial performance and social outreach and mission drift (Hermes and Lensink, 2007). Broadly speaking, trade-offs demonstrate the mismatch between financial performance and social outreach (Pischke, 1996). To be more specific, the primary goal of MFIs is extending financial services to the poor who are unbanked, which is more costly and less profitable. The presence of a conflict between financial performance and social outreach induces MFIs to migrate away from social objectives to commercial objectives by serving more well off clients – a phenomenon known as mission drift (Frank, 2008; Woller, 2007). In practice, some studies have found the presence of trade-offs and mission drift (Olivares-Pocalo, 2005; Hermes *et al*., 2011; Louis and Baesens, 2013; Im and Sun, 2015; Xu *et al*., 2016). Nonetheless, other studies provide no evidence of trade-offs/mission drift (Kar, 2014; Nurmakhanova *et al.*, 2014; Meyer, 2015; Quayes, 2015). Earlier studies have examined microfinance mission drift/ trade-offs in various contexts. However, to the best of our knowledge, no empirical research has been implemented to assess this controversial issue in the context of microsavings. These debatable topics will be thoroughly discussed and analysed in Chapter 5 of this thesis.

2.5. Conclusions

This chapter has reviewed the selective literature on microfinance and microfinance performance. We found that microfinance can be beneficial both from macro and micro perspectives. To be more specific, microfinance, through supplying services to the poor, enables countries to achieve economic development and poverty alleviation. In addition, microfinance can benefit the poor by increasing their asset accumulation, nutrition consumption, enhancing education. We observe that no research has been done to evaluate the impact of micro-savings on poverty relief at a macro level.

With regard to microfinance performance, the selective literature review shows that the financial performance and social outreach of MFIs are influenced by both country-level factors, such as inflation rate, GDP rate, GNI per capita, policy framework and firm-level factors, including objectives of MFIs, regulatory supervision, governance, female borrowers, lending approach, types of MFIs, governance. The survey of literature on microfinance performance has specified some gaps in literature that the thesis is addressing. *First*, previous research on the performance of MFIs has not much been concerned with the impact of offering micro-savings financial products. *Second*, no empirical studies have been done to investigate the debatable topic relating to microfinance trade-offs/mission drift in the context of microsavings. *Third*, no research on micro-savings has focused on the case study of Vietnam, a developing country where microfinance in general and microsavings in particular have had important roles in this country's poverty reduction. *Fourth*, studies on the effects of various MFI-specific characteristics and macroeconomic factors on MFI performance are subjected to several limitations: data were incomplete or unavailable in terms of the limited number of MFIs included in the datasets and the time period covered; the

samples were unrepresentative or biased (samples focused on one country or one region or only MFIs with good data were chosen); regression results appeared to be statistically insignificant; simple econometric techniques that could not deal with endogeneity problem.

Therefore, these gaps in literature of microfinance motivate us to spot four research ideas for this doctoral thesis which will be developed in the next four chapters. To be more specific, we find that it is essential to examine whether: (1) micro-savings affect financial performance of MFIs, (2) micro-savings affect social outreach of MFIs, (3) micro-savings have a role in trade-offs between financial sustainability and social outreach and mission drift; and (4) these issues need to be tested in a case study of Vietnam, a developing country that has gained achievements in poverty alleviation thanks to microfinance. Moreover, our research work endeavours to overcome the limitations of earlier studies by utilising an extensive and unique large dataset of 1,936 MFIs (for research of Chapter 3 and Chapter 4) and a dataset of 1,233 MFIs for Chapter 5, providing a representative sample MFIs in all regions of the whole world. Further, we tend to apply advanced econometric techniques including Hausman-Taylor and two-step system GMM to tackle endogeneity in econometric analysis.

CHAPTER 3

DOES OFFERING MICRO-SAVINGS AFFECT THE FINANCIAL PERFORMANCE OF MICROFINANCE INSTITUTIONS?

3.1. Introduction

In line with the positive contribution of microfinance in worldwide poverty alleviation, microfinance has grown as an industry since 1990s. According to Quayes (2012), most of MFIs operate in a not-for-profit basis to facilitate the alleviation of hunger and poverty, while others are active on a for-profit basis to focus more on financial sustainability. The quest for sustainability and eventual self-sufficiency is widely considered as a best practice in microfinance industry Pollinger *et al*. (2007). The significance of attaining financial sustainability has been stressed for some reasons. First, achievement in financial performance implies the efficient utilization of the funds allocated, which enables profitable MFIs to attract the interest of donor agencies. Second, the requirement of financial profitability would lay a foundation for future self-sufficiency of MFIs and eventually help to wean themselves off external subsidies (Vinelli, 2002). Third, microfinance institutions are performing in an increasingly commercialized environment (Pinz and Helmig, 2014); and hence sustainability enables microfinance institutions to become more competitive. Further, to highlight the essential role of financial sustainability, Schreiner (2000) notes that "unsustainable MFIs will

help the poor now, but they will not help the poor in the future because the MFIs will be gone".

Micro-savings, which are often called "the forgotten half of microfinance", have lately received a great deal of interests[23]. For example, at the G20 meeting in Seoul in 2010, micro-savings were recognized as key pillars of financial inclusion in developing countries. Recently, micro-savings have been described as "Next Big Thing" in global development agenda[24]. Economic theories and limited empirical studies on this topic have revealed some links between micro-savings and microfinance financial performance. To illustrate, offering micro-savings can enable MFIs to achieve their financial sustainability and cost efficiency (Sinha, 2003; Gingrich, 2004; Armendariz *et al*., 2005; Maisch *et al*., 2006; Caudill *et al*., 2009; Ross-Cambier, 2010; Bergsma, 2011; Hartarska *et al*., 2011; Ross-Cambier, 2011; Awaworyi *et al*., 2014). In contrast, some studies show that micro-savings are not related to financial performance of microfinance institutions (Hartarska, 2007; Hartarska, 2009; Gutiérrez-Goiria, 2011; Muller, 2013).

Combining both from the significance of MFIs' financial sustainability and the theoretical background as well as the mixed findings of previous research on the impact of micro-savings, it is therefore interesting to examine if there exists links between micro-savings and financial performance of MFIs in terms of sustainability and cost efficiency. To attain this research objective, this chapter will attempt to answer the general research questions (RQ): "Does offering micro-savings financial products affect

[23] See: 'Enable micro-savings through bank-linked mobile phones in Sri Lanka'. Available at: http://www.theigc.org/project/enabling-micro-savings-through-bank-linked-mobile-phones-in-sri-lanka/ , [Accessed: 20 December 2014]

[24] See: 'Micro-savings: Are we there yet?' Available at: http://www.ssireview.org/blog/entry/micro-savings_are_we_there_yet [Accessed: 10 November 2014]

financial performance of MFIs?" Accordingly, two sub-research questions (SRQ) need to be dealt with as below:

SRQ1: Does offering micro-savings affect the financial sustainability of MFIs?

SRQ2: Does offering micro-savings affect the cost efficiency of MFIs?

The contribution of this paper is threefold. First, this paper contributes to the existing literature by focusing on the influence of micro-savings on two dimensions of microfinance financial performance, including financial sustainability and cost efficiency. This is important because very limited research has been carried out to assess the effects of offering financial microsavings. Second, this study also differentiates itself from previous research by estimating the impacts of micro-savings on financial performance in a rigorous way. To the best of our knowledge, compared to earlier studies on micro-savings that use small sample of one country (Gingrich, 2004) or one region (Rossel-Cambier, 2012), this research work utilises the largest dataset which contains 1,936 MFIs from 79 countries in the world. Also, we have incorporated in our sample both deposit taking MFIs and non-deposit taking MFIs to avoid sample selection bias. Further, as previous studies utilised limited proxies for micro-savings, this is the first paper to examine the impact of three dimensions of micro-savings namely the voluntary savers, the volume of deposits and the number of deposit accounts per staff member. In addition, this is also the first empirical research to use "the number of net savers" as a proxy for voluntary savings which has never been used in previous empirical studies. Therefore, the findings provide further valuable insight into micro-savings and its potential impact on microfinance financial performance. Moreover, at the policy level, testing factors influencing microfinance financial performance is

important to improve sustainability and cost efficacy of MFIs so that microfinance industry can better meet the demand of their clients and contribute to the overall macro and socioeconomic development.

The outline of this chapter is presented as follows. Section 3.2 reviews the economic theories of micro-savings and empirical evidence of the association between micro-savings and financial performance of MFIs. The section also presents the critique of existing empirical evidence and clarifies key hypotheses. Section 3.3 describes the regression model, variables and dataset. The descriptive statistics are reported in section 3.4. Further, the regression results are discussed in section 3.5. Finally, section 3.6 provides conclusions.

3.2. Relevant literature review and hypothesis development

3.2.1. Theoretical underpinnings

Further to the literature review covered in Chapter 2 of this thesis, we undertake here a much more specific survey of the pertinent issues which is unique to this chapter.

3.2.1.1. Financial performance of microfinance institutions

The first aspect of financial performance of MFIs is *financial sustainability*. According to Yaron (1994), an MFI achieves financial sustainability "when its income equals or exceeds its expenditures, including imputed factors, such as the opportunity cost of its equity". Thus, *financial sustainability* primarily reflects the ability of MFIs to cover all their costs. As noted by Schreiner (2000), sustainability indicates the capability of an MFI to operate through time. Christen *et al.* (1994) identify three levels of financial sustainability as below.

(1) Level 1 – *Subsidy dependence*: at this level, MFIs are heavily dependent on grants and subsidies from donors.

(2) Level 2 – *Operational self-sufficiency*: at this level, MFIs are able to cover all non-financial costs, such as salaries and administrative costs, depreciation of fixed assets, and the cost of loan principal lost to default.

(3) Level 3 – *Full self-sufficiency*: at this level, MFIs have a capacity to cover not only non-financial costs but also financial expenses, and the MFIs no longer rely on subsidies.

Thomas and Kumar (2016) define sustainability of MFIs as the long-run operation of microfinance programme, involving the continuance of a full range of products and services that MFIs supply. They also add that financial sustainability reflects the capacity of MFIs to manage all of their costs and improve rational equity value in accordance with their social mission.

Financial sustainability is crucial to microfinance industry. Vinelli (2002) gives five underlying reasons for this point. First, sustainability not only guarantees the existence and development of MFIs but also promises non-stop supply of services that is demanded by potential clients and micro-enterprises. Additionally, sustainability stimulates repayment of borrowers[25]. Second, by pricing their services at market levels, MFIs are more likely to attract the target population of non-bankable credit clients who do not have access to cheaper services. Third, conventional lenders may be prevented from competing with heavily subsidized organizations. Fourth, sustainability enables

[25] According to Bates (1995), Gonzalez-Vega (1998), Gonzalez-Vega (1998), Bhatt and Tang (2001) and Schreiner and Morduch (2002), if borrowers assume that lender are not sustainable or permanent, or if they have a belief that lenders will not punish them, they are unlikely to repay their loans. Therefore, defaults may increase.

MFIs to raise capital from various sources. And, fifth, MFIs are more likely to manage costs if they highlight financial sustainability.

Another important aspect of microfinance performance is *cost efficiency* which denotes "how effectively an MFI using its resources, particularly its assets and personnel" (CGAP, 2003).

3.2.1.2. Theoretical framework

Concerning theoretical underpinnings, the possible influence of offering financial microsavings on microfinance financial sustainability and cost efficiency can be explained by some economic theories encompassing *financial intermediation theory* in terms of reduction of financial transaction cost theory[26], *economies of scale* and *economies of scope*.

Transaction costs, the time and money spent in implementing financial transactions, are one main issue of financial market (Mishkin, 2004). Financial intermediaries operate as coalitions of individual lenders or borrowers who make use of economies of scale or scope in the transaction technology (Scholtens & Wensveen, 2003). According to Mishkin (2004), financial intermediaries are able to mitigate transaction costs for some reasons. First, they have developed expertise in reducing them. Specifically, their expertise in computer technology enables them to provide clients with convenient services. Second, their larger size enables them to exploit economies of scale. Low transaction costs allow financial intermediaries to carry out risk sharing at low cost, which enables them to earn a profit on the spread between the returns they earn on risky assets and the payments the make on the assets they have

[26] Two of the most used theories of financial intermediation theory refer to reduction of financial cost theory (or the transaction cost approach) and information provision theory (or information asymmetry approach). The latter will be reviewed in Section 2 of Chapter 4.

sold. Another essential outcome of a financial intermediary's low transaction costs is the capacity to offer its customers with liquidity services, services that make it easier for clients to carry out transactions.

As defined by Besanko and Braeutigam (2011), *economies of scale* demonstrate the ability to operate at a lower unit cost when the scale of operation is enhanced at a given point in time. Mankiw (2001) wrote that economies of scale arise "whereby long-run average total cost falls as the quantity of output increases". Mishkin (2004) contended that financial intermediaries can take advantage of economies of scale through bundling the funds of many investors together. Accordingly, deposit taking activities can enable financial intermediaries to perform activities more cost-efficiently and profitably.

Economies of scope is a production characteristic in which the total cost of manufacturing given quantities of two products in the same firm is less than the total cost of manufacturing those quantities in two single-product firms (Besanko and Braeutigam, 2011). Thus, following this economic theory, deposit-taking MFIs can achieve better operational efficiency and financial sustainability by the synergies created through offering both microsavings and microloans.

3.2.1.3. Micro-savings and its impact on microfinance clients and microfinance institutions

Micro-savings

Hulme *et al*. (2015) note that there are three possible approaches to define micro-savings depending on whether one concentrates on the *people* saving, the *amounts* deposited, or the *institutions* where the savings takes place. Accordingly, micro-savings

can refer to savings made by low-income or poor people, or as small amounts of savings, or as savings deposited at institutions that capture micro-savings. The measurement of micro-savings based on the approach taken is described in Appendix 3.1.

Based on channel delivery mechanism, micro-savings are categorised into informal savings, semi-formal savings and formal savings (Mukhrjee, 2008; Hulme *et al.,* 2015). *Informal savings* take forms of in-kind, cash at home, deposit collectors and money guards, group-based systems including savings clubs in Rotating Savings and Credit Associations (ROSCAs). Informal savings are made by individuals or groups of low-income people rather than provided by organisations or financial institutions. In addition, *semi-formal savings* include savings products provided by NGOs, MFIs, villages groups and credit unions. Further, *formal savings* are financial products supplied by formal financial intermediates such as banks, cooperatives, savings post offices, insurance companies and other institutions. (See Appendix 3.2 for the advantages and disadvantages of various savings providers).

Moreover, micro-savings financial products offered by formal and semi-formal providers are *involuntary savings* and *voluntary savings* (Ledgerwood, 1999; Robinson, 2004). *Compulsory savings* are normally treated as collateral, indicating an amount of money that microfinance clients are required to deposit as a condition of receiving micro loans. Involuntary savings approach offers microfinance clients little or no choice of savings products; and hence, involuntary savings augment the cost of micro loans and cannot meet the needs of most poor savers (Robinson, 2004). Nonetheless, *voluntary savings* are financial services extended to both borrowers and non-borrowers without any enforcement. With voluntary savings, clients can deposit or withdraw based

on their demand. Seibel (1999) confirms that in comparison to other internal resources of MFIs such as equity, compulsory savings, insurance premiums and undistributed profits, voluntary savings are the most important growth factor.

Micro-savings as better meeting clients' needs

Practitioners and scholars have asserted that the poor can save (Rutherford, 2000; Hogarth et al., 2003; Paxton, 2009). To illustrate, Hogarth *et al*. (2003) discovered that between about 70 percent of 4,309 poor and low-income households in the sample confirm that they usually save. The analysis of Paxton (2009) based on a cross-sectional data collected from 2,029 Mexican households shows that the rural poor can and do save by employing multiple savings strategies. Marinangelli *et al*. (2011) also contend that the poor can save and they normally make use of various savings devices. Rutherford (2000) provides three methods that poor people save, namely saving up, saving down and saving through.

- "Saving up" - This is the most evident way to convert a series of present savings into lump sums in the future.
- "Saving down" – In this way, poor people get the lump sum, as a loan, first, and then they use the savings to repay the loan over time.
- "Saving through" – The saver goes on making a more or less continuous stream of savings that get converted to a lump sum at some intermediate point in time.

As stated by Collins *et al.* (2009), the income of the poor is low, irregular and uncertain. They also specify three needs that drive much of the financial activity of the

poor, including managing basics, coping with risks, and raising lump sums[27]. Accordingly, microfinance institutions are recommended to extend not only microcredit but also micro-insurance as well as micro-savings to the poor. Branch and Klaehn (2002) also emphasize that low-income people will deposit their cash holdings if they are provided with convenient and reliable savings facilities.

According to Beck (2015), the impact of micro-savings interventions seems more promising. As noted by Fiebig *et al*. (1999), micro-savings can enable the poor to get access to other financial services such as micro loans, micro-insurance or remittances. As a result, their demands are better met. Financial stress of borrowers can also be lessened in the light of micro-savings (Schicks and Rosenberg, 2011). Moreover, Zellar *et al*. (2000) and Christen *et al*. (2009) observe that the poor can benefit from micro-savings in terms of capital accumulation, future disposal income creation for future spending. They also note that micro-savings help the poor to avoid insecurity due to unexpected shocks. Laureti and Hamp (2011) contended that offering innovative microfinance products covering microcredit, micro-savings and micro-insurance is essential to the poor because it enables them to manage money, e.g. smooth consumption, coping with risks, and taking advantages of unexpected investment chances. The study of Searle and Koppe (2014) also shows that holing savings is linked to lower poverty rates and offers a nest egg in cases of emergency. Plus, another positive effect of micro-savings on the poor is enhancing women empowerment. To be more precise, micro-savings enable female clients to have more freedom and ameliorate their position in the families (Ashe, 2002; Vonderlack *et al*., 2002; Ashraf *et al.,* 2010;

[27] According to Collins *et al.* (2009): (i) Managing basics relate to cash flow management to transform irregular income flows into a reliable resource in order to meet daily meets; (ii) Coping with risks means dealing with the emergencies that can derail families with little in reserve; and (iii) Raising lump sums means accumulating usefully large sums of money to grasp opportunities and pay for big ticket expenses.

Tiwari, 2013). Further, Zelinsky (2009) studies a micro-savings program in Eastern Slovakia. Based on a sample of 112 households, their findings, on the whole, show that micro-savings programmes have a positive impact on poverty reduction. To summarize, literature on the impact of micro-savings on the poor converges in one point that micro-savings help to generate and enhance the welfare for the poor.

Micro-savings as enhancing cost-efficiency and financial sustainability of MFIs

Micro-savings are advantageous to MFIs in various ways. Generally, micro-savings are a source of fund with low financial costs (Hannig, 1999; Hirschland, 2005). Von Pischke (1991) affirms some evidence from Indonesia and Kenya that credit programmes were prolonged to the extent that they are funded with deposits captured in the areas where they offer loans. In addition, Hannig and Wisniwski (1999) and Hartarska (2010) note that the overall operating costs of MFIs can be significantly reduced in the light of the synergies created through economies of scope of savings and lending. The economies of scope of loan provision and deposits mobilisation in banking was theoretically identified by Diamond (1984) and empirically proved by Sounders (1999). Wisniwski (1999) further adds that savings mobilisation prompts incentives and disciplines for MFIs to improve their operational efficiency. Plus, small savings can make a contribution in repayment of microfinance institutions as borrowers are more likely to pay back their loans when they know that they are using their own and their neighbours' deposits. Concurring with this viewpoint, Hirschland (2005) asserts that savings can result in economies of scope, cost efficiency in loan provision; and thus transaction costs can be mitigated. Hannig *et al*. (1999) also stress that savings mobilisation can enhance commercial feasibility of MFIs because this approach induces MFIs to ameliorate the governance and cost efficacy. Dowla and Alamgir (2003)

suggest that providing fixed contractual saving and time deposit has a beneficial effect on financial viability and future sustainability of MFIs. Moreover, Seibel (1999), Armendariz *et al*. (2005) and Dokuliova *et al*. (2009) write that mobilizing savings enable MFIs to obtain the resources to finance the loan portfolio growth and as a result, savings make MFIs more independent of subsidies and other external funding sources which, as stated by Helms (2006), include international loans and grants; domestic loans in forms of concessional and commercial loans, and bonds; and therefore, savings have a positive effect on the sustainability of MFIs. Abakaeva and Glisovic-Mezieres (2009) also highlight the importance of savings as a stable source of funding for MFIs. They argue that savings deposits are the bedrock of funding, with very low volatile and low interest costs. To advocate for this viewpoint, Hannig *et al*. (1999) and El-Zoghbi (2010) state that deposits are possibly the most abundant, certain, and commercially viable funding source. Therefore, taking advantage of domestic sources as savings enables MFIs to cushion from risks of financing, foreign exchange and liquidity; and as a result, the sustainability of MFIs can be strengthened, particularly in times of financial crisis and economic down-turn. To illustrate, in the research of Dokuliova *et al*. (2009), the authors also contend that deposit-taking MFIs should survive the crisis better. They explain that increasing interest rates, foreign exchange rate losses and more expensive funds due to global financial crisis would lead to an increase in operating costs of non-deposit taking MFIs, which are not always transferable on their clients. The authors conclude that mobilizing savings is considered to be a core instrument for MFIs in achieving sustainability. Seibel *et al.* (2010) provide a case study of Bank Rakyat Indonesia (BRI) - a saving-led MFI that creates sustainable access to a wide range of microfinance services for ever-increasing numbers of mostly low-income households.

BRI was found to be resilient to both South East Asian financial crisis in 1997/98 and global financial crisis in 2008/09. Based on theoretical framework and literature on the benefits of microsavings on financial sustainability and cost-efficiency, I expect deposits activities help to enhance MFI financial performance. Accordingly, specific hypotheses are framed as below.

Hypothesis 1: Deposit-taking MFIs have better financial sustainability compared with MFIs that do not take micro-savings

Hypothesis 2: The volume of deposits enhances financial sustainability of MFIs

Hypothesis 3: The number of deposit accounts per staff member enhances financial sustainability of MFIs.

Hypothesis 4: Deposit-taking MFIs are more cost efficient compared with MFIs that do not take micro-savings.

Hypothesis 5: The volume of deposits enhances cost efficiency of MFIs.

Hypothesis 6: The number of deposit accounts enhances cost efficiency of MFIs.

The downside of micro-savings on performance of MFIs

The first disadvantage of micro-savings relates to administration costs. In particular, supplying small deposits leads to high administrative costs because micro-savers have a propensity to hold small value accounts that are more costly to maintain (Schmidt and Zeitinger, 1996; Yaron and Manos, 2007). Additionally, micro-savers normally request rapid and simple access to accounts as well as convenient withdrawals, which is expensive and labour-intensive from MFIs' viewpoint. Moreover, MFIs that capture deposits commonly have more deposits accounts than credit accounts. Therefore, an

MFI starting to provide micro-savings financial products can expect a firm and stable demand of new clients and the connected additional expenses, such as expenses related to new staff recruitment, existing staff training, reporting enhancement (Yaron and Manos, 2007). Also, Maisch *et al.* (2006) point out some further issues relating to deposit taking activities. Particularly, they are exposed to four major market risks, namely liquidity, term mismatch, interest rate and exchange rate risks. Liquidity risk arises when MFIs are unable to meet their maturing obligations on a timely basis, resulting from their incapability to adequately forecast and plan for changes in the needs of funding sources and cash (Steinward, 2000; Brom, 2009). Term mismatch risk occurs when long-term loans are financed by short-term liabilities (Mata, 2009). Interest risk refers to the risk of financial loss from changes in market interest rates. Interest risk emerges due to a change in the value of assets and liabilities following changes in market interest rates (Steinward, 2000). Finally, exchange rate risk denotes the possible loss of earnings or capital due to a mismatch in the currencies of assets and liabilities. Deposit-taking MFIs often undergo exchange rate risk when they borrow or mobilise savings in foreign currency to fund loans in local currency. They are exposed to the risk that the devaluation of local currency will enlarge the size of institutional debt, expressed in local currency (Steinward, 2000; Brom, 2009; Mata, 2009). (The pros and cons of micro-savings are summarized in Appendix 3.3). Based on these arguments, I have established two following hypotheses.

Hypothesis 7: The number of voluntary savers reduces financial sustainability of MFIs

Hypothesis 8: The number of voluntary savers reduces cost efficiency of MFIs.

3.2.2. A review of empirical evidence of micro-savings and microfinance financial performance

This part further provides empirical evidence of the relationship between micro-savings and the financial performance of MFIs to contribute a better comprehension of the impact of micro-savings. In consistent with the theoretical standpoint of micro-savings and their impact on microfinance performance, earlier studies have examined the effects of micro-savings on two dimensions of microfinance performance which are financial sustainability and cost efficiency.

Gingrich (2004) examines whether deposit taking activities are related to financial performance of Savings and Credit Cooperatives (SCCs) in Nepal. Their study is based on a dataset of 185 SCCs whose annual financial statements are audited and submitted to Nepal Federation of Savings and Credit Unions (NEFSCUN). Sampled SCCs take savings-led approaches. On average, the ratio of savings per total assets was about 70 percent. Their findings reveal that Nepali SCCs financially perform well in terms of profit and dividend yield indicators[28], implying evidence of financial sustainability. The researcher notes that decisions and activities of members are directly influenced by savings. The study also confirms that SCCs in Nepal have no demand for external funding sources, implying another clear evidence for the financial self-sufficiency of Nepali SCCc.

Caudill *et al.* (2009) seek to answer the research question: "Which MFIs are becoming more cost-effective over time?". To this end, the research group exploits a high quality dataset of 137 MFIs active in Eastern Europe and Central Asia for the years

[28] The formulae to calculate profit and dividend yield are below:
a) Profit = (Predividend surplus of revenue - expenditures) / total assets
b) Dividend Yield = (Profit x 25%) / member equity
(Source: Gingrich, 2004)

2003 and 2004. Their findings indicate that an improvement of microfinance performance goes with an increase in deposits. Particularly, MFIs having many thousand times of the volume of deposits are observed to more efficient compared with MFIs that do not take deposits. The research group implies that MFIs with sizable deposits are more likely to achieve self-sufficiency.

To understand how deposit taking activities might influence the overall cost of microfinance institutions, Hartarska *et al*. (2011) performed a semi-parametric analysis to investigate the scope economies from jointly lending and mobilising deposits. They draw on a global sample 882 MFIs extracted from the MIX Market platform. The data set straddles from 1998 to 2007. Their findings reveal that the combined economies of scopes appear to be the highest for MFIs in Middle East and Eastern Europe and the lowest for MFIs active in Latin America and Africa. It is also discovered that NBFIs are realising higher economies of scope. With regard to environmental/external elements, their findings further show that scope economies also vary by geographical region and population mix. Besides, the research group unearth the presence of some diseconomies of scope in non-profit MFIs, especially in more urban countries. Moreover, in Africa, the diseconomies of scope expand with the share of rural population; meanwhile, in Latin America and Asia, the diseconomies occur mostly in the more urban nations.

Bergsma (2011) explores whether offering micro-savings financial products makes sense to MFIs. To achieve the objective of research, the author uses ROA and OSS as proxies for financial performance and a binary variable dummySAVER as a proxy for deposit taking. The researcher performs an unbalanced panel regression basesd on a sample of 35 Opportunity International MFIs all over the world. Bergma

(2011) discovers that offering savings leads to an increase in ROA; indicating a positive impact of micro-savings on financial profitability of MFIs.

Bogan (2012) empirically tests the relationship between capital structure and two dimensions of financial performance, namely sustainability and cost efficiency. Their analysis is based on a panel data of MFIs in Africa, East Asia, Eastern Europe, Latin America, the Middle East, and South Asia for the years 2003 and 2006. Firstly, their findings show that MFIs that capture savings and the number of savers are not significantly linked to financial sustainability. A significant and negative is found for the variable 'deposits relative to assets'; however, the significance disappears when control variables are included in the regression. In the sub-sample for banks, a significant and positive link is found between the dummy variable 'Accept deposits' and OSS. The number of savers is, however, negatively related to financial sustainability of banks. Nonetheless, for Credit Unions, a significant and negative coefficient is found for the dummy variable "Accept deposits", meanwhile a significant and positive coefficient is seen for the number of savers. With regard to cost efficiency, all three proxies for savings are found to be insignificant.

Rossel-Cambier (2012) investigates whether the combination of micro loans, micro-insurance and micro-savings could enhance financial sustainability of MFIs. To achieve this research objective, the author makes use of a data set of 250 MFIs operating in Latin America and Caribbean. The author compares the financial performance of credit-led only MFIs and the financial performance of MFIs that offer combined products including micro credit, micro-savings and micro-insurance. Rossel-Cambier (2012) examines the impact of offering combined products and four dimensions of microfinance performance, namely cost efficiency, profitability,

productivity, and portfolio quality. By applying the Ordinary Least Squares (OLS) estimation, the research shows evidence of a positive relationship between combined products and cost efficiency. Despite finding no clear effects of this combination on financial performance in terms of return on assets (ROA), return on equity (ROE), and Operational Self-Sufficiency (OSS); it is still rational to infer that the role of savings to cost-effectiveness may be beneficial to the profitability of MFIs because cost reduction can lead to financial sustainability.

A positive relationship between micro-savings and financial sustainability is proved in the recent research of Awaworyi *et al*. (2014). They utilize the data for the period between 2005 and 2012 of 215 MFIs in South Asia and 322 MFIs in Latin America and the Caribbean. “Deposit account” serves as a proxy that captures the level of savings amongst microfinance clients. The researchers found that an increase in deposit accounts (savings) gives MFIs in South Asia the leverage to perform well financially.

In contrast to the findings of the above empirical studies which affirm a positive significant association between micro-savings and financial performance of MFIs, Gutiérrez-Goiria (2011) observes that offering savings makes no differences in the financial profitability and sustainability of MFIs. Their analysis is based on a global data set of 791 MFIs in various regions. The data obtained has values at 31 December of 2007. The study applies the Principal Components Analysis (PCA) technique. PCA is a descriptive multivariate methodology that investigates the sampled data. The research argues that one useful aspect of PCA is the possibility to make use of observations and variables which are not appropriately included in the analysis. Their findings show that the variable "number of savers" is evidently aligned with variables reflecting

institutional size, but is not related to variables measuring profitability and sustainability.

The findings of Gutiérrez-Goiria (2011) are compatible with Muller and Uhde (2013). Muller and Uhde (2013) employ a Hausman-Taylor Instrument Variable estimator to analyse data from 558 MFIs in 80 developing countries for the period from 2002 to 2007. In this study, "Ratio of voluntary savings to total assets" is used as a control variable in the regression model to assess the linkages between external governance quality and economic success of MFIs. The empirical evidence suggests no correlation between voluntary savings and financial sustainability of MFIs. These regression outputs also support the studies of Hartarska & Nadolnyak (2007) and Hartarska (2009).

Recently, Delgado *et al.* (2015) extend a developed generalised local polynomial estimator into a semiparametric smooth coefficient framework to estimate a generalised cost function. They provide estimates of scope economies from the joint production of microcredits and micro-savings for a dataset of MFIs from 50 countries. They discover that deposit-taking MFIs may not only supply much needed services for the poor but may also have cost advantages. However, their results reveal that 25% of MFIs that capture micro-savings experience diseconomies of scope, largely stemming from environmental factors.

Of all previous studies that have examined the relationship between micro-savings and microfinance financial performance, only Gingrich (2004), Bergsma (2011) and Rossel-Cambier (2012) focus on exploring the impact of micro-savings on financial sustainability and cost-efficiency of MFIs. Although they have discovered some linkages between offering savings and microfinance performance, their studies firstly

shows limitations in data and scope of research. To illustrate, Gingrich (2004) chose data of 185 SCCs in one coutry only - Nepal. Rossel-Cambier (2012) limited his investigation in only one region – Latin American and the Caribbean. Further, his dataset covers the year 2006 only. The dataset of Bergsma (2011) includes only 35 Opportunity International MFIs for the period 2004-2006. Besides, Bergsma (2011) and Rossel-Cambier (2012) employ one dummy variable SAVER/SAVINGS as a proxy for savings. Including only one proxy for savings in regression model might lead to a limited assessment of the effects of micro-savings on microfinance performance. In addition, all three studies apply simple econometric techniques that are unable to deal with econometric issues such as endogeneity. The rest of surveyed empirical researches utilize variables relating to savings as control variables, which means that their areas of interest focus on other factor rather than savings. Further, these studies also limit their dataset in a short period of time (Hartarska, 2007; Caudil *et al*., 2009; Hartarska; 2009; Gutiérrez-Goiria, 2011; Muller and Uhdee, 2013; Awaworyi *et al*., 2014). Apart from Awaworyi *et al*. (2014) which used an up-to-date data to the year 2012, other studies had data as far back as 2007.

These gaps in existing empirical studies motivate the development of our research. First, rather than limiting scope of research in one country or some regions, we employ a global dataset, containing information of a larger number of MFIs. To be specific, we utilise a panel dataset of 1,936 MFIs from 79 countries in Sub-Saharan Africa, East Asia & the Pacific, Eastern Europe & Central Asia, Latin America & the Caribbean, Middle East & North Africa; and South Asia. Secondly, our data covers a longer period of time than other earlier studies in this field which is between the year 2000 and 2012. Thirdly, we include more proxies for savings in regression model.

While previous studies used only one or two proxies for savings, our research assessed four proxies for savings including "dummy variable Deposit-taking MFIs", "net savers", "total deposits" and "deposit accounts per staff member". Notably, we use "net savers" as a proxy for voluntary savings that has never been examined before. Further, we use advanced Hausman-Taylor technique to test the links between micro-savings and financial performance of MFIs. We also apply advanced method - the generalised methods of moments (GMM) to test the robustness of the model.

Table 3.1 demonstrates an elaborate picture of earlier studies on the relationship between savings and financial performance and the proxies for micro-savings used in those researches.

Table 3.1: Summary of proxies for savings/deposit used in previous studies

Studies	Proxies for savings/deposit	Dataset	Findings
Gingrich (2004)	-Savings/Total Assets -Savings/Loans received as %	185 Savings and Credit Cooperatives (SSCs) in Nepal	Nepali SCCs had a strong financial profitability.
Hartarska *et al.* (2007)	- Ratio of Savings to Total Assets	114 Microfinance Institutions (MFIs) from 62 countries	No links between savings and financial performance (FP)
Caudil *et al.* (2009)	- DDeposits (Dummy variable) - Volume of Deposits	137 MFIs in Eastern Europe and Central Asia for the period 2003-2004	MFIs with higher volume of deposits are more cost effective.
Hartarska (2009)	- Ratio of Savings to Total Assets	108 MFIs from 30 countries	No links between savings and financial performance (FP)
Bergsma (2011)	- DummySAVINGS	30 Opportunity International MFIs worldwide	Offering savings has a positive impact on FP.
Gutierrez-Goiria *et al.* (2011)	- Number of savers	791 MFIs worldwide	No links between savings and financial performance (FP)
Bogan (2012)	- Deposits relative to assets - Dummy Accept Deposits	A panel data set of MFIs worldwide for the years 2003 and	- Deposits relative to assets: this ratio is negatively related to OSS; however, the significance

	- Number of savers	2006.	does not hold when control variable are included
Hartarska *et al.* (2011)	- Number of savers	882 MFIs (1998-2007)	MFIs can reduce costs by providing both microcredit and micro-savings
Rossel-Cambier (2012)	- Number of savers per staff member - Dummy SAVINGS	250 MFIs in Latin America and the Caribbean	MFIs offering MFIs are more cost effective and more productive
Hartarska *et al.* (2013)	- Volume of Deposits	989 MFIs from 69 countries	Deposit-taking MFIs are more efficient.
Muller (2013)	- Ratio of voluntary savings to total assets	558 MFIs in 80 developing countries	No links between savings and financial performance (FP)
Robert (2013)	- Ratio of deposits to total assets	358 MFIs (2008-2009)	Taking deposits corresponds with higher operating expenses. Taking deposits is positively related to financial sustainability.
Awaworyi & Marr (2014)	- Number of deposit accounts	322 MFIs in South Asia and Latin America and the Caribbean	An increase in deposit accounts gives MFIs in South Asia the leverage to perform well financially

Source: *Studies are identified and reviewed by the researcher. The identification of studies is necessarily selective, but carefully covers the main indicators and proxies.*

3.3. Regression model, variables, dataset and methodology

3.3.1. Regression model

The literature review of microfinance performance as presented in Chapter 2 and the survey of relevant literature on the effects of microsavings on MFI financial performance as synthesized in Section 3.2 of Chapter 3 specify MFI financial performance as a fuction of MFI-specific variables and macroeconomic factors. This paper endeavours to identify whether or not offering financial micro-savings has an influence on financial performance and the sign of the effect. We also seek to explore the way MFI financial performance is generally effected by other firm-specific control

variables including the age, charter types, size, portfolio quality, regulation, number of years reporting, data quality. Further, we also wish to investigate the relationship between microfinance financial performance and regional as well as macroeconomic factors. In the strict sense, we have a functional relationship for MFI financial performance explained by (3.1) as below.

$$(3.1)\ \mathbf{MFI}\boldsymbol{Per}_{it} = \mathbf{constant} + \xi\mathbf{SAV}_{it} + \varphi\mathbf{MFI}\boldsymbol{specific}_{it} + \delta\mathbf{MACRO}_{it} + \mathbf{c}_i + \boldsymbol{\mu}_{it}$$

Where $\mathbf{MFI}\boldsymbol{Per}_{it}$ is a set of financial performance measures for the MFI i at time t; $\mathbf{SAV}_{it}$ is a set of variables that captures the impact of micro-savings; $\mathbf{MFI}\boldsymbol{specific}_{it}$ is a set of institution-specific variables for the MFI i at time t; $\mathbf{MACRO}_{it}$ is a set of macroeconomic country-specific variables at time t in which the MFI i is active; $\mathbf{c}_i$ is the MFI's individual unobserved effect and $\boldsymbol{\mu}_{it}$ is the idiosyncratic error that is assumed to have zero mean and finite variance σ_μ^2 and to be i.i.d over all the observations in the data.

We utilise following variables as proxies for two dimensions of microfinance performance. First, operational self-sufficiency (denoted by OSS) is proxied for the financial sustainability. Second, operating expenses to total assets (denoted by OEA) is proxied for cost efficiency of MFIs.

We proxy four dimensions of micro-savings with the following variables: (i) dummy variable Deposit-taking MFIs to reflect MFIS that offer micro-savings financial products, (ii) the number of net savers (denoted by NS) to represent voluntary savers that are served; (iii) the volume of deposits (denoted by DEP) to demonstrate scale of deposits operation; and (iv) the number of deposit accounts per staff member (denoted by DAPSM) to measure the productivity of MFIs.

Accordingly, the four equations are set up as follows:

$$\textbf{(3.1.1)}\quad OSS_{it} = constant + \gamma_1 DumDeposit\text{-}taking_{it} + \gamma_2 MFI\textit{specific}_{it} + \gamma_3 MACRO_{it} + c_i + \mu_{it}$$

$$\textbf{(3.1.2)}\quad OSS_{it} = constant + \varphi_1 NS_{it} + \varphi_2 DEP_{it} + \varphi_3 DAPSM_{it} + \varphi_4 MFI\textit{specific}_{it} + \varphi_5 MACRO_{it} + c_i + \mu_{it}$$

$$\textbf{(3.1.3)}\quad OEA_{it} = constant + \beta_1 DumDeposit\text{-}taking_{it} + \beta_2 MFI\textit{specific}_{it} + \beta_2 MACRO_{it} + c_i + \mu_{it}$$

$$\textbf{(3.1.4)}\quad OEA_{it} = constant + \eta_1 NS_{it} + \eta_2 DEP_{it} + \eta_3 DAPSM_{it} + \eta_4 MFIspecificit + \eta_5 MACRO_{it} + c_i + \mu_{it}$$

3.3.2. Variables

Dependent variables

In accordance with both theoretical and empirical standpoints of the impact of micro-savings on MFI financial performance, our study also examines this relationship under two facets, namely financial sustainability and cost efficiency.

(1) Operational Self-Sufficiency (OSS)

Firstly, with regard to financial sustainability, we use operational self-sufficiency (OSS) as a proxy for financial sustainability. OSS reflects the capability of an MFI to cover its costs through operating revenues (Hartarska *et al.*, 2007; Vanroose *et al.*, 2013). OSS is the most widely utilised to measure financial sustainability of MFIs because institutional diversity and industry accounting practices make it more difficult to use other measures such as return on assets (ROA) or return on equity (ROE). Further, OSS does not reflect the level of subsidies for operating expenses but measures

the ability of a manager to run the business and to cover operational costs including possibly attracting soft funds.

$$\text{Operational Self-Sufficiency} = \frac{\text{Financial Revenues}^{29}}{\text{Financial Expenses + Impairment Loss on Loans + Operating Expenses}}$$

(2) Operating Expenses to total assets

In addition, we use operating expenses to total assets (OEA) to measure cost efficiency of an institution. This ratio measures the efficiency of an institution in reducing costs of operation. The operating expenses include all personnel expense, depreciation and amortization, and administrative expense. We use OEA as a proxy for microfinance efficiency following the suggestion of the Consultative Group to Assist the Poor - CGAP (2003) and Maudos & Solis (2009). They recommend using *total assets* as the most relevant denominator for microfinance institutions that offer other products other than credit[30].

$$\text{Operating Expenses to Assets} = \frac{\text{Operating Expenses}}{\text{Total Assets}}$$

Independent variables

Proxies for savings: We use four proxies for micro-savings as below.

[29] Financial Revenues = Revenues from the loan portfolio and from other financial assets are broken out separately and by type of income (interest, fee). Historical data from MIX Market does not offer a comparable level of detail in the income statement

[30] For credit-only MFIs, Operating Expenses/Gross loan portfolio is more used.

(1) Dummy variable *DumDeposit-taking MFIs*: This variable denotes whether an MFI mobilise micro-savings or not.

(2) The number of net savers

We use "the number of net savers" as a proxy for voluntary savers. This is a very important proxy for voluntary savings as the dataset obtained from the MIX Market platform does not differentiate between data of voluntary savings and data of compulsory savings. Compulsorty savings are normally treated as collateral, reflecting an amount of money that microfinance customers are required to deposit as a condition of attaining access to micro-credit. Based on this concept of compulsory savings, we assume that MFIs that have the number of active savers greater than the number of active borrowers may tend to offer financial micro-savings or voluntary savings as customers' deposits activities are not related to loans activities. Following this standpoint, we can presume that the deposits activities in these MFIs are carried out based on voluntary basis instead of as a requirement of obtaining microloans. Accordingly, we identify net savers as below:

Net savers = Number of active savers – Number of active borrowers

However, it should be noted that this measure may implicitly assumes that every borrower is also required to hold savings, which may not be true in all circumstances, for all borrowers of all types of MFIs in all countries around the world. Thus, 'net savers' may not be a perfect proxy for microsavings. However, due to the impossibility of obtaining data on voluntary savings for a large sample, we believe that using 'net savers' seems to be the best solution.

(3) *Total deposits*: This variable indicates the total deposits that MFIs can mobilise. This variable reflects the scale of micro-savings.

(4) *The number of deposit accounts per staff member*: This variable expresses the productivity of MFIs in savings mobilizing activities.

Institution-specific controls

(1) Size of MFIs

Some recent studies have found an association between the size of MFIs with their financial performance (Cull *et al*., 2007; Mersland and Strom, 2009 and Bogan, 2012). Size of MFI can be measured by total assets, gross loan portfolio, or gross loan portfolio to total assets. In our study, we use "gross loan portfolio to total assets" as a proxy for MFI size. This variable was used in the study of Waweru and Spraakman (2009).

(2) Portfolio quality

Further, we utilise portfolio at risk more than 30 days (PAR30) ratio to measure portfolio quality management of an MFI.

$$\textbf{Portfolio at risks more than 30 days ratio} = \frac{\textbf{Portfolio at risk more than 30 days}}{\textbf{Gross Loan Portfolio}}$$

(3) Age of MFIs

The age refers to the period that an institution has been in operation. The age reflects the experience of MFIs in their operation. Therefore, the age of MFIs could affect financial sustainability. In their studies, Cull *et al*. (2007) and Bogan (2012) have reported a relationship between the age of MFIs and microfinance sustainability.

(4) Regulation

Regulation of MFIs is defined by CGAP (2003) as "a set of government rules that apply to microfinance". Therefore, financial performance of regulated MFIs may different from the financial performance of unregulated ones. The impact of regulatory status on financial performance of MFIs was examined by Hartarska & Nadolnyak (2007) and Lafourcade *et al*. (2005).

(5) Type of MFIs

Charter type of MFIs may be another factor affecting financial performance. Based on the categories of the MIX, we assess MFIs under different types: Bank, Credit Union and Cooperatives (COOP), Non-bank Financial Intermediate (NBFI), and Non-Governmental Organization (NGO).

(6) Number of years reporting

The number of years providing data of MFIs in our dataset varies from the minimum one year to maximum ten years. Therefore, we would wish to examine whether number of years could affect microfinance performance. To the best of our knowledge, our paper is the first empirical study to use this variable.

(7) Data quality

The MIX Market uses a crediting system to demonstrate the data quality of MFIs, ranging from one diamond to five diamonds. The higher diamond rating implies better data quality[31]. To be more specific, *one-diamond level* denotes that MFIs provide general information. *Two-diamond level* refers to MFIs provide general information and

[31] Available at: https://www.themix.org/about/faqs [Accessed: 1 October 2013]

outreach data (at minimum, data for two consecutive years). *Three-diamond level* implies MFIs supply general information, outreach data and financial data (at minimum, data for two consecutive years). *Four-diamond level* is awarded to MFIs that provide general information, outreach data, financial data and audited financial statements (at minimum, auditors' opinion and notes are included for at least two consecutive years). *Five-diamond level* is awarded to MFIs that meet requirements of four-diamond level and rating or other due diligence report (at minimum, rating, due diligence and other benchmarking assessment reports or studies for one of the two years reported). In our research, we use dummies ranging from one-star to five-star to measure data quality of MFIs. To the best of our knowledge, we are the first to utilise these variables.

(8) Region of MFIs

Geographical location may affect financial performance of MFIs. According to Woller *et al*. (1999), it is difficult for MFIs operating in geographically isolated communities to achieve financial sustainability. Other studies also confirm that various regions around the world with different socioeconomic features may make microfinance work differently (Armendariz and Morduch, 2005; Van Rooyen *et al*., 2012). As our research a global dataset of MFIs from all regions, we find it rational to include dummies for region as control variables.

(9) Macroeconomic country-specific variables

According to Robinson (2001), MFIs can achieve financial profitability if they operate in favourably macroeconomic environment. Also, some previous empirical studies have found that macroeconomic factors influence the development of microfinance sector and microfinance institution performance (Vanroose, 2007; Crabb,

2008; Ahlin *et al.*, 2011; Janda *et al.*, 2014a; Janda *et al.*, 2014b). In our research, we use macroeconomic country-specific control variables including inflation rate, GDP growth rate, GNI per capita (in USD), and deposit interest rate.

The main variables of the model are summarized in Table 3.2 below.

Table 3.2: Summary of variables and measurement

Variable	Notation	Measure	TV/TI	Ex/En	Source
Dependent variables					
Operation Self-Sufficiency	OSS	Financial Revenue / (Financial Expense + Impairment Loss on Loans + Operating Expense)			The MIX
Operating expense to assets	OEA	Operating expense[32]/ Assets, average			The MIX
Independent variables					
Proxies for micro-savings:					
Net savers	NS	Number of active savers – Number of active borrowers	TV	En	The MIX
Deposits	DTA	Total Deposits	TV	En	The MIX
Deposit accounts per staff member	DAPSM	Number of deposit accounts /Personnel	TV	En	The MIX
Deposit-taking MFIs	$D_{\text{Deposit-taking MFI}}$	Dummy variable equal to 1 if the MFI takes deposits and 0 otherwise	TI	En	The MIX
Institutional control variables					
Gross loan portfolio to total assets	GLPTA	$\frac{\text{Gross loan portfolio}}{\text{Total Assets}}$	TV	En	The MIX
Portfolio at risks > 30 days	PAR30	Portfolio at risks > 30 days/ Gross Loan Portfolio	TV	En	The MIX
Percentage of women borrowers	WB	Number of active female borrowers/Number of active borrowers	TV	En	The MIX
New	*dum*New	Dummy variable is 1 if the MFI is in operation from 1 to 4 years and 0	TV	En	The MIX

[32] Operating expense = Financial expense + Impairment loss + Operating Expense (The MIX Link: http://www.mixmarket.org/fr/about/faqs/glossary)

		otherwise			
Young	*dum*Young	Dummy variable is 1 if the MFI is in operation from 5 to 8 years and 0 otherwise	TV	En	The MIX
Mature	*dum*Mature	Dummy variable is 1 if the MFI is in operation more than 8 years and 0 otherwise	TV	En	The MIX
Regulated	Reg	Dummy variable is 1 if the MFI is regulated and 0 otherwise	TI	En	The MIX
NGO	*dum*NGO	Dummy variable equal to 1 if the MFI is an NGO and 0 otherwise	TI	Ex	The MIX
NBFI	*dum*NBFI	Dummy variable equal to 1 if the MFI is a non-bank financial intermediation (NBFI) and 0 otherwise	TI	Ex	The MIX
Bank	*dum*Bank	Dummy variable equal to 1 if the MFI is a bank and 0 otherwise	TI	Ex	The MIX
COOP	*dum*COOP	Dummy variable equal to 1 if the MFI is a credit union/cooperative and 0 otherwise	TI	Ex	The MIX
Number of years reporting	NYR	The years that MFIs provide data	TI	Ex	The MIX
Five stars	Fivestars	Dummy variable is 1 if the MFI has data quality rated 5 stars and 0 otherwise	TI	Ex	The MIX
Four stars	Fourstars	Dummy variable is 1 if the MFI has data quality rated 4 stars and 0 otherwise	TI	Ex	The MIX
Three stars	Threestars	Dummy variable is 1 if the MFI has data quality rated 3 stars and 0 otherwise	TI	Ex	The MIX
Two stars	Twostars	Dummy variable is 1 if the MFI has data quality rated 2 stars and 0 otherwise	TI	Ex	The MIX
One star	Onestar	Dummy variable is 1 if the MFI has data quality rated 1 star and 0 otherwise	TI	Ex	The MIX
Regional control variables					
Africa	*dum*AF	Dummy variable is 1 if the MFI is active in Africa and 0 otherwise	TI	Ex	The MIX
East Asia and the Pacific	*dum*EAP	Dummy variable is 1 if the MFI is active in East Asia and the Pacific and 0 otherwise	TI	Ex	The MIX
Eastern Europe and	*dum*EECA	Dummy variable is 1 if the MFI is active in Eastern Europe and Central	TI	Ex	The MIX

Central Asia		Asia and 0 otherwise			
Latin America and the Carribean	*dum*LAC	Dummy variable is 1 if the MFI is active in Latin America and the Carribean and 0 otherwise	TI	Ex	The MIX
South Asia	*dum*SA	Dummy variable is 1 if the MFI is active in South Asia and 0 otherwise	TI	Ex	The MIX
Middle East and North Africa	*dum*MENA	Dummy variable is 1 if the MFI is active in Middle East and North Africa and 0 otherwise	TI	Ex	The MIX
Macroeconomic control variables					
Inflation	INF	The annual inflation rate of the country where the MFI is active	TV	Ex	WDI
GDP Growth rate	GDPR	The GDP per capita growth expressed in annual percentage	TV	Ex	WDI
GNI per capita	GNI	The per capita gross national income of the country where the MFI is active (using World Bank Atlas method)	TV	Ex	WDI
Deposit interest rate	DINT	The rate paid by commercial or similar banks for demand, time, or savings deposits	TV	Ex	WDI

Note: TV refers to time varying; TI refers to time invariant; Ex refers to Exogenous; En refers to Endogenous[33].

3.3.3. Description of dataset

To evaluate the link between micro-savings and financial performance of microfinance institutions, we use unbalanced panel data of 1,936 MFIs from 79 countries in Sub-Saharan Africa, East Asia & the Pacific, Eastern Europe & Central Asia, Latin America & the Caribbean, Middle East & North Africa and South Asia for the period 2000 – 2012 (see appendix 3.4 – the list of countries having MFIs used in the sample). To the best of our knowledge, this is the largest dataset used to empirically examine the relationship between micro-savings and financial sustainability of MFIs. The panel data

[33] *Time-varying variables* reflect variables that change over time meanwhile *time-invariant variables* demonstrate variables that do not change over time. *Endogenous* variables include variables assumed to be correlated with the unobservable MFI-individual effects. *Exogenous* variables are regressors assumed to be uncorrelated withMFI-specific unobserved effects.

is unbalanced because not all MFIs have information for every year. Each MFI has data for a minimum of 1 year to a maximum of 13 years. The dataset is obtained from two sources. Specifically, data set relating to microfinance indicators for the analysis of this research is extracted from the MIX Market (the MIX stands for Microfinance Information Exchange). Developed since 1990s, this data base is appreciated to be the premier source of microfinance (www.mixmarket.org). The MIX Market Website supplies accesses to both financial and social performance of over 2,000 MFIs world-wide. Data that is publicly uploaded on the web-base is for the use of research and analysis purposes. The sources of data on this platform are supplied by its member MFIs in the forms of audits, internal financial statements, management reports or other documents. Before being published, the data are examined by MIX experts. Microfinance closely connects to poverty reduction and various macro socio-economic issues. Therefore, data relating to macro factors is obtained through World Development Indicators (WDI). This database is established by the World Bank with free access to a wide range of data about development in countries all over the world (http://data.worldbank.org/indicator). The MFI-specific level dataset is merged with country-specific level dataset for each of the countries and years corresponding to MFI's in the dataset.

3.3.4. Methodology

The Ordinary Least Square (OLS) is one of the strongest and most applied for unknown parameters based on the Gauss-Markov theorem (Wooldridge, 2002; Gujarati, 2003, Green, 2011). The OLS estimator is only consistent when the regressors are exogenous and there is no perfect multicollinearity. In addition, the OLS is optimal in the class of linear unbiased estimators when the errors are homoscedastic and serially uncorrelated.

Under these conditions, the OLS technique provides unbiased estimators when the errors are assumed to have finite variances. In addition, under the assumption that the errors are normally distributed, the OLS estimator is the maximum likelihood estimator. Further, according to Menard (2002), by calculating an OLS regression model using the same dependent and independent variables, much of the diagnostic information for multicollinearity could be obtained. Thus, we firstly used Breusch and Pagan Lagrangian multiplier test to decide whether pooled OLS should be used. As the p-value of the test is insignificant, the Breusch and Pagan Lagrangian multiplier test suggests that the OLS is not appropriate in our research (See Appendix 3.7 - 3.11 - 3.15 - 3.19 - 3.23 and 3.27).

The common techniques for panel data are the fixed effects model (FE) and random effects model (RE). The random effects model is an appropriate specification if we are drawing N individuals randomly from a large population. This is usually the case for firm panel studies. In this case, N is usually large and a fixed effects model would lead to an enormous loss of degrees of freedom (Baltagi, 2012). Our dataset includes all MFIs that provide information in the period 2000-2012 to the MIX website. Further, the fixed effects model would remove the effects of time-invariant characteristics from the explanatory variables (Cameron and Trivedi, 2010; Janda and Turbat, 2013). In our regression model, time-invariant variables are included to explain for deposit-taking, charter types, regulatory status of MFIs or regional factors. Due to the drawbacks of FE, RE seems to be a better option for our study. However, the standard random choice is restrictive as it presumes that the explanatory variables (in this case SAV_{it}, $MFIspecific_{it}$ and $MACRO_{it}$) are uncorrelated with the unobserved MFI heterogeneity terms c_i ; that is, it assumes that $E(c_i|x_{it},\ldots,x_{iT}) = E(c_i)$ or $Cov(x_{it}c_i) = 0$. This very strong assumption can

be empirically tested. Therefore, we next test the assumed correlation between MFI-specific effects and regressors applying Hausman's specification test in the RE model. The rejection of the null hypothesis in the Hausman test indicates that the explanatory variables correlate with regressors, and thus the RE model assumptions do not hold (See Appendix 3.8 – 3.12 – 3.16 – 3.20 – 3.24 and 3.28). This problem can be dealt with by using Hausman-Taylor estimator proposed by Hausman and Taylor (1981). In this way, we can apply fixed effects while still being able to estimate the parameters of our endogenous time-invariant variables. Our empirical strategy is in line with many previous studies that utilised Hausman-Taylor to avoid the elimination of key time constant variables by the 'pure' fixed effects model (e.g., De Haas and Van Lelyveld, 2006; Hartarska and Nadolnyak, 2007; Mcphersona and Trumbull, 2008; Dixit and Pal, 2010; Muller and Uhde, 2013). The aim of the Hausman-Taylor estimation is to differentiate between regressors that are uncorrelated with fixed effects and those are potentially correlated with them.

Using the framework of Hausman and Taylor (1981), Equation (3.1) can be rewritten as

$$\boldsymbol{Y_{it}} = \boldsymbol{X_{1it}}\boldsymbol{\beta}_1 + \boldsymbol{X_{2it}}\boldsymbol{\beta}_2 + \boldsymbol{Z_{1it}}\boldsymbol{\gamma}_1 + \boldsymbol{Z_{2it}}\boldsymbol{\gamma}_2 + \mathbf{c}_i + \boldsymbol{\varepsilon_{it}} \quad (3.2)$$

Where the dependent variable $\boldsymbol{y_{it}}$ is a measure of the financial performance of the i^{th} MFI at time t; **X** displays time varying variables: net savers, deposits, deposit accounts per staff member, percentage of women borrowers, gross loan portfolio to total assets, par30, mature, young, GNI per capita, inflation rate, GDP growth rate, deposit interest rate; and Z includes time constant variables: Deposit-taking MFI, Regulated MFI, Bank. NGO, NBFI, CU_Coop, years of reporting, dummy variables for transparency of data ranging from one star (lowest) to five star (highest); and dummy variables for regional controls. C*i* denotes MFI-specific unobserved effects; and $\boldsymbol{\varepsilon_{it}}$ displays idiosyncratic

errors. Independent variables with subscripts 1 are not correlated with $\mathbf{c_i}$, (i.e exogenous variables) whereas the variables with subscripts 2 are correlated with $\mathbf{c_i}$ (i.e endogenous variables). All the explanatory variables are assumed uncorrelated with $\boldsymbol{\varepsilon_{it}}$. Hausman-Taylor (1981) estimator assumes that the exogenous variables (X_{1it} and Z_{1it}) serve their own instruments; time-varying endogenous variables (X_{2it}) are instrumented by their deviations from individual means ($X\text{-}\overline{X_{2it}}$); and time invariant endogenous variables (Z_{2it}) are instrumented by means of time varying variables ($\overline{X_{1it}}$)

We classify between exogenous and endogenous variables following the Hausman-Taylor procedure. The MFI's option to offer micro-savings depends substantially on its specific features. Thus, we treat our key time constant dummy variable *DumDeposit-taking MFI* as endogenous. We also assume that dummy variable *DumRegulated MFI* is endogenous because being regulated is one characteristic of deposit-taking MFIs. Further, we also presume that the MFI-specific variable (*net savers, total deposits, deposit accounts per staff member, gross loan portfolio to total assets, portfolio at risk more than 30 days, percentage of women borrowers and dummies for experience of MFIs*) are correlated with the unobservable MFI-individual effects $\mathbf{c_i}$. Thus, these variables are treated as endogenous variables. Control variables related to regional, macroeconomic variables and MFIs characteristics such as the dummies for transparency of data (Dummies One-star, Two-star, Three-star, Four-star and Five-star), number of years reporting and charter types of MFIs (Bank, NGO, NBFI, CU_COOP) are considered to be exogenous. The Hausman-Taylor technique requires that the number of exogenous time- varying variables be at least as large as the number of endogenous time constant variables. The strong advantage of the Hausman-Taylor approach is that we do not need to use external instruments as the instruments

can be derived within the model. Thus, Hausman-Taylor can address potential endogeneity problem. We also conducted Sargan-Hansen tests for overidentifying restrictions to examine the validity of instrumental variables. The hypothesis being tested in this case is the prediction that the instrumental variables are uncorrelated with some set of residuals. As reported in Table 3.5 and 3.6, the validity of our instruments is affirmed by the robust Sargan-Hansen tets of overidentifying restrictions throughout all regression specifications. In addition, we undertake Hausman specification tests to check the validity of Hausman-Taylor estimation versus FE models. The high p-value of these tests validates the appropriateness of Hausman-Taylor estimations (See Appendix 3.13-3.17-3.21-3.25 and 3.29). Furthermore, we also use the two-step system generalised methods of moments (GMM) to test the robustness of our results.

3.4. Descriptive statistics

The preliminary results of the data analysis are presented in Table 3.3 for the descriptive statistics and Table 3.4 for the correlation matrix. Further results from regression analysis are presented in subsequent tables.

Table 3.3: Descriptive statistics of all variables

Variables	Obs	Mean	Median	Std.Dev	Min	Max
OSS	9739	117.3032	111.71	71.09385	.24	2041.16
OEA	8303	18.73969	13.91	23.25291	.01	1275.18
PAR30	7690	7.723921	4.17	15.92677	.01	711.43
Net savers (persons)	2823	77,786.81	9,695	345,740.4	1	6,369,293
Deposits (USD)	4054	6.37e+07	2,667,109	6.68e+08	126	2.90e+10
Deposit accounts per staff member	3356	295.4544	205.5	338.5265	1	5602
Gross loan portfolio to total assets	10351	80.10112	77.55	245.9275	.07	12681.57
Percentage of woman borrowers	8214	65.21736	64515	28.04518	.12	668.91

Years of reporting	25168	5.536276	5	3.344933	1	13
Regulated MFI	10351	.6385856	1	.4804335	0	1
Deposit-taking MFI	25168	.4597107	0	.498384	0	1
Five star	24218	.0558675	0	.2296705	0	1
Four star	24218	.3869849	0	.4870702	0	1
Three star	24218	.2050954	0	.4037796	0	1
Two star	24218	.0042943	0	.0653916	0	1
Mature	10399	.6231368	1	.4846235	0	1
Young	10399	.2065583	0	.4048552	0	1
Bank	10632	.0904816	0	.2868839	0	1
CU_Coop	10632	.1661023	0	.37219	0	1
NBFI	10632	.3085026	0	.461897	0	1
NGO	10632	.3596689	0	.4799259	0	1
Africa	25168	.2381596	0	.4259657	0	1
East Asia and the Pacific	25168	.151343	0	.35839	0	1
Eastern Europe and Central Asia	25168	.1658058	0	.3719136	0	1
Latin America and the Caribbean	25168	.2365305	0	.42496	0	1
Middle East and North Africa	25168	.0160124	0	.1255254	0	1
South Asia	25168	.1921488	0	.3939972	0	1
GNI per capita	25168	2,019.398	1,100	2,310.358	80	14,310
Inflation rate[34]	24947	9.360355	6.422585	20.56024	-20.63	515.7774
GDP rate	24954	5.35872	5.227531	3.74866	-47.55	34.5
Deposit interest rate	15521	7.23059	6	6.89321	0	140

Note: The definition and measurement of main variables in this Chapter are presented in Table 3.2

Table 3.3 demonstrates the descriptive statistics of all the variables used for the estimation. The mean value of OSS for the period 2000 to 2012 was 117.32%, while the minimum value was 0.24% and maximum 2041.16%. An OSS ratio of above 100% indicates that an MFI can cover their expenses by operating revenue. A ratio below

[34] The outlier is Democratic Republic of the Congo that has the maximum of inflation rate of 515.7774 in the year 2000.

100%, however, demonstrates that the MFI is incurring losses. Thus, it could be inferred from the mean value of OSS that the MFIs used in our data set are generally doing well without depending on external subsidies. This fact is further supported by the low mean value of operating expense to assets which is 18.7%. The mean number of net savers is 77,786.81 (persons). A median of 9,695 and a high standard deviation (345,740.4 persons) indicate that the net saver's distribution is skewed heavily to small micro-savings outreach (more MFIs with small savings outreach, but with a long tail at the large scale of greater micro-savers). It is also shown in table 3.3 that the mean value of deposits is US$ 6.37e+07 and the mean value of deposit accounts per staff member is 295.4544 (accounts). The mean of gross loan portfolio to total assets is 80.1%. This variable reflects the size of MFIs. Therefore, it can be implied that these MFIs have big scale of operation. On average, women borrowers account for 65.2 percent of MFIs' active credit clients. The MFIs in the sample have varying years of reporting, minimum one year and maximum 13 years. Approximately 63.8 percent of MFIs in the dataset are regulated and 45.97 percent of the sample captures micro-savings. Thus, some MFIs take deposits without being regulated, which may be because savings may be part of group lending technology in some MFIs (Hartarska and Nadolnyak, 2007). In terms of the experience in microfinance industry, mature, young and new MFIs in the sample account for 62.31%; 20.65% and 17.03%, respectively[35]. Referring to the chartered types of MFIs, NGO and NBFI microfinance providers are the highest of the sample (35.9% and 30.8%, respectively). Concerning regional factors, 23.81%, the highest, are sampled in Africa; and 1.6%, the least, are sampled in the Middle East Asia. The second highest are sampled in Latin America and the Carribean, which is 23.6%.

[35] The MIX Market categorises the age of MFIs into 3 groups: (1) Mature MFIs have years of operation more than 8 years; (2) Young MFIs have the years of operation from 5 to 8 years; and (3) New MFIs are those who operate from 1 to 4 years.

The magnitude of inflation rate and GDP growth rate ranges from negative to positive values (-20.62722 to 515.7774 and -47.55299 to 34.5). This means that countries which MFIs are active have different macroeconomic situations.

Table 3.4 presents correlations between all variables. Many correlations are significant at the level of 5% or lower, but none are higher than 0.8. Therefore, it does not indicate any problem of multicollinearity (Kenedy, 2008). Further, we compute the variance inflation factor (VIF) for all the independent variables. Since all of them have a VIF less than 5 (see Appendix 3.6 - 3.10 - 3.14 - 3.18 - 3.12 and 3.26), we again rule out any problem of multicollinearity. It is shown in table 3.4 that all the three proxies for micro-savings (net savers, deposits and deposit accounts per staff member) are significantly positively correlated with operational self-sufficiency (OSS) and significantly negatively associated with operating expense to assets (OEA). These linkages imply that offering micro-savings may enable MFIs to improve their financial sustainability as well as cost-efficiency. There is also a significant negative relationship between the dummy variable $D_{\text{Deposit-taking}}$ and cost-efficiency; however this binary variable is not significantly correlated with OSS (see Appendix 3.5). Table 3.4 also displays that regulated MFIs and mature MFIs have more number of net savers, total deposits, higher deposit accounts per staff member and they are found to be both financially sustainable and efficient. Further, years of reporting and higher transparent levels of data also have positive impacts on financial performance. Micro-banks are found to be less efficient, less productive and have more voluntary savers and total deposits. NGO MFIs in the sample are less financially viable, less cost-efficient; and they have less micro-savers and less total deposits. In terms of regional controls, Africa serve more micro-savers, have more deposit accounts per staff member but this region

has less total deposits. MFIs active in Africa are less sustainable and efficient. In contrast, MFIs operating East Asia and the Pacific and Eastern Europe and Central Asia are doing well in terms of both financial sustainability and cost efficiency. Further, MFIs in countries that have higher GNI per capita and higher GDP growth rate can achieve better financial performance. Conversely, MFIs in countries with high deposit interest rate are found to be less sustainable and less efficient. This is logical because high deposit interest rate raises operating expenses of MFIs.

Table 3.4: Correlation matrix

	OSS	OEA	NS	DEP	DAPSM	PAR30	PWB	GLPTA	Reg	YR	Five-star	Four-star	Three-star	Two-star	One-star	Mature	New	Young	Bank	CU_Coop	NBFI	NGO	AF	EAP	MENA	EECA	LAC	SA	GNI	IFL	GDP	DIR
OSS	1.0																															
OEA	-.38*	1.0																														
NS	.07*	-.11*	1.0																													
DEP	.19*	-.33*	.74*	1.0																												
DAPSM	.15*	-.26*	.46*	.17*	1.0																											
PAR30	-.16*	-.01	-.002	-.07*	.06*	1.0																										
PWB	-.06*	.14*	-.10*	-.31*	.09*	-.06*	1.0																									
GLPTA	.01	.05*	-.11*	-.02*	-.03	-.01	.02	1.0																								
Reg	.03*	-.17*	.19*	.23*	-.03	-.01	-.16*	.01	1.0																							
YR	.09*	.02	.33*	.36*	.01	-.09*	-.02	-.01	.01	1.0																						
Five-star	.05*	-.01	.15*	.26*	-.03	-.06*	-.03*	.001	.02*	.19*	1.0																					
Four-star	.04*	.02	.06*	-.01	.01	-.05*	.12*	-.02	-.03*	.37*	-.19*	1.0																				
Three-star	-.03*	.01	.003	-.03	-.01	.04*	-.06*	-.01	.02	-.05*	-.12*	-.40*	1.0																			
Two-star	.03*	-.04*	-.03	-.01	-.03*	.01	-.02	.001	.04*	-.04*	-.02*	-.05*	-.03*	1.0																		
One-star	-.06*	-.03*	-.18*	-.14*	.02	.07*	-.06*	.02*	-.01	-.42*	-.18*	-.58*	-.37*	-.05*	1.0																	
Mature	.14*	-.19*	.24*	.30*	.15*	.03*	.01	-.02*	-.09*	.22*	.05*	.06*	-.04*	-.001	-.07*	1.0																
New	-.17*	.14*	-.17*	-.25*	-.14*	-.02	.01	-.01	.08*	-.24*	-.04*	-.06*	.05*	.001	.05*	-.58*	1.0															
Young	-.01	.10*	-.14*	-.15*	-.07*	-.05	-.02	.04*	.04*	-.04*	-.02*	-.02*	.01	-.001	.03*	-.66*	-.23*	1.0														
Bank	.02	.07*	.28*	.37*	-.15*	-.03*	-.11*	-.02*	.23*	.08*	.04*	.03*	.01	.03*	-.08*	-.05*	.06*	.004	1.0														
CU_Coop	.03*	-.21*	-.07*	-.03	.19*	.03*	-.19*	-.01	.09*	-.14*	-.21*	-.21*	.15*	.03*	.12*	.01	-.03*	.01	-.14*	1.0													
NBFI	.01	.11*	.01	.02	-.15*	-.03*	-.10*	-.006	.22*	-.06*	.08*	.07*	-.02	.005	-.12*	-.22*	.17*	.10*	-.21*	-.29*	1.0												
NGO	-.07*	.15*	-.11*	-.28*	.005	-.01	.33*	.03*	-.50	.05*	-.04*	.07*	-.05*	-.04*	-.01	.18*	-.15*	-.08*	-.24*	-.33*	-.50*	1.0											
AF	-.14*	.17*	.08*	-.13*	.13*	.08*	-.08*	-.04*	.19*	-.17*	-.12*	-.22*	.11*	.04*	.19*	-.12*	.09*	.06*	.05*	.19*	-.05*	-.11*	1.0										
EAP	.07*	-.04*	-.26*	-.20*	-.12*	.01	.09*	.002	.02*	-.12*	-.08*	-.03*	.07*	-.03*	.02*	-.08*	-.05*	-.06*	-.07*	-.09*	-.15*	.004	-.24*	1.0								
MENA	.01	-.05*	-.05*	-.07*	-.04*	.01	.001	-.011	-.08*	.05*	.005	-.06*	-.004	.05*	-.07*	-.002	-.02*	.02*	-.01	-.06*	-.07*	.13*	-.07*	-.05*	1.0							

EECA	.12*	-.08*	-.08*	.18*	-.22*	-.07*	-.29*	.001	.24*	.09*	-.05*	.01	.04*	-.01	-.01	-.20*	.14*	.11*	.09*	.05*	.26*	-.28*	-.25*	-.19*	-.06*	1.0						
LAC	.04*	.15*	.12*	.33*	-.01	-.03*	-.07*	-.004	-.40*	.19*	.27*	.05*	-.03*	.002	-.15*	.19*	-.15*	-.09*	-.01	-.04*	-.02	.15*	-.31*	-.24*	-.07*	-.25*	1.0					
SA	-.09*	-.21*	.12*	-.11*	.15*	.01	.37*	.04*	.04*	-.01*	-.04*	.19*	-.18*	-.03*	-.02*	.04*	-.02	-.03*	-.07*	-.10*	-.03*	.16*	-.27*	-.21*	-.06*	-.22*	-.27*	1.0				
GNI	.10*	-.03*	-.01	.33*	-.03*	-.03*	-.16*	-.01	-.24*	.05*	.14*	.03*	.02*	-.011	-.11*	.15*	-.12*	-.07*	-.01	-.01	.05*	-.001	-.45*	.03*	.01	.16*	.54*	-.27*	1.0			
IFL	.02	.03*	-.07*	-.11*	.03	.002	-.04*	-.02	.06*	-.04*	-.03*	-.04*	.01	-.005	.05*	-.08*	.09*	.01	.02*	-.03*	.03*	-.05*	.11*	-.05*	.003	.07*	-.07*	-.06*	-.16*	1.0		
GDP	.05*	-.05*	-.01	-.06*	-.05*	-.06*	-.02	.01	.09*	-.02*	-.03*	.012	.04*	-.02*	-.03*	-.09*	.08*	.03*	-.003	-.08*	.13*	-.06*	-.06*	.12*	-.04*	.13*	-.23*	.09*	-.06*	-.07*	1.0	
DIR	-.02*	.12*	-.02	-.15*	-.02	-.02	-.02	.003	.05*	-.05*	-.07*	-.004	-.05*	-.001	.08*	-.09*	.09*	.02*	.07*	-.10*	-.001	.04*	.15*	-.08*	.04*	-.0002	-.06*	-.04*	-.22*	.75*	-.09*	1.0

Note: * is statistically significant at the level of 5% or lower (2-tailed test)

Where OSS = Operational Self-Sufficiency (log); OEA = Operational Expenses to total Assets (log); NS = Net savers (log); DEP = Deposits (log), DAPSM = Deposit Accounts per Staff Member; PAR30 = Portfolio at Risks less than 30 days; PWB = Percentage of women borrowers; GLPTA = Gross loan portfolio to total assets; Reg = Regulated MFI; YR = Years of reporting; CU_Coop = Credit Unions and Cooperatives; NBFI = Non-bank Financial Intermediation; NGO = Non-governmental organisation; AF = Africa; EAP = East Asia and the Pacific; MENA = Middle East and North Africa; EECA = Eastern Europe and Central Asia; LAC = Latin America and the Caribbean; SA = South Asia; GNI = Gross National Income (log); IFL = Inflation rate; GDP = growth rate of Gross Domestic Products; DIR = Deposit Interest Rate.

3.5. Empirical findings

3.5.1. Linkages between micro-savings and financial sustainability

Table 3.5: Impact of micro-savings on financial sustainability: Hausman-Taylor Estimation

Variables	**Notation**	**Dependent variable: OSS (log)**		
		(1)	(2)	(3)
Constant		4.004*** (20.42)	4.700*** (13.58)	4.813*** (17.11)
Deposit-taking MFI	$D_{Deposit\text{-}taking}$	0.138 (0.47)		
Regulated MFI	$D_{Regulation}$	0.334 (1.00)	-0.442 (-0.79)	-0.383 (-1.36)
Net Savers	lnNS		-0.0131* (-2.35)	-0.0128* (-2.16)
Deposits	lnDEP		0.0517*** (4.76)	0.0518*** (4.50)
Deposit accounts per staff member	lnDAPS		0.0560*** (4.09)	0.0546*** (3.76)
Bank	Bank			-0.116 (-1.42)
Non-governmental organisation	NGO			-0.293* (-2.01)
Non-bank financial intermediation	NBFI			-0.187* (-2.51)
Credit Union&Cooperative	CU_Coop			-0.204* (-2.14)
Mature MFI	Mature	0.175*** (8.31)	0.146*** (4.67)	0.145*** (4.36)
Young MFI	Young	0.177*** (11.29)	0.134*** (5.68)	0.134*** (5.32)

Gross Loan Portfolio to Total Assets	GLPTA	0.000666*** (3.45)	0.00264*** (5.41)	0.00266*** (5.15)
Percentage of women borrowers	PWB	0.00114** (3.12)	0.000367 (0.81)	0.000366 (0.76)
PAR30	PAR30	-0.00236*** (-10.26)	-0.000284 (-1.40)	-0.000288 (-1.33)
Number of years reporting	lnNYR	-0.00895 (-0.16)	-0.100 (-1.60)	-0.0850 (-1.75)
Five-star MFI	Fivestar	-0.0290 (-0.26)	0.169 (0.81)	0.135 (1.23)
One-star MFI	Onestar	-0.00753 (-0.13)	-0.0210 (-0.23)	-0.0542 (-0.94)
Three-star MFI	Threestar	-0.00889 (-0.14)	-0.0516 (-0.60)	-0.0414 (-0.68)
Middle East and North Africa	MENA	0.148 (0.86)	0.193 (0.59)	0.277 (1.36)
East Asia and the Pacific	EAP	-0.0296 (-0.50)	0.181 (1.80)	0.105 (1.36)
South Asia	SA	-0.212 (-1.64)	-0.0659 (-0.52)	-0.0526 (-0.49)
Africa	AFR	-0.267 (-1.39)	0.0127 (0.07)	-0.0098 (-0.09)
Eastern Europe and Central Asia	EECA	-0.0500 (-0.23)	0.255 (1.38)	0.220* (2.16)
GNI per capita	lnGNI	0.0353* (2.43)	-0.177*** (-4.10)	-0.114*** (-3.76)
Inflation	INF	0.000587 (1.14)	-0.000509 (-0.95)	-0.000621 (-1.10)
GDP growth rate	GDPR	0.00283** (2.70)	0.9977*** (4.88)	0.00774*** (4.63)
Deposit interest rate	DINT	-1.09e-07 (-0.00)	-0.00400 (-1.55)	-0.00360 (-1.37)

Observations		6462	1820	1819
Number of groups		1418	622	621
Wald Chi2 P-value Wald test[a]		337.41*** 0.0000	207.03*** 0.0000	205.07*** 0.0000
P-value Breusch-Pagan Lagrangian test[b]		0.0000	0.0000	0.0000
P-value Hausman test (FE vs RE)[c]		0.0000	0.0011	0.0026
P-value Sargan-Hansen[d]		0.4428	0.5003	0.5488
P-value Hausman test[e] (FE vs HT)		0.8353	0.9625	0.8893

Notes:

(1) *, **, and *** represent significance at the levels of 10%, 5%, and 1%, respectively
(2) Absolute value of t statistics in parentheses
(3) The definition and measurement of variables follow Table 3.2.
(4) [a] Test of the null hypothesis that the coefficients in the given equation are all zero (Green, 2011). A low p-value indicates null hypothesis rejection.
(5) [b] Test for random effects (Ho: var (u) = 0 which means there are no random effects). A low p-value indicates null hypothesis rejection.
(6) [c] Test used to differentiate between FE model and RE model (Ho: difference in coefficients not systematic). A low p-value indicates that the FE model is preferred.
(7) [d] Test for over-identifying restrictions of instrumental variables[36]
(8) [e] Test used to differentiate between FE model and HT model (Ho: difference in coefficients not systematic). A high p-value provides evidence favouring the null hypothesis, indicating that the HT model is preferred.

Table 3.5 presents regression results of OSS (log) as a dependent variable. We performed a regression in three specifications to examine the linkages between micro-savings and financial sustainability. Specifically, we used dummy variable $D_{\text{Deposit-taking MFI}}$, three indicators of micro-savings (net savers, deposits and number of deposit accounts per staff member) in model (1) and (2) respectively. Finally, in model (3),

[36] In Hausman-Taylor estimation, endogenous time invariant variables are instrumented by exogenous variables

three proxies of micro-savings and dummy variables for different charter types of MFIs are included.

The model (1) shows that the dummy variable $D_{\text{Deposit-taking MFI}}$ has the expected positive sign as deposit-taking MFIs are assumed to be more financially sustainable compared to non-deposit taking ones thanks to benefits of deposit taking activities discussed in theory. However, the positive relationship between $D_{\text{Deposit-taking MFI}}$ and OSS is not statistically significant. Therefore, a further analysis should be focused on the impact of various dimensions of micro-savings on financial sustainability.

It appears in model (2) and (3) that the number of voluntary savers is negatively related to OSS (-0.0131 and -0.0128), significant at 0.1 level. The significant negative coefficient for net savers indicate that serving micro-savers may costly, and thus the incurred expenses may be the reason for the negative effects of net savers on financial sustainability. This outcome affirms *transaction costs theory* in the sense that supplying smaller deposits is more expenses. Our finding is generally dissimilar to Bogan (2012) who does not find a link between the number of savers and financial sustainability. Our result will be further examined in the next part of this chapter which tests the linkages between micro-savings and cost-efficiency. Moving to other aspects of micro-savings, we found a significant positive association between total deposits (in US dollars) and OSS. Specifically, the total deposits were positively related to financial performance (0.0517 and 0.0518). This finding is consistent with a theoretical standpoint which states that deposits are considered to be one of cheap loanable funding sources of MFIs. The rationale was that deposit-taking MFIs could achieve financial sustainability as they utilised deposits as a low cost capital to improve their business operations (Bergsma, 2011). Also, offering savings permits economies of scope due to low-cost use if

deposits for lending objectives (Rossel-Cambier, 2011). Therefore, higher volume of deposits would contribute to financial success of MFIs. 'Total deposits' is a very important variable in assessing the links between micro-saving and microfinance performance because Rosaz and Erice (2014) discover that approximately 50% of number of deposit accounts in MFIs are empty. Our findings are in line with Gingrich (2004), and Bergsma (2011). However, our findings contrast with the studies of Hartarska *et al.* (2007), Gutierrez-Goiria (2011), Muriu (2011), and Bogan (2012).

Another significant finding to emerge from our research is that the number of deposit accounts per staff member positively affects microfinance sustainability. This outcome demonstrates that an improvement in the productivity of deposit taking activities enables MFIs to reach financial viability. In general, the findings relating to the impacts of micro-savings not only confirm financial intermediation theories but also support our hypotheses.

The charter types of MFIs also affect financial sustainability. The significant negative coefficients are found for NGO, NBFI and CU_Coop in model (3) of Table 3.5. Our findings are in contrast to Omri & Chkoundali (2011) and Bogan (2012). Although we could not find a link between micro-banks that offer microfinance services and financial sustainability, we still can have some inferences. Compared with micro-banks, MFIs in forms of NGO, NBFI and CU_Coop have more limited ranges of microfinance services. For instance, NGO microfinance providers are usually not offering deposits. According to Hannig *et al.* (1999) and Wright (1999), though micro-savings can be captured at low financial costs, the small size of transaction might disproportionately raise administrative expenses. However, this disadvantage may be compensated by the synergies created through the economies of scope between savings

and lending. In other words, MFIs can reduce their overall costs by both extending loans and mobilising savings (Hartarska *et al.*, 2010). Compared with other types of MFIs, banks are obviously the most typical financial intermediations which use deposits as capital funds to offer credits to other clients. The other charter types of MFIs, on the contrary, are less financial intermediary; and thus may have higher costs, which may negatively affect their financial sustainability. In addition, Chahine and Tannir (2010) found clear evidence that the transformation from microfinance NGOs into a bank legal status helps transformed organizations to bolster their financial sustainability by enabling cost economies of scale and scope, and improve their capital structure by means of a larger dependence on leverage financing. Our finding, however, is dissimilar to Bogan (2012) who uncovers a significant and positive relationship between NGOs and financial sustainability.

In our regression model, gross loan portfolio to total assets (GLPTA) reflects the size the MFIs. All three specifications in Table 3.5 exhibit significant positive coefficients for GLPTA). As MFIs grow in size, they may become more profitable as they benefit from economies of scales. Further, as contended by Kyereboah-Coleman & Osie (2006), larger firms can be more profitable because they have the ability to accommodate risks and to improve productivity through diversification of products and services. This result also suggests that an increase in scale of operation enables MFIs to attain better financial performance. Further, Hudon (2010) argues that larger MFIs, in terms of number of active credit clients and gross loan portfolio to total assets, are slightly better managed. Our result confirms the findings of Kyereboah-Coleman & Osei (2008), Hartarska *et el*. (2007), Mersland et al (2009), Quayes (2012), Adhikary *et al*. (2014), and Mori et al (2014).

We do not find a relationship between regulatory status and financial sustainability. This supports the study of Hartarska and Nadolnyak (2007). However, in an analysis of 163 MFIs in Africa, Lafourcade *et al.* (2006) discover that regulated MFIs in Africa report higher weighted average return on assets (ROA) than that of unregulated African MFIs. The majority of MFIs in Africa capture deposits as a core financial service and utilise it as an essential source of loanable funds. The result of Lafourcade *et al.* (2006) implies that there may be indirect benefits from regulation, if regulation is the only way for MFIs in Africa to mobilise savings.

Concerning the microfinance history, we find that mature MFIs have better financial achievement compared to the new ones. This result implies the effect of institutional experience on microfinance sustainability. Our finding supports the studies of D'Espallier *et al.* (2013) and Postelnicu & Hermes (2015) but is opposed to Kyereboah-Coleman and Osei (2008) and Mersland and Strom (2009).

Moving towards other institutional control variables, we uncover that the years of reporting and the transparency level of data are not related to financial sustainability. The significant and positive coefficient of percentage of women borrowers in model (1) indicate that MFIs can still be sustainable while deepening their gender-related depth of outreach. As found out by D'Espallier et al (2011), female clients are generally better credit risks than men. Their findings affirm that a high percentage of women borrowers is related to lower portfolio risk, fewer write-offs, and fewer provisions, and hence focusing on women is generally associated with enhanced repayment. As a result, it may be more likely for MFIs to be financially viable when they serve more female credit clients. Our result reaffirms the study of Omri and Chkoundali (2011).

Concerning the impact of portfolio management, a significant and negative link was found between PAR30 and OSS. This result indicates that high ratio PAR30 may worsen financial performance of MFIs. This is reasonable as an increase in PAR30 would lead to a rise in impairment loss, and accordingly, their operating expenses can go up. As a consequence, MFIs with high PAR30 ratio can be more inefficient and less sustainable. Our finding confirms Ayayi and Sene (2010) by Nwachukwu (2014) and Strom *et al.* (2014) who also find a similar significant and negative relationship between PAR30 and financial sustainability. Nonetheless, our study invalidates Mersland & Strom (2009) and Kar (2011) who uncover a significant and positive association between PAR30 and OSS.

Regarding regional and macroeconomic control variables, it is found that MFIs active in Eastern Europe and Central Asia (EECA) are more financially sustainable. Further, GNI per capita has intermediate effects on microfinance sustainability. Also, GDP growth rate is observed to be positively linked to financial sustainability. *(Please see Appendix 3.30 for detailed discussion on the relationship between regional and macroeconomic control variables and financial sustainability).*

3.5.2. Linkages between micro-savings and cost-efficiency

Table 3.6: Impact of micro-savings on cost efficiency - Hausman-Taylor Estimation

Variables	**Notation**	**Dependent variable: OEA (log)**		
		(1)	(2)	(3)
Constant		4.881*** (13.33)	3.212*** (7.73)	2.630*** (6.29)
Deposit-taking MFI	$D_{Deposit\text{-}taking}$	-0.649 (-0.89)		

Regulated MFI	$D_{Regulation}$	-2.042* (-2.22)	-0.423 (-0.71)	0.490 (1.22)
Net Savers	lnNS		0.0473*** (5.71)	0.0471*** (5.70)
Deposits	lnDEP		-0.151*** (-9.47)	-0.150*** (-9.38)
Deposit accounts per staff member	lnDAPS		-0.0996*** (-5.02)	-0.0974*** (-4.90)
Bank	Bank			0.482*** (3.76)
Non-governmental organisation	NGO			0.656** (2.97)
Non-bank financial intermediation	NBFI			0.433*** (3.63
Credit Union&Cooperative	CU_Coop			0.118 (0.78)
Mature MFI	Mature	-0.150*** (-6.39)	-0.124** (-2.72)	-0.128** (-2.82)
Young MFI	Young	-0.099*** (-5.67)	-0.0477 (-1.38)	-0.0489 (-1.41)
Gross Loan Portfolio to Total Assets	GLPTA	0.0011*** (5.00)	0.0026*** (3.62)	0.00246*** (3.39)
Percentage of women borrowers	PWB	0.0017*** (4.16)	0.000379 (0.58)	0.000345 (0.53)
PAR30	PAR30	0.0005* (2.02)	-0.000236 (-0.81)	-0.00023 (-0.79)
Number of years reporting	lnNYR	0.0268 (0.17)	0.198* (2.33)	0.0561 (0.70)
Five-star MFI	Fivestar	0.376 (1.19)	0.00166 (0.01)	-0.270 (-1.67)
One-star MFI	Onestar	-0.366* (-2.47)	-0.118 (-1.16)	-0.104 (-1.14)

Three-star MFI	Threestar	-0.140 (-0.84)	-0.0129 (-0.14)	-0.0250 (-0.27)
Middle East and North Africa	MENA	-0.835 (-1.79)	-0.479 (-1.36)	-0.556 (-1.79)
East Asia and the Pacific	EAP	0.872 (1.57)	0.151 (1.33)	0.0904 (0.76)
South Asia	SA	0.0129 (0.03)	-0.136 (-0.93)	-0.414** (-2.61)
Africa	AFR	1.252* (2.10)	0.648** (3.16)	0.303 (1.84)
Eastern Europe and Central Asia	EEUA	0.740 (1.26)	-0.281 (-1.38)	-0.529*** (-3.44)
GNI per capita	lnGNI	-0.161*** (-9.75)	0.189*** (4.35)	0.192*** (4.37)
Inflation	INF	0.000452 (0.65)	0.00131 (1.46)	0.00167 (1.83)
GDP growth rate	GDPR	0.000687 (0.61)	-0.00255 (-1.11)	-0.00249 (-1.10)
Deposit interest rate	DINT	0.00350 (1.91)	0.00903* (2.39)	0.00879* (2.35)
Observations	Observations	5914	1714	1714
Number of groups		1367	585	585
Wald Chi2 P-value Wald test[a]		390.22*** 0.0000	297.23*** 0.0000	363.02*** 0.0000
P-value Breusch-Pagan Lagrangian test[b]		0.0000	0.0000	0.0000
P-value Hausman test (FE vs RE)[c]		0.0000	0.0000	0.0000
P-value Sargan-Hansen[d]		0.6526	0.0786	0.1525
P-value Hausman test[e] (FE vs HT)		0.983	0.0784	0.5679

Notes:

(1) *, **, and *** represent significance at the levels of 10%, 5%, and 1%, respectively
(2) Absolute value of t statistics in parentheses
(3) The definition and measurement of variables follow Table 3.2.

(4) [a] Test of the null hypothesis that the coefficients in the given equation are all zero (Green, 2011). A low p-value indicates null hypothesis rejection.
(5) [b] Test for random effects (Ho: var (u) = 0 which means there are no random effects). A low p-value indicates null hypothesis rejection.
(6) [c] Test used to differentiate between FE model and RE model (Ho: difference in coefficients not systematic). A low p-value indicates that the FE model is preferred.
(7) [d] Test for over-identifying restrictions of instrumental variables
(8) [e] Test used to differentiate between FE model and HT model (Ho: difference in coefficients not systematic). A high p-value provides evidence favouring the null hypothesis, indicating that the HT model is preferred.

Table 3.6 presents regression results of operating expenses to total assets (OEA) as a dependent variable. Specifically, we used dummy variable $D_{\text{Deposit-taking MFI}}$, three indicators of micro-savings (net savers, deposits and number of deposit accounts per staff member) in model (1) and (2) respectively. Finally, in model (3), both three proxies of micro-savings and dummy variables for different charter types of MFIs are included.

We firstly see from model (1) a negative sign for the coefficient the binary variable $D_{\text{Deposit-taking MFI}}$ of which may imply cost-efficiency of MFIs that capture micro-savings compared to those do not. However, this association is not statistically significant.

The outputs in model (2) and (3) will help to explore the impact of three dimensions of micro-savings on cost-efficiency of MFIs. A significant and positive link between number of voluntary savers and OEA is found. This means that serving more voluntary savers would raise the costs of MFIs. This result once again confirms the theory suggesting that offering micro-savings may be costly as supplying small deposit size may lead to a rise in administrative expenses (Schmidt and Zeitinger, 1996). Further, we found that deposits are significantly and negatively associated with the OEA. This means that higher volume leads to lower costs. Therefore, our findings support the research of Richardson & Oliva (2002) and Caudill *et al.* (2009). In

particular, Richard and Oliva (2002) discover that direct and indirect administrative costs of savings mobilisation drops significantly when a credit union reaches the US$ 1 million threshold of savings volume[37]. In addition, the findings of Caudill *et al.* (2009) show that MFIs with higher cost efficacy have many thousand times the volume of deposits compared with non-deposit-taking MFIs. Our findings also support Hartarska *et al.* (2013) who unearth that deposit-taking MFIs are closer to the optimal scale economies than MFIs that focus only on credit. Hartarska *et al.* (2013) also contend that efficiency differences between lending-only MFIs and deposit-taking MFIs offer important insights into the industry's push toward perceiving economies of scope by transforming MFIs into savings-mobilising MFIs. Nevertheless, our finding negates the study of Robert (2013). To be more specific, they uncover that taking deposits corresponds with higher operating expenses. In addition, we also find a significant and negative relationship between the number of deposit accounts per staff member and costs. This means that having more deposit account number per staff member enables MFIs to promote productivity and therefore the cost efficacy of MFIs could be enhanced. It would be rational to assume that when a staff member manages more deposit accounts, they have information of their savings customers. In case their existing savers ask for micro loans, it is easier and quicker for the staff to assess their existing savings clients as they have already had necessary information to evaluate risks. As they already had a client base, the assessment process is shortened and thus efficiency improves. Our findings are also in line with the study of Rossel-Cambier (2010). The findings relating to the impact of three aspects of micro-savings on cost-

[37] According to Richardson and Oliva (2002), direct administrative costs include human resources, marketing and commissions that are directly related to savings mobilisation; meanwhile indirect administrative costs include costs for human resources, administrative services, depreciation and protection.

efficiency further strengthen the results with regards to the links of micro-savings on financial sustainability as exhibited in model (2) and (3) of Table 3.5 and these findings also support theoretical framework and our hypotheses.

Concerning charter types, MFI in forms of micro-banks, NGOs, NBFI are found to be significantly and positively related to OEA, which means that these charter types are less efficient. It is noticeable that NGOs have largest magnitude and highest significance level in comparison to other charter types (0.656, significant at 0.05 level). NGOs are usually not offering micro-savings[38]. Thus, it is be more difficult for them to make use of synergies created through economies of scope of lending and savings mobilising to become cost efficient. Plus, NGOs are not regulated by a banking supervisory agency and they are registered as a non-profit for tax purposes or some other legal charter. In other words, NGOs are typically operating on a not-for-profit basis and they lack owners with a monetary incentive to monitor their investments (Speckbacher, 2008). As a consequence, they are more likely to become less efficient. However, our finding relating NGOs is inconsistent with Gutierrez-Nieto, Serranco-Cinca and Molinero (2007) who unearth that NGOs attempt to provide a large number of loans and perform as cheaply as possible. The research team contends that NGOs are more inclined to be operated by volunteers to reduce costs, and they strive for serving as many clients as possible[39].

We also discover that the dummy variable *Regulated MFIs* was negatively related to operating expenses to total assets (-2.042) and this linkage was significant at

[38] NGO microfinance providers are unregulated and normally do not take deposits. If NGO MFIs capture deposits, it may be one requirement of group lending technology. See Hartarska et al (2007) for further information.

[39] The analysis of Gutierrez-Nieto, Serranco-Cinca and Molinero (2007) is based on a data set of 30 MFIs in Latin America and Data Development Analysis technique.

0.1 level. This means that regulated MFIs are cost efficient compared with unregulated ones. This result confirms the literature for effect of regulatory status on firm performance. According to CMEF (2005), regulated MFIs operate on a for-profit basis and regulated institutions have a number of significant constituencies who, following the agency theory, sit on boards to protect their interests (Adams and Mehran, 2008). Thus, the positive association between regulatory status and cost efficiency of MFIs in our sample can be explained by the monitoring incentive. Also, as found by Tchakoute-Tchuigoua (2014), regulated MFIs can access additional funding sources in order to diversify their financing choice. Specifically, being regulated enables MFIs to capture more deposits than borrowings. Regulated MFIs, therefore, are able to reduce their overall operating expenses by exploiting deposits as a cheap fund.

In addition, referring to the experience of MFIs, the significant and negative coefficients for dummy variable *Dum*Mature and *Dum*Young indicate that more experienced MFIs appear to be more efficient than new ones. As contended by Kar (2010), experienced MFIs tend to have greater endowments to make them so well-organised and thus they are more efficient. The argument also goes that MFIs build up a solid customer base in their early years of operation, which significantly translates into greater efficiency (Kneiding and Mas, 2009). Our results are similar to the study of Gonzalez (2007) and Gonzalez (2011). In particular, Gonzalez (2007) found that, on average, older MFIs are more likely to have lower operating expenses ratio. This relationship, however, weakens over time. This effect is strongest in the first six years

of institutional history, when efficiency increases between two percent and eight percent per year. In the following years, this figure drops to one and two percent annually[40].

Referring to the size of MFIs, the significant and positive coefficient of GLPTA implies that MFIs appear to be less efficient when they are scaling up and are becoming larger. It seems reasonable to presume that when MFIs extend their scales of operation by serving more clients, more operating expenses may incur. The study of Gonzalez (2007) shows that as MFIs grow beyond 2,000 customers, no significant further efficiency gains are obtained resulting from economies of scale. Specifically, on average, most efficiency attainments thus are realised during the very early growth phase of an institution. The mean value and median of active borrowers of MFIs sampled in our dataset are 56,475 and 6,791 (persons) respectively. Thus, the findings of Gonzalez (2007) should also be a reasonable explanation to our research. A similar relationship between size of MFIs and cost efficiency is also discovered by Bassem (2008) and Bogan (2012). However, our finding refutes Mersland & Strom (2012) and Kar (2012) who observe that bigger MFIs appear to be more cost efficient.

With regards to portfolio quality management, we found that PAR30 is positively and significantly linked to OEA. One part of operating expenses is impairment loss. This is the non-cash expense calculated as a percentage of the value of the portfolio that is at risk of default. Thus, an increase of PAR30 leads to a rise in impairment loss and thus results in a reduction of cost efficiency of MFIs. Nonetheless, our finding is dissimilar to Mersland and Strom (2009) who uncover that PAR30 is negatively connected to operational costs.

[40] Gonzalez (2011) found that cost efficiency levels improve as MFIs age. In particular, improvements are biggest for MFIs younger than 5 years old and still meaningful for MFIs between 5-15 years old. Efficiency gains slow down for MFIs older than 15 years old.

Furthermore, a significant and positive coefficient is found for the percentage of women borrowers. This result confirms that MFIs are becoming less efficient when they improving their depth of outreach by serving more female credit clients. Our study supports the research of Hermes, Lensink and Meester (2011) but refutes Caudill, Gropper and Hartarska (2012) who discover that MFIs with higher percentage of female borrowers have lower costs.

In terms of regional control variables, we can see that MFIs active in in South Asia and Eastern Europe and Central Asia achieve better cost efficiency while MFIs active in Africa are very cost-inefficient. Regarding macroeconomic control variables, we found that GNI per capita has an intermediate effect on cost-efficiency while deposit interest rates negatively affect cost-efficacy. *(Please see Appendix 3.31 for detailed discussion on the relationship between regional and macroeconomic control variables and cost-efficiency).*

3.5.3. Robustness checks

To gauge the robustness of the results, we perform two-step system GMM estimation for the links of micro-savings and financial sustainability and cost efficiency. The diagnostic test in Table 3.7 shows that the model is well fitted with a statistically insignificant test for second-degree serial correlation AR (2). Accordingly, the statistically insignificant Hansen J-statistics for all regression models demonstrate that the utilised instruments are valid as the Hansen J-statistics of over-identifying restrictions tests the null of instruments validity. The results in Table 3.7 are qualitatively similar to the results presented Table 3.5 and Table 3.6, which boosts the robustness of previously obtained results

Table 3.7: Micro-savings and financial performance: Two-step System GMM estimation (Robustness checks)

Variables	Notation	Dependent variable	
		(1)	(2)
		OSS (log)	OEA (log)
Lag1lnOSS	L.lnOSS	0.219*** (3.54)	
Lag1lnOEA	L.lnOEA		0.591*** (6.79)
PAR30	Par30	-0.00105 (-1.83)	0.00006 (0.26)
Net Savers	lnNS	-0.0497* (-2.10)	0.0599* (2.26)
Deposits	lnDEP	0.0531 (1.94)	-0.00659 (-0.20)
Deposit accounts per staff member	lnDAPS	0.154** (3.12)	-0.174* (-2.49)
Net Savers x Bank	Ln(NS) x Bank	0.0626 (1.63)	-0.0337 (-0.67)
Net Savers x NGO	Ln(NS) x NGO	0.0200 (0.54)	-0.130*** (-3.54)
Net Savers x CU_Coop	Ln(NS) x COOP	-0.0366 (-1.00)	0.0359 (0.69)
Deposits x Bank	Ln(DEP) x Bank	-0.00723 (-0.23)	-0.0250 (-0.58)
Deposits x NGO	Ln(DEP) x NGO	0.0163 (0.44)	0.0331 (0.74)
Deposits x NBFI	Ln(DEP) x NBFI	-0.0181* (-2.27)	0.0106 (1.00)
DAPSM x Bank	Ln(DAPSM) x Bank	-0.150	0.140 (1.20)

		(-1.47)	
DAPSM x NGO	Ln(DAPSM) x NGO	-0.114 (-1.20)	0.172 (1.67)
DAPSM x CU_Coop	Ln(DAPSM) x CU_Coop	0.0291 (0.50)	-0.0783 (-0.96)
Mature	Mature	-0.0676 (-0.72)	-0.0846 (-0.75)
Young	Young	-0.0226 (-0.31)	-0.0961 (-1.08)
Gross Loan Portfolio to Total Assets	GLPTA	0.00260* (2.00)	0.000985 (0.56)
Percentage of women borrowers	PWB	0.00262 (1.84)	-0.000842 (-0.68)
GNP per capita	lnGNI	-0.0144 (-0.56)	0.00806 (0.26)
Inflation	INF	-0.00142 (-1.19)	0.00806 (0.26)
LagGDP growth rate	L.GDPR	0.00462 (1.42)	-0.00500 (-1.45)
Deposit interest rate	DINT	0.00543 (1.32)	0.00654 (1.34)
Observations	Observations	1620	1461
Number of intruments		484	405
F-test		3.23***	22.50***
AR(1)		Z = -3.37 p-value = 0.001	Z = -1.88 p-value = 0.060
AR(2)		Z = -0.02 p-value = 0.983	Z = 1.14 p-value = 0.254
Hansen J-Statistic		0.993	0.957

Notes:

(1) *, **, and *** represent significance at the levels of 10%, 5%, and 1%, respectively
(2) Absolute value of t statistics in parentheses
(3) The variables are defined and measured as described in Table 3.2.
(4) AR (1) and AR (2) are Arellano-Bond test for first order and second order autocorrelation, respectively.
(5) Hansen J-Statistic test the null hypothesis that the model is correctively specified and the instruments are valid.

3.6. Summary and conclusion

This chapter has explored whether mobilising deposits could affect two dimensions of MFI financial performance, namely financial sustainability and cost efficiency. By employing a large global dataset of 1,936 MFIs covering time period from 2000 to 2012, our empirical results have successfully answered our research questions and obtained some important findings that help to stress the roles of micro-savings in microfinance performance. We also undertake some empirical results to check the robustness of our results.

We obtain three important findings relating to the influence of offering micro-savings on both financial sustainability and cost efficiency. In particular, we see clear evidence that the *number of net savers* is negatively related to financial sustainability measured by OSS and cost efficiency proxied by OEA. These results confirm theories suggesting that offering voluntary micro-savings may be expensive for some reasons. First, savings clients tend to hold small value savings accounts that entail higher administrative expenses. Second, the demand of micro-savers for convenient access to account and simple withdrawals is assumed by MFIs to be costly and labour-intensive. More interestingly, we find that *both volume of deposits* and *the number of deposit accounts per staff member* have positive impacts on financial sustainability and cost efficiency of MFIs. These findings further reinforce theories which imply that deposit-taking MFIs can make use of micro-savings as a cheap loanable fund source and

enhance productivity in savings mobilisations in order to be efficient and sustainable. On the whole, our findings obviously reflect both pros and cons of micro-savings, which has important policy implication for practitioners. In particular, MFIs need to seek ways to reduce administrative costs of deposits activities, take advantages of synergies created by the combination of savings mobilising and lending as well as improve productivity of deposit taking activities in order to achieve both financial sustainability and cost efficiency.

With regard to firm-specific variables, we observe that older and experienced MFIs appears to be more efficient and profitable compared with new MFIs. This finding suggests that new MFIs can perform well by participating in large microfinance networks in order to make use of the knowledges through staff training programmes or learning experience from mature MFIs.

The negative relationship between portfolio quality in terms of PAR 30 implies that MFIs should improve risks managements in order to be sustainable. Further, the positive linkage between regulation and cost efficiency not only highlights the importance of supervision but also may indicate the advantages of micro-savings. In practice, savings are mainly captured regulated MFIs. Therefore, if regulation is the only way for MFIs to mobilise savings from public, our finding regarding regulation once again affirms the pros of deposit taking.

The size of MFIs and female borrowers both increase operating expenses and enhance financial sustainability of MFIs. Further, our study also indicates that types of MFIs do matter. Compared with other charter types, NGOs tend to be more inefficient and less sustainable. Additionally, our findings further confirm the influence of regional factors. In particular, cost inefficiency goes with MFIs in Africa. Despite the fact that

micro-savings are the most common in Africa in comparison to other regions, African MFIs have highest operating costs. This may be due to unfavourable macro socio-economic factors in Africa. On the contrary, cost efficiency goes with MFIs operating in South Asia and Eastern Europe and Central Asia (EECA). MFIs in EECA are also found to be more sustainable.

Finally, the findings relating to country-level variables in our research affirm that macroeconomic factors do influence performance of MFIs. In particular, we see that GDP growth rate is positively connected to financial sustainability and deposit interest rate is negatively associated to MFIs' efficiency. These findings have important implications for policy makers. Policy makers should stabilise macro environment in order to produce good condition for MFIs to perform efficiently and viably.

The clear evidence of the relationship between micro-savings and financial performance has motivated us to come up with another research question: "Does offering micro-savings financial products also do good to the social outreach of MFIs? We plan to explore this question in the next chapter of this thesis.

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CHAPTER 4

DOES OFFERING MICRO-SAVINGS ENABLE MICROFINANCE INSTITUTIONS TO IMPROVE THEIR SOCIAL OUTREACH?

4.1. Introduction

Microfinance has been widely acknowledged for its positive contribution to poverty reduction and economic growth acceleration (Johson and Rogaly, 1997; Martin *et al*., 2002; Manos & Yaron, 2009; Imai *et al*., 2010; Nawaz, 2010; Quayes, 2015). Therefore, making finance accessible to the poor is a crucial mechanism to fight against poverty in developing economies where there exists a huge unmet demand for financial services (Abate *et al.*, 2013).

Lawson (2010) states that microfinance programmes can improve the poor's lives but generally do not reach the extremely poor and the chronic poor. Among the poorest of the poor, the most essential element of microfinance is not supplying loans but offering savings (Collins *et al.*, 2009). The micro-saving approach has been quite successful in poverty reduction of the Philippine's poorest people (Tavanti, 2013).

The social performance of microfinance institutions, also known as microfinance outreach, implies how well microfinance institutions serve the poor. To achieve better social performance, MFIs need to find a mechanism to improve the outreach by reaching more poor people and serving ultra-poor and hard-to-reach people.

In other words, to better fulfil their social missions, it is essential for MFIs to both expand their breadth of outreach and deepen their depth of outreach.

However, the literature on the social performance of MFIs has generally not been concerned with the impact of offering micro-savings financial products. Further, there is no clear and decisive evidence, across many microfinance institutions and different countries across the world, that offering micro-savings enhances the outreach performance of microfinance institutions. It may be well the case micro-savings and microfinance outreach have no clear relationship, except for some individual countries, such as Philippines which was reported by Tavanti (2013).

The objective of this paper is to examine empirically whether offering micro-savings financial products by microfinance institutions has a positive and significant impact on microfinance outreach. To accomplish this objective, the study will attempt to answer the general research question: "Does offering micro-savings enable microfinance institutions to improve their outreach?". The analysis is based on a panel data of 1,936 microfinance institutions from 79 countries worldwide over a time period of 2000 to 2012.

The main contribution of this chapter is that it is the first research to explore the links between micro-savings and social outreach by using a unique and biggest global dataset. In addition, we can achieve more complete findings of the effects of microsavings on microfinancial social outreach by examining different aspects of microsavings, namely voluntary microsavers, scales of savings operations and productivity of microsavings activities. Further, our findings have an implication for policy makers in terms of proposing policies for poverty reduction at a macro level.

The outline of this chapter is organized as follows. Section 4.2 provides literature review on the association between micro-savings and microfinance outreach. Next, the regression model, variables and dataset are explained in section 4.3. The preliminary results are reported in section 4.4. Further, section 4.5 presents and discusses the regression results. Finally, section 4.6 concludes.

4.2. Relevant literature review and hypothesis development

4.2.1. Microfinance outreach and measurement

Generally speaking, social performance or social outreach of microfinance demonstrates how well MFIs serve the poor. In other words, social outreach implies how much social value that MFIs create for their customers (Isern *et al.,* 2007). As noted by Mayer (2002), microfinance outreach is a multidimensional term. Navajas *et al*. (2000) describes six facets of outreach as below.

- *Depth of outreach* reflects the benefit that microfinance customers can receive from MFIs
- *Worth of outreach to users* exhibits the level of willingness that a credit client pays to a micro loan.
- *Cost of outreach to users* displays the expense that a credit client has to pay for a micro loan
- *Breadth of outreach* implies the number of users or the number of active clients
- *Length of outreach* expresses the time frame in which an MFI generate loans
- *Scope of outreach* denotes the diversity of microfinance services and products extended to microfinance customers.

In alignment with the development of microfinance industry, frameworks and tools have been developed to monitor and assess social outreach of MFIs. The Social Performance Indicators Initiative (SPI) of the exchange network for microfinance practitioners "CERISE" (*Comité d'Echanges de Réflexion et d'Information sur les Systèmes d'Epargne-crédit*) refers to four dimensions of social performance: outreach to the poor and excluded, adaption of the services and the products to the target clients, improvement of social and political capital of clients, and social responsibility of the institutions (Zeller *et al.*, 2003).

In 2005, the Imp-Act Programme, as an action-research partner to 30 practitioners around the world, has embraced social performance management (SPM) as the systematic assessment of performance relative to social objectives and use of this information to improve practice. The Imp-Act guidebook defines social goals for microfinance into three categories: outreach to specific target group(s); sustainable delivery of appropriate services that responds to identified needs of specific target client markets; and impact, defined by positive economic or social changes in clients, their families, their businesses, or the wider community (Simanowitz and Pawlak, 2005).

Woller (2006), in a project by the United States Agency for International Development (USAID), develops the Social Performance Management (SPM) tool including seven aspects. In addition to the six aspects of outreach framework proposed by Navajas *et al*. (2000) as mentioned above, a seventh dimension – outreach to the community is added to the SPM tool framework. Outreach to the community refers to the MFI's interactions and relationships with its various stakeholders, both internal and external. Although outreach to the community is not part of the original Six Aspects

framework, it is nonetheless an important component of outreach that measures whether and the extent to which the MFI is contributing to the well-being of society at large.

Most recently, the MIX provides a complete list of indicator categories for social performance measurement as described in Table 4.1, namely mission and social goals, governance, range of products and services, social responsibility to clients, transparency of cost of services to clients, human resources and staff incentive, social responsibility to environment, poverty outreach, client outreach by lending methodology, enterprise financed and employed creation, and client retention rate[41].

Table 4.1: Social performance indicators developed by the MIX

Indicator category	What the indicator measures
1 – Mission and social goals	The MFI's stated commitment to its social mission, its target market and development objectives
2 – Governance	Whether members of the Board of Directors have been trained in social performance management and the presence of a formal Board committee that monitors social performance
3 – Range of products and services	Both financial and non-financial products and services offered by the MFI
4 – Social responsibility to clients	The number of Smart Campaign Client Protection Principles applied by the MFI
5 – Transparency of cost of services to clients	How the MFI states its interest rates
6 – Human resources and staff incentive	policies in place, board and staff composition, staff turnover rate, and staff incentives linked to social performance goals
7 – Social responsibility to environment	Whether the MFI has policies and initiatives in place to mitigate the environmental impact of financed enterprises
8 – Poverty outreach	Poverty levels of clients at entry and their movement out of poverty over time
9 – Client outreach by lending methodology	The type of lending methodology(-ies) employed by the MFI
10 – Enterprise financed and	The number of enterprises financed by the MFI and

[41] See: 'Social Performance Indicators'. Available at: http://www.themix.org/social-performance/Indicators [Accessed: March 15, 2015]

employed creation	employment opportunities created by the enterprises financed
11 – Client retention rate	The client retention rate of the MFI

(Source: The MIX Link, 2015)

Based on the general aforementioned dimensions of microfinance social outreach, specific indicators (proxies) have been identified to assess the social performance of MFIs. These indicators are reviewed in Table 4.2 as below.

Table 4.2: Measurement for microfinance outreach

Aspects of outreach	Measurement
Breadth of outreach	• Number of active borrowers • Number of clients served • Clients with non-enterprise loans as a percentage of borrowers • Voluntary savers as a percentage of borrowers • Clients with other financial services as a percentage of borrowers • Clients with nom-financial services as a percentage of borrowers • Portfolio outstanding
Depth of outreach	• Average loan size • Average loan size as a percentage of GNI per capita for new loan clients • Percentage of loans less than a $300 in Asia, Africa, and the Middle East; (b) $400 in Latin America and the Caribbean; and (c) $1,000 in Europe and Central Asia. • Percentage of female clients • Percentage of rural clients • Percentage of recent clients living below the national poverty line • Percentage of clients living on less than PPP adjusted US$1 per day • Percentage of enterprise loan clients selected poverty targeting tools.
Length of Outreach	• Profit margin • Return on equity • Return on assets • Portfolio at risk < 30 days • Operating expense relative to average loan portfolio
Scope of Outreach	• Number of distinct enterprise loan products • Number of distinct other loan products • Number of other financial services

	• Types of savings offered • Percentage of clients with three or more products or services
Cost of outreach	• Real yield on average gross loan portfolio • Nominal yield on average gross loan portfolio relative to prime commercial lending rate in home country • Weighted average number of days to approve and disburser loans after completion of loan application • Percentage of loan clients providing non-traditional collateral • Percentage of enterprise loan clients whom loan officers visit for regular financial transactions.
Worth of outreach	• Loan loss rate • Client retention rate • Share of two-year clients still with the program • Share of portfolio growth attributable to existing clients • Type of market research conducted
Outreach to the Community	• Percentage of operating revenues reinvested back into the community • Percentage of employees that have left the firm not including pension leaves and deaths • Female-male employee ratio among professional-level staff • Percentage of employees receiving at least two days of training • If the MFI has a written, formal internal CSR policy • If the MFI has a written, formal code of conduct governing actions towards employees and clients • If the MFI provides clients formal access to management • If the MFI provides health insurance for full-fill employees • If the MFI provides credit life insurance for borrowers • If the MFI discloses the effective interest rate on all loans

(**Sources:** Navajas *et al.*, 2000; Schreiner, 2002; Woller, 2006)

According to Zeller and Mayer (2002), microfinance outreach refers to the degrees to which microfinance institutions are serving the poor, both in terms of the number of active clients and the poverty level of their clients. In reality, studies examining how well MFIs serve the poor and the excluded people mainly focused on two core aspects of social performance which are breadth and depth of microfinance outreach. Widely-used indicators include (1) Number of clients served; (2) Number of active borrowers, (3) Average Outstanding Loan Balance; (4) Average Outstanding Loan Balance per

capita Gross National Income; and (3) Percentage of women borrowers (See, for example, Cull *et al*., 2007; Hartarska *et al*., 2007; Rossel-Cambier, 2010; Hermes *et al*., 2011).

4.2.2. Does offering micro-savings enable microfinance institutions to expand or deepen microfinance outreach: theoretical underpinnings and empirical evidence?

The theoretical background for the link between micro-savings and social outreach is *financial intermediation theory* in terms of *information provision theory*. According to Mishkin (2004), financial intermediaries help to deal with adverse selection and moral harzard which are the consequences of asymmetric information. Information asymmetry exists when one of the parties in a relationship or a contract has insufficient information in comparison with the other party. Adverse selection is an asymmetric information issue that takes place before the transaction arises. To be more specifically, potential bad credit risks are the ones who most actively seek out loans. Hence, the parties that are most likely to produce an undesirable outcome are the ones most likely wish to get involved in the transactions. Moral hazard, on the other hand, occurs after the transaction take places. The credit provider runs the risk that the borrower will engage in activities that are undesirable from the lender's viewpoint as they make it less likely that the loan will be repaid. Financial intermediaries help reduce adverse selection and moral hazard for some reasons because they have wider pool base of customers partly based on the number of their depositors. In addition, based on the record of their savings customers, financial intermediaries have better monitoring of risks, which increases the likelihood of loan repayment. Further, financial intermediaries are less depending on external funding sources. Rather, they can make use of deposits as cheap loanable funds to serve more credit clients. As a result, financial intermediaries are more likely to improve their social outreach.

As noted by Fiebig *et al.* (1999), Navajas *et al.* (2000), Schreiner (2002), Peachey (2007), the number of types of financial contracts provided by MFIs does affect microfinance outreach. In practice, MFIs with the best outreach offer both micro-credit and micro-savings. Small savings have a positive contribution to microfinance outreach for two reasons. Firstly, all the poor is deposit-worthy and save to smooth consumption, to finance investment and to buffer risk. Nonetheless, not all the poor people are credit-worthy. Secondly, deposits strengthen the incentives for sustainability and length of outreach. Further, thanks to supplying micro-savings, MFIs can better meet their clients' needs in terms of a larger choice of financial services. Therefore, one should expect that the social outreach of combined microfinance schemes is higher than that of mono-product MFIs. Hence, it could be inferred that micro-savings can expand access to other financial services, particularly credits services, for the clients.

Gingrich (2004) examines the effect of micro-savings on social performance of 185 Savings and Credit Cooperatives (SCCs) in Nepal. With reference to social performance, firstly, their findings indicate that deposit taking is negatively related to breadth of outreach. As Nepali SCCs use savings mobilised from clients as a main source of loanable funds, they have to charge adequately high interest rates to cover all operating costs, which might be a hindrance to the access to micro-loans of poor and low-income households. Still, many Nepali SCCs serve vulnerable people living in less developed and remote areas which are not reached by other MFIs. Therefore, with this regard, the researcher argues that Nepali SCCs could enhance their depth of outreach to some extent. In addition, the scope and length of outreach are found to be strong for Nepali SCCs as they offer a diversity of services.

Hartarska and Nadolnyak (2007) investigate the impact of regulation on microfinance outreach by using a dataset of 114 MFIs from 62 countries. They used the number of active borrowers as a measurement for microfinance breadth of outreach and the volume of savings (in US$) deposited in MFIs as a proxy for savings. Their findings demonstrate that savings have a positive contribution to the breadth of outreach.

Anduanbessa (2009) aims at offering statistical insights in exploring performance of Ethiopian MFIs. Their analysis is based on a cross-sectional dataset of 26 MFIs for the year 2006. They utilised Factor Analysis (FA) methodology to measure the performance of MFIs in Ethiopia. FA is a modelling technique explaining correlations among a set of observed variables through a linear combination of a few unknown number of unobserved random factors. Specifically, the deposits mobilised from clients, the number of active borrowers, and the gross loan portfolio establish the outreach aspect. On the other hand, profit margin, operational self-sufficiency (OSS), returns on assets and gross loan portfolio-to-total assets ratio set up financial sustainability aspect. To pinpoint the determinants of Ethiopian MFIs, a seemingly unrelated regression (SUR) model was fitted on the social outreach and financial sustainability facet scores synthesised by FA. Their findings display a negative relationship between capital and outreach. They offer the negative and strong correlation between capital and deposit as an underlying reason. They imply that as MFIs only endeavour to collect capital for their loanable funds, they fail to capture deposits; which, in turn, worsens their social outreach.

Rossel-Cambier (2010) explores whether combining micro-credit with micro-savings and micro-insurance affects breadth and depth of microfinance outreach by reviewing cross-sectional evidence of 250 MFIs in Latin America and the Caribbean. In

regression model, the author utilises the number of active borrowers as a proxy for outreach breadth; average loan balance per GNI capita and percentage of women borrowers as proxies for outreach depth. Deposit-taking MFIs is expressed by a dummy variable SAVINGS which takes the value 1 if the MFI offers micro-savings, 0 if not. The findings show that combining micro-credit with savings and insurance enables MFIs to increase their number of active borrowers. In other words, offering combined products has a positive effect on the breadth of microfinance outreach.

Bergsma (2011) performs an unbalanced panel regression based on financial data of 35 Opportunity International MFIs worldwide to explore the relationship between micro-savings and microfinance outreach. The regression results display no statistical evidence that offering savings curtail depth of outreach through extending the average loan size. Therefore, it is implied that offering savings does not hurt microfinance depth of outreach. Another interesting finding of this research is that deposit-taking MFIs have on average 27,924 more borrowers compared to non-deposit taking MFIs. This finding exhibits compatibility between savings mobilisation and outreach expansion.

Bogan (2012) investigates the relationship between capital structure and performance of MFIs. With regard to social outreach, their results do not exhibit any impact of savings in terms of deposits relative to assets, deposit taking, and number of savers on breadth of outreach. Their analysis is based on a panel dataset of MFIs with over US$ 1.3 million in total assets and at least a level 3 diamonds disclosure rating on the MIX Market, operating in Africa, East Asia, Eastern Europe, Latin America, the Middle East, and South Asia for the years 2003 and 2006. Based on theoretical underpinnings and empirical evidence of the impacts of deposit taking activities on breadth of social outreach, following hypotheses are established as below.

Hypothesis 1: Deposit-taking MFIs have better breadth of microfinance outreach compared with MFIs that do not take micro-savings

Hypothesis 2: The number of voluntary savers broadens the breadth of microfinance outreach.

Hypothesis 3: The volume of deposits broadens the breadth of microfinance outreach.

Hypothesis 4: The number of deposit accounts per staff member broadens the breadth of microfinance outreach.

Micro-savings also can enhance poor people's well-being. According to Collins *et al.* (2009), micro-savings firstly enable the poor to generate useful lump sums of cash for productive investments in microenterprises or in farming inputs. Additionally, savings help the poor to weather an unexpected adverse situation such as a heath emergency or crop failure. Moreover, savings enable the poor to store irregular income to fund basic day-to-day needs. Adjei *et al.* (2009) also find from their research in Ghana that micro-savings and micro-insurance have improved life quality of microloans clients as well as their family and has allowed them to build up their asset base. Rossel-Cambier (2010) found that the presence of micro-savings is accompanied with a relatively lower participation of poor and woman borrowers. Based on these findings, we set up further hypotheses as below.

Hypothesis 5: Deposit-taking MFIs do not enhance depth of microfinance outreach compared with MFIs that do not take micro-savings

Hypothesis 6: The number of voluntary savers does not enhance the income-related depth of microfinance outreach.

Hypothesis 7: The volume of deposits does not deepen the income-related depth of microfinance outreach.

Hypothesis 8: The number of deposit accounts deepens the income-related depth of microfinance outreach.

It is evident that empirical studies on the linkages between micro-savings and microfinance outreach are very limited. Only Gringrich (2004), Rossel-Cambier (2010) and Bergsma (2012) stress the importance on microsavings factors meanwhile the rest of empirical studies used micro-savings as control variables only. Further, all three studies focusing on micro-savings are subjected limitations relating to data, proxies for micro-savings and econometric techniques. Specifically, they utilised small samples that are not representative for MFIs. They did not use proxies that demonstrate voluntary savings. Additionally, Gringrich (2004), Rossel-Cambier (2010) and Bergsma (2012) apply OLS, a simple econometric technique that cannot deal with endogeneity in econometric analysis.

Table 4.3: Summary of previous studies on the links between micro-savings and social outreach.

Study	Methodology	Data set	Proxies for microsavings	Proxies for social outreach	Findings
Gingrich (2004)	OLS	185 Savings and Credit Cooperatives (SCCs) in Nepal	Savings to total assets; Savings to loans	Number of active borrowers,	SCCs in Nepal have worse outreach breadth but have strong depth, scope and length outreach.
Hartarska and Nadonyak (2007)	Hausman-Taylor	114 MFIs active in 62 countries	The volume of savings (in US$) deposited in MFIs	The number of active borrower is used as a proxy for breadth of outreach.	Savings have a positive contribution to the improvement of breadth of outreach.
Anduanbessa (2009)	Factor Analysis (FA), seemingly unrelated regression	26 MFIs for the year 2006	Total deposits	The number of active borrowers	MFIs that stress more importance on collecting capital for loanable funds fail to capture deposits and have worse social

	(SUR)				outreach.
Rossel-Cambier (2010)	OLS	250 MFIs in Latin America and the Caribbean.	Dummy SAVINGS	Breadth of outreach is proxied by the number of active borrowers Depth of outreach is proxied by average loan balance per GNI capita.	Offering micro-savings helps to improve breadth of outreach but worsens depth of outreach.
Bergsma (2011)	OLS	35 Opportunity International MFIs worldwide	Dummy SAVINGS	Breadth of outreach is proxied by the number of active borrowers Depth of outreach is proxied by average loan size.	Deposit-taking MFIs have more borrowers than non-deposit taking MFIs. No relationship is found between microsavings and depth of outreach
Bogan (2012)	OLS, probit, two stage least square	A panel dataset of MFIs with over US$1.3 million in total assets and at least a level 3 diamonds disclosure rating on the MIX Market. These MFIs are active for the years 2003 and 2006.	Deposit relative to assets; deposit taking, number of savers	Breadth of outreach is proxied by the number of active borrowers	No relationship is found between microsavings and breadth of outreach

Source: *Studies are identified and reviewed by the researcher. The identification of studies is necessarily selective, but carefully covers the main findings relating to microsavings and social outreach.*

4.3. Regression model, variables, dataset and methodology

4.3.1. Regression model

The above hypotheses can be represented by the following model:

(4.1) $\mathbf{MFI}\boldsymbol{Out}_{it} = \mathbf{constant} + \xi\mathbf{SAV}_{it} + \varphi\mathbf{MFI}\boldsymbol{specific}_{it} + \delta\mathbf{MACRO}_{it} + \mathbf{c}_i + \boldsymbol{\mu}_{it}$

Where $\mathbf{MFI}\boldsymbol{Out}_{it}$ is a set of outreach measures for the MFI i at time t; $\mathbf{SAV}_{it}$ is a set of variables that captures the impacts of micro-savings; $\mathbf{MFI}\boldsymbol{specific}_{it}$ is a set of institution-specific variables for the MFI i at time t; $\mathbf{MACRO}_{it}$ is a set of macroeconomic country-specific variables at time t in which the MFI i is active; ; $\mathbf{c}_i$ is the MFI's individual

unobserved effect and μ_{it} is the idiosyncratic error that is assumed to have zero mean and finite variance σ_{μ}^2 and to be i.i.d over all the observations in the data.

We utilise following variables as proxies for two dimensions of microfinance outreach. First, the number of active borrowers (denoted by NAB) is proxied for the breadth of microfinance outreach. Second, the average loan size adjusted by GNI per capita (denoted by LS_GNI) is proxied for the income-related depth of microfinance outreach.

We proxy four dimensions of micro-savings with the following variables: (i) dummy variable Deposit taking MFIs to reflect offering micro-savings financial products, (ii) the number of net savers (denoted by NS) to represent voluntary savers that are served; (iii) the volume of deposits (denoted by DEP) to demonstrate the deposit scale; and (iv) the number of deposit accounts per staff member (denoted by DAPSM) to measure the productivity of MFIs.

Accordingly, the four equations are set up as follows:

(4.1.1) $NAB_{it} = constant + \gamma_1 DumDeposit\text{-}taking_{it} + \gamma_2 MFI\mathit{specific}_{it} + \gamma_3 MACRO_{it} + c_i + \mu_{it}$

(4.1.2) $NAB_{it} = constant + \varphi_1 NS_{it} + \varphi_2 DEP_{it} + \varphi_3 DAPSM_{it} + \varphi_4 MFI\mathit{specific}_{it} + \varphi_5 MACRO_{it} + c_i + \mu_{it}$

(4.1.3) $LS\_GNI_{it} = constant + \beta_1 DumDeposit\text{-}taking_{it} + \beta_2 MFI\mathit{specific}_{it} + \beta_2 MACRO_{it} + c_i + \mu_{it}$

(4.1.4) $LS\_GNI_{it} = constant + \eta_1 NS_{it} + \eta_2 DEP_{it} + \eta_3 DAPSM_{it} + \eta_4 MFIspecificit + \eta_5 MACRO_{it} + c_i + \mu_{it}$

4.3.2. Variables

The dependent variables of the model are summarized in Table 4.4 below.

Table 4.4: Summary of dependent variables and measurement:

Variable	Notation	Measure	Source
Number of active borrowers	NAB	The number of individuals or entities who currently have an outstanding loan balance with the MFI or are primarily responsible for repaying any portion of the Gross Loan Portfolio	The MIX
Loan size_GNI	LS_GNI	Average loan balance per borrower[42]/GNI per capita	The MIX

All independent variables used in this Chapter are indentical to those of previous Chapter as described in Table 3.2.

4.3.3. Description of dataset

To evaluate the link between micro-savings and social outreach of microfinance institutions, we also use an unbalances panel dataset of 1,936 MFIs from 79 countries in all regions of the world. This sample is exactly the same as the sample used and described in Section 3.3.3 in Chapter 3. To the best of our knowledge, this is the largest dataset used to examine the relationship between micro-savings and microfinance outreach.

4.3.4. Methodology

In this chapter, we follow similar econometric strategy as Chapter 3. The test results confirm the validity of Hauman-Taylor technique (See Appendix 4.3-4.7-4.11-4.15-4.19

[42] Average loan balance per borrower = Gross loan portfolio/Number of active borrowers

and 4.5-4.9-4.13-4.17-4.21). To avoid as much replicates as possible, we do not describe in details those steps in this section.

4.4. Descriptive Statistics

The preliminary results of the data analysis are presented in Table 4.5 for the descriptive statistics and Table 4.6 for the correlation matrix. Further results from regression analysis are presented in subsequent tables.

Table 4.5: Descriptive statistics of dependent variables

Variables	Obs	Mean	Median	Std.Dev	Min	Max
Number of active borrowers	9972	56,475.96	6,791	341,444	1	6,710,000
Loan size_GNI	9908	133.3477	31.86	3,894.887	.01	382,753.2

Note: The definition and measurement of dependent variables are presented in Table 4.4

Table 4.5 reports the descriptive statistics of two dependent variables. As we use the same dataset as in chapter 3, we now focus only on two proxies of microfinance outreach to avoid replicates. The mean value of number of active borrowers is 56,475.96 persons, whereas the minimum value is 1 person and the maximum value is 6,710,000 persons. According to the benchmarks of the MIX, as the mean value of active credit clients is more than 30,000 persons, the MFIs in our sample generally have large breadth of outreach[43]. Also, a median of 6,791 persons and a high standard deviation (341,444 persons) indicate that the number of active borrowers' distribution is skewed heavily to the small outreach (more MFIs with small outreach, but with a long tail at the large outreach). The average loan size per borrower adjusted by GNI per

[43] According the benchmarks of the MIX, the outreach of MFIs is small, medium or large if their number of active borrowers is less than 10,000; between 10,000 and 30,000; and more than 30,000, respectively.

capita is the proxy for the income-related depth of microfinance outreach. The mean value of the average loan size is approximately 133%. As this mean value is between 20% and 149%; on the whole, the target market of MFIs in the dataset is broad end[44]. Furthermore, a median of 31.86% and a high standard deviation of 3,894.887% show that the average loan size's distribution is skewed heavily to the low end (more small loans, but with a long tail at the high end of large loans).

Table 4.6 presents correlations between all variables. The figures are Pearson correlation coefficients ranging from -1 to 1. The table demonstrates the bi-variate relationships between dependent and independent variables for the period 2000-2012. It also could be seen from table 4.6 that many correlations are significant at the level of 5% or lower, but none are higher than 0.8. Therefore, it does not indicate any problem of multicollinearity (Kenedy, 2008). Further, we compute the variance inflation factor (VIF) for all the independent variables. Since all of them have a VIF less than 5 (see Appendix 4.2 – 4.6 – 4.10 – 4.14 and 4.18), we again rule out any problem of multicollinearity. It is interesting to observe from table 4.6 that there are positive and significant associations between the number of active borrowers and three proxies for savings (net savers, deposits and deposit accounts per staff member). This may indicate that offering micro-savings would enable MFIs to expand their breadth of microfinance outreach. Further, the positive and significant correlation between the average loan size and the number of net savers as well as deposits may imply that micro-savings may enhance breadth of outreach but curtail the income-related depth of outreach. This point is further strengthened by the significant and positive relationship between the dummy

[44] The target market, or depth of outreach, measured by average loan balance per borrower/GNI per capita is categorised into 4 groups. The target market is low end, broad, high end and small business if the depth is less than 20%; depth between 20% and 149%; depth between 150% and 250%; and depth over 250%, respectively.

variable $D_{\text{Deposit-taking MFI}}$ and the two proxies of microfinance outreach (see Appendix 4.1). Also, the negative and significant relationship between the number of active borrowers and average loan size may be a sign that there is no trade-off between breadth of microfinance outreach and depth of microfinance outreach. It can also be seen from Table 4.6 that MFIs with a low ratio of PAR30 appear to serve more credit clients. Higher percentage of women borrowers enables MFIs to improve both their breadth and income-related depth of outreach. Regulated MFIs could have better breadth of outreach; however they are inclined to serve less poor people.

Table 4.6: Correlation matrix of variables used in the sample

	NAB	Ls_gni	NS	DEP	DAPSM	PAR30	PWB	GLPTA	Reg	YR	Five-star	Four-star	Three-star	Two-star	One-star	Mature	New	Young	Bank	CU_Coop	NBFI	NGO	AF	EAP	MENA	EECA	LAC	SA	GNI	IFL	GDP	DIR
NAB	1.0																															
Ls_gni	-.24*	1.0																														
NS	.65*	.23*	1.0																													
DEP	.60*	.42*	.74*	1.0																												
DAPSM	.15*	-.07*	.46*	.18*	1.0																											
PAR30	-.08*	-.003	-.002	-.07*	.06*	1.0																										
PWB	.26*	-.51*	-.10*	-.31*	.09*	-.06*	1.0																									
GLPTA	-.03*	.03*	-.11*	-.06*	-.03	-.01	.02	1.0																								
Reg	.06*	.32*	.19*	.23*	-.03	-.01	-.16*	.01	1.0																							
YR	.39*	.08*	.33*	.36*	.01	-.09*	-.02	-.01	.01	1.0																						
Five-star	.17*	-.001	.15*	.26*	-.03	-.06*	-.03*	.001	.02*	.19*	1.0																					
Four-star	.24*	.08*	.06*	-.01	.01	-.05*	.12*	-.02	-.03*	.37*	-.19*	1.0																				
Three-star	-.14*	.07*	.002	-.03	-.01	.04*	-.06*	-.01	.02	-.05*	-.12*	-.40*	1.0																			
Two-star	-.01	.04*	-.03	-.03	-.03*	.01	-.02	.0001	.04*	-.04*	-.02*	-.05*	-.03*	1.0																		
One-star	-.27*	.03*	-.18*	-.15*	.02	.07*	-.06*	.02*	-.01	-.42*	-.18*	-.58*	-.39*	-.05*	1.0																	
Mature	.28*	-.01	.24*	.29*	.15*	.03*	.01	-.02*	-.09*	.22*	.05*	.06*	-.04*	-.0001	-.07*	1.0																
New	-.27*	-.01	-.17*	-.25*	-.14*	-.02	.01	-.01	.08*	-.24*	-.04*	-.05*	.05*	.001	.05*	-.58*	1.0															
Young	-.09*	.02	-.14*	-.15*	-.07*	-.05	-.02	.04*	.04*	-.04*	-.02*	-.02*	.01	-.001	.03*	-.66*	-.23*	1.0														
Bank	.21*	.21*	.28*	.37*	-.15*	-.03*	-.11*	-.02*	.23*	.08*	.04*	.03*	.01	.03*	-.08*	-.05*	.06*	.003	1.0													
CU_Coop	-.25*	.22*	-.07*	-.03	.19*	.03*	-.19*	-.01	.09*	-.14*	-.21*	-.21*	.15*	.03*	.12*	.01	-.03*	.01	-.14*	1.0												
NBFI	.04*	.05*	.01	.02	-.15*	-.03*	-.10*	-.01	.22*	-.06*	.08*	.07*	-.02	.01	-.12*	-.22*	.17*	.10*	-.21*	-.29*	1.0											
NGO	.05*	-.36*	-.11*	-.28*	.005	-.01	.33*	.03*	-.50	.05*	-.04*	.07*	-.05*	-.04*	-.01	.18*	-.15*	-.08*	-.24*	-.33*	-.50*	1.0										
AF	-.07*	.19*	.08*	-.13*	.13*	.08*	-.08*	-.04*	.19*	-.17*	-.12*	-.22*	.11*	.04*	.19*	-.12*	.09*	.06*	.05*	.19*	-.05*	-.11*	1.0									

EAP	-.04*	-.10*	-.26*	-.19*	-.12*	.01	.09*	.002	.02*	-.12*	-.08*	-.03*	.07*	-.03*	.02*	-.08*	-.05*	-.06*	-.07*	-.09*	-.15*	.004	-.24*	1.0								
MENA	.04*	-.05*	-.05*	-.07*	-.04*	.01	.001	-.01	-.09*	.04*	.01	-.06*	-.004	.06*	-.07*	-.002	-.02*	.02*	-.01	-.06*	-.07*	.13*	-.07*	-.05*	1.0							
EECA	-.28*	.28*	-.08*	.18*	-.22*	-.07*	-.29*	.001	.24*	.09*	-.05*	.01	.04*	-.008	-.012	-.20*	.14*	.11*	.09*	.05*	.26*	-.28*	-.25*	-.19*	-.06*	1.0						
LAC	.07*	-.12*	.12*	.33*	-.01	-.03*	-.07*	-.004	-.40*	.19*	.27*	.05*	-.03*	.002	-.15*	.19*	-.15*	-.09*	-.01	-.04*	-.02	.15*	-.31*	-.24*	-.07*	-.25*	1.0					
SA	.28*	-.24*	.12*	-.11*	.15*	.01	.37*	.04*	.04*	-.01*	-.04*	.19*	-.18*	-.03*	-.02*	.04*	-.02	-.03*	-.07*	-.10*	-.03*	.16*	-.27*	-.21*	-.06*	-.22*	-.27*	1.0				
GNI	-.04*	-.24*	-.01	.33*	-.03*	-.03*	-.16*	-.006	-.24*	.05*	.14*	.030	.02*	-.011	-.11*	.15*	-.12*	-.07*	-.01	-.01	.05*	-.001	-.45*	.03*	.01	.16*	.54*	-.27*	1.0			
IFL	-.09*	.07*	-.07*	-.11*	.03	.002	-.04*	-.02	.06*	-.04*	-.03*	-.04*	.01	-.005	.05*	-.08*	.09*	.01	.02*	-.03*	.03*	-.05*	.11*	-.05*	.003	.07*	-.07*	-.06*	-.16*	1.0		
GDP	-.01	-.002	-.01	-.06*	-.05*	-.06*	-.002	.01	.09*	-.02*	-.03*	.01	.04*	-.02*	-.03*	-.09*	.08*	.03*	-.003	-.08*	.13*	-.06*	-.06*	.12*	-.04*	.13*	-.23*	.09*	-.06*	-.07*	1.0	
DIR	-.05*	.02	-.02	-.15*	-.02	-.02	-.02	.003	.05*	-.05*	-.07*	-.004	-.05*	-.001	.08*	-.09*	.09*	.02*	.07*	-.10*	-.001	.04*	.15*	-.08*	.04*	-.0002	-.06*	-.04*	-.22*	.75*	-.10*	1.0

Note: * is statistically significant at the level of 5% or lower (2-tailed test)

Where NAB = Number of active borrowers (log); LS_GNI = Loan size adjusted by GNI per capita (log); NS = Net savers (log); DEP = Deposits (log), DAPSM = Deposit Accounts per Staff Member; PAR30 = Portfolio at Risks less than 30 days; PWB = Percentage of women borrowers; GLPTA = Gross loan portfolio to total assets; Reg = Regulated MFI; YR = Years of reporting; CU_Coop = Credit Unions and Cooperatives; NBFI = Non-bank Financial Intermediation; NGO = Non-governmental organisation; AF = Africa; EAP = East Asia and the Pacific; MENA = Middle East and Northern Africa; EECA = Eastern Europe and Central Asia; LAC = Latin America and the Caribbean; SA = South Asia; GNI = Gross National Income (log); IFL = Inflation rate; GDP = growth rate of Gross Domestic Products; DIR = Deposit Interest Rate.

4.5. Empirical findings

The estimation results are reported in table 4.7 and table 4.8; each representing different aspect of microfinance outreach.

4.5.1. Linkages between micro-savings and breadth of microfinance outreach

Table 4.7: Impact of micro-savings on breadth of microfinance outreach (dependent variable: Number of active borrowers (log)) – Hausman-Taylor Estimation.

Variables	Notation	Dependent variable: NAB (log)	
		(1)	(2)
Constant		-6.181** (-3.08)	0.434 (0.62)
Deposit-taking MFI	$D_{Deposit\text{-}taking}$	-2.485 (-0.50)	
Regulated MFI	$D_{Regulation}$	6.022 (1.06)	-2.086* (-2.52)
Net Savers	lnNS		-0.00338 (-0.31)
Deposits	lnDEP		0.504*** (24.07)
Deposit accounts per staff member	lnDAPS		0.0980*** (3.72)
Bank			0.734** (3.08)
Non-governmental organisation	NGO		0.196 (0.46)
Non-bank financial intermediation	NBFI		0.551* (2.47)
Credit Union/Cooperative	CU_Coop		-0.792** (02.83)
Mature		0.423*** (11.77)	0.136* (2.26)
Young		0.370*** (13.84)	0.149** (3.26)
Gross Loan Portfolio to Total Assets	GLPTA	0.00337*** (10.18)	0.00870*** (9.27)
Percentage of women borrowers	PWB	0.00280*** (4.48)	0.000966 (1.11)

PAR30	PAR30	-0.00113** (-2.86)	-0.000427 (-1.09)
Number of years reporting	lnNYR	1.906* (2.17)	0.729*** (5.70)
Five-star MFI	Fivestar	-0.477 (-0.25)	0.649* (1.97)
One-star MFI	Onestar	0.108 (0.12)	0.0412 (0.24)
Three-star MFI	Threestar	0.0284 (0.03)	0.168 (0.93)
Middle East and North Africa	MENA	2.000 (0.69)	0.594 (0.96)
East Asia and the Pacific	EAP	0.587 (0.19)	0.751*** (3.31)
South Asia	SA	1.733 (0.78)	1.966*** (6.74)
Africa	AFR	0.585 (0.18)	0.961** (3.20)
Eastern Europe and Central Asia	EECA	-4.358 (-1.15)	-0.123 (-0.40)
GNI per capita	lnGNI	1.158*** (46.34)	-0.0925 (-1.67)
Inflation	INF	0.00434*** (4.98)	-0.000607 (-0.59)
GDP growth rate	GDPR		0.000467 (0.15)
Deposit interest rate	DINT	-0.0171*** (-7.02)	-0.00839 (-1.68)
Observations	Observations	6518	1832
Number of groups		1431	714
Wald Chi2 P-value Wald test[a]		4864.34*** 0.0000	2756.61*** 0.0000
P-value Breusch-Pagan Lagrangian test[b]		0.0000	0.0000
P-value Hausman test (FE vs RE)[c]		0.0000	0.0000
P-value Sargan-Hansen[d]		0.5767	0.8467
P-value Hausman test (FE vs HT)[e]		0.9810	0.9626

Notes:

(1) *, **, and *** represent significance at the levels of 10%, 5%, and 1%, respectively
(2) Absolute value of t statistics in parentheses
(3) The definition and measurement of variables follow Table 4.4 and Table 3.2

(4) [a] Test of the null hypothesis that the coefficients in the given equation are all zero (Green, 2011). A low p-value indicates null hypothesis rejection.
(5) [b] Test for random effects (Ho: var (u) = 0 which means there are no random effects). A low p-value indicates null hypothesis rejection.
(6) [c] Test used to differentiate between FE model and RE model (Ho: difference in coefficients not systematic). A low p-value indicates that the FE model is preferred.
(7) [d] Test for over-identifying restrictions of instrumental variables
(8) [e] Test used to differentiate between FE model and HT model (Ho: difference in coefficients not systematic). A high p-value provides evidence favouring the null hypothesis, indicating that the HT model is preferred.

Table 4.7 exhibits the results using the number of active borrowers (NAB, log) to examine the links between micro-savings and breadth of microfinance outreach. We performed a regression in two specifications to examine the linkages between micro-savings and breadth of outreach. Specifically, we used dummy variable $D_{\text{Deposit-taking MFI}}$ in model (1). In model (2), three indicators of micro-savings (net savers, deposits and number of deposit accounts per staff member) and different charter types of MFIs are included.

Firstly, model (1) shows no links between the dummy variable $D_{\text{Deposit-taking MFI}}$ and the breadth of microfinance outreach. Therefore, a further analysis should be focused on the impacts of various dimensions of micro-savings on social performance of MFIs.

It is shown in Table 4.7 that the number of voluntary savers is not statistically related to the number of active clients. However, it is interesting to discover that the total deposits are positively related to the number of active borrowers. These findings strongly confirm theories which suggest that providing micro-savings could benefit MFIs in terms of expanding access to micro-credit clients; accordingly, the breadth of microfinance outreach can be expanded. Our findings are in line with Hartarska *et al.* (2007), Hartarska (2009), Rossel-Cambier (2010) and Bergsma (2011).

With regards to the productivity of deposit taking activity, a significant and positive coefficient is found for the number of deposit accounts per staff member. This result affirms that an improvement in productivity of micro-savings enables MFIs to broaden their breath of outreach by serving more credit clients. It seems sensible to presume that when a staff member manages many deposit accounts, they have information about their microfinance savers. If their existing micro-savers ask for micro loans, the staff member already has much information they need to assess risks. Therefore, it is easier for the MFIs to extend accesses to micro credits to their existing customers. As a result, there is an increase in their active borrowers.

We next move to institutional control variables. Pertaining to charter types, we found that microfinance banks and NBFIs are positively linked to the number of active borrowers (their coefficients are 0.734 and 0.551 and their significance levels are at 0.01 and 0.05, respectively). As presented in chapter 2, micro-banks are the most typical financial intermediations and NBFI is an institution that offers similar services to those of a micro-bank, but an NBFI microfinance provider is licensed under a separate category. By providing a diversified range of microfinance products, such as savings and loans, both of these charter types have a broader social outreach. In particular, micro-banks have the largest magnitude. Our findings reaffirm a point that the diversity of products enables MFIs to extend their breadth of outreach. Our result contradicts Vanroose and D'Espallier (2013) who find a significant negative relationship between banks and breadth of outreach. We do not uncover the link between NGO and the number of active borrowers. Furthermore, the significant negative coefficient for Credit Union/Cooperative denotes that this charter type has small breadth of outreach. Credit Union/Cooperative MFIs are non-profit and member-based financial intermediary

organizations. They are not regulated by a state bank, but they may be supervised by regional or national cooperative councils. Therefore, compared with micro-banks, Credit Union/Cooperative has lower regulatory status, which may hinder them from providing a wide range of services. As a result, their breadth of outreach is smaller. This finding is compatible with Vanroose and D'Espallier (2013) who also discover a positive linkage between Credit Union/Cooperatives and the number of active borrowers.

The significant positive coefficients are also found for *dum*Mature and *dum*Young. These results imply that the experience of MFI does influence microfinance outreach. Experienced MFIs are normally more profitable and they have a good client base. They are therefore more likely to have greater number of active borrowers. As contended by Knei and Mas (2009), when MFIs become older, they normally aim at growing their customer base. Our findings are similar to Hartarska and Nadolnyak (2007), Assefa *et al.* (2013) and Vanroose and D'Espallier (2013).

We further find that gross loan portfolio to total assets is positively linked to the number of active borrowers. This relationship is statistically significant. This means that there is a positive association between the size or the scale of microfinance operation and the breadth of microfinance outreach. The size of an MFI often goes hand in hand with financially sustainability, which has been examined and proved in previous chapter (see part 3.5.1 – Chapter 3) and in many earlier studies. Additionally, large MFIs can source more funding. Moreover, big MFIs are usually part of large networks. Thus, it may be easier for them to reach more active clients. Further, this result also indicates that it may be necessary for MFIs to upscale their operations in order to expand their breadth outreach. A positive link between the size of MFIs and the number of active

borrows is also found in the research of Mersland and Strom (2009), Vanroose and D'Espallier (2013), Mori and Mersland (2014).

Another interesting finding in our research is a significant positive link between the number of reporting years and the number of active borrowers is seen in both models of table 4.7. The number of years that data is reported may reflect the management quality of MFIs in general. It can be inferred that MFIs with good operation will be more likely to be sustainable and hence they have more active borrowers.

Additionally, the significant and positive coefficient for dummy variable *dum*Five-star in model (2) demonstrates that the quality of data matters. The transparency of data is ranked in five levels ranging from one-star (lowest) and five-star (highest). High transparent level of data may reflect a good corporate governance of MFIs. Apparently, MFIs with better data management in particular and better cooperate governance in generally are normally doing well; and as a result they are more able to provide micro credits to many clients. Our result implies that it is necessary for MFIs to improve their data management in order to have a better breadth of outreach.

Regarding the regulatory status of MFIs, it is displayed in model (2) that regulated MFIs are negatively related to the breadth of microfinance outreach, indicating that regulated MFIs serve fewer credit clients than non-regulated ones. This supports the literature that implies that, as MFIs undertake transformation, they start to work more with fewer and less poor customers in order to adhere to regulatory requirements (Hartarska and Nadolyank, 2007). Our finding is similar to the study of Mori and Mersland (2014).

Plus, percentage of women borrowers has a significant and positive association with the breadth of outreach. One of outstanding characteristics of microfinance is targeting female clients who are assumed to be more vulnerable and have lower social status, especially in less developed countries. Therefore, it is reasonable to assume that an increase of female borrowers will lead to an extension of breadth of microfinance outreach. Further, a significant and negative coefficient for PAR30 demonstrates that MFIs with a high ratio PAR30 are more likely to have smaller outreach. This is consistent with theory and empirical literature which suggests that, MFIs with bad portfolio management have impairment loss and become inefficient and less profitable. As a result, they have lower breadth of outreach. Our finding is different from Mersland and Strom (2009) who provide no evidence of PAR 30 and the breadth of outreach.

Regarding regional control variables, it is found that MFIs in East Asia and the Pacific, South Asia and Africa have larger breadth of outreach. In terms of macroeconomic control variables, we observe that GNI per capita and inflation rate positively affect outreach breadth meanwhile deposit interest rates negatively influence outreach breadth. (*Please see Appendix 4.22 for detailed discussion on the relationship between regional and macroeconomic factors and breadth of outreach*).

4.5.2. Linkages between micro-savings and the income-related depth of microfinance outreach

Table 4.8: Impact of micro-savings on the income-related depth of microfinance outreach (dependent variable: Average loan size adjusted by GNI per capita (log)) – Hausman Taylor estimation

Variables	**Notation**	**Dependent variable: LS_GNI (log)**		
		(1)	(2)	(3)
Constant		2.418*** (13.35)	2.165** (2.92)	2.140*** (3.96)
Deposit-taking MFI	$D_{Deposit\text{-}taking}$	0.895 (1.55)		
Regulated MFI	$D_{Regulation}$		-0.00622 (-0.00)	0.287 (0.37)
Net Savers	lnNS		0.0223* (2.35)	0.0024* (2.36)
Deposits	lnDEP		0.0835*** (6.25)	0.0835*** (6.24)
Deposit accounts per staff member	lnDAPS		-0.140*** (-6.20)	-0.141*** (-6.22)
Bank				0.143 (0.69)
Non-governmental organisation	NGO			-0.808* (-2.18)
Non-bank financial intermediation	NBFI			-0.221 (-1.21)
Credit Union&Cooperative	CU_Coop			0.0480 (0.22)
Mature MFI	Mature	-0.0118	-0.102*	-0.101*

		(-0.52)	(-1.97)	(-1.96)
Young MFI	Young	-0.000412 (-0.02)	-0.0971* (02.47)	-0.0968* (02.46)
Gross Loan Portfolio to Total Assets	GLPTA	0.00156*** (5.95)	0.00356*** (4.41)	0.00359*** (4.45)
PAR30	PAR30	-0.00122*** (-3.88)	-0.000255 (-0.71)	-0.000256 (-0.71)
Number of years reporting	lnNYR	0.154 (1.39)	0.314* (2.20)	0.315** (2.68)
Five-star MFI	Fivestar	0.139 (0.84)	0.191 (0.36)	0.0398 (0.14)
One-star MFI	Onestar	0.293** (2.77)	0.534* (2.25)	0.366* (2.30)
Three-star MFI	Threestar	0.035 (0.29)	0.192 (0.84)	0.0602 (0.36)
Middle East and North Africa	MENA	-0.515 (-1.45)	-0.765 (-1.06)	-0.111 (-0.21)
East Asia and the Pacific	EAP	-0.496 (-1.36)	-0.408 (-1.68)	-0.324 (-1.51)
South Asia	SA	-0.551*** (-3.29)	-0.516 (-1.94)	-0.268 (-1.01)
Africa	AFR	0.437 (1.51)	0.586 (1.39)	0.610* (2.39)
Eastern Europe and Central Asia	EECA	1.158* (8.74)	0.469 (0.99)	0.210 (0.83)
Inflation	INF	0.00162* (2.39)	-0.000154 (-0.17)	-0.000225 (-0.24)
GDP growth rate	GDPR	0.00260 (1.86)	-000763 (-0.30)	-0.000737 (-0.29)
Deposit interest rate	DINT	-0.00445*	-0.00979*	-0.00967*

		(-2.44)	(-2.35)	(-2.32)
Observations	Observations	7276	2169	2166
Number of groups		1516	680	677
Wald Chi2 P-value Wald test[a]		287.47*** 0.0000	273.08*** 0.0000	364.39*** 0.0000
P-value Breusch-Pagan Lagrangian test[b]		0.0000	0.0000	0.0000
P-value Hausman test (FE vs RE)[c]		0.0000	0.0000	0.0000
P-value Sargan-Hansen[d]		0.0831	0.6344	0.5791
P-value Hausman test[e] (FE vs HT)		0.7284	0.8058	0.7746

Notes:

(1) *, **, and *** represent significance at the levels of 10%, 5%, and 1%, respectively
(2) Absolute value of t statistics in parentheses
(3) The definition and measurement of variables follow Table 4.4 and Table 3.2
(4) [a] Test of the null hypothesis that the coefficients in the given equation are all zero (Green, 2011). A low p-value indicates null hypothesis rejection.
(5) [b] Test for random effects (Ho: var (u) = 0 which means there are no random effects). A low p-value indicates null hypothesis rejection.
(6) [c] Test used to differentiate between FE model and RE model (Ho: difference in coefficients not systematic). A low p-value indicates that the FE model is preferred.
(7) [d] Test for over-identifying restrictions of instrumental variables
(8) [e] Test used to differentiate between FE model and HT model (Ho: difference in coefficients not systematic). A high p-value provides evidence favouring the null hypothesis, indicating that the HT model is preferred.

Table 4.8 demonstrates the regression results where the average loan size adjusted by GNI per capita (LS_GNI, log) is used as an independent variable to examine the links between micro-savings and depth of microfinance outreach. We performed a regression in three specifications. Specifically, we used dummy variable $D_{\text{Deposit-taking MFI}}$, three indicators of micro-savings (net savers, deposits and number of deposit accounts per staff member) in model (1) and (2) respectively. Finally, in model (3), both three proxies of micro-savings and dummy variables for different charter types of MFIs are included.

It appears from model (1) that there is an insignificant negative link between dummy variable *dum*Deposit-taking and the average loan size. Therefore, we cannot conclude whether or not deposit taking MFIs have deeper income-related depth of outreach in comparison to non-deposit taking ones. Further analyses need to be done by looking at particular aspects of micro-savings shown in model (2) and (3).

The proxy for voluntary micro-savings – the number of net savers – is positively linked to the average loan size. This relationship is statistically significant at the 0.05 level. This result may denote that an increase of voluntary savers would lead to a reduction in the number of less poor clients. In other words, serving more voluntary savers curtails their depth of microfinance outreach. As analysed and proved in Chapter 3 of this thesis, "the number of net savers" is negatively linked to both cost efficiency and financial sustainability. Clearly, voluntary savings are costly. To deal with this issue, MFIs are inclined to extend their services to better off poor and easier-to-reach clients who are presumed to be less risky, less costly and more profitable to serve. By doing so, MFIs that capture voluntary micro-savings enlarge their loan sizes; which leads to a lower depth of outreach. The total deposits were also found to be positively related to the average loan size. The positive significant links between these two proxies for micro-savings are consistent with the theory which suggests that micro-savings benefit their clients. Micro-savings improve customers' well-being, living standard and help to increase their income. Accordingly, they may escape poverty and ask for larger loans from MFIs. In return, MFIs tend to extend their average loan size to better meet their clients' demand. The finding concerning the role of deposits to the depth of outreach is similar to Rossel-Cambier (2010). With regard to the productivity dimension of micro-savings, we however found a negative and significant link between the number

of deposit accounts per staff member and the average loan size. The reason underlying this result may be that an improvement in the productivity of deposit taking activities will result in an enhancement of efficiency. As such, MFIs are more likely to be profitable in order to target the low-end market through providing smaller loans.

Turning towards institutional control variables, we further discover that NGO is negatively related the average loan size (-0.808, significant at the 0.05 level). NGO microfinance institutions are unregulated and operating on a non-for-profit basis. They are more inclined to social mission instead of economic target. Therefore, it is not surprising to observe that NGOs serve more hard-to-reach people who are assumed to be risky and costly by supplying smaller loans compared to other charter types. By doing so, the income-related depth of outreach of NGOs is deepened. In contrast, as micro-banks and NBFIs are commercially oriented, they are more likely to use credit rationing to diminish information asymmetries in the credit market, and thus they deny access to microfinance services to the more poor people. Rather, NGOs may take advantages of their network relationships to extend services to more clients, including the poor. According to Webb *et al.* (2010), it is the embeddedness within multiple informal networks that makes NGOs to work more effectively than micro-banks and other types of MFIs. Our findings support Zeller & Johannsen (2008) and Barry & Tacneng (2014) who also verify that NGOs microfinance institutions socially outperform compared with other charter types.

In addition, we also found that gross loan portfolio to total assets was positively linked to the average loan size. This means that there is a positive association between the size or the scale of microfinance operation and the depth of microfinance outreach. Larger MFIs have more funds and they can offer bigger average loan. Our result

supports the study of Mori and Mersland (2014). This output may imply a trade-off in microfinance industry. To be more specific, when MFIs are commercialising or scaling-up, they tend to shorten their depth of outreach by serving better off poor people who are less risky and more profitable.

Model (2) and model (3) report that the experience of MFIs does influence the depth of microfinance as negative significant coefficients are found for both *dum*Mature and *dum*Young (-0.101 and -0.0968, respectively; both are significant at the 0.05 level). To be more precise, older MFIs are able to reach more poor clients. Our analyses in part 3.5 of chapter 3 also point out that experienced MFIs perform more efficiently and more profitably compared to MFIs that newly enter microfinance market. Moreover, older MFIs are usually part of large microfinance networks. Therefore, older MFIs are more likely to provide small loans to more poor customers so that they can improve their depth of outreach. New MFIs, on the contrary, tend to serve well off clients to deal with costs at the early stage of development. Our findings are in line with Mersland and Strom (2009).

We do not find a link between regulation and average loan size. This is inconsistent with Cull *et al.* (2011) and Mori *et al.* (2014) who discover a positive link between regulation and depth of microfinance outreach. It is contended that regulated MFIs supply larger average loans than unregulated ones. This is rational in that as MFIs transform, they begin to serve less poor clients so as to adhere to regulatory requirements.

Moreover, portfolio quality does matter. In particular, the relationship between PAR30 and average loan is negative and significant, indicating that MFIs with better portfolio quality management tend to serve well off credit clients who are less risky and

more profitable by enlarging their loan sizes. On the contrary, MFIs with worse portfolio quality in terms high PAR 30 ratio are more likely to serve ultra-poor and hard-to-reach clients who are more risky and less profitable. Our result is inconsistent with Mersland & Strom (2009) and Kar (2012) who find no linkages between PAR30 and average loan size.

Another interesting finding in our research is that the number of years reporting positively related to the average loan size. This means that the more years that data of MFIs was reported, the more people of lower poverty level were served; as a result, the depth of outreach could be shortened. Further, MFIs with lower level of data transparency appear to have lower depth of outreach.

In addition, we found that MFIs in Africa and EECA tend to supply larger average loan size and South Asian MFIs tend to offer smaller loans. Further, inflation rate is negatively related to depth of outreach. In contrast, deposit interest rates positively affect outreach depth. (*Please see Appendix 4.23 for detailed discussion on the relationship between regional and macroeconomic factors and depth of outreach*).

4.5.3. Robustness checks

The two-step system GMM estimation results for robustness checks of the links between micro-savings and microfinance outreach are reported in Table 4.8. The diagnostic tests in Table 4.9 show that the model is well fitted with a statistically insignificant test for second-degree serial correlation AR (2). Accordingly, the statistically insignificant Hansen J-statistics for all regression models demonstrate that the utilised instruments are valid as the Hansen J-statistics of over-identifying restrictions tests the null of instruments validity. The results in Table 4.8 are

qualitatively similar to the results presented table 4.7 and table 4.8, which boosts the robustness of previously obtained results.

Table 4.9: Robustness checks for the links between micro-savings and microfinance outreach: Two-step system GMM Estimation.

Variables	**Notation**	**Dependent variable**	
		(1)	(2)
		NAB (log)	LS_GNI (log)
Lag1lnNAB	L.lnNAB	0.756*** (14.41)	
Lag1lnloansize_gni	L.lnLS_GNI		0.438*** (3.61)
PAR30	Par30	-0.00146 (-1.72)	0.000251 (0.51)
Net Savers	lnNS	-0.0270 (-0.64)	-0.0433 (-0.70)
Deposits	lnDEP	0.138** (2.68)	0.158** (2.91)
Deposit accounts per staff member	lnDAPS	0.180* (2.07)	-0.115 (-0.98)
Net Savers x Bank	Ln(NS) x Bank	-0.00760 (-0.12)	0.000565 (0.01)
Net Savers x NGO	Ln(NS) x NGO	0.0779 (1.35)	-0.0603 (-0.63)
Net Savers x CU_Coop	Ln(NS) x CU_Coop	0.0716 (0.91)	-0.0803 (-0.80)
Deposits x Bank	Ln(DEP) x Bank	0.0211 (0.45)	0.00976 (0.19)
Deposits x NGO	Ln(DEP) x NGO	-0.0482 (-0.79)	-0.0880 (-1.46)

Deposits x CU_Coop	Ln(DEP) x CU_Coop	-0.0251 (-0.46)	0.0423 (0.69)
DAPSM x Bank	Ln(DAPSM) x Bank	0.0283 (0.20)	-0.00330 (-0.02)
DAPSM x NGO	Ln(DAPSM) x NGO	0.0279 (0.19)	0.204 (1.21)
DAPSM x CU_Coop	Ln(DAPSM) x CU_Coop	-0.0785 (-0.63)	0.0579 (0.38)
Mature	Mature	-0.608*** (-3.92)	-0.0110 (-0.09)
Young	Young	-0.274 (-1.87)	-0.0475 (-0.41)
Gross Loan Portfolio to Total Assets	GLPTA	0.00858*** (3.77)	0.00714** (3.27)
Percentage of women borrowers	PWB	0.00804*** (3.72)	
GNP per capita	lnGNI	-0.0857 (-1.70)	-0.393*** (-4.68)
Inflation	INF	-0.00477** (-2.90)	0.00123 (0.69)
Lag1GDP growth rate	L.GDPR	0.00301 (0.71)	-0.0107* (-2.33)
Deposit interest rate	DINT	-0.00684 (-0.92)	-0.000567 (-0.08)
Observations	Observations	1604	1891
Number of instruments		486	571
F-test		82.29***	18.52***
AR(1)		Z = -4.29 p-value = 0.000	Z = -4.00 p-value = 0.000
AR(2)		Z = -0.96 p-value = 0.339	Z = 0.57 p-value = 0.571

Hansen J-Statistic		0.994	0.999

Notes:

(1) *, **, and *** represent significance at the levels of 10%, 5%, and 1%, respectively
(2) Absolute value of t statistics in parentheses.
(3) The variables are defined and measured as described in Table 4.4 and Table 3.2.
(4) AR (1) and AR (2) are Arellano-Bond test for first order and second order autocorrelation, respectively.
(5) Hansen J-Statistic test the null hypothesis that the model is correctively specified and the instruments are valid.

4.6. Conclusions

This chapter has investigated the linkages between micro-savings and two core dimensions of microfinance social outreach, namely breadth of outreach and depth of outreach. By employing a large global dataset 1,936 MFIs in 79 countries from the period 2000-2012, we have been able to identify the effects of micro-savings and microfinance outreach. We also undertake some empirical results to check the robustness of our results.

We find no evidence of a linkage between voluntary savings proxied by "net savers" and breadth of outreach. Nonetheless, both "total deposits" and "the number of deposit accounts per staff members" are positively associated with breadth of outreach. Our findings confirm theories which suggest that offering savings may extend access to other microfinance products for the poor, such as micro loans or micro-insurance. As a result, MFIs have more active borrowers. In addition, our study also affirms that MFIs can enhance their breadth of outreach by boosting their productivity in deposit taking activities. Obviously, these findings have implications for microfinance practitioners. Specifically, it is necessary for MFIs to diversify their services and increase productivity to have a better breadth of outreach.

We also obtain important and interesting findings with reference to the influence of micro-savings on income-related depth of outreach. *Firstly*, a positive and significant linkage between 'the number of net savers' and 'the average loan size' primarily indicate that voluntary is expensive. This point is already theoretically verified and also empirically proved in Chapter 3 of this thesis. To cope with cost inefficiency, MFIs that mobilise micro-savings from public tend to serve well off people who are less costly, less risky and more profitable. *Secondly*, a positive and significant relationship is also observed between 'total deposits' and 'the average loan size'. These two findings may imply the benefits that microfinance clients can reap from micro-savings. In particular, micro-savings enhance the well-being of micro-savers in terms of income generating and assets accumulating. When becoming wealthier, they are likely to demand higher loan sizes. These findings are meaningful for policy makers. Specifically, policy makers in less developed and developing countries should set up a flexible framework to make it easier for MFIs to mobilise micro-savings from public. As a result, MFIs can be more sustainable through exploiting savings as a loanable fund; and more importantly, micro-savers can benefit from savings financial products in order to improve their income and well-being. Accordingly, viewing from a macro perspective, poverty rates can be lessened. *Thirdly*, 'the number of deposit accounts per staff member' is negatively connected to 'the average loan size', indicating that MFIs should bolster their productivity in deposits mobilisation so that their depth of outreach is improved.

Besides, more interesting findings are also reported in our research. Banks and NBFI have better breadth of outreach, meanwhile NGOs outperform in terms of depth of outreach. More mature MFIs appear to have better breadth and depth of outreach compared with new MFIs. Plus, larger MFIs have a larger breadth of outreach;

however, their depth of outreach is curtailed when they are scaling up. Our findings also demonstrate that serving more female borrowers enables MFIs to improve their breadth of outreach. Also, MFIs with better portfolio quality have more number of active borrowers but they have a propensity to serve better off clients. Further, MFIs having more number of reporting years appear to have more credit clients and serve easier-to-reach people. The level of transparency of data is shown to matter. Specifically, MFIs with higher level of data transparency tend to have better of outreach. On the contrary, MFIs with lower level of data transparency appear to have lower depth of outreach. Regarding regional factors, larger breadth of outreach goes with MFIs in East Asia and the Pacific, South Asia and Africa. MFIs in South Asia also perform well in terms of depth of outreach, which contrasts with MFIs in Central Asia. Finally, relating to macroeconomic elements, we find that MFIs can improve their breadth of outreach when they are active in countries with high GNI per capita and high inflation. Further, breadth and depth of outreach is shortened if deposit interest rate is decreasing and the inflation rate is rising, respectively.

To conclude, our findings have achieved the primary objective of our research and made a contribution to the existing literature. On the whole, our empirical results provide clear evidence that micro-savings have impacts on both the breadth and income-related depth of microfinance outreach.

At this point, our research work shows that micro-savings have affected both financial performance and social outreach. So, are micro-savings related to another dimension of microfinance performance which is still debatable, known as mission drift and trade-offs between financial performance and social outreach?. This question will be explored in Chapter 5 of this thesis.

CHAPTER 5

MICRO-SAVINGS AND THE MISSION DRIFT/ TRADE-OFFS BETWEEN FINANCIAL SUSTAINABILITY AND SOCIAL OUTREACH

5.1. Introduction

Increasingly, "the forgotten half" micro-savings[45] have been acknowledged for their positive impacts on both microfinance clients microfinance institutions. Micro-savings can enable the poor "to afford acquisitions, smooth consumption over time and self-insure against income shocks" (Berg, 2010). Taking micro-savings can also help MFIs to improve their financial sustainability, cost efficiency and social outreach (Armendariz *et al*., 2005; Bergsma, 2011; Caudill *et al*., 2009; Gingrich, 2004; Maisch *et al*., 2006; Ross-Cambier, 2010; Ross-Cambier, 2011).

There are two hotly debated topics in research on microfinance which involve the trade-offs between financial and social performance of microfinance institutions and mission drift. More specifically, microfinance *trade-off* demonstrates a mismatch between financial sustainability and social outreach of MFIs, which leads to *mission drift* when microfinance institutions swift away from their primary social mission of serving the poor to commercial mission of enhancing profitability (Woller, 2007). Indeed, some empirical studies have found that the goal of financial viability goes against the aim of serving the poor clients or expanding outreach (see, for example,

[45] Micro-savings was first considered as “the forgotten half” of rural finance by Vogel (1984)

Olivares-Pocalo, 2005; Hermes *et al*., 2011; Louis and Baesens, 2013; Im and Sun, 2015; Xu *et al*., 2016). However, some scholars could not find evidence of trade-off in microfinance industry (Gutierrez-Nieto *et al.*, 2009; Mersland and Strom, 2010; Quayes, 2012; Kar, 2013; Louis, Seret and Baesens, 2013; Kar, 2014; Nurmakhanova *et al.*, 2014; Meyer, 2015; Quayes, 2015). As noted by Woller (2007), the answer to the question of trade-offs between financial performance and social outreach relies on the situation. Indeed, some factors have been investigated, such as macroeconomic context or subsidies. Nevertheless, to the best of our knowledge, no empirical studies have been undertaken to test the possible effect of offering micro-savings financial products on the issues of trade-offs and mission drift in microfinance.

It is therefore interesting to examine whether the offering of micro-savings financial products by microfinance institutions helps mitigate any trade-off between financial sustainability and social outreach and mission drift for MFIs that take micro-savings.

This research aims to seek empirical evidence of possible trade-off and mission drift for the context of offering micro-savings. To this end, the more specific objectives of the research are to investigate whether there is a trade-off between sustainability and breadth of outreach and whether there is a trade-off between sustainability and depth of outreach in the context of micro-savings. To be consistent with the aims and objectives of the research, we attempt to answer the general research question: "Do trade-offs between financial sustainability and microfinance outreach and mission drift exist for MFIs that take micro-savings?"

The contribution of this study is threefold. First, the paper fills the gap in the literature of microfinance trade-offs and mission drift. Second, the paper provides more

empirical evidence of microfinance trade-offs and mission drift in the context of micro-savings. Thirdly, compared to other samples used in existing work on microfinance trade-offs; our research employs a large data set which contains 1,233 MFIs[46] active in 79 countries, spanning 13 years from 2000 to 2012; thus, this big panel data set could provide us with richer findings.

The remainder of this paper is structured as follows. Section 5.2 reviews the literature on microfinance trade-off/mission drift and develops some relevant hypotheses. Section 5.3 is concerned with regression model, variables and dataset. Descriptive statistics are reported in Section 5.4. Section 5.5 is the core section of this Chapter where the regression results are discussed. Section 5.6 provides conclusions.

5.2. Relevant literature review and hypothesis development

5.2.1. Mission drift and trade-offs between financial and social performances of microfinance institutions.

5.2.1.1. Concept of microfinance trade-offs and mission drift

Conceptually, trade-off implies the conflict between financial performance and social performance of MFIs. More specifically, the greater focus on financial sustainability and commercialisation has raised concerns about the effects of this process on breadth of outreach (the number of clients) and depth of outreach (the socioeconomic level) in microfinance institutions (Hermes and Lensink, 2007). In other words, financial sustainability hurts social outreach (Otero & Rhyne, 1994; Rhyne, 1998; Ausbergs *et al*., 2010). Specifically, as noted by Von Pischke (1996), the incompatibility between

[46] In this chapter, we only choose MFIs that have the number of reporting years for at least 4 years. Thus, the total number of MFIs used in the dataset is 1,233 MFIs.

financial sustainability and social outreach is evident from common sense or when elucidated by extremes. According to Conning (1999), the underlying reason for trade-offs between outreach and sustainability is the arising costs of monitoring and delegation due to moral hazard between credit clients and credit staff. As stated by Woller (2002), mission drift, which is the flip side of commercialization in microfinance, is the trivialization of social mission with a view to maximizing financial returns over time. To elucidate this point, Hishigsuren (2007) notes that, in order to maximize profitability, MFIs are inclined to offer larger loans to better clients; which, in turn, may result in access denial to more vulnerable and hard-core poor people. Supporting this viewpoint, Armendáriz *et al*. (2010) refers mission drift to a phenomenon whereby MFIs extend their average loan sizes over time by reaching out of better off customers neither for progressive lending nor for cross-subsidization grounds. They also express that mission drift transpires when an MFI transforms from being a non-for-profit to a for-profit MFI, and during this process it moves to serve wealthier customers by enlarging its average loan size. Furthermore, according to Cull *et al*. (2007), mission drift is defined as switch in the composition of new clients, or a retargeting from poorer to better off clients among current clients. Epstein *et al*. (2010) explains that mission diffusion initially takes place when MFIs aim at offering a diversity of services and products and adjusting the interests of stakeholders. More severely, mission drift occurs as a consequence of commercialisation and scaling-up in order to achieve financial self-sufficiency (Christen, 2001; Hamada, 2010).

It should be noted that “trade-off” and “mission drift” are two distinct concepts which are clearly described by Woller (2007). According to Woller (2007), offering microfinance services to the poor and hard-to-reach clients necessitates higher costs and

lower per unit return. Consequently, it is more difficult for MFIs to scale up. This trend reflects a trade-off inheriting in the relationship between social and financial performance of microfinance institutions. This trade-off induces MFIs to move to higher end market and exclude their traditional poor customers, implying a phenomenon known as mission drift. Copestake (2007) defines mission drift as "*ex post* changes in stated preferences to fit unplanned performance outcomes". Generally speaking, mission drift is a dynamic process reflecting a shift in the aims and objectives of MFIs over time. It may often take place when there is a transformation in ownership structure which leads to de-emphasis on breadth and depth of outreach. The trade-off between financial sustainability and social outreach is essentially static in the short run (if it exists), but may shift over time. Mission drift may occur whether there is a trade-off or not.

5.2.1.2. Theoretical framework for the possible trade-offs/mission drift in the context of microsavings and hypothesis development

As microfinance trade-offs/mission drift concern both financial performance and social outreach, *theories of financial intermediation* are also theoretical background for the possible trade-offs/mission drift in the context of microsavings. As thoroughly discussed in Chapter 3 and Chapter 4 of this thesis, financial intermediaries can improve their operational efficiency and accordingly, they can achieve financial sustainability by taking advantage of economies of scale and scope when they offer both savings and credit services. In addition, financial intermediaries can help to deal with two issues of asymmetric information, namely adverse selection and moral harzard. Based on the records of their savings customers, financial intermediaries can facilitate the credit screening process. Further, they can increase their client base as today's savers may

become tomorrow's borrowers. Also, cost-efficient and profitable financial intermediaries are more likely to make use of their loanable funds in order to extend their breadth of outreach through serving more credit clients. Based on these theoretical underpinnings, I form hypotheses relating to the role of microsavings on microfinance trade-offs/mission drift as below.

- ✓ *Hypothesis 1: There are no trade-offs between financial sustainability and breadth of microfinance outreach for MFIs that take micro-savings.*
- ✓ *Hypothesis 2: There is no mission drift for MFIs that take micro-savings.*

Transaction costs, as contended by Mishkin (2004), are one main issue of financial market. Transaction costs encompass any direct costs, as well as any concomitant inefficiencies in production or misallocation that resulted from them (Allen, 1991). Transaction costs have a fixed cost component in order that unit costs for smaller deposits or smaller loans are high in comparison to larger financial transactions. Thus, transaction cost reduction goes with transaction size enlargement. Further, according to Dowla and Alamgir (2003), offering fixed contractual savings and time deposits might benefit MFIs in terms of financial sustainability. The long-term deposits imply more stable capital, ensuring liquidity for MFIs. Nonetheless, long-term deposits are more costly and they go counter to microfinance members' inclination towards accessible and liquid savings. Better-off among the members and non-members will be the source of demand for long-term deposits. Cost considerations might induce MFIs to collect savings from better off members by supplying other financial products besides long-term and contractual savings. These deposits will be more stable, which leads to less frequent account movement and helps to lessen the effective costs of savings collection. Thus, the lower transaction costs of mobilising deposits from the better off members

might prompt MFIs to sidestep their original social mission and mobilise savings mainly from the better off among the poor. Based on the literature, I would expect deposit-taking MFIs to suffer more from the trade-offs between financial sustainability and depth of outreach compared to non-deposit taking MFIs. Accordingly, the following hypothesis is set up.

- ✓ *Hypothesis 3: There are trade-offs between financial sustainability and income-related depth of microfinance outreach for MFIs that take micro-savings.*

5.2.1.3. Empirical evidence of microfinance trade-offs between financial and social performance of MFIs and mission drift.

Empirical evidence has found mixed findings trade-offs between financial performance and social outreach in microfinance industry. According to Reichert (2016), studies utilising the MIX Market datasets are found less likely to prove evidence of trade-offs, meanwhile research using an economic frontier approach and efficiency indicators are more likely to affirm trade-offs in performance of MFIs.

Olivares-Polanco (2005) is one of the earliest researchers to empirically explore whether commercialization leads to trade-offs based on a data set of 28 MFIs in Latin America for the 1999-2001 period. The author uses depth of outreach as a dependent variable which is proxied by three measures, namely Average Outstanding Loan (AOL)[47], Average Outstanding Loan to per capita Gross Domestic Product of the 20%

[47] Average outstanding loan (AOL) = Outstanding loan portfolio/The number of active clients

poorest (AOL/PCGDP20%)[48], and US$-years loan/$-years income 20%[49]. Firstly, they find that more experienced MFIs supply smaller average loan size. Secondly, their findings demonstrate that MFIs active in more competitive environment tend serve wealthier clients. Thirdly, their result also shows that profitability in terms of ROA is positively related the average loan size. On the whole, the findings of Olivares-Polanco (2005) have a clear implication for a trade-off between profitability and depth of outreach.

Ferro Luzzi and Webber (2006) measure performance of 45 MFIs surveyed by the Graduate Institute of Development Studies of Geneva for the period 1999-2003 by employing Factor Analysis (FA) modelling technique. In particular, outreach performance dimension is established by five variables, namely female borrowers, lending methodology, poverty criteria, collateral and average loan size. Financial sustainability is measured by Operational Self-Sufficiency (OSS). After that, a seemingly unrelated regression (SUR) model was fitted on the social outreach and financial sustainability dimension scores calculated by FA. Their regression outputs demonstrate that MFIs often face some obstacles to achieve financial sustainability when striving for outreach expansion. The authors are therefore convinced that there are times when trade-offs between social outreach and financial viability are unavoidable.

To investigate global evidence of trade-offs, Cull *et al*. (2007) make use of a data on 124 MFIs from 49 countries between 1999 and 2002. To measure "financial profitability", the authors use three variables including Operational Self-Sufficiency

[48] AOL/PCGDP20% = AOL/Per capita GDP of the 20% poorest

[49]
$$\text{\$-years loans/\$-years income 20\%} = \text{AOL} \times \frac{12}{\dfrac{\text{Average term to maturity}}{\text{Per capita GDP of the 20\% poorest} / 2}}$$

(OSS), Financial Self-Sufficiency (FSS), and adjusted returns on assets (ROA). The independent variables are the real gross portfolio yield, capital costs relative to assets, labour costs to assets, lending technology, the age of MFIs, size of MFIs, the ratio of loans to assets, the average loan size per capita GNP, a dummy variable reflecting the institution's formal profit status, and region variables. Their findings firstly show that MFIs still can be profitable while serving the poor. Nonetheless, a trade-off occurs between profitability and reaching the poorest.

Cull *et al*. (2011a) develop their area of interest by employing a larger data set of 346 institutions in 67 countries covering from 2002 to 2004. They adopt a similar methodological approach that was used by Cull *et al.* (2007). The research group focuses on the linkage between trades-offs and commercialization, regulations and financing. Firstly, they find that NGOs serve poorer clients and more women compared with NBFIs and banks. Based on this finding, the authors affirm evidence of trade-off between financial sustainability and social outreach. Cull *et al.* (2011a) also unearth that MFIs under stricter and more frequent supervision appear to be as financially viable as other MFIs although they have to bear higher supervision costs. On the contrary, regulatory supervision makes MFIs to enlarge the average loan size and lessen the number of female clients. Thus, regulated MFIs are more likely to have trade-offs. Further, to compete with commercial banks that are entering microfinance industry, MFIs are inclined to tap into low-end markets by reducing the average loan size and serving more female borrowers. On the whole, the findings of Cull *et al* (2011a) demonstrate that types of MFIs and regulatory supervision have a role on the existence of trade-offs between financial sustainability and social outreach.

Cull *et al*. (2011b) further examine the impact of regulatory supervision on both microfinance profitability and social outreach. Their analysis is based on a newly-constructed data of 245 high-quality MFIs. Similar to previous researches in Cull *et al.* (2007) and Cull *et al.* (2011a), this study also reveals that regulatory supervision makes MFIs to reduce the number of female borrowers in order to maximize profitability. This finding reaffirms the belief that regulatory supervision can lead to a trade-off between financial sustainability and social outreach.

Evidence of trade-offs between efficiency and social outreach is also proved by Hermes, Lensink and Meesters (2011). They employ a sample of 435 MFIs over a period from 1997 to 2007. The authors set up a cost function and employ stochastic frontier analysis (SFA) to identify a cost frontier and specify influencing factors. Their findings show that MFIs that supply smaller average loans sizes and serve more female clients appear to be less efficient. Thus, Hermes *et al.* (2011) give clear evidence of a trade-off between the social outreach and efficiency in microfinance

Louis and Baesens (2013) test the hypothesis that for-profit MFIs are being more cost efficient and, thus, might achieve better social performance while being financially sustainable. To test this hypothesis, a general estimating equations framework is used in order to correct for the correlations with each cluster. Their analyses are based on a comprehensive longitudinal data set spanning from 1996 to 2010 and covering six regions, 70 countries and 456 MFIs. Their findings could not support their hypothesis, which means that MFIs registering as being for-profit cannot achieve their dual missions at the same time.

Armendariz *et al.* (2013) attempt to examine whether there is a relationship between subsidy uncertainty and mission drift. To this end, the authors use data from

230 MFIs active in 60 countries over the 1999-2006 periods. They find that subsidy uncertainty is positively linked to the interest rates charged to borrowers, which means that uncertain subsidised-MFIs tend to serve wealthier clients.

Recently, Im and Sun (2015) explore the relationship between profits and outreach to the poor. Their empirical analysis was based on a multilevel mixed model and a data set of 1,129 MFIs across 98 countries spanning from 2003 to 2009. Depending on the institutional logics perspective, their study predicts that MFIs following commercial logic are more likely to pursue profitability instead of expanding social outreach; in contrast, MFIs following social-welfare logic are inclined to tolerate relatively low profitability and attempt to improve their outreach. Therefore, it can be inferred from these findings that a trade-off between financial profitability and social outreach does exist.

Microfinance trade-offs and mission drift are debatable and indecisive. Notwithstanding the evidence of trade-off and mission drift observed on the earlier studies, some scholars find that there is no mismatch between financial sustainability and social outreach. Based on a data set of 379 MFIs in 74 countries covering the period from 1998 to 2008, Mersland and Strom (2010) perform regression applying general methods of moment (GMM) estimations together with other panel data methods including fixed effects, random effects, first difference and instruments. Primarily, their finding shows that an increase in average loan size leads to a rise in average profits and average operational costs. It is also observed that; the significant economic impact of average operational costs on average loan size is higher than that of average profits, indicating that profits and costs may balance out each other. Therefore, the authors assert that trade-offs do not occur. Also, the researchers utilise logistic regression to

examine three other proxies for depth of outreach, namely lending methodology, rural market and female clients. They unearth that MFIs with higher average costs are likely to serve fewer women; however, they have more individual and urban clients. In other words, MFIs may improve cost-efficiency by making use of group-based lending and serving more rural and women borrowers. Thus, cost efficiency is compatible with social outreach. Mersland and Strom (2010) come to a conclusion that mission drift does not exist.

Bassem (2012) discovers that microfinance providers can well and truly achieve both financial and social objectives and thus fulfil their "ultimate promise". Their analysis was based on a sample of 64 microfinance institutions of the Middle East and North America region, from 2008 to 2010.

Drawing on a large cross-section data on 702 MFIs operating in 83 countries for the year 2006, Quayes (2012) provides empirical evidence of a harmony between financial sustainability and depth of outreach. Their results indicate that financial sustainability positively affects the depth of outreach for the high-disclosure MFIs. In return, a better depth of outreach also leads to better financial self-sufficiency for high-disclosure MFIs.

Employing a unique technique called self-organizing maps (SOM) to encapsulate the existing heterogeneity among institutions; Louis *et al.* (2013) investigate the relationship between social outreach and financial sustainability. Their analysis is based on a global data set of 650 MFIs. They find no evidence of trade-offs. In contrast, their findings exhibit compatibility between social outreach and financial performance.

Nurmakhanova *et al.* (2014) utilise data set of 450 MFIs from 71 countries over period 2006-2008. In their study, financial sustainability is measured by operational self-sufficiency (OSS); the depth of outreach is measured by the average loan balance per borrower over GDI per capita. Further, the percentage of female borrowers and the number of active borrowers are two proxies for the breadth of outreach. Their analysis is based on a limited information maximum likelihood procedure. Their overall findings indicate that focusing on financial sustainability does not necessarily hurt the depth and breadth of outreach. Interestingly, they find that deposit-taking MFIs tend to serve well-off (less risky and more profitable) clients and have less number of active borrowers, which means that MFIs that take micro-savings are more susceptible to the trade-off between financial sustainability and depth/breadth of outreach.

Most recently, Quayes (2015) uses a panel of 764 MFIs from 87 countries for the period 2003-2006 to examine the issue of microfinance trade-off. He found that financial achievement goes hand in hand with depth of outreach which is proxied by average loan balance. This is particularly true for MFIs that have attained a high level of disclosure or higher level of accountability.

To summarise, this survey of empirical literature indicates that the existence of mission drift and trade-offs between financial sustainability and microfinance outreach is contested. Previous studies examine microfinance trade-offs/ mission drift in various context, including competition, lending type, women borrowers, disclosure, subsidies, mission of microfinance operation, experience of MFIs, regulatory supervision, and macroeconomic context. Indeed, no research has concerned micro-savings and microfinance trade-offs/mission drift. This heterogeneity of results raises a need for more empirical evidence of this topic, especially in the context of micro-savings.

Moreover, samples used in previous studies of microfinance trade-off had various time periods, spanning from 1 year to maximum 11 years. Also, some researchers only utilised one observation per MFI rather than panel data in their analysis (Cull *et al.*, 2007; Gutierrez-Nieto, 2009; Quayes, 2012; Lebovics et *al.*, 2016). To highlight the importance of changes over time in the study of microfinance trade-offs, Cull *et al.* (2007) assert that "cross-sectional data are not ideal for addressing mission drift since the issues inherently involve adaption over time" (p. 127). In my study, a global panel data set of 1,233 MFIs active in 79 countries spanning 13 years is used to examine the possible trade-off and mission drift between financial sustainability and social outreach in the context of micro-savings.

Table 5.1 summarises earlier studies on microfinance trade-offs and mission drift.

Table 5.1: Summary of empirical research on microfinance trade-off/mission drift

Study	Methodology	Data set (Source, number of MFIs, number of countries, period)	Outreach variables	Financial impact variables	Findings
Olivares-Polaco (2005)	OLS	MIX Market, 28 MFIs in Latin America, 1999-2001	Average Outstanding Loan (AOL); AOL to per capita GDP of the lowest 20%; USD-years loan/income of the lowest 20%.	Return on assets (ROA)	There's a trade-off between depth of outreach and sustainability.
Cull, Demirguc-Kunt and Morduch (2007)	OLS	MIX market, 124 MFIs, 49 countries, the database contains one observation per institution from 1999-2002, 70% of the observations are from 2002.	Average loan size over GNP per capita, Average loan size over GNP p.c poorest 20%; Percentage of women borrowers	Financial Self-Sufficiency (FSS)	Possibility of earnings profits while serving the poor, but a trade-off emerges between profitability and serving the poorest
Gutierrez-Nieto et al. (2009)	Data Envelopment Analysis (DEA)	MIX market, 189 MFIs, unknown number of countries, 2003	DEA outputs: number of active women borrowers, indicator of benefit to the poorest	DEA outputs: gross loan portfolio, financial revenue	Positive but low correlation between social efficiency and financial efficiency. With one exception, no socially efficient but financially inefficient MFIs are found.
Mersland and Strom (2010)	Fixed effects, Random effects, first difference, logistic regression	Rating fund, 379 rated MFIs in 74 countries, 1998-2008	Average loan size; Main market; lending methodology; gender bias dummy	Average profit; average operation cost	Cannot evidence of mission drift
Hermes, Lensink, Meesters (2011)	Stochastic frontier analysis (SFA)	MIX Market, 435 MFIs, 1997-2007	Average loan size; Percentage of female borrowers	Cost function: total costs	MFIs that have better depth of outreach are less efficient.
Bassem (2012)	Generalised Least Squares (GLS)	MIX Market, 64 MFIs of the Middle East and North Africa region, 2008-2010	Social range index, Percentage of female borrowers	ROA, ROE, OSS	MFIs can well and truly achieve their double objective.

Quayes (2012)	OLS, logistic regression, 3SLS	702 MFIs in 83 countries, 2006	Average loan size/GNI per capita; Percentage of women borrowers; number of active borrowers	FSS, OSS	A positive complementary relationship between financial sustainability and depth of outreach
Armendariz et al (2013)	Seemingly unrelated regression	MIX Market, 230 MFIs in 60 countries, 1999-2006	Interest rate; Average loan balance/GNI per capita	Subsidy uncertainty	Subsidy uncertainty leads to mission drift
Kar (2013)	Random Effects (Error components 2SLS)	MIX Market, 409 MFIs in 71 countries	Average loan size to GNI per capita, Percentage of women borrowers	FSS, ROA	No trade-off between profitability and depth of outreach
Louis and Baesens (2013)	Generalised estimating equations panel data approach	MIX Market, 456 MFIs in 70 countries, 1995-2010	Average loan size per borrower/GNI per capita; Percentage of women borrowers, Dummies for breadth of outreach	Real yield on gross loan, ROA, return on equity (ROE)	A lower depth of outreach and less outreach to women are associated with for-profit MFIs. This implies a trade-off.
Louis *et al*. (2013)	Self-Organizing Maps	MIX Market, a global sample 650 MFIs, the year 2011	Depth of outreach (Low-High), Outreach to women (Low-High), Breadth of outreach (small-medium-large)	Yield, Profit margin, gross loan portfolio to assets, costs of loans, portfolio at risk > 30 days, debt to equity ratio	No trade-offs. A significant, positive association between social outreach and financial performance
Adhikary and Papachristou (2014)	OLS, Random Effects, GMM	MIX Market, 113 MFIs from 6 countries in South Asia, 2003-2009	Average loan size per GNI per capita, percentage of women borrowers	OSS, ROA	A financially sustainable microfinance expansion can achieve its social goals at an acceptable credit risk level
Kar (2014)	Fixed effects 2SLS and EC2SLS	MIX Market, 379 MFIs in 71 countries, 2003-2008.	Average loan size to GNI per capita, average loan balance per borrower; Percentage of women borrowers	Cost per dollar lent, FSS	No trade-off
Lebovics, Hermes and Hudon (2014)	Data Envelopment Analysis (DEA) and multivariate	MIX Market and Vietnam Microfinance Working Group, 28 Vietnamese MFIs, year 2011	DEA outputs: Poverty outreach, number of depositors	DEA outputs: gross loan portfolio, financial revenue	For Vietnamese MFIs, social and financial performance are not related.

	analysis				
Nurmakhanova, Kretzschamar and Fedhila (2014)	Limited information maximum likelihood procedure	MIX Market, 450 MFIs, 71 countries, 2006-2008.	Average loan per GDP per capita, Percentage of female borrowers, number of active borrowers	Operational Self-Sufficiency (OSS)	Focusing on financial sustainability does not necessarily hurt the depth and breadth of outreach.
Im and Sun (2015)	A multilevel quantitative approach	MIX Market, 1,129 MFIs in 98 countries, 2003-2009.	Average loan balance over gross national income (GNI) per capita	ROE	Possible trade-off
Quayes (2015)	2SLS, FE, RE, HT	MIX Market, 764 MFIs in 87 countries, 2003-2006	Average loan balance/GNI per capita	Profit margin, ROA, OSS	Greater depth of outreach has a positive impact on the financial performance of MFIs
Xu, Copestake and Peng (2016)	FE, RE	MIX Market, 218 MFIs in 76 countries, 2001-2011	Average loan balance/GNI per capita	OSS, ROE, Financial Revenue/Assets	Mission drift exists

Source: *Studies are identified and reviewed by the researcher. The identification of studies is necessarily selective, but carefully covers the main findings relating to microfinance trade-offs/mission drift.*

5.3. Regression model, variables and description of dataset

5.3.1. Regression model

The above hypotheses can be represented by the following model:

$$\mathrm{OUT_{it}} = \alpha \mathrm{OUT}_{it-1} + \sum_{j=1}^{J} \beta_j \, \mathrm{MFI}Per_{it}^{j} + \sum_{k=1}^{K} \beta_k \mathrm{SAV}_{it}^{k} + \sum_{l=1}^{L} \beta_l \, \mathrm{MFI}specific_{it}^{l} + \sum_{m=1}^{M} \beta_m \, \mathrm{MACRO}_{ct}^{m} + \varepsilon_{it} \qquad (5.1)$$

Where $\mathbf{OUT}_{it}$ is a set of outreach measures for the MFI i at time t; with i = 1,2,…, N; t = 1,2,…, T; $\mathbf{MFI}Per_{it}$ is a set of financial performance measures**;** $\mathbf{SAV}_{it}$ is a set of variables measures micro-savings; $\mathbf{MFI}specific_{it}$ is a set of institution-specific variables; $\mathbf{MACRO}_{ct}$ is a set of macroeconomic country-specific variables; $\varepsilon_{it} = \upsilon_i + \mu_{it}$ is an error term that includes υ_i - the unobserved complete set of individual MFI-specific effects, and μ_{it} – the idiosyncratic error.

There are possible interactions between micro-savings and other institutional-specific variables that could come into play. Therefore, to have a thorough examination of the possible trade-off in the context of micro-savings, we created an interaction by multiplying net savers, volume of deposits, and the number of deposit accounts per staff member by dummy variables in terms of legal status (bank, NGO, NBFI, Credit Union and Cooperatives). We also created interactive terms between dummy variable for deposit-taking MFIs (*dum*Deposittaking) and level of financial intermediation (*dum*HighFI, *dum*LowFI) with other variables, such as OSS, *dum*ProfitMFIs and *dum*RegulatedMFIs.

5.3.2. Variables

In this chapter, variables used in our analysis are similar to those of Chapter 3 and Chapter 4. The definition and measurement of these variables have been well presented in the two previous chapters. To avoid replicates, variables used in this chapter are summarized in Table 5.2.

Table 5.2: Summary of definition and measurement of variables in this chapter

Variable	Notation	Measure	Source
Dependent variables: Outreach (OUT_{it})			
Number of active borrowers	NAB	Number of active borrowers	The MIX
Average loan size_GNI	LS_GNI	Average loan balance per borrower[50]/GNI per capita	The MIX
Independent variables:			
MFIPer_{it}			
Operation Self-Sufficiency	OSS	Financial Revenue / (Financial Expense + Impairment Loss on Loans + Operating Expense)	The MIX
Operating expenses to assets	OEA	Operating expenses/ Assets	The MIX
Portfolio at risks > 30 days	PAR30	Portfolio at risks > 30 days/ Gross Loan Portfolio	The MIX
SAV_{it}			
Net savers	NS	Number of active savers – Number of active borrowers	The MIX
Deposits	DEP	Total Deposits	The MIX
Deposit accounts per staff member	DAPSM	Number of deposit accounts /Personnel	The MIX
Deposit-taking MFIs	$D_{\text{Deposit-taking MFI}}$	Dummy variable equal to 1 if the MFI takes deposits and 0 otherwise	The MIX
Institution-specific controls (*MFI$specific_{it}$*)			
Gross loan portfolio to total assets	GLPTA	$\frac{\text{Gross loan portfolio}}{\text{Total Assets}}$	The MIX
Self-sustainability	*dum*SUS	Dummy variable is 1 if the MFI is self-sustainable and	The MIX

[50] Average loan balance per borrower = Gross loan portfolio/Number of active borrowers

		0 otherwise	
High Financial Intermediation	*dum*HighFI	Dummy variable is 1 if the MFI has total volume of savings more than 20% of total assets and 0 otherwise	The MIX
Low Financial Intermediation	*dum*LowFI	Dummy variable is 1 if the MFI has total volume of savings less than 20% of total assets and 0 otherwise	The MIX
New	*dum*New	Dummy variable is 1 if the MFI is in operation from 1 to 4 years and 0 otherwise	The MIX
Young	*dum*Young	Dummy variable is 1 if the MFI is in operation from 5 to 8 years and 0 otherwise	The MIX
Mature	*dum*Mature	Dummy variable is 1 if the MFI is in operation more than 8 years and 0 otherwise	The MIX
Regulated	*dum*Reg	Dummy variable is 1 if the MFI is regulated and 0 otherwise	The MIX
For-profit	*dum*Profit	Dummy variable is 1 if the MFI is for-profit and 0 otherwise	The MIX
Macroeconomic country-specific variables (*MACRO$_{it}$*)			
Inflation	INF	The annual inflation rate of the country where the MFI is active	WDI
GDP Growth rate	GDPR	The GDP per capita growth expressed in annual percentage	WDI
GNI per capita	GNI	The per capita gross national income of the country where the MFI is active (using World Bank Atlas method)	WDI
Deposit interest rate	DINT	The rate paid by commercial or similar banks for demand, time, or savings deposits	WDI

The signs of the finance and micro-savings coefficients on the breadth and depth of outreach are expected as follows.

Table 5.3: Expected signs of finance and micro-savings on the breadth and depth of outreach

	NAB (Breadth of outreach)	LS_GNI (Depth of outreach)
OSS	Positive	Negative
OEA	Positive	Negative
PAR30	Indeterminate	Indeterminate

Dummy Deposit-taking MFI	Positive	Positive
NS	Positive	Positive
DEP	Positive	Positive
DAPSM	Positive	Negative

5.3.3. Description of dataset

The MFI data used in this study are collected from the Microfinance Information Exchange (MIX) database (http://www.themix.org/). The participation in the MIX data base is voluntary. Hence, the data set is not representative of all microfinance institutions and could be skewed towards MFIs that stressed financial objectives (Cull, Demirguc-Kunt, and Morduch, 2009). Despite this disadvantage, Hermes, Lensink, and Meester (2011) contended that the MIX data is the best and most popular data source for research on microfinance for some reasons. First, the data are adjusted following international accounting standards (Cull *et al*., 2009). Second, this web-based platform contains the most extensive and reliable cross-country financial and social performances as well as characteristics of MFIs (Quayes, 2015). In addition, we gather data on country-level variables from World Development Indicators to complete the MIX data (http://data.worldbank.org/data-catalog/world-development-indicators). Our sample contains 1,233 MFIs active in 79 countries covering all regions worldwide from 2000 to 2012. Only MFIs that have data for at least four years are included in our sample. Both deposit taking MFIs and non-deposit taking MFIs are also included in our dataset in order to avoid sample selection bias.

5.3.4. Methodology

In this research work, two-step system GMM estimation is applied for reasons explained below.

MFI social outreach is predicted in linear regressions by a set of variables that captures the impact of micro-savings as well as the MFI-specific variables and macroeconomic country-specific control variables. When estimating equation (5.1), some econometric problems may arise:

Firstly, endogeneity may occur due to a possibility of reverse causation. Causality may run in both directions: from social outreach to financial performance. For example, it is possible that financially sustainable MFIs with better sources of loanable funds are more likely to serve more active borrowers and reach poorer and hard-to-reach people who are assumed to be more costly and risky to serve. However, the causality could also run in the opposite direction, MFIs with better social outreach can become more financially sustainable. This reverse causality may make regressors correlate with the error term in equation (5.1).

S*econdly*, time - invariant variables (fixed effects) may be correlated with explanatory variables. These fixed-effects are contained in the error term ε_{it} in equation (5.1), which consists of the unobserved institution-specific effects υ_i and the idiosyncratic error μ_{it}.

Thirdly, the presence of the lagged dependent variable OUTr_{it-1} gives rise to autocorrelation.

Fourthly, the panel dataset has a short time dimension (T = 13 years) and a large MFI dimension (N = 1,233 MFIs worldwide). If the panel dataset has a long

time dimension, the impact of shocks on firm's fixed effects and the endogeneity problem would reduce. Similarly, the correlation of the lagged dependent variable with the error term will be insignificant.

The aforementioned econometric problems can be solved by using Arellano-Bond generalized method-of-moment (GMM) estimators. To clarify this, as summarized by Roodman (2009), Arellano-Bond generalized method-of-moment (GMM) estimators are generally designed for situations with (1)"small T, large N" panels; (2) a linear functional relationship; (3) one left-hand-side variable that is dynamic, depending on its own past realisations; (4) independent variables that are not strictly exogenous, meaning they are correlated with past and possibly current realizations of the error; (5) fixed individual effects; and (6) heteroscedasticity and autocorrelation within individuals but not across them.

5.4. Descriptive Statistics

Table 5.4 presents the summary statistics of variables of the whole sample that enter the analysis. For Operational Self-Sufficiency (OSS), values below 100% demonstrate that the respective MFI is not doing very well in terms of generating cost-covering revenue. The mean value of Operational Self-Sufficiency (OSS) of MFIs in the sample for the period 2000-2012 was 117.031%. Therefore, we could assume that most of the MFIs in the sample are financially sustainable. The mean value for operating expenses to total assets is roughly 18.29%, which is quite similar to those found by Kar (2012). Moreover, the average default rate in terms of portfolio-at-risk more than 30 days (PAR30) is approximately 7.3%, which is quite similar to the findings of Mersland and Strom (2010). Regarding institutional experience, 65.24% of MFIs in the data set are mature, which means that they have

been active for more than 8 years in the microfinance industry. About 63.18% of MFIs in the whole sample are regulated. 48.33% of MFIs have savings although not all MFIs sampled are regulated. This may be because in some MFIs savings may be part of group lending technology (Hartarska and Nadolnyak, 2007). The mean value for NAB variable confirms that the average number of active borrowers of MFIs is 62,060 persons. In addition, the mean value of net savers of MFIs is 87,300 persons. The average loan size adjusted GNI per capita 81.617%. A median of 32.55% and a high standard deviation (301.78%) demonstrate that the average loan's distribution is skewed heavily to the low end (more small loans, but with a long tail at the high end of large loans). About 62% of MFIs in the whole sample are non-for-profit organisations which focus on social mission rather than financial mission.

Table 5.4: Descriptive statistics of all variables

Variables	Obs	Mean	Median	Std.Dev	Min	Max
OSS	8429	117.0301	112.02	64.79865	.24	1938.29
OEA	7456	18.29457	14.01	16.10844	.02	474.36
PAR30	6920	7.386873	4.095	15.69919	.01	711.43
Active borrowers	8557	62,060.22	8404	359,404	1	6,710,000
Loan size_GNI	8512	81.61765	32.55	301.7855	.02	13,822.17
Net savers	2395	87,300.49	11,300	368,635.3	1	6,369,293
Deposits	3444	7.12e+07	3349647	7.22e+08	155	2.90e+10
Deposit accounts per staff member	2944	293.8852	207	334.0583	1	5602
Gross loan portfolio to total assets	8820	81.53341	77.975	264.7588	.07	12681.57
Regulated MFI	8977	.6318369	0	.4823328	0	1

Deposit-taking MFI	16029	.4833115	0	.499737	0	1
High FI	11717	.2352991	0	.4242037	0	1
Low FI	11717	.0578646	0	.2334973	0	1
Profit MFI	8924	.3863738	0	.4869452	0	1
Mature	8949	.6524751	1	.4762107	0	1
Young	8949	.2063918	0	.4047376	0	1
New	8949	.1411331	0	.3481782	0	1
Bank	9077	.0924314	0	.28965	0	1
CU_Coop	9077	.1498292	0	.3569236	0	1
NBFI	9077	.3171753	0	.465402	0	1
NGO	9077	.3691748	0	.482608	0	1
GNI per capita	15782	2,124.944	1,210	2,292.268	80	14,310
Inflation rate	15870	8.810567	6.422585	15.57998	-20.63	515.7774
GDP rate	15876	5.316472	5.091984	3.865936	-47.56	34.5
Deposit interest rate	15521	6.996912	6	5.780659	0	140

Note: The variables of this chapter are defined and measured in Table 5.2

Table 5.5 lists correlation coefficients for the variables in the study. Most notably, operational self-sufficiency, the number of net savers, total deposits and the number of deposit accounts per staff member are all positively and significantly correlated with breadth of outreach measure. This is perhaps an indication that there are no trade-offs between financial sustainability and breadth of outreach for MFIs that take micro-savings. Also, it is shown in table 5.5 that operational self-sufficiency, the number of net savers and total deposits are all positively correlated with the average loan size while the number of deposit accounts per staff member is negatively correlated with average loan size. These correlations may indicate a

complexity in the story of mission drift and trade-offs between financial sustainability and depth of outreach for MFIs that take micro-savings.

Table 5.5: Correlation matrix of variables used in the sample

	OSS	OEA	Par30	NAB	LS_GNI	NS	DEP	DAPSM	GLPTA	Reg	Mature	New	Young	YR	Bank	CU_Coop	NBFI	NGO	GNI	IFL	GDP	DIR
OSS	1.0 8429																					
OEA	-.38* 7452	1.0 7456																				
Par30	-.17* 6817	.003 6311	1.0 6290																			
NAB	.09* 8048	-.12* 7211	-.07* 6862	1.0 8557																		
LS_GNI	.09* 8027	-.27* 7196	.005 6860	-.24* 8512	1.0 8512																	
NS	.06* 2356	-.15* 2254	.02 2100	.64* 2374	.25* 2368	1.0 2395																
DEP	.19* 3313	-.36* 3103	-.03 2776	.58* 3237	.44* 3225	.73* 2390	1.0 3444															
DAPSM	.13* 2911	-.24* 2788	.06* 2636	.12* 2914	-.07* 2911	.42* 2277	.17* 2889	1.0 2944														
GLPTA	.01 8391	-.21* 7439	-.02 6860	-.04* 8399	.03* 8382	-.14* 2383	-.08* 3416	-.01 2933	1.0 8820													
RegMFI	.03* 8342	-.17* 7378	-.02 6882	.09* 8460	.33* 8415	.22* 2375	.26* 3411	-.03 2926	.01 8709	1.0 8977												
Mature	.14* 8337	-.20* 7374	.04* 6876	.26* 8444	-.01 8400	.20* 2385	.27* 3424	.16* 2934	-.03* 8696	-.09* 8914	1.0 8949											
New	-.18* 8337	.17* 7374	-.04* 6876	-.24* 8444	-.01 8400	-.12* 2385	-.19* 3424	-.15* 2934	.01 8696	.07* 8914	-.55* 8949	1.0 8949										
Young	-.01 8337	.11* 7374	-.02 6876	-.10* 8444	.02 8400	-.14* 2385	-.17* 3424	-.08* 2934	.04* 8696	.05* 8914	-.69* 8949	-.21* 8949	1.0 8949									
YR	.06*	-.07*	-.08*	.35*	.09*	.27*	.30*	-.04*	-.04*	.07*	.19*	-.18*	-.07*	1.0								

	8429	7456	6920	8557	8512	2395	3444	2944	8820	8977	8949	8949	8949	16029								
Bank	.01	-.97*	-.05*	.23*	.24*	.31*	.43*	-.17*	-.02	.24*	-.03*	.03*	.01	.12*	1.0							
	8416	7446	6916	8551	8506	2393	3440	2942	8807	8977	8949	8949	8949	9077	9077							
CU_Coop	.03*	-.18*	.03*	-.23*	.23*	-.05*	-.003	-.23*	-.01	.07*	.03*	-.04*	.002	-.11*	-.13*	1.0						
	8416	7446	6916	8551	8506	2393	3440	2942	8807	8977	8949	8949	8949	9077	9077	9077						
NBFI	-.001	.08*	-.03*	.03*	.05*	-.004	-.003	.16*	-.01	.24*	-.22*	.17*	.12*	.05*	-.22*	-.29*	1.00					
	8416	7446	6916	8551	8506	2393	3440	2942	8807	8977	8949	8949	8949	9077	9077	9077	9077					
NGO	-.06*	.14*	.003	.03*	-.37*	-.13*	-.32*	.01	.03*	-.51*	.17*	-.13*	-.09*	.02	-.24*	-.32*	-.52*	1.00				
	8416	7446	6916	8551	8506	2393	3440	2942	8807	8977	8949	8949	8949	9077	9077	9077	9077	9077				
GNI	.12*	-.02*	-.02	-.06*	-.24*	-.004	.34*	-.03	-.01	-.26*	.17*	-.14*	-.08*	.04*	-.01	-.02	.04*	-.004	1.00			
	8337	7383	6843	8466	8421	2390	3435	2939	872	8881	8854	8854	8854	15782	8981	8981	8981	8981	15782			
IFL	.02	.04*	-.01	-.10*	.08*	-.07*	-.12*	.02	-.02	.06*	-.10*	.10*	.03*	-.05*	.03*	-.04*	.04*	-.05*	-.15*	1.00		
	8379	7414	6878	8508	8463	2391	3437	2940	8768	8923	8896	8896	8896	15870	9023	9023	9023	9023	15782	15870		
GDP	.05*	-.05*	-.05*	.001	-.01	-.01	-.07*	-.06*	.01	.13*	-.09*	.08*	.04*	-.03*	-.01	-.08*	.02*	-.08*	-.04*	-.001	1.00	
	8223	7306	6761	8358	8314	2391	3436	2941	8610	8761	8734	8734	8734	14648	8861	8861	8861	8861	14588	14645	15876	
DIR	-.02	.09*	.02	-.06*	.03*	.01	-.13*	-.01	.01	.06*	-.10*	.10*	.04*	-.05*	-.07*	-.11*	-.01	.04*	-.20*	.70*	-.02*	1.00
	8230	7287	6791	8365	8320	2334	3374	2884	8620	8759	8732	8732	8732	15521	8859	8859	8859	8859	15452	15506	14314	15521

Notes: * is statistically significant at the 0.05 level or lower (2-tailed test). Figures beneath are the observations (N)

Where OSS = Operational Self-Sufficiency (log); OEA = Operational Expenses to total Assets (log); NAB = Number of active borrowers (log), LS_GNI = Average loan size per borrower adjusted by GNI per capita; NS = Net savers (log); DEP = Deposits (log), DAPSM = Deposit Accounts per Staff Member; PAR30 = Portfolio at Risks less than 30 days; PWB = Percentage of women borrowers; GLPTA = Gross loan portfolio to total assets; Reg = Regulated MFI; YR = Years of reporting; CU_Coop = Credit Unions and Cooperatives; NBFI = Non-bank Financial Intermediation; NGO = Non-governmental organisation; GNI = Gross National Income (log); IFL = Inflation rate; GDP = growth rate of Gross Domestic Products; DIR = Deposit Interest Rate.

5.5. Empirical findings

The regression results are presented in Table 5.6, 5.7, 5.8, 5.9, representing the links between micro-savings and mission drift/trade-offs between financial sustainability and social outreach.

In all estimations, microfinance institution-specific variables are considered as endogenous, in the sense that each behavioural factor can simultaneously cause the responses to the others, meanwhile, macroeconomic variables and time dummies are treated as strictly exogenous. The low p-value of F-test indicates the null hypothesis rejection, which denotes that the estimated models fit the panel data reasonably well. Further, the Hansen test for overidentifying restrictions affirms that the models are correctively specified and the instruments are valid. High p-values of Hansen test imply that the null hypothesis of valid instruments cannot be rejected. AR (1) and AR (2) are Arellano-Bond test for first order and second order autocorrelation, respectively. The p-values of AR (1) and AR (2) of all specifications evidently demonstrate that all the models meet the requirement. In particular, the tests reject the null hypothesis of zero first order serial correlation by cannot reject the absence of second order serial correlation. Moreover, in all regressions, the lags of dependent variables are statistically significant, which justifies the selection of dynamic model and system GMM.

5.5.1. Mission drift/Trade-offs between sustainability and breadth of microfinance outreach in the context of micro-savings.

Tables 5.6 - 5.7 present the regression results using the number of active borrowers (NAB, log) as dependent variable to explore whether or not a mission drift and trade-offs between sustainability and breadth of outreach exists in the context of micro-

savings. In table 5.6, various specifications are investigated. In particular, an interactive term between the dummy variable *Dum*Deposittaking and OSS (log) is used in specification (1)[51]. In specification (2), besides the interactive term between the dummy variable *Dum*Deposittaking and OSS (log), interactive term between *Dum*Profit and OSS (log)[52] as well as interactive term between *Dum*Regulated and OSS (log)[53] are also included. In specification (3), we use dummy variables reflecting scales of savings operation. Specifically, *dum*HighFI is a proxy for MFIs that have voluntary savings more than 20% of total assets; *dum*LowFI is a proxy for MFIs that have voluntary savings less than 20% of total assets; and *dum*NonFI is a proxy for MFIs that have no voluntary savings[54]. In specification (4), we interact dummy variables of scales of savings operation (HighFI and lowFI) with OSS (log)[55] and with dummyProfit MFIs[56] and dummyRegulated MFIs[57].

Table 5.7 reports regression outputs with various specifications where different dimensions of micro-savings are utilised. In specification (1), three proxies for micro-savings including net savers, total deposits and the number of deposit accounts per staff membe are incorporated. In specification (2), (3) and (4), we include the interactive

[51] The interactive term *OSSxDummyDeposit-taking* demonstrates financially sustainable deposit-taking MFIs. We wish to examine whether deposit-taking MFIs can both enjoy financial achievement and expand their outreach breadth.
[52] The interactive term *OSSxDummyProfit* demonstrates financially sustainable for-profit MFIs. We wish to examine whether deposit-taking MFIs that focus on profit target can both fulfil their economic mission and social mission.
[53] The interactive term *OSSxDummyRegulated* demonstrates financially sustainable regulated MFIs. We wish to examine whether regulated deposit-taking MFIs can both enjoy financial achievement and expand their outreach breadth.
[54] By incorporating these dummies in the model, we want to explore whether scale of operation in terms of deposits activities does matter or not in the relationship between microfinance trade-offs.
[55] By using interactive terms *OSSxHighFI* and *OSSxLowFI*, we want to examine whether sustainable MFIs still can both scale up their deposits activities and improve their outreach breadth.
[56] By using interactive terms *ProfitxHighFI* and *ProfitxLowFI*, we want to examine whether for-profit MFIs still can scale up their deposits activities and still fulfil their economic and social missions.
[57] By using interactive terms *RegulatedxHighFI* and *RegulatedxLowFI*, we want to examine whether regulated MFIs can both scale up their deposits activities and improve their outreach breadth.

terms between net savers, total deposits and deposit accounts per staff member and different chartered types of MFIs (i.e Bank, NGO, NBFI). By doing so, we wish to examine the role of each dimension of micro-savings on microfinance trade-offs/mission drift and we want to see if the impacts differ depending on types of MFIs.

Table 5.6: Micro-savings and mission drift/trade-offs between financial sustainability and breadth of outreach: Evidence from scales of micro-savings: Two-step system GMM estimation

Variables	**Notation**	**Dependent variable: NAB (log)**			
		(1)	(2)	(3)	(4)
Lag1lNAB	L1.lnNAB	1.110*** (37.07)	1.110*** (34.87)	1.140*** (41.59	1.095*** (35.72
Lag2lNAB	L2.lnNAB	-0.146*** (-5.47)	-0.157*** (-5.67)	-0.183*** (-6.94)	-0.151*** (-5.76)
LnOSS	lnoss	0.243*** (5.60)	0.250*** (5.57)	0.261*** (5.68)	0.239*** (4.89)
OEA	OEA	-0.00175 (-1.42)	0.000328 (0.19)	-0.000961 (-0.78)	-0.00121 (-0.68)
PAR30	Par30	-0.00169* (-2.16)	-0.00159* (-1.98)	-0.00160* (-2.09)	-0.00142 (-1.88)
OSSDeposit-taking MFI	lnOSS x $D_{\text{Deposit-taking}}$	0.0436* (3.19)	0.0458** (3.18)		
OSSProfitMFI	lnOSS x $D_{\text{ProfitMFI}}$		-0.0204 (-1.13)		
OSSRegMFI	lnOSS x $D_{\text{RegulatedMFI}}$		0.0250 (1.59)		
HighFI_MFI	$D_{\text{HighFI\_MFI}}$			0.159** (3.01)	
LowFI_MFI	$D_{\text{LowFI\_MFI}}$			0.204**	

				(3.22)	
OSSHighFI	LnOSS x D_{HighFI_MFI}				0.0692* (2.44)
OSSLowFI	LnOSS x D_{Low_MFI}				0.0730** (2.70)
ProfitHighFI	D_{Profit} x D_{HighFI_MFI}				0.0302 (0.23)
ProfitLowFI	D_{Profit} x D_{LowFI_MFI}				0.364 (1.88)
RegulatedHighFI	$D_{Regulation}$ x D_{HighFI_MFI}				-0.200 (-1.24)
RegulatedLowFI	$D_{Regulation}$x D_{LowFI_MFI}				-0.442* (-2.21)
MatureMFI	Mature	-0.569*** (-7.02)	-0.517*** (-5.88)	-0.375*** (-6.19)	-0.284*** (-6.12)
YoungMFI	Young	-0.252*** (-3.64)	-0.218** (-3.07)	-0.177** (-2.78)	
NewMFI	New				0.252*** (3.56)
Gross Loan Portfolio to Total Assets	GLPTA	-.000071*** (-7.98)	0.00173 (1.65)	-.0000696*** (8.19)	0.00145 (1.62)
GNP per capita	lnGNI	0.0160 (1.07)	0.0138 (0.81)	0.0054 (0.44)	-0.00543 (-0.34)
Inflation	INF	-0.00192 (-1.53)	-0.00217 (-1.69)	-0.00126 (-1.03)	-0.00193 (-1.37)
Lag1GDP growth rate	L.GDPR	0.00119 (0.64)	0.000359 (0.17)	0.00120 (0.69)	-0.00021 (-0.01)
Deposit interest rate	DINT	-0.00395 (-1.58)	-0.00551* (-2.09)	-0.00295 (-1.31)	-0.00326 (-1.31)
Observations	Observations	4764	4729	4431	4400
Number of instruments		795	795	881	795

F-test		659.17***	364.22***	607.39***	307.71***
AR(1)		Z = -9.04 p-value = 0.000	Z = -8.88 p-value = 0.000	Z = -9.12 p-value = 0.000	Z= -8.87 p-value = 0.000
AR(2)		Z = - 0.44 p-value = 0.663	Z = - 0.33 p-value = 0.738	Z=- 0.14 p-value = 0.892	Z = -0.17 p-value = 0.809
Hansen J-Statistic		0.268	0.300	0.580	0.291

Notes:

(1) *, **, and *** represent significance at the levels of 10%, 5%, and 1%, respectively
(2) Absolute value of t statistics in parentheses.
(3) The variables are defined and measured as described in Table 5.2.
(4) AR (1) and AR(2) are Arellano-Bond test for first order and second order autocorrelation, respectively.
(5) Hansen J-Statistic test the null hypothesis that the model is correctively specified and the instruments are valid.

Innitially, it is shown in all four specifications of both tables that the operational self-sufficiency (OSS, log) is positively related to the number of active borrowers. These results demonstrate that, on the whole, MFIs in our sample can achieve both financial sustainability and large breadth of outreach. Now, we pay our attention to important proxies for microsavings. A positive and significant coefficient is found for the interactive term between *dum*Deposittaking and OSS (log), implying that financially sustainable MFIs that capture deposits can have more active borrowers. Further, positive significant coefficients are also found for *dum*HighFI and *dum*LowFI (see specification 3-Table 5.6) and positive significant coefficients are found for the interactive terms between OSS (log) and two dummy variables of scales of savings operation (see specification 4 – table 5.6). Based on this clear evidence, it can be concluded that micro-savings are win-win for MFIs in terms of the relationship between financial sustainability and breadth of outreach. This important finding can be further

reinforced by the significant and positive linkage between the total deposits and the number of active borrowers as reported in table 5.6. This again highlights the contribution of micro-savings in attaining a win-win situation for microfinance institutions. Our findings are consistent with the studies of Hartarska and Nadolnyak (2007) and Nurmakhanova *et al.* (2014). In this chapter, we incorporate not only OSS (log) but also interactive terms between OSS (log) and proxies for microsavings in the function of number of active borrowers to assess possible trade-offs between financial sustainability and outreach breadth. By doing this, more value can be added in our contribution. To be more specific, the finding regarding the role of micro-savings and compatibility between financial and social performance once again strengthens what have been found in Chapter 3 and Chapter 4. Particularly, it is further confirmed that sustainable deposit-taking are less depending on expensibe external funds like debts. Rather, they can make use of deposits attracting from public as a cheap loanable to serve more credit customers. Their client base is increased and as a result, trade-offs between financial sustainability and breadth of outreach do not exist for MFIs that capture deposits

Looking at the regression results of interactive terms between three dimensions of micro-savings and different charter types of MFIs as exhibited in Table 5.7, we discover that the number of net savers, total deposits and the number of deposit accounts per staff member enable NGOs to improve their breadth of outreach. Therefore, NGOs are less susceptible to the occurrence of a trade-off between sustainability and breadth of outreach. In addition, it is shown in specification (2) of Table 5.6 that the interactive term between OSS (log) and regulated MFIs is positively linked to the number of active borrowers. This result, however, is not significant.

Further, the interaction between dummy Regulated MFIs and low level of financial intermediation (*dum*LowFI) is observed to be negatively related to the breadth of outreach. This finding indicates that the positive association that results from the analysis in this chapter is weaker/lower for MFIs having lower level of voluntary savings to assets. As displayed in Table 5.6 (specification 2), the interactive term between OSS and for-profit MFIs is negatively associated to the number of active borrowers, however this relationship is statistically insignificant. Besides, a significant and positive link between the interactive term of *dum*for-profit MFIs and *dum*LowFI is found in specification (4) – Table 5.6. Therefore, we do not see any sign of mission drift in the context of micro-savings.

Turning towards institutional-specific control variables, as shown in table 5.7, the significant and positive association between operating expenses to total assets and the number of active borrowers implies that it may be costly for MFIs when expanding the breadth of outreach (Kar, 2012). With reference to portfolio management, the variable PAR30 is negatively related to the number of active borrowers. This relationship is statistically significant in specification (1), (2) and (3) of Table 5.6, indicating that MFIs with high ratio of PAR30 or bad portfolio quality management are more likely to have trade-offs between financial sustainability and breadth of outreach.

We further observe from both tables negative significant coefficients for *dum*Mature and *dum*Young. These results indicate that, when other variables are taken into consideration, MFIs are inclined to reduce their clientele base over time. This result contradicts the findings of Hartarska and Nadolnyak (2007), Mersland and Strom (2009) and Kar (2012) but supports the results obtained by Nurmakhanova *et al.* (2014) who find that mature and experienced MFIs have less credit clients.

We find interesting result in respect of the size of MFIs. "Gross loan portfolio to total assets" is observed to be negatively related to the number of active borrower (see specification (1) and (3) in Table 5.6). Nonetheless, the magnitude is very small and the significance level is low (-.000071; -0.0000696, respectively; significant at 1% level). On the contrary, specification (1) in Table 5.7 displays a positive and significant coefficient for "Gross loan portfolio to total assets" (0.00532, significant at 10% level). On the whole, the size of MFIs does not play an important part in examining mission/ trade-offs for the context of savings.

Table 5.7: Micro-savings and mission drift/trade-offs between financial sustainability and breadth of outreach: Evidence from three indicators of micro-savings - Two-step system GMM estimation

Variables	**Notation**	**Dependent variable: NAB (log)**			
		(1)	(2)	(3)	(4)
Lag1lnNAB	L.lnNAB	0.881*** (27.71)	0.838*** (23.70)	0.855*** (21.57)	0.839*** (24.56)
LnOSS	lnoss	0.347** (3.03)	0.361*** (3.33)	0.378*** (3.48)	0.366** (3.20)
OEA	OEA	0.0120* (3.04)	0.00957* (2.34)	0.00812 (1.96)	0.00890* (2.13)
PAR30	Par30	-0.000861 (-1.30)	-0.000653 (-1.02)	-0.000554 (-1.01)	-0.00064 (-1.04)
Net Savers	LnNS	-0.0286 (-1.36)	-0.0372 (-1.60)	-0.00728 (-0.35)	-0.0167 (-0.81)
Deposits	LnDEP	0.134*** (4.73)	0.150*** (4.83)	0.138*** (4.24)	0.148*** (4.63)
DAPSM	LnDAPSM	0.0714 (1.31)	0.0852 (1.92)	0.0324 (0.57)	0.0548 (1.21)

Net Savers x Bank	Ln(NS) x Bank		0.0115 (0.76)		
Net Savers x NGO	Ln(NS) x NGO		0.0399* (2.02)		
Net Savers x NBFI	Ln(NS) x NBFI		0.0178 (1.09)		
Deposits x Bank	Ln(DEP) x Bank			0.00119 (0.13)	
Deposits x NGO	Ln(DEP) x NGO			0.0250* (2.06)	
Deposits x NBFI	Ln(DEP) x NBFI			0.00887 (1.07)	
DAPSM x Bank	Ln(DAPSM) x Bank				0.0178 (0.68)
DAPSM x NGO	Ln(DAPSM) x NGO				0.0704* (2.26)
DAPSM x NBFI	Ln(DAPSM) x NBFI				0.0323 (1.32)
Mature	Mature	-0.664*** (-4.91)	-0.627*** (-4.61)	-0.641*** (-4.74)	-0.640*** (-4.75)
Young	New	-0.255* (-2.09)	-0.247* (-2.10)	-0.260* (-2.18)	-0.257* (-2.15)
Gross Loan Portfolio to Total Assets	GLPTA	0.00532* (2.30)	0.00420 (1.89)	0.00404 (1.81)	0.00404 (1.81)
GNI per capita	lnGNI	-0.142*** (-4.71)	-0.121*** (-3.62)	-0.112*** (-3.60)	-0.114*** (03.23)
Inflation	INF	-0.00376* (-2.46)	-0.00304* (-2.02)	-0.00242 (-1.66)	-0.00292* (-1.96)
Lag1GDP growth rate	L.GDPR	0.00499 (1.31)	0.00548 (1.21)	0.00271 (0.72)	0.00403 (1.12)
Deposit interest rate	DINT	-0.00325 (-0.78)	-0.00698 (-1.28)	-0.00727 (-1.43)	-0.00662 (-1.22)

Observations	Observations	1763	1763	1763	1763
Number of instruments		448	502	476	502
F-test		159.22***	164.47***	174.12***	161.42***
AR(1)		Z = -5.04 p-value = 0.000	Z = -4.95 p-value = 0.000	Z = -4.92 p-value = 0.000	Z = -4.90 p-value = 0.000
AR(2)		Z = - 0.10 p-value = 0.914	Z = - 0.04 p-value = 0.970	Z = - 0.04 p-value = 0.929	Z = - 0.06 p-value = 0.955
Hansen J-Statistic		0.775	0.987	0.883	0.983

Notes:

(1) *, **, and *** represent significance at the levels of 10%, 5%, and 1%, respectively
(2) Absolute value of t statistics in parentheses.
(3) The variables are defined and measured as described in Table 5.2.
(4) AR(1) and AR(2) are Arellano-Bond test for first order and second order autocorrelation, respectively.
(5) Hansen J-Statistic test the null hypothesis that the model is correctively specified and the instruments are valid.

Among macroeconomic control variables; GNI per capita coefficients are negative and significant, implying that an improvement of people's living standard adversely affects breadth of microfinance outreach (see Table 5.7). When there is a rise in GNI per capita, the living standard and income of people improve as well. Thus, many poor people can be lifted out of poverty. They may say good bye to MFIs and ask for financial services from commercial banks which have more advantages compared to microfinance products. As a result, the number of active borrowers in MFIs goes down. This finding implies that MFIs active in countries with high GNI per capita are more susceptible to the occurrence of a trade-off between financial sustainability and breadth of outreach. Our results support the study of Kar (2012).

We also discover a negative significant association between inflation rate and the number of active borrowers (see Table 5.7). It is reasonable to assume that, in heavy inflationary environment, loan interest rates increase. Hence, loans become more expensive for credit clients because they have to pay more in order to obtain the loans. It would be more difficult for poor customers to make loans from MFIs. Therefore, the number of active borrowers decreases. Our finding indicates that MFIs operating in heavy inflationary environment are more susceptible to the occurrence of a trade-off between financial sustainability and breadth of outreach.

We could not find any links between GDP growth rate and the number of active borrowers. Our findings are in contrast to the studies of Hartarska and Nadolnyak (2007), and Vanroose and D'Espallier (2013). They find that a growing economy positively influences MFI performance; which enables MFIs to cover costs more easily and stimulates demand for micro-credits. As a result, MFIs could reach more poor clients while improving their financial sustainability. Hence, we cannot confirm if MFIs operating in countries that have higher GDP growth rates are less or more susceptible to have mission drift between financial sustainability and breadth of outreach.

Finally, we observe that MFIs operating in countries with high deposit interest rates are more susceptible to the occurrence of trade-offs between financial sustainability and social outreach. To clarify, on one hand, from clients' perspective, when deposit interest rates increase, clients have a propensity to put money in MFIs rather than borrowing as they can earn more money from their savings. On the other hand, viewing from MFIs' perspective, an increase in deposit interest rates leads to an increase in credit interest rates, which micro loans become more expensive. Thus, less

people can bear higher credit interest rates and make loans from MFIs. Accordingly, higher deposit interest rates are linked to a lower breadth of outreach, and vice versa.

5.5.2. Mission drift/Trade-offs between sustainability and income-related depth of microfinance outreach in the context of micro-savings.

Table 5.8 and Table 5.9 report the regression results using the average loan size adjusted by GNI per capita (LS_GNI, log) as a dependent variable to examine the possible mission drift and trade-offs between financial sustainability and income-related depth of outreach exists in the context of micro-savings. The usages and meanings of variables incorporated in all specifications of Table 5.8-5.9 are similar to those of Table 5.6-5.7.

Table 5.8: Micro-savings and mission drift/trade-offs between financial sustainability and depth of outreach: Evidence from scales of micro-savings - Two-step system GMM estimation

Variables	**Notation**	**Dependent variable: LS_GNI (log)**			
		(1)	(2)	(3)	(4)
Lag1lnLS_GNI	L.lnLS_GNI	0.793*** (15.85)	0.776*** (13.90)	0.774*** (14.87)	0.765*** (13.07
LnOSS	lnOSS	0.0461 (0.99)	0.0231 (0.47)	0.0778 (1.48)	0.0806 (1.51)
OEA	OEA	-0.000150 (-1.37)	-0.000839 (-0.46)	0.000022 (0.01)	-0.00230 (-1.12)
PAR30	Par30	-0.000579 (-1.37)	-0.000619 (-1.38)	-0.000514 (-1.32)	-0.00065 (-1.52)
OSSDeposit-taking MFI	lnOSS x $D_{Deposit-taking}$	0.0588*** (3.43)	0.042** (2.64)		
OSSProfitMFI	lnOSS x $D_{ProfitMFI}$		-0.00248		

			(-0.16)		
OSSRegMFI	lnOSS x $D_{RegulatedMFI}$		0.0638*** (3.68)		
HighFI_MFI	D_{HighFI_MFI}			0.174** (2.63)	0.165 (1.08)
LowFI_MFI	D_{LowFI_MFI}			0.124 (1.43)	-0.802 (-0.67)
OSSHighFI	LnOSS x D_{HighFI_MFI}				-0.140 (-1.20)
OSSLowFI	LnOSS x D_{Low_MFI}				0.166 (0.64)
ProfitHighFI	D_{Profit} x D_{HighFI_MFI}				0.123 (0.88)
ProfitLowFI	D_{Profit} x D_{LowFI_MFI}				0.607** (2.65)
RegulatedHighFI	$D_{Regulation}$ x D_{HighFI_MFI}				0.158 (0.87)
RegulatedLowFI	$D_{Regulation}$x D_{LowFI_MFI}				-0.233 (-0.88)
MatureMFI	Mature	-0.155* (-2.08)	-0.0421 (-0.70)	-0.0939 (-1.52)	-0.115 (-1.69)
YoungMFI	Young	-0.0205 (-0.40)	-0.0214 (-0.41)	-0.0111 (-0.19)	-0.0724 (-1.29)
Gross Loan Portfolio to Total Assets	GLPTA	0.0001*** (7.08)	0.00162 (1.15)	0.000103*** (8.13)	0.00182 (1.27)
GNI per capita	lnGNI	-0.0233 (-1.29)	-0.0174 (-0.58)	-0.0586** (-3.27)	-0.0718** (-3.12)
Inflation	INF	0.00237* (2.12)	0.00218* (2.00)	0.00155 (1.40)	0.00160 (1.49)
Lag1GDP growth rate	L.GDPR	-0.00494** (-3.12)	-.00842*** (-4.32)	-0.00275 (-1.84)	-0.00377* (-2.34)
Deposit interest	DINT	-0.00236	-0.00319	-0.00340	-0.00186

rate		(-1.07)	(-1.43)	(-1.46)	(-0.81)
Observations	Observations	5702	5656	5188	5147
Number of instruments		820	820	820	820
F-test		166.19***	109.32***	188.81***	80.62***
AR(1)		Z = -7.91 p-value = 0.000	Z = 7.68 p-value = 0.000	Z = -7.24 p-value = 0.000	Z= -7.08 p-value = 0.000
AR(2)		Z = - 1.71 p-value = 0.087	Z = - 1.37 p-value = 0.172	Z=- 1.83 p-value = 0.068	Z = -1.68 p-value = 0.092
Hansen J-Statistic		0.182	0.182	0.132	0.187

Notes:

(1) *, **, and *** represent significance at the levels of 10%, 5%, and 1%, respectively
(2) Absolute value of t statistics in parentheses.
(3) The variables are defined and measured as described in Table 5.2.
(4) AR(1) and AR(2) are Arellano-Bond test for first order and second order autocorrelation, respectively.
(5) Hansen J-Statistic test the null hypothesis that the model is correctively specified and the instruments are valid.

We start out with the important variables relating to micro-savings. First, significant and positive coefficients are found for the interactive term between OSS (log) and *dum*Deposit-taking MFI (see specification (1) & (2) in Table 5.8), indicating clear evidence of a trade-off between financially sustainability and depth of outreach. Also, it is shown in specification (3) of table 5.8 that *dum*HighFI is positively linked to the average loan sizes. In addition, total deposits are shown to be positively associated with the average loan size. This relationship is statistically significant at 5% and 10% levels (see Table 5.8). Obviously, deposit-taking MFIs are more susceptible to the occurrence of the trade-off between sustainability and depth of outreach and mission drift. This finding not only reaffirms the outcomes discovered in Chapter 3 and Chapter 4 but also supports theories of transaction costs. Specifically, it is believed that transaction costs

are high when offering small savings and/or small loans. Thus, in order to reduce transaction costs and achieve financial sustainability, deposit-taking MFIs tend to make larger transactions. By doing this, deposit-taking are more inclined to serve better-off clients, which may lead to trade-offs between financial sustainability and depth of outreach. However, Christen (2001) argued that larger loans do not necessarily reflect mission drift. Rather, larger loan sizes could be simply the function of various elements including choice of strategy, period of entry into the market or natural growth of the target clients. Thus, our findings confirm the theory in the sense that customers can benefit from micro-savings. To be specific, by depositing small account of savings in MFIs, customers can improve their well-being in general and their income in particular. As a result, they are more likely to be lifted out of poverty and become wealthier. Accordingly, they will ask for larger loans. In return, MFIs will increase their loan sizes to better meet the demand of their clients. We further see a significant and positive coefficient for the interactive term between for-profit MFIs and low scale of savings in specification of Table 5.8. This finding indicates that MFIs operating on a for-profit basis and capturing deposits tend to provide larger loans to fulfil their preferred financial mission.

We continue to look closer at the impact of two other dimensions of micro-savings on the possible trade-offs. Based on the regression results in Table 5.9, we do not see any roles of net savers in the possible trade-off between financial sustainability and depth of outreach. On the other hand, we discover a significant negative link between the number of deposit accounts per staff member and the average loan size (see specification (1) and (2)). This result indicates that an improvement in the productivity of deposit taking activities enables MFIs to extend their services to poorer and hard-to-

reach customers by reducing their loan sizes. Therefore, it could be inferred that by enhancing the productivity in deposit taking activities, MFIs could achieve a win-win situation in terms of the relationship between financial sustainability and depth of outreach.

Nonetheless, the impact of the number of net savers on the possible trade-off varies depending on the charter type of MFIs. The regression outputs of the interactive terms between net savers and MFI types demonstrate that serving more voluntary depositors does not hurt depth of outreach in the cases of NGO microfinance organizations. The coefficient of this interactive term is -0.0417, statistically significant at 0.1 level. This finding is rational as NGOs are unregulated and active on a not-for-profit basis. They aim at social mission by reaching more poor clients. Though insignificant, the negative result in the cases of NBFI tells the similar story. For microfinance banks, serving more voluntary savers make them to increase their loan sizes. However, this result is not statistically significant.

In terms of scale of micro-savings, specification (3) of Table 5.9 exhibits that, for NGO microfinance institutions, having higher total deposits enables them to improve their income-related depth of outreach. The interactive terms between deposits and other charter types, however, are not significant.

With regards to the interactive terms relating to the productivity of micro-savings, the interactive term between deposit accounts per staff member and NGO microfinance provider is reported to be negatively linked to the average loan size. This relationship is statistically significant at 5% level. The interactive terms of deposit accounts per staff member and NBFI as well as Credit Union/Cooperatives are also negative but statistically insignificant. On contrary, the interactive term between the

proxy for productivity of micro-savings and microfinance banks has a positive sign; however, this output is not statistically significant, either. Based on the regression estimations of the interactive terms between three dimensions of micro-savings and different charter types of MFIs, it can be concluded that micro-savings are win-win for NGO microfinance institutions.

The negative but insignificant coefficient is found for the interactive term between OSS (log) and the dummy variable for-profit MFIs (see specification (2) – Table 5.8). Thus, we cannot see a mission drift between financial mission and social mission of MFIs. Referring regulatory status of MFIs, Table 5.8 (specification (2)) exhibits a positive significant relationship between the interactive term between OSS (log) and *dum*Regulation. This finding indicates that, in order to achieve financial viability, regulated MFIs curtail their depth of outreach by increasing the average loan size. Thus, regulated MFIs are more susceptible to the occurrence of the trade-offs between financial sustainability and depth of outreach. Our results contradict the research of Nurmakhanova *et al.* (2014) who found no links between regulation and income-related depth of outreach.

Both tables show no significant relationship between OSS (log) and the average loan size (log). Therefore, on the whole, we do not see any sign of the trade-offs between financial sustainability and income-related depth of microfinance outreach. Our results are not similar to Quayes (2012), Kar (2013), and Nurmakhanvova *et al*. (2014) who found that the income-related depth of outreach is positively influenced by financial sustainability.

Furthermore, operating expenses to total assets (OEA) is found to be negatively related to the average loan size, statistically significant at 10% level (see specification 1

– Table 5.10); which implies that serving poor people are more costly for deposit-taking MFIs. According to Kneiding and Mas (2009), MFIs can be more cost efficient when extending their loan sizes. They argue that, for the same amount of money to be lent, the MFI has to evaluate only one customer rather than two or three different customers, which indicates less staff time and effort. Gonzalez (2008) discovers that an increase on loan size from 10 per cent of GNI per capita to 20 percent is expected to make operating expenses to decrease as a percentage of gross loan portfolios by over 7 percent points. In short, our finding implies that efficient MFIs are more susceptible to the occurrence of a trade-off between financial sustainability and income-related depth of outreach by increasing their loan sizes. Our findings validate the research by Makame and Murinde (2007), Gonzalez & Researcher (2010), D'espallier, Guerin, Mersland (2013), Ngo, Mulineux and Ly (2014), but contrast with Quayes (2012) and Louis *et al.* (2013) who find that MFIs with a low cost per loan have a better depth of outreach.

Table 5.9: Micro-savings and mission drift/trade-offs between financial sustainability and depth of outreach: Evidence from three indicators of micro-savings - Two-step system GMM estimation.

Variables	**Notation**	**Dependent variable: LS_GNI (log)**			
		(1)	(2)	(3)	(4)
Lag1lnls_gni	L.lnLS_GNI	0.812*** (17.99)	0.722*** (13.40)	0.724*** (13.84)	0.726*** (13.84)
OSS (log)	lnOSS	-0.0425 (-0.43)	-0.0513 (-0.45)	-0.0484 (-0.43)	-0.0638 (-0.59)
OEA	OEA	-0.00830* (-2.44)	-0.00759 (-1.60)	-0.00724 (-1.57)	-0.00738 (-1.36)
PAR30	Par30	0.000658*	0.000457	0.000455	0.000461

		(2.38)	(0.98)	(1.06)	(1.02)
Net Savers	LnNS	0.0139 (0.79)	0.0151 (0.65)	0.00312 (0.17)	0.00108 (0.06)
Deposits	LnDEP	0.0705** (2.90)	0.0683* (2.31)	0.0700* (2.32)	0.0626* (2.34)
DAPSM	LnDAPSM	-0.100* (-2.58)	-0.0988* (-2.08)	-0.0805 (-1.70)	-0.0750 (-1.59)
Net Savers x Bank	Ln(NS) x Bank		0.0188 (1.18)		
Net Savers x NGO	Ln(NS) x NGO		-0.0417* (-2.13)		
Net Savers x NBFI	Ln(NS) x NBFI		-0.00842 (-0.49)		
Deposits x Bank	Ln(DEP) x Bank			0.0123 (1.29)	
Deposits x NGO	Ln(DEP) x NGO			-0.0269* (-2.26)	
Deposits x NBFI	Ln(DEP) x NBFI			-0.00453 (-0.47)	
Deposits x CU_Coop	Ln(DEP) x CU_Coop			0.000145 (0.02)	
DAPSM x Bank	Ln(DAPSM) x Bank				0.0470 (1.80)
DAPSM x NGO	Ln(DAPSM) x NGO				-0.0664* (-2.17)
DAPSM x NBFI	Ln(DAPSM) x NBFI				-0.0185 (-0.67)
DAPSM x CU_Coop	Ln(DAPSM) x CU_Coop				-0.00406 (-0.18)
Mature	Mature	-0.363*** (-3.84)	-0.237* (-2.09)	-0.220 (-1.96)	-0.224* (-1.97)
Young	Young	-0.260**	-0.239**	-0.234**	-0.228**

		(-3.14)	(-2.84)	(-2.79)	(-2.72)
Gross Loan Portfolio to Total Assets	GLPTA	0.00982*** (3.37)	0.0123*** (3.87)	0.0122*** (3.82)	0.0124*** (3.82)
GNP per capita (log)	lnGNI	-0.126*** (-4.10)	-0.207*** (-4.40)	-0.210*** (-4.72)	-0.201*** (-4.47)
Inflation	INF	0.00182 (1.26)	0.000754 (0.50)	0.000376 (0.24)	0.000806 (0.52)
Lag1GDP growth rate	L1.GDPR	-0.0098*** (-3.54)	-0.0111*** (-3.32)	-0.0110** (-3.16)	-0.0107** (-3.16)
Deposit interest rate	DINT	-0.00602 (-1.44)	-0.00592 (-0.98)	-0.00612 (-1.06)	-0.00740 (-1.16)
Observations	Observations	1760	1760	1760	1760
Number of instruments		448	448	448	448
F-test		74.06***	50.07***	52.39***	51.26***
AR(1)		Z = -6.55 p-value = 0.000	Z = -6.31 p-value = 0.000	Z = -6.30 p-value = 0.000	Z = -6.34 p-value = 0.000
AR(2)		Z = 0.01 p-value = 0.995	Z = 0.16 p-value = 0.874	Z = 0.19 p-value = 0.851	Z = 0.11 p-value = 0.914
Hansen J-Statistic		0.566	0.489	0.476	0.518

Notes:

(1) *, **, and *** represent significance at the levels of 10%, 5%, and 1%, respectively
(2) Absolute value of t statistics in parentheses.
(3) The variables are defined and measured as described in Table 5.2.
(4) AR(1) and AR(2) are Arellano-Bond test for first order and second order autocorrelation respectively.
(5) Hansen J-Statistic test the null hypothesis that the model is correctively specified and the instruments are valid.

It is demonstrated in Table 5.9 (see specification 1) that PAR30 is positively related to the average loan size (0.000658, significant at 0.1 level). This means that MFIs having a low ratio of PAR30 or better portfolio quality management are more likely to reach

more poor customers by offering smaller loan sizes. Therefore, on the whole, our regression results show that MFIs with good portfolio management are less susceptible to the trade-offs between financial sustainability and income-related depth of outreach.

Moving to other institution-specific control variables, we found that there is a positive and significant relationship between gross loan portfolio to total assets and the average loan size (see Table 5.8 - 5.9). This result means that, larger MFIs tend to serve better off poor clients; as a result, the scaling-up of MFIs may curtail the depth of outreach. Our findings are in line with the results of Hartarska and Nadolnyak (2007), Mersland and Strom (2009), Bogan (2012), and Kar (2012) who uncover that as MFIs get bigger, it increases concerns for trade-offs.

Concerning the experience of MFIs, we found that older MFIs tend to have better depth of outreach. This finding is verified by negative significant coefficients of both *dum*Mature and *dum*Young (see Table 5.8-5.9). As discussed in part 4.5.2 of chapter 4, experienced MFIs are normally cost efficient and financially viable. Thus, they are likely to reach more poor customers. This finding denotes that older MFIs are less susceptible to the occurrence of the trade-off between financial sustainability and depth of outreach. Our result contradicts the research of Kneiding and Mas (2009). To be more specific, they find that average loan sizes increase over time. The industry data displays that young MFIs double their average loan size over a three-year period, meanwhile mature MFIs enlarge loan size by approximately 25 percent during the same period. Our study is in line with Mersland and Strom (2009).

We continue to move to macroeconomic control variables. GNI per capita is found to be negatively related to the average loan size. This association is statistically significant in most specifications of Table 5.8 - 5.9. This result demonstrates that MFIs

operating in countries having high GNI per capita are inclined to offer smaller loan sizes and vice versa. In the other words, MFIs active in such countries have deeper depth of outreach and are less likely to have trade-offs.

Additionally, it is shown in Table 5.8 (specification (1)-(2)) that MFIs active in countries of high inflation rates tend to serve wealthier people in order to deal with increasing operating expenses. Therefore, MFIs operating in such countries are more susceptible to have a trade-off between sustainability and depth of outreach. Our findings are, however, inconsistent with the research of Nurmakhanova *et al*. (2014).

GDP growth rates are reported to be negatively significantly linked to the average loan size in most specifications of Table 5.8 - 5.9. It seems reasonable to argue that in countries with developed economy, MFIs are more likely to exploit good macroeconomic environment, as a result, they can be more profitable and can reach more poor customers. This finding provides clear evidence that MFIs operating in countries that have higher GDP growth rate are less likely to have a trade-off between financial sustainability and depth of outreach.

5.6. Conclusions

This chapter has examined whether or not mission drift/ trade-offs between financial sustainability and microfinance outreach emerge for MFIs that take micro-savings. Our analysis is based on a global data set of 1,233 MFIs operating 79 countries for the period 2000-2012.

With respect to the relationship between financial sustainability and breadth of outreach, our findings clearly show that MFIs that offer micro-savings financial products can both enhance financial sustainability while serving more active clients.

We, therefore, assert that micro-savings are win-win for deposit-taking MFIs in terms of the relationship between sustainability and breadth of outreach. Our findings also indicate no evidence of mission drift for MFIs that mobilise savings from public. Nonetheless, regulated MFIs that have a low scale of savings appear to be more likely to have a trade-off between financial sustainability and social outreach.

In addition, we find that MFIs with better portfolio quality and MFIs that newly enter microfinance markets can also enjoy a win-win situation in terms of the association between sustainability and depth of outreach. The size of MFIs does not play an important part in examining mission/ trade-offs for the context of savings. Regarding macroeconomic contextual factors, our findings demonstrate that MFIs active in countries that have high GNI per capita, high inflation rate and high deposit interest rates are more susceptible to the occurrence of trade-offs between financial sustainability and breadth of outreach.

Regarding the relationship between financial sustainability and breadth of outreach, we found that MFIs that offer micro-savings are more susceptible to the occurrence of trade-offs between sustainability and depth of outreach. This finding is verified by significant and positive linkages between dummy Deposit-taking MFIs, dummy variables denoting scales of micro-savings and the total deposits with the average loan size. Nevertheless, the number of deposit accounts per staff members appears to be significantly negatively related to the average loan size. This is good news for MFIs that capture micro-savings as they are possible to achieve financial sustainability while improving their depth of outreach by boosting their productivity in savings mobilisation activities. In addition, NGO microfinance providers are likely to have a win-win situation in terms of the relationship between financial viability and

depth of outreach. This result is proved by the negative and significant coefficients for the interactive terms between NGO and all three proxies for micro-savings, namely net savers, total deposits, and the number of deposit accounts per staff members. Moreover, we do not find evidence of mission drift.

Relating to other control variables, we observe that MFIs with better portfolio management, MFI having more experience in microfinance sector are less likely to have trade-offs. On the contrary, larger MFIs and regulated MFIs are more susceptible to the trade-offs between sustainability and depth of outreach. It is not surprising to observe from our study that for-profit MFIs appear to serve better off clients through offering large loans. Finally, concerning country-level factors, we discover that complementarities between sustainability and depth of outreach are found for MFIs active in countries having higher GNI per capita and higher GDP growth rate. In contrast, MFIs operating in high inflationary environment are more susceptible to the occurrence of trade-offs.

To conclude, our findings demonstrate that we have been able to achieve the primary objective of our research which is to explore the possible mission drift and trade-offs between financial sustainability and social outreach in the context of micro-savings. Accordingly, our research has made a contribution to the existing literature of microfinance trade-offs/mission drift. On the whole, our empirical results indicate that micro-savings are win-win for deposit-taking MFIs in terms of the linkages between financial sustainability and breadth of outreach. Notably, MFIs that offer micro-savings can also achieve a win-win situation in terms of the relationship between financial sustainability and depth of outreach by enhancing their productivity in savings mobilisation activities. More importantly, our findings in this research work can offer

implications for both policy makers and microfinance practitioners. To be more specific, policy makers need to seek ways to provide good macroeconomic environment for MFIs to operate efficiently; accordingly they are more likely to obtain achievements in both financial performance and social outreach. Moreover, MFIs should bolster their productivity in deposit-taking activities, improve their portfolio management, and participating microfinance networks in order to perform well in terms both sustainability and outreach.

CHAPTER 6

MICRO-SAVINGS AND MICROFINANCE PERFORMANCE: EVIDENCE FROM VIETNAM

6.1. Introduction

More than two decades ago, Vietnam was classified as belonging to the group of poorest countries in the world (World Bank, 2013)[58]. For long, poverty alleviation and hunger eradication have remained at the heart of Vietnam Government's concerns. In 1986, the Renovation (Doi Moi) was initiated with aims to promote living standards and well-being of poor and disadvantaged people in the country. Accordingly, microfinance sector was significantly driven by the Government (Marban-Flores, 2014) as microfinance better meets the financial demands of poor people who lack accesses to traditional banking systems. After nearly 30 years of operations, microfinance has been recognised as an effective tool for poverty reduction strategy in Vietnam (Nguyen and Le, 2013). The poverty rate falls from 58% in 1993; 14.5% in 2008 to around 10 % in 2010 (Nguyen et al, 2011; World Bank, 2016[59]) and Vietnam is one of the fastest growing economies in the region (Abeysekera *et al.*, 2014; World Bank, 2016). In reality, some limited empirical studies have investigated microfinance in Vietnam (Quach, 2005; Vuong *et al*., 2013; Phan *et al*., 2013; Abeysekera *et al.*, 2014; Lebovics

[58] See: World Bank (2013) "Vietnam: Achieving success as a middle-income country". Available at: http://www.worldbank.org/en/results/2013/04/12/vietnam-achieving-success-as-a-middle-income-country [Accessed: 24 February 2016]

[59] See: World Bank (2016) "Lesson from Vietnam in a slowing global economy". Available at: http://www.worldbank.org/en/news/opinion/2016/02/23/lessons-from-vietnam-in-a-slowing-global-economy [Accessed: 24 February 2016]

et al., 2014; Duong and Nghiem, 2014). However, most of those studies focus on microcredit. Abeysekera *et al.* (2014 and Lebovics *et al.* (2014 study the issue of mission drift for MFIs in Vietnam. However, Abeysekera *et al.*, 2014 utilise data of People's Credit Fund which target at people over poverty line (See Figure 6.1). None of these studies investigate the impact of micro-savings. Therefore, one of the objectives of this study is to investigate why microfinance has been so effective in poverty reduction in Vietnam and whether micro-savings play a role in the social outreach of microfinance institutions in Vietnam.

With the increasingly significant role of microfinance in alleviating poverty, Vietnam Government has placed a large amount of strategic importance on the establishment of a safe and sustainable microfinance system to better serve poorer and low income people. Thus, another important objective of this study is to explore whether micro-savings influence financial sustainability of microfinance institutions in Vietnam.

To accomplish these research objectives, we will attempt to answer the general research question: "Do micro-savings affect financial sustainability and social outreach of microfinance institutions in Vietnam?". This research question is highly policy relevant in the current Vietnamese context as Vietnam Government has made attempts to set up a sustainable microfinance system in order to achieve their poverty reduction targets.

In choosing Vietnam as a case study to implement the research, this study makes four main contributions to policy and existing literature. First, the paper provides more empirical evidence of the effects of micro-savings on financial sustainability of microfinance institutions (MFIs) in Vietnam. Second, the paper provides more

empirical evidence of the effects of micro-savings on social outreach of Vietnamese MFIs. Thirdly, compared to other samples used in limited existing work on microfinance performance in Vietnam, our research use a larger data set which contains 38 MFIs, spanning 13 years from 2000 to 2012. This larger panel data set helps provide richer findings for the topic of microfinance performance in Vietnam. Fourth, at the policy level, examining the impact of micro-savings on microfinance performance in Vietnam is important for Vietnamese Government to form policies that may create favourable conditions for Vietnamese MFIs to develop and for Vietnamese poor people to access to microfinance services.

The remainder of this paper proceeds as follows: Section 2 describes an overview of microfinance sector in Vietnam. Section 3 presents the effects of micro-savings on microfinance performance in Vietnam. Further, Section 4 reports the robustness checks for the main findings. Finally, Section 5 provides conclusion and recommendation.

6.2. Overview of microfinance in Vietnam

6.2.1. Microfinance structure in Vietnam

In Vietnam, the term "microfinance institution" is defined as an organization operating in financial and banking sector with the main functions of using owner's equity, loan capital and savings to provide small and simple financial and banking services to low-income households and people especially the poor ones (Decree No. 28 /Article 2:2005)[60].

[60] Available at: http://www.bu.edu/bucflp/files/2012/01/Decree-No.-282005ND-CP-on-the-Organization-and-Operation-of-Microfinance-Institutions-in-Vietnam.pdf

Microfinance suppliers in Vietnam are classified into three sectors: formal, semi-formal and informal.

6.2.1.1. Formal sector

Formal sector includes MFIs licensed by the State Bank of Vietnam (SBV) and subject to the Law on Credit Institutions 2010, Decree No.28/2005-CP.Currently, formal MFIs that focus on serving the poor in Vietnam include Vietnam Bank for Social Policies[61], M7 Microfinance Limited Institution, and TYM – a small sized and limited financial company[62], MF Thanh Hoa.[63]

6.2.1.2. Semi-formal sector

According to Putzey (2002), the semi-formal finance system consists of various structures of decentralised financing which extend microfinance services to poor and low income people who are unbanked. As described by Nguyen *et al.* (2013), semi-formal MFIs in Vietnam can be distinguished by:

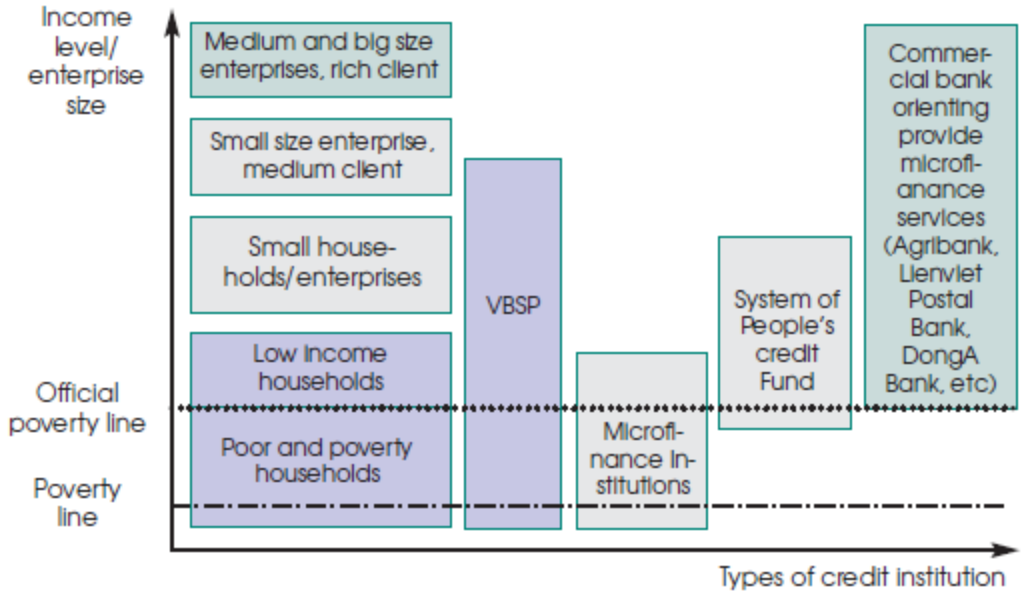
- a component of any program/ project development that offers microfinance services;
- In-charge microfinance programs that are not registered as an MFI;
- Social funds active in the field of microfinance: social funds, also known as mass organisations are normally represented at four levels, such as national, provincial, district and commune (Putzey, 2002). As presented by Ha et al. (2008), social funds provide small credits on their own accounts.

[61] From 1997 to 2003, it carried the name as Vietnam Bank for the Poor (VBP)
[62] M7 MFI and TYM were licensed at the end of October 2012.
[63] MF Thanh Hoa was licensed in August 2014

- Non-governmental organisations including both international NGOs and local NGOs that supply microfinance services

The current microfinance segmentation in Vietnam is illustrated in Figure 6.1.

Figure 6.1: Current microfinance segmentation in Vietnam



Sources: Le and Tran (2003); Nguyen and Le (2010).

6.2.1.3. Informal sector

Informal sector of Vietnam microfinance is shaped from three main sources (McCarty, 2001; Putzey, 2001):

Relatives / friends / neighbours:

Following this source, loans are supplied on basis of negotiation depending on partners' social relationship and reputation.

Ho/ Hui

Members of these groups come mainly from the same area, and are even organized 'on the spot' between colleagues and friends. The savings and credit can be made either in cash or in kind such as gold (Putzey, 2002; Quach 2002; Le at al 2005).

Money lenders

Money lenders often charge very high interest rates compared with semi-formal and formal institutions. Le *et al.* (2005) states that the informal microfinance in Vietnam has three forms: (i) lending based on mutual credibility, thus not requiring any written loan contracts; (ii) lending through pawn shops requiring physical collaterals; and (iii) lending through small traders, input suppliers and marketing agencies in local areas.

6.2.2. Products and services of microfinance in Vietnam

6.2.2.1. Financial products and services

***Micro-credit*:**

Microcredit is one of the main microfinance services that all Vietnam MFIs offer to their clients. Micro-loans have different terms: daily loans, weekly loans, monthly loans, six-month loans, twelve-month loans, emergency loans. Micro-credits are provided to borrowers based on group-lending method or individual method.

Micro-savings:

According to World Bank (2007), the supply of micro-savings financial products in Vietnam microfinance market is equally "standardized" but relatively "widely available". Micro-savings products in Vietnam include voluntary savings and compulsory savings. Except for VBSP, TYM, M7 and MF Thanh Hoa, who are licensed

to mobilise voluntary savings from the public, semi-formal MFIs limit their mobilising savings mainly in the form of compulsory savings. Savings can be drawn when the loan is fully liquidated, and is often considered partly as collateral or guarantee of clients' microloan. In Vietnam, MFI NGOs offer more limited voluntary savings services because it is difficult for them to compete with the saving interest rates in the market. Furthermore, a small network causes the limitation of its capital which is mainly funded by donors and external low-cost sources (Nguyen and Le, 2013).

According to Vietnam Microfinance Working Group (2014), funds of MFIs (excluding VBSP) gathered from savings have been increasing steadily at 30% in the past 4 years (2011-2014). The number of depositors in 2014 was 574,448 persons. In 2014, the savings balance of 30 MFIs (excluding VBSP) was equivalent to VND 1,500 billion[64], in which the balance of savings of three licensed MFIs makes up 38% of the total.

Key features of savings in Vietnam are highlighted as below:

- Types of micro-savings: voluntary savings and compulsory savings
- Voluntary savings are mainly mobilised by licensed MFIs
- VBSP, the biggest MFI in Vietnam, receives funds from Government to make loans to their clients.
- Voluntary savings are limited in NGO MFIs in Vietnam
- Savings balance and the number of depositors of Vietnamese MFIs are increasing steadily

[64] Equivalent to 70,159,027 UD$, VND/US$ Exchange rate: 21,380 (As of 31st December 2014)

Microinsurance:

In Vietnam, micro-insurance is supplied by insurance companies, despite the fact that many official insurance companies are reluctant to provide such services due to the high costs involved. Current regulation does not allow MFIs to provide their own insurance services but only to be an agent for official insurances in order to protect the insured. In addition, MFIs can also set up mutual funds with community-based products towards risk-sharing in a geographical area.

6.2.2.2. Non-financial products and services

Besides financial services, MFIs in Vietnam also offer non-financial microfinance services, including education consultancy about finance, business management, and gender equality.

6.3. Micro-savings and microfinance performance in Vietnam

6.3.1. Regression model

$$\mathbf{MFI}\boldsymbol{Per}_{\mathrm{it}} = \alpha + \sum_{j=1}^{J} \boldsymbol{\beta}_j \mathbf{SAV}_{it}^{j} + \sum_{m=1}^{M} \boldsymbol{\beta}_m \mathbf{MFI}\boldsymbol{specific}_{it}^{m} + \sum_{n=1}^{N} \boldsymbol{\beta}_n \mathbf{MACRO}_t^n + \boldsymbol{\varepsilon}_{\mathrm{it}} \quad (6.1)$$

Where $\mathbf{MFIS}\boldsymbol{Per}_{it}$ is a set of performance measures for the MFI i at time t, with i = 1,2,…, N; t = 1,2,…, T; $\mathbf{MFIS}\boldsymbol{Per}_{it}$ includes Operational Self-Sufficiency (OSS), number of active borrowers (NAB), and average loan size adjusted by GNI per capita (LS_GNI); $\mathbf{SAV}_{it}$ is a set of variables that measures micro-savings including the number of net savers; the total deposits and the number of deposit account per staff member; $\mathbf{MFI}\boldsymbol{specific}_{it}$ is a set of institution-specific variables including gross loan portfolio to total assets, number of years reporting, and dummy variables for the age and data quality of MFIs; $\mathbf{MACRO}_t$ is a set of macroeconomic variables at time t which include

GNI per capita, inflation rate and GDP growth rate; $\varepsilon_{it} = \upsilon_i + \mu_{it}$ is an error term that includes υ_i - the unobserved complete set of individual MFI-specific effect, and μ_{it} – the idiosyncratic error.

6.3.2. Variables

In this chapter, we use three dependent variables, namely Operation Self-Sufficiency (OSS), number of active borrowers (NAB) and average loan size adjusted by GNI per capita. Regarding proxies for micro-savings, we also utilise 'net savers', 'total deposits' and 'number of deposits accounts per staff member'. In addition, gross loan portfolio to total assets, age, number of years reporting, proxies for data quality are incorporated in regression model as MFI-characteristic control variables. Moreover, macroeconomic control variables include inflation rate, GDP growth rate and GNI per capita. All these variables have been used in econometric analyses in Chapter 3, 4 and 5. Thus, to avoid repetitions, we do not describe the notation, measure and source of these variables in this section.

The signs of micro-savings coefficients on financial sustainability and the breadth and depth of outreach are expected as follows:

Table 6.1: Expected signs of micro-savings on financial sustainability and on the breadth and depth of outreach

	OSS (Financial Sustainability)	NAB (Breadth of outreach)	LS_GNI (Depth of outreach)
Net savers (NS)	Negative	Positive	Positive
Deposits (DEP)	Positive	Positive	Positive
Deposit accounts per staff member (DAPSM)	Positive	Intermediate	Negative

6.3.3. Description of dataset

To evaluate the links between micro-savings and the performance of microfinance institutions in Vietnam, we use unbalanced panel data of 38 MFIs in Vietnam for the period 2000 – 2012. The panel data is unbalanced because not all MFIs have information for every year. Each MFI has data for a minimum of 1 year to a maximum of 13 years. The dataset is obtained from two sources. Specifically, data for MFI-specific variables are collected from the MIX Market database. Further, the data for country-specific variables are assembled from World Bank data base (World Development Indicators – WDI).

As our dataset covers time period from 2000-2012, VBSP is the only formal MFI in the sample[65]. Agribank (Vietnam Bank for Agriculture and Rural Development) and the People's Credit Fund were used in some research on Vietnam microfinance as formal MFIs, which is not relevant because both focus on middle-income and high-income clients in rural areas (Putzey, 2002; Le, 2008; Nguyen and Le, 2010)[66]. Meanwhile, VBSP and other MFIs focus more on low-income clients and the poor[67]. According to the report of Vietnam Microfinance Working Group (VMFWG), up to 31st December 2014, there are 51 organisations operating in the microfinance sector in Vietnam. Our analysis uses the information of 38 MFIs which accounts for 74.5% of MFIs in Vietnam sector. Specifically, our data set includes 33 deposit takings MFIs, accounting for 86.84% of whole sample. The control group consists of 5 non-deposit-taking MFIs which account for only 13.16% of the whole sample. (See Appendix 6.10 – List of Vietnam MFIs studied).

[65] TYM and M7 became formal MFIs in October 2012 and Microfinance Thanh Hoa became formal in August 2014.
[66] See Figure 6.1
[67] See Figure 6.1

6.3.4. Methodology

This study uses fixed effects (FE) model and random effects (RE) model to test the links between micro-savings and financial sustainability as well as outreach of microfinance institutions in Vietnam. The choice between a FE and a RE model is determined by Hausman test p-value (See Appendix 6.3 – 6.6 and 6.9).

6.3.5. Descriptive Statistics

Table 6.2: Descriptive statistics of all variables

Variable	Notation	Obs	Mean	Median	Std.Dev	Min	Max
Net savers	NS	93	4,033.654	1,508	13,341.22	2	125,823
Deposits (US$)	DEP	138	3.19e+07	211,323	1.92e+08	0	1.59e+09
Deposit accounts per staff member	DAPSM	124	277.4435	228	192.6857	0	919
Operational Self-Sufficiency	OSS	165	137.251	138.83	77.15899	1.96	706.81
Operating Expenses to total assets	OEA	130	11.71854	9.67	8.10428	1.23	56.31
Number of active borrowers	NAB	184	329,213.2	5,464.5	13,707.03	159	8,166,287
Loan size_GNI (US$)	LS	184	21.65538	13.425	43.4061	01	395.59
Gross loan portfolio to total assets	GLPA	180	131.4865	91.785	567.0743	34.85	7695.87
Years of reporting	YR	494	4.921053	4	3.185261	1	13

Mature	Mature	197	.4263959	0	.4958128	0	1
New	New	197	.3045685	0	.461397	0	1
One-star MFIs	Onestar	494	.1315789	0	.3383751	0	1
Two-star MFIs	Twostar	494	.0263158	0	.160235	0	1
Three-star MFIs	Threestar	494	.7631579	1	.4255756	0	1
Four-star MFIs	Fourstar	494	.2067308	0	.4050356	0	1
Inflation	INF	494	10.453	9.232	5.546168	2.677	22.67332
GNI per capita (US$)	GNI	494	846.92	760	372.9443	400	1550
GDP Growth rate	GDPR	494	6.4894	6.423	.7198109	5.247	7.547248

Table 6.2 presents the summary statistics of variables that enter the analysis. Firstly, with regards to the outreach of voluntary savings, the mean value of net savers of MFIs is 4,033 persons. On average, Vietnamese MFIs have much lower mean value of net savers compared to global MFIs which is 77,786 persons[68]. Notably, a median of 1,508 net savers and a high standard deviation of 13,341 savers demonstrate that the number of net savers' distribution is skewed heavily to the small outreach of micro-savings (more MFIs with small outreach of micro-savings, but with a long tail of at the medium outreach of savings). Secondly, concerning the scales of micro-savings, table 6.3 reveals that the mean value of total deposits of Vietnamese MFIs is US$ 3.19e+07, which is lower than that of global MFIs (US$ 6.37e+07)[69]. Thirdly, relating to the productivity of micro-savings, it is reported that the mean value of the number of deposit accounts per

[68] See table 3.3
[69] See table 3.3

staff member of Vietnamese MFIs is 277.4435 deposit accounts per staff member, which is quite similar to that of global MFIs (295.4544 deposit accounts per staff member)[70].

Moving to proxies for financial performance, we first see that the mean value of Operational Self-Sufficiency (OSS) of Vietnamese MFIs in the sample for the period 2000-2012 was 137.251%. For Operational Self-Sufficiency (OSS), values below 100% demonstrate that the respective MFI is not doing very well in terms of generating cost-covering revenue. Therefore, we could assume that, on average, most of the MFIs in the sample are financially sustainable. On the whole, Vietnamese MFIs have a higher OSS than that of global MFIs which is 113,955%[71]. The mean value for operating expenses to assets is roughly 11,718%, lower than that of global MFIs (18,739%)[72].

Turning towards variables relating to social outreach, the mean value for the number of active borrowers is 329,213 persons, indicating that Vietnamese MFIs generally have large breadth of outreach[73]. The mean value of active borrowers of Vietnamese MFIs is much higher than that of global MFIs which is about 56,475 persons[74]. The average loan size adjusted by GNI per capita of Vietnamese MFIs is approximately 21.65%, which is much smaller than the average loan size of global MFIs (133.34%)[75]. As the mean value of the average loan size is between 20% and 149%, in general, the target market of Vietnamese MFIs is broad end[76].

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[70] See table 3.3
[71] See table 3.3
[72] See table 3.3
[73] According to the benchmarks of the MIX, the outreach of MFIs is small, medium, or large if their number of active borrowers is less than 10,000; between 10,000 and 30,000; and more than 30,000, respectively.
[74] See table 4.5
[75] See table 4.5
[76] The target market, or depth of outreach, measured by average loan balance per borrower/GNI per capita is categorised into 4 groups. The target market is low end, broad, high end and small business if the depth

Regarding institutional experience, 42.63% of MFIs in the data set are mature, demonstrating that they have been active for more than 8 years in the microfinance industry. The average years of reporting are nearly 5 years. 76% of MFIs in the sample have transparency level of data rated at three-star level.

In addition, Vietnamese MFIs, on average, are bigger than global MFIs as Vietnamese MFIs have a higher mean value of gloss loan portfolio to assets.

In summary, key characteristics of Vietnamese MFIs compared to global MFIs are as below:

- Smaller breadth of micro-savings outreach (lower mean value of net savers)
- Smaller scales of micro-savings (lower mean value of total deposits)
- Similar productivity of deposit taking activities (quite similar mean value of number of deposit accounts per staff member)
- Better financial sustainability (higher mean value of OSS)
- More cost efficient (lower mean value of operating expenses to assets)
- Larger breath of credit outreach (higher mean value of number of active borrowers)
- Better in come-related depth of outreach (lower mean value of average loan size adjusted GNI per capita)
- Having larger sizes in terms of gross loan portfolio

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is less than 20%; depth between 20% and 149%; depth between 150% and 250%; and depth over 250%, respectively.

Table 6.3: Correlation matrix of variables used in the sample

	lnetsavers	ldeposits	lnDAPS	lnOSS	OEA	lnNAB	lnLS_GNI	GLPTA	lnYR	Four-star	One-star	Three-star	Mature	New	lnGNI	INF	GDPR
lnetsavers	1.000																
ldeposits	.4457*	1.000															
lnDAPS	.4827*	.2866*	1.000														
lnOSS	.2164*	.0098	.3929*	1.000													
OEA	-.0950	-.3532*	-.0574	-.4273*	1.000												
lnNAB	.4037*	.8676*	.2199*	-.1492	-.2632*	1.000											
lnLS_GNI	.1727	.6345*	.0002	-.1397	-.2204*	.4073*	1.000										
GLPTA	.3043*	-.2454*	.1741	.1338	-.0875	-.0925	-.0741	1.000									
lnYR	.3135*	.4615*	.3114*	-.0042	-.0657	.4513*	.2457*	-.0500	1.000								
Four-star	.0450	.0687	.0044	-.0271	.1231	.0256	.0304	-.0299	.0828	1.000							
One-star	-.0311	-.0520	-.1321	.1861*	-.0523	-.1419	.0420	-.0199	-.2961*	-.1140*	1.000						
Three-star	-.0620	-.0539	.0167	-.1017	-.0716	.0690	-.0415	.0379	.2976*	-.5255*	-.6987*	1.000					
Mature	.1478	.5183*	.1823*	.0593	-.2922*	.4123*	.2824*	-.0679	.3770*	-.1919*	-.0908	.2226*	1.000				

New	-.0306	-.4146*	-.2184*	.1679*	.2203*	-.3051*	-.0966	.1184	-.2132*	.1109	-.0302	-.0879	-.5706*	1.000			
lnGNI	.0134	-.1084	-.0088	.0141	-.0127	-.1253	-.0694	.0155	-.0000	-.000	-.000	-.000	-.0721	-.1062	1.000		
INF	.0743	-.0737	-.0450	-.0771	.0350	-.0644	-.0719	-.0834	0.000	-.000	.000	-.000	-.0483	-.0837	.5481*	1.000	
GDPR	.0029	.0750	-.1232	-.0735	.0142	.0401	-.0021	-.0826	0.000	.000	-.000	.000	.0094	.1317	-.5103*	-.2087*	1.000

Notes: (1) * is statistically significant at the level of 5% or lower (2-tailed test)

(2) The definition and measurement of main variables of this Chapter are presented in Table 3.2 and Table 4.4

Table 6.3 lists correlation coefficients for the variables in the study. We computed VIF of all independent variables that enter the analyses. As all of them have a VIF less than 5 (see Appendices 6.1-6.4 and 6.7), we rule out any problem of multicollinearity.

Most notably, the number of net savers and the number of deposit accounts per staff member are both positively correlated with financial sustainability. This is perhaps an indication that there micro-savings have a positive contribution into sustainability of MFIs in Vietnam. Also, it is shown in Table 6.3 that all three proxies for micro-savings are positively correlated to the breadth of microfinance outreach proxied by the number of active borrowers and to the depth of microfinance outreach measured by the average loan size. The significant positive correlation between total deposits and average loan size may indicate that MFIs in Vietnam enable to improve the well-being of their depositors.

6.3.6. Empirical findings

6.3.6.1. Linkages between micro-savings and financial sustainability of Vietnam MFIs

Table 6.4: Micro-savings and financial sustainability: Random-effects GLS regression

Variables	Notation	Dependent variable: OSS (log)
Constant	Constant	4.957*** (4.06)
Net Savers	lnNS	-0.0431* (-2.27)
Deposits	lnDEP	0.0577* (2.10)
Deposit accounts per staff member	lnDAPS	0.151* (1.98)
Gross Loan Portfolio to Total Assets	GLPTA	0.00761* (2.45)
Mature	Mature	0.0827 (0.74)
New	New	-0.0279 (-0.32)

Number of years reporting	lnNYR	0.120 (1.02)
One-star MFI	One_star	-0.0887 (-0.18)
Three-star MFI	Three_star	-0.372 (-1.45)
GNI per capita	lnGNI	-0.263 (-1.76)
Inflation	INF	-0.000255 (-0.07)
GDP growth rate	GDPR	-0.0168 (-0.42)
Within R-squared		0.3143
Between R-squared		0.3596
Overall R-squared		0.3170
Wald chi2 (12)		36.55
Prob>chi2		0.0003
Hausman specification test		Chi2 (9) = 6.42 Prob>chi2 = 0.6974
Observations		88

Notes: (1) *, **, and *** represent significance at the levels of 10%, 5%, and 1%, respectively

(2) Absolute value of t statistics in parentheses.

Table 6.4 presents regression result of the relationship between micro-savings and financial sustainability of MFIs in Vietnam by using RE model. The results demonstrate that the number of voluntary savers was negatively associates with operational self-sufficient (-0.0431) and significant of 10% level. This can be explained by the fact that serving more clients in terms of saver may entail higher costs and hence leads to poorer financial performance. We also found a significant positive association between deposits (in US dollars) and OSS. Specifically, total deposits were positively related to financial performance (0.0577), significantly at the level of 10%. This finding supports theoretical viewpoint which states that deposits are considered to be one of funding sources of MFIs. In addition, our results support theories of financial intermediation including transaction costs and asymmetric information (Allen *et al*, 1998; Scholtens

and Wensveen, 2003). Also, offering savings permits economies of scope due to low-cost use if deposits are for lending objectives (Diamond, 1984; Rossel-Cambier, 2011). Therefore, higher volume of deposits would contribute to financial success of MFIs. In addition, we also discovered that the number of deposit account per staff member positively related to OSS. Our findings are in line with Gingrich (2004), and Bergsma (2011). However, our findings contrast with the studies of Hartarska *et al.* (2007) and Gutierrez-Goiria (2011). These studies found no evidence between micro-savings and financial sustainability. All the findings relating to three dimensions of micro-savings and financial sustainability are similar to the results of the cross-country analysis based on global dataset which was discussed in the Chapter 3 of this thesis.

Compared to the total deposits and the number of deposit accounts per staff member, the role of the number of micro-savers on financial sustainability is less important as its coefficient is smaller. Therefore, on the whole, deposit taking has a positive impact on financial sustainability of MFIs in Vietnam. Our finding supports the research of Bergsma (2011) and Kurgat (2011). Bergsma (2011) looks at the case study of Taytay Sa Kauswagan Incorprorated (TSKI), a leading MFI in the Philippines. The author found that there was a big difference ROA when TSKI included micro-savings and excluded micro-savings in their ranges of services. In period 1998-2002 when micro-savings were not offered, TSKI suffered from a negative average ROA (-3.52%) and the average OSS was only 91.4%, less than 100% meaning that TSKI was not financially sustainable. In contrast, from 2003 to 2008, when micro-savings were offered, its average ROA was 2.53% and its average OSS was 112.3%. The study of Bergsma (2011) evidently demonstrates a positive relationship between micro-savings and financial performance. Kurgat (2011) examined the case of Kenya Women Finance

Trust (KWFT), a deposit-taking MFI and they discover that savings balances are strongly and positively linked to financial performance of KWFT (p = 94.3% at 5% level of significance). However, the results of our study are dissimilar to the study of Njeri (2012). Their research generally suggests that deposit taking has had a negative impact on the financial performance of MFIs. To obtain such results, Njeri uses the data of three nation-wide deposit-taking MFIs in Kenya collected for five years prior to transformation and the entire period after transformation varying from one year to maximum three years. The negative relationship between deposit taking and financial performance of MFIs in Kenya is mainly attributed to the huge transformational costs incurred during the transition period. However, as stated in the research of Njeri (2012), experience from other countries such as Uganda implies that, with time, deposit taking MFIs achieve positive financial results.

Turning to control variables; first, there is a positive and significant relationship between the size of MFIs and financial sustainability in the case of Vietnam. When MFIs' gross loan portfolio grows, they achieve efficiency, among other issues, by reducing information asymmetries (Behr *et al.*, 2011). As a result, larger MFIs can obtain financial sustainability. This finding is also consistent with our result of the cross-country analysis and the case of Ethiopia in the study of Abate *et al.* (2014). However, we could not find any links between other control variables and financial sustainability of Vietnamese MFIs.

6.3.6.2. Links between micro-savings and breadth of outreach of Vietnam MFIs

Table 6.5: Micro-savings and breadth of outreach: Fixed effects (FE) regression, dependent variable: Number of active borrowers (log)

Variables	Notation	Dependent variable: NAB (log)
Constant	Constant	2.479 (1.95)
Depositors	lnDepositors	0.425*** (5.85)
Deposits	lnDEP	0.164*** (4.59)
Deposit accounts per staff member	lnDAPS	-0.361*** (-4.40)
Gross Loan Portfolio to Total Assets	GLPTA	0.0136*** (3.79)
Mature	Mature	-0.0142 (-0.13)
New	New	0.276*** (2.88)
GNI per capita	lnGNI	0.187 (1.09)
Inflation	INF	-0.00343 (-0.85)
GDP growth rate	GDPR	-0.00830 (-0.18)
Within R-squared		0.6307
Between R-squared		0.8777
Overall R-squared		0.8726
F (9,74)		14.04
Prob > F		0.0000
Hausman specification test		Chi2 (9) = 18.90 Prob>chi2 = 0.0260
Observations		114

Notes: (1) *, **, and *** represent significance at the levels of 10%, 5%, and 1%, respectively

(2) Absolute value of t statistics in parentheses.

Table 6.5 reports the results using the number of active borrowers (NAB, log) to investigate the relationship between micro-savings and breadth of outreach. It is shown that both the number of voluntary savers and the total of deposits are positively related

to the number of active borrowers, significant at 1% level. This result implies that MFIs in Vietnam can expand their breadth of outreach by increasing the number of their micro-savers and the total of deposits. These findings are similar to the results of the cross-country analysis in the second empirical of the thesis. However, in contrast to the findings of global analysis, the number of deposit account per staff member is found to be negatively linked to the number of active borrowers in Vietnam MFIs.

In addition, we found that gross loan portfolio to total assets was positively related to the breadth of outreach (0.0136) and significant at 1% level. This finding is consistent with the cross-country regression results. Our finding once again confirms the belief that large MFIs can source more funding, have better client bases compared with small MFIs. Therefore, large MFIS are more likely to serve a higher number of active borrowers. In addition, MFIs in Vietnam depend heavily on subsidy funds and grants from Government and NGOs MFIs have a great focus on social mission which is the breadth of outreach (De Sousa-Shields and Frankiewicz, 2004). Thus, they target at reaching a greater number of active borrowers. This finding implies that, similar to global MFIs, Vietnam MFIs can upscale their operations to expand their breadth of outreach.

In terms of microfinance experience, we found that new MFIs in Vietnam positively linked to breadth of outreach. This means that it is easier for MFIs operating less than 4 years to improve their breadth of outreach. This result is different from the finding of our cross-country analysis in chapter 4 of this. In the cross-country analysis, we find that new MFIs have lower breadth of outreach than young and mature MFIs.

Most of MFIs in Vietnam apply group lending method[77]. Joint liability could mitigate the effects of asymmetric information (Galariotis *et al.*, 2011) and help new MFIs to expand their breadth of outreach. Moreover, it may be rational to assume that new MFIs tend to be members of big microfinance networking, such as Vietnam Microfinance Working Group or Banking with the Poor. By participating in such networks, new MFIs can take advantages of training and education programs. Further, by joining meetings with other mature members, new MFIs in Vietnam can learn experience to improve their breadth of outreach at early stage of their operation.

Regarding other macroeconomic variables, we do not find any significant relationship between the breadth of outreach and GNI per capita, inflation rate as well as GDP growth rate for MFIs in Vietnam.

6.3.6.3. Linkages between micro-savings and income-related depth of outreach of Vietnam MFIs

Table 6.6: Micro-savings and depth of outreach: Fixed-effects regression: dependent variable: Average loan size_GNI (log)

Variables	Notation	Dependent variable: LS_GNI (log)
Constant	Constant	-0.998 (-0.69)
Net Savers	lnNS	-0.0358 (-0.79)
Deposits	lnDEP	0.650*** (9.51)
Deposit accounts per staff member	lnDAPS	-0.271 (-1.39)
Gross Loan Portfolio to Total Assets	GLPTA	-0.0319*** (-4.41)
Mature	Mature	-0.148 (-0.54)

[77] According to Vietnam Microfinance Bulletin (2008), 70% of MFIs in Vietnam apply group lending method.

New	New	0.0762 (0.43)
Inflation	INF	0.0156 (1.90)
GDP growth rate	GDPR	-0.0287 (-0.34)
Within R-squared		0.6762
Between R-squared		0.2694
Overall R-squared		0.3870
F (8,55)		14.36
Prob>F		0.0000
Hausman specification test		Chi2 (8) = 17.27 Prob>chi2 = 0.0274
Observations		90

Notes: (1) *, **, and *** represent significance at the levels of 10%, 5%, and 1%, respectively

(2) Absolute value of t statistics in parentheses.

Table 6.6 shows the results using the average loan size (LS, log) to examine the links between micro-savings and income-related depth of outreach in the case of MFIs in Vietnam. We find no links between the number net savers as well as the number of deposit accounts per staff members and the depth of outreach. These findings are different from our cross-country analysis in Chapter 4. However, we observe that total deposits are positively related to the average loan size. This finding supports the result of cross-country analysis in Chapter 4. In addition, our result reaffirms a theory relating to micro-savings. On one hand, clients can reap benefits from micro-savings in terms of income growth, assets accumulation or well-being enhancement. As a result, micro-savings clients in Vietnam can be lifted out of their poverty status to become wealthier. Accordingly, they may ask for larger loans to make some investments or to run small business. This finding is meaningful both at a micro and a macro level. In particular, our finding helps to explain that micro-savings can be part of the success of poverty

reduction in Vietnam. On the other hand, the positive linkage between micro-savings and the average loan size can imply that offering micro-savings financial products is expensive for MFIs in Vietnam. To deal with cost inefficiency, Vietnamese MFIs tend to serve better off clients who are less risky, less costly and more profitable to serve.

Concerning the size of MFIs, we found that gross loan portfolio was negatively associated to the average loan size. This means that MFIs in Vietnam can reach the poorest while upscaling their operations. This finding is opposed to the results of cross-country analysis. As mentioned above, MFIs in Vietnam are mostly subsidised by Government and are inclined to focus on social mission. Therefore, our finding is consistent with De Sousa-Shields and Frankiewicz (2004). They state that subsidised funds and social mission lead MFIs to concentrate on supplying small loans to a larger number of credit clients.

6.4. Robustness checks:

To affirm the main findings, robustness checks were performed by running the same set of regressions for a smaller data set of 325 observations of 25 MFIs that reported data for at least 3 years. As shown in table 6.7, utilizing a significantly reduced unbalanced sub sample does not fundamentally change the picture. Therefore, our results are validated.

Table 6.7: Micro-savings and financial sustainability, outreach breadth and outreach depth: Random-effects GLS regression and Fixed effects Regression (Robustness – dependent variable: OSS (log), NAB (log), and LS (log))

Variables	Notation	Dependent variable: OSS (log)	Dependent variable: NAB (log)	Dependent variable: LS (log)
		RE	FE	RE
Constant	Constant	4.839*** (4.04)	2.738* (2.57	-3.467* (-2.38)
Net Savers	lnNS	-0.0545**** (-3.45)	0.358*** (5.46)	0.0376 (1.80)
Deposits	lnDEP	0.0774 (1.61)	0.364*** (6.82)	0.0579 (1.10)
Deposit accounts per staff member	lnDAPS	0.126 (1.79)	-0.286** (-3.80)	0.0254 (0.30)
Gross Loan Portfolio to Total Assets	GLPTA	-0.00283 (-0.88)	0.00738***(3.80)	-0.00243 (-0.60)
Mature	Mature	0.0551 (0.58)	0.0441 (0.47)	-0.0396 (-0.38)
New	New	0.00322 (0.05)	0.317*** (3.92)	-0.222** (-2.60)
Number of years reporting	lnNYR	0.311 (0.98)		0.729* (2.37)
Three-star MFI	Three_star	-0.273 (-1.03)		0.116 (0.50)
GNI per capita	lnGNI	-0.204 (-1.50)	-0.118 (-0.73)	0.914*** (5.39)
Inflation	INF	0.00530 (1.74)	-0.00023 (-0.07)	0.0037 (0.88)
GDP growth rate	GDPR	-0.00745 (-0.24)	0.0115 (0.29)	-0.0861*(-2.10)
Within R-squared		0.2826	0.7003	0.7854
Between R-squared		0.3768	0.9011	0.5204
Overall R-squared		0.2006	0.8953	0.5272
F-test			17.66***	
Wald test		27.65***		196.45***
Hausman specification test		Chi2 (9) = 4.91 Prob>chi2 = 0.8425	Chi2 (9) = 471.87 Prob>chi2 = 0.000	Chi2 (9) = 15.30 Prob>chi2 = 0.0829
Observations		75	98	78

Notes: (1) *, **, and *** represent significance at the levels of 10%, 5%, and 1%, respectively

(2) Absolute value of t statistics in parentheses.

6.5. Conclusions

This chapter has examined the impact of micro-savings on financial sustainability and outreach of MFIs in the case of Vietnam by employing a dataset of 38 MFIs in Vietnam from the period 2000-2012.

We firstly discover that micro-savings clearly affected the financial sustainability of MFIs in Vietnam. Specifically, an increase of the number of voluntary savers negatively impacts financial sustainability. This finding supports the theoretical point that offering small size of savings may have high transaction costs. Our result is consistent to the study of Nijeri (2012) which uncovers that deposit taking has a negative impact on financial performance of MFIs in Kenya due to high costs incurred in transformation process. Further, both the total deposits (in US$) and the number of deposit accounts per staff member help Vietnamese MFIs to improve their financial mission. These results reconfirm the view point that savings can be a cheaper funding source compared to other commercial sources of MFIs. As the magnitudes of the effects of total deposits and the number of deposit accounts per staff member are greater than that of the number of voluntary savers, it could therefore be inferred that for deposit-taking MFIs in Vietnam, micro-savings generally have positive effects on their financial sustainability. This finding is consistent with the result of the cross-country analysis in previous chapter.

Moreover, we found that increasing *both* the number of savers and the total deposits enables MFIs in Vietnam to serve more credit clients. Meanwhile, an increase of the number of accounts per staff member lessens the breadth of outreach. In addition, it should be noted that the magnitudes of the impact of savers and total deposits are larger than that of the number of deposit accounts per staff member. Our general

findings therefore imply that offering micro-savings enables MFIs in Vietnam to improve their breadth of outreach. The other findings are similar to the results in cross-country analysis presented in previous chapters.

Regarding the relationship between micro-savings and income-related depth of microfinance, we do find a positive and significant relationship between the total deposits and the average loan size for MFIs in Vietnam. This finding is similar to the cross-country analysis.

With regard to other control variables, we found that for MFIs in Vietnam, upscaling their operations would enable them to enhance their financial sustainability and breadth of outreach without hurting their income-related depth of outreach. We further discover that new MFIs in Vietnam tend to have higher number of active borrowers than old MFIs. On the whole, our empirical results provide clear evidence that micro-savings have a positive impact on both financial sustainability and breadth of microfinance outreach for MFIs in Vietnam. The results of this study are consistent with the theories for the effects of micro-savings on microfinance performance but Vietnam differs slightly from countries in the global panel as a whole. This can be explained by the fact that most Vietnamese MFIs are subsided by the Government.

Empirical evidence of the positive impacts of micro-savings on financial sustainability and breadth of microfinance presented in this chapter has clear implications for policy makers and MFIs practitioners in Vietnam. Specifically, as micro-savings are found to be beneficial in terms of enhancing performance of Vietnamese MFIs, improving well-being of Vietnamese micro-savers at a micro level and accordingly reducing poverty at a macro level, Vietnam Government should implement suitable policies stimulate micro-savings mobilisation in Vietnam. For

instance, Vietnam Government should establish a suitable legal framework and provide favourable business environment for microfinance sector to develop. As for Vietnamese MFIs, they should find solutions to take advantages of micro-savings. For example, they need to enhance their productivity, upscaling to bolster their financial sustainability. Mature MFIs in Vietnam should provide innovative and flexible products in order to improve both their breadth and depth of outreach.

CHAPTER SEVEN

CONCLUSIONS

7.1. Summary

This chapter concludes the thesis by firstly summarising the main findings. We will show how these findings achieve the objectives of the research identified in the introductory chapter of the thesis. We will also demonstrate how these results reflect the hypotheses that have been listed in the four empirical chapters. In addition, we will suggest some policies for policy makers and practitioners. At the end of this Chapter, we also extend some ideas for further research,

While most studies in the field of microfinance have focused on microcredit and its impacts on the microfinance clients, micro-savings have been considered "the forgotten half of microfinance". Further, many studies have examined factors influencing microfinance financial performance and social outreach, but very few researches have been carried out to investigate the roles of micro-savings on both micro-savers and microfinance performance. This thesis is therefore a first attempt and a response to the need for more understanding on constraints to the impact of micro-savings on the financial and social performance of MFIs. To deal with these issues, we used a dataset of from 1,936 MFIs and a sample of 1,233 MFIs all over the world from the Mix Market database, thereby presenting comprehensive evidence on the linkages between micro-savings and microfinance performance both in the context of world economies and the case study of Vietnam.

We believe we have made significant contributions to the more limited literature on micro-savings relative to that on micro credit. First, to the best of our knowledge, we use the largest datasets of MFIs worldwide over a longer period of time than any of the previous studies in this field. Second, we examine different aspects of micro-savings in order to have an in-depth analysis. Third, we use the variable "net savers" - the proxy for voluntary savings which has never been empirically examined before. Fourth, we also use new performance indicators as control variable in our estimation including "the number of reporting years" and dummies variables proxied for the transparency of the data. Fifthly, we use a combination of estimation techniques including Hausman-Taylor, GMM, FE and RE with an attempt to have a rigorous analysis.

7.2.Main findings

Our research was to aim at providing an in-depth analysis of the relationship between micro-savings and microfinance performance. To pursue this aim, we utilise both institution- and country-level data to empirically examine whether *(i) offering micro-savings affects financial sustainability and cost-efficiency, (ii) offering micro-savings enables MFIs to improve their breadth and depth of microfinance outreach, (iii) trade-offs between financial sustainability and social outreach/ and mission drift exists for MFIs that take micro deposit; and (iv) micro-savings have impacts on both financial performance and social outreach in the context of Vietnam.*

Firstly, the impact of micro-savings on financial performance was examined in chapter three. The literature review points out some limitations of previous studies. The first drawback is relating to data. Earlier research utilised limited data set ranging in short time period. In addition, previous studies normally use the data of MFIs which have been rated from three or four star. They excluded MFIs whose data has been rated only

one star or two star. This way of selecting data is not random, which may lead to sample selection bias. The second limitation refers to the proxies used for micro-savings. In previous studies, dummy variable "Deposit-taking" or the ratio "deposits to total assets" or "deposits to loans" were normally used. All empirical studies obtained data from the MIX website. Although the MIX platform provides data of over 2,000 MFIs worldwide, their dataset does not differentiate between voluntary savings and compulsory savings. To avoid such limitations, our study used the largest global dataset of 1,936 MFIs active in 79 countries ranging a long period from 2000 to 2012. We also apply a completely new proxy for voluntary savings which has never been examined before. Specifically, voluntary savings is proxied by "net savers" which is the positive differences between "the number of active savers" and "the number of active borrowers". We also incorporated new control variables which have never been tested, including "the number of reporting years" and dummy variables relating to transparency level of data, ranging from "one star" (lowest) to "five star" (highest). Further, besides using dummy variable *Dum*Deposit-taking in order to make a comparison between the financial performance of deposit taking MFIs and non-deposit taking ones, we also look at different dimensions of micro-savings with an attempts to have thorough and in-depth analyses. To deal with potential endogeneity problem, we apply Hausman-Taylor estimation as the main regression approach and GMM to retest the robustness of our results.

Our first main important finding of Chapter three is that *micro-savings have influenced financial sustainability of microfinance institutions*. Our finding confirms earlier studies (e.g., Gingrich, 2004 and Bergsma, 2011). Specifically, MFIs that have higher total volume of deposits (in US$) and having more deposit accounts per staff

member are more likely to attain better financial achievement. These results support the theories that deposits are considered to be one of cheap loanable funding sources of MFIs. The number of voluntary savers is found to be negatively affected operational self-sufficiency. This finding is consistent with a theoretical standpoint which suggests that, offering the small size of savings may entail high transaction costs.

The other important finding of Chapter three is that we find strong evidence that *micro-savings have a role in the cost efficiency of microfinance institutions*. Specifically, serving more voluntary savers would increase the costs of MFIs, and thus reduce the efficiency of MFIs. This result once again confirms the theory that offering micro-savings may be costly. Further, we found that the total deposits significantly and negatively associated with microfinance operating expenses to total assets. This means higher volume leads to an improvement of cost efficiency. Therefore, our findings support the research of *Caudill et al*. (2009) and *Hartarska et al.* (2013). In addition, a significant and negative relationship was found between the number of deposit account per staff member and the operating expenses to total assets. This result indicates that enhancing the productivity of deposit activities can help improve cost efficiency of MFIs. Our findings are in line with the studies of Rossel-Cambier (2010).

Secondly, the impact of micro-savings on social outreach was investigated in chapter four. To overcome limitations of previous studies, we utilised the same dataset, same main and control variables and used the same econometric techniques, such as Hausman-Taylor as a main regression approach and GMM for robustness checks.

In Chapter four, we find strong evidence of the relationship between micro-savings and breadth of microfinance outreach. Specifically, "net savers" does not influence the breadth of outreach but the other two proxies do matter. "Total deposits"

and "the number of deposit accounts per staff members" *are found to be positively linked to the breadth of microfinance outreach*. These findings confirm that capturing micro-savings enables MFIs to broaden their breadth of outreach in terms of serving more microcredit clients. Our findings are in line with the studies of Hartarska et al (2007), Rossel-Cambier (2010) and Bergsma (2011).

Empirical results from Chapter four also demonstrate that *increasing the number of deposit accounts per staff member or an improvement of productivity of deposit taking activities enables MFIs to deepen their depth of microfinance outreach by reaching more poor customers*. However, *net savers and the total volume of deposits are found to be positively related to the income-related depth of microfinance outreach*. This result may explain the contribution of micro-savings to the improvement of income and well-being of microfinance clients. Accordingly, MFIs better meet the demand of their clients by extending the average loan size. Our finding supports the research of Rossel-Cambier (2010).

Thirdly, the roles of micro-savings in the mission drift /trade-offs between financial sustainability and breadth and depth of outreach were evaluated in Chapter Five. To this end, we used a global dataset of 1,233 MFIs operating in 79 countries spanning for 13 years from 2000 to 2012. In this chapter, we utilised GMM estimation as our main regression approach as GMM is believed to deal with many econometric issues.

In this chapter, we firstly discover that *in terms of mission drift/trade-offs between financial sustainability and breadth of outreach, micro-savings are win-win for deposit-taking MFIs*. To be more specific, compared to non-deposit-taking MFIs, MFIs that offer micro-savings can enjoy financial viability while expanding their breadth of outreach in terms of increasing the number of active borrowers. We also found that

deposit-taking MFIs can fulfil their mutual missions by improving financial sustainability and enhancing their breadth and depth of outreach.

Further, we found that *trade-offs between financial sustainability and income-related depth of outreach do occur when MFIs scale up their deposit taking activities*. Our empirical results in chapter five also reveal that *enhancing the productivity of micro-savings by increasing the number of deposit accounts per staff member enables MFIs that capture savings to have a win-win situation*.

Chapter Six examined the effects of micro-savings on financial sustainability and breadth and income-related depth of outreach in the context of Vietnam. So far, there has had no empirical research on this topic in Vietnam. We used a dataset of 38 MFIs from the year 2000 to 2012.

We discover that *micro-savings clearly affected the financial sustainability of MFIs in Vietnam*. Specifically, an increase of the number of voluntary savers negatively impacts financial sustainability while an increase in both total deposits (in US$) and the number of deposit accounts per staff member helps Vietnamese MFIs improve their financial mission. As the magnitudes of the effects of total deposits and the number of deposit accounts per staff member are greater than that of the number of voluntary savers, it could therefore be concluded that for deposit-taking MFIs in Vietnam, micro-savings broadly have positive effects on the financial sustainability. This finding is consistent with the result of the cross-country analysis in chapter three and chapter four of the thesis.

Moreover, we find that *increasing both the number of savers and the total deposits enables MFIs in Vietnam serve more microcredit clients*. Further, we discover

that *MFIs in Vietnam tend to serve well off clients through enhancing total volumes*, which is in line with the cross-country analysis. Our general findings therefore imply that offering micro-savings in Vietnam enables MFIs to improve their breadth of outreach.

7.3.Recommendations for policy and practice

Our empirical results affirm the influence of offering savings and other institution-specific factors as well as macroeconomic factors of the countries where the MFIs are operating on both financial performance and social outreach. Therefore all of these factors should be taken into account in evaluating microfinance performance in order to improve financial sustainability, cost efficiency, breadth and income-related depth of microfinance outreach.

7.3.1. Stabilising macroeconomic environment

At a macro level, the evidence of macroeconomic variables including GNI per capita, GDP growth rate, inflation rate and deposit interest rate calls for country-specific risks management. To be more specific, the Governments, Ministries of Finance and Central Banks should have appropriate and beneficial policies in order to improve economic development and create favourable business environment for microfinance industry. Also, as micro-savings have been found to have some positive contributions into the performance of MFIs, this thesis calls for the development of suitable regulatory policies that enable MFIs to take deposits.

7.3.2. Enhancing cost efficiency to achieve financial sustainability by reducing administrative costs of micro-savings

Cost efficiency can result in financial sustainability. Being more sustainable can help MFIs to mobilise more savings from pubic because nobody wants to deposit money in MFIs that are not financially viable. As our findings indicate that serving micro-savers may be costly, MFIs should seek solutions to reduce administrative costs of micro-savings in order to achieve financial sustainability. We recommend some possible methods as below:

- *Lean structures:* MFIs should employ lean field offices with a minimum of infrastructure and staffing. Further, MFIs should use ATMs where it is costly to establish a branch.
- *Streamlining of operations:* MFIs should apply modern technologies instead of manual administration of savings accounts to minimize transaction costs. For instance, using mobile phone banking and internet banking can lead to a decrease in administrative expenses. More specifically, using e-bank statements instead of paper bank statements can help to reduce costs.
- *Networking:* As the experience of MFIs do affect financial sustainability and cost efficiency of MFIs, our research recommends that new MFIs should learn experiences from older MFIs in order to perform well at the very starting stage of their operation. Moreover, they should take part in large network to benefit from the expertise these networks offer in the form of consulting services to their partners
- *Staffing:* MFIs should consider using volunteer staff
- *Improving productivity:* MFIs should improve the productivity of deposit taking to become more cost efficient, financial viable and can serve more customers and reach more poor clients.

7.3.3. Transformation

In order to be transformed into regulated MFIs; from an institutional perspective, MFIs should improve their service quality, improve their staff's knowledge and ability and perform well so that they are allowed to be transformed into regulated MFIs and can take deposits.

7.3.4. Diversifying products and services

MFIs should diversify their range of products and services in order to make use of economics of scale. By doing so, MFIs are more likely to reduce costs, increase volume of deposits expand their client base and improve their depth of outreach and therefore can achieve financial sustainability. Specifically, MFIs should consider offering both financial and non-financial products and services. Further, financial products should be varied by including micro-savings, micro credit, micro-insurance, remittances. Each of these services would contribute to the growth of deposits. For instance, Mata (2009) finds a positive and significant impact of money transfer activity on deposit taking activity of MFIs. It is noteworthy that MFIs should reduce their reliance on subsidies in order to diversify their range of services. Cozarenco *et al.* (2016) discovers that micro-savings financial products are crowded out by subsidies. Their findings imply that subsidies impede service diversification of MFIs as well as hinder the positive effects of micro-savings that have been affirmed by previous studies.

With reference to diversification of micro-savings, MFIs should use flexible and innovative methodologies to enhance savings mobilisation activities. For instance, MFIs should launch special programs to attract savings from public, such as offering free savings account opening or presenting voucher to new savings clients. In addition, MFIs

should offer different types of savings accounts with special purposes in order to better meet the demand of their client. For example, MFIs should provide micro-savings financial products for schooling purpose, for marriage purpose or for funeral purpose.

7.3.5. Enhancing portfolio management

As portfolio management and regulatory do matter, this study suggest MFIs managers to enhance their corporate governance and monitoring incentive in order to reduce costs and improve their breadth and depth of social outreach.

7.3.6. Policy implications for Vietnam

Vietnam Government should set up appropriate legal framework so that microsavings activities in Vietnam can further develop. For instance, policy makers in Vietnam should consider exempting corporate income taxes from deposits activites for a limited time frame and allow deposit-taking MFIs to enjoy favourable tax regimes to boost the growth of microsavings in Vietnam. By doing so, MFIs in Vietnam are more likely to be financially sustainable and serve more microfinance customers. As a result, Vietnam is more able to eliminate hunger and reduce poverty in their country.

7.4. Ideas for further research

We believe that further research based on main findings of our doctoral thesis is necessary. There are some ways to extend this research. *First*, one possible extension of the work reported for this doctoral thesis is to explore the role of micro-savings using field experiments of microfinance institutions and households who save with these institutions. The idea is that while field experiments show increased uptake of micro-credit (see, for example, randomized evaluation of a group-lending micro-credit

program in Hyderabad, India, by Abhijit et *al*., 2015), it is not clear whether households and small business can equally demonstrate increased take-up of micro-savings, especially Vietnam. Further, the field experiment approach helps to investigate the impacts of micro-savings on households and small business. According, a more complete picture of the benefits of micro-savings can be obtained.

Second, further research should be undertaken to explore the impact of micro-savings at a macro-level. For example, future research should investigate whether increasing micro-savings financial products in microfinance industry can enable countries to improve their GNI per capita and GDP growth rate or reduce their poverty rate. To the best of our knowledge, no empirical studies have been undertaken to test the link between micro-savings and poverty reduction at a macro level.

Third, future research should also include capita structure in the model regression to explore if micro-savings is a better fund compared to other sources funding.

Fourth, future research should examine trade-offs between financial and social performance in the context of micro-savings based on different aspects of social performance. As contended by Woller (2007), it is simplistic and superficial if trade-offs are viewed in only the relationship between financial performance and poverty outreach as poverty outreach is only one aspect of social performance.

Fifth, further research should investigate determinants of offering micro-savings financial products in order to identify which factors really influence the efficiency of deposit-taking. By doing so, policy makers and MFIs managers can highlight beneficial factors and deal with negative factors.

Sixth, future research should explore the influence of the variation in tax regimes on financial performance. The findings of such research would be beneficial for policy makers.

Seventh, future research should apply propensity score matching in order to deal with sample selection bias in studies on microfinance generally.

APPENDICES

Appendix 3.1: Defining micro-savings

Approach to identifying micro-savings	Micro-savings measurement	Issues
Savings by low-income and poor people	Micro-savings = Income minus consumption	• Income and consumption measured with error in household surveys (under reporting of income) • Is debt/credit ex-ante micro-savings • From client's perspective, savings may include some forms of consumption or productive investment such as jewellery.
Low level of deposits and balances in saving accounts	Micro-savings = aggregate balances in cash and liquid saving schemes below a defined threshold	• Defining threshold • Includes the never poor with small amounts of savings
Savings in institutions specialising in microfinance	Micro-savings = balances in microfinance institutions	• Continuum of institutions – the reach of formal, large-scale institutions (e.g. banks, credit unions, post offices) to low-income groups makes this measure problematic

Source: Hulme *et al.* (2015)

Appendix 3.2: Summary of advantages and disadvantages of various saving providers

Service providers	Examples	Advantages	Disadvantages
Informal	Money lenders, ROSCAs, ASCAs, input suppliers	- serve poor clients, primarily - operating in remote, rural regions - low-cost operations - easily replicable and/or self-replications - build on social capital and self-esteem	- limited product offering - limited managerial capacity - savings methods limit asset building - risk of exclusion of poorer individuals - expensive (money lenders) - risk of theft of savings
Member-owned	SHGs, FSAs, CVECAs, Financial cooperatives	- indigenous - low-cost operations - accessible to poor and remote - profits used to benefit members	- governance challenges (risk of capture by net borrowers/elite, manager-oriented) - lack of effective financial supervision in some countries - scope of operations limited to members - limited products offered
NGOs	International network affiliates, Domestic NGOs	- knowledge of poor clients - social mission oriented - more willing and able to take risks to work at frontier	- many donor dependent - limited range of services; limited or no voluntary savings - small scale (except South Asia) - high-cost operations in many cases (with major exceptions)
Transforming (formerly Credit-only) MFIs		- knowledge of poor clients - social mission often oriented - increasingly more interested in using deposits to diversify funding sources	- inadequate institutional capacity for savings - high costs of institutional transformation - credit-led culture; staff pose resistance to transformation
Formal financial institutions	State-owned banks, Rural or community banks, NBFIs, Mainstream commercial	- broad range of services - large branch infrastructure and points of sale	- profit motive may dilute social mission - difficult to reach very poor and remote clients

	banks	- own capital - resources to invest in technology and innovation	- Products often do not always meet the needs of the poor. - lack of low-cost delivery channels

Sources: Helms (2006); Glisovic *et al.* (2011)

Appendix 3.3: Pros and cons of micro-savings products from client and MFI perspectives

Product type	Client perspective		MFI Perspective	
	Pros	**Cons**	**Pros**	**Cons**
Compulsory savings	- Imposed by institutions; clients save to be members/get loan - Low interest rate	- Highly inaccessible (sometimes only available upon loan repayment or account closure) - May discourage voluntary savings	- Provides funds and loan collateral - Significant but predictable demands on staff	- Low interest rate
Demand/Voluntary savings	- Unexpected needs or opportunities - Consumption smoothing - Store windfalls and remittance - Does not require regular income	- Low/no interest	- Large number of accounts - Low financial costs - Stable, current accounts are more volatile	- Small average balance - High administrative costs - Least profitable - Heavy demands on staff, monitoring and information systems, - Constant liquidity management
Contractual savings	- Expected needs or opportunities - Encourage discipline - Higher interest	- Problematic if irregular income	- Longer-term funds - Larger average balances - More profitable	- Higher financial costs (typically) - May be volatile - Fewer administrative requirements - Cash flow nearly predictable
Time deposits	- Expected needs or opportunities - Store long-term surplus - Transfer	- Require large deposits - Inaccessible	- Longer-term funds - Largest average balances (fewer accounts)	- Highest financial costs - More volatile

	payment - High interest		- More profitable - Lowest administrative cost - Require little management	

Source: Hirsland (2005); Hulme *et al.* (2015)

Appendix 3.4 – List of countries studied

1	Afganistan	Dominican Republic	Macedonia	Romania
2	Albani	East Timor	Madagascar	Russia
3	Armenia	Ecuador	Malawi	Rwanda
4	Azerbaijan	Egypt	Mali	Senegal
5	Bangladesh	El Salvador	Mexico	Serbia
6	Benin	Ethiopia	Moldova	Sierra Leone
7	Bolivia	Georgia	Mongolia	South Africa
8	Bosnia and Herzegovina	Ghana	Montenegro	South Sudan
9	Brazil	Guatemala	Mozambique	Sri Lanka
10	Bulgaria	Guinea	Nepal	Syria
11	Cambodia	Haiti	Nicaragua	Tajikistan
12	Cameroon	Honduras	Niger	Tanzania
13	Chad	India	Nigeria	Togo
14	Chile	Indonesia	Pakistan	Uganda
15	China	Jamaica	Palestine	Ukraine
16	Colombia	Kenya	Panama	Uzbekistan
17	Congo, Democratic Republic of the	Kosovo	Paraguay	Vietnam
18	Congo, Republic of the	Kyrgyzstan	Peru	Yemen
19	Costa Rica	Laos	Philippines	Zambia
20	Cote d'Ivoire (Ivory Coast)	Liberia	Poland	

Appendix 3.5 - Correlation matrix between the dummy variable Deposit-taking MFI and other variables used in the analysis

	OSS	OEA	Deposit-taking MFI	PAR30	PWB	GLPTA	Reg	YR	Five-star	Four-star	Three-star	Two-star	One-star	Mature	New	Young	Bank	CU_Coop	NBFI	NGO	AF	EAP	MEA	EU	LAC	SA	GNI	IFL	GDP	DIR
OSS	1.000																													
OEA	-.3834*	1.000																												
Deposit-taking	.0190	-.1528*	1.000																											
PAR30	-.1627*	-.0056	.0158	1.000																										
PWB	-.0581*	.1439*	.0317*	-.0644*	1.000																									
GLPTA	.0089	.0509*	-.0303*	-.0136	.0194	1.0000																								
Reg	.0273*	-.1707*	.2892*	-.0059	-.1624*	.0067	1.000																							
YR	.0876*	.0204	.0658*	-.0980*	-.0179	-.0145	.0126	1.000																						
Five-star	.0486*	-.0048	-.0105	-.0627*	-.0333*	.0009	.0196*	.1856*	1.000																					
Four-star	.0403*	.0202	.0247*	-.0482*	.1163*	-.0158	-.0251*	.3734*	-.1933*	1.000																				
Three-star	-.0301*	.0111	.0491*	.0366*	-.0602*	-.0058	.0177	-.0525*	-.1236*	-.4036*	1.000																			
Two-star	.0284*	-.0405*	.0719*	.0058	-.0167	.0001	.0375*	-.0400*	-.0160*	-.0522*	-.0334*	1.000																		
One-star	-.0584*	-.0265*	-.0717*	.0739*	-.0611*	.0239*	-.0050	-.4214*	-.1776*	-.5802*	-.3709*	-.0480*	1.000																	
Mature	.1354*	-.1892*	.1140*	.0275*	.0090	-.0239*	-.0992*	.2188*	.0492*	.0612*	-.0436*	-.0001	-.0661*	1.000																
New	-.1691*	.1437*	-.0996*	-.0204	.0071	-.0076	.0829*	-.2382*	-.0423*	-.0568*	.0482*	.0012	.0520*	-.5826*	1.000															
Young	-.0085	.1019*	-.0440*	-.0514	-.0170	.0355*	.0420*	-.0408*	-.0198*	-.0206*	.0076	-.0010	.0311*	-.6561*	-.2312*	1.000														
Bank	.0198	.0663*	.2326*	-.0340*	-.1087*	-.0199*	.2292*	.0832*	.0354*	.0317*	.0116	.0290*	-.0771*	-.0476*	.0577*	.0035	1.000													
CU_Coop	.0311*	-.2126*	.2381*	.0303*	-.1983*	-.0100	.0898*	-.1436*	-.2069*	-.2065*	.1511*	.0315*	.1197*	.0134	-.0326*	.0142	-.1408*	1.000												
NBFI	.0040	.1077*	-.2181*	-.0344*	-.1048*	-.0057	.2180*	-.0618*	.0775*	.0686*	-.0167	.0054	-.1195*	-.2158*	.1685*	.1020*	-.2107*	-.2981*	1.000											
NGO	-.0679*	.1498*	-.2397*	-.0069	.3343*	.0322*	-.5025	.0491*	-.0407*	.0728*	-.0469*	-.0369*	-.0107	.1763*	-.1464*	-.0753*	-.2364*	-.3345*	-.5006*	1.000										
AF	-.1362*	.1747*	.2485*	.0810*	-.0769*	-.0355*	.1974*	-.1732*	-.1226*	-.2241*	.1132*	.0415*	.1866*	-.1218*	.0920*	.0603*	.0500*	.1952*	-.0534*	-.1084*	1.000									
EAP	.0653*	-.0415*	.2149*	.0058	.0936*	.0018	.0245*	-.1219*	-.0815*	-.0326*	.0700*	-.0273*	.0171*	-.0843*	-.0467*	-.0575*	-.0716*	-.0946*	-.1518*	.0038	-.2361*	1.000								
MENA	.0144	-.0451*	-.0516*	.0123	.0014	-.0106	-.0850*	.0448*	.0049	-.0603*	-.0037	.0556*	-.0686*	-.0016	-.0198*	.0203*	-.0120	-.0635*	-.0702*	.1322*	-.0713*	-.0539*	1.000							
EECA	.1205*	-.0835*	-.2217*	-.0697*	-.2971*	.0011	.2368*	.0943*	-.0539*	.0080	.0361*	-.0078	-.0117	-.2029*	.1395*	.1134*	.0905*	.0528*	.2550*	-.2775*	-.2493*	-.1883*	-.0569*	1.000						
LAC	.0370*	.1469*	-.1673*	-.0250*	-.0736*	-.0039	-.4010*	.1923*	.2733*	.0481*	-.0338*	.0015	-.1526*	.1898*	-.1470*	-.0906*	-.0082	-.0409*	-.0190	.1510*	-.3112*	-.2351*	-.0710*	-.2481*	1.000					
SA	-.0855*	-.2144*	-.0579*	.0108	.3738*	.0423*	.0387*	-.0125*	-.0418*	.1902*	-.1808*	-.0321*	-.0167*	.0408*	-.0188	-.0314*	-.0677*	-.1031*	-.0251*	.1634*	-.2727*	-.2060*	-.0622*	-.2174*	-.2715*	1.000				
GNI	.1048*	-.0251*	-.1946*	-.0302*	-.1648*	-.0067	-.2364*	.0495*	.1376*	.0302*	.0207*	-.0114	-.1131*	.1492*	-.1202*	-.0673*	-.0092	-.0108	.0488*	-.0006	-.4534*	.0265*	.0094	.1551*	.5412*	-.2662*	1.000			
IFL	.0182	.0280*	.0160*	.0018	-.0449*	-.0163	.0645*	-.0439*	-.0337*	-.0411*	.0083	-.0045	.0517*	-.0769*	.0873*	.0110	.0231*	-.0307*	.0273*	-.0513*	.1098*	-.0519*	.0032	.0678*	-.0725*	-.0582*	-.1633*	1.000		

GDP	.0483*	-.0483*	-.0439*	-.0591*	-.0019	.0071	.0927*	-.0216*	-.0266*	.0120	.0402*	-.0173*	-.0312*	-.0867*	.0830*	.0266*	-.0030	-.0783*	.1250*	-.0565*	-.0631*	.1210*	-.0413*	.1278*	-.2308*	.0979*	-.0648*	-.0747*	1.000	
DIR	-.0241*	.1180*	.0023	-.0212	-.0155	.0033	.0547*	-.0525*	-.0678*	-.0043	-.0519*	-.0010	.0806*	-.0875*	.0911*	.0209*	.0676*	-.1017*	-.0008	.0355%	.1549*	-.0841*	.0420*	-.0002	-.0612*	-.0364*	-.2202*	.7500*	-.0995*	1.000

Notes: * is statistically significant at the level of 5% or lower (2-tailed test)

Where OSS = Operational Self-Sufficiency (log); OEA = Operational Expenses to total Assets (log); NS = Net savers (log); DEP = Deposits (log), DAPSM = Deposit Accounts per Staff Member; PAR30 = Portfolio at Risks less than 30 days; PWB = Percentage of women borrowers; GLPTA = Gross loan portfolio to total assets; Reg = Regulated MFI; YR = Years of reporting; CU_Coop = Credit Unions and Cooperatives; NBFI = Non-bank Financial Intermediation; NGO = Non-governmental organisation; AF = Africa; EAP = East Asia and the Pacific; MENA = Middle East and North Africa; EECA = Eastern Europe and Central Asia; LAC = Latin America and the Caribbean; SA = South Asia; GNI = Gross National Income (log); IFL = Inflation rate; GDP = growth rate of Gross Domestic Products; DIR = Deposit Interest Rate.

Appendix 3.6 – Variance Inflation Factor (VIF) of all independent variables – (Table 3.5 - model 1)

Variables	VIF	1/VIF
Africa (AF)	2.93	.341084
Mature	2.53	.394742
South Asia (SA)	2.41	.413441
GNI per capita	2.31	.432476
Young	2.18	.438571
Eastern Europe and Central Asia (EECA)	1.85	.540277
Years of reporting (YR)	1.68	.594337
One star	1.63	.612394
East Asia and the Pacific (EAP)	1.56	.640542
Deposit-taking MFI	1.50	.666593
Regulated MFI	1.48	.674493
Deposit interest rate (DIR)	1.35	.740062
Percentage of women borrowers (PWB)	1.32	.760058
Inflation rate (IFL)	1.32	.760383
Three star	1.21	.827129
Five star	1.20	.834256
GDP growth rate (GDP)	1.09	.916994
Middle East and North Africa (MENA)	1.06	.946314
Par30	1.03	.969605
Gross loan portfolio to total assets (GLPTA)	1.01	.992701
Mean VIF	**1.64**	

Appendix 3.7 - Breusch and Pagan Lagrangian multiplier test for random effects (Table 3.5 – Model 1)

Ln(oss)[mfi_id, t] = Xb + u[mfi_id] + e[mfi_id, t]		
	Var	Sd = sqrt(Var)
Ln(oss)	.1560563	.3950396
e	.0717878	.2679325
u	.1020896	.3195147
Test: Var(u) = 0 Chi2(1) = 1964.11 Prob > chi2 = 0.0000		

Appendix 3.8 - Hausman Test FE vs. RE (Table 3.5 – Model 1)

	Coefficients -			
	(b) Fe_name	(B) Re_name	(b-B) Difference	Sqrt(diag(V_b-V_B) S.E.
Par30	-.0023654	-.0025413	.0001758	.0000686
GLPTA	.0006713	.0000259	.0006454	.0002055
Mature	.1726221	.19145	-.0188279	.147057
Young	.1761218	.1691929	.0069289	.0076999
PWB	.001156	.0002029	.000953	.0002662
GNI	.0377458	.0098025	.0279433	.0120878
IFL	.0005524	.0008093	-.0002569	.0001853
GDP	.0026721	.0032754	-.0006033	.0003367
DIR	-.0001253	-.0005936	.0004683	.0006659
b= consistent under Ho and Ha; obtained from xtreg B = inconsistent under Ha; efficient under Ho; obtained from xtreg Test: Ho: difference in coefficients not systematic Chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 58.10 Prob > chi2 = 0.0000				

Appendix 3.9 - Hausman Test FE vs. HT (Table 3.5 – Model 1)

	Coefficients -			
	(b) eq_fe	(B) eq_ht	(b-B) Difference	Sqrt(diag(V_b-V_B) S.E.
Par30	-.0023654	-.0023641	-1.35e-06	.0000918
GLPTA	.0006713	.0006659	5.37e-06	.0000773
Mature	.1726221	.1746636	-.0020415	.0085626
Young	.1761218	.177004	-.0008822	.0062932
PWB	.001156	.0011415	.0000145	.0001464
GNI	.0377458	.0353115	.0024342	.006149
IFL	.0005524	.0005874	-.000035	.0002086
GDP	.0026721	.0028259	-.0001538	.0004447
DIR	-.0001253	-1.09e-07	-.0001252	.0005969
b= consistent under Ho and Ha; obtained from xtreg B = inconsistent under Ha; efficient under Ho; obtained from xthtaylor Test: Ho: difference in coefficients not systematic				

Chi2(2) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 0.36 Prob > chi2 = 0.8353

Appendix 3.10 - Variance Inflation Factor (VIF) of all independent variables (Table 3.5 - model 2)

Variables	VIF	1/VIF
Africa	4.74	.210894
CU_Coop	4.23	.236410
Deposits (log)	4.03	.247923
South Asia	3.82	.261655
Net savers (log)	3.81	.262571
NGO	3.53	.282989
GNI (log)	3.52	.283800
Mature	3.24	.308259
NBFI	3.21	.311131
East Asia and the Pacific	2.92	.342636
Bank	2.77	.360893
Young	2.75	.364019
Year of reporting	1.87	.534827
DAPSM (log)	1.81	.553236
Percentage of women borrowers	1.79	.558614
One star	1.70	.587419
Eastern Europe and Central Asia	1.54	.647431
Regulated MFI	1.53	.652597
Three star	1.48	.675169
GLPTA	1.47	.680228
Five star	1.37	.729104
Deposit interest rate (DIR)	1.34	.745065
Inflation rate	1.34	.745759
Middle East and North Africa	1.18	.848539
GDP growth rate	1.12	.892142
Par30	1.06	.946070
Mean VIF	**2.43**	

Appendix 3.11: Breusch and Pagan Lagrangian multiplier test for random effects (Table 3.5 – Model 2)

Ln(oss)[mfi_id, t] = Xb + u[mfi_id] + e[mfi_id, t] Estimated results:		
	Var	Sd = sqrt(Var)
Ln(oss)	.0817719	.2859578
e	.0239958	.1549057
u	.0670659	.2589709
Test: Var(u) = 0 Chi2(1) = 313.82 Prob > chi2 = 0.0000		

Appendix 3.12: Hausman Test FE vs. RE (Table 3.5 – Model 2)

	Coefficients –			
	(b) Fe_name	(B) Re_name	(b-B) Difference	Sqrt(diag(V_b-V_B) S.E.
Net savers (log)	-.0131994	-.0165888	.0033894	.0032444
Deposits (log)	.0505832	.0263401	.0242432	.0104146
DAPSM (log)	.0552031	.0747238	-.0195207	.0103666
Par30	-.000284	-.0004142	.0001302	.0000586
GLPTA	.0027011	.0031226	-.0004215	.0003335
PWB	.0003874	.0001532	.0002342	.0003569
Mature	.1473564	.1517435	-.004387	.0230162
Young	.1349368	.1278236	.0071133	.0135525
GNI	-.1159107	-.0395805	-.0763302	.0285348
IFL	-.0005905	-.0003624	-.0002281	.0002306
GDP	.0077695	.0091059	-.0013364	.0007096
DIR	-.0046052	-.0002223	-.0043829	.0018641
b= consistent under Ho and Ha; obtained from xtreg B = inconsistent under Ha; efficient under Ho; obtained from xtreg Test: Ho: difference in coefficients not systematic Chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 30.25 Prob > chi2 = 0.0026				

Appendix 3.13 - Hausman Test FE vs. HT (Table 3.5 – Model 2)

	Coefficients -			
	(b) eq_fe	(B) eq_ht	(b-B) Difference	Sqrt(diag(V_ b-V_B) S.E.
Net savers	-.0131994	-.0131131	-.0000863	.0032299
Deposits	.0505832	.0516678	-.0010846	.0063677
DAPSM	.0552031	.0559627	-.0007596	.0079652
Par30	-.000284	-.0002844	4.32e-07	.0001173
GLPTA	.0027011	.0026354	.0000658	.0002857
PWB	.0003874	.0003667	.0000208	.0002606
Mature	.1473564	.1464294	.0009271	.0180934
Young	.1349368	.1344451	.0004917	.0136658
GNI	-.1159107	-.1170955	.0011848	.0172112
IFL	-.0005905	-.0005091	-.0000814	.0003247
GDP	.0077695	.0077283	.0000412	.0009165
DIR	-.0046052	-.0040004	-.0006048	.0016929

b= consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha; efficient under Ho; obtained from xthtaylor

Test: Ho: difference in coefficients not systematic

Chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 0.29

Prob > chi2 = 0.9625

Appendix 3.14 - Variance Inflation Factor (VIF) of all independent variables – (Table 3.5 - model 3)

Variables	**VIF**	**1/VIF**
Africa	4.53	.220608
Deposits (log)	3.90	.256731
Net savers (log)	3.75	.266936
GNI (log)	3.43	.291258
South Asia	3.43	.291483
Mature	3.04	.329104
Young	2.71	.368852
East Asia and the Pacific	2.03	.491896
Year of reporting	1.84	.544158

One star	1.68	.594756
DAPSM (log)	1.58	.632865
PWB	1.50	.665780
EU	1.47	.678539
Three star	1.40	.712970
Five star	1.36	.734133
GLPTA	1.32	.759763
RegMFI	1.31	.760632
DIR	1.29	.773111
Inflation rate	1.27	.790139
Middle East and North Africa	1.15	.870119
GDP	1.08	.922906
Par30	1.05	.952390
Mean VIF	**2.19**	

Appendix 3.15: Breusch and Pagan Lagrangian multiplier test for random effects (Table 3.5 – Model 3)

Ln(oss)[mfi_id, t] = Xb + u[mfi_id] + e[mfi_id, t]		
Estimated results:		
	Var	Sd = sqrt(Var)
Ln(oss)	.081821	.2860436
e	.0239958	.1549057
u	.067972	.2607145
Test: Var(u) = 0		
	Chi2(1) = 312.07	
	Prob > chi2 = 0.0000	

Appendix 3.16: Hausman Test FE vs. RE (Table 3.5 – Model 3)

	Coefficients -			
	(b) Fe_name	(B) Re_name	(b-B) Difference	Sqrt(diag(V_ b-V_B) S.E.
Net savers (log)	-.0131994	-.0168944	.003695	.0032721
Deposits (log)	.0505832	.0295581	.0210252	.0105228

DAPSM (log)	.0552031	.0779424	-.0227393	.0106422
Par30	-.000284	-.0003924	.0001084	.0000585
GLPTA	.0027011	.0028235	-.0001223	.0003482
PWB	.0003874	-.0000261	.0004136	.0003704
Mature	.1473564	.1447632	.0025933	.0238692
Young	.1349368	.1237162	.0112207	.0138344
GNI	-.1159107	-.0405826	-.0753281	.0286044
IFL	-.0005905	-.0002014	-.000389	.0002445
GDP	.0077695	.0090612	-.0012917	.0007218
DIR	-.0046052	.0006051	-.0052103	.0018923

b= consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha; efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

Chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 32.52

Prob > chi2 = 0.0011

Appendix 3.17 - Hausman Test FE vs. HT (Table 3.5 – Model 3)

	Coefficients –			
	(b) eq_fe	(B) eq_ht	(b-B) Difference	Sqrt(diag(V_b-V_B) S.E.
Net savers	-.0131994	-.0128227	-.0003767	.002555
Deposits	.0505832	.0517627	-.0011794	.0050882
DAPSM	.0552031	.0546297	.0005734	.0062889
Par30	-.000284	-.0002876	3.58e-06	.0000922
GLPTA	.0027011	.0026593	.0000418	.0002283
PWB	.0003874	.0003656	.0000218	.0002058
Mature	.1473564	.1448103	.0025462	.0143704
Young	.1349368	.1337628	.001174	.0107926
GNI	-.1159107	-.1138973	-.0020133	.0139173
IFL	-.0005905	-.0006211	.0000307	.0002712
GDP	.0077695	.0077364	.0000331	.0007435
DIR	-.0046052	-.0036032	-.0010019	.0016166

b= consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha; efficient under Ho; obtained from xthtaylor

Test:	Ho: difference in coefficients not systematic
	Chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
	= 0.63
	Prob > chi2 = 0.8893

Appendix 3.18 - Variance Inflation Factor (VIF) of all independent variables – (Table 3.6 - model 1)

Variables	VIF	1/VIF
Africa	2.82	.354267
Mature	2.72	.367544
Young	2.47	.405377
South Asia	2.40	.415940
GNI	2.33	.429494
Eastern Europe and Central Asia	1.86	.538955
Years of reporting	1.63	.614719
East Asia and the Pacific	1.54	.647288
One star	1.53	.653828
Deposit-taking MFI	1.51	.664067
Regulated MFI	1.49	.673197
Percentage of women borrowers	1.33	.749987
Three star	1.21	.829480
Five star	1.20	.831981
DIR	1.20	.834718
Inflation rate	1.18	.849819
GDP	1.09	.914840
Middle East and North Africa	1.06	.943814
Par30	1.03	.973427
Gross loan portfolio to total assets	1.01	.992093
Mean VIF	**1.64**	

Appendix 3.19: Breusch and Pagan Lagrangian multiplier test for random effects (Table 3.6 – Model 1)

Ln(oea)[mfi_id, t] = Xb + u[mfi_id] + e[mfi_id, t] Estimated results:		
	Var	Sd = sqrt(Var)
Ln(oea)	.4796285	.6925521
e	.077972	.2792347
u	.3227326	.5680956
Test: Var(u) = 0 Chi2(1) = 5764.32 Prob > chi2 = 0.0000		

Appendix 3.20: Hausman Test FE vs. RE (Table 3.6 – Model 1)

	Coefficients -			
	(b) Fe_name	(B) Re_name	(b-B) Difference	Sqrt(diag(V_b -V_B) S.E.
Par30	.0005035	.0004955	7.93e-06	.0000285
GLPTA	.0010479	.0001464	.0009016	.0002217
Mature	-.1498622	-.2453581	.0954958	.012388
Young	-.0999904	-.1338588	.0338684	.005888
PWB	.0016697	.0033404	-.0016707	.0002134
GNI	-.1605284	-.0760336	-.0844947	.0109756
IFL	.0004303	.0003361	.0000942	.0001881
GDP	.000716	.0004889	.0002271	.0001574
DIR	.0033848	.0066297	-.0032449	.0006206
b= consistent under Ho and Ha; obtained from xtreg B = inconsistent under Ha; efficient under Ho; obtained from xtreg Test: Ho: difference in coefficients not systematic Chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 185.39 Prob > chi2 = 0.0011				

Appendix 3.21 - Hausman Test FE vs. HT (Table 3.6 – Model 1)

	Coefficients -			
	(b) eq_fe	(B) eq_ht	(b-B) Difference	Sqrt(diag(V_b -V_B) S.E.
Par30	.0005035	.0005037	-2.48e-07	.0001064
GLPTA	.0010479	.0010481	-1.77e-07	.0000895
Mature	-.1498622	-.1496484	-.0002138	.0100275
Young	-.0999904	-.0998753	-.000115	.0075373
PWB	.0016697	.0016718	-2.02e-06	.0001716
GNI	-.1605284	-.1605894	.000061	.0070938
IFL	.0004303	.0004523	-.000022	.0003
GDP	.000716	.0006865	.0000295	.0004831
DIR	.0033848	.0034991	-.0001143	.0007959

b= consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha; efficient under Ho; obtained from xthtaylor

Test: Ho: difference in coefficients not systematic

Chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 0.03

Prob > chi2 = 0.9831

Appendix 3.22 - Variance Inflation Factor (VIF) of all independent variables (Table 3.6 - model 2)

Variables	**VIF**	**1/VIF**
Africa	4.40	.227224
Deposits (log)	3.94	.253849
Net savers (log)	3.77	.265554
South Asia	3.49	.286262
GNI	3.49	.286608
Mature	3.12	.319130
Young	2.80	.357084
East Asia and the Pacific	2.03	.493204
Years of reporting	1.76	.568110
DAPSM (log)	1.58	.632739
PWB	1.53	.653788

One star	1.52	.655985
Easter Europe and the Pacific	1.47	.678400
Three star	1.40	.714232
Five star	1.36	.732797
Regulated MFI	1.33	.753719
DIR	1.31	.765821
GLPTA	1.26	.790734
Inflation rate	1.26	.793254
Middle East and North Africa	1.16	.859138
GDP	1.08	.923830
Par30	1.04	.957110
Mean VIF	**2.10**	

Appendix 3.23: Breusch and Pagan Lagrangian multiplier test for random effects (Table 3.6 – Model 2)

Ln(oea)[mfi_id, t] = Xb + u[mfi_id] + e[mfi_id, t]		
Estimated results:		
	Var	Sd = sqrt(Var)
Ln(oea)	.4095355	.6399496
e	.0401125	.2002812
u	.2068757	.4548359
Test: Var(u) = 0		
Chi2(1) = 1075.17		
Prob > chi2 = 0.0000		

Appendix 3.24: Hausman Test FE vs. RE (Table 3.6 – Model 2)

	Coefficients –			
	(b) Fe_name	(B) Re_name	(b-B) Difference	Sqrt(diag(V_b-V_B) S.E.
Net savers (log)	.0462856	.0687268	-.0224412	.0032382
Deposits (log)	-.1518809	-.1153311	-.0365498	.0129912
DAPSM (log)	-.0958266	-.1681405	.072314	.0111708
Par30	-.000224	-.0002465	.0000224	.

GLPTA	.0025027	.0017699	.0007328	.0003735
PWB	.0003798	.00244	-.0020602	.0003957
Mature	-.1242193	-.1895018	.0652825	.0253747
Young	-.046763	-.0579831	.0112201	.0131128
GNI	.1874592	.0984236	.0890356	.0369772
Inflation rate	.0017665	.0010016	.0007649	.0003196
GDP	-.0025031	-.0022475	-.0002557	.0005768
DIR	.0064777	.0105735	-.0040958	.0019524

b= consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha; efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

Chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 130.11

Prob > chi2 = 0.0000

Appendix 3.25 - Hausman Test FE vs. HT (Table 3.6 – Model 2)

	Coefficients -			
	(b) eq_fe	(B) eq_ht	(b-B) Difference	Sqrt(diag(V_b-V_B) S.E.
Net savers	.0462856	.0472992	-.0010136	.0028255
Deposits	-.1518809	-.1514176	-.0004633	.0056235
DAPSM	-.0958266	-.0995976	.0037711	.0069297
Par30	-.000224	-.0002361	.000012	.0000981
GLPTA	.0025027	.0026205	-.0001178	.0002602
PWB	.0003798	.0003792	6.28e-07	.0002209
Mature	-.1242193	-.1243019	.0000826	.0155011
Young	-.046763	-.0476749	.0009119	.0117075
GNI	.1874592	.1893468	-.0018876	.0169187
IFL	.0017665	.0013096	.0004569	.0004029
GDP	-.0025031	-.0025481	.0000449	.0007839
DIR	.0064777	.0090312	-.0025535	.0018477

b= consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha; efficient under Ho; obtained from xthtaylor

Test: Ho: difference in coefficients not systematic

Chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 3.10 Prob > chi2 = 0.0784

Appendix 3.26 - Variance Inflation Factor (VIF) of all independent variables – (Table 3.6 - model 3)

Variables	VIF	1/VIF
Africa	4.62	.216280
CU_Coop	4.44	.225416
Deposits (log)	4.08	.244832
South Asia	3.92	.255093
Net savers (log)	3.83	.260910
NGO	3.66	.272905
GNI per capita	3.58	.279340
NBFI	3.32	.301257
Mature	3.32	.301431
East Asia and the Pacific	2.92	.342587
Bank	2.91	.343410
Young	2.83	.353096
PWB	1.81	.551161
DAPSM (log)	1.80	.556032
Year of reporting	1.78	.562199
Regulated MFI	1.57	.636507
Eastern Europe and Central Asia	1.55	.644363
One star	1.55	.646127
Three star	1.48	.677601
GLPTA	1.40	.716265
Five star	1.37	.727507
DIR	1.35	.738805
Inflation rate	1.33	.750959
Middle East and North Africa	1.19	.836814
GDP	1.12	.893979
Par30	1.05	.948625
Mean VIF	**2.45**	

Appendix 3.27: Breusch and Pagan Lagrangian multiplier test for random effects (Table 3.6 – Model 3)

Ln(oea)[mfi_id, t] = Xb + u[mfi_id] + e[mfi_id, t] Estimated results:		
	Var	Sd = sqrt(Var)
Ln(oea)	.4095355	.6399496
e	.0401125	.2002812
u	.2004874	.4477582
Test: Var(u) = 0 Chi2(1) = 1053.02 Prob > chi2 = 0.0000		

Appendix 3.28: Hausman Test FE vs. RE (Table 3.6 – Model 3)

	Coefficients –			
	(b) Fe_name	(B) Re_name	(b-B) Difference	Sqrt(diag(V_b-V_B) S.E.
Net savers (log)	.0462856	.0650589	-.0187733	.0034038
Deposits (log)	-.1518809	-.1216772	-.0302037	.0129033
DAPSM (log)	-.0958266	-.1474253	.0515988	.0111629
Par30	-.000224	-.0002381	.000014	8.40e-06
GLPTA	.0025027	.0016442	.0008585	.0003672
PWB	.0003798	.0019148	-.001535	.0003852
Mature	-.1242193	-.162387	.0381677	.0249445
Young	-.046763	-.0447652	-.0019978	.0135883
GNI	.1874592	.1173393	.0701199	.0371262
Inflation rate	.0017665	.0012036	.0005629	.0003206
GDP	-.0025031	-.0031742	.000671	.0006522
DIR	.0064777	.0090661	-.0025884	.0019929
b= consistent under Ho and Ha; obtained from xtreg B = inconsistent under Ha; efficient under Ho; obtained from xtreg Test: Ho: difference in coefficients not systematic Chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 84.84				

Prob > chi2 = 0.0000

Appendix 3.29 - Hausman Test FE vs. HT (Table 3.6 – Model 3)

	Coefficients -			
	(b) eq_fe	(B) eq_ht	(b-B) Difference	Sqrt(diag(V_b-V_B) S.E.
Net savers	.0462856	.0471466	-.000861	.0028638
Deposits	-.1518809	-.1501112	-.0017696	.005616
DAPSM	-.0958266	-.0973513	.0015247	.006888
Par30	-.000224	-.0002302	6.22e-06	.0000991
GLPTA	.0025027	.0024072	.0000455	.0002571
PWB	.0003798	.0003447	.0000351	.0002235
Mature	-.1242193	-.1283802	.0041609	.0158054
Young	-.046763	-.0488833	.0021203	.0118691
GNI	.1874592	.191801	-.0043418	.0160299
IFL	.0017665	.0016652	.0001013	.0003779
GDP	-.0025031	-.0024914	-.0000117	.0008324
DIR	.0064777	.0087869	-.0023092	.0019207
b= consistent under Ho and Ha; obtained from xtreg B = inconsistent under Ha; efficient under Ho; obtained from xthtaylor Test: Ho: difference in coefficients not systematic Chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 2.02 Prob > chi2 = 0.5679				

Appendix 3.30: Detaied discussion on the relationship between regional and macroeconomic control variables and financial sustainability.

In terms of regional factors, model (3) displays that MFIs operating in Eastern Europe and Central Asia (EECA) attain better financial accomplishments compared with MFIs active in other regions. A similar finding is also unearthed by Kar (2011). Microfinance in EECA has had a rapid growth (Forster, Greene and Pytkowska, 2003).

According to Pitknowska and Rataj (2007) and Sheremenko *et al.* (2016), group lending is more popular in Central Asia and Caucasus; while individual lending is more popular in Eastern European parts of EECA; especially MFIs in Russia focus only on individual lending method. Indeed, the regression outputs in Sheremenko *et al.* (2016) show that Russian MFIs are less sustainable. This finding implies that group lending may be one attribute of financial sustainability in EECA as group lending methodology mitigates adverse selection and moral hazards. Moreover, group lending has been proved by earlier studies to reduce microfinance costs (see, for example, Caudill, Gropper and Hartarska (2012)). Sheremenlo *et al.* (2016) further add that microfinance industry in EECA is more commercialized. This may be another rational argument to elucidate the finding relating to financially sustainability of EECA MFIs in our study. Janda and Turbat (2013) also find that one beneficial determinant of financial performance of MFIs in Central Asia is serving female borrowers[78].

GNI per capita is found to have intermediate effects on financial sustainability. A significant positive association between GNI per capita and OSS is discovered in model (1) which uses $D_{\text{Deposit-taking MFI}}$ as an important time invariant variable. This result can be explained in terms of national prosperity which is reflected by GNI per capita. When MFIs active in better developed countries with higher GNI per capita, they can be financial viable more easily by taking advantages of the national favourable economic development. However, significant negative coefficients are found for GNI per capita in both model (2) and (3) where three indicators of micro-savings and charter types of MFIs are included. These results may point to the fact that when the income of poor households are rising and have escaped poverty, they tend to move from MFIs to

[78] The study of Janda and Turbat (2013) uses a data set of 90 MFIs in Central Asia. They apply pooled OLS and fixed effects model estimations.

commercial banks because of advantages that commercial banks offer (Ngo, 2013). Therefore, a reduction in their active clients may lead to a decrease in the income of MFIs, which make them less sustainable.

We do not see a relationship between inflation rate and microfinance sustainability, which is dissimilar to the study of Demirguc-Kunt and Huisinga (1999), Hartarska *et al.* (2007) and Vanroose (2007) who find a positive and significant link between inflation rate and financial sustainability. As explained by Vanroose (2007), microfinance tends to be more present in countries that suffer from economic instability such as inflation. The increase of players this industry may make microfinance market to become more competitive. As contended by Motta (2004), a competitive environment may contribute to reducing operating costs; and it may also encourage firms to develop new products and efficient technologies. As a result, firms could become more financial profitability. According to Hartarska and Nadolnyak (2007), it seems that MFIs have developed sufficient safeguards and operate well in highly inflationary situation.

GDP growth rate was found to be positively associated with sustainability in all three models of Table 3.5. This means that a growing economy positively impacts microfinance performance. It enables MFIs to cover costs more easily; and thus MFs are more likely to gain financial achievements. Our result supports the studies of Hartarska *et al.* (2007), Martins and Winkler (2013), and Janda and Jetek (2014a).

Appendix 3.31: Detaied discussion on the relationship between regional and macroeconomic control variables and cost efficiency.

The regression results indicate that MFIs operating in South Asia and Eastern Europe and Central Asia achieve better cost efficiency while MFIs active in Africa are very cost-inefficient. We share similar findings with Stephens and Tazi (2006) and Gonzalez (2011) who discover that South Asian MFIs are the most efficient, while MFIs in Sub-Saharan are the least efficient. MFIs in Africa are also found to be inefficient in the research of Hermes *et al.* (2009). The authors explain that African MFIs operate in the macroeconomic, political and institutional environments that are less supportive for them to be efficient. Concurring with Hermes *et al.* (2009), Arnone *et al.* (2012) also identify that the economic and institutional context in Africa is not good enough to create clear conditions of efficiency for African MFIs. This point is proved by a significant and negative connection between GDP growth rate and operational efficiency for the sample of African MFIs[79]. Steel and Isern (2012) also point out that MFIs in Africa have the highest operating costs of all regions. Caudill, Gropper, and Hartarska (2012) also investigate the efficiency of MFIs in Eastern Europe and Central Asia; and their findings indicate that group lending and extending loans to female clients are related to cost reduction. To clarify underlying reasons for cost efficiency of South Asian MFIs, Stephens and Tazi (2006) argue that low personnel expenses and group-based operating model have a positive impact on South Asia's cost efficiency. They contend that personnel cost is the single largest expense for an MFI and MFIs in South Asia manage these costs better than those in any other region. Further, the predominance of group-based lending approaches in South Asia enables

[79] In the research work of Arnone *et al.* (2012), operational efficiency is denoted by the ratio 'Operating expenses/Gross loan portfolio'.

MFI staff to deal with more transactions and incur lower costs than individual approaches[80]. Lapenu and Zeller (2002) also note that MFIs in Asia can take advantages of low labour costs.

Moving to macroeconomic control variables, we firstly found that GNI per capita has an intermediate effect on cost efficiency. A significant and negative association between GNI per capita and OEA is discovered in model (1) which uses $D_{\text{Deposit-taking MFI}}$ as an important time invariant variable. This result can be explained in terms of national prosperity which is reflected by GNI per capita. When MFIs active in better developed countries in terms of higher GNI per capita, they are more efficient as they can take advantages of their national favourable economic development. However, significant and positive coefficients are found for GNI per capita in both model (2) and (3) where three indicators of micro-savings and charter types of MFIs are included. As discussed above, when the GNI per capita of a nation goes up, poor and low-income people can have higher income and can be lifted out of poverty. They will be more likely to demand for services from commercial banks. Thus, microfinance industry may become more competitive, which makes MFIs to seek for solutions to do well. To this end, they may make more investments or undertake a transformation. These processes may incur costs which make MFIs to become less efficient.

In addition, both inflation rate and GDP growth rate are found not to be related to cost efficacy. However, we discover that MFIs active in countries that have high deposit interest rates are less cost efficient. At a macro level, deposit interest rates regulated by Central Banks influences deposit interest rates applied at financial

[80] According to Stephens and Tazi (2006), individual lending approach is more common in Latin America and elsewhere.

intermediaries including deposit-taking MFIs. For deposit-taking MFIs, deposit interest rate is one of financial expenses as they have to pay their savings clients. Therefore, when the basic deposit interest rate increases, deposit-taking MFIs have to raise their commercial deposit interest rates, which lead to a rise in their operating costs, and as a consequence, they become less efficient.

Appendix 4.1: Correlation matrix of the dummy variables and other variables used in the analysis

	NAB	Ls_gni	Deposit-taking MFI	PAR30	PWB	GLPTA	Reg	YR	Five-star	Four-star	Three-star	Two-star	One-star	Mature	New	Young	Bank	CU_Coop	NBFI	NGO	AF	EAP	MEA	EU	LAC	SA	GN1	IFL	GDP	DIR
NAB	1.000																													
Ls_gni	-.2441*	1.000																												
Deposit-taking MFI	.2439*	.2264*	1.000																											
PAR30	-.0795*	-.0026	.0158	1.000																										
PWB	.2599*	-.5071*	.0317*	-.0644*	1.000																									
GLPTA	-.0282*	.0256*	-.0303*	-.0136	.0194	1.0000																								
Reg	.0593*	.3210*	.2892*	-.0059	-.1624*	.0067	1.000																							
YR	.3978*	.0782*	.0658*	-.0980*	-.0179	-.0145	.0126	1.000																						
Five-star	.1703*	-.0006	-0105	-.0627*	-.0333*	.0009	.0196*	.1856*	1.000																					
Four-star	.2386*	.0812*	.0247*	-.0482*	.1163*	-.0158	-.0251*	.3734*	-.1933*	1.000																				
Three-star	-.1405*	.0667*	.0491*	.0366*	-.0602*	-.0058	.0177	-.0525*	-.1236*	-.4036*	1.000																			
Two-star	-.0055	.0388*	.0719*	.0058	-.0167	.0001	.0375*	-.0400*	-.0160*	-.0522*	-.0334*	1.000																		
One-star	-.2743*	.0308*	-.0717*	.0739*	-.0611*	.0239*	-.0050	-.4214*	-.1776*	-.5802*	-.3709*	-.0480*	1.000																	
Mature	.2771*	-.0075	.1140*	.0275*	.0090	-.0239*	-.0992*	.2188*	.0492*	.0612*	-.0436*	-.0001	-.0661*	1.000																
New	-.2673*	-.0111	-.0996*	-.0204	.0071	-.0076	.0829*	-.2382*	-.0423*	-.0568*	.0482*	.0012	.0520*	-.5826*	1.000															
Young	-.0864*	.0190	-.0440*	-.0514	-.0170	.0355*	.0420*	-.0408*	-.0198*	-.0206*	.0076	-.0010	.0311*	-.6561*	-.2312*	1.000														
Bank	.2084*	.2066*	.2326*	-.0340*	-.1087*	-.0199*	.2292*	.0832*	.0354*	.0317*	.0116	.0290*	-.0771*	-.0476*	.0577*	.0035	1.000													
CU_Coop	-.2466*	.2212*	.2381*	.0303*	-.1983*	-.0100	.0898*	-.1436*	-.2069*	-.2065*	.1511*	.0315*	.1197*	.0134	-.0326*	.0142	-.1408*	1.000												
NBFI	.0423*	.0494*	-.2181*	-.0344*	-.1048*	-.0057	.2180*	-.0618*	.0775*	.0686*	-.0167	.0054	-.1195*	-.2158*	.1685*	.1020*	-.2107*	-.2981*	1.000											
NGO	.0465*	-.3602*	-.2397*	-.0069	.3343*	.0322*	-.5025	.0491*	-.0407*	.0728*	-.0469*	-.0369*	-.0107	.1763*	-.1464*	-.0753*	-.2364*	-.3345*	-.5006*	1.000										
AF	-.0652*	.1947*	.2485*	.0810*	-.0769*	-.0355*	.1974*	-.1732*	-.1226*	-.2241*	.1132*	.0415*	.1866*	-.1218*	.0920*	.0603*	.0500*	.1952*	-.0534*	-.1084*	1.000									
EAP	-.0352*	-.0952*	.2149*	.0058	.0936*	.0018	.0245*	-.1219*	-.0815*	-.0326*	.0700*	-.0273*	.0171*	-.0843*	-.0467*	-.0575*	-.0716*	-.0946*	-.1518*	.0038	-.2361*	1.000								
MENA	.0390*	-.0487*	-.0516*	.0123	.0014	-.0106	-.0850*	.0448*	.0049	-.0603*	-.0037	.0556*	-.0686*	-.0016	-.0198*	.0203*	-.0120	-.0635*	-.0702*	.1322*	-.0713*	-.0539*	1.000							
EECA	-.2750*	.2796*	-.2217*	-.0697*	-.2971*	.0011	.2368*	.0943*	-.0539*	.0080	.0361*	-.0078	-.0117	-.2029*	.1395*	.1134*	.0905*	.0528*	.2550*	-.2775*	-.2493*	-.1883*	-.0569*	1.000						

LAC	.0654*	-.1158*	-.1673*	-.0250*	-.0736*	-.0039	-.4010*	.1923*	.2733*	.0481*	-.0338*	.0015	-.1526*	.1898*	-.1470*	-.0906*	-.0082	-.0409*	-.0190	.1510*	-.3112*	-.2351*	-.0710*	-.2481*	1.000					
SA	.2765*	-.2386*	-.0579*	.0108	.3738*	.0423*	.0387*	-.0125*	-.0418*	.1902*	-.1808*	-.0321*	-.0167*	.0408*	-.0188	-.0314*	-.0677*	-.1031*	-.0251*	.1634*	-.2727*	-.2060*	-.0622*	-.2174*	-.2715*	1.000				
GNI	-.0409*	-.2354*	-.1946*	-.0302*	-.1648*	-.0067	-.2364*	.0495*	.1376*	.0302*	.0207*	-.0114	-.1131*	.1492*	-.1202*	-.0673*	-.0092	-.0108	.0488*	-.0006	-.4534*	.0265*	.0094	.1551*	.5412*	-.2662*	1.000			
IFL	-.0883*	.0654*	.0160*	.0018	-.0449*	-.0163	.0645*	-.0439*	-.0337*	-.0411*	.0083	-.0045	.0517*	-.0769*	.0873*	.0110	.0231*	-.0307*	.0273*	-.0513*	.1098*	-.0519*	.0032	.0678*	-.0725*	-.0582*	-.1633*	1.000		
GDP	-.0067	-.0019	-.0439*	-.0591*	-.0019	.0071	.0927*	-.0216*	-.0266*	.0120	.0402*	-.0173*	-.0312*	-.0867*	.0830*	.0266*	-.0030	-.0783*	.1250*	-.0565*	-.0631*	.1210*	-.0413*	.1278*	-.2308*	.0979*	-.0648*	-.0747*	1.000	
DIR	-.0521*	.0174	.0023	-.0212	-.0155	.0033	.0547*	-.0525*	-.0678*	-.0043	-.0519*	-.0010	.0806*	-.0875*	.0911*	.0209*	.0676*	-.1017*	-.0008	.0355%	.1549*	-.0841*	.0420*	-.0002	-.0612*	-.0364*	-.2202*	.7500*	-.0995*	1.000

Notes: * is statistically significant at the level of 5% or lower (2-tailed test)

Where OSS = Operational Self-Sufficiency (log); OEA = Operational Expenses to total Assets (log); NS = Net savers (log); DEP = Deposits (log), DAPSM = Deposit Accounts per Staff Member; PAR30 = Portfolio at Risks less than 30 days; PWB = Percentage of women borrowers; GLPTA = Gross loan portfolio to total assets; Reg = Regulated MFI; YR = Years of reporting; CU_Coop = Credit Unions and Cooperatives; NBFI = Non-bank Financial Intermediation; NGO = Non-governmental organisation; AF = Africa; EAP = East Asia and the Pacific; MENA = Middle East and North Africa; EECA = Eastern Europe and Central Asia; LAC = Latin America and the Caribbean; SA = South Asia; GNI = Gross National Income (log); IFL = Inflation rate; GDP = growth rate of Gross Domestic Products; DIR = Deposit Interest Rate.

Appendix 4.2 – Variance Inflation Factor (VIF) of all independent variables – (Table 4.7 - model 1)

Variables	VIF	1/VIF
Africa	2.93	.341386
Mature	2.52	.397382
South Asia	2.37	.421891
GNI per capita	2.32	.430428
Young	2.27	.441196
Eastern Europe	1.79	.559892
Years of reporting	1.69	.592855
One star	1.63	.612410
East Asia and the Pacific	1.54	.649466
Deposit-taking MFI	1.50	.666525
Regulated MFI	1.48	.674327
Deposit interest rate	1.34	.744463
Percentage of women borrowers	1.32	.759529
Inflation rate	1.30	.768327
Three star	1.21	.824936
Five star	1.20	.836379
Middle East and North Africa	1.06	.945406
Par30	1.03	.971724
Gross loan portfolio to total assets	1.01	.992888
Mean VIF	**1.66**	

Appendix 4.3: Breusch and Pagan Lagrangian multiplier test for random effects (Table 4.7 – Model 1)

Ln(NAB)[mfi_id, t] = Xb + u[mfi_id] + e[mfi_id, t]

Estimated results:

	Var	Sd = sqrt(Var)
Ln(NAB)	3.518564	1.875783
e	.2294719	.4790323
u	1.997102	1.413189

Test: Var(u) = 0

Chi2(1) = 10680.89

Prob > chi2 = 0.0000

Appendix 4.4: Hausman Test FE vs. RE (Table 4.7 – Model 1)

	Coefficients -			
	(b) Fe_name	(B) Re_name	(b-B) Difference	Sqrt(diag(V_b-V_B) S.E.
Par30	-.0011276	-.0011779	.0000503	.
GLPTA	.0033658	.0000909	.0032749	.0003491
PWB	.0028035	.0040673	-.0012638	.0002023
Mature	.4224222	.6097743	-.1873522	.0122421
Young	.3703761	.449532	-.0791559	.0018179
GNI	1.157714	.9606653	.1970486	.0115905
Inflation rate	.004332	.0045975	-.0002655	.
DIR	-.017145	-.0180239	.0008789	.

b= consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha; efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

Chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 142.77

Prob > chi2 = 0.0000

(V_b – V_B is not positive definite)

Appendix 4.5 - Hausman Test FE vs. HT (Table 4.7 – Model 1)

	Coefficients -			
	(b) eq_fe	(B) eq_ht	(b-B) Difference	Sqrt(diag(V_b-V_B) S.E.
Par30	-.0011276	-.0011274	-1.71e-07	.0002002
GLPTA	.0033658	.0033652	6.60e-07	.000168
PWB	.0028035	.0028031	3.81e-07	.0003178
Mature	.4224222	.4225624	-.0001403	.018248
Young	.3703761	.3704383	-.0000622	.0136007
GNI	1.157714	1.157578	.0001363	.0126961
IFL	.004332	.0043357	-3.63e-06	.0004424
DIR	-.017145	-.0171295	-.0000155	.0012397

b= consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha; efficient under Ho; obtained from xthtaylor

Test: Ho: difference in coefficients not systematic

Chi2(1) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 0.00

Prob > chi2 = 0.9810

Appendix 4.6 – Variance Inflation Factor (VIF) of all independent variables – (Table 4.7 - model 2)

Variables	VIF	1/VIF
Africa	4.78	.209248
CU_Coop	4.24	.235619
Deposits (log)	4.05	.247044
South Asia	3.83	.261419
Net savers (log)	3.82	.261627
NGO	3.53	.283091
GNI (log)	3.23	.309634
Mature	3.21	.311340
NBFI	2.92	.342210
East Asia and the Pacific	2.81	.356168
Bank	2.69	.371461
Young	1.90	.526397
Years of reporting (log)	1.81	.553445
DAPSM (log)	1.79	.558834
PWB	1.70	.589396
One star	1.54	.649643
Eastern Europe and Central Asia	1.53	.651727
Regulated MFI	1.49	.671981
Three star	1.46	.684492
GLPTA	1.37	.729414
Five star	1.34	.747606
DIR	1.34	.748486
Middle East and North Africa	1.18	.848736
GDP growth rate	1.12	.890696
Par30	1.06	.944124
Mean VIF	**2.43**	

Appendix 4.7 - Breusch and Pagan Lagrangian multiplier test for random effects (Table 4.7 – Model 2)

Ln(NAB)[mfi_id, t] = Xb + u[mfi_id] + e[mfi_id, t] Estimated results:		
	Var	Sd = sqrt(Var)
Ln(NAB)	3.395956	1.842812
e	.0696875	.2639838
u	.6772915	.8229772
Test: Var(u) = 0 Chi2(1) = 1432.60 Prob > chi2 = 0.0000		

Appendix 4.8 - Hausman Test FE vs. RE (Table 4.7 – Model 2)

	Coefficients -			
	(b) Fe_name	(B) Re_name	(b-B) Difference	Sqrt(diag(V_b-V_B) S.E.
Net savers (log)	-.0035538	.0142506	-.0178044	.0023501
Deposits (log)	.503737	.527791	-.024054	.0140699
DAPSM (log)	.0986632	.0989162	-.0002529	.0105519
Par30	-.0004263	-.0005464	.0001201	.
PWB	.0009749	.0040731	-.0030982	.000379
GLPTA	.0086875	.0093473	-.0006598	.0003094
Mature	.1367797	.1129719	.0238078	.0230926
Young	.1489418	.1390388	.009903	.010575
GNI	-.0962254	-.1640931	.0678677	.0389089
Inflation rate	-.0005082	-.0004558	-.0000525	.
GDP growth rate	.000342	.0024099	-.0020679	.
DIR	-.0087025	-.0047	-.0040024	.0017196
b= consistent under Ho and Ha; obtained from xtreg B = inconsistent under Ha; efficient under Ho; obtained from xtreg Test: Ho: difference in coefficients not systematic Chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 166.88 Prob > chi2 = 0.0000 (V_b – V_B is not positive definite)				

Appendix 4.9 - Hausman Test FE vs. HT (Table 4.7 – Model 2)

	Coefficients -			
	(b) eq_fe	(B) eq_ht	(b-B) Difference	Sqrt(diag(V_b-V_B) S.E.
Net savers	-.0035538	-.0033803	-.0001735	.002351
Deposits	.503737	.5035079	.0002291	.0047593
DAPSM	.0986632	.0979866	.0006766	.0057875
Par30	-.0004263	-.0004274	1.12e-06	.0000846
PWB	.0009749	.0009662	8.67e-06	.0001891
GLPTA	.0086875	.008697	-9.43e-06	.0002126
Mature	.1367797	.1358969	.0008829	.0132008
Young	.1489418	.1485051	.0004366	.0099073
GNI	-.0962254	-.0924567	-.0037688	.0130931
IFL	-.0005082	-.0006068	.0000986	.00026
GDP	.000342	.0004673	-.0001252	.0006891
DIR	-.0087025	-.0083884	-.000314	.0016456

b= consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha; efficient under Ho; obtained from xthtaylor

Test: Ho: difference in coefficients not systematic

Chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 0.29

Prob > chi2 = 0.9626

Appendix 4.10 – Variance Inflation Factor (VIF) of all independent variables – (Table 4.8- model 1)

Variables	**VIF**	**1/VIF**
Mature	2.45	.408516
Young	2.26	.442799
Africa	1.74	.574430
YR	1.57	.638438
One star	1.56	.639386
Eastern Europe and Central Asia	1.47	.678674
South Asia	1.45	.687653
EAP	1.44	.694749
Deposit-taking MFI	1.37	.730761
DIR	1.34	.747336

Inflation rate	1.30	.768749
Three star	1.23	.815977
Five star	1.19	.841124
GDP growth rate	1.08	.921756
Middle East and North Africa	1.05	.953128
Par30	1.03	.973175
GLPTA	1.01	.994089
Mean VIF	**1.44**	

Appendix 4.11: Breusch and Pagan Lagrangian multiplier test for random effects (Table 4.8 – Model 1)

Ln(Loansize_GNI)[mfi_id, t] = Xb + u[mfi_id] + e[mfi_id, t] Estimated results:		
	Var	Sd = sqrt(Var)
Ln(Loansize_GNI)	1.510367	1.22897
e	.1278793	.3576021
u	1.241863	1.114389
Test: Var(u) = 0 Chi2(1) = 12156.86 Prob > chi2 = 0.0000		

Appendix 4.12 - Hausman Test FE vs. RE (Table 4.8 – Model 1)

	Coefficients -			
	(b) Fe_name	(B) Re_name	(b-B) Difference	Sqrt(diag(V_b-V_B) S.E.
Par30	-.0012191	-.0012497	.0000307	.0000365
GLPTA	.0015613	.0004816	.0010797	.0002541
Mature	-.0121878	.0149936	.0010797	.0002541
Young	-.0006325	.0117875	-.01242	.0034833
Inflation rate	.0015975	.0016992	-.0001017	.0000949
GDP growth rate	.0027962	.0025925	.0002037	.000159
DIR	-.004682	-.0044248	-.0002571	.0003482
b= consistent under Ho and Ha; obtained from xtreg B = inconsistent under Ha; efficient under Ho; obtained from xtreg				

Test: Ho: difference in coefficients not systematic

Chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 40.59

Prob > chi2 = 0.0000

(V_b – V_B is not positive definite)

Appendix 4.13 - Hausman Test FE vs. HT (Table 4.8 – Model 1)

	Coefficients -			
	(b) eq_fe	(B) eq_ht	(b-B) Difference	Sqrt(diag(V_b-V_B) S.E.
Par30	-.0012191	-.0012167	-2.39e-06	.0000808
GLPTA	.0015613	.001562	-6.45e-07	.0000683
Mature	-.0121878	-.0117759	-.0004119	.0058384
Young	-.0006325	-.0004124	-.0002201	.0049969
IFL	.0015975	.0016218	-.0000244	.0001782
GDP	.0027962	.0026005	.0001957	.0003799
DIR	-.004682	-.0044459	-.0002361	.0004979

b= consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha; efficient under Ho; obtained from xthtaylor

Test: Ho: difference in coefficients not systematic

Chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 0.63

Prob > chi2 = 0.7284

Appendix 4.14 – Variance Inflation Factor (VIF) of all independent variables – (Table 4.8 - model 2)

Variables	**VIF**	**1/VIF**
Deposits (log)	4.12	.242897
Net savers (log)	3.84	.260127
Mature	3.00	.333159
Young	2.70	.370864
Africa	2.60	.384205
South Asia	2.07	.484249

EAP	1.95	.511574
YR (log)	1.63	.613287
One star	1.59	.628635
DAPSM	1.54	.648053
Easter Europe	1.44	.692095
Three star	1.37	.731722
Five star	1.36	.732621
DIR	1.35	.742644
GLPTA	1.28	.780733
Inflation rate	1.26	.796560
Regulated MFI	1.26	.796806
Middle East and North Africa	1.13	.888133
GDP growth rate	1.07	.034352
Par30	1.05	.955101
Mean VIF	**1.88**	

Appendix 4.15- Breusch and Pagan Lagrangian multiplier test for random effects (Table 4.8 – Model 2)

Ln(Loansize_GNI)[mfi_id, t] = Xb + u[mfi_id] + e[mfi_id, t] Estimated results:		
	Var	Sd = sqrt(Var)
Ln(Loansize_GNI)	1.271404	1.127566
e	.0632001	.2513962
u	.8685744	.9319734
Test: Var(u) = 0 Chi2(1) = 2426.22 Prob > chi2 = 0.0000		

Appendix 4.16 - Hausman Test FE vs. RE (Table 4.8 – Model 2)

	Coefficients -			
	(b) Fe_name	(B) Re_name	(b-B) Difference	Sqrt(diag(V_b-V_B) S.E.
Net savers (log)	.0219971	.0176163	.0043808	.0023344

Deposits (log)	.0829124	.1189998	-.0360874	.0060585
DAPSM (log)	-.1398343	-.1706259	.0307916	.0086381
Par 30	-.0002518	-.0003526	.0001007	.
GLPTA	.0035934	.0032352	.0003581	.0002783
Mature	-.1005738	-.0881224	-.0124515	.0200279
Young	-.0966415	-0845996	-.0120419	.0106224
Inflation rate	-.0001895	-.0001886	-0.60e-07	.000134
GDP growth rate	-.0007559	-.0014778	.0007219	.000342
Deposit interest rate	-.0107572	-.0084843	-.0022728	.0013802

b= consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha; efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

Chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 51.97

Prob > chi2 = 0.0000

(V_b – V_B is not positive definite)

Appendix 4.17 - Hausman Test FE vs. HT (Table 4.8 – Model 2)

	Coefficients -			
	(b) eq_fe	(B) eq_ht	(b-B) Difference	Sqrt(diag(V_b-V_B) S.E.
Net savers	.0219971	.0222828	-.0002858	.0025455
Deposits	.0829124	.0835023	-.00059	.0036158
DAPSM	-.1398343	-.1400029	.0001686	.0061504
Par30	-.0002518	-.0002553	3.45e-06	.0000955
GLPTA	.0035934	.003561	.0000324	.0002222
Mature	-.1005738	-.1016889	.0011151	.0137265
Young	-.0966415	-.0970514	.0004099	.0104308
IFL	-.0001895	-.0001541	-.000354	.0002843
GDP	-.0007559	-.0007628	6.87e-06	.0006797
DIR	-.0107572	-.0097891	-.0009681	.0015459

b= consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha; efficient under Ho; obtained from xthtaylor

Test: Ho: difference in coefficients not systematic

Chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 0.43

Prob > chi2 = 0.8058

Appendix 4.18 – Variance Inflation Factor (VIF) of all independent variables – (Table 4.8 -model 3)

Variables	VIF	1/VIF
Deposits (log)	4.26	.234817
CU_Coop	4.12	.242965
Net savers (log)	3.93	.254243
Mature	3.27	.305450
NBFI	3.25	.307510
Bank	3.17	.315676
EAP	3.14	.318335
NGO	3.03	.330450
Africa	2.78	.360069
Young	2.75	.363235
SA	2.55	.392414
DAPSM (log)	1.79	.558500
Years of reporting	1.68	.595398
One star	1.61	.621469
Eastern Europe	1.55	.645978
Regulated MFI	1.52	.658916
Three star	1.43	.697918
GLPTA	1.42	.703891
DIR	1.39	.717474
Five star	1.38	.724280
Inflation rate	1.32	.755287
Middle East and North Africa	1.16	.860685
GDP growth rate	1.10	.905419
Par30	1.06	.947084
Mean VIF	**1.88**	

Appendix 4.19 - Breusch and Pagan Lagrangian multiplier test for random effects (Table 4.8 – Model 3)

Ln(NAB)[mfi_id, t] = Xb + u[mfi_id] + e[mfi_id, t] Estimated results:		
	Var	Sd = sqrt(Var)
Ln(Loansize_GNI)	1.2725	1.128052
e	.0632001	.2513962
u	.7966093	.8925297
Test: Var(u) = 0 Chi2(1) = 2166.09 Prob > chi2 = 0.0000		

Appendix 4.20 - Hausman Test FE vs. RE (Table 4.8 – Model 3)

	Coefficients -			
	(b) Fe_name	(B) Re_name	(b-B) Difference	Sqrt(diag(V_b-V_B) S.E.
Net savers (log)	.0219971	.0179461	.004051	.002304
Deposits (log)	.0829124	.114918	-.0312856	.0059047
DAPSM (log)	-.1398343	-.1827624	.0429281	.0084405
Par 30	-.0002518	-.0004032	.0001514	.
GLPTA	.0035934	.0037124	-.000119	.0002632
Mature	-.1005738	-.0680772	-.0324966	.01851
Young	-.0966415	-.0760763	-.0205652	.0099153
Inflation rate	-.0001895	-.0003367	.0001472	.0003177
GDP growth rate	-.0007559	-.001466	.0007101	.0003177
Deposit interest rate	-.0107572	-.0084316	-.0023256	.0013513
b= consistent under Ho and Ha; obtained from xtreg B = inconsistent under Ha; efficient under Ho; obtained from xtreg Test: Ho: difference in coefficients not systematic Chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 53.59 Prob > chi2 = 0.0000 (V_b – V_B is not positive definite)				

Appendix 4.21 - Hausman Test FE vs. HT (Table 4.8 – Model 3)

	Coefficients -			
	(b) eq_fe	(B) eq_ht	(b-B) Difference	Sqrt(diag(V_b-V_B) S.E.
Net savers	.0219971	.0223784	-.0003814	.0025547
Deposits	.0829124	.0834849	-.0005725	.0036032
DAPSM	-.1398343	-.1405607	.0007265	.0061021
Par30	-.0002518	-.0002561	4.23e-06	.000096
GLPTA	.0035934	.003595	-1.60e-06	.0002186
Mature	-.1005738	-.1011998	.0006259	.0137785
Young	-.0966415	-.0968315	.00019	.010471
IFL	-.0001895	-.0002254	.0000359	.0002722
GDP	-.0007559	-.0007374	-.0000185	.0007132
DIR	-.0107572	-.009669	-.0010882	.0015498

b= consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha; efficient under Ho; obtained from xthtaylor

Test: Ho: difference in coefficients not systematic

Chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 0.51

Prob > chi2 = 0.7746

Appendix 4.22: Detailed discussion on the relationship between regional and macroeconomic factors and breadth of outreach.

In terms of regional-specific control variables, table 4.7 reports that MFIs in East Asia and the Pacific, South Asia and Africa have larger breadth of outreach. Further, it is noteworthy that the magnitude of South Asia (SA) is the largest. Most of MFIs in SA make use of group lending methodology and serve a high percentage of female clients (Stephens and Tazi, 2006). Further, all of the countries in SA have high levels of subsidy from foreign donors, governments, or from eroding network of cooperatives (World Bank, 2006). These may be underlying reasons for large breadth of

outreach in SA. With respect to Africa, some advantages at micro, meso and macro levels have been identified to play a role in good social performance of African MFIs, such as strong savings growth, large number of points of services, technology advances, and the presence of professional associations. Moreover, Sub-Saharan Africa contains 48 countries and 47% of the people live on less than US$ 1.25 a day. Sub-Saharan Africa has the highest poverty rate in the world[81]. East Asia and Pacific (EAP) has significant share of the world's population which is 27% and a poverty rate of 24%[82]. These key socio features imply that both Africa and EAP have a high demand of microfinance services to deal with poverty issues and vulnerability. Accordingly, MFIs in these regions have higher number of active borrowers.

Turning towards macroeconomic control variables, we firstly see that GNI per capita is found to have a positive impact on breadth of microfinance outreach. There was a positive and significant relationship between GNI per capita and the number of active borrowers. GNI per capita can reflect the development of a country; therefore, MFIs active in countries of high GNI per capita can make use of favourable macroeconomic conditions. As a result, MFIs can be more profitable and are more likely to serve more micro-credit clients. Accordingly, an increase in GNI per capita can enable MFIs to expand their breadth of microfinance outreach.

In model (1) of table 4.7, we found a significant positive link between inflation rates and the number of active borrowers. There may be two reasonable arguments for this finding. First, as stated by Boyd *et al.* (2001), in countries with high inflation rate, there is a declining tendency in banking activities, which may lead to an increasing

[81] See: 'Sub-Saharan Africa'. Available at: http://www.cgap.org/countries/sub-saharan-africa [Accessed : 1 April 2016]
[82] See: 'East Asia and the Pacific'. Available at: http://www.cgap.org/countries/east-asia-and-pacific [Accessed: 1 April 2016]

demand for microfinance services. As a result, MFIs active in such countries are more likely to serve more credit customers. Secondly, in countries which are heavily affected by inflation, the real income and living standard of their people decrease. More people become poor and they may ask for services from MFIs. Thus, MFIs expand their breadth of outreach in response to the increasing demand in microfinance market. Our finding, however, invalidates Hartarska (2005) who unearths a negative link between inflation rates and the number of active borrowers.

Finally, a significant negative relationship between deposit interest rate and the number of active borrowers is shown in model (1). It may be rational to assume that, when the deposit interest rate regulated by Central Bank decrease, the deposit interest rates applied in financial intermediaries go down as well. Accordingly, people are less likely to deposit their money in financial intermediaries in general and in MFIs in particular as their income from deposit interest rate decreases. Instead, they may tend to borrow more because deposit interest rate is one component of credit interest rate. Thus, a decline in deposit interest rate may go with a decline in credit interest rate as well. Micro loans become cheaper than before, which attracts more credit customers. In addition, viewing from an institutional standpoint, low deposit interest rates indicate that financial expenses may dwindle. Thus, MFIs can become more efficient, more profitable and they therefore can reach more clients, which extends their breadth of outreach.

Appendix 4.23: Detailed discussion on the relationship between regional and macroeconomic factors and depth of outreach.

Model (3) in table 4.8 demonstrates that MFIs in Africa tend to supply larger loans. It has been reported by Steel and Isern (2012) that Africa is the leading region in

terms of savings mobilisation and MFIs in African are having worse depth of outreach compared to other regions. This once again confirms that micro-savings are beneficial to both savers and MFIs. Specifically, savings clients are able to improve their income and living standard. Accordingly, they are more likely to be lifted out of poverty and can demand larger loans. In response, MFIs in Africa tend to extend their average loan size to satisfy their customers' requirement. By doing so, the depth of outreach of MFIs in Africa is curtailed. MFIs in EECA also have large average loan size. As described by Sheremenko, Escalante and Florkowski (2016), MFIs in EECA are mostly focusing on credit provision rather than savings mobilisation and are more commercialised compared with other regions. Microfinance commercialisation normally goes with serving better off clients in terms of bigger loan size. D'Espallier *et al.* (2013) also prove that unsubsidised MFIs in EECA are offering larger loans. Dissimilar to EECA and Africa, MFIs in South Asia appear to have better income-related depth of outreach. South Asian MFIs mainly utilise small group-based lending and serve a high percentage of women borrowers (80%). Therefore, they are more likely to reach poorest clients through supplying smaller loans.

Turning now towards macroeconomic control variables, a positive and significant coefficient for inflation rate is found in model (1). According to Vanroose (2008), high inflation rates impede MFIs to expand their scale of operation due to increasing costs. Rather, to deal with cost escalation, MFIs tend to serve better off clients who are assumed to be less costly and less risky. Accordingly, the loan sizes are enlarged.

Interestingly, deposit interest rate is found to be negatively associated with the average loan size (coefficients are -0.0046, -0.00979 and -0.00967, significant at 0.05

level). Deposit interest rate is one type of MFIs' financial expenses. Therefore, when this rate goes down, the operating expenses of MFIs might decrease as well. Thus, MFIs can be more efficient and more profitable. Therefore, it is easier for them to scale up and serve less poor clients.

Appendix 5.1: Correlation matrix (dumHighFI and dumLowFI)

	OSS	OEA	NAB	LS_GNI	PAR30	HighFI	LowFI	GLPTA	Mature	New	Young	RegMFI	ProfitMFI	GNI	IFL	GDP	DIR
OSS	1.000 8429																
OEA	-.3835* 7452	1.000 7456															
NAB	.0860* 8048	-.1154* 7211	1.000 8557														
LS_GNI	.0872* 8027	-.2739* 7196	-.2366* 8512	1.000 8512													
PAR30	-.1754* 6817	.0033 6311	-.0670* 6862	.0049 6860	1.000 6920												
HighFI	.0449* 7366	-.1840* 6661	.2530* 7451	.2090* 7413	.0235 6812	1.000 11717											
LowFI	-.0561* 7366	.0296* 6661	.1025* 7451	-.0319* 7413	-.0200 6182	-.1375* 11717	1.000 11717										
GLPTA	.0093 8391	.2120* 7439	-.0383* 8399	.0310* 8382	-.0166 6860	-.0196 7695	-.0134 7695	1.000 8820									
Mature	.1361* 8337	-.2023* 7374	.2570* 8444	-.0113 8400	.0443* 6876	.1884* 7772	-.0331* 7772	-.0282* 8696	1.000 8949								
New	-.1838* 8337	.1650* 7374	-.2374* 8444	-.0092 8400	-.0401* 6876	-.1534* 7772	.0050 7772	-.0058 8696	-.5554* 8949	1.000 8949							
Young	-.0053 8391	.1056* 7374	-.1004* 8444	0209 8400	-.0204 6876	-.0919* 7772	.0347* 7772	.0381* 8696	-.6988* 8949	-.2067* 8949	1.000 8949						
RegMFI	.0317* 8342	-.1690* 7378	.0988* 8460	.3292* 8415	-.0155 6882	.2843* 7804	.0303* 7804	.0108 8709	-.0893* 8914	.0671* 8914	.0474* 8914	1.000 8949					
ProfitMFI	.0314* 8301	-.0171 7348	.1592* 8416	.1529* 8379	-.0091 6857	.0862* 7760	.0265* 7760	-.0448* 8672	-.1509* 8828	.1360* 8828	.0656* 8828	.3993* 8873	1.000 8924				
GNI	.1182* 8337	-.0235* 7383	-.0632* 8466	-.2641* 8421	-.0229 6843	-.0446* 11537	-.1241* 11537	-.0112 8726	.1696* 8854	-.1408* 8854	-.0787* 8854	-.2588* 8881	-.0171 8829	1.000 15782			
IFL	.0154 8379	.0379* 7414	-.1018* 8508	.0791* 8463	-.0105 6878	-.0236* 11603	-.0052 11603	-.0150 8768	-.0971* 8896	.1038* 8896	.0250* 8896	.0632* 8923	.0521* 8870	-.1538* 15782	1.000 15870		

GDP	.0517* 8223	-.0532* 7306	.0011 8358	-.0075 8314	-.0513* 6761	-.0391* 10971	.0403* 10971	.0087 8610	-.0913* 8734	.0818* 8734	.0376* 8734	.1269* 8761	.0422* 8710	-.0410* 14588	-.0014 14645	1.000 14648	
DIR	-.0200 8230	.0940* 7287	-.0605 8365	.0290* 8320	.0181 6791	-.0946* 11297	-.0206* 11297	.0064 8620	-.1014* 8732	.0963* 8732	.0373* 8732	.0575* 8759	.0176 8707	-.2031* 15452	.7004* 15506	-.0239* 14314	1.000 15521

Notes: * is statistically significant at the level of 5% or lower (2-tailed test)

Where OSS = Operational Self-Sufficiency (log); OEA = Operational Expenses to total Assets (log); NS = Net savers (log); DEP = Deposits (log), DAPSM = Deposit Accounts per Staff Member; PAR30 = Portfolio at Risks less than 30 days; HiFI = High Financial Intermediation; LowFI = Low Financial Intermediation, GLPTA = Gross loan portfolio to total assets; Reg MFI= Regulated MFI; GNI = Gross National Income (log); IFL = Inflation rate; GDP = growth rate of Gross Domestic Products; DIR = Deposit Interest Rate.

Appendix 5.2: Correlation matrix (dumDeposit-takingMFI)

	OSS	OEA	NAB	LS_GNI	PAR30	Deposit-taking MFI	GLPTA	Mature	New	Young	RegMFI	ProfitMFI	GNI	IFL	GDP	DIR
OSS	1.000 8429															
OEA	-.3835* 7452	1.000 7456														
NAB	.0860* 8048	-.1154* 7211	1.000 8557													
LS_GNI	.0872* 8027	-.2739* 7196	-.2366* 8512	1.000 8512												
PAR30	-.1754* 6817	.0033 6311	-.0670* 6862	.0049 6860	1.000 6920											
Deposit-taking MFI	-.0100 8429	-.1533* 7456	.2622* 8557	.1723* 8512	.0091 6920	1.000 16029										
GLPTA	.0093 8391	.2120* 7439	-.0383* 8399	.0310* 8382	-.0166 6860	-.0311* 8820	1.000 8820									
Mature	.1361* 8337	-.2023* 7374	.2570* 8444	-.0113 8400	.0443* 6876	.1112* 8949	-.0282* 8696	1.000 8949								
New	-.1838* 8337	.1650* 7374	-.2374* 8444	-.0092 8400	-.0401* 6876	-.0964* 8949	-.0058 8696	-.5554* 8949	1.000 8949							
Young	-.0053 8391	.1056* 7374	-.1004* 8444	0209 8400	-.0204 6876	-.0479* 8949	.0381* 8696	-.6988* 8949	-.2067* 8949	1.000 8949						
RegMFI	.0317* 8342	-.1690* 7378	.0988* 8460	.3292* 8415	-.0155 6882	.2977* 8949	.0108 8709	-.0893* 8914	.0671* 8914	.0474* 8914	1.000 8949					
ProfitMFI	.0314* 8301	-.0171 7348	.1592* 8416	.1529* 8379	-.0091 6857	.0909* 8924	-.0448* 8672	-.1509* 8828	.1360* 8828	.0656* 8828	.3993* 8873	1.000 8924				
GNI	.1182* 8337	-.0235* 7383	-.0632* 8466	-.2641* 8421	-.0229 6843	-.2372* 15782	-.0112 8726	.1696* 8854	-.1408* 8854	-.0787* 8854	-.2588* 8881	-.0171 8829	1.000 15782			
IFL	.0154 8379	.0379* 7414	-.1018* 8508	.0791* 8463	-.0105 6878	-.0160* 15870	-.0150 8768	-.0971* 8896	.1038* 8896	.0250* 8896	.0632* 8923	.0521* 8870	-.1538* 15782	1.000 15870		

GDP	.0517* 8223	-.0532* 7306	.0011 8358	-.0075 8314	-.0513* 6761	-.0551* 14648	.0087 8610	-.0913* 8734	.0818* 8734	.0376* 8734	.1269* 8761	.0422* 8710	-.0410* 14588	-.0014 14645	1.000 14648	
DIR	-.0200 8230	.0940* 7287	-.0605 8365	.0290* 8320	.0181 6791	-.0284* 15521	.0064 8620	-.1014* 8732	.0963* 8732	.0373* 8732	.0575* 8759	.0176 8707	-.2031* 15452	.7004* 15506	-.0239* 14314	1.000 15521

Notes: * is statistically significant at the level of 5% or lower (2-tailed test)

Where OSS = Operational Self-Sufficiency (log); OEA = Operational Expenses to total Assets (log); NS = Net savers (log); DEP = Deposits (log), DAPSM = Deposit Accounts per Staff Member; PAR30 = Portfolio at Risks less than 30 days; GLPTA = Gross loan portfolio to total assets; Reg MFI= Regulated MFI; GNI = Gross National Income (log); IFL = Inflation rate; GDP = growth rate of Gross Domestic Products; DIR = Deposit Interest Rate.

Appendix 6.1 – Variance Inflation Factor (VIF) of all independent variables (Table 6.4)

Variables	VIF	1/VIF
Deposits (log)	1.98	.504223
Years of reporting	1.98	.505319
GNI per capita	1.95	.512049
DAPSM	1.77	.563987
Mature	1.64	.609891
Net savers (log)	1.59	.629856
GDP growth rate	1.55	.643889
New	1.52	.658200
Three star	1.32	.758163
One star	1.32	.758644
Gross loan portfolio to assets	1.26	.795314
Inflation rate	1.16	.861790
Mean VIF	**1.59**	

Appendix 6.2: Breusch and Pagan Lagrangian multiplier test for random effects (Table 6.4)

Ln(OSS)[mfi_id, t] = Xb + u[mfi_id] + e[mfi_id, t]		
Estimated results:		
	Var	Sd = sqrt(Var)
Ln(OSS)	.1501275	.387463
e	.031181	.1765814
u	.1480196	.3847332
Test: Var(u) = 0		
	Chi2(1) = 13.46	
	Prob > chi2 = 0.0002	

Appendix 6.3 - Hausman Test FE vs. RE (Table 6.4)

	Coefficients -			
	(b) Fe_name	(B) Re_name	(b-B) Difference	Sqrt(diag(V_b-V_B) S.E.
Net savers (log)	-.0465748	-.0430831	-.0034918	.0095002
Deposits (log)	.065485	.0577331	.0077519	.0178242
DAPSM (log)	.2112854	.1507511	.0605343	.0505365

GLPTA	.0052446	.007611	-.0023664	.0011177
Mature	.1094764	.0826904	.0267861	.0970024
New	-.0313829	-.0278783	-.0035046	.0383449
GNI per capita	-.3132406	-.2628832	-.0503574	.0712988
Inflation rate	.0008048	-.0002549	.0010596	.0009409
GDP growth rate	-.0157253	-.0168193	.001094	.0075285

b= consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha; efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

Chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 6.42

Prob > chi2 = 0.6974

(V_b – V_B is not positive definite)

Appendix 6.4 – Variance Inflation Factor (VIF) of all independent variables (Table 6.5)

Variables	**VIF**	**1/VIF**
Deposits (log)	4.65	.214842
Depositors (log)	4.35	.230031
Years of reporting	2.34	.426599
GNI per capita	2.25	.444650
GDP growth rate	1.88	.532214
Mature	1.79	.559808
DAPSM (log)	1.73	.577881
New	1.60	.626102
Three star	1.30	.769795
One star	1.29	.775262
Inflation rate	1.16	.858537
Gross loan portfolio to assets	1.16	.863117
Mean VIF	**2.13**	

Appendix 6.5 - Breusch and Pagan Lagrangian multiplier test for random effects

(Table 6.5)

Ln(NAB)[mfi_id, t] = Xb + u[mfi_id] + e[mfi_id, t] Estimated results:		
	Var	Sd = sqrt(Var)
Ln(NAB)	2.849585	1.688071
e	.0494612	.2223987
u	.2295544	.4791183
Test: Var(u) = 0 Chi2(1) = 33.56 Prob > chi2 = 0.0000		

Appendix 6.6 - Hausman Test FE vs. RE (Table 6.5)

	Coefficients -			
	(b) Fe_name	(B) Re_name	(b-B) Difference	Sqrt(diag(V_b-V_B) S.E.
Depositors (log)	.4252981	.6235475	-.1982494	.0375891
Deposits (log)	.1642755	.2392116	-.0749361	.0112603
DAPSM (log)	-.3611892	-.5267487	.1655595	.0359262
GLPTA	.0135505	.0114844	.0020661	.
Mature	-.0142136	.0107551	-.0249687	.
New	.2762965	.2537696	.0225269	.
GNI per capita	.1866588	-.0741687	.2608275	.
Inflation rate	-.0034278	-.0019954	-.0014324	.
GDP growth rate	-.0082972	-.0087705	.0004733	.
b= consistent under Ho and Ha; obtained from xtreg B = inconsistent under Ha; efficient under Ho; obtained from xtreg Test: Ho: difference in coefficients not systematic Chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 18.90 Prob > chi2 = 0.0260 (V_b – V_B is not positive definite)				

Appendix 6.7 – Variance Inflation Factor (VIF) of all independent variables (Table 6.6)

Variables	VIF	1/VIF
Deposits (log)	2.02	0.495443
Years of reporting (log)	1.87	0.534883
DAPSM (log)	1.78	0.561539
Mature	1.67	0.599392
Net savers (log)	1.60	0.626000
Gross loan portfolio to assets	1.36	0.735144
New	1.35	0.739249
Three star	1.30	0.769071
One star	1.22	0.820434
GDP growth rate	1.19	0.841497
Inflation rate	1.14	0.874681
Mean VIF	**1.50**	

Appendix 6.8 - Breusch and Pagan Lagrangian multiplier test for random effects (Table 6.6)

Ln(LS_GNI)[mfi_id, t] = Xb + u[mfi_id] + e[mfi_id, t]

Estimated results:

	Var	Sd = sqrt(Var)
Ln(LS_GNI)	.7832795	.8850308
e	.1559011	.3948431
u	.3186729	.5645112

Test: Var(u) = 0

Chi2(1) = 11.08

Prob > chi2 = 0.0009

Appendix 6.9 - Hausman Test FE vs. RE (Table 6.6)

	Coefficients -			
	(b) Fe_name	(B) Re_name	(b-B) Difference	Sqrt(diag(V_b -V_B) S.E.
Net savers (log)	-.0358218	-.032878	-.0029437	.0145459
Deposits (log)	.6497858	.495908	.1538778	.0337121

DAPSM (log)	-.2708474	-.2764989	.0056515	.105343
GLPTA	-.0318575	-.0297345	-.002123	.
Mature	-.1483981	-.3209859	.1725879	.154142
New	.0761964	.1927733	-.1165769	.019199
Inflation rate	.0155809	.0137803	.0018006	.
GDP growth rate	-.0287086	-.1055383	.0768297	.

b= consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha; efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

Chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 17.27

Prob > chi2 = 0.0274

(V_b – V_B is not positive definite)

Appendix 6.10: List of Vietnamese MFIs studied

No.	Name of MFIs	Deposit-taking	
		Yes	No
1	Binh Minh CDC	X	
2	BTV	X	
3	BTWU	X	
4	CAFPE BR-VT	X	
5	CEF	X	
6	Chi-Em	X	
7	Child Fund Hoa Binh	X	
8	CPCF	X	
9	Credit& Saving Project – Women Union, Phu Yen District, Son La	X	
10	CSOD	X	
11	Dairu	X	
12	Fund for Women Development – HCM	X	

13	M7 Can Loc	X	
14	M7 DB District	X	
15	M7 DBP City	X	
16	M7 Dong Trieu	X	
17	M7 Mai Son	X	
18	M7 Ninh Phuoc	X	
19	M7 Uong Bi	X	
20	MCDI	X	
21	Microfinance Fund, Hai Phong	X	
22	Microfinance Program – Women's Union, ben Tre Province	X	
23	NMA	X	
24	Plan International Vietnam	X	
25	PNN	X	
26	STU	X	
27	TCVM Thanh Hoa	X	
28	TYM	X	
29	VBSP	X	
30	Viet ED MF	X	
31	Women Development Fund, Lao Cai	X	
32	Women Development Fund, Quang Binh	X	
33	WU, Ha Tinh		
34	Child Fund Bac Kan		X
35	M7 MFI		X
36	SCJ		X
37	SNV NAPA		X
38	WV Vietnam		X

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