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PERFORMANCE MEASUREMENT OF  
SOUTH ASIAN MICROFINANCE  
INSTITUTIONS



A THESIS PRESENTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE

DEGREE OF  
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IN  
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NEW ZEALAND.

**Uzma Bibi Shahzad**

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In the name of Allah, the Entirely Merciful, the Especially Merciful.

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## **Abstract**

This thesis studies microfinance institutions (MFIs), which are a special type of financial institution that pursue the dual objectives of outreach and financial sustainability. The study evaluates the social and financial efficiency of a panel data set of 372 MFIs in Bangladesh, India, Nepal, Pakistan and Sri Lanka, covering the period 1998 to 2013, using performance ratios and other techniques.

The thesis introduces two new ways of measuring the social objectives of MFIs. The comparative results show that these new outreach indicators provide a better explanation of social performance of MFIs than those commonly used in the literature. We employ these new measures alongside financial sustainability to assess the performance of different types of MFIs in achieving their dual objectives. The results show that non-regulated and profit-oriented MFIs perform relatively well in terms of the dual objectives but face higher operating expenses, creating conflict between outreach and financial sustainability.

In addition, the social and financial efficiency of MFIs are evaluated using data envelopment analysis (DEA) and stochastic frontier analysis (SFA). For DEA, to obtain more robust results, a double bootstrap approach is used and we find that the financial efficiency of these institutions appears stronger than their social efficiency. Cost efficiency estimates show that, on average, South Asian MFIs are operating with the same financial and social efficiency scores, while institutional and country differences matter more for financial efficiency than for social efficiency. The results also suggest that, on average, MFIs exhibit increasing returns to scale in financial sustainability but not when

performance relative to the social objectives is measured. Similarly, improved technological progress is more evident for financial than social efficiency.

The impact of women in various roles and corporate governance on the efficiency of MFIs is investigated for the first time. The presence of female loan officers is found to have a positive effect while female board members and female borrowers show a significant negative impact on financial and social efficiency of MFIs. We find a strong positive association between the governance of an MFI and its financial and social efficiency. We find similar effects of governance and gender roles on efficiency using both the DEA and SFA approaches.

Dedicated to my mother (AMMI GEE)  
and my husband (ABU AWLADI)



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## **List of Abbreviations**

MFIs – Microfinance institutions

DEA – Data envelopment analysis

SFA – Stochastic frontier analysis

PFBs – Percentage of female borrowers

PFOs – Percentage of female loan officers

PFMs – Percentage of female board members

RQ – Research question

PAR 30 – Portfolio at risk greater than 30 days

OER – Operating expense ratio

CAR – Capital to assets ratio

GNI – Gross national income

LNAB – Logarithmic value of number of active borrowers of MFIs

LAST – Logarithmic value of total assets of MFIs

DMATURE - Dummy of mature MFIs

GDP – Gross domestic products

ROA – Returns on assets

OSS – Operational self-sufficiency

ALBPBG – Average loan balance per borrowers divided by gross national income

GLS – Generalised least square model

TE – Technical efficiency

SE – Scale efficiency

BCC - Banker, Charnes and Cooper

CCR - Charnes, Cooper and Rhodes

CRS – Constant returns to scale

VRS – Variable returns to scale

COC – Cost of physical capital

CPL – Cost of labour

COB – Cost of borrowings

RTS – Returns to scale

DMUs – Decision making units

FEAR – Frontier efficiency analysis with R

MIX market – Microfinance information exchange market

SBM – Slacks based measure

C-GAP – Consultative to Assist the Poor

Translog - Transcendental Logarithmic

MSB - Market share of microfinance borrowers

MSBA - Market share of microfinance borrowers adjusted

MENA – Middle East and North America

i.e. – Id Est (that is)

e.g. – Exempli Gratia (for example)

NGOs - Non-government organizations

SHFs - Shareholder firms

COOPs - Microfinance banks

PPP - Purchasing power parity

SBP - State Bank of Pakistan

SECP - Security and exchange commission of Pakistan

CBOs - Community-based organizations

FISA - Financial Intermediary Societies Act





# 1. Introduction



This chapter presents an introduction and background to the performance analysis of microfinance institutions and the motivation for this thesis. The chapter starts by describing the importance of these financial institutions, the challenging environment for their operations and the need to analyse their performance and efficiency. The chapter proceeds with identifying the research goals that are followed by motivation for the thesis. At the end, we set out the contribution and an outline of the thesis.

## 1.1. Background

Microfinance<sup>1</sup> institutions (MFIs) are selected for performance evaluation because of their critical importance for a special group of customers, primarily the poor in the developing world, and their future promise of an economic development solution. MFIs work similarly to conventional banks as they collect money (accept deposits) and make loans. However, the difference is the target market as MFIs lend small amounts to the poor, accept grants and generally have a lower default rate than conventional banks (Haq, 2008; Von Pischke, 1996). In spite of these differences, as they deal with money, their financial and social performance still needs to be measured. In the past, microfinance simply offered financial services to low income clients, but now it has broadened its scope to include all those who are usually excluded by mainstream financial services. As the significance of microfinance is growing, especially among donors and commercial parties, the requirement for financial sustainability is becoming greater (Hardy, Holden, & Prokopenko, 2003).

The performance of MFIs can be measured by using the tools that are used to measure the performance of traditional banks, but the bodies that grant money to the MFIs value the social aspects more than the financial aspects (Weiss & Montgomery, 2007). Therefore in order to undertake performance assessment of MFIs, both of these aspects need to be addressed. Moreover, as MFIs are a special form of financial institution that follow the dual objectives of outreach and financial sustainability so their performance

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<sup>1</sup> The Bangladeshi economist, Muhammad Yunus, initiated a financial project for the poor in 1976 that would become the Bangladeshi Grameen Bank in 1983. Later the concept of microfinance was formalised, receiving tremendous international recognition which culminated in a Nobel Peace Prize for the pioneer, Muhammad Yunus, in 2006. Along with international recognition, microfinance has had huge success, with total assets of these institutions over US\$60 billion by 2008 and average annual assets growth of 39% between 2004 and 2008 (Chen, Stephen, & Reille, 2010).

also needs to be measured according to these objectives (Cull, Demirguc-Kunt, & Morduch, 2007).

MFIs were developed to provide credit to the poor, who have no access to commercial banks, generally to help them set up their own income generating business. This focus is called outreach. But providing credit to the poor can be a costly business which may conflict with the financial sustainability of MFIs. Therefore, donors provide financial support to these institutions so that they focus on their outreach objective. Recent developments in microfinance business such as commercialisation, technological change and increase in competition, have caused these subsidized MFIs to shift their focus onto financial sustainability.

This stresses the importance of being able to cover the cost of lending money out of the income generated from loan portfolios and reducing this cost as much as possible. If microfinance institutions are able to attain both the outreach and financial sustainability objectives at the same time, these objectives are compatible with each other. Otherwise there is a trade-off<sup>2</sup> between them or they conflict with each other. There is much debate among scholars as to whether the focus should be on a financial perspective or a social perspective when assessing MFIs' performance. At a broader level these two concepts are perceived as both mutually compatible (Conning, 1999; Copestake, 2007; Woller, Dunford, & Woodworth, 1999) and conflicting (Cull et al., 2007; Morduch, 2000).

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<sup>2</sup> For more detail see Von Pischke (1996), Navajas, Schreiner, Meyer, Gonzalez-Vega, & Rodriguez-Meza (2000) and Schreiner (2002).

However, the key determinants of variation in microfinance efficiency cannot be clearly understood from looking only at these objectives of outreach and financial sustainability. A clear understanding of the significant microfinance efficiency factors would provide microfinance managers and policy makers with guidelines for improving MFI efficiency. It would further help them to compare themselves with these benchmarks to improve their own operations.

Therefore, we evaluate these unique objectives of South Asian<sup>3</sup> MFIs and their trade-off using performance ratios, and parametric and non-parametric techniques commonly used to measure efficiency. The central questions to answer in this thesis are on the efficiency level of MFIs and what efficiency determinants for these institutions are important. There has been a lot of research on efficiency in banking over the past few decades and as microfinance resembles small scale banking, techniques for performance studies that are common in banking research are now also applied to microfinance (Cull et al., 2007; Mersland & Strom, 2009). Moreover, it is critical for the financial and non-financial sector of these countries to know the roles of MFIs, and to consider MFIs' roles on South Asia's economic development and future policy making. As MFIs in the region are working under different ownership and regulatory structures, we analyse their performance according to each of these aspects

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<sup>3</sup> We choose South Asian microfinance programs due to their distinct characteristics. For example MFIs are largely concentrated in this region and according to Microfinance Information Exchange (MIX) market the region has world's largest microfinance sector, dominated by India and Bangladesh. Along with that according to the dataset used in this study, the South Asian microfinance program has shown a consistent growth and efficient performance in providing financial services to their low income clients (MIX market, 2011). For more detail on microfinance in South Asia, see Appendix 1 and 2.

The importance of microfinance raises the need for appropriate governance structures for these financial institutions. If MFIs' managers are working within sound governance frameworks, they will allocate funds according to these institutions' objectives. In contrast, if managers enjoy discretion and act in their own interest rather than that of the funders and the institutions themselves, then MFIs will be less likely to serve society. One of the reasons for recurring difficulties for MFIs is their poor governance. For example, the 2010 problems<sup>4</sup> for MFIs not only affected their own performance but also negatively affected the overall Indian economy, ultimately increasing poverty (Taylor, 2011). Good corporate governance is becoming an important requirement for MFIs as microfinance may reach a large number of clients. However, good corporate governance is a challenge for MFIs because of their dual objectives, the fiduciary responsibility of the board and various types of ownership structures. These factors are another focus of this research.

Moreover, microfinance is particularly suited for studying the effect of female involvement because of its social mission. Microfinance is to a large extent a woman's business as female borrowers are the MFIs' largest market, and lending to women is considered one of the main reasons for microfinance's success (Armendariz & Morduch, 2010). But microfinance is not only a business 'for women,' it is to a large extent also a business 'by women'. Several women are industry icons, for example, Pilar Ramirez of Banco FIE in Bolivia and Ingrid Munro in Jamii Bora in Kenya. The proportion of top

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<sup>4</sup> One of the examples of poor governance structure of MFIs is Andhra Pradesh incident in India. Here, in first nine months of 2010 more than 200 microfinance clients committed suicide due to excessive debt claims and aggressive loan collection parties.

female executives and directors in MFIs is high. In our sample, the proportion of female board members is almost 33% of the total, the percentage of female loan officers is 35%, and about 83% of borrowers are women. These proportions are much higher than corresponding figures in traditional firms. For instance, for their very large sample of U.S. companies, Adams & Ferreira (2009) report that only 8.8% of directors are female.

In compiling this thesis, we divide our analysis into four main parts. The first one is social performance evaluation. Outreach is a core concept of microfinance and is considered an important criterion to evaluate the social effectiveness of MFIs (Schreiner, 2002). In recent years, there have been a number of discussions in the microfinance literature on the importance of the social objectives of MFIs. We look at new ways, not captured by previous indicators used in literature, to measure breadth and depth of outreach to evaluate the social performance of MFIs. We also compare these new indicators with existing indicators found in the literature.

Secondly, MFIs are a special type of financial institutions that pursue both social and financial objectives. Therefore, we examine both social and financial objectives of MFIs through performance ratios, and explore their relationship with each other. We also examine whether this relationship differs across different types of ownership structures, regulatory status and across countries.

Until recently, the efficiency issue was commonly examined using non-structural approaches like financial ratios, but more emphasis is now being given to parametric and non-parametric methods such as data envelopment analysis (DEA) and stochastic frontier analysis (SFA). We use both of these approaches. For our non-parametric approach, in

the third part of our study, we perform two stage analysis; DEA efficiency scores and regression analysis. In the first stage, along with conventional DEA approaches, we use the slacks-based measure (SBM)-super efficiency model (to identify the outliers in our database). In the second stage, we use truncated bootstrapped regressions to analyse the sampled MFIs' specific operating characteristics that may impact on variations in microfinance efficiency. Out of a range of possible key efficiency determinants<sup>5</sup> we chose gender and governance indicators. Our final study using a parametric SFA model, allows us to estimate cost and technical inefficiency simultaneously. We further regress these scores on governance and gender variables.

## **1.2. Motivation**

In 1986, a young woman in her twenties in a small village of Pakistan received the terrible news of her husband's death. In desperate financial circumstances with three daughters (all under 7), with no family support, this mother managed to find some other women in similar circumstances and they all decided to pool their resources. The only skill they knew was handicraft; to do embroidery on pieces of cloth. One of the women who was older thus with less chance of attracting male harassment, went to the markets and sold the cloth. The meagre money received was just enough to survive. From a small beginning, they were able to provide for their children not only food and shelter but also good education, culminating in one daughter being able to study overseas.

This personal experience provides the motivation for my study, along with the knowledge that MFIs are helping women especially to build a better economic foundation for their

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<sup>5</sup> The reason for this choice is discussed in chapter 4.

lives. MFIs are actively working in South Asia to assist in the fight against poverty. Mainstream banks refuse to take the risk of lending to the poor and their policies also exclude potential small investors from formal financial services (Kono & Takahashi, 2010). In this situation where poor people all over the world are excluded from formal financial systems, microfinance increases opportunities for self-employment by providing formal and informal access to capital for otherwise marginalized people (Sievers & Vandenberg, 2007). Microfinance is therefore considered a vital and effective tool in the global battle against poverty (Krauss & Walter, 2009).

### **1.3. Research Contribution**

Even though a few papers on microfinance efficiency evaluation are already available, research on this topic is still in its infancy, with the first studies produced only around 20 years ago. We advance the existing empirical literature in several ways. Firstly, we introduce new ways of measuring the two aspects of outreach to evaluate the social performance of MFIs. Secondly, the review of microfinance literature highlights the importance of performance assessment of MFIs; we contribute to the literature by addressing this topic in terms of their dual objectives of outreach and financial sustainability. We evaluate their role in different categories and classify MFIs as profit-oriented and non-profit-oriented institutions, regulated and non-regulated institutions and MFIs from India and South Asian countries other than India.

Using DEA, we extend the literature by employing double bootstrapping method and the super-efficiency model to investigate the dual objectives of MFIs. Another contribution of this study is that, in the second stage, we explore the links to efficiency, gender and

governance. Furthermore, our study differs from existing studies as we estimate cost efficiency and technical efficiency using SFA, an approach not previously widely applied in microfinance. These efficiency scores are further used to compare the efficient use of available resources by ownership type and organizational regulatory structure, and to correlate outreach with financial sustainability objectives.

#### **1.4. Outline of the Dissertation**

This thesis is organized into 6 chapters (including this). Chapter 2 provides a review of previous studies related to microfinance efficiency and productivity analysis. Chapter 3 gives an overview of our data and chapter 4 elaborates on the methodology used. Chapter 5 discusses the results from each approach used and the thesis ends with a discussion of the research and points out future directions. An overview of each chapter is given below:

**Chapter 2** begins by describing the previous literature on efficiency techniques using financial ratios, non-parametric methods like data envelopment analysis and parametric methods like stochastic frontier analysis. The review of the related literature also helps to develop an understanding of the different approaches suggested by researchers for efficiency analysis of financial institutions. This chapter also points out gaps in the past research, which explains why we use these techniques.

**Chapter 3** outlines the data that is used, primarily in respect of MFIs in South Asia and sets out the individual studies undertaken in an attempt to answer the questions posed. Both balanced and unbalanced panel data is used according to different techniques of efficiency evaluation.

**Chapter 4** describes the details of methodologies used in this thesis. Different models such as regression analysis, generalized least squares and truncated regression models are used. For the data envelopment analysis technique, the super efficiency model and conventional models of variable returns to scale and constant returns to scale are elaborated in detail. For stochastic frontier analysis, a Translog (Transcendental Logarithmic) cost function is used.

**Chapter 5** reports and discusses the results of different analysis described in chapter 4. Social and financial performance is evaluated individually using financial ratios before we split the sample into different sub-samples according to ownership and regulatory structures to further evaluate performance. Efficiency results from DEA and SFA techniques are presented with explanations of links to corporate governance, gender and efficiency.

**Chapter 6** summarizes the research contributions and concludes the research presented in this thesis. It further provides some suggestions for areas where follow up research might be undertaken in the future, and possible extensions of this research.

## 2. Conceptual underpinnings and related literature

“Know thy self, know thy enemy.

A thousand battles, a thousand victories.”

Sun Tzu

This chapter reviews the existing theoretical and empirical literature on performance and efficiency evaluation of MFIs using their dual roles. In each section, we also include the research questions and related expected answer. We start with performance evaluation studies and then review social and financial performance objectives, one by one. The chapter proceeds with the review of literature on the linkages between the productivity, efficiency, governance and gender roles, and financial and social objectives of MFIs. While evaluating the existing literature, the research gap is identified and the need to fill this gap is highlighted. The chapter concludes with a summary of the research questions.

### 2.1. Performance of MFIs

Microfinance is defined as the delivery of financial services by institutions, such as savings, loans and financial insurance for low-income clients, including those who are self-employed such as farmers (Ledgerwood, 1999). It is considered a vital and effective

tool in the global battle against poverty, but compared with traditional banking, it shows very high intermediation margins (Krauss & Walter, 2009). Over the last decade, theoretical and empirical studies in microfinance literature have suggested the importance of microfinance taking place in both developed and developing economies (Schreiner, 2002). Although microfinance developed to provide financial services to low income clients, it has now broadened its scope to include some of those who are usually excluded by mainstream financial services. As the importance of microfinance grows, the requirement for better performance of MFIs is becoming greater (Hardy et al., 2003). However, the bodies that grant money to MFIs value the social aspects more than the financial aspects (Weiss & Montgomery, 2007).

In the subsequent sections, we scrutinise in detail the existing social performance measures while introducing two new ways of measuring and evaluating trade-off among social and financial objectives of MFIs. We examine the social and financial objectives of MFIs through performance ratios and try to determine their relationships with each other. We also examine whether these relationships differ across different types of ownership structures, regulatory status and across various countries. It is important to note that we are not dealing with the impact of MFIs on poverty but instead focusing on the evaluation of the financial and social performance of MFIs.

## **2.2. Social Performance of MFIs**

Outreach is a core concept of microfinance that may be used as an important criterion to evaluate the social objective of MFIs (Schreiner, 2002). In recent years, there have been a number of discussions in microfinance literature on the importance of the social

objectives of MFIs. Moreover, outreach is a multifaceted concept that has different dimensions (Meyer, 2002; Navajas et al., 2000). Some of these dimensions are: worth and cost to users, length and scope of its output and lastly breadth and depth of outreach; the last two are repeatedly used in microfinance literature. According to Navajas et al. (2000) the length is the time frame of supply of financial services of MFIs which is difficult to measure, so profit is used as a proxy because in the absence of guaranteed donations, profit is the only signal of survival for MFIs. The scope of outreach is the number and types of loans and financial services supplied; it is also identified as an integrated approach or maximalist approach (Shetty, 2009). According to Sinclair (2012), with a change in poverty level, the demand for financial services also changes. The scope of outreach not only indicates the demands of the poor, but also the change in their demands as their level of welfare changes. In addition to loans, they demand secure savings, remittance transfers, insurance and other services that are provided by microfinance (Meyer, 2002).

Breadth or scale of outreach is the number of clients that are being served. It generally includes those people who were not previously served by any financial institutions as they can't meet their requirements of collateral etc. to apply for loans. The number of active borrowers or clients that are served by MFIs is commonly used as a measure of breadth of outreach (Bassem, 2009; Cull et al., 2007; Hartarska, 2005, 2009; Hartarska & Mersland, 2012; Meyer, 2002; Navajas et al., 2000; Tchakoute-Tchuigoua, 2010). However, Kyereboah-Coleman (2008) used the annual rate of change in active clients to evaluate the breadth of outreach. Breadth is considered as a quantity, and depth is considered as a quality measure of microfinance credit (Ahlin, Lin, & Maio, 2011; Balkenhol, 2007; Christen & Drake, 2001; Hermes, Lensink, & Meesters, 2011).

The term ‘depth of outreach’ refers to “the value the society attached to the net gain from the use of microcredit by a given borrower” (Navajas et al., 2000, p. 335), and as its direct measure is not available, proxies such as access to public service, education, ethnicity etc. are used as indirect measures. The commonly used measure of depth of outreach is the average loan balance per borrower divided by gross national income (for example, see Gutierrez-Nieto, Serrano-Cinca, & Molinero, 2009; Tchakoute-Tchuigoua, 2010). Other researchers have used the percentage of female borrowers (Cull et al., 2007; Mersland, Randoy, & Strom, 2011; Schreiner, 2002) because (especially in developing countries) females are considered to have more problems in obtaining loans as compared to males. Moreover, many women in developing countries are also forced to hand the loan over to men, who subsequently use the proceeds for their own purposes (Goetz & Gupta, 1996). Other scholars have employed yet other measures of outreach such as average outstanding loan size (Mersland et al., 2011; Mersland & Strom, 2009), volume of loans (Hartarska & Mersland, 2012), and rural and urban market criteria (Mersland et al., 2011).

Due to data limitation, the commonly used outreach indicators are limited to breadth and depth of outreach, although these indicators are also not free from criticism. The following discussion details the limitations as identified in microfinance literature. For example, Quayes (2012) describes the limitations of using depth of outreach and says in order to know the poverty level of microfinance borrowers, their income level should be assessed. No such data has been collected and the average loan balance per borrower divided by gross national income (ALBPBG) is used instead, although it is not an ideal measure for poverty level. Copestake (2007) has also criticised previous authors’ outreach indicators, identifying their weaknesses, and noting the lack of consensus. For example,

to measure the breadth of outreach, the number of active borrowers is used but this gives no information as to how active clients are. To measure the depth of outreach, average outstanding credit is used but this also needs further explanation as to whether a change is due to a change in the exchange rate, inflation rate or a shift of MFIs towards richer clients. A review of previous microfinance research suggests that these outreach indicators are limited in their usefulness. Some other studies not satisfied with previous indicators introduce their own outreach indicators, for example, Gutiérrez-Nieto et al. (2009) introduce an indicator of benefit to the poor.

We have identified two new ways of measuring the breadth and depth of outreach. The breadth of outreach is defined by the market share of microfinance borrowers ( $MSB_{ij}$ ), calculated as:

$$MSB_{ij} = \frac{NAB_{ij}}{TAB_j} \quad (\text{Equation 2.1})$$

$NAB_{ij}$ = number of active borrowers of microfinance from MFI  $I$  in country  $j$

$TAB_j$ = Total number of active borrowers of MFIs in country  $j$

The depth of outreach is defined by the market share of the number of active borrowers adjusted by market share of assets ( $MSBA_{ij}$ ), calculated by the market share of borrowers divided by the market share of assets. If  $MSBA_{ij}$  has a value less than one, that indicates less outreach, and a figure greater than one, indicates more outreach.  $MSBA_{ij}$  is calculated as:

$$MSBA_{ij} = \frac{NAB_{ij}/TAB_j}{A_{ij}/TA_j} \quad (\text{Equation 2.2})$$

Where

$NAB_{ij}$  = number of active borrowers of microfinance from MFI  $I$  in country  $j$

$TAB_j$  = Total number of active borrowers of MFIs in country  $j$

$A_{ij}$  = Total assets of MFI  $I$  in country  $j$

$TA_j$  = Total MFI assets in country  $j$

We also check our results using breadth and depth of outreach indicators from the literature. Additional indicators used from the literature are the number of active borrowers for the breadth of outreach and the percentage of female borrowers and the average loan balance per borrower divided by GNI for depth of outreach.

As discussed in Copestake (2007), there is a wider scope for analysing the social performance of all providers of retail financial services. He posits a need to monitor, analyse, and report trends in standardized indicators of financial inclusion and client satisfaction of these institutions. Based on this, our first research question (RQ) is how well do the existing factors of performance explain the proxy variables/indicators of social performance of MFIs? The expected answer to this question is that new ways of measuring breadth and depth of outreach can explain the social objective of MFIs better than existing indicators. To evaluate social performance, we use some performance determinants from existing studies to cover a wide variety of commonly used variables. These performance determinants include some institution-specific and country-specific indicators (as control variables), and financial ratios such as risk, cost and capital ratios.

Among the institution-specific variables, we have age and the size of the MFIs. Age controls for the effect of experience and the presumption is that older MFIs are performing better than younger institutions (Hermes et al., 2011; Mersland & Strom, 2010). Alternatively, we might argue that young or recently established MFIs are delivering better performance as they have the opportunity to learn from existing knowledge accumulated by longer established institutions. The second institution-specific variable is size, measured by total assets of the MFIs. Size of the MFIs allows us to test the hypothesis that large MFIs are more efficient as they might benefit from economies of scale.

The country-specific variables are those macroeconomic variables that are also considered as possible determinants of an MFI's performance, including general structure variables such as inflation and the size of the economy. According to Ahlin et al. (2011), inflation can hinder the microfinance lending mission and may also impact on microfinance cost of funds and borrowers' incentives for defaults. Moreover, unanticipated inflation lowers MFIs' returns, and in response, MFIs may build (conservatively) large inflation premia into interest rates. Real gross domestic product (GDP) is used as a proxy to measure the size of an economy. We are expecting in this study that real GDP will have a negative impact on the social performance of MFIs and inflation will have a positive impact.

In a basic model of control variables, we add performance measurement ratios<sup>6</sup> that are described in Consultative Group to Assist the Poor (C-GAP) (2003) to assess the

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<sup>6</sup> In our process of choosing the more parsimonious variables, we first include all of these 21 ratios in earlier regressions then we end up including only three ratios for the final analysis. Some of them are highly correlated with each other or with other explanatory variables (For detail, see Appendix 3).

performance of South Asian MFIs. Portfolio quality is measured with repayment risk that shows the riskier part of the loan portfolio; the more overdue loans are, the higher the chance of their not being repaid (Morduch, 1999). We used the variable, portfolio at risk greater than 30 days divided by loan portfolio (PAR30) as an assessment of credit quality of MFIs. This ratio helps us to assess the portfolio quality and loan repayment performance of clients of the MFIs. PAR30 is expected to be positively related to social performance as a higher risk loan may mean higher social performance. It might be because they are taking greater risk in pursuit of social objectives rather than focusing on the repayment of the loan. Small loans with high transaction costs may indicate that the institution is doing a better job with its social performance.

Productivity or cost ratios show the rate at which an institution is generating revenues to cover its expenses: we use the operating expense ratio (OER). The microfinance literature views a high value of this ratio positively, in the sense that a higher cost for the MFIs shows that the institution is spending more to reach poorer clients. So it is expected that a higher value of cost ratios might result in greater social performance. Another ratio is chosen from the category of financial management ratios. It is capital to assets ratio (CAR), calculated by dividing the total equity of a MFI by its total assets. A capital ratio reflects the capital structure of an institution (Ledgerwood, 1999) as well as its financial strength. We expect that the higher the value of capital to assets ratio, the less will be its social performance. A high value of this ratio would indicate that relatively less lending is being done.

Additionally, as we introduce new methods for two outreach indicators so their relationship with other explanatory variables (in line with Hermes et al., 2011) in our model needs to be explained. In terms of breadth of outreach, we expect it should be

positively related with explanatory variables. Two arguments can be discussed in this regard. First, in line with the market-failure theory of microfinance (Woller, 2012) it could be argued that MFIs are substitutes for the conventional banking sector. In this case MFIs would solve the shortcomings of the traditional banking sector through their different lending systems. It is generally considered that because of transformation costs and information asymmetries, banks often fail to serve some part of the population. MFIs often use group lending and because of these alternative lending systems, they are able to serve clients considered too risky by banks. Therefore, it might be said that MFIs only concentrate on clientele that is not served by banks.

Secondly, while the part of the population in developed countries served by conventional financial institutions is quite large, that fraction decreases from 80% to 20% for developing countries (Cull, Demirguc-Kunt, & Morduch, 2008). As our data sample is based on developing countries, we expect that large numbers of households are not being served by conventional banks and that MFIs in this region should serve more clients. With the large number of people not served by conventional banks, MFIs may focus on the richest among the poor as a major portion of their clients. Therefore, it is expected that as the financial sector grows, the breadth of outreach of microfinance also grows although the depth of outreach may shrink.

The depth of outreach is also related to serving poorer clients and it is reasonable to believe that people in this niche would be poorer than the ones served by banks. If MFIs want to fill the market gap created by banks, they would primarily be focusing on these clients. However, in less developed economies, as the number of unbanked people is bigger, MFIs would have a wider range of clients to choose from, not only from the poor.

Depending on whether they want to increase access for the unbanked or for the poor in general, MFIs could be attracted towards the better-off people in this segment, since these could be less costly to serve. Overall, these arguments predict a negative impact of microfinance performance on the depth of outreach of MFIs.

### **2.3. Social and Financial Performance of MFIs**

In this section, we review the literature on performance criteria for MFIs, trade-off evaluation and finally the literature on governance of MFIs. During the 1990s, some researchers suggested a framework for the assessment of MFIs' performance, based on the dual concepts of outreach and financial sustainability (Kereta, 2007; Morduch, 1999). For example, Yaron (1994) introduces two fundamental criteria of outreach and financial sustainability for performance assessment of MFIs. Another important innovation is made by Zeller & Meyer (2002), who suggest a third criterion of welfare impact, but it is not used by the researchers generally because it is difficult to measure (Manos & Yaron, 2009).

Performance of MFIs has also been assessed by using different methods, for example, the subsidy dependence index (SDI) developed by Yaron (1992). The SDI is generally accepted and adopted by many researchers including Nawaz (2010); Gonzales-Vega, Schreiner, Meyer, Rodriguez & Navajas (1996) and Lariviere & Martin (1999). The financial self-sufficiency index, developed by Christen, Rhyne, Vogel, & McKean (1995) and Farrington (2000), has applied accounting ratios such as cost per borrower, return on assets, administrative expense ratio and client per staff member to evaluate MFIs' performance. Arsyad (2005) takes a similar approach and uses cost per unit of currency

lent, operating cost ratios and cost per loan while measuring the efficiency of Indonesian MFIs.

Koveos & Randhawa (2004) analysed the framework of MFIs using the balanced scorecard approach, which includes four measurement perspectives: the financial perspective, the customer perspective, the internal-business processes perspective, and the learning and growth perspective. Lafourcade, Isern, Mwangi, & Brown (2005) assessed performance of MFIs in terms of their dual objectives in Africa using 22 indicators. Ferro-Luzzi & Weber (2006) illustrated some statistical tools, such as factor analysis and cluster analysis in the context of MFIs' performance evaluation. In a global analysis of leading micro banks, Cull et al. (2007) assessed financial and social performance, and explored the patterns of loan repayment, profitability, and cost reduction of 124 institutions in 49 countries. In India, Crombrughe Tenikue, & Sureda (2008) conducted performance analysis for a sample of 42 MFIs. They investigated three particular aspects of sustainability: cost coverage by revenue, repayment of loans and cost-control. Berguiga (2008) measured the performance of social and financial objectives of MFIs in MENA countries, while Gutierrez-Nieto et al. (2009) only measured the social efficiency of MFIs.

Some studies on MFIs have focused on the assessment of their performance by only evaluating their financial indicators, such as profitability, loan delivery mechanisms and recovery rate (Christen et al., 1995; Yaron, 1994). The study of Christen et al. (1995), for example, analyses outreach and financial sustainability in terms of the performance assessment of some MFIs in Bangladesh, Bolivia, Costa Rica, the Dominican Republic, Indonesia, Kenya, Niger, and Senegal. Using consolidated financial data for each MFI,

their study suggests that efficient operations and appropriate pricing policies are two keys to achieving financial sustainability objectives. However, their study does not reveal the influence of formal and informal factors of performance. The financial sustainability of MFIs, however, cannot be achieved if the institutions do not meet the needs of the people that they are designed to help (Snow, 1999). He points out that a sustainable MFI must be embedded in, and linked with, the network of existing local institutions. Hence, sustainability must be socially constructed, that is, arrangements of a social and economic nature must be made purposively.

In 1995, the C-GAP (Consultative Group to Assist the Poor) was established with a consortium of 33 public and private development agencies to give access to financial services to the poor in developing countries. They also suggested the use of outreach and sustainability as two key criteria to evaluate the performance of MFIs. Later, they agreed on some performance measurement ratios for MFIs that are used to define performance criteria for MFIs (C-GAP, 2003). We use the same ratios to assess the financial and social performance of South Asian MFIs.

To explain the possible trade-off between financial and social objective of MFIs, Navajas et al. (2000), Schreiner (2002), Von Pischke (1996) identify that higher transaction costs are associated with poor lenders and small loans. They also note that such loans can be less cost effective in comparison to larger loans so an increase in the depth of outreach causes higher administrative costs and poorer financial performance.

Studies by Lariviere & Martin (1999) and Paxton & Cuevas (2002) also note that lending innovations and adoption of new technology such as cellular phones are causing a great reduction in transaction costs. The introduction of commercialization in the microfinance

industry is also considered as another challenge for existing non-profit MFIs, as commercialised MFIs are more concerned with profits and hence concentrate less on lending to the poor. The emphasis on financial sustainability could hamper the mission of outreach.

Others argue that poor borrowers have a higher rate of repayment and that positive dynamics can compensate the associated risk and cost of lending, so that there would be no trade-off between financial sustainability and outreach. Moreover, if the per unit cost of disbursing and monitoring small loans is less than the per unit cost of larger loans, then the depth of financial sustainability and outreach would positively reinforce each other. Manos & Yaron (2009) argue in their study that trade-offs may exist between sustainability and outreach in the short-run, but they also argue that this conflict in achieving microfinance objectives can be improved in the long-run. In support of their argument, they say that in the long run, institutions may be able to enjoy economies of scale, and can also be successful in improving their innovations and operational modes.

We advance the existing empirical literature in several ways. First, based on this review it can be seen that none of the above studies explicitly measure the performance of MFIs in terms of dual objectives by using standard measures of ratios suggested by C-GAP (2003). Some of the existing studies used these ratios but not in relation to the dual objectives of MFIs. For example, Gutierrez-Nieto, Serrano-Cinca, & Molinero (2007) use profitability ratios, but they suggest further investigation of risk factors in performance assessment of MFIs. Some studies, for instance, Caudill, Gropper & Hartarska (2009) and Paxton (2007) take into account more general efficiency determinants related to the performance measurement of MFIs. Others like Arsyad (2005) used these performance

ratios to make comparisons among institutions and countries but no evidence was found that these performance ratios have ever been used to study the dual objectives of MFIs.

Secondly, the review of microfinance literature highlights the importance of performance assessment of MFIs and, therefore, we contribute to the literature by addressing this topic in terms of their dual objectives of outreach and financial sustainability. We also identify that both the dimensions of breadth and depth of outreach collectively explain the social performance and no single measure is individually able to fully explain the entirety of social performance of MFIs.

Thirdly, we have done an extensive analysis of different types of MFIs to check the robustness of our results. There are a number of characteristics that could play a role in determining the levels of performance in an MFI, such as geographical location, type of credit technology, type of loans etc. The MFIs subject to the present analysis can be classified into the following main categories: profit-oriented (PIs) and non-profit-oriented institutions (NPIs), and regulated and non-regulated institutions. Based on this, our second RQ of thesis is do performance for social and financial objectives of MFIs vary among different sub groups?

We now elaborate on the expected outcomes of this section in defining the expected link between social and financial determinants and the different categories of MFIs. Financial sustainability refers to the survival or continuity of an institution within its relevant market. It determines the institution's progress, and is also about generating enough revenues from financial services to cover the institution's costs. Social

performance encompasses the entire process implemented by an MFI to generate positive outcomes for its clients and for the overall communities it serves. It would also include the analysis of the development objectives of institutions to see how effective they are in monitoring progress towards their social objectives.

The social performance of MFIs is measured by breadth and depth of outreach. The commonly used measure of breadth of outreach is the number of active borrowers (Bassem, 2009; Cull et al., 2007; Hartarska, 2005, 2009; Hartarska & Mersland, 2012; Meyer, 2002; Navajas et al., 2000; Tchakoute-Tchuigoua, 2010). The average loan balance per borrower divided by gross national income (Gutierrez-Nieto et al., 2009; Tchakoute-Tchuigoua, 2010) and the percentage of female borrowers (Cull et al., 2007; Mersland et al., 2011; Schreiner, 2002) are used for depth of outreach.

Some limitations of using these outreach indicators have been identified in microfinance literature (for further detail, see Copestake, 2007; Gutierrez-Nieto et al., 2009; Quayes, 2012). We also develop our own breadth and depth indicators, that measure the extent to which MFIs focus on borrower numbers rather than amount borrowed, as described in detail in section 2.2. We expect that the breadth and depth of outreach are opposite to each other. For example, Vanroose & D’Espallier (2013) state that the depth of outreach is related to serving poorer clients and breadth of outreach is about reaching more borrowers (that might not be poor), so they are not working in same direction. More precisely, it can be said that breadth of outreach and financial sustainability objectives are supposed to work in the same direction of getting more material benefit to the institution, while the depth of outreach might behave differently from both of them by targeting the real poor, with a negative effect on financial performance. In other words, we might say

the depth of outreach is efficiency depriving, while the breadth of outreach is efficiency improving. The detail of this link in terms of financial ratios is elaborated in more detail in subsequent sections while comparing the performance of different types of MFIs in the context of social and financial performance.

### **2.3.1. Ownership Structure of MFIs**

The financial strength of an institution is usually measured by its profitability level, however, its impact on social performance could be negative as MFIs that aim for higher levels of profitability could be doing so by targeting the more profitable, rather than the poor populace (Yaron, 1994). The level of profitability of MFIs is expected to vary from one ownership structure to another. Levine (1997) describes the importance of different institutional forms, which financial systems can take in order to perform their underlying functions. The various ownership structures<sup>7</sup> of MFIs are non-government organizations (NGOs), shareholder firms (SHFs), microfinance banks, cooperatives (COOPs), and others such as rural support programs etc. Some MFIs may have the same type of ownership structure, but their organizational objectives may differ so we have categorised them as profit-oriented and non-profit-oriented MFIs.

Scholars debate which ownership structure is the most efficient in terms of operations. This can be seen in microfinance policy reports. Some favour profit-oriented MFIs by describing their strengths in comparison to non-profit-oriented MFIs, as the former have an advantage in accessing funds and, hence, could perform better. On the other hand, non-profit-oriented MFIs are considered as less professional and commercial because of their

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<sup>7</sup> NGOs are those organizations which are governed without any legal owner. SHFs are those that are limited by shares. These shares are held by non-profit or profit seeking investors which can be an individual or organization. COOPs are customer owned organizations like credit unions and savings and credit cooperatives.

lack of management and ownership structure (C-GAP, 2003; Hardy et al., 2003; Jansson, Rosales, & Westley, 2004).

Others argue that the varied ownership structure of organizations do not perform significantly differently from each other (Crespi-Cladera, Garcia-Cestona, & Salas, 2004; Mersland, 2009; Mersland & Strom, 2008). Overall, these studies found no significant difference in the performance of MFIs after analysing their ownership types. We expect that the profit-oriented MFIs perform better in financial objectives than the non-profit-oriented MFIs, who are expected to be better in social objectives. More specifically, we expect that non-profit-oriented MFIs should have more depth of outreach, less breadth of outreach and lower financial sustainability, while profit-oriented MFIs are expected to have better breadth of outreach, high financial sustainability and lower depth of outreach.

### **2.3.2. Regulatory Framework of MFIs**

The various ownership structures of MFIs have different regulatory frameworks that impact the performance of these institutions so, along with the ownership structure, the role of the regulatory framework must be considered for MFI performance assessment (Hardy et al., 2003). The importance of microfinance regulations has been recognized since their inception, as typical banking regulations are not appropriate for microfinance. However, until now, most of them have not been regulated because of the perceived cost (Cull, Demirguc-Kunt, & Morduch, 2011). Researchers look at the role of prudential regulations in order to ensure the sustainability of MFIs (Cull et al., 2011). Hudon (2010) suggests that regulated and larger MFIs tend to be better managed. Hardy et al. (2003) also study the impact of regulations on the performance of these institutions. They suggest

that there should be some form of tiered regulations for MFIs, like licensing to get a business started, monitoring the performance of the clients served and sources of funds. Some other studies, for example, Arun (2005) and Brau & Woller (2005), also favor the transformation of MFIs into regulated institutions.

On the other hand, Hartarska & Nadolnyak (2007) find that regulation affects neither the financial nor the social performance of MFIs, with Hartarska (2005) noting that non-regulated MFIs tend to be more efficient in social terms than the regulated ones. Based on the above, we empirically investigate regulated and non-regulated MFIs in the South Asian region. In this region, the retail landscape of microfinance is divided into categories of formal, semiformal and informal institutional types (Schicks, 2007). The basis for this categorization is the regulatory threshold of their activities. Cull et al. (2011) review outreach and profitability of regulated MFIs and find that profit focused MFIs can maintain their profit levels with regulations by reducing access to those customers such as women borrowers who are expensive to reach otherwise.

In another study, Cull & Spreng (2011) evaluate the impact of privatization of commercial banks on the efficiency of MFIs that compete against them. They find that the privatization of the commercial banks has a negligible impact on the outreach of MFIs with continuous but slow loan growth. In other words, they conclude that to cope with regulations, MFIs' outreach level should be reduced. The expected answer arising from this framework is that non-regulated MFIs should have higher depth, lower breadth and lower financial sustainability than regulated MFIs, who should have higher breadth and financial sustainability, and lower depth of outreach. Overall, we may say that non-

regulated MFIs are expected to perform better relative to social objectives and the regulated MFIs are expected to perform better relative to financial objectives.

### **2.3.3. Indian vs. other South Asian Countries MFIs**

MFIs have different internal and external regulatory frameworks. Internal frameworks refer to the regulatory status of these institutions and the latter framework refers to the regulations of the country in which they operate in. A better regulatory environment generally means better functioning institutions. In turn, these institutions contribute to the growth and stability of the country (Levine, 1997). The economic conditions of a particular country are also important for the success of the microfinance sector. Armendariz & Morduch (2010) also find that MFIs can provide effective financial intermediation under a well-functioning regulatory environment. Hubka & Zaidi (2005) suggest that local government should undertake regulatory reforms to improve the overall business environment and, in particular, to help market-based MFIs by controlling unfair competition from public institutions.

These arguments are backed by some studies like Crabb (2008), who describes the sustainability of MFIs and the way they are affected by the institutional and environmental-specific variables. He posits that the intervention of the banking industry and the government can reduce economic freedom in a country and result in less successful MFIs. He concludes that environmental variables are very useful factors in the success of MFIs. The exploration of the regulatory environments can cover capital requirements, taxation, risk management and interest rate regulations. On one hand high economic growth may result in the expansion or contraction of microfinance services,

and may increase profitable expansion opportunities and demand by microfinance clients. On the other hand, it may also raise household incomes to the level where they are able to take part in formal financial services.

Based on this evidence we assume that the social and financial performance of MFIs is conditional on different economies, types of ownership and regulations. Since MFIs are operating in different economies this cross country dissimilarity is examined by looking at the performance of MFIs in individual countries. For practical purposes, we categorise the data into Indian (51% of institutions in our sample are from India, a large economy), and from other South Asian countries (excluding India).

According to MIX market data, Indian MFIs compare favourably on efficiency parameters with MFIs in other South Asian countries. Bandyopadhyay & Shankar (2014) compare the performance of Indian MFIs before and after the 2010 Andhra Pradesh incident (referred to in Chapter 1), and find that MFIs' overall performance is improved. They further suggest that the effect of this incident on efficiency of Indian MFIs was temporary, and these institutions reconsider their strategies that improved their relative efficiency. Based on this literature, we expect that in the cross country comparison, institutions in India are expected to perform better in social and financial objectives than those in the other sample countries.

To evaluate the performance in different sub categories of MFIs, we use performance determinants from existing studies to cover commonly used variables in the literature. These performance determinants include institution-and country-specific indicators that are control variables in the present study. Among the institution-specific variables, we have age and the size of the MFIs. Age controls for the effect of experience and the

presumption is that older MFIs are performing better in achieving social and financial objectives than young institutions (Hermes et al., 2011; Mersland & Strom, 2010). Alternatively, we might argue that recently established MFIs are delivering better performance as they have the opportunity to learn from existing knowledge accumulated by longer established institutions. The second institution-specific variable is size, measured by total assets of the MFIs. Size of the MFIs allows us to test the hypothesis that large MFIs are more efficient in achieving both social and financial objectives, as they might benefit from economies of scale.

The country level control variables are those macroeconomic variables that are also considered as possible determinants of MFIs' performance; we use inflation and real GDP. Real GDP is used as a proxy to measure the size of an economy. We expect that real GDP will have a negative impact on performance relative to the social and financial objectives of MFIs, while inflation is expected to have a positive impact.

As basic control variables, we add three performance measurement ratios that are described by C-GAP (2003) to assess the performance of South Asian MFIs. Portfolio quality is measured with repayment risk highlighting the riskier part of the loan portfolio; the more that loans are overdue, the higher the chance of not being repaid (Morduch, 1999). PAR30 is expected to be positively related to social performance as a higher risk loan means higher social performance, and inversely related to financial sustainability as a higher risk means lower financial sustainability. In other words, more small loans with high transaction costs may indicate that the institution is doing a better job with social performance, while at the same time it is compromising on its financial sustainability objective.

Risk ratio informs us of a loan loss of an institution. Less ownership control indicates that non-profit-oriented MFIs lack some incentive to follow up defaulters and they are more inclined to accept the client's reasons for defaulting. Yet, for profit-oriented and regulated MFIs, there can sometimes be a trade-off between slightly increased loan loss and reduced operational costs. Nevertheless, we expect loan losses to be higher in non-profit-oriented and non-regulated MFIs than their counterparts.

Productivity or cost ratios show the rate at which an institution is generating revenues to cover its expenses, and we use operating expense ratio in this context. The microfinance literature views a high value of this ratio positively, in the sense that high costs for MFIs show that institutions are spending more to reach poorer clients, although they cause financial sustainability of the MFIs to be lower. It is expected that a high value of operating expense ratio might cause stronger social performance but compromise on their financial sustainability objective. Implicit in the policy recommendations is that the owners with pecuniary incentives are better able to induce efficient operations. Thus, we expect operational cost to be higher in non-profit-oriented and non-regulated MFIs than profit-oriented and regulated MFIs.

The capital ratio shows the capital structure of an institution (Ledgerwood, 1999). We expect that the higher the capital to assets ratio, the more financially sustainable will be an institution but the poorer its social performance. A high value for this ratio would indicate that relatively less lending is being done. A high value for the capital ratio is one reason that prevents formal financial institutions from providing credit services to the poor. Therefore, it might be said that if MFIs are achieving high capital ratios then they

are doing well on financial sustainability objectives but being less effective at helping the poor. So we expect that regulated and profit-oriented MFIs are better in getting more capital sources than non-regulated and non-profit-oriented MFIs.

The expected signs of variables in relation to financial and social objectives that are developed according to Hermes et al. (2011) are summarized in Table 2.1.

**Table 2.1: Expected signs for variables impacting financial and social performance**

|  | Social performance | Financial sustainability |
|--|--------------------|--------------------------|
| Year                                   | (+)                | (+)                      |
| Dummy of mature inst.                  | (+)                | (+)                      |
| Log of assets                          | (+)                | (+)                      |
| Log of real GDP                        | (-)                | (-)                      |
| Inflation                              | (-)                | (+)                      |
| Portfolio at risk greater than 30 days | (+)                | (-)                      |
| Operating expense ratio                | (+)                | (-)                      |
| Capital to assets ratio                | (-)                | (+)                      |

Note: ‘+’ sign shows the positive link and ‘-’ sign shows the negative link in the dual objective of MFIs and the performance measurement indicators.

#### 2.4. Efficiency of MFIs

This section briefly reviews the frontier estimation methods used in microfinance literature, focusing on the underlying concept of efficiency. Until recently, the efficiency issue was commonly examined using non-structural approaches like financial ratios but this conventional approach shifted towards non-parametric and parametric methods such as DEA and SFA. This section is divided in three sub-sections. Microfinance efficiency literature that uses these techniques is evaluated in sub sections 2.4.1 and 2.4.2 respectively, and then the importance of the link between governance, gender and

efficiency is elaborated, using existing literature along with the research question and related expected answer.

The performance of MFIs has been evaluated using different methods or techniques, among which financial ratios are recognized as a traditional approach to monitor the performance of financial institutions. Ratios are also simple to calculate if a producer is using a single input to produce a single output. However, in multiple input and output variables, they may be aggregated into a single efficiency score relative to a production frontier. Flückiger & Vassiliev (2007), Gutierrez-Nieto et al. (2009), Hermes et al. (2011) describe these parametric and non-parametric techniques as the best methodologies to measure dual objectives of MFIs simultaneously. DEA and SFA are mostly applied to the data at one point in time and provide measures of relative efficiency among firms. These techniques are also used to measure technical and efficiency change using panel data.

Efficiency is not a novel concept in the microfinance industry. However, studies evaluating efficiency of MFIs are relatively rare. Previous efficiency studies of MFIs may be categorised according to the technique used. Some microfinance efficiency studies use DEA approach only (Bassem, 2008; Gutierrez-Nieto et al., 2007; Hassan & Sanchez, 2009; Qayyum & Ahmed, 2006; Sedzro & Keita, 2009) while others use SFA technique only (Hassan & Tufte, 2001; Hermes et al., 2011; Servin, Lensink, & Berg, 2012). Some have combined both of these techniques (Annim, 2012; Bolli & Thi, 2012; Desrochers & Lamberte, 2003). The related literature is discussed in detail in subsequent sections.

### 2.4.1. Efficiency Studies using DEA

As described earlier, financial ratios are often used to define the performance criteria for MFIs in microfinance literature (Microrate, 2003; Piot-Lepetit & Nzongang, 2014; Schreiner, 2002). For example, the cost per client and operating expense ratios were suggested as a criteria for MFIs' performance evaluation (C-GAP, 2006; Rosenberg, 2009). We analyse the performance of MFIs by using some of these financial ratios, but as these accounting based ratios have some limitations<sup>8</sup>, we use some standard techniques that prevail in banking literature. However, measuring the efficiency of MFIs based on these ratios can produce distorted results unless they have been properly adjusted. These adjustments may include donation contribution to the income of the institution or subsidy adjustments that account for reduced costs (Manos & Yaron, 2009). More adjustments might include non-performing loans in order to compare MFIs on a consistent basis, adjustments for foreign exchange gains or losses, and inflation adjustments to recognize the loss in the real value of equity (C-GAP, 2003).

Despite the undeniable better accuracy of adjusted data, the estimates of financial ratios are not easy to make and data are seldom available. Moreover, ratios in isolation provide little help to identify benchmarking policies, and the effects of economies of scale and

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<sup>8</sup> Some authors like Sedzro & Keita (2009) and Gregoriou, Messier, & Sedzro (2005) etc. posit that ratios have a single numerator and denominator and this single dimension failed to capture the multi-dimensional nature of microfinance's production process (C-GAP, 2003) so they do not allow for trade-offs between input and output variables. Secondly, a comparison of ratios does not account for unobserved heterogeneity due to differences in demographic, ownership and regulatory status (Balkenhol, 2007). Thirdly, ratios assume the linearity of economies of scale so they do not account for the economies of scale while comparing the size of the institutions and hence are not able to pinpoint the optimal scale of an MFI (Worthington, 1998).

the estimation of overall performance measures of firms (Athanasopoulos, 1995). On the contrary, frontier methods have become a more sophisticated and powerful way of benchmarking the firms (Berger & Humphrey, 1997). SFA and DEA are the commonly used frontier techniques to measure the efficiency<sup>9</sup> of microfinance programs.

Financial institution efficiency has been studied since the 1980s and the literature still continues to grow. The efficiency of financial institutions is measured according to how they conduct their business. The assessment of the efficiency of MFIs, like other financial institutions, is based on a production function. A MFI is called efficient when neither any other MFI nor combination of MFIs provide a better productive bundle in the observed sample.

Significant variation in choosing the efficiency measurement indicators is present in the literature. For example, some microfinance efficiency studies use non-parametric techniques alone (Bassem, 2008; Qayyum & Ahmed, 2006; Sedzro & Keita, 2009), some use parametric approaches alone (Hassan & Tufte, 2001) and others combine them also (Bolli & Thi, 2012; Desrochers & Lamberte, 2003). We choose DEA because of some of its advantages as discussed in detail in section 4.3. DEA has become a popular method of investigating microfinance efficiency on the basis of region, country and institution. In addition to that, DEA studies also show considerable differences in the microfinance input and output variables.

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<sup>9</sup> For a detailed discussion about the strengths and weaknesses of both methods see Berger & Mester (1997) and Bauer, Berger, Ferrier, & Humphrey (1998).

The efficiency of MFIs is generally assessed according to the financial and social objectives of microfinance. Financial sustainability is measured using operational and financial indicators, while social objectives or outreach are measured using the number of loans outstanding and number of active borrowers. The trade-off between these dual objectives of MFIs is also examined widely in microfinance literature (Armendariz & Morduch, 2010; Cull et al., 2007).

Gutiérrez-Nieto et al. (2007; 2009) measure the financial and social efficiency of MFIs using DEA. In their 2007 study, they analyse the trade-off between financial and social objectives, but find only one MFI in their database that is socially efficient but financially inefficient. In order to meet both objectives simultaneously, they therefore suggest that along with social efficiency, MFIs need to be financially efficient. Flückiger & Vassiliev (2007) also measure the financial and social efficiency of MFIs using DEA, and argue for microfinance to focus more on financial efficiency as it is becoming more important than in the past. They also describe DEA as the best methodology to measure dual objectives of MFIs simultaneously.

Crawford, Skully, & Tripe (2014) examine the financial and social efficiency of Cambodian MFIs in an in-country rather than cross country level analysis, using panel data to discover how Cambodian MFIs are meeting their objectives over time. They find that larger MFIs achieve their social objectives while smaller institutions appear to meet financial objectives more effectively. They also find the trend of less social and more profitable efficiency over time and conclude that microfinance dual objectives are not mutually exclusive.

The key determinants of variations in microfinance efficiency cannot be clearly understood from looking only at these two objectives of financial sustainability and outreach. A clear understanding of the significant microfinance efficiency factors would provide guidelines for microfinance managers and policy makers, for improving the efficiency of MFIs and further help them to compare their peers with these benchmarks to improve their own operations.

Only a few studies have combined DEA efficiency scores with further statistical analysis to identify the significant determinants causing the variation in microfinance efficiency. For example, Leon (2001) uses DEA to study Peruvian municipal banks. She finds that governance, business environment and productivity of resources are contributing factors for the cost efficiency of their sample group. Nghiem, Coelli, & Rao (2006) use two stage analysis of the DEA model to assess the technical and scale efficiency (SE) of Vietnam's MFIs. An important finding is that age and location of the MFIs are important determinants of their efficiency.

Haq, Skully, & Pathan (2010) use DEA and Tobit models to measure the efficiency scores of 39 MFIs in all regions of the world. They find NGOs are more efficient in production approach and banks appear to be more efficient in the intermediation approach in fulfilling their dual objectives of alleviating poverty and achieving financial sustainability simultaneously. Nawaz (2010) also uses two stage DEA based Malmquist indices in his efficiency study on microfinance and analyses the role of subsidies in microfinance. His findings uphold the trade-off between outreach to the poor and financial efficiency of MFIs. Thus, those MFIs that cater to the poor tend to be less efficient than those with relatively well-off clients. He also concludes that lending to females is efficient only in

presence of subsidies. Hartarska, Shen, & Mersland (2013) note that expanding loan size is less costly than increasing customer numbers. Thus, the for-profit MFIs can focus on targeting higher net worth customers rather than providing small loans to poorer customers. They find that MFIs are moving away from being small NGOs to big institutions and hence reducing their costs, suggesting that economies of scale exist for MFIs.

We also perform two stage analysis; DEA efficiency scores and regression analysis. In the first stage, along with the conventional models of DEA we use SBM-super efficiency model (to identify the outliers in our database). In the second stage, we analyse the sampled MFIs' specific operating characteristics like ownership and regulatory structures that are likely impacts on the variations in microfinance efficiency. For possible key efficiency determinants, we chose governance indicators<sup>10</sup> suggested by Müller & Uhde (2013) and Barry & Tacneng (2014), Annim (2012) and Hermes et al. (2011) that are discussed in detail in section 2.4.3.

#### **2.4.2. Efficiency Studies using SFA**

In line with the literature on efficiency in banks, we estimate a stochastic cost frontier and measure output by the number of clients and financial revenues for social and financial efficiency, respectively. The microfinance literature using this technique has identified various links between firm performance and governance and ownership and regulatory structure of MFIs. Therefore, a brief review of the existing microfinance governance literature is used to identify the governance mechanisms relevant for MFIs, and to formulate and test empirical hypotheses.

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<sup>10</sup> We downloaded 6 governance indicators, but 4 are highly correlated with each other or with control variables so there are only two governance variables that we can use in our regression model.

A number of prior studies have used SFA to explore the relationship between efficiency measures and governance. Hartarska (2005) measures the impact of governance on outreach and sustainability of MFIs in Central and Eastern Europe and the newly independent states. She finds a trade-off between the MFI outreach and sustainability objectives, depending on stakeholders' representation on the board and also suggests that external governance mechanisms play a limited role. Hassan & Tufte (2001) examine the determinants of cost inefficiency of the Grameen Bank using branch-level cost data from 1988 to 1991. The average inefficiency score for the Grameen Bank runs from 3% to 6%. Female dominated branches are found to be more efficient than other types of branches. They suggest that allowing NGOs to operate side by side may increase the level of competition among them, and thus increase their operational efficiency. They also suggest that the government should invest in infrastructure development to help to reduce the transactions costs of microfinance banks and hence improve their operational efficiency.

Cull et al. (2007) use SFA to examine the microfinance promise of reducing poverty by employing profit-making banking practices in low-income communities. They find that although many MFIs manage to secure high repayment rate of loans, relatively few earn profits so far. They explore patterns of profitability, loan repayment, and cost reduction in 124 institutions in 49 countries. They suggest that although there is a possibility of earning profits while serving the poor, on the other hand, trade-offs can also emerge between these objectives.

Gregoire, Tuya & Ramirez (2008) analyse the efficiency of MFIs in Peru between 1999 and 2003 using SFA. They find that MFIs with the largest assets and those that are operating in less concentrated markets are more efficient. They suggest that cost efficiency of MFIs is affected by the institutions' net assets, average loan size, financial leverage, financial sufficiency, business experience and proportion of farm loans. Mersland & Strom (2009) examine the relationship between firm performance and corporate governance in MFIs using a self-constructed global dataset on MFIs. They suggest that financial performance improves with the presence of local directors, an internal board auditor, and a female CEO. They further suggest that there is no difference in performance between non-profit organizations and shareholder firms, and regulation also has no effect on efficiency of MFIs, but they posit the need for an industry specific approach to MFI governance.

Caudill et al. (2009) utilize data from Eastern Europe and Central Asian MFIs and find that generally the longer MFIs are in operation, the lower operating costs are. But this finding of cost effectiveness may not apply to all MFIs, given the differences in subsidies, organizational form and operating environments. The estimation of a pooled model reveals that roughly half the MFIs are able to operate with reduced costs over time, while half cannot. Among other things, they also suggest that the larger MFIs offering deposits and those receiving lower subsidies, operate more cost effectively over time.

Masood & Ahmad (2010) measure the efficiency levels and efficiency determinants of 40 Indian MFIs by applying SFA for the sample years of 2005 to 2008. They find that on average, the efficiency level of Indian MFIs improve over the period of study. They also find regulated MFIs to be less efficient and the age of MFIs to be a positive determinant of efficiency. Greater outreach is associated with high efficiency that ultimately negates

the general perception of trade-off between outreach and financial sustainability. Hermes et al. (2011) also use SFA to examine trade-off between outreach and financial sustainability of MFIs. They find that outreach is negatively related to the efficiency of MFIs; specifically those institutions that have a lower average of loan balances and more proportion of female borrowers, are also less efficient.

Oteng-Abayie, Amanor & Frimpong (2011) empirically investigate the economic efficiency of 135 MFIs in Ghana, using a Cobb-Douglas SFA for the period from 2007 to 2010. They investigate the assumption of possible economies of scale in lending, if firms improve strategies of mobilizing savings and provide good quality service to their clients. They find a high degree of inefficiency (56.29% economic efficiency on average) in the microfinance industry. They suggest that age, the cost per borrower and savings indicators are significant determinants of economic efficiency. They recommend that microfinance practitioners can help to improve the performance of MFIs by enhancing their technical training programmes, by operating diversified savings products to improve their portfolio quality, and by heightening the extent of social commitment to both staff and clients.

Servin, Lensink & Berg (2012) examine the technical efficiency of the different ownership types of MFIs operating in Latin America. In particular, they test whether the differences in technical efficiency, both inter-firm and intra-firm, can be explained by the differences in ownership. The results show that the NGOs and the financial cooperatives have much lower inter-firms and intra-firm technical efficiencies than other types of MFIs. These findings suggest that ownership type is another important indicator of MFIs efficiency. Hartarska & Mersland (2012) evaluate the effectiveness of several governance

mechanisms on MFI performance by capturing the cost minimization goals and the goals of serving many poor clients. They explore the impact of measurable governance mechanisms on individual efficiency coefficients, and find that efficiency increases with a board size of up to nine members, and decreases after that. They also suggest that the donors' presence on the board and CEO chairing the board is not beneficial, while the MFIs being regulated by an independent banking authority are more efficient.

Quayes (2012) investigates mission drift among subsidized MFIs utilizing data from 702 MFIs operating in 83 countries, and he finds empirical evidence of a positive complementary relationship between financial sustainability and depth of outreach. Abate, Borzaga & Getnet (2013) analyse the effect of an increasingly important efficiency requirement on the traditional social mission of microfinance using SFA on microfinance providers in Ethiopia. Furthermore, their study also addresses whether the way that ownership is organised and practised, affects the cost of microfinance delivery. They find that financial cooperatives are better at cost containment, compared with specialised MFIs owned by shareholders. The results indicate a trade-off between outreach to the poor and cost-efficiency, suggesting a difficulty in trying to achieve the two goals simultaneously.

Strøm, D'Espallier & Mersland (2014) investigate the relationships between female leadership, firm performance, and corporate governance in a global panel of 329 MFIs in 73 countries covering the years 1998–2008. They find female leadership to be significantly associated with larger boards, younger firms, a non-commercial legal status, and more female clientele. They also note that having female board members is positively related to MFIs' performance.

The findings of Cull et al. (2007), Hermes et al. (2011) and Quayes (2012) are largely based on those MFIs that are united by their strong commitments to achieving financial self-sufficiency, and voluntarily supplying data to organizations like MIX Market. On the other hand, our data, like Abate et al. (2013; 2014), encompass those MFIs that are committed to achieving either economic viability, or social visibility, or both.

### **2.4.3. Gender, Corporate Governance and Efficiency**

There are a handful of studies analysing the link of gender, corporate governance, and performance, in particular the efficiency of MFIs, and the findings of these studies are mixed. The microfinance business is to a large extent a woman's business as female borrowers are the MFIs' largest market, and lending to woman is considered one of the main reasons for microfinance's success (Armendariz & Morduch, 2010). But microfinance is not only a business 'for women,' it is to a large extent, also a business 'by women'. The female proportion of top executives and directors in MFIs is high. In our South Asian sample, the ratio of female board members (PFMs) is almost 33% of the total board, the percentage of female loan officers (PFOs) is 35% of the total loan officers, and about 83% of the total borrowers are women. These proportions are much higher than the corresponding figures in traditional firms. For instance, for their very large sample of U.S. companies, Adams & Ferreira (2009) report that only 8.8% of directors are female. We investigate what role gender and corporate governance play in financial and social performance in MFIs.

Unlike studies in high-income countries, for example, Smith, Smith & Verner (2006) often consider only the role of directors, we address these questions for the board

members. Our data tells us that the MFIs' median time in operation is eight years. In eight years, the weight of tradition has not settled in a firm, so that a masculine culture has not yet become ingrained, and the male network has not had time to become established. This creates opportunities for able women to rise in the MFIs' leadership hierarchy. The microfinance business is also typically a mission-driven organization (Randøy, Strøm, & Mersland, 2013). Thus, we are able to tell if the leadership's gender matters for governance, and performance in circumstances that are different from those usually studied.

Both Armendariz & Morduch (2010) and D'Espallier, Guérin, & Mersland (2011) deal with the microfinance customer aspect. Armendariz & Morduch (2010) argue that financial sustainability and female targeting are perfectly compatible, since due to higher repayment rates among female borrowers, female targeting has often been attributed to increased efficiency within microfinance. While D'Espallier et al. (2011) confirm that the targeting of women leads to higher repayment rates in MFIs. Strøm, D'Espallier, & Mersland (2014) investigate the role of female leadership on MFI's governance and financial performance.

In the general governance literature, only Adams & Ferreira (2009) address both the performance and governance issues related to female directors. They find that a positive effect of female directors on performance is only detectable for firms with weak governance structures, but also female directors are "tougher" monitors than men. Furthermore, Smith et al. (2006) and Francoeur, Labelle, & Sinclair-Desgagné (2008) investigate the relationships between financial performance and female directors on the

one hand, and a female CEO on the other; however, they do not look into corporate governance issues.

Mersland & Strøm (2009) find that the MFIs with female CEOs achieve higher financial performance due to their better understanding of the market in which the MFI operates. This argument implies that an MFI that is matched with a leadership of the same traits (referring here to gender), perform better. The underlying theory for this, is the Becker (1973) model for the marriage market. Thus, the expected finding is that female managers and directors will improve the MFI's performance due to the better match between the MFI's leadership team and its market conditions. Thomas and Ramaswamy (1996) also find that the matching of leaders with specific traits and the firm's strategies increases the firm performance.

Shrader, Blackburn, & Iles (1997) summarize this in an early investigation that women are more oriented toward supporting and maintaining relationships than men. Therefore, it is assumed that with more women, the managerial positions and organizational learning is improved. Moreover, besides Shrader et al. (1997), Smith et al. (2006) and Francoeur et al. (2008) also study the role of women as managers and directors in microfinance performance. They find that female managers improve the firm's performance, but that female directors are only weakly or negatively linked to its financial performance. Although their findings are contrary to others, for example, some studies find a positive relation like Carter, Simkins, & Simpson (2003), and Campbell & Minguez-Vera, (2008), while others detect a negative link like Shrader et al. (1997); Smith et al. (2006) and Adams & Ferreira (2009) between gender and performance.

Some important studies that analyse the impact of ownership and regulatory structures on microfinance performance are as follows. Mersland (2009) compare the cost of different ownership structures of MFIs, and conclude that the coexistence of ownership types is essential to best serve the customers. Kyereboah-Coleman & Osei (2008) examine the impact of governance on performance measures of outreach and profitability in MFIs, and find that governance plays a critical role in the performance of MFIs. Mersland & Strom (2009) examine the relationship between firm performance and corporate governance in MFIs. They find no difference between non-profit organisations and shareholder firms in financial performance and outreach, and also find no impact of regulations on performance of MFIs.

Hartarska & Nadolnyak (2007) find that regulatory involvement does not directly affect performance either in terms of operational self-sustainability or outreach. However, they also find some indirect benefits of regulations on those MFIs who collect savings as they appear to reach more borrowers after regulation is introduced. Cull, Demirguc-Kunt, & Morduch (2011) conclude that profit-oriented MFIs in trying to maintain the profit level curtail outreach to women and customers that are costly to reach, while MFIs with a weaker commercial focus instead tend to reduce profitability but maintain outreach.

Based on this literature as discussed in sections 2.4.1, 2.4.2 and 2.4.3, the 3<sup>rd</sup> RQ of the thesis arises that further address our research objectives. Third RQ is divided in two parts, firstly, how efficient MFIs operations in South Asian countries are, and what factors explain the variation in microfinance efficiency? Secondly, as suggested by Strøm et al. (2014) for future research, we want to explore whether governance and the involvement of women could be key determinants of MFIs' efficiency. These questions and their

expected answer are addressed below in detail along with explanation of some internal and external factors that might affect the MFIs' efficiency.

The relative efficiency of some of the sub-groups within our data set is different between countries and between institutions of different types. Although economic conditions in South Asia are similar, the different countries in which our MFIs operate might make their efficiency levels vary accordingly. For example, the population size in each country, the poverty rate, the microfinance regulations, the microfinance penetration and other similar differences matter a lot, making it important to analyse them separately. In particular, we investigate how MFIs manage the financial and administrative burdens of complying with the different environments. In this context, we expect that patterns and trends of MFIs' efficiency (scale and technical efficiency) vary, depending on the assumption of underlying returns to scale.

Governance indicators are mainly categorised as internal and external governance mechanisms in microfinance literature (Caudill et al., 2009; Hartarska & Nadolnyak, 2007). Internal mechanisms generally include ownership of an MFI, board composition and regulatory structures while external governance mechanisms include political stability and the control of corruption. The main difference between internal and external mechanisms is that the former is a matter of choice for an institution, while the latter are more or less determined by external factors: the market and the supervisory environment (Mersland, 2007).

Attention is paid not only to internal governance mechanisms, i.e. the ownership, regulatory structure, women board members, but also to external governance

mechanisms, i.e., political stability and the control of corruption. The non-profit-oriented MFIs such as NGOs and credit unions are mainly built on the social objectives of serving the poor, while the profit-oriented MFIs such as microfinance banks are working to serve both outreach and financial sustainability objectives. Because both types of profit-oriented and non-profit-oriented MFIs are working as MFIs, we expect that the profit-oriented MFIs should concentrate more on financial efficiency, and the non-profit-oriented MFIs concentrate more on social efficiency. We also expect that relative efficiency levels vary according to the different types of MFIs, and expect that internal governance to be positive efficiency determinants for MFIs.

External governance indicators include institutional quality variables. Several studies have emphasized the contribution of “institutions” in determining the level of a country’s economic development (Easterly & Levine, 2003; Rodrik, Subramanian, & Trebbi, 2004). Institutional failures that include bureaucracy and corruption explain why South Asia remains relatively poor. “Institutions” can be viewed as the cumulative outcome of past policy actions (Rodrik et al., 2004). In South Asia, the set of economic “institutions” have been heavily influenced by civil wars, economic crises and political instability in the past decades, which have contributed to the patterns of poor governance in these economies. Institutional quality can either aggravate or lessen uncertainties that arise from incomplete information by channelling information about market conditions, reduce risk related to property rights, and make politicians accountable to citizens (Bora et al., 2004). Strong institutional environments facilitate rule-based exchanges but weak institutional environments, due to dense social networks, favour relationship-based exchanges (Peng, 2003). So we expect internal and external governance to be positive efficiency determinants for MFIs.

Diversity in board composition in terms of gender is another issue that has attracted our attention. Along with that, we also use some other gender variables, PFOs and percentage of female borrowers (PFBs) in our regressions to see the overall impact of females on the efficiency level of MFIs. Many MFIs dealt with mainly women so we expect that females on boards, as officers and as clients will positively impact the financial and social efficiency level of MFIs.

As size (in terms of the total assets or loan size and age) of MFIs matters more for their efficiency levels, we use it as one of the control variables. The difference in size of the institution is linked directly to the difference in relative costs although the high transaction costs mean that the institution is reaching the very poor with small scale services that often entail charging high fees. In microfinance literature, most empirical studies have included size in their analysis, using loan size or total assets as a proxy, so we also want to see the impact of size on financial and social efficiency of MFIs. The second variable for size of MFIs is age, measured by adding a dummy variable for mature MFIs. Other macroeconomic variables such as real GDP (Cull & Spreng, 2011; Hudon & Traca, 2011) and inflation are also used as control variables.

## **2.5. Summary**

The research questions of the thesis are summarised as follows:

RQ 1: How well do the existing factors of performance explain the proxy variables/indicators of social performance of MFIs?

RQ2: Does performance for social and financial objectives of MFIs vary among different sub groups?

RQ3: What is the technical, scale and cost efficiency levels of South Asian MFIs and what factors explain the variation in microfinance efficiency? Are governance and gender variables included among the key determinants of MFIs' efficiency?



## 3. Data Description

“You can have data without information, but you cannot have information without data.”

Daniel Keys Moran

To answer the research questions from the previous chapter, we use different methodologies, and data is constructed according to the requirement of each methodology. This chapter provides the details of the data sample and data sources that are used according to the requirements of different methodologies. It starts with data description used in social performance evaluation, and then social and financial performance evaluation. The chapter outlines the data for both non-parametric and parametric efficiency techniques, one by one.

### 3.1. Social Performance Evaluation

An unbalanced panel data of 372 MFIs for the 16 years from 1998 to 2013 is used to answer the RQ 1. Both absolute values and financial ratios are used for measuring MFI performance. Annual data<sup>11</sup> is gathered from various sources; primary data on MFIs is downloaded from the MIX market<sup>12</sup>, and macroeconomic data from the World Bank

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<sup>11</sup> Country-specific indicators are often reported only once in a year so they are assumed to be constant over the whole period.

<sup>12</sup>The primary data is retrieved from MIX market during November/December 2012 and subsequently downloaded data for 2012 and 2013 in July 2014 from <http://www.mixmarket.org/>.

website<sup>13</sup>. The country level data is also downloaded from World Bank Development Indicators, including the common variables for financial development suggested in the finance and growth literature. Data related to financial statements and other relevant information is also gathered from MIX market. Given that MFI data is downloaded from MIX market, the definition of the variables are also utilized from MIX market information. The explanation of these variables are summarised in Table 3.1, descriptive statistics in Table 3.2 and correlation among variables is presented in Table 3.4.

Our dataset comprises MFIs operating in five countries of South Asian region (Bangladesh, India, Nepal, Pakistan and Sri Lanka)<sup>14</sup>. These MFIs include 22 banks (6%), 41 credit unions or cooperatives (11%), 87 (23%) non-bank financial institutions (NBFIs), 205 (55%) NGOs and 17 (05%) institutions categorised as ‘other’. Poverty is the common characteristic of countries in this region and the region has the lowest GDP per capita of the world. India is the largest economy of the region, followed by Bangladesh and Pakistan.

Table 3.2 shows the summary of the descriptive statistics for MFIs in our data sample. We report the sample mean, standard deviation, minimum and maximum values and skewness and kurtosis of explanatory variables. Skewness and kurtosis values show that the normality assumption doesn’t hold in the data, but we rely on asymptotic properties as our data size is big enough. Moreover, as we utilise data from different databases so the number of observation for these variables varies from each other.

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<sup>13</sup>See <http://data.worldbank.org/indicator>

<sup>14</sup> For more detail on economies profile, microfinance sector and MFIs regulations in South Asia region, see Appendix 1 and Appendix 2.

Table 3.1: Variable descriptions for social performance analysis

| Variable            | Name   | Calculated as   | Explanation  | Data source  |  |
|---------------------|--|---|--|--|--|
| Dependent variables | Number of active borrowers (NAB)                   | Total number of credit clients and borrowers at the end of each period        | Social performance indicator – breadth of outreach   | MIX market   |  |
|                     | Average loan balance per borrower/GNI (%) (ALBPBG) | Average loan balance per borrower is divided by gross national income         | Social performance indicator – depth of outreach   |  |  |
|                     | Percentage of female borrowers (%) (PFBs)          | Number of female borrowers divided by total clients                           | Social performance indicator – depth of outreach   |  |  |
|                     | Social performance                                 | Market share of borrowers (MSB)   | Number of active borrowers divided by total borrowers in each country  | Social performance indicator – new breadth of outreach indicator   | Own calculation based on MIX market data |
|                     |  | Market share of number of borrowers adjusted by market share of assets (MSBA) | Market share of borrowers divided by market share of assets  | Social performance indicator – new depth of outreach indicator   |  |
|                     | Institution Control                                | Dummy of mature institutions (DMATURE)  | Mature MFIs in data sample to know whether or not MFIs have been in operation for 8 years or more.   | DYOUNG (less than 8 years old) and DMATURE (equals to 8years or older) dummies are created for age and DYOUNG dummy is chosen as base dummy. | MIX market                               |
| Country Control     | Assets (LAST)                                      | Logarithmic value of total assets   | Proxy of size measure  | World development indicators   |  |
|                     | Real GDP (LREALGDP)                                | Logarithmic value of real GDP   | Proxy to measure the country size  |  |  |
|                     | Inflation (annual %) (INFL)                        | Inflation, consumer prices  | Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly.                   |  |  |
| Risk Ratio          | Portfolio at risk greater than 30 days (%) (PAR30) | Portfolio at risk greater than 30 days divided by gross loan portfolio        | This ratio gives a fraction of the loan portfolio at risk (behind schedule with payments) for more than thirty days. This is an early indicator of default problems, and perhaps more objectively measured in terms of timing than the loan loss expense rate. | MIX market   |  |
| Cost Ratio          | Operating expense ratio (%) (OER)                  | Operating expense divided by average gross loan portfolio                     | Cost per dollar loaned   |  |  |
| Capital Ratio       | Capital to assets ratio (%) (CAR)                  | Total equity divided by total assets  | Ratio of total equity to total assets  |  |  |

Notes: Definition and source of variables used in the analysis are explained as defined in their respective data sources.

Source: Authors' compilation

Table 3.2: Descriptive statistics for explanatory variables of social performance

| Variables                             | Mean       | Min.      | Max.          | Std.        | Skewness | Kurtosis | Observations |
|---------------------------------------|------------|-----------|---------------|-------------|----------|----------|--------------|
| Number of active borrowers            | 204,177    | 19,000    | 6,710,000     | 737,981     | 5.745    | 38.119   | 2,188        |
| Average loan balance per borrower GNI | 24.800%    | 0.000%    | 990.100%      | 0.537       | 9.948    | 128.339  | 2,176        |
| Percentage of female borrowers        | 86.800%    | 0.000%    | 145.400%      | 0.246       | -2.090   | 6.357    | 1,883        |
| Market share of borrowers             | 0.003      | 0.000     | 0.102         | 0.008       | 3.931    | 26.735   | 2,184        |
| Market share of borrowers adjusted    | 5.438      | 0.006     | 92.384        | 10.439      | 3.600    | 18.978   | 2,081        |
| Dummy of mature institutions          | 0.713      | 0.000     | 1.000         | 0.453       | -0.953   | 1.909    | 3,893        |
| Assets                                | 31,300,000 | 119,000   | 1,900,000,000 | 120,000,000 | 7.354    | 70.281   | 2,227        |
| Real GDP                              | 3,206.144  | 1293.454  | 9,425.737     | 1,467.419   | 0.684    | 3.424    | 5,952        |
| Inflation                             | 7.277%     | 2.007%    | 22.564%       | 3.378       | 1.079    | 6.182    | 5,952        |
| Portfolio at risk > 30 days           | 06.400%    | 0.000%    | 711.400%      | 0.225       | 19.751   | 521.076  | 1,904        |
| Operating expense ratio               | 20.100%    | 0.100%    | 888.000%      | 0.451       | 13.156   | 208.188  | 1,686        |
| Capital to asset ratio                | 22.000%    | -115.100% | 591.800%      | 0.276       | 2.697    | 34.751   | 2,209        |

Notes: Variables are defined in Table 3.1.

Table 3.3: Correlation among social performance variables

|          | LNAB      | ALBPBG    | PFBs      | MSB      | MSBA      | DMATURE   | LAST      | LREALGDP | INFL   | PAR30  | OER      | CAR |
|----------|-----------|-----------|-----------|----------|-----------|-----------|-----------|----------|--------|--------|----------|-----|
| LNAB     | 1         |           |           |          |           |           |           |          |        |        |          |     |
| ALBPBG   | -0.241*** | 1         |           |          |           |           |           |          |        |        |          |     |
| PFBs     | 0.075***  | -0.252*** | 1         |          |           |           |           |          |        |        |          |     |
| MSB      | 0.526***  | -0.035    | -0.136*** | 1        |           |           |           |          |        |        |          |     |
| MSBA     | -0.229*** | -0.004    | 0.027     | 0.067**  | 1         |           |           |          |        |        |          |     |
| DMATURE  | 0.176***  | 0.070**   | 0.055**   | 0.082*** | -0.013    | 1         |           |          |        |        |          |     |
| LAST     | 0.897***  | -0.051    | -0.070**  | 0.524*** | -0.306*** | 0.147***  | 1         |          |        |        |          |     |
| LREALGDP | 0.071**   | -0.201*** | -0.162*** | 0.084*** | -0.157*** | -0.152*** | 0.147***  | 1        |        |        |          |     |
| INFL     | 0.158***  | -0.013    | -0.108*** | 0.164*** | -0.017    | 0.035**   | 0.254***  | 0.359*** | 1      |        |          |     |
| PAR30    | 0.047**   | 0.018     | -0.051**  | 0.017    | -0.028    | 0.074***  | 0.073***  | 0.061**  | 0.034  | 1      |          |     |
| OER      | -0.246*** | 0.017     | -0.153*** | -0.062** | 0.011     | -0.167*** | -0.181*** | -0.006   | 0.005  | -0.007 | 1        |     |
| CAR      | -0.115*** | -0.039    | -0.177*** | -0.059** | -0.008    | -0.091*** | -0.147*** | 0.089*** | -0.009 | -0.011 | 0.095*** | 1   |

Note: \*\*\*, \*\* denote significance at the 1% and 5% levels respectively. Definitions of notations are as follows. LNAB is natural logarithm of number of active borrowers. ALBPBG is Average Loan Balance per Borrower divided by GNI. PFBs is the percentage of female borrowers. MSB is market share of borrowers. MSBA is market share of number of borrowers adjusted by market share of assets. DMATURE is the dummy indicator for mature institutions. LAST is the natural logarithm of total assets. LREALGDP is natural logarithm of real GDP and INFL is the inflation of each country that MFI is located in. PAR30 is portfolios at risk greater than 30 days, OER is operating expense ratio and CAR is capital to assets ratio, see Table 3.1.

According to Chakravarty and Pylypiv (2015), who studied a global sample of 947 MFIs from 2000 to 2010, MFIs around the world demonstrate a low PAR30, with a global average of 6.2%. South Asian MFIs also maintain similar portfolio quality, with an average of 6%. The average value of the operating expense of all MFIs reporting to MIX Market for 2006 was about 19%, similar to our average value of 20%. Only a few extremely efficient MFIs in our sample have an operating expense ratio below 10%.

According to Rosenberg (2009), very small loans are relatively more expensive to issue than the large ones, so this is the main reason for charging higher interest rates by MFIs than that of non-MFIs (such as banks); commercial banks making larger loans usually have a operating expense ratio well below 5%. Despite numerous poor people being able to generate positive returns from their investments, obviously not all are able to use borrowed money in such a productive way, and therefore, cannot afford loans at commercial rates from MFIs.

The average capital ratio of 22% shows that MFIs are much less leveraged, which is explained by the fact that it is more difficult to leverage the risky MFIs' loan portfolios (Conning, 1999). The capital ratios of MFIs are much higher than other financial institutions, especially banks, for which Barth, Noelle, Phumiwasana and Yago (2003) identify an average capital ratio of 12%, from a sample of banks from 47 countries. Similarly Demirguc-Kunt, Detragiache, and Merrouche (2013) study multicountry panel of banks from 2005 to 2008 that show an average capital ratio of 7 to 8%.

Correlations among variables are presented in Table 3.3. This correlation matrix is constructed for each set of data to identify the basic relationships between variables. To explore the potential for multi-collinearity we use a benchmark of 0.70 (Kennedy, 2008), which is only identified<sup>15</sup> in LNAB and LAST (0.897). But as LNAB is not the primary variable, we only include this variable for comparing it with our defined measures so we proceed our analysis. In addition to that, since panel data estimates give more data points, the multi-collinearity problem is reduced even further (Hsiao, 2003).

The correlation between the breadth of outreach measure and most explanatory variables is positive and significant; however, the correlation between the depth of outreach measure and most explanatory variables is negative and significant. Most of the correlations are less than 50%. For instance, MSBA (a depth of outreach measure) is negatively linked with most of the explanatory variables. Also, LNAB (the natural logarithm of active borrowers, a breadth of outreach indicator) and MSB (breadth of outreach measure) are significantly (in most cases) positively correlated with all regressors except OER and CAR. Regression analysis allows us to investigate the strength of these correlations.

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<sup>15</sup> The correlation problem occurs when correlation among indicators are strong enough that simultaneously including them in the same regression model may create misleading results. For example, we used log real GDP and human development index (which is a composite country index covering education, life expectancy and income-HDI) as institution-specific variable but the correlation between them appears as high at 84 per cent; therefore, after thorough check, HDI was excluded from the model.

### 3.2. Social and Financial Objectives Trade-off

To answer the second RQ of trade-off analysis of financial and social performance in different types of MFIs, we use the same data sample as described in section 3.1 of the unbalanced panel data of 372 cross sections (MFIs) for 16 years from 1998 to 2013 but here we use some more variables that are described in Table 3.4. The descriptive statistics of these variables is presented in Table 3.5 and Table 3.6 shows the correlation among these variables.

As our datasets comprise different types of MFIs such as NGOs, NBFIs, banks, credit unions, we split the data into two categories of non-profit-oriented institutions and profit-oriented institutions<sup>16</sup>. Non-profit-oriented institutions are 71% (263 MFIs) and 29% (109 MFIs) of the whole sample are profit-oriented institutions. We alternatively categorize the data as 63% regulated institutions (236 MFIs) and 37% non-regulated institutions (136 MFIs). When we look at the macro level differences among MFIs, we see that 50% (187 MFIs) of our data sample are from India and 50% (185 MFIs) from other sample countries. The number of MFIs operating in Bangladesh represents 21%, while Nepal, Pakistan and Sri Lanka represent 13%, 8% and 7% respectively of our data sample. The numbers of MFIs in each category in the sample countries are presented in Figure 1.

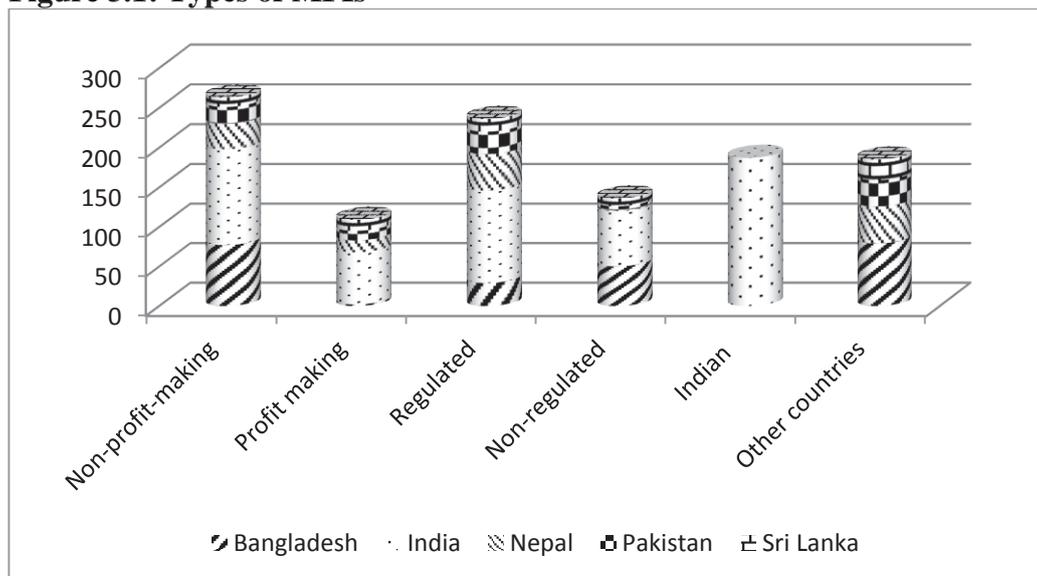
Table 3.5 shows the summary of some of the descriptive statistics for the whole sample and sub-groups of MFIs. We report the sample means and standard deviations of explanatory variables of pooled data and by organizational form (profit-oriented versus

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<sup>16</sup> Non-profit-oriented MFIs include NGOs, credit unions and other institutions and the category of profit-oriented MFIs include banks, rural banks and NBFIs.

non-profit-oriented; regulated versus non-regulated and Indian versus other sample countries). The summary statistics comparison shows significant variations in all these sub-groups, while an ANOVA F-test gives the significance level of the differences between the group means. These findings are discussed in more detail in section 5.2.

**Figure 3.1: Types of MFIs**



Source: Authors' calculations, based on data collected from MIX market on August 2014. Figure 1 graphs the proportion of different types of MFIs in each sample country and x-axis shows number of MFIs.

The correlations between variables are presented in Table 3.6. This correlation matrix is constructed to identify the basic relationship among all variables and to explore the potential of multi-collinearity. Using a benchmark of 0.70 (Kennedy, 2008), no multi-collinearity problem is identified.

Table 3.4: Variable descriptions for social and financial performance analysis

| Variable            | Name  | Calculated as  | Explanation  | Data source                  |
|---------------------|---|--|--|------------------------------|
| Dependent variables | Market share of borrowers (MSB)   | Number of active borrowers divided by total borrowers in each country                              | New defined social performance indicator   | MIX market                   |
|                     | Market share of number of borrowers adjusted by market share of assets (MSBA) | Market share of borrowers divided by market share of assets  | New defined social performance indicator   |                              |
| Institution Control | Operational self-sufficiency (%) (OSS)  | Financial revenue divided by (financial expense + impairment loss + operating expense)             | It measures how well MFI can cover its operating cost through its operating revenues.  | MIX market                   |
|                     | Dummy of mature institutions (DMATURE)  | Mature MFIs in data sample to know whether or not MFIs have been in operation for 8 years or more. | Dummy of young (less than 8 years old) and dummy of mature (equals to or greater than 8years old) dummies are created for age and dummy of young is chosen as base dummy.  |                              |
| Country Control     | Assets (LAST)   | Logarithmic value of total assets  | Total assets used as proxy of size measure   | World development indicators |
|                     | RealGDP (LREALGDP)  | Logarithmic value of real GDP  | Proxy to measure the country size.   |                              |
| Risk Ratio          | Inflation (annual %) (INFL)   | Inflation, consumer prices   | Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly.                   | MIX market                   |
|                     | Portfolio at risk greater than 30 days (PAR30)                                | Portfolio at risk greater than 30 days divided by gross loan portfolio                             | This ratio gives a fraction of the loan portfolio at risk (behind schedule with payments) for more than thirty days. This is an early indicator of default problems, and perhaps more objectively measured in terms of timing than the loan loss expense rate. |                              |
| Cost Ratio          | Operating expense ratio (%) (OER)   | Operating expense divided by average gross loan portfolio  | Cost per dollar loaned   | MIX market                   |
| Capital Ratio       | Capital to assets ratio (%) (CAR)   | Total equity divided by total assets   | Ratio of total equity to total assets  |                              |

Notes: Definition and source of variables used in the analysis are explained as defined in their respective data sources.

**Table 3.5: Descriptive statistics for explanatory variables for financial and social performance analysis**

|                                | All data<br>(N = 372) |        | Regulated<br>(N = 236) |         | Non-regulated<br>(N = 136) |         | F-test |       | Profit-oriented<br>(N = 109) |        | Non-profit-oriented<br>(N = 263) |        | F-test |          | Indian<br>(N = 187) |       | Other countries<br>(N = 185) |       | F-test   |       |
|--------------------------------|-----------------------|--------|------------------------|---------|----------------------------|---------|--------|-------|------------------------------|--------|----------------------------------|--------|--------|----------|---------------------|-------|------------------------------|-------|----------|-------|
|                                | Mean                  | Std.   | Mean                   | Std.    | Mean                       | Std.    | Mean   | Std.  | P-values                     | Mean   | Std.                             | Mean   | Std.   | P-values | Mean                | Std.  | Mean                         | Std.  | P-values |       |
| MSB                            | 0.003                 | 0.008  | 0.004                  | 0.008   | 0.003                      | 0.008   | 0.0024 | 0.024 | 0.006                        | 0.010  | 0.002                            | 0.006  | 0.000  | 0.000    | 0.002               | 0.006 | 0.005                        | 0.009 | 0.000    | 0.000 |
| MSBA                           | 5.438                 | 10.439 | 6.586                  | 11.966  | 3.273                      | 6.114   | 0.000  | 0.000 | 5.977                        | 10.687 | 5.161                            | 10.302 | 0.002  | 0.002    | 1.889               | 5.048 | 8.513                        | 0.689 | 0.000    | 0.000 |
| OSS                            | 1.112                 | 0.506  | 1.093                  | 0.523   | 1.147                      | 0.470   | 0.004  | 0.004 | 1.052                        | 0.422  | 1.142                            | 0.541  | 0.003  | 0.003    | 1.073               | 0.429 | 1.142                        | 0.557 | 0.087    | 0.087 |
| DMATURE                        | 0.713                 | 0.665  | 0.788                  | 0.409   | 0.472                      | 0.453   | 0.000  | 0.000 | 0.563                        | 0.496  | 0.770                            | 0.421  | 0.000  | 0.000    | 0.639               | 0.481 | 0.779                        | 0.415 | 0.000    | 0.000 |
| Assets (\$m)                   | 31.000                | 28.000 | 36.000                 | 165.000 | 88.000                     | 120.000 | 0.004  | 0.004 | 53.2                         | 167    | 20.3                             | 85.8   | 0.000  | 0.000    | 29.1                | 93.4  | 33.2                         | 139   | 0.933    | 0.933 |
| Real GDP                       | 3206                  | 3246   | 3136                   | 1503    | 1444                       | 1467    | 0.000  | 0.000 | 3706                         | 1528   | 2998                             | 1389   | 0.000  | 0.000    | 3611                | 941   | 2796                         | 1760  | 0.000    | 0.000 |
| Inflation                      | 7.277                 | 7.354  | 7.145                  | 3.219   | 3.464                      | 3.378   | 0.100  | 0.100 | 7.541                        | 3.650  | 7.168                            | 3.252  | 0.001  | 0.001    | 7.164               | 3.219 | 7.392                        | 3.527 | 0.040    | 0.040 |
| Portfolio at risk<br>> 30 days | 0.064                 | 0.070  | 0.053                  | 0.124   | 0.262                      | 0.225   | 0.160  | 0.160 | 0.092                        | 0.349  | 0.050                            | 0.113  | 0.000  | 0.000    | 0.065               | 0.311 | 0.064                        | 0.111 | 0.290    | 0.290 |
| Operating<br>expense ratio     | 0.201                 | 0.223  | 0.157                  | 0.242   | 0.524                      | 0.451   | 0.001  | 0.001 | 0.212                        | 0.388  | 0.196                            | 0.481  | 0.061  | 0.061    | 0.184               | 0.398 | 0.214                        | 0.487 | 0.001    | 0.001 |
| Capital to asset<br>ratio      | 0.220                 | 0.241  | 0.180                  | 0.190   | 0.310                      | 0.276   | 0.000  | 0.000 | 0.219                        | 0.218  | 0.204                            | 0.283  | 0.000  | 0.000    | 0.213               | 0.234 | 0.226                        | 0.308 | 0.646    | 0.646 |

Note: ANOVA-F-test shows the level of significance of the differences in mean values for each sub-group. The test was performed to test the null hypotheses that there was no significant difference between regulated vs. non-regulated MFIs and profit-oriented vs. non-profit-oriented MFIs and Indian and other South Asian countries. MSB is market share of borrowers, MSBA is market share of borrowers adjusted and OSS is operational self-sufficiency.

Table 3.6: Correlation among explanatory variables for financial and social performance analysis

| Correlation | MSB      | MSBA      | OSS       | DMATURE   | LAST      | LREALGDP | INFL    | PAR30  | OER      | CAR |
|-------------|----------|-----------|-----------|-----------|-----------|----------|---------|--------|----------|-----|
| MSB         | 1        |           |           |           |           |          |         |        |          |     |
| MSBA        | 0.089**  | 1         |           |           |           |          |         |        |          |     |
| OSS         | 0.084**  | 0.057     | 1         |           |           |          |         |        |          |     |
| DMATURE     | 0.065    | 0.016     | 0.114**   | 1         |           |          |         |        |          |     |
| LAST        | 0.568*** | -0.329*** | 0.094**   | 0.128***  | 1         |          |         |        |          |     |
| LREALGDP    | 0.072*   | -0.240*** | -0.133*** | -0.310*** | 0.129***  | 1        |         |        |          |     |
| INFL        | 0.138*** | 0.085*    | -0.085*   | -0.080*   | 0.149***  | 0.334*** | 1       |        |          |     |
| PAR30       | 0.044    | -0.065    | -0.116*** | 0.118***  | 0.120***  | 0.037    | 0.092** | 1      |          |     |
| OER         | -0.064   | -0.023    | -0.259*** | -0.185*** | -0.172*** | 0.023    | 0.029   | -0.006 | 1        |     |
| CAR         | -0.031   | -0.109**  | 0.027     | -0.108**  | -0.051    | 0.153*** | 0.043   | -0.008 | 0.167*** | 1   |

Note: \*\*\*, \*\*, \* denote significance at the 1%, 5% and 10% levels respectively. Definitions of notations are as follows: MSB is market share of borrowers, MSBA is market share of borrowers adjusted by market share of assets, OSS is operational self-sufficiency, DMATURE is the dummy indicator for mature institutions, LAST is the natural logarithm of total assets, LREALGDP is natural logarithm of real GDP and INFL is the inflation of each country that MFI is located on, PAR30 is portfolio at risk greater than 30 days, OER is operating expense ratio and CAR is capital to assets ratio.

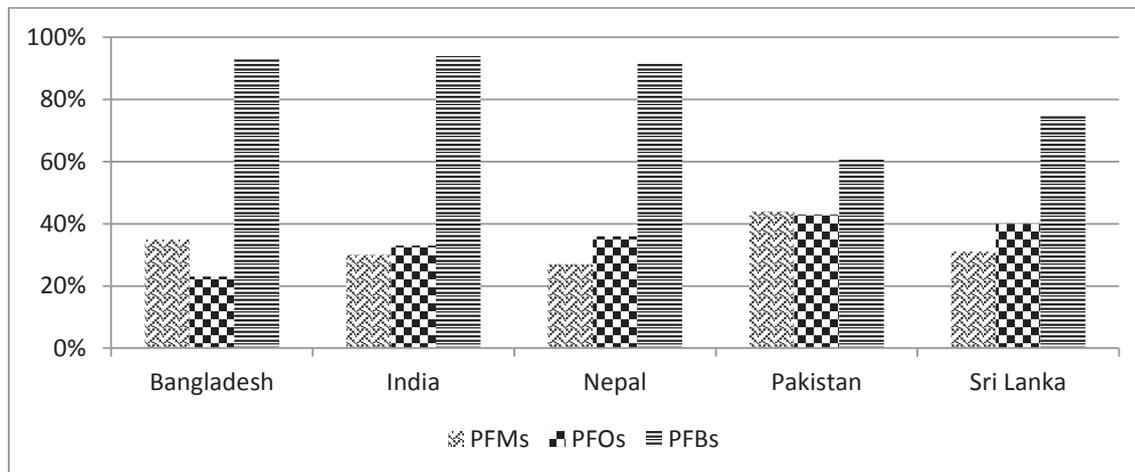
### 3.3. Efficiency Analysis Data – Using DEA

In order to perform efficiency analysis (to answer the RQ 3) using DEA, we perform two stage analysis; calculating DEA efficiency scores and then applying regression analysis. The variables are explained in Table 3.7. The descriptive statistics is presented in Table 3.8 and correlation among variables is presented in Table 3.9. In the first stage, as suggested in Dyson et al. (2001) that balanced panel dataset allows to identify changes between years so we use balanced panel data and restrict to non-missing observations only: As a result, our data sample is reduced to 101 MFIs from 2005 to 2012 and so it is used for the second stage analysis too but here we use unbalanced panel data for the period of eight years<sup>17</sup> from 2005 to 2012.

Overall, the distributions of observations of MFIs between the sample countries are as follows: 35% from India, 27% from Bangladesh, 18% from Nepal, 14% from Pakistan and only 6% from Sri Lanka. These MFIs include banks, credit unions or cooperatives, NBFIs, NGOs and other institutions. We split them into two categories of non-profit-oriented institutions and profit-oriented institutions, comprising 65% and 35% of the whole sample respectively. Furthermore, in our dataset 64% MFIs are regulated and 36% are non-regulated. The proportion of PFMs (percentage of female board members), PFOs (percentage of female loan officers) and PFBs (percentage of female borrowers) in each sample countries are presented in Figure 3.2. We use the same data sources (MIX market and World Bank indicators) as are described in detail in section 3.1. Data on governance indicators is also downloaded from the database of the World Bank.

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<sup>17</sup> The data after 2012 was missing for the governance variables that were not yet available at time of writing.

**Figure 3.2: Proportion of female ratio in MFIs of each sample country**

Note: Percentage values of female board members (PFMs), female loan officers (PFOs) and female borrowers (PFBs) are drawn against each sample countries.

Table 3.8 provides the summary statistics of variables used in first and second stage analysis. Although we use input and output variables from microfinance literature, we use the raw values of these variables (absolute value instead of relative value). It can be seen from maximum and minimum values of these variables that there is a lot of variation between these observations (see Table 3.8). For example, the size of MFIs in South Asia can be interpreted by two variables i.e. the number of personnel and the number of active borrowers. The minimum numbers of personnel working in MFIs are 4 with the average number of 1,479 and the minimum numbers of active borrowers are 58 with average number of 343,747. The minimum and maximum values of our indicators suggest a wide range for each variable and prompt the use of robust regression methods as a check on robustness to outliers. Table 3.9 reports the correlation coefficient between DEA input and output variables. This identifies the basic relationships among all variables and explores potential multi-collinearity, which is not identified.

**Table 3.7: Definition of input and output variables for efficiency evaluation using DEA**

| Specification                                       | Indicators  | Definition  | Data Source |
|---|---|---|-------------|
| <b>First-stage DEA models</b>                       |   |   |             |
| Input variables for financial and social efficiency | Personnel   | Number of employees actively employed by the MFI. This includes contract employees, advisors who dedicate most of their time to the microfinance even they are not on the MFIs' rosters of employees.   | MIX Market  |
|   | Operating expenses                                  | Administrative expenses excluding interest expense.   |             |
|   | Financial expenses                                  | These expenses continue to be classified by associated liability, but are also broken down by type of expense (interest, fee) for each associated financial liability.  |             |
|   | Number of active borrowers                          | The numbers of individuals or entities who currently have an outstanding loan balance with the MFI or are primarily responsible for repaying any portion of the Loan Portfolio, Gross. Individuals who have multiple loans with an MFI should be counted as a single borrower.                                    |             |
|   | Female borrowers                                    | Number of active borrowers among number of active borrowers   |             |
| Output variable for financial and social efficiency | Gross loan portfolios                               | All outstanding principal for all outstanding client loans including delinquent, new and restructured loans. But this stream does not include the written off loans and it also excludes the interest receivable and employee loans.  |             |
|   | Financial revenues                                  | Revenues from the loan portfolio and from other financial assets are broken out separately and by type of income (interest, fee).   |             |
| Output variables for financial efficiency           | Interest revenue                                    | Interest fee on loan portfolio  |             |
| <b>Second-stage explanatory variables</b>           |   |   |             |
| Institution-specific variables                      | Dummy of mature MFIs (DMATURE)                      | Dummy of mature takes the value of one when the age of MFIs is equal or greater than 8 years old and zero otherwise.  |             |
|   | Size of institutions (LAST)                         | Logarithmic values of total assets  |             |
|   | Risk coverage ratio (%) (RSKC)                      | Impairment loss allowance divided by portfolios at risk greater than 30 days.   |             |
|   | Portfolios at risk greater than 30 days (%) (PAR30) | The value of all loans outstanding that have one or more instalments of principal past due more than 30 days. This includes the entire unpaid principal balance, including both the past due and future instalments, but not accrued interest. It also includes loans that have been restructured or rescheduled. |             |

|  |   |   |            |
|--|---|---|------------|
| Country-specific/environmental variables | Real GDP (LREALGDP)   | Logarithmic value of real GDP that is used as a proxy to measure the size of an economy.  | World Bank |
|  | Inflation, consumer prices (annual %) (INFL)                                  | Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly.  |            |
| Governance indicators                    | Internal indicator: Percentage of female board members (%) (PFMs)             | Number of women board members divided by total board members.   | MIX Market |
|  | Internal indicator: Dummy of non-profit-oriented MFIs                         | This is a dummy variable that is equal to one if the MFI is a non-profit-oriented institution and zero otherwise  |            |
|  | Internal indicator: Dummy of regulated  | This is a dummy variable that is equal to one if the MFI is listed as regulated institution and zero otherwise  |            |
|  | External indicator: Political stability and absence of violence and terrorism | Reflects perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism. Estimate of governance ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance.                      | World Bank |
|  | External indicator: Control of corruption                                     | Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. Estimate of governance (ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance). |            |
|  | Percentage of female loan officers (%) (PFOs)                                 | Number of women loan officers divided by total loan officers  |            |
| Gender variables                         | Percentage of female borrowers (%) (PFBs)                                     | Number of women active borrowers divided by number of active borrowers  | MIX Market |

Notes: Variables are explained as defined in their respective data sources.

Table 3.8: Descriptive statistics for efficiency evaluation using DEA

| Variable  | Mean       | Min.   | Max.          | Std.        | Skewness | Kurtosis |
|---|------------|--------|---------------|-------------|----------|----------|
| <b>First stage DEA model input variables</b>          |            |        |               |             |          |          |
| Personnel   | 1,479,671  | 4,000  | 34,841,000    | 4,053,470   | 4.425    | 22.613   |
| Operating expenses                                    | 4,778,091  | 2,256  | 117,256,574   | 13,669,223  | 4.529    | 24.523   |
| Financial expenses                                    | 3,893,606  | 1,084  | 157,735,748   | 14,174,387  | 6.927    | 64.124   |
| <b>First stage DEA model output variables</b>         |            |        |               |             |          |          |
| Gross loan portfolio                                  | 42,556,877 | 8,786  | 1,007,989,551 | 12,748,1444 | 4.505    | 23.819   |
| Financial revenue                                     | 11,105,578 | 3,552  | 322,123,003   | 35,066,484  | 4.376    | 21.749   |
| Number of active borrowers                            | 334,747    | 58,000 | 6,710,000     | 1,036,423   | 4.878    | 27.421   |
| Interest fee  | 5,501,514  | 3,378  | 150,172,100   | 17,135,417  | 4.425    | 22.613   |
| Female borrowers                                      | 306,422    | 58,000 | 6,457,033     | 964,020     | 4.657    | 24.568   |
| <b>Second stage explanatory variables</b>             |            |        |               |             |          |          |
| Dummy of mature MFIs                                  | 0.860      | 0.000  | 1.000         | 0.347       | -2.530   | 7.399    |
| Dummy of Regulated MFIs                               | 0.356      | 0.000  | 1.000         | 0.479       | -0.560   | 1.313    |
| Dummy of non-profit-oriented MFIs                     | 0.653      | 0.000  | 1.000         | 0.476       | -0.860   | 1.740    |
| Assets (\$m)  | 57.900     | 0.037  | 1,090,000     | 179,000     | 4.239    | 21.400   |
| Real GDP  | 3,403      | 1,667  | 8,855         | 1,550       | 0.627    | 2.742    |
| Inflation   | 8.830      | 3.465  | 22.564        | 3.084       | 1.459    | 7.708    |
| Political stability and absence of violence/terrorism | -1.540     | -2.812 | -0.695        | 0.471       | -1.634   | 5.272    |
| Control of corruption                                 | -0.727     | -1.423 | -0.098        | 0.320       | -0.031   | 2.085    |
| Percentage of female board members                    | 0.328      | 0.067  | 1.000         | 0.193       | 1.347    | 4.822    |
| Percentage of female loan officers                    | 0.315      | 0.005  | 1.000         | 0.279       | 1.185    | 3.310    |
| Percentage of female borrowers                        | 0.881      | 0.026  | 1.000         | 0.218       | -1.864   | 5.340    |
| Portfolios at risk greater than 30 days               | 0.055      | 0.001  | 0.928         | 0.101       | 5.636    | 43.595   |
| Portfolios at risk greater than 90 days               | 0.069      | 0.001  | 0.969         | 0.115       | 4.580    | 29.723   |
| Risk coverage ratio                                   | 0.069      | 0.001  | 0.969         | 0.115       | 4.580    | 29.723   |

Note: Variables are defined in Table 3.7

**Table 3.9: Correlation among second stage variables relative to DEA analysis**

|         | FCCI    | SCCO    | DMATURE | LAST    | LGDP     | INFL   | REG       | NBFI   | CORCNT  | STAB   | PFMA   | PFOA   | PFBS    | PARR30  | PARR90 | RISK |
|---------|---------|---------|---------|---------|----------|--------|-----------|--------|---------|--------|--------|--------|---------|---------|--------|------|
| FCCI    | 1       |         |         |         |          |        |           |        |         |        |        |        |         |         |        |      |
| SCCO    | 0.353   | 1       |         |         |          |        |           |        |         |        |        |        |         |         |        |      |
| DMATURE | -0.065  | -0.132  | 1       |         |          |        |           |        |         |        |        |        |         |         |        |      |
| LAST    | -0.190  | -0.083  | 0.088   | 1       |          |        |           |        |         |        |        |        |         |         |        |      |
| LGDP    | -0.049  | 0.019*  | -0.041  | -0.030  | 1        |        |           |        |         |        |        |        |         |         |        |      |
| INFL    | -0.005  | -0.035  | 0.045   | 0.006   | 0.320    | 1      |           |        |         |        |        |        |         |         |        |      |
| REG     | 0.020** | 0.052*  | -0.104  | -0.079  | -0.171   | 0.076  | 1         |        |         |        |        |        |         |         |        |      |
| NBFI    | 0.133   | -0.049  | 0.258   | -0.127  | -0.187   | -0.048 | -0.373    | 1      |         |        |        |        |         |         |        |      |
| CORCNT  | -0.129  | 0.040   | -0.198  | -0.091  | 0.586*** | -0.001 | -0.083**  | -0.313 | 1       |        |        |        |         |         |        |      |
| STAB    | -0.157  | -0.011  | 0.001   | 0.081   | 0.178**  | -0.418 | -0.309*** | -0.011 | 0.482   | 1      |        |        |         |         |        |      |
| PFMA    | 0.092   | 0.010** | 0.069   | 0.018   | -0.009   | 0.047  | -0.048    | 0.185  | -0.122  | -0.135 | 1      |        |         |         |        |      |
| PFOA    | 0.001** | -0.033  | 0.003*  | -0.120  | 0.189    | 0.113  | 0.034     | -0.002 | 0.136** | -0.099 | 0.055  | 1      |         |         |        |      |
| PFBS    | 0.081   | 0.029   | 0.030   | 0.038** | -0.189   | -0.205 | -0.214    | 0.088  | 0.055   | 0.332* | 0.042* | -0.009 | 1       |         |        |      |
| PARR30  | 0.006*  | 0.010*  | 0.050   | -0.006  | 0.083**  | 0.020  | 0.040***  | -0.090 | 0.026*  | 0.018  | -0.029 | 0.004* | 0.000   | 1       |        |      |
| PARR90  | 0.119*  | -0.003  | 0.096*  | 0.073   | 0.022    | 0.022  | 0.029     | -0.099 | -0.047  | -0.029 | 0.052* | -0.010 | 0.022** | 0.419*  | 1      |      |
| RISK    | 0.028   | -0.006  | -0.025  | -0.037  | 0.010    | -0.016 | -0.044    | 0.066  | 0.007   | -0.048 | 0.025  | -0.053 | 0.108*  | -0.047* | -0.048 | 1    |

Note: \*\*\*, \*\*, \* denote significance at the 1%, 5% and 10% levels respectively. Correlations among second stage variables are presented. FCCI and SCCO are dependent variables of financial and social efficiency scores. FCCI is financial efficiency scores that is calculated using variable returns to scale and input oriented model and SCCO is social efficiency scores that is calculated using variable returns to scale and output oriented model. DMATURE is the dummy indicator for mature institutions, LAST = logarithm of assets, LGDP = logarithm of real GDP, INFL = inflation, REG = regulated MFIs, NBFI = non-profit-oriented MFIs, CORCNT = corruption control, STAB = political stability, PFMA = Average value of percentage of female board members, PFOA = Average value of percentage female loan officers, PFBS = percentage of female borrowers, see Table 3.7 for detail

### 3.4. Efficiency Analysis Data – Using SFA

The same data sources of MIX market and World Bank development indicators are used as explained in detail in section 3.1 to answer the RQ3. As SFA is different methodology the variables used here are different from the DEA approach described in section 3.3. The variables used in SFA efficiency approach are shown in Table 3.10, their descriptive statistics are presented in Table 3.11 and the correlations among variables in Table 3.12.

We have unbalanced panel data for 392 MFIs for 16 years from 1998 to 2013 but only small numbers of observations are found in earlier years. When we run the model, it therefore reduces to eleven years for 2003 to 2013. The distribution of observations in the sample countries is 51% of MFIs from India, 21% from Bangladesh, 12% from Nepal, 9% from Pakistan and only 7% from Sri Lanka. We split different types of MFIs into two categories of non-profit-oriented institutions and profit-oriented institutions and they are 72% and 28% of our sample respectively; 66% are regulated MFIs and 34% are non-regulated MFIs in our sample.

Table 3.10 provides the descriptive statistics for the variables used. The average values of female data show that South Asian MFIs have higher proportion of PFBs (83%) in comparison to PFMs and PFOs (33% and 29% respectively). The external governance indicator shows the weak political stability of South Asian countries (with negative mean values), lower real GDP level (3,467 USD on average) and high inflation rate (8% on average). Seventy six percent of our sample institutions are mature, defined as operating for 8 years or more. Table 3.11 provides the correlation coefficient between variables. This correlation matrix is constructed for each set of data to identify the basic

relationships among all variables and to explore the potential for multi-collinearity, which is not identified.

Table 3.10: Variables explanation for efficiency evaluation using SFA

| Variable          | Name   | Calculated as   | Explanation   | Data source                  |
|-------------------|--|---|---|------------------------------|
| Outputs           | Total cost                                     | Total expense to total assets ratio times total assets        | Total cost includes all types of cost.  |                              |
|                   | Logarithm of number of active borrowers (LNAB) | Total borrowers and clients of MFIs                           | The number of credit clients at the end of each period are used as social performance output  |                              |
|                   | Gross loan portfolio (GLP)                     | Gross value of all outstanding bills                          | All outstanding bills due for all outstanding client loans. This includes current, delinquent, and renegotiated loans, but not loans that have been written off. It does not include interest receivable.   |                              |
| Inputs            | Cost of labour (COL)                           | Operating expenses divided by number of employees             | Operating expenses include those administrative expenses that exclude interest expenses.  |                              |
|                   | Cost of borrowings (COB)                       | Financial expenses divided by total liabilities               | Financial expenses are classified by associated liability and are also broken down by type of expense (interest, fee) for each associated financial liability.  |                              |
|                   | Cost of physical capital (COC)                 | Non-personnel operating expenses divided by total liabilities | Non-personnel operating expenses are all expenses that are categorised other than personnel operating expenses. Total liabilities are total amount of obligations raised from past transactions.  | MIX market                   |
|                   | Risk coverage ratio (%) (RSKC)                 | Impairment Loss Allowance divided by PAR greater than 30 days | The non-cash expense is used to create or increase the impairment loss allowance and is calculated as a percentage of the value of the loan portfolio that is at risk of default. PAR30 is value of all loans outstanding that have one or more instalments of principal past due more than 30 days. This includes the entire unpaid principal balance, including both the past due and future instalments, but not accrued interest and rescheduled loans. |                              |
|                   | Dummy of mature institutions (DMATURE)         | Mature MFIs in data sample                                    | Dummy of young (less than 8 years old) and dummy of mature (equals to or greater than 8 years old) dummies are created for age and dummy of young is chosen as base dummy.  |                              |
| Control variables | Assets (LAST)                                  | Logarithmic value of total assets                             | Total assets used as proxy of size measure  |                              |
|                   | Real GDP (LREALGDP)                            | Logarithmic value of real GDP                                 | Proxy to measure the country size.  | World development indicators |

## Chapter 3 – Data Description

|                      | Inflation (INFL)              | Inflation, consumer prices (annual %)                     | Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly.   |
|----------------------|-------------------------------|---|--|
| Governance variables | Internal governance indicator | Percentage of female board members (%) (PFMs)             | Number of women board members divided by total board members   |
|                      |                               | Dummy of non-profit-oriented MFIs                         | This is a dummy variable that is equal to one if the MFI is a non-profit-oriented institution and zero, if otherwise   |
|                      | External governance indicator | Dummy of regulated  | This is a dummy variable that is equal to one if the MFI is listed as regulated institution and zero, if otherwise   |
|                      |                               | Political stability and absence of violence and terrorism | Reflects perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism. Estimate of governance (ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance). |
| Gender variables     | Gender                        | Percentage of female loan officers (%) (PFOs)             | Number of women loan officers divided by total loan officers   |
|                      |                               | Percentage of female borrowers (%) (PFBs)                 | Number of women active borrowers divided by number of active borrowers   |

Notes: Variables are explained as defined in their respective data sources.

**Table 3.11: Descriptive statistics for efficiency evaluation using SFA**

| Variable                           | Mean        | Min.     | Max.           | Std.          | Obs. |
|------------------------------------|-------------|----------|----------------|---------------|------|
| Total cost                         | 8,171,288   | 1,690    | 305,000,000    | 27,100,000    | 565  |
| Total cost adjusted-TC/COC         | 300,000,000 | 46,380   | 12,500,000,000 | 1,280,000,000 | 563  |
| Gross loan portfolios              | 31,900,000  | 13,169   | 1,010,000,000  | 101,000,000   | 632  |
| Number of active borrowers         | 244,912     | 94.000   | 6,710,000      | 798,139       | 629  |
| Operating expenses                 | 3,669,222   | 553.000  | 117,000,000    | 11,200,000    | 565  |
| Number of Personnel                | 2,270       | 1.000    | 263,300        | 17,902        | 627  |
| Total borrowings                   | 20,800,000  | 10,747   | 501,000,000    | 55,300,000    | 465  |
| Non-personnel operating expenses   | 1,386,005   | 553.000  | 49,200,000     | 3,972,737     | 565  |
| Liabilities                        | 34,500,000  | 12,936   | 1,790,000,000  | 134,000,000   | 626  |
| Input1 - CPL                       | 2,288       | 89.000   | 9,583          | 1,309         | 436  |
| Input1 adjusted-CPL/COC            | 71,527      | 491.000  | 1,099,636      | 92,039        | 435  |
| Input2-COB                         | 23.711      | 1.000    | 486.000        | 36.669        | 561  |
| Input2 adjusted –COB/COC           | 509.004     | 3.858    | 6076.825       | 720.251       | 553  |
| Input3-COC                         | 0.101       | 0.003    | 3.546          | 0.264         | 563  |
| Risk coverage ratio                | 0.503       | 0.001    | 0.998          | 0.298         | 632  |
| Dummy of mature MFIs               | 0.755       | 0.000    | 1.000          | 0.430         | 612  |
| Total assets                       | 41,300,000  | 19,011   | 1,900,000,000  | 149,000,000   | 629  |
| Regulated MFIs                     | 0.690       | 0.000    | 1.000          | 0.463         | 612  |
| Non-profit-oriented MFIs           | 0.572       | 0.000    | 1.000          | 0.495         | 612  |
| Real GDP                           | 3466.665    | 1293.454 | 8855.504       | 1,612.765     | 612  |
| Inflation                          | 7.928       | 2.007    | 22.564         | 3.158         | 612  |
| Dummy of Bangladesh                | 0.267       | 0.000    | 1.000          | 0.443         | 632  |
| Dummy of India                     | 0.422       | 0.000    | 1.000          | 0.494         | 632  |
| Dummy of Nepal                     | 0.112       | 0.000    | 1.000          | 0.316         | 632  |
| Dummy of Pakistan                  | 0.097       | 0.000    | 1.000          | 0.296         | 632  |
| Percentage of female board members | 0.329       | 0.067    | 1.000          | 0.198         | 407  |
| Percentage of female loan officers | 0.285       | 0.002    | 1.182          | 0.282         | 458  |
| Percentage of female borrowers     | 0.829       | 0.026    | 1.031          | 0.255         | 632  |
| Political stability                | -1.434      | -2.810   | -0.450         | 0.400         | 620  |

Note: Variables are defined in Table 3.10. We adjusted all inputs, outputs and total cost by dividing them with COC (cost of capital). For detail, we add descriptive statistics of both not adjusted and adjusted variables. Input1-CPL is calculated by dividing the operating expense dividing by number of employees, input2-COB is calculated by dividing the financial expenses with total liabilities and input3-COC is calculated by dividing the non-personnel operating expenses with total liabilities. For detail, we add descriptive statistics of both individual variables and inputs that created after dividing them.

Table 3.12: Correlation among variables for efficiency evaluation using SFA

|            | Input1-CPL | input2-COB | input3-COC | RSKC     | DMATUR | LAST     | RGLTD   | NPRO   | LGDP     | DBANG    | DIND     | DNEPAL   | DPAK     | PFM <sub>s</sub> | PFO <sub>s</sub> | PFB <sub>s</sub> | STAB  |
|------------|------------|------------|------------|----------|--------|----------|---------|--------|----------|----------|----------|----------|----------|------------------|------------------|------------------|-------|
| input1-CPL | 1.000      |            |            |          |        |          |         |        |          |          |          |          |          |                  |                  |                  |       |
| input2-COB | 0.373      | 1.000      |            |          |        |          |         |        |          |          |          |          |          |                  |                  |                  |       |
| input3-COC | 0.108**    | 0.375**    | 1.000      |          |        |          |         |        |          |          |          |          |          |                  |                  |                  |       |
| RSKC       | -0.003     | 0.075**    | 0.027      | 1.000    |        |          |         |        |          |          |          |          |          |                  |                  |                  |       |
| DMATUR     | -0.224     | -0.252     | -0.191     | 0.027**  | 1.000  |          |         |        |          |          |          |          |          |                  |                  |                  |       |
| LAST       | 0.150      | -0.133     | -0.167     | -0.107*  | 0.164  | 1.000    |         |        |          |          |          |          |          |                  |                  |                  |       |
| RGLTD      | 0.108*     | 0.102      | 0.078      | -0.095** | -0.155 | 0.037    | 1.000   |        |          |          |          |          |          |                  |                  |                  |       |
| NPRO       | -0.245     | -0.079     | -0.060     | 0.271**  | 0.220  | -0.217** | -0.486  | 1.000  |          |          |          |          |          |                  |                  |                  |       |
| LGDP       | 0.209      | 0.079      | 0.056      | -0.392   | -0.191 | 0.017    | 0.013   | -0.347 | 1.000    |          |          |          |          |                  |                  |                  |       |
| DBANG      | 0.089**    | -0.005     | -0.010*    | -0.088*  | 0.031* | 0.081*   | 0.026   | -0.075 | 0.274**  | 1.000    |          |          |          |                  |                  |                  |       |
| DIND       | -0.227     | -0.095     | -0.054     | 0.319    | 0.278  | 0.161    | -0.086  | 0.491  | -0.729** | -0.166   | 1.000    |          |          |                  |                  |                  |       |
| DNEPAL     | 0.025      | -0.151     | 0.011*     | -0.395   | -0.189 | 0.051    | -0.125  | -0.287 | 0.561    | 0.042**  | -0.578   | 1.000    |          |                  |                  |                  |       |
| DPAK       | 0.070      | -0.029     | -0.071**   | 0.206    | 0.008  | -0.157   | 0.160** | -0.146 | -0.424   | -0.012   | -0.161   | -0.289   | 1.000    |                  |                  |                  |       |
| PFMs       | 0.184*     | 0.373**    | 0.127**    | 0.139    | -0.099 | -0.277   | 0.124*  | 0.046  | 0.119**  | 0.087**  | -0.202** | -0.361   | -0.101*  | 1.000            |                  |                  |       |
| PFOs       | 0.088      | 0.077      | 0.135*     | 0.028*   | 0.014  | -0.131   | 0.029   | 0.164  | -0.049*  | -0.001*  | 0.066**  | -0.007   | -0.090   | 0.146            | 1.000            |                  |       |
| PFBs       | -0.189*    | -0.055     | -0.036*    | -0.072   | 0.121* | -0.193*  | 0.077   | 0.013  | 0.075    | -0.022** | -0.058   | -0.096** | -0.015*  | 0.133*           | 0.069*           | 1.000            |       |
| STAB       | -0.163     | -0.341     | -0.074     | 0.024    | -0.034 | 0.075*   | -0.141  | 0.093  | -0.105   | -0.081   | 0.126    | 0.329    | -0.027** | -0.524           | 0.025*           | 0.040            | 1.000 |

Note: \*\*\*, \*\*, \* denote significance at the 1%, 5% and 10% levels respectively. Correlation of cost efficiency and inefficiency regressors are presented. Input1-CPL = first input cost of labour, input2 - COB = second input cost of borrowers, input3 - COC = third input cost of capital, RSKC = risk coverage ratios, DMATUR = dummy of mature (greater than or equal to 8years) MFIs, LAST = logarithm of assets, RGLTD = dummy of regulated MFIs, NPRO = dummy of non-profit-oriented MFIs, LGDP = logarithmic value of real GDP, DBANG = dummy of Bangladesh, DIND = dummy of India, DNEPAL = dummy of Nepal, DPAK = dummy of Pakistan, PFM<sub>s</sub> = Percentage of female board members, PFO<sub>s</sub> = Percentage of female loan officers, PFB<sub>s</sub> = percentage of female borrowers, STAB = political stability, see Table 3.10 for more details.

### 3.5. Summary

This chapter provides a brief overview of data and databases that are used in this thesis. The research questions that we have constructed in Chapter 2 require the use of different methodologies and data is constructed according to the requirements of each methodology. The two main databases, MIX market and World Bank Development indicators are used as sources of data. Explanations of variables, data description and correlation between each variable are presented in detail in tables in respective sub-sections.

The chapter starts with the data description used in social performance evaluation, then both the social and financial performance evaluation. The chapter proceeds with a description of the data used in both efficiency techniques of non-parametric and parametric technique, one by one. Overall, we use unbalanced panel data from year 1998 to 2013 for 372 MFIs. However, for ‘DEA methodology’ as suggested in Dyson et al. (2001), we use balanced panel data and restrict to non-missing observations only: As a result our data sample is reduced from 372 to 101 MFIs from year 2005 to 2012. Since it is difficult to maintain a balanced panel dataset from repeated cross-sectional observations due to various random and other causes, according to Baltagi (2008) it might not be too problematic for the SFA analysis to use unbalanced data.



## 4. Methodology

“If you cannot measure it, you cannot control it.”

John Grebe

This chapter serves as a foundation for the thesis in which we shall discuss techniques that can be used to identify firm-level inefficiencies. Models of each methodology are described and problems and challenges in their usage are noted. This chapter is divided into several parts. In sections 4.1 and 4.2, we present our regression model for a performance evaluation of MFIs using financial ratios. In section 4.3, we illustrate conventional models of DEA and the bootstrapping technique. In this section, we also describe a truncated regression model to identify the important efficiency determinants. Section 4.4 describes a cost efficiency model of SFA and a general inefficiency model to identify the important efficiency determinants. The final section contains concluding comments.

### 4.1. Social Performance Evaluation

To answer the first RQ using the data that is described in section 3.1, we follow the methodology of comparative framework of Bassem (2008) and Hartarska (2005) that is used to analyse the performance of MFIs. Although they used this model for analysing

the social and financial performance of MFIs, we are using it for estimating the social performance of MFIs only as follows:

$$PS_{ijt} = \alpha_0 + S_{ijt}\beta + M_{ijt}\gamma + R_{ijt}\delta + \varepsilon_{ijt} \quad (\text{Equation 4.1})$$

In Equation 4.1,  $PS_{ijt}$  represents the social performance of MFI  $I$ , located in country  $j$ , in year  $t$ . The social performance of MFIs is measured by the natural logarithm of number of active borrowers (LNAB), average loan balance per borrower divided by gross national income, percentage of female borrowers (PFBs), market share of borrowers (MSB) and market share of borrowers adjusted by market share of assets (MSBA). The parameters  $\beta$ ,  $\gamma$ ,  $\delta$  are vectors.  $S_{ijt}$  is a vector of MFI-specific variables: total assets (Hartarska & Nadolnyak, 2007; Mersland & Strom, 2009) and age of institution (Ahlin et al., 2011; Bassem, 2009).  $M_{ijt}$  represents the country-specific macroeconomic variables based on the MFI's country of origin. These variables include size of the economy calculated by real GDP (Cull & Spreng, 2011; Hudon & Traca, 2011) and inflation (Hartarska, 2005).  $R_{ijt}$  represents performance ratios for the MFI, namely risk ratio (Ahlin et al., 2011; Mersland & Strom, 2010), cost ratio (Tchakoute-Tchuigoua, 2010) and capital ratio (Abate et al., 2013; Hartarska & Nadolnyak, 2007). Finally,  $\varepsilon_{ijt}$  is the error term and is assumed to be independent and normally distributed with a zero mean.

The financial ratios that we include are categorized into portfolio quality, cost ratios, financial management or leverage ratios. We start our first regression analysis<sup>18</sup> by including all of these ratios (Table A3.1 in Appendix 3) one by one in our basic model due to their correlation with either other ratios or with our control variables that we use

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<sup>18</sup> For brevity, results are not reported.

in the basic model. Sometimes this high correlation does not show in the correlation coefficient but, even then, they are conceptually correlated (as described in Appendix 3), so we have to drop most of them. Then, in our final regression, we ended up with the PAR30, operating expense ratio and financial management ratio.

Moreover, we examine that PAR30, risk coverage and write-off ratios are more realistic measures of portfolio quality in comparison to the provision expense ratio that is dependent on accounting practices. Although other portfolio quality ratios, like write-off ratios and PAR30, are also dependent on accounting ratios, their dependence is low in comparison to the provision expense ratio. Therefore, this ratio is excluded from our regression model. Among cost ratios, the operating expense ratio appears to be an important one for two reasons. One is it is commonly significant in our analysis for most of the sustainability and outreach regressions. Secondly, including too many variables in the regression model can limit the degrees of freedom, so we pick and choose that we consider the most important and significant ratios to explain the financial and social performance of MFIs.

We include a number of controls in our model to account for differences that are present in MFIs and commonly discussed in microfinance literature (Ahlin et al., 2011; Hermes et al., 2011). We refer to these control variables as our basic model of Equation 3 that includes MFI-specific and the macroeconomic variables. We use ‘year variable’ to capture time-fixed effects in our regressions.

We estimate this model using panel data estimation, taking into account endogeneity caused by omitted variables. In panel regression, the problem of endogeneity arises

because of correlation between the explanatory variables and the error term, but it may also result from measurement error, autocorrelation of the error term or because of omission of an important variable (heterogeneity). We use two panel methods, random and fixed effects, which control for this endogeneity problem. While trying both fixed and random effects alongside each other, the Likelihood Ratios and Hausman test show that a fixed effect is the better choice in our model. We use a generalized least square (GLS) model that is considered more efficient than ordinary least square in panel data estimation literature due to having a smaller standard error and the best linear unbiased estimator in the presence of autocorrelation and heteroskedasticity (Lee, 2005).

However, there are a number of methodological issues that might bias parameter estimates and that require careful attention. The minimum and maximum values of our indicators suggest a wide range for each variable that prompts the use of additional regression methods as a check on robustness to outliers. Given our large sample size, we rely on the asymptotic normality assumption, but to control for circular arguments among variables, we have done some empirical tests. Firstly, we have done Granger Causality tests (up to second lag) that help to determine the reasoning of dependent and independent variables (Gujarati & Porter, 2003). We also conducted unit root tests for each variable individually and find that a unit root problem is present in some of the variables (number of active borrowers, total assets and real GDP). As a remedy, we take the log of those variables, following which the unit root problems no longer exist.

#### 4.2. Trade-off Evaluation between Social and Financial Objectives

As discussed in section 4.1, to analyse the performance of MFIs, we follow the comparative framework model of Bassem (2008) and Hartarska (2007), but we also used that model for performance assessment of MFIs with respect to their dual objectives to answer the second RQ using the data that is described in section 3.2. The model is presented as follows:

$$PS_{ijt} = \alpha_0 + S_{ijt}\beta + M_{ijt}\gamma + R_{ijt}\delta + \varepsilon_{ijt} \quad (\text{Equation 4.2})$$

Equation 4.2 is a standard form regression model which can be used for multiple dependant variables.  $PS_{ijt}$  represents the social and financial performance of the microfinance institution  $i$ , located in country  $j$ , in year  $t$ . Social performance is measured by market share of borrowers (MSB) and market share of borrowers adjusted by market share of assets (MSBA), while financial sustainability is measured by return on assets (ROA) and operational self-sufficiency (OSS). The parameters  $\beta$ ,  $\gamma$ ,  $\delta$  are vectors.  $S_{ijt}$  is a vector of microfinance institution-specific variables: total assets and age of institution.  $M_{ijt}$  represents the country-specific macroeconomic variables, including size of the economy and inflation.  $R_{ijt}$  represents performance ratios for the MFI comprising risk, cost and capital ratios. Finally,  $\varepsilon_{ijt}$  is the error term and is assumed to be independent and normally distributed with a zero mean.

For financial performance, we use both ROA and OSS variables. ROA is a measure of the overall profitability of an institution (Galema, Lensink, & Spierdijk, 2011). OSS is a financial sustainability indicator to measure the ability of a microfinance institution to cover its costs through operating revenues. OSS is considered to be a direct measure of

the institution's financial sustainability in terms of generating enough revenues to cover all of its financial and operational cost (Quayes, 2012). We use both of these indicators, but for our final detailed analysis we chose to use the OSS<sup>19</sup> indicator only.

All empirical tests like Likelihood ratios test, Hausman test, Granger Causality tests, Unit root test that are discussed in section 4.1 are also repeated here for this GLS model that is presented in Equation 4.2.

### **4.3. Efficiency Assessment Method - DEA**

To answer the third RQ using the data that is described in section 3.3, we apply non-parametric and parametric efficiency assessment methods that are described in section 4.3 and 4.4. The underlying concept of efficiency depends on the economic notion of production technology that transforms input variables into output variables. The non-parametric approach of DEA not only measures relative efficiency, but also helps us to identify the best practice institutions. The most valuable outcome of a DEA assessment is to identify the efficient peers for each inefficient MFI.

One of the assumptions of the DEA model is that each decision making unit (DMU) in the sample would handle a similar mix of products and resources in a similar environment. This assumption makes the efficient DMU a suitable role model for other DMUs in order to improve their performance in the sample (Berger & Mester, 1997; Piot-Lepetit & Nzongang, 2014; Thanassoulis, 1999). Our discussion of this methodology begins with a description of the calculation of the technical efficiency (TE) and scale efficiency (SE)

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<sup>19</sup> ROA shows as highly correlated with total assets in our model, so we have preferred OSS as a proxy for financial sustainability.

using conventional models of constant returns to scale (CRS) and variable returns to scale (VRS) using input-oriented and output-oriented models.

#### 4.3.1. Conventional Frontier Models

Charnes, Cooper and Rhodes (1978) coined the term ‘DEA’ and introduced an input-oriented CRS model. Later Banker, Charnes and Cooper (1984) introduced the VRS model. Both efficiency models measure a maximum ratio of weighted output to weighted input for each DMU, subject to a set of constraints or assumptions. These are called the Charnes, Cooper and Rhodes (CCR or CRS) and Banker, Charnes and Cooper (BCC or VRS) models<sup>20</sup>.

A DEA model can be constructed either to maximize outputs or to minimize inputs. These orientations influence the efficiency measurement. An input-oriented model assumes a proportional reduction in input usage with output level held constant, while an output-oriented model assumes a proportional increase in output production with input levels held fixed (Cook, Tone, & Zhu, 2013). In choosing the models’ orientation, we follow Crawford et al. (2014). Hence, in financial efficiency, we assume that microfinance managers have more control on input variables and in social efficiency they are influencing output level more. So we use input-oriented model for financial efficiency and output-oriented model for social efficiency.

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<sup>20</sup> The CRS assumptions are only appropriate when all firms are operating at an optimal scale; otherwise, the TE results are confounded by scale efficiencies. In VRS model, following additional constraint are added. First, the output of the reference unit must be at the same level as the output of base DMU. Second, the input usage of first DMU must be greater than or same as used in reference DMUs. In the case of VRS, efficiency can also be measured in any orientation, and these measurements helped to identify multiple, overused input variables and unutilized output variables (Berger & Humphrey, 1997). VRS provides measurement of pure technical efficiency (PTE) that evaluates how efficient a MFI is at managing and using its resources and infrastructure under exogenous conditions. A smaller PTE value means the MFI cannot use its resources and infrastructure to generate the output volume efficiently, and vice versa.

In microfinance literature, it has been argued that output orientation is not appropriate for microfinance as maximization of outputs, like interest rates and profit margins, may amount to client exploitation (Marakkath, 2014). However, as we are using number of active borrowers as an output for social efficiency, it seems more appropriate to use output orientation. It should also be noted that efficient firms appear efficient in both orientations, but the efficiency scores of inefficient firms may differ between the two methods (Mersland & Strom, 2014). According to Coelli, Rao, O'Donnell and Battese (2005), these models are presented as follows.

#### 4.3.1.1. Input-Oriented Model

We may assume that there are  $n$  MFIs that are converting  $m$  input variables into  $s$  output variables. Each MFI  $j$  consumes  $X_{ij} \geq 0$  of input variables  $i$  to produce  $Y_{rj} \geq 0$  of output variables  $r$  and each MFI has at least one positive input and output (Fare, Grosskopf, & Lovell, 1994). The corresponding input oriented model using VRS assumptions is as follows:

$$\min_{\theta, \lambda_j} \theta \quad (\text{Equation 4.3})$$

Subject to:

$$\sum_{j=1}^n \lambda_j Y_{rj} \geq Y_{rj} \quad (\text{Y is output, } r = 1, \dots, s)$$

$$\theta X_{ij} \geq \sum_{j=1}^n \lambda_j X_{ij} \quad (\text{X is input, } i = 1, \dots, m)$$

$$\sum_{j=1}^n \lambda_j = 1 \quad (\text{MFIs, } j = 1, \dots, n)$$

$$\lambda_j \geq 0$$

This model attempts to proportionally reduce inputs of the MFIs  $j$  as much as possible while not decreasing its current level of outputs. This process is applied for each MFI,

and an optimal solution of  $\theta$  yields an efficiency score for a MFI for which  $\theta = 1$  indicates efficient MFI and  $\theta < 1$  as an inefficient MFI.  $\sum_{j=1}^n \lambda_j = 1$  is the only condition that makes a CRS model a VRS model, but it is not presented here for brevity. Moreover,  $\theta$  is scalar and  $\lambda$  is the  $n \times 1$  vector of VRS; the value of  $\theta$  obtained is the efficiency scores of  $j^{\text{th}}$  MFI.

#### 4.3.1.2. Output-Oriented Model

The output-oriented DEA models are very similar to input-oriented DEA models. The VRS-output oriented model is presented as follows:

$$\max_{\theta, \lambda_j} \theta \quad (\text{Equation 4.4})$$

Subject to:

$$\begin{aligned} \theta Y_j + \lambda_j Y_{rj} &\geq 0 && (\text{Y is output, } r = 1, \dots, s) \\ X_i - \lambda_j X_{ij} &\geq 0 && (\text{X is input, } i = 1, \dots, m) \\ \sum_{j=1}^n \lambda_j &= 1 && (\text{MFIs, } j = 1, \dots, n) \end{aligned}$$

$$\lambda_j \geq 0$$

where  $1/\theta$  defines TE scores that vary between zero and one. For more detail, see Coelli et al. (2005).

Moreover, the DEA surface differs depending on the scale assumptions that underpin the model and the general scale assumptions employed are CRS and VRS. If returns to scale are assumed to be constant, then the appropriate model is CRS; otherwise, VRS is best. In the present study, because we have a large variation in the size of institution studied, we chose the VRS model.

### 4.3.2. Scale Efficiency

Overall, TE is measured by using input-oriented and output-oriented directions of both the CCR or CRS and BCC or VRS models. Any difference between these efficiency scores reflects scale inefficiency (SE), with scale efficiency calculated as follows:

$$SE = \theta_{jCRS} / \theta_{jVRS} \quad (\text{Equation 4.5})$$

where  $\theta_j$  are the TE scores of each MFI using CRS and VRS models.

To measure the efficiency scores, we use DEA-solver 9.0 and statistical program R, using its package ‘FEAR 1.15’<sup>21</sup> developed by Wilson (2005). In FEAR, efficiency is measured using the input or output distance functions of Shephard (1970) that are the reciprocals of the Farrell (1957) input or output distance functions. Therefore, to get the exact scores while using these efficiency scores in our second-stage regression, we use the reciprocal of these FEAR scores. We run DEA-Solver for TE scores and FEAR software for bootstrapped TE scores.

### 4.3.3. SBM-Super Efficiency Model

Various DEA models, of which the CCR and BCC modes outlined above are typical, have been developed to use either input or output orientations. The emphasis of these models is on a proportional augmentation of potential output (output slacks) or proportional reduction of excessive input (input slack). However, there are also models where managers of an organization can place emphasis on both input reduction and output

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<sup>21</sup> FEAR software is used in addition to DEA-solver because we want to perform iteration on efficiency scores and that were not possible in DEA-Solver

augmentation at the same time by decreasing input slacks and improving output slacks. These slacks-based models are called non-oriented models. We also employ this slack-based super efficiency model to conduct DEA as suggested by Tone (2002).

The construction of the SBM score is similar to other DEA measures. Any of the institutions that appear as efficient in the SBM model must be efficient in other DEA measures, but not vice versa (Tone, 2002). The aim of the ‘super-efficiency model’ is to discriminate between efficient decision making units (DMUs) whose efficiency estimates are greater than one. The larger the score, the more efficient the DMU, but it is possibly judged to be an outlier at the same time. By virtue of its being an outlier — its super-efficiency value will be greater than one — there seems to be some agreement (no ‘cut-off’ standard exists) that values above 2.0 indicate DMUs as outliers (Hartman, Storbeck, & Byrnes, 2001).

In order to rank the extreme efficient units (Tone, 2002), the following super efficiency model (presented in Equation 4.6) is used. When considering a set of  $n$  observed decision making units [DMU<sub>j</sub> |  $j=1, \dots, n$ ], the input and output matrices corresponding to these DMUs are  $X = (X_{ij})$  and  $Y = (Y_{rj})$ .

$$\min_{\theta, \lambda_j} \theta = \left( \min_{\lambda, \bar{X}, \bar{Y}} \frac{\left( \frac{1}{m} \sum_{i=1}^m \bar{X}_i / X_{ij} \right)}{\left( \frac{1}{n} \sum_{r=1}^n \bar{Y}_r / Y_{rj} \right)} \right) \quad (\text{Equation 4.6})$$

Subject to:

$$\begin{aligned} \bar{X}_i &\geq \sum_{j=1, j \neq 0}^m \lambda_j X_{ij} && (\text{X is input, } i = 1, \dots, m) \\ \bar{Y}_r &\leq \sum_{r=1, r \neq 0}^n \lambda_j Y_{rj} && (\text{Y is output, } r = 1, \dots, S) \\ \bar{X} &\geq X_j && \bar{Y} \leq Y_j \\ \bar{Y} &\geq 0, \lambda \geq 0 \end{aligned}$$

$X > 0, Y > 0,$

The greater the objective function value, the higher the rank of the corresponding extremely efficient DMUs. The model indicates the distance  $DMU_j$  of the efficient points  $(\bar{X}, \bar{Y})$  in the new production possibility set after the removal of  $DMU_j$  regarding  $\bar{X} \geq X_j$  and  $\bar{Y} \geq Y_j$ . It also considers those points that have the smallest distance from the DMU under evaluation<sup>22</sup>.

We find more outliers (i.e. DMUs with efficiency scores greater than 2) in the BCC model than the CCR model. We delete all observations of that particular institution from our data sample, reducing it from 842 to 808 observations, and then run the conventional models again without the outliers and apply the bootstrap on these efficiency scores. Applying bootstrap on first-stage efficiency scores helps to obtain bias-corrected estimates and it further improve the second-stage results (Simar & Wilson, 2007).

A number of different ways have been suggested in microfinance literature to select the input and output variables for DEA analysis. These efficiency techniques are ranked under different sets of input and output variables that are mainly based on intermediation and production models (Berger & Humphrey, 1997). In the intermediation model, physical resources and deposits are considered as inputs and loans are considered as an output, while in the production model, physical resources are considered as an input and deposits are treated as output.

As most MFIs do not collect deposits (only regulated MFIs collect deposits) and since one of the conditions of DEA methodology is to choose homogenous decision making

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<sup>22</sup> (For more detail please see Avkiran, 2011; Drake, Hall, & Simper, 2006; Tone, 2002)

units (DMUs) for the sample, deposits are excluded from the DEA model (for more detail see Gutierrez-Nieto et al., 2007; Gutierrez-Nieto et al., 2009). These authors argue that both the production and intermediation approaches are difficult to deal with in microfinance study; therefore, for the selection of input and output variables, they use microfinance scope<sup>23</sup> and objectives. For selection of input and output variables, we are also guided by the dual objectives of these institutions. For social efficiency, three input variables, number of personnel, operating expenses and financial expenses, and two output variables, number of active borrowers and gross loan portfolios, are selected and financial revenues is added as output variable for financial efficiency. We are mindful of the recommendation<sup>24</sup> of Dyson et al. (2001) in choosing particular sets of input and output variables.

#### **4.3.4. Truncated Bootstrapped Regression Model**

After obtaining the DEA efficiency scores (bounded at both ends of the 0 and 1 distribution) in the first-stage, we calculated the truncated regression equation in the second stage. The DEA efficiency scores obtained from the first-stage DEA analysis are termed the raw scores as they do not reflect each sampled MFI's specific operating characteristic or the managerial and operational factors which may or may not be under the control of microfinance management. These environmental factors are not specifically included in our efficiency analysis, so we adopt the second stage regression approach as advocated by Fried, Schmidt and Yaisawarng (1999).

Truncated regression (as per Simar & Wilson, 2007) is used to model the dependent variables. The approach is to run the regression analysis for microfinance operating

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<sup>23</sup> Microfinance scope includes financial and operational scope, and microfinance objectives include financial sustainability and outreach.

<sup>24</sup> Pitfalls 3.1, 3.2, 4.1, 4.3 and 5.1

characteristics of South Asian MFIs and identify the significant factors to explain variations in microfinance performance.

A basic estimation for second stage analysis can be written as follows:

$$\theta_{ikt} = \alpha_0 + C_{ikt}\beta + Z_{ikt}\gamma + \varepsilon_{ikt} \quad (\text{Equation 4.7})$$

This equation can be understood as the first-order approximation of the unknown true relationship.  $\theta_{ikt}$  is the efficiency score of microfinance institution  $i$ , located in country  $k$ , in year  $t$ .  $\alpha_0$  is a constant,  $C_{ikt}$  is a vector of control variables for microfinance institution  $i$  and country  $k$ .  $Z_{ikt}$  are the exogenous (governance and gender) variables expected to be associated with efficiency scores. The parameters  $\beta$  and  $\gamma$  are vectors.  $\varepsilon_{ikt}$  is the error term.

Applying the Simar and Wilson (2007) bootstrap approach, the distribution of  $\varepsilon_{ikt}$  that was limited to the condition of  $\varepsilon_{ikt} \geq 1 - \alpha_0 - Z_{ikt}\gamma$ , is  $\varepsilon_{ikt} \sim iidN(0, \sigma^2\varepsilon)$ . Furthermore, the unobserved dependent variable  $\theta_{ikt}$  (efficiency scores of MFIs) is now replaced by  $\theta^*_{ikt}$ . The new model specification is shown as follows:

$$\theta^*_{ikt} = \alpha_0 + C_{ikt}\beta + Z_{ikt}\gamma + \varepsilon_{ikt} \quad (\text{Equation 4.8})$$

MFI-specific and macroeconomic variables are control variables that are added to account for institution and country differences. MFI-specific variables are: MFI size and MFI age. Macroeconomic variables used include real GDP and inflation. We use ‘year variable’ to capture trend. The governance variables include external and internal governance variables, while the external governance indicators include corruption control and political stability (developed by Kaufmann, Kraay, & Massimo, 2009). These governance

indicators range from a scale of approximately  $(-2.5)$  to  $(2.5)$ , where  $(-2.5)$  indicates very weak institutional quality. Internal governance indicators include ownership structure (dummy for non-profit-oriented and PFMs) and regulatory structure (dummy for regulated) of MFIs (as suggested by Hartarska, 2005; Hartarska & Mersland, 2012; Mersland & Strom, 2009). We also include other gender variables that are PFOs and PFBs (Agier & Szafarz, 2013).

#### **4.4. Efficiency Assessment Method-SFA**

To answer the third RQ using the data that is described in section 3.4, the second efficiency technique is being described in this section. As described earlier, the concept of the production frontier begins with Farrell (1957). Two approaches which have been widely used in the literature are non-parametric DEA and parametric SFA. In this section, we are describing SFA which has at least two advantages over nonparametric approaches. First, nonparametric methods assume that all variations in firm performance are attributable to inefficiency, which is problematic as it ignores the exogenous shocks in the measurement, omitted variables and measurement errors. Second, hypothesis testing can also be carried out for the parameter estimates by using SFA. On the other hand, the main disadvantage of using parametric methods is that they impose a functional form on the data, whereas true efficiency measurement is dependent on the functional form that should accurately represent the true model (Coelli et al., 2005).

Several SFA models are used in the literature to determine cost efficiency. Two that are usually used are the Translog and the Cobb-Douglas models. In order to determine the best specification, Gregoire, Tuya & Ramirez (2008) use a Likelihood Ratio test and

prove that the Translog specification is a better specification for the cost function of MFIs. More specifically, we use the SFA-BC model suggested by Battese and Coelli (1995). The BC model has an advantage over the standard two-step models (Aigner, Lovell, & Schmidt, 1977) in that it estimates the cost frontier and the coefficients of the efficiency variables simultaneously. According to Wang and Schmidt (2002), the two-step approach assumes that the efficiency term is identically truncated and normally distributed in the first step, while in the second step, the same efficiency terms are assumed to be normally distributed and dependent on the set of explanatory variables, thus inherently rendering biased coefficients. Furthermore, two-step SFA involves a contradiction of assumptions, and the inefficiency depends on the explanatory variables that could be partly affected by institution input choices based on knowledge of their level of inefficiency.

Furthermore, the structural approach to determine the optimal scale of efficiency in financial institutions involves estimating a cost or profit function; the former refers to cost minimisation and the latter to profit maximisation. By adopting the conventional SFA model illustrated by Battese and Coelli (1995) for panel data, we specify our cost function model as suggested by Hermes et al. (2011) with a Translog specification. Due to the nature of the business of MFIs, we use cost frontier in our SFA analysis. If we have a data set relating these inputs to output for varying levels of inputs and output, we can estimate the parameters of the Translog production function directly.

For the microfinance industry, cost functions are given more importance as they assume exogenous output and use input prices, whereas the profit function uses input and output prices, which is problematic for a study on MFIs as Abate et al. (2014) argue that detailed price data (interest rates charged) on loans are not collected. From a theoretical

perspective, the cost function is also more appropriate when firms have some market power in the output market and they are price takers in the input markets (Varian, 1984). MFIs have some market power in serving the poor that the conventional financial sector avoids. Furthermore, MFIs are price takers in input markets as they compete with peers worldwide for access to financial capital (loans and donations), participate in a competitive market for physical capital and pay competitive salaries for relatively skilled labour. Finally, although some MFIs operate as profit-oriented institutions, the majority remain non-profit-oriented; however, even then, all MFIs strive to minimize costs and maximize profit. Therefore, we estimate a typical Translog cost function.

Cost-efficiency is measured in terms of how close the cost of a MFI lies to the efficient cost frontier for a given technology. We used the one-step stochastic cost frontier approach illustrated by Battese and Coelli (1995) that estimates the cost frontier and inefficiency correlates simultaneously, as presented in Equation 4.9.

$$\ln(TC_{i,t}) = \beta_0 + \beta_1 \ln(Y_{i,t}) + \beta_2 \ln(CPL_{i,t}) + \beta_3 \ln(COB_{i,t}) + 0.5 [\beta_4 \ln(Y_{i,t})^2 + \beta_5 \ln(CPL_{i,t})^2 + \beta_6 \ln(COB_{i,t})^2 + \beta_7 \ln(CPL_{i,t}) \ln(Y_{i,t}) + \beta_8 \ln(COB_{i,t}) \ln(Y_{i,t}) + \beta_9 \ln(CPL_{i,t}) \ln(COB_{i,t})] + \beta_{10} (year_{i,t}) + 0.5 [\beta_{11} (year_{i,t})^2 + \beta_{12} (year_{i,t}) \ln(CPL_{i,t}) + \beta_{13} (year_{i,t}) \ln(COB_{i,t})] + \beta_{14} other\ factors_{i,t} + u_{i,t} + v_{i,t}$$

(Equation 4.9)

TC is total cost. Y is equal to the outputs for every  $i^{\text{th}}$  firm. These outputs include gross loan portfolios (GLP) for financial performance and the number of active borrowers (NAB) for social performance. Input variables are cost of labor (CPL) and cost of borrowing (COB). CPL is equal to personnel operating expenses<sup>25</sup> divided by the number

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<sup>25</sup> Cost of physical capital (COC) is the price input that is used to adjust the total cost, CPL and COB. COC is equal to non-personnel operating expenses divided by total liabilities. Data for TC, CPL and COC are not directly available from the dataset we have used for this study (Mix Market; see data section for further description of this source). Instead, information in terms of ratios, such as total expenses to total assets is

of employees, and COB is equal to interest expenses divided by the total borrowings. The specification of our cost function takes into account the individual input and output variables, the square of these variables (quadratic terms), as well as combinations of these variables (interaction terms).

We add ‘time’ to capture the effects of technological change or unobserved heterogeneity over time that runs from 1 to 16 (year dummy). In addition to that, we add control variables (other factors) that are financial ratio (risk coverage ratio), type of MFIs (dummies for profit-oriented MFIs and regulated MFIs) and country dummies (Bangladesh, India, Nepal and Pakistan).  $\beta$  is the vector of coefficients,  $u_{i,t}$  is a variable representing the cost or technical inefficiency and  $v_{i,t}$  is a random variable representing noise. The error term is a composite expression of cost inefficiency and random error terms and it estimates that the expected value of the inefficiency term is conditional on the estimated values of the residuals.

Moreover, we also apply some restrictions on our cost and price variables that are discussed as follows. As stated in Hartarska et al. (2013), homogeneity in input price variables requires the following restrictions:

$$\begin{aligned} \beta_2 \text{ and } \beta_3 &= 1 \\ \sum_{i=5} \beta_i &= 0 \\ \beta_{12} \text{ and } \beta_{13} &= 0 \end{aligned}$$

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only given. This is why we have multiplied this ratio with total assets to obtain data for TC. Thus, TC is measured as the total expenses to total assets ratio times total assets in US dollars. CPL is available but it is further divided by gross national income (GNI per capita), so we multiply the ratio with GNI per capita. This, CPL is measured as the operating expenses of total personnel divided by GNI per capital times GNI per capita. Thirdly, for COC, we subtract personnel expenses from total operating expenses to get non-personnel operating expenses that are used as a numerator for COC; for a denominator that is total liabilities, we multiplied equity with debt to equity ratio.

These restrictions are imposed in the estimation by normalizing (dividing) the total cost and all input prices by COC. We also account for country differences in our model (Bolti & Thi, 2014; Chaffai, Dietsch, & Lozano-Vivas, 2001; Kumbhakar, Lozano-Vivas, Lovell, & Hasan, 2001). Furthermore, cost functions of financial institutions also consider credit risk, which is typically measured by non-performing loan ratios. This consideration is needed because a high non-performing loan ratio requires more resources to manage the higher risk, and if it is not accounted for, the estimated scale economies will be reduced. Therefore, the estimated results might show that there are economies of scale whereas, in fact, when risk is incorporated, it shows that the same financial institutions are operating at minimum costs with constant returns to scale (Hughes & Mester, 2008). Therefore, we also control for the level of risk using risk coverage ratio, which is a standard ratio used by MFIs to measure the risk level of their loan portfolio.

The central aim of this analysis is to investigate the impact of governance and gender variables on the efficiency of MFIs. In this framework, we calculate an inefficiency measure for an MFI. To analyze this relationship between efficiency, governance and gender, we specify an empirical model where the inefficiency variable is the dependent variable and in which we have governance and gender variables. The general specification of the inefficiency equations we estimate is as follows:

$$\mu_{i,t} = \delta_0 + \delta_1 \text{PFO}_{i,t} + \delta_2 \text{PFBS}_{i,t} + \delta_3 \text{PFMS}_{i,t} + \delta_4 \text{STAB}_{i,t} + \delta_5 \text{other factors} + \text{error term} \quad (\text{Equation 4.10})$$

In equation 4.10,  $\mu_{i,t}$  stands for the first moment of the technical inefficiency distribution for MFI  $i$ , at time  $t$ , that is calculated from cost function. Gender variables include

percentage of percentage of female loan officers (PFOs), percentage of female borrowers (PFBs) and percentage of female board members (PFMs). The external governance indicator is STAB (political stability). The control variables (other factors) include age (dummy of mature MFIs), size of MFIs (log of total assets) and size of sample economies (real GDP of sample countries).  $\delta$  is the vector of coefficients. We use STATA software to run the frontier estimation as suggested by Belotti, Daidone, Ilardi & Atella (2012).

#### **4.5. Summary**

In this chapter, we discussed how performance and efficiency measurement techniques can be used for the dual objectives of MFIs. Models of each methodology are described. To evaluate the social and financial performance simultaneously, we use the regression model of Bassem (2008) and Hartarska (2007). Moreover, we chose the fixed effect model in this context that contains control variables, performance ratios and ‘year’ to add trend.

We use several models in the DEA efficiency technique. For example, first of all, we use the SBM-super efficiency model to identify outliers in data then, on uncontaminated data, we use conventional DEA models of BCC and CCR. Finally, as DEA has a lack of statistical properties, especially the non-inclusion of data noise, we use Simar and Wilson's (2007) data-generating process via the bootstrap method to correct the bias of estimated coefficient and to enhance an approximation of the asymptotic distribution. Finally, we use the one-step SFA as illustrated by the BC 1995 model to evaluate the cost efficiency and technical inefficiency simultaneously.



## 5. Results

“If you don’ t get what you want, you suffer; if you get what you don’ t want, you suffer; even when you get exactly what you want, you still suffer because you can’ t hold on to it forever. Your mind is your predicament. It wants to be free of change. Free of pain, free of the obligations of life and death. But change is law and no amount of pretending will alter that reality.”

Socrates

This chapter summarizes the findings that we get from using the methodologies discussed in chapter 4. Along with the regression results, the robustness checks are also presented. The chapter starts with the social performance regression results where we compare the findings of all social performance indicators. This is followed by the trade-off regression results of different types of MFIs. We then present the efficiency estimates that have been obtained using the non-parametric DEA and the parametric SFA approaches. Our findings are mostly in line with the existing literature. These diverse efficiency techniques allow us to analyse different aspects of efficiency. We find quite consistent results from the efficiency determinants that increase the robustness of our findings.

### 5.1. Social Performance Analysis of MFIs

This section reports the results obtained from the outreach measures. We are investigating the outreach measures that are used in the microfinance literature to explain the social performance and compare those with our own defined social performance indicators (for detail, see section 2.2). We estimate the empirical model described in Equation 4.1 Table 5.1 shows the results from regression with LNAB, ALBPBG, PFBs (percentage of female borrowers), MSB and MSBA as dependent variables. The models encompass explanatory variables from Table 3.1. Results for detailed analysis of social performance indicators, breadth of outreach measured by LNAB (logarithm of number of active borrowers) and MSB (market share of borrowers) are presented in Tables 5.2 and 5.3. The depth of outreach is measured by MSBA (market share of borrowers adjusted) with results shown in Table 5.4. The focus of the analysis is the microfinance outreach indicators and their relationship with performance ratios (risk, cost and capital ratios), controlling for macroeconomic and institutional variables.

For breadth of outreach measure using LNAB and MSB indicators, results are mostly as expected. However, MSB regression produces better results as the R-square for LNAB regression is quite high at 97%, indicating a possibly spurious regression. The possible explanation that comes to mind is that this result is due to the high correlation (see Table 3.3) compared to other explanatory variables of the log asset variable with LNAB. The MSB indicator controls for this problem by looking at the market share of the number of active borrowers. We see that overall fit is around 80%, but we find more variables are significant with expected signs. Therefore, we think it is more reasonable to do further analysis for breadth of outreach by using the MSB indicator. These results should be interpreted with caution as they may be idiosyncratic to the sample period and region.

For depth of outreach, we used all indicators suggested before, but we did not get any significant results for ALBPBG and PFBs regressions. This may be due to data choice or simply that those indicators do not represent social performance well. However, the MSBA indicator produces better results, mostly in line with our expectations, even though it has the lowest R-square measure of 68%. To get a better understanding whether our suggested indicators are defining the social performance as expected or not, we further explore the results individually for each specification. Moreover, we use these new outreach indicators with financial sustainability in analysing the trade-off of MFIs' dual objectives, with results presented in section 5.2.

With MSB the dependent variable, we see that MFIs' specific characteristics have a positive significant impact, denoting that the social performance is improving in time and with bigger size institutions. These results are the opposite for the depth of outreach regression (when MSBA used), in line with our expectations. In this context, it could be said that larger sized institutions are not reaching more people; instead, as they get bigger, they shift their objective towards commercialization. The time indicator 'year' (which is equivalent to adding the 'age' variable into the regressions) is significant, and mature firms have a significant impact in breadth of outreach, but not with the depth of outreach. These latter findings are consistent with those of Hartarska (2005) and Hudon (2010).

Table 5.1: Outreach indicators regressions for social performance

|  | Breadth of outreach indicators |                     |      | Depth of outreach indicators |                   |                      |
|--|--------------------------------|---------------------|------|------------------------------|-------------------|----------------------|
|  | LNAB                           | MSB                 | MSBA | ALBPBG                       | PFBs              | MSBA                 |
| Year                                   | -0.303<br>(-1.56)              | 0.001**<br>(2.29)   |      | -0.004<br>(-0.31)            | 0.012*<br>(1.75)  | -2.822***<br>(-6.57) |
| Dummy of mature institutions           | 0.188**<br>(3.03)              | 0.001*<br>(1.69)    |      | -0.025<br>(-0.95)            | 0.010<br>(0.71)   | 1.372<br>(1.35)      |
| Log of assets                          | 0.738***<br>(11.78)            | 0.002***<br>(3.76)  |      | 0.004<br>(0.34)              | -0.005<br>(-0.82) | -2.668**<br>(-3.05)  |
| Log of real GDP                        | 0.278<br>(0.67)                | -0.015**<br>(-2.40) |      | 0.084<br>(0.30)              | -0.184<br>(-1.45) | 55.127***<br>(6.07)  |
| Inflation                              | 0.017***<br>(3.60)             | 0.0001**<br>(2.47)  |      | -0.002<br>(-0.96)            | 0.002<br>(1.35)   | 0.214***<br>(3.45)   |
| Portfolio at risk greater than 30 days | 0.014<br>(0.40)                | 0.001<br>(1.27)     |      | -0.025<br>(-1.50)            | -0.012<br>(-0.93) | -0.380<br>(-1.15)    |
| Operating expense ratio                | -0.521***<br>(-7.36)           | 0.0004<br>(0.93)    |      | 0.041<br>(1.08)              | -0.015<br>(-0.95) | -2.418**<br>(-2.42)  |
| Capital to assets ratio                | 0.068<br>(0.05)                | 0.001<br>(0.80)     |      | -0.403<br>(-1.23)            | 0.387<br>(1.44)   | -2.355<br>(-1.19)    |
| No. of observations                    | 1488                           | 1486                |      | 1486                         | 1453              | 1475                 |
| No. of cross sections                  | 341                            | 341                 |      | 340                          | 341               | 337                  |
| Adj. R <sup>2</sup>                    | 0.97                           | 0.80                |      | 0.91                         | 0.86              | 0.68                 |
| Redundant Fixed effect test (P-value)  | 0.000                          | 0.000               |      | 0.000                        | 0.000             | 0.000                |

Note: The dependent variables are each of the outreach indicators (logarithm of number of active borrowers (LNAB), market share of the number of borrowers (MSB), average loan balance per borrowers divided by GNI (ALBPBG), percentage of female borrowers (PFBs), and market share of the number of borrowers adjusted by market share of assets (MSBA)). Fixed effects estimates used for panel data and standard errors are robust to clusters. T-statistics are provided in parentheses below coefficient estimates. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% levels, respectively.

The macroeconomic variables results demonstrate the importance of controlling for cross-country differences. Among them, the impact of the logarithm of real GDP is negative and significant for breadth of outreach measure, comparable with Bassem (2009) and Ashraf and Hassan (2011). It also has a positive significant impact on the depth of outreach measure. MFIs are reaching more borrowers in a higher inflationary environment as the level of inflation has a positive and significant impact in all specifications of breadth and depth of outreach regressions, consistent with the findings of Hartarska (2005) and Bassem (2009). The positive values might also indicate that even in a high inflation environment, MFIs can manage to reach more borrowers.

Among the performance ratios, we expect risk and cost ratios to be compatible with social performance, such that a higher value of these ratios indicates stronger social performance of MFIs. We chose PAR30 and operating expense ratios from the risk and cost ratios, but did not find significant results for the risk ratio in any regression. However, expense ratio appears negative and significant in the depth of outreach regression, indicating that an additional percentage point increase of operating expense ratio is associated with a 2.42% decrease in the market share of the number of borrowers, adjusted by market share of assets. This result is contrary to our expectation that depth of outreach is positively linked with cost ratios. Could it be that higher costs necessitate higher intermediation margins, which would not be sustainable for larger loans (with the effect thus reflected in lower reported depth of outreach)?

Contrary to our expectations, we find capital ratio has a positive impact in breadth of outreach and has a negative impact in depth of outreach regression; however, we cannot comment further as neither coefficient is significant. Reasonably high proportions of the

variations in the two new outreach indicators are explained by the usual determinants of social performance and so the two new indicators may be considered in empirical studies. They reflect market shares which have not been considered in the literature hitherto. All significant variables have impacts according to our expectations in regressions of breadth of outreach and financial sustainability, but depth of outreach produced opposite signs from our expectations, except for inflation and age indicators.

To check the robustness of our results, we run the model for the different combinations of explanatory variables, and the corresponding results are summarised in Tables 5.2, 5.3 and 5.4. Table 5.2 presents the breadth of outreach results using number of active borrowers. Results from breadth and depth of outreach using new indicators are compiled in Tables 5.3 and 5.4. The findings are mostly consistent with Table 5.1 and show that risk and capital ratios are not significant in any specification of breadth and depth of outreach. The operating expense ratio is negative and significant in both depth and breadth of outreach (Table 5.2 and Table 5.4).

The summary of this section is combined with a trade-off evaluation, and presented at the end of section 5.2.

Table 5.2: Breadth of outreach indicator: Number of active borrowers

|  | (I)                 | (II)                | (III)                | (IV)                | (V)                  | (VI)                | (VII)                | (VIII)               |
|--|---------------------|---------------------|----------------------|---------------------|----------------------|---------------------|----------------------|----------------------|
| Year                                   | -0.032<br>(-1.45)   | -0.036<br>(-1.62)   | -0.037*<br>(-1.77)   | -0.037*<br>(-1.70)  | -0.031<br>(-1.61)    | -0.040*<br>(-1.85)  | -0.037*<br>(-1.81)   | -0.303<br>(-1.56)    |
| Dummy of mature institutions           | 0.186**<br>(2.95)   | 0.178**<br>(2.85)   | 0.172**<br>(2.72)    | 0.173**<br>(2.73)   | 0.190**<br>(3.06)    | 0.177**<br>(2.84)   | 0.172**<br>(2.72)    | 0.188**<br>(3.03)    |
| Log of assets                          | 0.823***<br>(14.92) | 0.811***<br>(14.50) | 0.754***<br>(12.69)  | 0.830***<br>(14.87) | 0.738***<br>(11.73)  | 0.805***<br>(14.25) | 0.752***<br>(12.72)  | 0.738***<br>(11.78)  |
| Log of real GDP                        | 0.259<br>(0.57)     | 0.185<br>(0.37)     | 0.442<br>(1.02)      | 0.303<br>(0.65)     | 0.293<br>(0.69)      | 0.281<br>(0.56)     | 0.458<br>(1.08)      | 0.278<br>(0.67)      |
| Inflation                              | 0.006<br>(0.87)     | 0.186**<br>(3.27)   | 0.012**<br>(2.66)    | 0.006<br>(0.92)     | 0.016***<br>(3.52)   | 0.019***<br>(3.40)  | 0.012**<br>(2.74)    | 0.017***<br>(3.60)   |
| Portfolio at risk greater than 30 days |                     | 0.055<br>(1.11)     |                      |                     | 0.019<br>(0.52)      | 0.035<br>(0.81)     |                      | 0.014<br>(0.40)      |
| Operating expense ratio                |                     |                     | -0.489***<br>(-6.20) |                     | -0.522***<br>(-7.51) |                     | -0.482***<br>(-6.02) | -0.521***<br>(-7.36) |
| Capital to assets ratio                |                     |                     |                      | -0.158<br>(-0.80)   |                      | -0.147<br>(-0.68)   | -0.053<br>(-0.35)    | 0.092<br>(0.53)      |
| No. of observations                    | 2099                | 1819                | 1626                 | 2081                | 1489                 | 1809                | 1625                 | 1488                 |
| Cross sections                         | 363                 | 353                 | 351                  | 363                 | 341                  | 353                 | 351                  | 341                  |
| Adj. R <sup>2</sup>                    | 0.96                | 0.96                | 0.97                 | 0.96                | 0.97                 | 0.96                | 0.97                 | 0.97                 |
| Redundant Fixed effect (P-value)       | 0.000               | 0.000               | 0.000                | 0.000               | 0.000                | 0.000               | 0.000                | 0.000                |

Note: The dependent variable is the 'market share of the number of active borrowers'. Fixed effects estimates used for panel data and standard errors are robust to clusters. T-statistics are provided in parentheses below coefficient estimates. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% levels, respectively.

**Table 5.3: Breadth of outreach indicator: Market share of the number of borrowers**

|  | (I)                 | (II)                | (III)               | (IV)                | (V)                 | (VI)                | (VII)              | (VIII)              |
|--|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|--------------------|---------------------|
| Year                                   | 0.001**<br>(2.28)   | 0.001**<br>(2.68)   | 0.001<br>(1.64)     | 0.001**<br>(2.27)   | 0.001**<br>(2.18)   | 0.001**<br>(2.76)   | 0.001**<br>(1.75)  | 0.001**<br>(2.29)   |
| Dummy of mature institutions           | 0.002**<br>(2.10)   | 0.002*<br>(1.86)    | 0.002*<br>(1.73)    | 0.002**<br>(2.09)   | 0.001*<br>(1.70)    | 0.002*<br>(1.86)    | 0.001*<br>(1.72)   | 0.001*<br>(1.69)    |
| Log of assets                          | 0.001**<br>(3.31)   | 0.001***<br>(3.88)  | 0.002***<br>(3.48)  | 0.001***<br>(3.27)  | 0.002***<br>(3.80)  | 0.001***<br>(3.77)  | 0.002***<br>(3.44) | 0.002***<br>(3.76)  |
| Log of real GDP                        | -0.013**<br>(-2.12) | -0.016**<br>(-2.64) | -0.011*<br>(-1.73)  | -0.013**<br>(-2.14) | -0.014**<br>(-2.27) | -0.016**<br>(-2.74) | -0.012*<br>(-1.86) | -0.015**<br>(-2.40) |
| Inflation                              | 0.0001**<br>(2.15)  | 0.0001**<br>(2.35)  | 0.0001***<br>(2.42) | 0.0001**<br>(2.16)  | 0.0001**<br>(2.42)  | 0.0001**<br>(2.39)  | 0.0001**<br>(2.47) | 0.0001**<br>(2.47)  |
| Portfolio at risk greater than 30 days | 0.001<br>(1.34)     | 0.001<br>(1.34)     |                     |                     | 0.001<br>(1.29)     | 0.001<br>(1.31)     |                    | 0.001<br>(1.27)     |
| Operating expense ratio                |                     |                     | 0.0002<br>(0.35)    |                     | 0.0005<br>(1.08)    |                     | 0.0001<br>(0.22)   | 0.0004<br>(0.93)    |
| Capital to assets ratio                |                     |                     |                     | -0.00004<br>(-0.00) |                     | 0.0004<br>(0.63)    | 0.001<br>(0.62)    | 0.001<br>(0.80)     |
| No. of observations                    | 2097                | 1817                | 1624                | 2079                | 1487                | 1807                | 1623               | 1486                |
| Cross sections                         | 363                 | 353                 | 351                 | 363                 | 341                 | 353                 | 351                | 341                 |
| Adj. R <sup>2</sup>                    | 0.76                | 0.78                | 0.79                | 0.76                | 0.80                | 0.78                | 0.79               | 0.80                |
| Redundant Fixed effect test (P-value)  | 0.000               | 0.000               | 0.000               | 0.000               | 0.000               | 0.000               | 0.000              | 0.000               |

Note: The dependent variable is the 'market share of the number of active e borrowers'. Fixed effects estimates used for panel data and standard errors are robust to clusters. T-statistics are provided in parentheses below coefficient estimates. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% levels, respectively.

Table 5.4: Depth of outreach indicator: Market share of the number of borrowers adjusted

|  | (I)                  | (II)                 | (III)                | (IV)                 | (V)                  | (VI)                 | (VII)                | (VIII)               |
|--|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Year                                   | -2.625***<br>(-6.38) | -2.674***<br>(-6.12) | -2.816***<br>(-6.61) | -2.660***<br>(-6.36) | -2.786***<br>(-6.50) | -2.688***<br>(-6.08) | -2.866***<br>(-6.71) | -2.822***<br>(-6.57) |
| Dummy of mature institutions           | 0.848<br>(1.05)      | 1.060<br>(1.21)      | 1.213<br>(1.23)      | 0.785<br>(0.96)      | 1.389<br>(1.35)      | 1.039<br>(1.18)      | 1.210<br>(1.24)      | 1.372<br>(1.35)      |
| Log of assets                          | -1.763***<br>(-3.57) | -1.896**<br>(-3.18)  | -2.482**<br>(-3.13)  | -1.754***<br>(-3.37) | -2.614**<br>(-3.00)  | -1.936**<br>(-3.14)  | -2.538**<br>(-3.20)  | -2.668**<br>(-3.05)  |
| Log of real GDP                        | 50.482***<br>(6.13)  | 51.395***<br>(5.72)  | 54.606***<br>(6.27)  | 50.992***<br>(6.00)  | 54.072***<br>(6.04)  | 51.853***<br>(5.63)  | 55.824***<br>(6.31)  | 55.127***<br>(6.07)  |
| Inflation                              | 0.135**<br>(2.35)    | 0.177**<br>(3.05)    | 0.196**<br>(3.21)    | 0.140**<br>(2.47)    | 0.205**<br>(3.23)    | 0.184**<br>(3.20)    | 0.203**<br>(3.39)    | 0.214***<br>(3.45)   |
| Portfolio at risk greater than 30 days |                      | -0.162<br>(-0.47)    |                      |                      | -0.232<br>(-0.67)    | -0.327<br>(-0.99)    |                      | -0.380<br>(-1.15)    |
| Operating expense ratio                |                      |                      | -2.573**<br>(-2.67)  |                      | -2.712**<br>(-2.60)  |                      | -2.251**<br>(-2.44)  | -2.418**<br>(-2.42)  |
| Capital to assets ratio                |                      |                      |                      | -1.313<br>(-0.66)    |                      | -0.841<br>(-0.40)    | -2.739<br>(-1.40)    | -2.355<br>(-1.19)    |
| No. of observations                    | 2081                 | 1803                 | 1613                 | 2063                 | 1476                 | 1793                 | 1612                 | 1475                 |
| Cross sections                         | 360                  | 350                  | 347                  | 360                  | 337                  | 350                  | 347                  | 337                  |
| Adj. R <sup>2</sup>                    | 0.71                 | 0.70                 | 0.69                 | 0.71                 | 0.68                 | 0.70                 | 0.70                 | 0.68                 |
| Redundant Fixed effect test (P-value)  | 0.000                | 0.000                | 0.000                | 0.000                | 0.000                | 0.000                | 0.000                | 0.000                |

Note: The dependent variable is the 'market share of the number of active borrowers adjusted'. Fixed effects estimates used for panel data and standard errors are robust to clusters. T-statistics are provided in parentheses below coefficient estimates. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% levels, respectively.

## 5.2. Trade-off Analysis in Social and Financial Objectives

Next, we estimate the regression models defined in Equation 4.2, with the results summarised in Tables 5.5 to 5.8. Table 5.5 presents the estimation results compared to both the social and financial objectives. Social objectives are measured with a breadth of outreach indicator, MSB, and a depth of outreach indicator, MSBA, while financial objectives are measured with an OSS indicator. The focus of this performance analysis is to evaluate the trade-off between social and financial objectives of South Asian MFIs.

To evaluate the trade-off, as explained in RQ2, we examine the response of dual objectives of MFIs using performance ratios. If the response is opposite, this shows the existence of trade-off; otherwise, objectives are found to be compatible with each other. It is interesting to note that with the depth of outreach, the financial sustainability objective shows trade-off and compatibility with breadth of outreach. We present the results using pooled data and then categorized into different sub groups according to ownership structure, regulatory structure and the countries in which the MFIs operate, as discussed in section 2.3.

### 5.2.1. Performance of MFIs Related to Dual Objectives

In Table 5.5, we see that MFI-specific variables have a positive significant impact in breadth of outreach and financial sustainability, denoting that social and financial performance improves over time and with bigger institutions. These results are the opposite for depth of outreach (when MSBA is used), in line with our expectation that breadth and depth of outreach are opposite to each other. In a depth of outreach context it might be said that bigger institutions are not reaching more people, but shift their

objective towards commercialisation as they get bigger (for detail see Khan, 2010; Montgomery & Weiss, 2011). The time indicator ‘year’ is significant and firms’ maturity has a significant impact on breadth of outreach but not on depth of outreach. These findings are consistent with those of Hartarska (2005) and Hudon (2010).

Among macroeconomic variables, the impact of the logarithm of real GDP is negative and significant for the breadth of outreach and financial sustainability measures. This is comparable with Bassem (2009) and Ashraf and Hassan (2011) and also according to our expectations. The logarithm of real GDP has a significant positive impact on the depth of outreach measure. The level of inflation has a positive and significant impact on the breadth and depth of outreach, consistent with the findings of Hartarska (2005) and Bassem (2009). The inflation results might imply that even in a high inflation environment, MFIs can manage to reach more borrowers. Among institution and country-specific controls, we find a positive link in breadth of outreach and a negative link in depth of outreach regressions according to our expectation, except for the logarithm of real GDP indicator. That might indicate that when inflation is high, MFIs are expected to operate more efficiently in reaching greater numbers of poor clients and this, in turn, leads to better social performance for MFIs.

The negative values of the operating expense ratio in the depth of outreach and financial sustainability regression indicate that a one percentage point increase of operating expense ratio is associated with a 2.42 percentage decrease in MSBA (depth of outreach) and a 0.29 percentage decrease in OSS (financial sustainability), respectively. This result is again in line with our expectations in case of OSS not for depth of outreach as we expect that more cost is associated with more outreach - depth of outreach and financial sustainability.

Table 5.5: Social and financial performance regressions

| Variables                              | Social performance        |                          | Financial performance |                     |
|--|---------------------------|--------------------------|-----------------------|---------------------|
|  | MSB – breadth of outreach | MSBA – depth of outreach | OSS                   | OSS                 |
| Year                                   | 0.001**<br>(2.29)         | -2.822***<br>(-6.57)     | 0.022<br>(1.40)       | 0.022<br>(1.40)     |
| Dummy of mature institutions           | 0.001*<br>(1.69)          | 1.372<br>(1.35)          | -0.051<br>(-0.98)     | -0.051<br>(-0.98)   |
| Log of assets                          | 0.002***<br>(3.76)        | -2.668**<br>(-3.05)      | 0.060**<br>(2.07)     | 0.060**<br>(2.07)   |
| Log of real GDP                        | -0.015**<br>(-2.40)       | 55.127***<br>(6.07)      | -0.704**<br>(-1.98)   | -0.704**<br>(-1.98) |
| Inflation                              | 0.0001**<br>(2.47)        | 0.214***<br>(3.45)       | -0.002<br>(-0.50)     | -0.002<br>(-0.50)   |
| Portfolio at risk greater than 30 days | 0.001<br>(1.27)           | -0.380<br>(-1.15)        | -0.124<br>(-1.35)     | -0.124<br>(-1.35)   |
| Operating expense ratio                | 0.0004<br>(0.93)          | -2.418**<br>(-2.42)      | -0.291**<br>(-2.72)   | -0.291**<br>(-2.72) |
| Capital to assets ratio                | 0.001<br>(0.80)           | -2.355<br>(-1.19)        | 0.242**<br>(2.30)     | 0.242**<br>(2.30)   |
| No. of observations                    | 1486                      | 1475                     | 1500                  | 1500                |
| Cross sections                         | 341                       | 337                      | 343                   | 343                 |
| Adj. R <sup>2</sup>                    | 0.80                      | 0.68                     | 0.48                  | 0.48                |
| Redundant Fixed effect test (P-value)  | 0.000                     | 0.000                    | 0.000                 | 0.000               |

Note: The dependent variables for social performance are ‘market share of the number of borrowers’, ‘market share of the number of borrowers adjusted by market share of assets’. The dependent variable used for financial performance is ‘operational self-sufficiency’. MFIs’ specific characteristics and country specific characteristics are reported as a basic model enlisted before performance ratios. Fixed effects estimates used for panel data and standard errors are robust to clusters. T-statistics are provided in parentheses below coefficient estimates. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% levels, respectively.

For depth of outreach, these findings are consistent with the findings of Hermes et al. (2011) and with Cull et al. (2007), who also find the same link and conclude that social performance is associated with lower average operating expenses. The operating expense ratio appears consistently negative and significant in almost all regressions of depth of outreach and financial sustainability. The capital to assets ratio also shows a positive link with financial sustainability, which is again in line with our expectation that higher capital strengthens the financial sustainability objectives of MFIs.

Summarising the overall findings, stronger financial and social performance are associated with higher capital, and it tends to decrease while introducing riskier and costly loans. The results also suggest that control variables of institutional and country-specific variables influence the social objective of MFIs more than their financial objective.

### **5.2.2. Split Sample Regressions**

To check the robustness of our earlier regression results (Table 5.5), we split our data sample into different sub-categories as suggested by Bert et al. (2011) and Mersland and Strom (2009). We categorize the MFIs as profit-oriented and non-profit-oriented institutions (Table 5.6), regulated and non-regulated institutions (Table 5.7), and Indian and other countries' institutions (Table 5.8). Overall, we conclude that our results are quite consistent with results for the full sample. Moreover, as we split our sample into different sub-groups to examine the difference between the coefficients in each pair of sub samples, we conduct the Chow test, which is used to test whether the coefficients in two different groups using different data sets are equal. We find strong evidence that each

sub-sample has a significantly different impact on outreach and financial sustainability indicators than their counterparts.

Before discussing the regression results, we explain the link of social and financial indicators in different sub-samples to the descriptive statistics presented in Table 3.5. We find regulated and profit-oriented MFIs have greater depth and breadth of outreach but lower financial sustainability than their counterparts. South Asian MFIs outside India have higher social and financial performance than Indian MFIs. Regulated and profit-oriented MFIs have the expected higher breadth of outreach. Non-regulated MFIs have an unexpected lower depth of outreach and higher financial sustainability; similarly, non-profit-oriented MFIs have an unexpected high financial sustainability but lower depth of outreach.

We do not find the trade-off in dual objectives in different sub-samples of MFIs either. In fact, we find significant differences in these ratios. For example, the average values of financial ratios of PAR30, OER and CAR are significantly higher in non-regulated and profit-oriented sub samples in comparison to their counterparts. Not only do non-regulated MFIs have higher and riskier loan portfolios as expected but, interestingly, they have more capital, contrary to our expectations. The average capital ratio for the regulated MFIs is 0.18 and for non-regulated MFIs, 0.31. While profit-oriented MFIs have higher riskier and costly loans, these average capital ratios are not according to expectation.

These mean values probably show the specific characteristics of South Asian MFIs, and it seems that non-profit-oriented MFIs are not sacrificing business opportunities in order to meet social objectives. However, the difference in performance is minimal. For

example, the average expense ratio for the profit-oriented MFIs is 0.21 and for non-profit-oriented MFIs is 0.20 and the difference is statistically significant. The sub-group of South Asian countries excluding India have more costly microfinance business but, at the same time, they have more capital. Another point to note is that the difference between these ratios is not significant in last sub-group of South Asian countries; therefore, we cannot say that Indian MFIs are managed in a more cost effective way than other South Asian MFIs.

From Table 3.5, it can also be seen from the average values of the sub-samples that MFIs in regulated, non-profit-oriented and South Asian countries excluding India appear to be older (more than 70%) in comparison to their counterparts in the data samples. On average, mature MFIs comprise 71% of all data samples. It can also be seen that those MFIs (in the case of non-regulated, profit-oriented and other countries) that have greater average values in performance ratios also appear to be larger in size in comparison to their counterparts. Such difference is as expected as the size of the institution and associated input costs are comparatively higher for profit-oriented, regulated and other countries' MFIs. In contrast, the size of the institution, as measured by total assets of non-profit-oriented, regulated and Indian MFIs, is significantly lower as these institutions are smaller in size and constrained by local resources to expand their performance in financial objectives. For robustness, we regress these performance ratios and control variables on breadth, depth and financial sustainability indicators as presented in detail below.

### 5.2.2.1. Sub-sample of Profit-oriented and Non-profit-oriented MFIs

In Table 5.6, the findings of the social and financial performance of the sub groups of profit-oriented and non-profit-oriented MFIs are presented, and are mostly consistent with pooled sample (Table 5.5). In performance ratios, PAR30 has a negative impact for non-profit-oriented MFIs and CAR has a positive impact for profit-oriented MFIs, but for financial sustainability regressions only. The negative relationship of PAR30 with non-profit-oriented MFIs might suggest that the financial sustainability of these MFIs decreases because of adopting riskier loans, suggesting the importance of the ownership structure of MFIs. For depth of outreach, we find an opposite link in both of these types of MFIs although the link is not significant.

The risk ratio results are according to our expectations that having more risky loans negatively impacts the financial sustainability of non-profit-oriented MFIs compared to their counterparts. The positive impact of capital ratio shows that profit-oriented MFIs have more capital which strengthens their financial performance. The capital ratio results are also according to our expectations that profit-oriented MFIs have access to more capital, positively impacting their financial sustainability compared to non-profit-oriented MFIs. Overall, we do not find any significant difference in these ownership types, consistent with the findings of Mersland and Strom (2009). OER is negative except in the case of the profit-oriented sub-group for breadth of outreach. This might imply that profit-oriented MFIs reach more borrowers, as expected, in a more cost effective manner than non-profit-oriented MFIs. These findings are contrary to Mersland (2009), who finds that the costs of microfinance are generally higher for shareholder-owned firms than non-profit-oriented MFIs.

Table 5.6: Performance of profit-oriented vs non-profit-oriented MFIs

|  | MSB – breadth of outreach |                     | MSBA – depth of outreach |                      | OSS - financial performance |                      |
|--|---------------------------|---------------------|--------------------------|----------------------|-----------------------------|----------------------|
|  | Profit-oriented           | Non-profit-oriented | Profit-oriented          | Non-profit-oriented  | Profit-oriented             | Non-profit-oriented  |
| Year                                   | 0.001**<br>(2.00)         | 0.001*<br>(1.95)    | -3.433***<br>(-4.74)     | -2.474***<br>(-4.82) | 0.034*<br>(1.90)            | -0.006<br>(-0.25)    |
| Dummy of mature institutions           | 0.002<br>(1.30)           | 0.0003<br>(0.23)    | 2.960<br>(1.47)          | 0.346<br>(0.32)      | -0.038<br>(-0.64)           | -0.042<br>(-0.48)    |
| Log of assets                          | 0.002**<br>(3.21)         | 0.001**<br>(2.15)   | -1.035<br>(-1.37)        | -4.308**<br>(-3.00)  | 0.144***<br>(4.42)          | -0.007<br>(-0.17)    |
| Log of real GDP                        | -0.014<br>(-1.60)         | -0.015**<br>(-2.16) | 51.710***<br>(4.06)      | 57.934***<br>(4.61)  | -1.513***<br>(-3.75)        | 0.194<br>(0.37)      |
| Inflation                              | 0.0001*<br>(1.80)         | 0.0001**<br>(2.07)  | 0.119<br>(1.52)          | 0.347***<br>(3.79)   | -0.006<br>(-1.38)           | 0.004<br>(0.82)      |
| Portfolio at risk greater than 30 days | 0.0004<br>(0.99)          | 0.001<br>(1.40)     | 0.168<br>(0.52)          | -1.538<br>(-0.82)    | -0.054<br>(-0.85)           | -0.507***<br>(-4.61) |
| Operating expense ratio                | 0.001**<br>(2.39)         | -0.0003<br>(-0.59)  | -1.774*<br>(-1.84)       | -2.332<br>(-1.21)    | -0.133**<br>(-2.94)         | -0.867**<br>(-2.32)  |
| Capital to assets ratio                | -0.001<br>(-0.51)         | 0.001<br>(1.04)     | 0.174<br>(0.07)          | -3.540<br>(-1.08)    | 0.187*<br>(1.70)            | 0.226<br>(1.63)      |
| No. of observations                    | 533                       | 953                 | 531                      | 944                  | 537                         | 963                  |
| Cross sections                         | 105                       | 236                 | 104                      | 233                  | 106                         | 237                  |
| Adj. R <sup>2</sup>                    | 0.83                      | 0.76                | 0.71                     | 0.68                 | 0.65                        | 0.45                 |
| Redundant Fixed effect test (P-value)  | 0.000                     | 0.000               | 0.000                    | 0.000                | 0.000                       | 0.000                |
| Sub-group difference (P-value)         | 0.000                     | 0.000               | 0.000                    | 0.000                | 0.000                       | 0.000                |

Note: The dependent variables are MSB (proxy of breadth of outreach), MSBA (proxy of depth of outreach) and OSS (proxy of financial sustainability). Data sample of profit-oriented, non-profit-oriented institutions are reported. Fixed effects estimates are used for panel data and standard errors are robust to clusters. T-statistics are provided in parentheses below coefficient estimates. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% levels, respectively.

The size of the institutions, measured using log of assets, has a positive impact in almost all regressions except for depth of outreach for the non-profit-oriented group. This positive impact of size of MFIs is expected as large firms have the ability to accommodate risk and to enhance productivity through diversification of their products and services. This may be due to microfinance businesses expanding by creating new branches across the South Asia region, increasing the opportunity to get close to customers and, thus, making them more profitable. However, the negative impact of size on outreach could be explained by the fact that size does not necessarily ensure outreach if this is not put to efficient use. Thus, the implications are that most MFIs in South Asia are not utilizing their size to enhance their depth of outreach. These findings are in line with Kyereboah-Coleman and Osei (2008).

Size of country also has a positive impact in almost all regressions except for breadth of outreach (non-profit-oriented MFIs) and financial sustainability (profit-oriented MFIs). This might imply that big economies neither strengthened financially the profit-oriented MFIs nor helping non-profit-oriented MFIs to reach more borrowers but at the same time, the size of an economy is helping these institutions to achieve depth of outreach objective. Overall, MFIs' performance ratios show that profit-oriented and non-profit-oriented MFIs are similar relative to the financial sustainability objective, but profit-oriented MFIs have more impact on social performance than non-profit-oriented MFIs.

#### **5.2.2.2. Sub-sample of Regulated and Non-regulated MFIs**

Table 5.7 summarizes the findings of social and financial performance for regulated and non-regulated MFIs that are mostly consistent with the pooled sample (Table 5.5). We

compare the results among these sub-groups for the social (breadth and depth of outreach) and financial objectives of MFIs, respectively. Among performance ratios, only PAR30, negatively, and CAR, positively, impact the financial sustainability of non-regulated MFIs; more risky loans decrease, but more capital strengthens the financial sustainability of non-regulated MFIs. This might imply that the financial sustainability of non-regulated MFIs decreases because of adopting riskier loans, so we suggest that regulations should tackle this problem of strengthening an institution's financial position without changing their social objective of providing credit to the poor — a costly and riskier segment of the economy. The risk ratio results are according to our expectations that non-regulated MFIs having riskier loans may not be more financial sustainable than regulated MFIs, although this is contrary to the findings of Mersland and Strom (2008).

The positive impact of capital shows that non-regulated MFIs have more capital, which might be because more subsidies have strengthened their financial objective. The capital ratio results are contrary to our expectations that non-regulated MFIs with fewer potential sources of capital may not achieve more financial sustainability than regulated MFIs. These findings confirm the results of Hartarska and Nadolnyak (2007), who could not find a positive link between regulation and MFI financial results when considering capitalization and regulatory status. The positive coefficient for CAR might indicate that MFIs develop a business model that has a capital level equalling or better than regulated MFIs. As we find insignificant results in regulated regressions for financial sustainability, we cannot comment for sure.

OER shows a negative impact in almost all financial and social (depth of outreach) performance models, except for non-regulated MFIs for depth of outreach. This again is according to our expectations that regulated MFIs are not managed in a more cost-

effective manner. The positive relationship shows that expensive loans are actually reaching the real poor and that MFIs are sacrificing financial sustainability to achieve this. The coefficients of these performance ratios are not significant in most social performance regressions; in fact, very few significant results were obtained, indicating that it is difficult to pick the best type of regulatory structure. However, as the Chow test proves that the coefficients of these sub-groups are different, it might seem that these results confirm the findings of Cull et al. (2011), who say that the operating cost levels for the two groups of regulated and non-regulated MFIs are not significantly different from one another in terms of breadth of outreach and financial sustainability.

Among the control variables, institutions' size appears to be a positive performance indicator for both sub groups for financial sustainability and has a positive (negative) impact in breadth (depth) of outreach of regulated MFIs. Therefore, it seems that the regulation of MFIs helps them achieve both financial sustainability and social (breadth of outreach) objectives, but they are not reaching the real poor (negative relationship in case of depth of outreach). Being mature institutions has no difference for financial sustainability as we do not find significant results for this variable except for regulated MFIs in depth and breadth of outreach where it has a positive impact. This might show that regulated MFIs manage to reach the real poor (depth of outreach) as they get mature: in our case, age matters more than assets in achieving social objectives, especially in depth of outreach.

These findings are in line with Kyereboah-Coleman and Osei (2008) but contrary to Hartarska and Nadolnyak (2007), who found that regulatory involvement does not directly affect performance. The size of the economy has a positive (negative) impact for

the depth of outreach (financial sustainability) of regulated MFIs and negative in the case of non-regulated MFIs for depth of outreach. This might imply that big economies do not need the microfinance business to be strengthened financially, but they are helping to reach more poor if the institutions are regulated. Overall, the performance ratios show that non-regulated MFIs impact more in the financial sustainability objective than regulated MFIs, but differences in the social performance in both of these sub-samples of MFIs were less important.

### 5.2.2.3. Sub-sample of MFIs in India and other South Asian countries

Table 5.8 presents the findings for social and financial performance for the sub-groups of MFIs in India and other South Asian countries. In terms of financial ratios, we find that PAR30 has a negative effect on financial performance for the other countries group. CAR is positively linked with Indian MFIs in the financial sustainability regression. Furthermore, consistent with our pooled sample (Table 5.5), OER is negatively linked, except in the case of Indian MFIs for breadth of outreach. The results might imply that MFIs in South Asian countries, other than India, are managed in a more cost-effective manner than Indian MFIs. The positive link of CAR shows that capital has a stronger impact on Indian MFIs than their counterparts. Among control variables, age has no difference for any sub group regressions as we do not find any significant results in *DMATURE* variable. The size of institutions, using LAST, shows a positive impact in all models, except in the case of depth of outreach for Indian MFIs and the other South Asian countries group in case of financial sustainability.

Table 5.7: Performance of regulated vs non-regulated MFIs

|  | MSB – breadth of outreach |                      | MSBA – depth of outreach |                   | OSS - financial performance |                      |
|--|---------------------------|----------------------|--------------------------|-------------------|-----------------------------|----------------------|
|  | Regulated                 | Non-regulated        | Regulated                | Non-regulated     | Regulated                   | Non-regulated        |
| Year                                   | 0.0004<br>(0.99)          | 0.002***<br>(4.04)   | -3.185***<br>(-6.48)     | -0.291<br>(-0.63) | 0.036**<br>(2.08)           | 0.007<br>(0.36)      |
| Dummy of mature inst.                  | 0.002*<br>(1.66)          | 0.0003<br>(0.40)     | 2.446*<br>(1.74)         | -0.050<br>(-0.07) | -0.064<br>(-0.99)           | -0.005<br>(-0.10)    |
| Log of assets                          | 0.002***<br>(4.24)        | 0.001<br>(1.54)      | -3.337**<br>(-3.04)      | 0.436<br>(0.79)   | 0.068*<br>(1.80)            | 0.062***<br>(2.34)   |
| Log of real GDP                        | -0.008<br>(-1.05)         | -0.041***<br>(-3.84) | 64.694***<br>(6.40)      | -4.928<br>(-0.45) | -1.213**<br>(-2.90)         | -0.280<br>(-0.59)    |
| Inflation                              | 0.0001*<br>(1.88)         | 0.0002***<br>(2.41)  | 0.193**<br>(2.72)        | 0.295**<br>(2.66) | 0.0001<br>(0.02)            | -0.002<br>(-0.35)    |
| Portfolio at risk greater than 30 days | 0.001<br>(1.19)           | -0.0003<br>(-0.37)   | -0.479<br>(-1.62)        | -0.095<br>(-0.04) | -0.080<br>(-1.08)           | -0.474***<br>(-4.16) |
| Operating expense ratio                | 0.001<br>(1.44)           | 0.0005<br>(0.18)     | -3.083**<br>(-2.51)      | 7.380**<br>(3.36) | -0.271**<br>(-2.54)         | -1.322***<br>(-5.94) |
| Capital to assets ratio                | 0.001<br>(1.27)           | -0.002<br>(-0.46)    | -1.874<br>(-0.92)        | -0.337<br>(-0.11) | 0.134<br>(1.51)             | 1.095***<br>(5.83)   |
| No. of observations                    | 998                       | 488                  | 989                      | 486               | 1009                        | 491                  |
| Cross sections                         | 220                       | 121                  | 217                      | 120               | 221                         | 122                  |
| Adj. R <sup>2</sup>                    | 0.78                      | 0.86                 | 0.69                     | 0.72              | 0.45                        | 0.74                 |
| Redundant Fixed effect test (P-value)  | 0.000                     | 0.000                | 0.000                    | 0.000             | 0.000                       | 0.000                |
| Sub-group difference (P-value)         | 0.000                     | 0.000                | 0.000                    | 0.000             | 0.000                       | 0.000                |

Note: The dependent variables are MSB (proxy of breadth of outreach), MSBA (proxy of depth of outreach) and OSS (proxy of financial sustainability). Data sample of regulated and non-regulated institutions are reported. Fixed effects estimates are used for panel data and standard errors are robust to clusters. T-statistics are provided in parentheses below coefficient estimates. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% levels, respectively.

Table 5.8: Performance of MFIs in Indian vs other South Asian countries

|  | MSB – breadth of outreach |                      | MSBA – depth of outreach |                      | OSS - financial performance |                     |
|--|---------------------------|----------------------|--------------------------|----------------------|-----------------------------|---------------------|
|  | Indian                    | Other countries      | Indian                   | Other countries      | Indian                      | Other countries     |
| Year                                   | 0.0001<br>(0.19)          | 0.001***<br>(3.72)   | 0.716<br>(1.21)          | -2.251***<br>(-5.10) | -0.015<br>(-0.39)           | 0.037<br>(1.57)     |
| Dummy of mature institutions           | 0.001<br>(0.86)           | 0.002<br>(1.30)      | 0.843<br>(1.29)          | 0.747<br>(0.39)      | -0.035<br>(-0.78)           | -0.057<br>(-0.52)   |
| Log of assets                          | 0.002***<br>(3.61)        | 0.001*<br>(1.92)     | -1.320<br>(-1.41)        | -6.149***<br>(-3.74) | 0.1127***<br>(3.55)         | -0.038<br>(-0.82)   |
| Log of real GDP                        | -0.004<br>(-0.41)         | -0.021***<br>(-3.04) | -7.074<br>(-1.10)        | 57.248***<br>(5.00)  | -0.648<br>(-1.02)           | -0.531<br>(-0.98)   |
| Inflation                              | 0.0001<br>(1.32)          | 0.0001*<br>(1.75)    | 0.076<br>(0.92)          | 0.306***<br>(4.33)   | 0.006<br>(0.75)             | -0.005<br>(-1.32)   |
| Portfolio at risk greater than 30 days | 0.001<br>(1.16)           | 0.003<br>(1.53)      | -0.151<br>(-0.93)        | 3.613<br>(0.90)      | -0.072<br>(-1.01)           | -0.469**<br>(-3.51) |
| Operating expense ratio                | 0.001**<br>(2.10)         | -0.001<br>(-1.43)    | -0.682<br>(-1.56)        | -3.545*<br>(-1.72)   | -0.162***<br>(-3.12)        | -0.761**<br>(-2.16) |
| Capital to assets ratio                | -0.0003<br>(-0.16)        | 0.001<br>(0.84)      | -2.353<br>(-1.10)        | -2.132<br>(-0.74)    | 0.245**<br>(2.12)           | 0.219<br>(1.55)     |
| No. of observations                    | 654                       | 832                  | 650                      | 825                  | 658                         | 842                 |
| Cross sections                         | 168                       | 173                  | 166                      | 171                  | 169                         | 174                 |
| Adj. R <sup>2</sup>                    | 0.54                      | 0.86                 | 0.66                     | 0.68                 | 0.64                        | 0.45                |
| Redundant Fixed effect test (P-value)  | 0.000                     | 0.000                | 0.000                    | 0.000                | 0.000                       | 0.000               |
| Sub-group difference (P-value)         | 0.005                     | 0.005                | 0.000                    | 0.000                | 0.000                       | 0.000               |

Note: The dependent variables are MSB (proxy of breadth of outreach), MSBA (proxy of depth of outreach) and OSS (proxy of financial sustainability). Data sample of MFIs in India and other South Asian sample countries are reported. Fixed effects estimates are used for panel data and standard errors are robust to clusters. T-statistics are provided in parentheses below coefficient estimates. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% levels, respectively.

### 5.2.3. Synopsis of Social and Financial Performance Analysis

We compare different outreach measures in section 5.1, and the main findings are summarised below. For breadth of outreach using LNAB and MSB indicators, we see that results are mostly as expected. However, MSB regression produces better results as the R-square for LNAB regression is quite high at 97%, indicating a possibly spurious result. We could not carry this LNAB variable for further analysis as it shows high correlation with other explanatory variables, such as LAST. The MSB indicator controls for this problem by simply looking at the market share of the number of borrowers. For depth of outreach, we used ALBPBG, PFBs and MSBA, but did not get any significant results for ALBPBG and PFBs regressions. This may be due to data choice or simply that those indicators do not represent social performance well. However, the MSBA indicator produces better results, mostly in line with our expectations. To get a better understanding of whether our suggested indicators are defining the social performance as expected, we further explore the results individually for each specification.

To evaluate the trade-off, we examine the response of social and financial objectives of MFIs using performance ratios. We find with depth of outreach, the financial sustainability objective shows trade-off and compatibility with breadth of outreach. Summarising section 5.2, we find that the size of MFIs has a positive and significant impact in almost all models except the non-profit-oriented and other countries sub samples. Moreover, the results show that financial performance is affected by the capital ratio; less leveraged MFIs have better financial sustainability, perhaps suggesting a link between donors' willingness to provide equity to MFIs that do well and preference to extend loans to those MFIs that slack off. Thus, the result conforms to the notions that

MFIs with bigger endowments would be more efficient because they do not need to adjust their mission in order to get additional capital. Overall, these findings indicate that the difference in ownership and regulatory structures of MFIs and among South Asian MFIs operating in different countries is minimal. Comparable findings are suggested in Hartarska & Nadolnyak (2007) and Mersland & Strom (2008).

### **5.3. Social and Financial Efficiency Estimates from DEA Methodology**

Using models from Equations 3.3, 3. 4, 3.5 and 3.8, results are presented as follows. The first DEA stage efficiency scores (bootstrapped and non-bootstrapped) of South Asian MFIs are reported in section 5.3.1, and the impact of governance and gender indicators on these efficiency scores is described in the section 5.3.2, using the truncated bootstrapped regression model.

#### **5.3.1. First Stage Efficiency Estimates**

The average efficiency estimates for all DEA models are reported in Table 5.9 and sub-groups efficiency scores are reported in Table 5.10. In Table 5.9, efficiency scores are categorised as (A) original DEA efficiency estimates before outlier identification, and (B) efficiency estimates of uncontaminated data (after deleting the outliers). In column (C) bias-corrected bootstrap estimates are reported using the uncontaminated data. We find that after deleting the outliers, the efficiency scores increase but decrease after applying the bootstrap technique. Efficiency estimates from traditional DEA models overestimate the TE (technical efficiency) scores that ultimately affects the second stage analysis (Simar & Wilson, 2007).

**Table 5.9: Average DEA efficiency scores**

|                                  | (A)   | (B)   | Diff     | (C)   | Diff    |
|----------------------------------|-------|-------|----------|-------|---------|
|                                  |       |       | (A-B)    |       | (B-C)   |
| <b>Financial</b>                 |       |       |          |       |         |
| BCC-I                            | 0.532 | 0.628 | -0.11*** | 0.563 | 0.06*** |
| BCC-O                            | 0.538 | 0.641 | -0.10*** | 0.595 | 0.05*** |
| CCR-I/O                          | 0.484 | 0.554 | -0.07*** | 0.490 | 0.07*** |
| Input oriented scale efficiency  | 0.921 | 0.890 | 0.03***  | 0.877 | 0.01**  |
| Output oriented scale efficiency | 0.911 | 0.869 | 0.04***  | 0.848 | 0.00*** |
| <b>Social</b>                    |       |       |          |       |         |
| BCC-I                            | 0.507 | 0.508 | -0.01    | 0.444 | 0.06*** |
| BCC-O                            | 0.513 | 0.515 | -0.00    | 0.453 | 0.06*** |
| CCR-I/O                          | 0.452 | 0.454 | -0.00    | 0.392 | 0.06*** |
| Input oriented scale efficiency  | 0.916 | 0.916 | -0.00    | 0.898 | 0.02**  |
| Output oriented scale efficiency | 0.906 | 0.906 | 0.00     | 0.884 | 0.00**  |
| Observations                     | 824   | 808   |          | 808   |         |

Notes: BCC and CCR denote variable returns to scale and constant returns to scale respectively. ‘I’ refers to input-oriented model and ‘O’ refers to output-oriented model. Column A shows efficiency estimates of contaminated data or before deleting outliers, column B shows efficiency estimated after outlier deleted and column C shows bootstrapped efficiency estimates using uncontaminated data. The differences in means are based on the independent t-test.

These results reveal the sensitivity of the efficiency measures to sample variation. The results indicate that we should be careful in making relative comparisons of the performance among different DEA models based on original DEA efficiency scores. For example, the average financial BCC-I<sup>26</sup> has an efficiency score of 0.532 and after deleting the outliers, it increases and we obtain an efficiency score of 0.628 while with the bias corrected bootstrap score is 0.563. Although the difference is less dramatic it is still substantial and statistically significant. Thus we can say with certainty that these different models are significantly different in terms of technical efficiency.

Furthermore, in the first stage analysis, we decompose<sup>27</sup> the financial and social efficiency scores into TE and SE as shown in Table 5.10. Table 5.10 shows that financial

<sup>26</sup> (Banker et al., 1984) - input-oriented model

<sup>27</sup> We have estimated the BCC input (output) oriented models for financial (social) efficiency of MFIs using pooled data. Mean values of these scores are further arranged within the individual sub-samples. These sub-samples are for sample countries that are Bangladesh, India, Nepal, Pakistan and Sri Lanka; for a sample period of eight years from 2005 to 2012; for different ownership structures as non-profit-oriented and profit-oriented MFIs; and for regulatory structure of MFIs. Dyson et al. (2001) highlight the homogeneity assumption with each sub-sample runs in single capacity (each DMU will make an efficiency score by comparing itself with a similar group), as is also done by Sufian (2006). There is not much difference between the economic conditions of South Asian MFIs, so we did not test the sub-samples individually. The results reported in Table 5.10 are only the mean values within the individual sub-samples, being sub-

efficiency is higher than social efficiency in all sub-groups and in the pool data sample<sup>28</sup>. Overall, financial efficiency (technical) is more than 50% and social efficiency is more than 40%; SE remains at almost a similar level (above 80%) for all sub-groups, although it is much higher than TE. We categorized our sub-sample analysis across countries, across years, across ownership and regulatory structure. The efficiency levels in sample countries are according to our expectation that, in spite of working in a similar economic environment, the efficiency levels of South Asian MFIs may vary from each other. As more than 60% of our data sample lies in Bangladesh and India, we compare their scores and find that the social TE of MFIs in Bangladesh is better, while Indian MFIs are better in financial TE and SE. Their difference is small, but it is statistically significant. Overall, MFIs in India and Nepal are more financially technically efficient, and Nepalese and Sri Lankan MFIs are more socially technically efficient. No institution appears efficient in any model for all years consistently (see Table A3.2 in Appendix 3).

The second categorization of our data sample is yearly. SE in different years is similar for both financial and social efficiency. However, financial TE scores show an increasing trend. Social TE remains more or less unchanged from 2005 to 2012. The third categorization of our data sample is according to different ownership structure. We find that non-profit-oriented MFIs are more socially efficient in comparison to profit-oriented MFIs, which are more financially efficient. The last categorization of our data sample is according to regulatory structure of MFIs. While comparing the sub-groups of regulated and non-regulated MFIs, non-regulated MFIs are more socially efficient and regulated

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sets of the population. That means we run the data as a single panel rather than individual sub-samples (for more detail, see Tulkens & Eeckaut, 1995).

<sup>28</sup> Detailed efficiency scores for each MFI are presented in Table A3.2 Appendix 3.

MFI's are more financially efficient. The difference between these sub-samples is significant too.

**Table 5.10: Sub-groups efficiency scores from DEA approach**

|                           | Observations | FBCC-I   | SBCC-O | FSCALE-I | SSCALE-O |
|---------------------------|--------------|----------|--------|----------|----------|
| All sample                | 808          | 0.563    | 0.453  | 0.877    | 0.884    |
| Across country            |              |          |        |          |          |
| Bangladesh                | 216          | 0.528    | 0.465  | 0.842    | 0.859    |
| India                     | 280          | 0.591    | 0.439  | 0.879    | 0.864    |
| Nepal                     | 144          | 0.591    | 0.509  | 0.922    | 0.921    |
| Pakistan                  | 112          | 0.530    | 0.383  | 0.879    | 0.918    |
| Sri Lanka                 | 56           | 0.551    | 0.478  | 0.879    | 0.918    |
| Difference Bang and India |              | -0.06*** | 0.03*  | -0.04*** | -0.00    |
| Across time               |              |          |        |          |          |
| 2005                      | 101          | 0.517    | 0.453  | 0.877    | 0.868    |
| 2006                      | 101          | 0.521    | 0.471  | 0.893    | 0.886    |
| 2007                      | 101          | 0.543    | 0.420  | 0.891    | 0.895    |
| 2008                      | 101          | 0.542    | 0.458  | 0.882    | 0.872    |
| 2009                      | 101          | 0.582    | 0.462  | 0.874    | 0.883    |
| 2010                      | 101          | 0.594    | 0.452  | 0.865    | 0.882    |
| 2011                      | 101          | 0.604    | 0.452  | 0.860    | 0.885    |
| 2012                      | 101          | 0.598    | 0.457  | 0.871    | 0.901    |
| Difference 2005-2012      |              | -0.08*** | -0.00  | 0.01     | -0.03*   |
| Ownership structure       |              |          |        |          |          |
| Profit-oriented           | 280          | 0.590    | 0.443  | 0.869    | 0.885    |
| Non-profit-oriented       | 528          | 0.548    | 0.459  | 0.881    | 0.883    |
| Difference                |              | 0.04***  | -0.02  | -0.01*   | -0.00    |
| Regulatory structure      |              |          |        |          |          |
| Regulated                 | 520          | 0.568    | 0.445  | 0.874    | 0.883    |
| Non-regulated             | 288          | 0.553    | 0.468  | 0.882    | 0.886    |
| Difference                |              | 0.02*    | -0.02* | -0.01    | -0.00    |

Note: FBCC-I denotes financial variable returns to scale using input-oriented model, and SBCC-O denotes social variable returns to scale using output-oriented model. FSCALE-I denotes financial scale efficiency using input-oriented model, and SSCALE-O denotes social scale efficiency using output-oriented model. The differences in means are based on the Mann-Whitney test.

Overall, we can see that South Asian MFIs appear scale efficient, but technically inefficient. Low scores for TE show that MFIs are not utilizing their resources efficiently to generate the required output levels and technical inefficiency is not due to scale inefficiency in these institutions. Comparable efficiency studies from banking literature

in line with these findings are Berger and Humphrey (1991) and Berger, Hunter and Timme (1993).

### **5.3.2. Second Stage Regression Analysis**

Although the first stage efficiency scores are worth presenting on their own, we also seek to identify some key determinants of the differences in MFIs' efficiency scores. In this section, we present the results of the panel data estimations obtained with the truncated bootstrapped regression method for the period of eight years from 2005 to 2012. These estimations aim to identify factors that determine the financial and social efficiency of MFIs. Tables 5.11 and 5.12 provide the results of key drivers of financial and social efficiency, respectively. We hold the control variables fixed and introduce all the other governance and gender indicators in this main set, one at a time, in order to check the stability of the coefficient of these governance and gender measures. The bootstrapped financial and social efficiency scores are dependent variables for Tables 5.11 and 5.12 respectively.

The dominant approach in gender studies seems to be that performance improves with more women in management and on the board (Strøm et al., 2014). This research finds that microfinance efficiency is negatively associated with PFMs (percentage of female board members) and PFBs, and positively associated with more PFOs (percentage of female loan officers) and with better corporate governance (institutional quality variable).

As expected, the internal governance indicator of non-profit-oriented MFIs has a positive impact on social efficiency, while regulated MFIs and PFMs, surprisingly, have a

negative relationship with financial efficiency. This relationship confirms the findings of Mersland and Strøm (2009), where only few internal governance mechanisms are associated with financial performance. An interpretation of these negative results suggests that governance is of little importance for financial performance. The study further shows that among gender indicators, PFOs, as expected, has a positive impact on financial and social efficiency while, surprisingly, female borrowers has a negative impact on both efficiency determinants. Our findings in the case of female borrowers are consistent with Hermes et al. (2011), who also find a negative impact of female borrowers on efficiency (suggesting the presence of a trade-off), and Nawaz (2010), who suggests that MFIs having more female borrowers are efficient only if they are subsidized. However, these findings are contrary to Bassem (2009) and Mersland and Strom (2008).

PFMs shows a negative impact on financial efficiency, contrary to our expectations and the findings of Mersland and Strøm (2009). This shows that microfinance efficiency is enhanced with a female manager, but reduced with more female directors, also in line with microfinance literature (for more detail see Francoeur et al., 2008; Shrader et al., 1997; Smith et al., 2006). Adams and Ferreira (2009) also find that female directors overall have a negative impact upon performance. However, our findings for female managers in general support arguments for high ability among female MFI leaders due to a superior match of tasks. The firm controls show that the firm effects are reasonable, being positive for MFI size in both financial and social regressions.

Table 5.11: Financial efficiency regressions using DEA efficiency estimates

|  | I                  | II                  | III                 | IV                 | V                  | VI                   | VII                 | VIII                | IX                  | X                   | XI                   |
|--|--------------------|---------------------|---------------------|--------------------|--------------------|----------------------|---------------------|---------------------|---------------------|---------------------|----------------------|
| Year   | 0.009***<br>(3.35) | 0.009***<br>(3.57)  | 0.008***<br>(3.050) | 0.010***<br>(3.84) | 0.008***<br>(3.01) | 0.002<br>(0.80)      | 0.004<br>(1.28)     | 0.009***<br>(3.01)  | 0.009***<br>(3.10)  | 0.008***<br>(2.75)  | 0.006**<br>(1.87)    |
| DMATURE  | -0.016<br>(-1.03)  | -0.004<br>(-0.27)   | -0.012<br>(-0.81)   | -0.004<br>(-0.28)  | -0.016<br>(-1.06)  | 0.001<br>(0.05)      | 0.017<br>(0.83)     | -0.016<br>(-1.05)   | -0.021<br>(-1.31)   | -0.025<br>(-1.52)   | 0.002<br>(0.08)      |
| Log of assets  | 0.024***<br>(6.41) | 0.022***<br>(5.86)  | 0.024***<br>(6.34)  | 0.026***<br>(7.20) | 0.023***<br>(6.32) | 0.031***<br>(6.74)   | 0.034***<br>(7.57)  | 0.028***<br>(6.76)  | 0.026***<br>(7.02)  | 0.031***<br>(7.38)  | 0.037***<br>(7.50)   |
| Log of real GDP  | 0.026**<br>(2.05)  | 0.022*<br>(1.68)    | 0.031**<br>(2.43)   | -0.032*<br>(-1.73) | 0.018<br>(1.24)    | 0.051***<br>(3.66)   | -0.031<br>(-1.23)   | 0.017<br>(1.23)     | 0.019<br>(1.44)     | 0.004<br>(0.27)     | -0.077**<br>(-2.77)  |
| Inflation  | -0.003*<br>(-1.73) | -0.004*<br>(-1.80)  | -0.004*<br>(-1.88)  | -0.001<br>(-0.57)  | -0.001<br>(-0.57)  | -0.004*<br>(-1.86)   | -0.002<br>(-0.93)   | -0.004**<br>(-2.06) | -0.004*<br>(-1.78)  | -0.004*<br>(-1.94)  | -0.002<br>(-0.96)    |
| Non-profit-oriented  |                    | -0.028**<br>(-2.47) |                     |                    |                    |                      | -0.006<br>(-0.33)   |                     |                     |                     | -0.003<br>(-0.13)    |
| Regulated  |                    |                     | 0.207**<br>(1.99)   |                    |                    |                      | -0.004<br>(-0.24)   |                     |                     |                     | -0.036**<br>(-2.30)  |
| Control of Corruption  |                    |                     |                     | 0.118***<br>(4.91) |                    |                      | 0.148***<br>(3.96)  |                     |                     |                     | 0.141***<br>(3.70)   |
| Political stability and Absence of violence                  |                    |                     |                     |                    | 0.024<br>(1.59)    |                      | -0.023<br>(-1.08)   |                     |                     |                     | -0.004<br>(-0.15)    |
| Percentage of female board members<br>(average 2008 to 2012) |                    |                     |                     |                    |                    | -0.086***<br>(-3.64) | -0.063**<br>(-2.53) |                     |                     |                     | -0.054*<br>(-1.85)   |
| Percentage of female loan officers (average<br>2008 to 2012) |                    |                     |                     |                    |                    |                      |                     | 0.092***<br>(3.93)  |                     | 0.074**<br>(2.99)   | 0.077**<br>(3.02)    |
| Percentage of female borrowers                               |                    |                     |                     |                    |                    |                      |                     |                     | -0.101**<br>(-3.12) | -0.095**<br>(-2.70) | -0.165***<br>(-3.88) |
| Number of cross sections                                     | 751                | 751                 | 751                 | 751                | 751                | 572                  | 572                 | 646                 | 675                 | 594                 | 493                  |
| P-values   | 0.000              | 0.000               | 0.000               | 0.000              | 0.000              | 0.000                | 0.000               | 0.000               | 0.000               | 0.000               | 0.000                |
| Log-likelihood   | 403.71             | 406.61              | 405.43              | 418.42             | 405.25             | 315.41               | 329.57              | 345.29              | 380.33              | 329.52              | 305.36               |

Note: Technical bootstrapped financial efficiency (using variable returns to scale – input oriented) is the dependent variable. \*, \*\* and \*\*\* indicate significance level of coefficients at the 10%, 5% and 1%, respectively. The truncated regression analysis with bootstrapping (Simar & Wilson, 2007) results above was derived from 2000 bootstrapped iterations.

Table 5.12: Social Efficiency regressions using DEA efficiency estimates

|  | I                  | II                 | III                | IV                  | V                   | VI                  | VII                  | VIII                | IX                  | X                    | XI                   |
|--|--------------------|--------------------|--------------------|---------------------|---------------------|---------------------|----------------------|---------------------|---------------------|----------------------|----------------------|
| Year   | -0.003<br>(-1.09)  | -0.003<br>(-1.17)  | -0.003<br>(-1.02)  | -0.003<br>(-0.89)   | -0.005<br>(-1.48)   | -0.009**<br>(-2.91) | -0.009**<br>(-2.80)  | -0.003<br>(-0.75)   | -0.005<br>(-1.37)   | -0.003<br>(-0.89)    | -0.008**<br>(-2.53)  |
| DMATURE  | 0.048**<br>(2.72)  | 0.043**<br>(2.22)  | 0.044**<br>(2.46)  | 0.056**<br>(3.08)   | 0.047**<br>(2.68)   | 0.044**<br>(2.05)   | 0.044*<br>(1.87)     | 0.034*<br>(1.91)    | 0.039**<br>(1.98)   | 0.024<br>(1.26)      | 0.027<br>(1.09)      |
| Log of assets  | 0.019***<br>(3.57) | 0.020***<br>(3.84) | 0.019***<br>(3.65) | 0.021***<br>(3.95)  | 0.018***<br>(3.29)  | 0.022***<br>(4.20)  | 0.025***<br>(4.78)   | 0.017***<br>(3.12)  | 0.022***<br>(4.03)  | 0.021***<br>(3.50)   | 0.030***<br>(5.10)   |
| Log of real GDP  | -0.019<br>(-1.15)  | -0.017<br>(-1.03)  | -0.025<br>(-1.55)  | -0.056**<br>(-2.32) | -0.035**<br>(-2.04) | -0.026<br>(-1.54)   | -0.086***<br>(-3.01) | -0.049**<br>(-2.88) | -0.038**<br>(-2.17) | -0.066***<br>(-3.62) | -0.128***<br>(-4.08) |
| Inflation  | -0.003<br>(-1.48)  | 0.013<br>(-1.40)   | -0.003<br>(-1.20)  | -0.002<br>(-0.83)   | 0.001<br>(0.30)     | -0.001<br>(-0.55)   | 0.002<br>(0.74)      | -0.003<br>(-1.26)   | -0.003<br>(-1.30)   | -0.003<br>(-1.40)    | 0.002<br>(0.84)      |
| Non-profit-oriented  | -0.013<br>(0.98)   |                    |                    |                     |                     | 0.022<br>(1.17)     |                      |                     |                     |                      | 0.047**<br>(2.10)    |
| Regulated  |                    |                    | -0.024*<br>(-1.89) |                     |                     | -0.007<br>(-0.48)   |                      |                     |                     |                      | -0.023<br>(-1.36)    |
| Control of Corruption  |                    |                    |                    | 0.075**<br>(2.57)   |                     | 0.109**<br>(2.61)   |                      |                     |                     |                      | 0.109**<br>(2.64)    |
| Political stability and<br>Absence of violence                       |                    |                    |                    |                     | 0.050**<br>(3.03)   |                     | 0.007<br>(0.33)      |                     |                     |                      | 0.043*<br>(1.68)     |
| Percentage of female loan<br>board members (average<br>2008 to 2012) |                    |                    |                    |                     |                     | -0.060**<br>(-2.20) | -0.047<br>(-1.61)    |                     |                     |                      | -0.054<br>(-1.47)    |
| Percentage of female loan<br>officers (average 2008 to<br>2012)      |                    |                    |                    |                     |                     |                     |                      | 0.133**<br>(4.01)   |                     | 0.106**<br>(3.11)    | 0.084**<br>(2.75)    |
| Percentage of female<br>borrowers                                    |                    |                    |                    |                     |                     |                     |                      |                     | -0.104**<br>(-2.79) | -0.112**<br>(-2.88)  | -0.194***<br>(-4.27) |
| Number of cross sections   | 747                | 747                | 747                | 747                 | 747                 | 569                 | 569                  | 642                 | 671                 | 590                  | 490                  |
| P-values   | 0.000              | 0.000              | 0.000              | 0.000               | 0.000               | 0.000               | 0.000                | 0.000               | 0.000               | 0.000                | 0.000                |
| Log-likelihood   | 290.04             | 290.47             | 291.60             | 294.05              | 294.55              | 272.23              | 280.69               | 262.91              | 273.71              | 254.51               | 258.07               |

Note: Technical bootstrapped social efficiency (variable returns to scale – output oriented) is the dependent variable. \*, \*\*, and \*\*\* indicate significance level of coefficients at the 10%, 5% and 1%, respectively. The truncated regression analysis with bootstrapping (Simar & Wilson, 2007) results above was derived from 2000 bootstrapped iterations.

We cannot tell exactly why we get some results contrary to our expectations for gender variables, but we can only record some possibilities that raise further research questions. MFIs' PFMs may be token or targeting a different market segment (for further detail see Adams & Ferreira, 2009; Branson, 2007). It could be ethnicity differences or the way the women are represented in businesses in the South Asia region. In terms of the negative effect of PFBS, critics argue that women, mostly in developing countries, are often forced to hand loans over to men, who subsequently use the loan for their own purposes. This may lead to an additional burden for women if they are held responsible for the repayment (Goetz & Gupta, 1996). These possibilities can be used for future research to better understand what influence women have on microfinance efficiency because the variable we have used for measuring efficiency is not picking up that point. Moreover, in the gender literature, Kanter (1977) suggests that 'window-dressing' or 'tokenism' is an argument for the endogeneity of female leadership – in other words that women are not independent. She suggests that female directors should be elected in order to demonstrate commitment to gender-neutral policies.

We find an inverse impact of external governance in finance and social efficiency. Corruption control is positive and significant for both financial and social efficiency regressions, while political stability appears positively significant only in the case of social efficiency. As in the descriptive statistics, all of these variables have negative values in the data sets (showing a low level of governance), so positive signs in regressions are actually showing a negative impact of these variables on efficiency. These findings are mostly in line with Müller and Uhde (2013), who find a positive impact of a country's external governance on the financial sustainability objective (contrary to our findings), and a negative impact on the social objective of MFIs (according to our

findings). However, our results are consistent with both the financial and social efficiency objectives of Barry and Tacneng (2014), who find that weak governance favours relationship-based exchanges. These exchanges further result in superiority of the social objective on one hand and, on the other hand, stronger governance may encourage a conventional financial system to cater for more borrowers; hence, there is a compatibility of both objectives of financial and social MFIs.

A number of control variables also show interesting implications, generally in line with previous research linking governance variables to firms' market conditions. Size of MFIs in terms of logarithm of assets is positive and highly significant in all regressions of financial and social efficiency, confirming the findings of Kyereboah-Coleman and Osei (2008). This is because a large firm has the ability to enhance productivity through diversification of products and services and to accommodate risk.

The size of institutions has a positive impact on financial and social efficiency, while real GDP (size of country) has a negative impact on both financial and social objectives of MFIs. When real GDP increases, MFIs' efficiency deteriorates. In terms of social efficiency, this is reasonable in that the social objectives of MFIs are being achieved with MFIs that are actually working in the right direction. However, in the case of financial efficiency, the reduction in efficiency is unexpected. But it can also be argued that presumably, increases in GDP denote economic growth. A growing economy may offer an expanded set of economic opportunities for its residents some of whom may be the poor being served by the MFIs. It is conceivable that the ensuing dynamics can push some of the MFI clients up the economic ladder and out of the purview of the MFIs. This 'loss

of business' can weaken the balance sheets of the MFIs and eventually show up in diminished financial performance.

This unexpected efficiency reduction could be explained by the fact that the size of the country does not necessarily ensure the financial performance of MFIs. This implies that real GDP is not a positive performance determinant for most MFIs in South Asia. The MFI's age is highly positive and significant in all specifications of social efficiency, but not significant when PFOs and PFBs variables are added, showing that corporate governance becomes more important in the social context as the MFI is larger and older. This seems reasonable, since formalization often tends to overtake the entrepreneurial spirit as the firm matures. Furthermore, the age of MFIs does not tend to support the notion of synergy between financial efficiency and maturity.

### **5.3.3. Synopsis of Efficiency Analysis using DEA**

Overall, we did not see any trade-off between the financial and social objectives of MFIs. The debate as to which objective should have priority is not yet resolved in microfinance literature, but it seems that the financial sustainability approach has become more popular in microfinance practice. Better governance is good for the efficiency level of MFIs, although the influence of gender (PFMs and PFBs) is not positive and this negative link might be special to the sample period and region.

How reliable are the above results? Here, we report robustness checks for the estimation method and variable specification. This check is motivated by the diversity of results in the literature depending on the method used or the variable specification. In the first

robustness test, we estimate the first stage efficiency scores using different output variables, such as interest revenue for financial efficiency (along with GLP) and PFBs (along with GLP), and find a very similar pattern of efficiency scores ( see A3.3 in Appendix 3).

Secondly, our ambivalent results for female directors motivated alternative tests employing different specifications. To check the robustness of our second stage female indicators, we thought that women on the board might mean that MFIs follow a less risky strategy reflected, in turn, in lower revenues (and thus lower financial efficiency according to our existing specification). Some adjustment or control for risk in the regression might therefore be useful. We use portfolio at risk greater than 30 days and risk coverage as risk ratios and interact them with female indicators ( see A3.4 in Appendix 3) using the methodology as explained in Balli and Sørensen (2013). We run the regressions with interactions between gender variables and risk factors, but find that almost all of them have insignificant results, telling us that there is no interaction between female indicators and risk ratios of MFIs.

Thirdly, as we find a negative link between real GDP and efficiency, we want to see if this is due to Sri Lanka being a relatively more economically advanced country than other South Asian countries in our sample. We therefore re-run the model with Sri Lanka omitted, but results remain the same. In unreported regressions, we also run the Tobit model, omitting Sri Lanka (as it has large real GDP) and simple GLS regression with both fixed effects and random effects, but find no material difference in results from those presented here. Signs of the coefficients are almost similar although significance level varies a lot. The overall conclusion of the robustness checks is that our results are

confirmed when we change the model and vary the specifications. Thus, our conclusions for the link among governance, gender and efficiency is upheld.

#### **5.4. Social and Financial Efficiency Estimates from SFA Methodology**

In this section, social and financial efficiency estimates are presented using SFA methodology with the findings of baseline model of SFA explained in 5.4.1. Using this methodology, we get economies of scale, technological progress and cost efficiency estimates that are reported in Figure 3, 4 and 5. We also report technical inefficiency scores from using the SFA-BC model that we use in second stage to explore efficiency determinants in section 5.4.2.

##### **5.4.1. Baseline Model Results**

The procedure we have used to generate these results is as follows. The cost frontier and inefficiency equations are estimated simultaneously (see Battese & Coelli, 1995) using outputs of GLP (for financial efficiency) and NAB (for social efficiency). Table 5.13 provides the cost frontier estimates and regression estimation results with respect to governance and gender variables in Panel A and Panel B, respectively. Column one of Table 5.13 presents a basic model of inputs and outputs (with quadratic and interaction terms) and with control variables, the second column adds the year dummy with its quadratic and interaction terms and, in the third column, we control the country heterogeneity by including the dummy variables for four countries. The same is repeated for specifications in columns IV to VI where output is measured by NAB. These six

specifications are those on which our analysis is primarily focused. Since our data has a panel structure, all estimations are carried out using pooled regressions.

Panel A of Table 5.13 refers to the estimation results of the cost frontier. We find increasing returns to scale when looking at the output coefficient alone as it is greater than one in all specifications. A positive and greater than one coefficient imply an outward shift of the cost function or higher cost. The estimation results for the cost function appear to be as expected in most cases. In all model specifications, almost all core variables—input prices, outputs and their derivatives—have the expected signs and are statistically significant at the 5% level or better (except for one input of COB whose quadratic and interacting terms are usually negative but, generally significant only at the 10% level), while other variables showing unexpected signs are not statistically significant. The coefficients for COB, GLP and NAB are always significant and positive, while the coefficient for CPL is negative but significant only at the 10% level in one of each specification of both output regressions, not as expected. However, as CPL is highly significant and positive in quadratic terms, this leads us to conclude that our specification of the cost frontier fits the theory reasonably well.

Furthermore, the panel nature of the data allows us to study the role of technical progress in microfinance and answer questions such as whether costs decrease with time. Unfortunately, the majority of time variables are statistically insignificant and, hence, we cannot conclude that MFIs' costs decrease or increase over time. The results, including country controls, are presented in columns III and VI. All dummy variables for countries and for the type of MFIs are statistically significant in almost all specifications in the financial efficiency regressions, but not (mostly) in social efficiency regressions,

indicating that the type of MFI and different economies affect the cost frontier for financial efficiency more.

For example, the base country is Sri Lanka; so the results are suggesting that costs are significantly higher in the other four countries than in Sri Lanka for financial performance; but results are suggesting that in social performance only India has significantly higher costs. Similarly, regulated MFIs have lower costs than unregulated MFIs in financial performance; non-profit oriented MFIs have significantly higher costs than profit oriented MFIs in financial performance. This confirms our expectations that the relative efficiency level varies according to different types of MFIs.

In addition, the risk ratio is statistically insignificant in financial regressions, but negative and significant in social efficiency regressions that indicate that high risk is not associated with high cost, contrary to what is expected. More risk decreases cost in social performance but has an insignificant positive effect on cost in financial performance.

**Table 5.13: Regression results for SFA approach**

| Output: GLP | Output: NAB |
|-------------|-------------|
|-------------|-------------|

|  | I                   | II                 | III                 | IV                   | V                    | VI                   |
|--|---------------------|--------------------|---------------------|----------------------|----------------------|----------------------|
| Panel A – Cost frontier estimates                      |                     |                    |                     |                      |                      |                      |
| Log (Y)  | 1.208***<br>(6.79)  | 1.128***<br>(6.37) | 1.024***<br>(5.88)  | 1.072***<br>(9.04)   | 1.106***<br>(9.43)   | 1.036***<br>(8.85)   |
| Log(CPL)   | -0.375<br>(-1.14)   | -0.511<br>(-1.49)  | -0.541*<br>(-1.63)  | -0.391*<br>(-1.71)   | -0.369<br>(-1.44)    | -0.252<br>(-1.00)    |
| Log (COB)  | 1.563**<br>(4.25)   | 1.494**<br>(3.63)  | 1.541***<br>(3.82)  | 1.649***<br>(6.93)   | 1.386***<br>(4.88)   | 1.151***<br>(3.94)   |
| Log (Y) <sup>2</sup>                                   | 0.015<br>(1.32)     | 0.018<br>(1.54)    | 0.020*<br>(1.78)    | 0.016*<br>(1.83)     | 0.015*<br>(1.70)     | 0.019**<br>(2.15)    |
| Log (CPL) <sup>2</sup>                                 | 0.076<br>(1.39)     | 0.071<br>(1.32)    | 0.116**<br>(2.18)   | 0.182***<br>(4.16)   | 0.185***<br>(4.38)   | 0.167***<br>(3.97)   |
| Log (COB) <sup>2</sup>                                 | -0.122*<br>(-1.88)  | -0.122*<br>(-1.84) | -0.128*<br>(-1.95)  | 0.137**<br>(2.31)    | 0.223***<br>(3.53)   | 0.214***<br>(3.39)   |
| Log(CPL)* log (COB)                                    | 0.055<br>(0.49)     | 0.056<br>(0.50)    | -0.020<br>(-0.18)   | -0.326***<br>(-3.20) | -0.397***<br>(-4.00) | -0.361***<br>(-3.60) |
| Log(CPL)* log (Y)                                      | -0.022<br>(-0.51)   | -0.030<br>(-0.68)  | -0.052<br>(-1.22)   | -0.056<br>(-1.56)    | -0.053<br>(-1.50)    | -0.056<br>(-1.62)    |
| Log (COB)* log (Y)                                     | -0.113**<br>(-2.33) | -0.085*<br>(-1.73) | -0.028<br>(-0.57)   | 0.018<br>(0.40)      | 0.007<br>(0.16)      | 0.025<br>(0.59)      |
| Risk coverage ratio                                    | 0.066<br>(1.06)     | 0.069<br>(1.12)    | 0.020<br>(0.31)     | -0.191***<br>(-3.90) | -0.180***<br>(-3.76) | -0.098*<br>(-1.94)   |
| Regulated MFIs   | -0.084<br>(-1.77)   | -0.075<br>(-1.59)  | -0.104**<br>(-2.20) | -0.056<br>(-1.62)    | -0.059*<br>(-1.74)   | -0.030<br>(-0.83)    |
| Non-profit-oriented MFIs                               | 0.148***<br>(3.36)  | 0.171***<br>(3.83) | 0.091**<br>(1.98)   | 0.001<br>(0.04)      | -0.028<br>(-0.88)    | 0.033<br>(0.92)      |
| Year   |                     | -0.089<br>(-0.87)  | -0.016<br>(-0.16)   |                      | -0.145*<br>(-1.89)   | -0.140*<br>(-1.76)   |
| Year <sup>2</sup>                                      |                     | -0.008<br>(-1.21)  | -0.010<br>(-1.54)   |                      | -0.005<br>(-1.02)    | -0.004<br>(-0.74)    |
| Year * log(CPL)  |                     | 0.043*<br>(1.74)   | 0.038<br>(1.53)     |                      | 0.023<br>(1.23)      | 0.012<br>(0.62)      |
| Year * log (COB)                                       |                     | -0.027<br>(-0.95)  | -0.035<br>(-1.22)   |                      | 0.033<br>(1.56)      | 0.045**<br>(2.13)    |
| Dummy of Bangladesh                                    |                     |                    | 0.505***<br>(6.23)  |                      |                      | -0.103<br>(-1.52)    |
| Dummy of India   |                     |                    | 0.348***<br>(5.12)  |                      |                      | 0.107**<br>(1.97)    |
| Dummy of Nepal   |                     |                    | 0.327***<br>(3.30)  |                      |                      | 0.012<br>(0.14)      |
| Dummy of Pakistan                                      |                     |                    | 0.299***<br>(3.49)  |                      |                      | -0.043<br>(-0.62)    |
| Observations   | 416                 | 416                | 416                 | 416                  | 416                  | 416                  |
| Wald test (P-values)                                   | 0.000               | 0.000              | 0.000               | 0.000                | 0.000                | 0.000                |
| Panel B - The inefficiency equations                   |                     |                    |                     |                      |                      |                      |
| DMATURE  | 0.030<br>(1.44)     | 0.035*<br>(1.67)   | 0.041*<br>(1.73)    | 0.114***<br>(3.81)   | 0.098***<br>(3.40)   | 0.096***<br>(3.54)   |
| Size of MFIs   | 0.005<br>(0.99)     | 0.004<br>(0.79)    | 0.006<br>(0.99)     | 0.009<br>(1.09)      | 0.010<br>(1.29)      | 0.011<br>(1.61)      |
| Log of real GDP  | -0.01<br>(-0.71)    | 0.004<br>(0.19)    | 0.062**<br>(2.66)   | 0.137***<br>(4.63)   | 0.122***<br>(4.25)   | 0.088***<br>(3.29)   |
| Percentage of female loan officers (PFOs)              | 0.162***<br>(5.88)  | 0.155***<br>(5.57) | 0.197***<br>(6.18)  | 0.144***<br>(3.59)   | 0.144***<br>(3.69)   | 0.156***<br>(4.28)   |
| Percentage of female borrowers (PFBs)                  | 0.055<br>(1.59)     | 0.068*<br>(1.95)   | 0.072*<br>(1.80)    | -0.799<br>(-1.58)    | -0.079<br>(-1.61)    | -0.094**<br>(-2.05)  |
| Percentage of female board members (PFMs)              | 0.0001<br>(0.00)    | -0.006<br>(-0.15)  | -0.018<br>(-0.39)   | -0.025<br>(-0.42)    | -0.062<br>(-1.06)    | -0.082<br>(-1.50)    |
| Political stability                                    | -0.011<br>(-0.49)   | -0.021<br>(-0.89)  | -0.049*<br>(-1.82)  | 0.057*<br>(1.67)     | 0.043<br>(1.29)      | 0.022<br>(0.71)      |
| Observations   | 295                 | 295                | 295                 | 295                  | 295                  | 295                  |
| Significance level or F-statistics of likelihood ratio | 0.000               | 0.000              | 0.003               | 0.000                | 0.000                | 0.000                |

Note: T-statistics are in parentheses, \*, \*\* and \*\*\* denotes significance at levels 10%, 5%, 1%, respectively. Log (Y) = logarithm value of output that is GLP for financial performance and NAB for social performance. CPL = logarithm value of first input cost of labour and COB = logarithm value of second input cost of borrowers (see Table 3.10 for detail). TC is dependent variables for Panel A, and its residuals are used as dependent variables for Panel B. We include the constant in both panels, but these are not reported to save space.

### 5.4.1.1. Economies of Scale

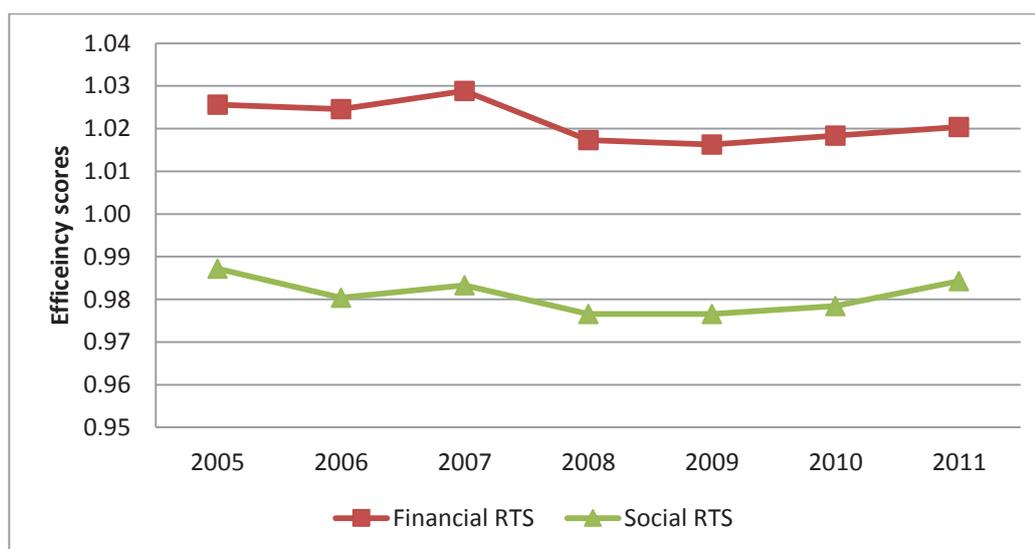
Economists pay much attention to the effect of a change in production or cost on outputs, or returns to scale. In the context of a cost function, returns to scale are computed as the reciprocal of the cost elasticity with respect to all outputs. From the cost function, the scale elasticity with respect to outputs is computed as:

$$SE_{i,t} = \frac{\partial \ln(TC_{i,t})}{\partial \ln(Y_{i,t})} = \beta_1 + \beta_4 (\ln Y_{i,t}) + 0.5 \beta_7 (\ln CPL_{i,t}) + 0.5 \beta_8 (\ln COB_{i,t})$$

(Equation 5.1)

For details of the terms, see Equation 4.9. The returns to scale (RTS) are calculated as follows:  $RTS = 1/SE$ . If  $RTS > 1$ , then a MFI exhibits increasing returns to scale or enjoys economies of scale. If  $RTS < 1$ , the MFI exhibits decreasing returns to scale or faces diseconomies of scale while, if the  $RTS = 1$ , the MFI is at constant returns to scale, indicating that the institution is at the optimal scale.

**Figure 5.1: Returns to scale, 2005-2011**



Note: We do not have enough observations for the period 1998 to 2004 or for year 2012 and 2013, so we report results for average financial and social efficiency score only for the period 2005 to 2011.

Figure 5.1 provides the average values for returns to scale and technological progress of financial and social efficiency of South Asian MFIs. The sample mean throughout the sample period for financial returns to scale is greater than one, while in social returns to scale, it is less than one. The results show that an average microfinance institution exhibits increasing returns to scale (financial) that is below its optimal scale. On the other hand, social performance is not enjoying economies of scale, implying that their current operating scale is greater than their optimal scale size.

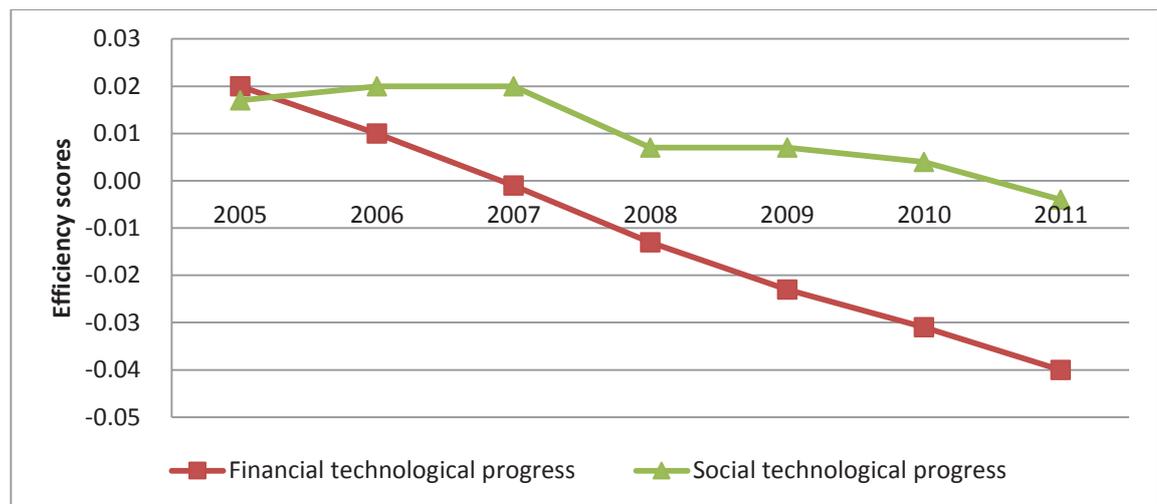
#### 5.4.1.2. Technological Progress

The effect of technological progress on costs is measured by the elasticity of cost with respect to a time variable. Because of technology changes over time, conventional banking and economics studies add a time trend as a proxy for technical progress, so we adopt the same. Technical progress is expected to reduce total cost, and the expectation is that costs will decrease with time, which is captured by the derivative of cost with respect to time. A technical progress term is both added directly and interacted with input price and output variables in the base line model of the cost function. From the cost function, this elasticity is computed as follows:

$$TP_{i,t} = \frac{\partial \ln(TC_{i,t})}{\partial \ln(\text{year}_{i,t})} = \beta_{10} + \beta_{11}(\text{year}_{i,t}) + 0.5 \beta_{12}(\ln CPL_{i,t}) + 0.5 \beta_{13}(\ln COB_{i,t})$$

(Equation 5.2)

For details of the terms, see Equation 4.9. If  $TP_{i,t} \leq 0$ , technological progress reduces costs incurred by MFIs; otherwise, if  $TP_{i,t} > 0$ , technological progress imposes more costs on MFIs.

**Figure 5.2: Technological progress, 2005-2011**

Note: We do not have enough observations for the period 1998 to 2004 or for year 2012 and 2013, so we report results for average financial and social efficiency score only for the period 2005 to 2011.

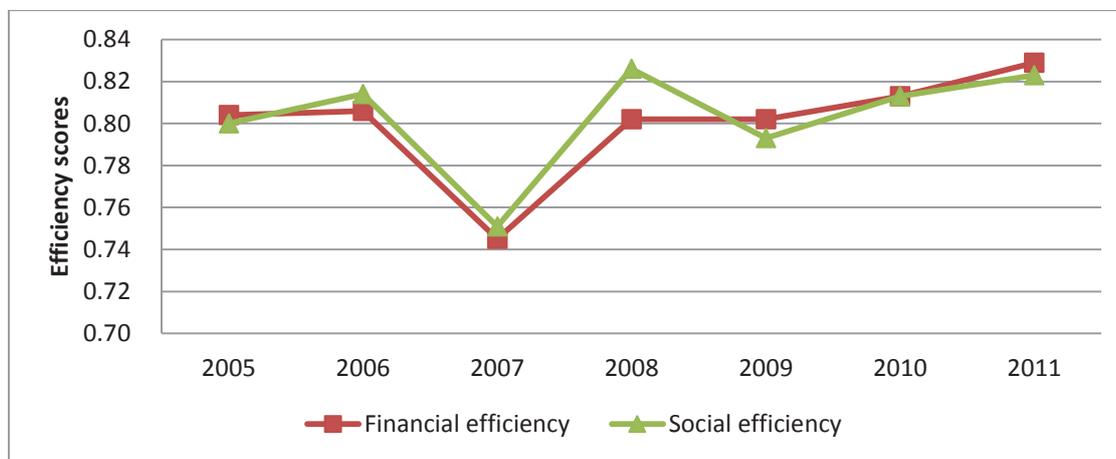
As shown in Figure 5.2, technological progress leads to an increase in cost at a diminishing rate during the first 2 years in financial efficiency and the first 6 years in social efficiency, after which cost decreases at an increasing rate. For example, technological progress of financial efficiency reduced the costs incurred by the average MFI by 0.1 percent in 2004, 1.3 percent in 2005 and 2.3 percent in 2006, and so on. It appears that financial efficiency enjoyed a more positive effect of technological progress than social efficiency. This result is understandable in the sense that the exposure of commercialization and the effect of stronger technological platforms should initially be more on financial objectives rather than social objectives, although, ultimately, they reduce their overall costs.

#### 5.4.1.3. Cost Efficiency Scores

The rapid rise and fall of the microfinance industry (Bandyopadhyay & Shankar, 2014) make development of microfinance the main focus of the researchers, therefore, we also sought to analyse the differences in cost efficiency of MFIs over the period studied. We

calculated cost efficiency from the basic model of cost function (Equation 4.9). Microfinance has indeed overturned an established idea of MFIs accepting the poor as their financial service clients and shown the possibility of providing cost effective financial services to the poor (Brau & Woller, 2005). We also observed the dynamics of cost efficiency over the time, with the yearly mean cost efficiencies of the South Asian MFIs presented in Figure 5.3.

**Figure 5.3: Cost efficiency, 2005-2011**



Note: We do not have enough observations for the period 1998 to 2004 or for year 2012 and 2013, so we report results for average financial and social efficiency score only for the period 2005 to 2011.

Figure 5.3 shows that, on average, the financial and social cost efficiency scores of MFI is 0.80, suggesting that the average MFI needs to reduce its actual cost by 20% to become cost efficient. This overall cost efficiency level is similar and comparable to the results in recent microfinance studies, such as Gregoire, Tuya & Ramirez (2008), who analyze the efficiency of MFIs in Peru between 1999 to 2003 using SFA.

#### 5.4.2. Inefficiency Regressions

As was mentioned above, along with specification of the cost frontier estimates, we also focus on the specification of the inefficiency equation and the impact of gender on the

efficiency levels of these MFIs. From the stochastic frontier analysis, we generated a cost inefficiency score that shows the level of inefficiency of a particular MFI. The score is non-negative; it is equal to zero if the MFI is perfectly efficient. Before commenting on the results, we want to mention that the baseline model measures the extent to which an MFI is considered to be inefficient. This means that we expect that the coefficient for the gender variables (high proportion of females) should be significantly negative in social efficiency and significantly positive in financial efficiency.

Panel B of Table 5.13 shows the results from estimating the inefficiency equation. The results in columns I to VI suggest that gender is a strong efficiency indicator for MFIs, especially PFBs and PFOs, although the PFMs variable remains insignificant in all regressions. In all equations, the coefficient for PFOs is positive and highly significant and, as expected, the coefficient of PFBs is positive in financial efficiency and negative in social efficiency. This result confirms our expectations that as MFIs are mainly focused on women, female involvement should be associated with greater efficiency, but this is only confirmed for PFOs and PFBs coefficients. We could not find any impact of PFMs on MFI efficiency, in contrast to Mersland and Stromk (2009), who find it as a positive indicator of MFI efficiency. Our findings might suggest that MFIs that focus more on lending to females are less financially efficient but more socially efficient.

In addition, the results also indicate that PFOs negatively impact the efficiency level of MFIs since the coefficient for PFOs is positive and significant, with these results not changing when we include different sets of control variables. The coefficient for PFOs remains negative and highly significant in all specifications, although the coefficient of PFBs became significant after adding the control variables in regressions. We find

political stability (an external governance indicator) positively impacting financial efficiency and negatively impacting social efficiency. These findings are partially according to our expectation that external governance is positive efficiency indicator of MFIs.

With respect to the control variables, panel B of Table 5.13 shows that the coefficient for the variable *DMATURE* is positive and significant, indicating that older MFIs are less efficient. This supports the view that more recently established institutions benefit from knowledge of microfinance practices that has been built up during past decades. Based on existing knowledge, these new MFIs may leapfrog older institutions in terms of the efficiency of their activities.

### **5.4.3. Synopsis of Efficiency Analysis using SFA**

Summarizing the results in Table 5.13, we find no support for a trade-off between social and financial efficiency of MFIs in our sample. These findings remain significant even after controlling for a number of other variables. Our results seem contrary to Cull et al. (2007) and Hermes et al. (2011) who find a trade-off between these MFI objectives. We believe that we have made an important contribution to the scarce academic work on the trade-off discussion. First, we use a more recent South Asian dataset and information from MFIs over a longer period of time than any of the previous studies. Secondly, along with the dual objectives of MFIs, we also use governance and gender variables to evaluate their possible impact on MFI efficiency. Thirdly, we measure MFI cost efficiency, using SFA, a method that has been used only very recently in the microfinance literature. As a robustness test, we apply different output variables, such as average loan balance

portfolios GNI per capita for social efficiency and OSS for financial efficiency, but the findings are similar to those presented in Table 5.13.

If we compare the findings from both DEA and SFA, we find the same link of gender and performance that show the robustness of our results. In terms of scale efficiency, the SFA techniques show that MFIs in South Asia are enjoying economies of scale in financial efficiency, but not in social efficiency, while DEA show scale efficiency at almost the same level for both financial and social efficiency. Both techniques show that South Asian MFIs are technically and cost inefficient, especially in contrast with scale efficiency.

### **5.5. Summary**

We evaluate the social and financial efficiency of South Asian MFIs using performance ratios and other techniques, like DEA and SFA, that are generally used for the efficiency evaluation of banks. The findings of this chapter are as follows. First of all, we evaluate existing social efficiency determinants and then introduce two new ways of measuring

the breadth and depth of outreach. While comparing these outreach indicators, we find that these new measures provide a better explanation of the social performance of MFIs in South Asia and that breadth and depth of outreach operate opposite to each other. Furthermore, we use these outreach measures with financial sustainability measures to compare the performance of different sub groups of MFIs in achieving both social and financial objectives. The results show that non-regulated and profit-oriented microfinance providers perform relatively well in terms of both of these objectives, but face higher operating expenses, creating tension between outreach and financial sustainability.

Furthermore, while evaluating the efficiency level of MFIs using DEA, we find that the financial efficiency of these institutions appears stronger than social efficiency. We also investigate the role of women in various capacities and corporate governance in determining the efficiency of MFIs. We find an almost similar impact of governance and gender from both DEA and SFA. PFOs are found to be a positive efficiency determinant for MFIs, while more PFMs and PFBs show negative impacts on MFI efficiency. We find that bad governance has a negative impact on the efficiency of MFIs. In cost efficiency estimates, financial and social efficiency scores show that, on average, South Asian MFIs are operating at the same level, but institution and country differences matter more for their financial efficiency than for social efficiency.

Furthermore, the results suggest that the average number of MFIs exhibit positive returns to scale in financial sustainability, but these institutions are not enjoying the economies of scale when the social objective is measured. Similarly, financial efficiency enjoyed a more positive effect of technological progress than social efficiency. Overall, we do not find a trade-off between microfinance objectives.



## 6. Conclusion

“Success is not determined by the outcome. The outcome is the result of having already decided that you are successful to begin with.”

T. F. Hodge

This chapter provides a review of the research reported in this thesis. It also presents answers to the research questions addressed and highlights the contribution to the efficiency analysis literature of MFIs. This chapter concludes with a discussion of suggested future work.

### 6.1. An overview of the Research

This thesis studies MFIs, which are a special type of financial institution that pursue the dual objectives of outreach and financial sustainability. The study evaluates the social and financial efficiency of a panel data set of 372 South Asian MFIs, covering the period 1998 to 2013, using performance ratios and other techniques, not commonly used in the microfinance literature. Four aspects of performance evaluation of MFIs have been discussed in this thesis, including social performance, the trade-off between social and financial performance, efficiency analyses through DEA and SFA techniques, and the linkage of efficiency with governance and gender variables.

The struggle against poverty is the mission of microfinance, and to our knowledge, no clear methodology exists to measure how far an MFI meets its social obligations. Much debate has taken place on adequate measures of social performance of MFIs, as existing indicators are not adequately covering the social objective of MFIs.

The first RQ asks how well the existing factors of performance explain the proxy variables/indicators of social performance of MFIs. We have addressed the issue of existing inadequate social performance indicators, and have taken a step further by introducing two new ways of measuring the breadth and depth of outreach to explain the social performance of MFIs. In specifying these indicators, we include the market share of MFIs based on their number of clients (breadth of outreach) and divide this breadth of outreach by the share of assets that each MFI possess (depth of outreach). Reasonably high proportions of the variations in the two new outreach indicators are explained by the usual determinants of social performance and so the two new indicators may be considered in empirical studies. They reflect market shares which have not been considered in the literature hitherto.

Using these new indicators, we have found from institution-specific and country-specific variables that mature, big institutions and those working in high inflation environments manage to reach more borrowers. Big institutions have less depth of outreach and the MFIs in countries with sound economic health can only manage to achieve outreach depth. We have also found that loans with high operating costs negatively impact on the breadth and depth of outreach measures. Most of our findings confirm the findings of earlier studies (for more detail, see Cull et al., 2007; Hermes et al., 2011). Analysing both dimensions of social performance of MFIs, we find that they are negatively related to

each other. Breadth of outreach generally shows a positive correlation with financial performance determinants of MFIs, and depth of outreach shows a negative correlation. This has led us to further examine the link between these two outreach indicators.

An MFI's mission is to supply loans to small businesses, especially women, in the developing world, and it aims to do so in a financially sustainable manner (Morduch, 1999). Providing financial services to poor people and achieving financial sustainability are dual objectives of MFIs. RQ2 asks whether performance for social and financial objectives of MFIs vary among different sub groups. We measure the performance of these institutions in terms of both these objectives. We study whether different regulatory structure, ownership structure and MFIs operating in different South Asian countries impact the performance of MFIs. Our overall conclusion is that they do not.

Two dimensions of breadth and depth of outreach are used to measure social performance and OSS is used to measure financial sustainability. Here we find that achieving financial sustainability and serving poor clients, as measured by operating expenses, are contradictory in terms of breadth of outreach but not in terms of depth of outreach. Overall, we find that a stronger depth of outreach is associated with riskier loans. We also find a decrease in financial sustainability after riskier and more costly loans are issued. Thus, the result conforms to the notions that MFIs with bigger asset size or endowments are more efficient, which might imply that these institutions do not need to adjust their mission in order to get additional capital.

Using split samples, the expected answer of RQ2 is partially accepted, as non-regulated MFIs and non-profit-oriented MFIs are found to reach more borrowers in spite of having

high costs in breadth of outreach. Regulated, profit-making and other South Asian countries are still facing the challenge of high cost that is (overall) negatively impacting their dual objectives. These findings indicate that the difference in ownership and regulatory structures of MFIs and among South Asian MFIs operating in different countries is minimal. Comparable findings are suggested in (Mersland & Strom, 2008) and (Hartarska & Nadolnyak, 2007).

RQ3 asks about the technical, scale and cost efficiency levels of South Asian MFIs and what factors explain the variation in microfinance efficiency. We conduct efficiency analysis of MFIs using techniques commonly used in the banking literature. We use panel data (annual observations from 2005 to 2012) to evaluate the efficiency levels of 101 MFIs of South Asian countries and DEA to measure efficiency scores in the social and financial context . We assess bootstrapped TE (input and output oriented) and SE in the first stage of our analysis and the results confirm the existing literature (for example Qayyum & Ahmed, 2006) that South Asia MFIs are technically inefficient but scale efficient.

Using SFA, the cost and technical inefficiency of South Asian MFIs are also assessed simultaneously. Cost efficiency estimates show that MFIs are operating at a similar level in both a financial and social context but institutional and country differences matter more for financial efficiency than for social efficiency. Furthermore, the results show that the average MFIs exhibit increasing returns to scale in financial sustainability, but these institutions are not enjoying economies of scale when social objectives are measured. Similarly, financial efficiency enjoyed the most positive effect of technological progress.

These results confirm our priori expectations that patterns and trends of MFIs' efficiency vary, depending on the assumption of underlying returns to scale.

As part of this analysis, we explore the female contribution to MFIs' efficiency to answer the second part of RQ3 as to whether governance and gender variables should be included among the key determinants of MFIs' efficiency. MFIs are remarkable in that they elect more female chairs and female directors than firms in advanced countries do, so we also see linkages of their efficiency levels with governance and gender variables. We investigate the roles of female in achieving the social and financial objective of MFIs and their relationships with financial and social performance of MFIs as found in Mersland & Strom (2014).

In order to explain the possible determinants of microfinance efficiency, a second stage regression analysis is conducted using a truncated bootstrapped regression model. We try to identify what is causing the variations in microfinance efficiency that cannot be understood from looking only at efficiency scores. Finally, we use another efficiency technique, SFA, to examine the linkages between governance, gender and efficiency. Second stage DEA findings show that good internal corporate governance appears (mostly) a positive determinant of MFIs' efficiency, but poor external corporate governance is a negative determinant of MFIs' efficiency. Similarly although PFOs (percentage of female loan officers) are positive determinants of MFIs efficiency, PFMs (percentage of female board members) and PFBs (percentage of female borrowers) are negative determinants of MFIs efficiency so the role of females is ambiguous.

These findings confirm our priori expectations that governance of MFIs is positively correlated with the financial and social efficiency of these institutions. The expected

answer that PFOs are positively correlated to the financial and social efficiency of MFIs, is accepted while PFBs are negatively correlated with MFI financial and social efficiency. We also continue our analysis, based on dual objectives of whether there is a trade-off between outreach to the poor and financial efficiency of MFIs. Using a sample of 392 MFIs for a sample period of 16 years from 1998 to 2013, we find convincing evidence that there is no trade-off between the dual objectives of MFIs.

## **6.2. Academic Contribution of the Thesis**

Even though a few papers on microfinance efficiency evaluation are already available, research on this topic is still in its infancy, with the first studies produced only around 20 years ago. We have advanced the existing empirical literature in several ways.

Firstly, MFIs are mission oriented institutions due to their struggle to alleviate poverty, but to our knowledge, no clear methodology exists to measure how far an MFI meets its social obligations. Much debate has taken place on existing measures of social performance of MFIs as existing indicators are not evaluating the social objectives of MFIs. Therefore, to evaluate the social performance of MFIs, we introduce two new ways of measuring the outreach measures of breadth and depth of outreach, and our regression results suggest reasonably high proportions of the variations in the two new outreach indicators are explained by the usual determinants of social performance and so the two new indicators may be considered in empirical studies. They reflect market shares which have not been considered in the literature hitherto.

Secondly, the review of microfinance literature highlights the importance of performance assessment of MFIs, and therefore, we contribute to the literature by addressing this topic

in terms of their dual objectives of outreach and financial sustainability, and extensively evaluate their roles as different categories. Our datasets comprise different ownership structures, regulatory structures and five sample countries so for robustness of our trade-off analysis, we split the data into categories of non-profit-oriented institutions and profit-oriented institution regulated and non-regulated institutions, and MFIs in India (being a large economy of the region and comprising 51% of our data sample) and MFIs from countries other than India.

Thirdly, in using DEA, we extend the literature by using the double bootstrapping method in the context of dual objectives of MFIs, and we use the super-efficiency model to identify the outliers in efficiency estimates. Another contribution of this study is that, in the second stage, for the first time, we try to explore the link of efficiency, gender and governance.

Fourthly, in using SFA, our study is different from existing studies. We estimate cost efficiency and technical efficiency using SFA, a method that has not been widely applied in microfinance. The cost efficiency scores are further used for comparing efficient use of available resources by ownership type and organizational regulatory structure, and to relate outreach with financial sustainability indicators. Finally, we use disaggregated data that includes both social oriented and financial oriented MFIs of varying size, which potentially reduces the bias of large commercial firms and self-selection biases seen in prior studies.

### 6.3. Further Research

There are several ways in which the research reported in this thesis could be extended in future research. Firstly, it is important to remember that these results should be interpreted with caution, as they may be idiosyncratic to the sample period and region. The sample size in this study is restricted by data availability, the choice of statistical analysis, time and MFIs covered so results must be carefully considered since many specific (other) factors can affect MFIs' working process. We believe that the mostly conflicting governance and performance results are because MFIs are young firms, and the optimal governance form has perhaps not been finalized. MFIs in South Asia might face difficult challenges that may be outside the control of these institutions. Our approach might not capture all potential strategic management decisions. The inclusion of other corporate governance and gender variables would also merit further considerations. More research on the practices of boards is needed to assess the effects on MFIs' efficiency levels. Future research could explore the extent and the implications of the females attributes, like education and experience, in more detail.

Secondly, the social performance of MFIs should be evaluated, using at least two aspects of breadth of outreach and depth of outreach as these two outreach measures are opposite to each other. Considering only one aspect with financial sustainability in trade-off analysis might be misleading. Due to data limitations, we could not include both outreach indicators in our efficiency evaluations using DEA and SFA, but we strongly recommend this for future analysis.

Thirdly, in our case, most of the performance ratios are not significant in regressions: In fact, very few significant results are obtained, indicating that it is difficult to pick the type

of best regulatory and ownership structures. Therefore, further assessment of MFI's performance is required in terms of the current legal structure of these institutions. For example, which type of institution (and in which country) is most efficient, what type of lending methodology is most appropriate, and what are the other success factors that can be used as a benchmark in microfinance industry. More determinants of social and financial efficiency are also required to explore whether social, religious, cultural factors involved in efficiency of MFIs or not.

Finally, nevertheless, South Asian MFIs are facing several challenges. Many MFIs work in rural areas, where there is weak infrastructure and low population density, resulting in high operating costs. Due to higher costs and smaller operations volume, South Asian MFIs are facing difficulties in reaching more poor clients. We suggest that these institutions need to scale up, transform, or merge with other institutions to achieve better performance level that can guarantee their continued operation. Further research is needed to look into this issue more carefully.



**References**

- Abate, G. T., Borzaga, C., & Getnet, K. (2013). Cost efficiency and outreach of microfinance institutions: Trade-offs and the role of ownership. *Journal of International Development*, 26(6), 923-932. doi: 10.1002/jid.2981
- Abate, G. T., Borzaga, C., & Getnet, K. (2014). *Cost efficiency and outreach of microfinance institutions in Ethiopia: Do they contrast with financial cooperatives?* (Working Paper). Retrieved from [http://www.euricse.eu/sites/euricse.eu/files/db\\_uploads/documents/1401093570\\_n2530.pdf](http://www.euricse.eu/sites/euricse.eu/files/db_uploads/documents/1401093570_n2530.pdf)
- Adams, R. B., & Ferreira, D. (2009). Women in the boardroom and their impact on governance and performance. *Journal of Financial Economics*, 94(2), 291-309.
- Agier, I., & Szafarz, A. (2013). Microfinance and gender: Is there a glass ceiling on loan size? *World Development*, 42, 165-181.
- Ahlin, C., Lin, J., & Maio, M. (2011). Where does microfinance flourish? Microfinance institution performance in macroeconomic context. *Journal of Development Economics*, 95(2), 105-120. doi: 10.1016/j.jdeveco.2010.04.004
- Aigner, D., Lovell, C. A. K., & Schmidt, P. (1977). Formulation and estimation of stochastic frontier production function models. *Journal of Econometrics*, 6, 21-37.
- Annim, S. K. (2012). Microfinance efficiency: Trade-offs and complementarities between the objectives of microfinance institutions and their performance perspectives. *European Journal of Development Research*, 24(5), 788-807.
- Armendariz, B., & Morduch, J. (2010). *The economics of microfinance*. Cambridge, MA: MIT Press Books.

- Arsyad, L. (2005). An assessment of microfinance institution performance: The importance of institutional environment. *International Journal of Business* 7(3), 391-427.
- Arun, T. (2005). Regulating for development: The case of microfinance. *Quarterly Review of Economics and Finance*, 45(2-3), 346-357.
- Ashraf, A., & Hassan, M. K. (2011). *Firm-level attributes and performance of microfinance institutions* (Working Paper). Retrieved from <http://ssrn.com/abstract=1929587>
- Athanassopoulos, A. D. (1995). Goal programming & data envelopment analysis (GoDEA) for target-based multi-level planning: Allocating central grants to the Greek local authorities. *European Journal of Operational Research*, 87(3), 535-550. doi: [http://dx.doi.org/10.1016/0377-2217\(95\)00228-6](http://dx.doi.org/10.1016/0377-2217(95)00228-6)
- Avkiran, N. K. (2011). Association of DEA super-efficiency estimates with financial ratios: Investigating the case for Chinese banks. *Omega*, 39, 323-334.
- Balkenhol, B. (2007). *Microfinance and public policy: Outreach, performance and efficiency*. New York, NY: Palgrave Edition.
- Balli, H. O., & Sørensen, B. E. (2013). Interaction effects in econometrics. *Empirical Economics*, 45(1), 583-603.
- Baltagi, B. H. (2008). *Econometric analysis of panel data*. New York, NY: John Wiley & Sons.
- Bandyopadhyay, T., & Shankar, S. (2014). The impact of the 2010 Andhra Pradesh crisis on the operational efficiency of Indian microfinance institutions. In R. Mesland & R. O. Strom (Eds.), *Microfinance institutions: Financial and social performance* (pp. 119-138). New York, NY: Palgrave Macmillan.

- Banker, R. D., Charnes, A., & Cooper, W. W. (1984). Some models for estimating technical and scale inefficiencies in data envelopment analysis. *Management Science*, 30(9), 1078-1092.
- Barry, T. A., & Tacneng, R. (2014). The impact of governance and institutional quality on MFI outreach and financial performance in Sub-Saharan Africa. *World Development*, 58, 1-20.
- Barth, J., Noelle, D., Phumiwasana, T., & Yago, G. (2003). A cross-country analysis of the bank supervisory framework and bank performance. *Financial Markets, Institutions & Instruments*, 12, 67-120.
- Bassem, B. S. (2008). Efficiency of microfinance institutions in the Mediterranean: An application of DEA. *Transition Studies Review*, 15(2), 343-354.
- Bassem, B. S. (2009). Governance and performance of microfinance institutions in Mediterranean countries. *Journal of Business Economics and Management*, 10(1), 31-43.
- Battese, G. E., & Coelli, T. (1995). A model for technical inefficiency effects in a stochastic frontier production function for panel data. *Empirical Economics*, 20, 325-332.
- Bauer, P. W., Berger, A. N., Ferrier, G. D., & Humphrey, D. B. (1998). Consistency conditions for regulatory analysis of financial institutions: A comparison of frontier efficiency methods. *Journal of Economics and Business*, 50, 85-114.
- Becker, G. S. (1973). A theory of marriage: Part I. *Journal of Political Economy*, 81(4), 813-846.
- Belotti, F., Daidone, S., Ilardi, G., & Atella, V. (2012). *Stochastic frontier analysis using Stata* (Working Paper). CEIS. Retrieved from <http://ssrn.com/abstract=2145803>

- Berger, A. N., & Humphrey, D. B. (1991). The dominance of inefficiencies over scale and product mix economies in banking. *Journal of Monetary Economics*, 28, 117-148.
- Berger, A. N., & Humphrey, D. B. (1997). Efficiency of financial institutions: International survey and directions for future research. *European Journal of Operational Research*, 98(2), 175-212.
- Berger, A. N., Hunter, W. C., & Timme, S. G. (1993). The efficiency of financial institutions: A review and preview of research past, present, and future. *Journal of Banking and Finance*, 17, 221-249.
- Berger, A. N., & Mester, L. J. (1997). Inside the black box: What explains differences in the efficiencies of financial institutions? *Journal of Banking and Finance*, 21, 895-947.
- Berguiga, I. (2008). *Social performance and financial performance of microfinance institutions in the MENA countries*. Paris, France: University of Paris. Retrieved from <http://www.gredeg.cnrs.fr/Colloques/NFI/Papers/PapierOnLine/Berguiga.pdf>
- Bert, D. E., Guérin, I., & Mersland, R. (2011). Women and repayment in microfinance: A global analysis. *World Development*, 39(5), 758-772. doi: 10.1016/j.worlddev.2010.10.008
- Bibi, U., Balli, H. O., Matthews, C. D., & Tripe, D. W. L. (2014). *New approaches to measure the social performance of microfinance institutions* (Working Paper). Palmerston North, New Zealand: Massey University.
- Bibi, U., Balli, H. O., Matthews, C. D., & Tripe, D. W. L. (2014a). *Performance through financial ratios of South Asian microfinance institutions* (Working Paper). Palmerston North, New Zealand: Massey University.

- Bibi, U., Balli, H. O., Matthews, C. D., & Tripe, D. W. L. (2014b). *Impact of governance indicators and gender on microfinance efficiency – A truncated regression model based on DEA scores* (Working Paper). Palmerston North, New Zealand: Massey University.
- Bibi, U., Balli, H. O., Matthews, C. D., & Tripe, D. W. L. (2015). *Gender and efficiency of microfinance institutions: A stochastic frontier analysis* (Working Paper). Palmerston North, New Zealand: Massey University.
- Bolli, T., & Thi, A. V. (2012). *On the estimation stability of efficiency and economies of scale in microfinance institutions*. Retrieved from [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1994480](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1994480)
- Bolli, T., & Thi, A. V. (2014). Regional differences in the production processes of financial and social outputs of microfinance. *Economics of Transition*, 22(3), 461-495.
- Bora, B., Zdenek Drabek, K., Finger, M., Jansen, M., Keck, A., Low, P., . . . D'Andrea, R. T. B. (2004). *Exploring the linkage between the domestic policy environment and international trade*. Geneva, Switzerland: World Trade Organization (WTO).
- Branson, D. (2007). *No seat at the table: How corporate governance keeps women out of America's boardrooms*. New York, NY: New York University Press.
- Brau, J., & Woller, G. (2005). Microfinance: A comprehensive review of the existing literature and an outline for future financial research. *Journal of Entrepreneurial Finance and Business Ventures*, 9, 1-26.
- C-GAP. (2003). *Guiding principles on regulation and supervision of microfinance*. Washington, DC: Consultative Group to Assist the Poor (C-GAP). Retrieved from [http://info.worldbank.org/etools/docs/library/83619/cgap\\_paper.pdf](http://info.worldbank.org/etools/docs/library/83619/cgap_paper.pdf)

- C-GAP. (2006). *Good practice guidelines for founders of microfinance*. Washington DC: C-GAP Retrieved from <http://www.cgap.org/gm/document-1.9.2746/donorguidelines.pdf>
- Campbell, K., & Minguez-Vera, A. M. (2008). Gender diversity in the boardroom and firm financial performance. *Journal of Business Ethics*, 83(3), 435-451.
- Carter, D. A., Simkins, B. J., & Simpson, W. G. (2003). Corporate governance, board diversity and firm value. *Financial Review*, 38, 33-53.
- Caudill, S. B., Gropper, D. M., & Hartarska, V. (2009). Which microfinance institutions are becoming more cost effective with time? Evidence from a mixture model. *Journal of Money, Credit and Banking*, 41(4), 651-672.
- Chaffai, M. E., Dietsch, M., & Lozano-Vivas, A. (2001). Technological and environmental differences in the European banking industries. *Journal of Financial Services Research*, 19(2/3), 147-162.
- Chakravarty, S., & Pylypiv, M. I. (2015). The role of subsidization and organizational status on microfinance borrower repayment rates. *World Development*, 66(0), 737-748. doi: <http://dx.doi.org/10.1016/j.worlddev.2014.09.007>
- Charnes, A., Cooper, W. W., & Rhodes, E. (1978). Measuring the efficiency of decision making units. *European Journal of Operational Research*, 2, 429-444.
- Chen, G., Stephen, R., & Reille, X. (2010). *Growth and vulnerabilities in microfinance*. C-GAP Focus Note No. 61.
- Christen, R., & Drake, D. (2001). *Commercialization of microfinance*. Retrieved from [http://mfbvva.org/uploads/tx\\_bbvagbmicrof/Commercialization\\_of\\_Microfinance.pdf](http://mfbvva.org/uploads/tx_bbvagbmicrof/Commercialization_of_Microfinance.pdf)
- Christen, R., Rhyne, E., Vogel, R. C., & McKean, C. (1995). *Maximizing the outreach of microenterprise finance: An analysis of successful microfinance programs*

- (Program and Operations Assessment Report No. 10). Washington, DC: US Agency for International Development.
- Coelli, T. J., Rao, P., O'Donnell, C. J., & Battese, G. E. (2005). *An introduction to efficiency and productivity analysis*. New York, NY: Springer.
- Conning, J. (1999). Outreach, sustainability and leverage in monitored and peer-monitored lending. *Journal of Development Economics*, 60, 51-77.
- Cook, W. D., Tone, K., & Zhu, J. (2013). Data envelopment analysis: Prior to choosing a model. *Omega*, 44, 1-4.
- Copestake, J. (2007). Mainstreaming microfinance: Social performance management or mission drift? *World Development*, 35(10), 1721-1738. doi: 10.1016/j.worlddev.2007.06.004
- Crabb, P. (2008). Economic freedom and the success of microfinance institutions. *Journal of Developmental Entrepreneurship*, 13(2), 205-219.
- Crawford, A., Skully, M., & Tripe, D. (2014). *Are profitable microfinance programs less efficient at reaching the poor? A case study in Cambodia* (Working Paper). Retrieved from [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1968280](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1968280)
- Crespi-Cladera, R., Garcia-Cestona, M., & Salas, V. (2004). Governance mechanisms in Spanish banks. Does ownership matter? *Journal of Banking and Finance*, 28, 2311-2330.
- Crombrughe, A., Tenikue, M., & Sureda, J. (2008). Performance analysis for a sample of microfinance institutions in India. *Annals of Public and Cooperative Economics*, 79(2), 269-299.
- Cull, R., Demirguc-Kunt, A., & Morduch, J. (2007). Financial performance and outreach: A global analysis of leading microbanks. *Economic Journal*, 117, 107-133.

- Cull, R., Demirguc-Kunt, A., & Morduch, J. (2008). Microfinance meets the market. *Journal of Economic Perspectives*, 23(1), 167-192.
- Cull, R., Demirguc-Kunt, A., & Morduch, J. (2011). Does regulatory supervision curtail microfinance profitability and outreach? *World Development*, 39(6), 949-965.
- Cull, R., & Spreng, C. P. (2011). Pursuing efficiency while maintaining outreach: Bank privatization in Tanzania. *Journal of Development Economics*, 94(2), 254-261.
- Demirguc-Kunt, A., Detragiache, E., & Merrouche, O. (2013). Bank capital: Lessons from the financial crisis. *Journal of Money, Credit and Banking*, 45(6), 1147-1164. doi: 10.1111/jmcb.12047
- Desrochers, M., & Lamberte, M. (2003). *Efficiency and expense preference in Philippines' cooperative rural banks* (Working Paper). Retrieved from [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=382360](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=382360)
- Drake, L., Hall, M. J. B., & Simper, R. (2006). The impact of macroeconomic and regulatory factors on bank efficiency: A non-parametric analysis of Hong Kong's banking system. *Journal of Banking & Finance*, 30(5), 1443-1466. doi: 10.1016/j.jbankfin.2005.03.022
- Dyson, R. G., Allen, R., Camanho, A. S., Podinovski, V. V., Sarrico, C. S., & Shale, E. A. (2001). Pitfalls and protocols in DEA. *European Journal of Operational Research*, 132, 245-259.
- Easterly, W., & Levine, R. (2003). Tropics, germs, and crops: How endowments influence economic development. *Journal of Monetary Economics*, 50(1), 3-39.
- Fare, R., Grosskopf, S., & Lovell, C. A. K. (1994). *Production frontiers*. New York, NY: Cambridge University Press.
- Farrell, M. J. (1957). The measurement of productive efficiency. *Journal of Royal Statistical Society*, 120(3), 253-290.

- Farrington, T. (2000). *Efficiency in microfinance institutions*. Microbanking Bulletin. Retrieved from <http://wtrc.allanreyes.com/resources/Efficiency%20in%20MFIs.pdf>
- Ferro-Luzzi, G., & Weber, S. (2006). *Measuring the performance of microfinance institutions* (Working Paper). Retrieved from [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=918750](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=918750)
- Flückiger, Y., & Vassiliev, A. (2007). Efficiency in microfinance institutions : An application of data envelopment analysis to MFIs in Peru. *Microfinance and Public Policy: Outreach, Performance, and Efficiency* (pp. 91-94). New York, NY: Palgrave MacMillan and International Labor Organization.
- Francoeur, C., Labelle, R., & Sinclair-Desgagné, B. (2008). Gender diversity in corporate governance and top management. *Journal of Business Ethics*, 81, 83-95.
- Fried, H. O., Schmidt, S. S., & Yaisawarng, S. (1999). Incorporating the operating environment into a nonparametric measure of technical efficiency. *Journal of Productivity Analysis*, 12, 249-267.
- Galema, R., Lensink, R., & Spierdijk, L. (2011). International diversification and microfinance. *Journal of International Money and Finance*, 30, 507-515.
- Goetz, A. M., & Gupta, R. S. (1996). Who takes the credit? Gender, power, and control over loan use in rural credit programs in Bangladesh. *World Development*, 24(1), 45-63.
- Gonzales-Vega, C., Schreiner, M., Meyer, R. L., Rodriguez-Meza, J., & Navajas, S. (1996). *Bancosol: The challenge of growth for microfinance organizations* (Occasional Paper No. 2332). Columbus, OH: Rural Finance Program, Department of Agricultural Economics, Ohio State University

- Gregoire, J. R., Tuya, O., & Ramirez. (2008). Cost efficiency of microfinance institutions in Peru: A stochastic frontier approach. *Latin American Business Review*, 7(2), 41-70.
- Gregoriou, G., Messier, J., & Sedzro, K. (2005). Accessing the relative efficiency of credit unions branches using data envelopment analysis. *INFORMS*, 42, 281-297.
- Gujarati, D. N., & Porter, D. C. (2003). *Basic econometrics* (5th ed.). Boston, MA: McGraw-Hill.
- Gutierrez-Nieto, B., Serrano-Cinca, C., & Molinero, C. M. (2007). Microfinance institutions and efficiency. *Omega-International Journal of Management Science*, 35(2), 131-142.
- Gutierrez-Nieto, B., Serrano-Cinca, C., & Molinero, C. M. (2009). Social efficiency in microfinance institutions. *Journal of the Operational Research Society*, 60, 104-119. doi: 10.1057/palgrave.jors.2602527
- Haq, A. (2008). *Microfinance industry assessment: A report on Pakistan*. Islamabad: Pakistan Microfinance Network
- Haq, M., Hoque, M., & Pathan, S. (2008). Regulation of microfinance institutions in Asia: A comparative analysis. *International Review of Business Research Papers*, 4, 421-450.
- Haq, M., Skully, M., & Pathan, S. (2010). Efficiency of microfinance institutions: A data envelopment analysis. *Asia-Pacific Financial Markets*, 17, 63-97.
- Haq, M. F., Akmal, M., Shafique, B., Abbasi, M. U., & Chaudhry, M. S. (2009). *Towards achieving social and financial sustainability: A study on the performance of microfinance in Pakistan*. Islamabad, Pakistan: International Labour Organization & State Bank of Pakistan. Retrieved from

[http://www.ilo.org/islamabad/whatwedo/publications/WCMS\\_143165/lang--en/index.htm](http://www.ilo.org/islamabad/whatwedo/publications/WCMS_143165/lang--en/index.htm)

- Hardy, D., Holden, P., & Prokopenko, V. (2003). Microfinance institutions and public policy. *Journal of Economic Policy Reform*, 6(3), 147-158.
- Hartarska, V. (2005). Governance and performance of microfinance institutions in Central and Eastern Europe and the newly independent states. *World Development*, 33(10), 1627-1643. doi: 10.1016/j.worlddev.2005.06.001
- Hartarska, V. (2009). The impact of outside control in microfinance. *Managerial Finance*, 35(12), 975-989.
- Hartarska, V., & Mersland, R. (2012). Which governance mechanisms promote efficiency in reaching poor clients? Evidence from rated microfinance institutions. *European Financial Management*, 18(2), 218-239.
- Hartarska, V., & Nadolnyak, D. (2007). Do regulated microfinance institutions achieve better sustainability and outreach? Cross-country evidence. *Applied Economics*, 39(10), 1207-1222.
- Hartarska, V., Shen, X., & Mersland, R. (2013). Scale economies and input price elasticities in microfinance institutions. *Journal of Banking & Finance*, 37(1), 118-131.
- Hartman, T. E., Storbeck, J. E., & Byrnes, P. (2001). Allocative efficiency in branch banking. *European Journal of Operational Research*, 134, 232-242.
- Hassan, M. K., & Sanchez, B. (2009). *Efficiency analysis of microfinance institutions in developing countries* (Working Paper). Retrieved from [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1492238](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1492238)

- Hassan, M. K., & Tufte, D. R. (2001). The x-efficiency of a group-based lending institution: The case of the Grameen Bank. *World Development*, 29(6), 1071-1082.
- Hermes, N., Lensink, R., & Meesters, A. (2011). Outreach and efficiency of microfinance institutions. *World Development*, 39(6), 938-948. doi: 10.1016/j.worlddev.2009.10.018
- Hsiao, T. (2003). *Analysis of panel data*. Cambridge, UK: Cambridge University Press.
- Hubka, A., & Zaidi, R. (2005). *Impact of government regulation on microfinance*. Washington, DC: World Bank.
- Hudon, M. (2010). Management of microfinance institutions: Do subsidies matter? *Journal of International Development*, 22(7), 890-905. doi: 10.1002/jid.1639
- Hudon, M., & Traca, D. (2011). On the efficiency effects of subsidies in microfinance: An empirical inquiry. *World Development*, 39(6), 966-973. doi: 10.1016/j.worlddev.2009.10.017
- Hughes, J. P., & Mester, L. J. (2008). Bank capitalization and cost: Evidence of scale economies in risk management and signalling. *Review of Economics and Statistics*, 80(314-325).
- Irfan, M. (2000). Poverty in South Asia. *Pakistan Development Review* 39(4 ), 1141-1151.
- Jansson, T., Rosales, R., & Westley, G. (2004). *Principles and practices for regulating and supervising microfinance*. Washington, DC: Inter-American Development Bank.
- Kanter, R. M. (1977). Some effects of proportions on group life: Skewed sex ratios and responses to token women. *American Journal of Sociology*, 82(5), 965-990.

- Kaufmann, D., Kraay, A., & Massimo, M. (2009). *Governance matters VIII: Aggregate and individual governance indicators, 1996–2008*. (Working Paper No. 4975). Washington, DC: World Bank. Retrieved from <http://www.sciencedirect.com/science/article/pii/S0305750X13002908#bb0255>
- Kennedy, P. (2008). *A guide to econometrics* (6th ed.). Malden, MA: Blackwell Publishing.
- Kereta, B. B. (2007). *Outreach and financial performance analysis of microfinance institutions in Ethiopia*. Paper presented at the African Economic Conference United Nations Conference Centre (UNCC), Addis Ababa, Ethiopia.
- Khan, A. A. (2010). Commercialization of microfinance - Is the sector losing its identity by evading its original 'social service' responsibility? *Social and Environmental Accountability Journal*, 28(2), 78-90.
- Koch, T. W., & MacDonald, S. S. (2010). *Bank management*. Mason, OH: South-Western CENGAGE Learning.
- Kono, H., & Takahashi, K. (2010). Microifnace revolutions: Its effects, innovations, and challenges. *Developing Economics*, 48(1), 15-73.
- Koveos, P., & Randhawa, D. (2004). Financial services for the poor: Assessing microfinance institutions *Managerial Finance*, 30(9), 70-95.
- Krauss, N., & Walter, I. (2009). Can microfinance reduce portfolio volatility? *Economic Development and Cultural Change*, 58(1), 85-110.
- Kumbhakar, S. C., Lozano-Vivas, A., Lovell, C. A. K., & Hasan, I. (2001). The effects of deregulation on the performance of financial institutions: The case of Spanish savings banks. *Journal of Money, Credit and Banking*, 33(1), 101-120.

- Kyereboah-Coleman, A., & Osei, K. A. (2008). Outreach and profitability of microfinance institutions: The role of governance. *Journal of Economic Studies*, 35(3), 236-248.
- Lafourcade, A. L., Isern, J., Mwangi, P., & Brown, M. (2005). *Overview of the outreach and financial performance of microfinance institutions in Africa*. Washington DC: Microfinance Information Exchange Retrieved from [http://www.ruralfinancenetwork.org/pubs/MIX%20Africa\\_Data\\_Study.pdf](http://www.ruralfinancenetwork.org/pubs/MIX%20Africa_Data_Study.pdf)
- Lariviere, S., & Martin, F. (1999). Innovations in rural microfinance: The challenge of sustainability and outreach *Innovations in microfinance for the rural poor: Exchange of knowledge and implications for policy* (pp. 85-110). Feldafing, Germany: German Foundation for International Development.
- Ledgerwood, J. (1999). Sustainable banking with the poor. In World Bank (Ed.), *Microfinance handbook: An institutional and financial perspective*. Washington DC: Springer.
- Lee, Y.-J. (2005). *Specification testing for functional forms in dynamic panel data models*. (Unpublished Doctoral dissertation) Cornell University, Ithaca, NY.
- Leon, J. V. (2001). *Decentralized efficient organizations of microfinance: The case of the Peruvian municipal banks* (Working Paper). Wittenberg University, Ohio.
- Levine, R. (1997). Financial development and economic growth: Views and agenda. *Journal of Economic Literature*, 35, 688-726.
- Manos, R., & Yaron, J. (2009). Key issues in assessing the performance of microfinance institutions. *Canadian Journal of Development Studies*, 29(1), 101-122.
- Marakkath, N. (2014). *Sustainability of Indian microfinance institutions: A mixed methods approach*. Mumbai, India: Springer.

- Masood, T., & Ahmad, M. I. (2010). *Technical efficiency of microfinance institutions in India: A stochastic frontier approach* (Working Paper). Retrieved from [http://mpa.ub.uni-muenchen.de/25454/1/MPRA\\_paper\\_25454.pdf](http://mpa.ub.uni-muenchen.de/25454/1/MPRA_paper_25454.pdf)
- Mersland, R. (2007). Innovations in savings and credit groups: Evidence from Kenya. *Small Enterprise Development: An International Journal*, 18(1), 50-56.
- Mersland, R. (2009). The cost of ownership in microfinance organizations. *World Development*, 37(2), 469-478. doi: 10.1016/j.worlddev.2008.03.006
- Mersland, R., Randoy, T., & Strom, R. O. (2011). The impact of institutional influence on microbanks' performance: A global survey. *International Business Review*, 20(2), 163-176.
- Mersland, R., & Strom, R. O. (2008). Performance and trade-offs in microfinance organizations: Does ownership matter? *Journal of International Development*, 20(5), 598-612. doi: 10.1002/jid.1432
- Mersland, R., & Strom, R. O. (2009). Performance and governance in microfinance institutions. *Journal of Banking and Finance*, 33, 662-669.
- Mersland, R., & Strom, R. O. (2010). Microfinance mission drift? *World Development*, 38(1), 28-36. doi: 10.1016/j.worlddev.2009.05.006
- Mersland, R., & Strom, R. O. (2014). *Microfinance institutions: Financial and social performance*. London, UK: Palgrave Macmillan.
- Meyer, R. L. (2002). The demand for flexible microfinance products: Lessons from Bangladesh. *Journal of International Development*, 14(3), 351-368. doi: 10.1002/jid.884
- Microrate. (2003). *Performance indicators for microfinance institutions* (Technical Guide). Retrieved from <http://www.microrate.com/>

- MIX market. (2011). *Asia Regional Snapshot*. Retrieved from <http://www.themix.org/publications/mix-microfinance-world/2012/03/2011-asia-regional-snapshot>
- Montgomery, H., & Weiss, J. (2011). Can commercially-oriented microfinance help meet the millennium development goals? Evidence from Pakistan. *World Development*, 39(1), 87-109.
- Morduch, J. (1999). The microfinance promise. *Journal of Economic Literature*, XXXVII, 1569-1614.
- Morduch, J. (2000). The microfinance schism. *World Development*, 28(4), 617-629.
- Müller, O., & Uhde, A. (2013). The impact of external governance quality on the economic and social success of microfinance institutions. *International Journal of Monetary Economics and Finance*, 6(2-3), 116-149.
- Navajas, S., Schreiner, M., Meyer, R. L., Gonzalez-Vega, C., & Rodriguez-Meza, J. (2000). Microcredit and the poorest of the poor: Theory and evidence from Bolivia. *World Development*, 26, 33-46.
- Nawaz, A. (2010). *Efficiency and productivity of microfinance: Incorporating the role of subsidies*. Brussels, Belgium: CEB Research Institute of Management Sciences. Retrieved from <http://www.microfinancegateway.org/gm/document-1.9.49865/Technical,%20Economic%20and%20Allocative.pdf>
- Nghiem, H. S., Coelli, T., & Rao, P. (2006). *Efficiency and effectiveness of micro-finance in Vietnam: Evidence from NGO schemes in the north and the central regions*. Centre of Efficiency and Productivity Analysis, School of Economics, University of Queensland. St Lucia, Australia. Retrieved from [http://hongson2.tripod.com/Efficiency\\_Microfinance.pdf](http://hongson2.tripod.com/Efficiency_Microfinance.pdf)

- Oteng-Abayie, E., Amanor, K., & Frimpong, J. (2011). The measurement and determinants of economic efficiency of microfinance institutions in Ghana: A stochastic frontier approach. *African Review of Economics and Finance*, 2, 149-166.
- Paxton, J. (2007). Technical efficiency in a semi-formal financial sector: The case of Mexico. *Oxford Bulletin of Economics and Statistics*, 69, 57-74.
- Paxton, J., & Cuevas, C. E. (2002). Outreach and sustainability of member-based rural financial intermediaries. In M. Zeller & R. L. Meyer (Eds.), *The triangle of microfinance: Financial sustainability, outreach and impact*. London: The Johns Hopkins University Press.
- Peng, M. W. (2003). Institutional transitions and strategic choices. *The Academy of Management Review*, 28(2), 275-296.
- Piot-Lepetit, I., & Nzongang, J. (2014). Financial sustainability and poverty outreach within a network of village banks in Cameroon: A multi DEA approach. *European Journal of Operational Research*, 234, 319-330.
- Qayyum, A., & Ahmed, M. (2006). *Efficiency and sustainability of microfinance institutions in South Asia*. Islamabad, Pakistan: Pakistan Institute of Development Economics (PIDE), Pakistan. Retrieved from [http://saneinetwork.net/Files/06\\_07.pdf](http://saneinetwork.net/Files/06_07.pdf)
- Quayes, S. (2012). Depth of outreach and financial sustainability of microfinance institutions. *Applied Economics*, 44(26), 3421-3433.
- Randøy, T., Strøm, R. Ø., & Mersland, R. (2013). The impact of entrepreneur - CEOs in microfinance institutions: A global survey. *Entrepreneurship Theory & Practice*, 39(4), 1-27. doi: 10.1111/etap.12085

- Rodrik, D., Subramanian, A., & Trebbi, F. (2004). Institutions rule: The primacy of institutions over geography and integration in economic development. *Journal of Economic Growth*, 9(2), 131-165.
- Rosenberg, R. (2009). *Measuring results of microfinance institutions: Minimum indicators that donors and investors should track* (Technical Guide). C-GAP. Retrieved from <http://www.cgap.org/sites/default/files/CGAP-Technical-Guide-Measuring-Results-of-Microfinance-Institutions-Minimum-Indicators-That-Donors-and-Investors-Should-Track-Jul-2009.pdf>
- Schicks, J. (2007). Developmental impact and coexistence of sustainable and charitable microfinance institutions: Analysing BancoSol and Grameen Bank. *European Journal of Development Research*, 19(4), 551-568.
- Schreiner, M. (2002). Aspects of outreach: A framework for discussion of the social benefits of microfinance. *Journal of International Development*, 14(5), 591-603. doi: 10.1002/jid.908
- Sedzro, K., & Keita, M. (2009). Assessing the efficiency of microfinance institutions using data envelopment analysis. *Journal of International Finance and Economics*, 9(2), 54-67.
- Servin, R., Lensink, R., & Berg, M. V. D. (2012). Ownership and technical efficiency of microfinance institutions: Empirical evidence from Latin America. *Journal of Banking and Finance*, 36, 2136-2144.
- Shephard, R. W. (1970). *Theory of cost and production functions*. Princeton, NJ: Princeton University Press.
- Shetty, N. K. (2009). The microfinance promise in financial inclusion and welfare of the poor: Evidence from India. *Journal of Applied Economics*, 8(5/6), 174-189.

- Shrader, C. B., Blackburn, V. B., & Iles, P. (1997). Women in management and firm financial performance: An exploratory study. *Journal of Managerial Issues*, 9(3), 355-372.
- Sievers, M., & Vandenberg, P. (2007). Synergies through linkages: Who benefits from linking micro-finance and business development services? *World Development*, 35(8), 1341-1358. doi: 10.1016/j.worlddev.2007.04.002
- Simar, L., & Wilson, P. W. (2007). Estimation and inference in two-stage, semi-parametric models of production processes. *Journal of Econometrics*, 136, 31-64.
- Sinclair, H. (2012). *Confessions of a microfinance heretic: How micro-lending lost its way and betrayed the poor*. San Francisco, CA: Berrett-Koehler Publishers.
- Sinha, S., Rasmussen, S., Brar, A., Sinha, F., Ivatury, G., Matin, I., . . . Hashemi, S. (2007). *Microfinance in South Asia: Toward financial inclusion for the poor*. Washington, DC: The World Bank. Retrieved from <http://siteresources.worldbank.org/SOUTHASIAEXT/Resources/Publications/448813-1184080348719/fullreport.pdf>
- Smith, N., Smith, V., & Verner, M. (2006). Do women in top management affect firm performance? A panel study of 2,300 Danish firms. *International Journal of Productivity and Performance Management*, 15(7), 569-593.
- Snow, D. (1999). Microcredit: An institutional development opportunity. *International Journal of Economic Development*, 1(1), 65-79.
- Strøm, R. Ø., Bert, D. E., & Mersland, R. (2014). Female leadership, performance, and governance in microfinance institutions. *Journal of Banking & Finance*, 42, 60-75.

- Sufian, F. (2006). The efficiency of non-bank financial institutions: Empirical evidence from Malaysia. *International Research Journal of Finance and Economics*, 1(6), 49-65.
- Taylor, M. (2011). Freedom from poverty is not for free: Rural development and the microfinance crisis in Andhra Pradesh, India. *Journal of Agrarian Change*, 11(4), 484-504. doi: 10.1111/j.1471-0366.2011.00330.x
- Tchakoute-Tchuigoua, H. (2010). Is there a difference in performance by the legal status of microfinance institutions? *Quarterly Review of Economics and Finance*, 50(4), 436-442.
- Thanassoulis, E. (1999). Data envelopment analysis and its use in banking. *Interfaces*, 29(3), 1-13.
- Thomas, A. S., & Ramaswamy, K. (1996). Matching managers to strategy: Further tests of the Miles and Snow typology. *British Journal of Management*, 7, 247-261.
- Tone, K. (2002). A slacks-based measure of super-efficiency in data envelopment analysis. *European Journal of Operational Research*, 143, 32-41.
- Tulkens, H., & Eeckaut, P. V. (1995). Non-parametric efficiency, progress and regress measures for panel data: Methodological aspects. *European Journal of Operational Research*, 80, 474-499.
- Vanroose, A., & D'Espallier, B. (2013). Do microfinance institutions accomplish their mission? Evidence from the relationship between traditional financial sector development and microfinance institutions' outreach and performance. *Applied Economics*, 45(15), 1965-1982.
- Varian, H. R. (1984). The Nonparametric Approach to Production Analysis. *Econometrica*, 52(3), 579-597.

- Von Pischke, J. D. (1996). Measuring the trade-off between outreach and sustainability of microenterprise lenders. *Journal of International Development*, 8(2), 225-239.
- Wang, H.-J., & Schmidt, P. (2002). One-step and two-step estimation of the effects of exogenous variables on technical efficiency levels. *Journal of Productivity Analysis*, 18, 129-144.
- Weiss, J., & Montgomery, H. (2007). Great expectations: Microfinance and poverty reduction in Asia and Latin America. *Oxford Development Studies*, 33(3), 391-416.
- Wilson, P. W. (2005). FEAR 1.0: A software package for frontier efficiency analysis with R. *Socio-Economic Planning Sciences*, 42, 247-254.
- Woller, G. (2012). From market failure to marketing failure: Market orientation as the key to deep outreach in microfinance. *Journal of International Development*, 14(3), 305-324.
- Woller, G., Dunford, C., & Woodworth, W. (1999). Where to microfinance. *International Journal of Economic Development*, 1, 29-64.
- Worthington, A. C. (1998). The application of mathematical programming techniques to financial statement analysis: Australian gold production and exploration. *Australian Journal of Management*, 23(1), 97-113.
- Yaron, J. (1992). *Assessing development finance institutions: A public interest analysis* (Discussion Paper). Washington, DC: World Bank
- Yaron, J. (1994). What makes rural finance institutions successful? *World Bank Research Observer*, 9(1), 49-70.
- Zeller, M., & Meyer, R. L. (2002). *The triangle of microfinance: Financial sustainability, outreach and impact*. London, UK: Johns Hopkins University Press.



## APPENDICES

### **Appendix 1: Microfinance in South Asia**

This study makes a theoretical and empirical review of MFIs in five major countries of the South Asia region: Bangladesh, India, Nepal, Pakistan and Sri Lanka. Poverty is the common characteristic of countries in this region, which has the lowest GDP per capita in the world (Irfan, 2000). A profile of South Asian economy is presented in Table A1.

We choose South Asian microfinance programs due to their distinct characteristics. For example, MFIs are largely concentrated in this region and, according to the MIX market, the region has the world's largest microfinance sector, dominated by India and Bangladesh (MIX market, 2011). In addition, according to the dataset used in this study, the South Asian microfinance program has shown consistent growth and efficient performance in providing financial services to their low income clients (MIX market, 2011). The term 'microfinance' was first used in this region, and MFIs are largely concentrated here. Various types of MFIs are operating in these countries and are mainly categorized as formal (microfinance banks), semiformal (NGOs, cooperatives and saving banks) and informal (self-help groups (SHGs), credit associations and individual money lenders). The basis for this categorization is the regulatory threshold of their activities.

The socioeconomic history of these South Asian countries reflects their constant struggle to improve the living standards of their population and, thus, sustain growth. They are trying to improve economic growth through enhancement of social indicators. This region has the potential for market growth for microenterprises due to its characteristics of large population density and formal financial services (provided by financial institutions) that

are not affordable for all. Therefore, microfinance, which aims to serve the poor, has a good potential to flourish in this region (Haq, Hoque, & Pathan, 2008). Some of the MFIs developed their efficiency through low operating expenses, different lending methodologies and strong outreach.

According to the World Bank, informal systems in South Asia, such as money lending, have existed from ancient times. However, formal microfinance was initially started in the 1970s and later through the integrated development programmes of the 1980s–90s, followed by the high levels of subsidy growth of MFIs in Bangladesh in the late 1990s. Microfinance was introduced in South Asia as the sole source of financial services for low income families. The microfinance sector was revolutionized in the region with the introduction of additional financial instruments. These included the diversity of MFI models in Bangladesh and the introduction of microfinance regulations in Nepal and Pakistan.

Additionally, every type of institutional model prevails in South Asia. For example, there is the Grameen model that is predominant in Bangladesh, the community-based organizations (CBOs) in Nepal and cooperatives that are the main channel of MFIs in Sri Lanka. The rural support programs of Pakistan and self-help groups (SHGs) are an alternative innovative institution to restrictive cooperative rules in India. Most of the MFIs are turning into service companies and, in addition, commercial banks in the region are introducing new instruments in micro-financing. Moreover, the types of products are offered according to different institutional models. For example, loans are offered as a ‘Grameen’ type and as per individual lending programs. Interest rates on fixed loans with

borrowing cycles are charged by the Grameen model and declining balances are charged as other types of MFIs.

The financial sustainability of MFIs in the South Asian region is highly variable. In Bangladesh, leading MFIs are highly successful, but most of them rely on subsidies. MFIs in India have average financial sustainability. Leading MFIs in Nepal suffer from deteriorating portfolio quality, but some of them are still making profits in a low subsidy environment. In Pakistan, multidimensional programs and high subsidies make it difficult to achieve sustainability. In Sri Lanka, cooperatives are largely profitable, but they are not financially sustainable.

The World Bank report (Sinha et al., 2007) describes the outreach of microfinance in different South Asian countries in detail. Bangladesh and Sri Lanka are classified as high outreach, Nepal and India as medium and Pakistan as low outreach. A small number of MFIs provide finance to microfinance clients in Bangladesh. In Nepal, high coverage is based on the CBOs, which have an extensive network. MFIs are generally confined to some parts of the country, like the Kathmandu Valley and South Plain. In India, the outreach of microfinance has considerably increased in recent years because of the substantial growth of NGOs and the SHGs link programs. In Pakistan, microfinance outreach from the specialized microfinance banks and NGOs is less than 10 per cent of the potential market, whereas in Bangladesh and Sri Lanka, microfinance has expanded its services to more than 60 per cent of the poor population. Microfinance has created another spillover effect throughout the region: the engagement of women in social and economic wellbeing through microenterprise promotion.

**Table A1: Profile of South Asian Countries**

|  | Bangladesh   | Sri Lanka         | Nepal                         | India  | Pakistan  |
|--|--|-------------------|-------------------------------|--|---|
| <b>Geographic and Demographic Indicators</b> |  |                   |                               |  |   |
| Population <sup>29</sup> (In millions)       | 156  | 17.6              | 29.6                          | 1210.2   | 184   |
| Education <sup>30</sup> (%)                  | 56.5   | 90.8              | 60.3                          | 68.3   | 54.2  |
| Poverty Index <sup>31</sup> (%)              | 29   | 2.10              | 35                            | 29   | 27  |
| HDI Value <sup>32</sup>                      | 0.500  | 0.691             | 0.458                         | 0.547  | 0.504   |
| <b>Economic Indicator</b>                    |  |                   |                               |  |   |
| GDP per capita (in USD)                      | 1,458  | 4,999             | 1,189                         | 3,354  | 2,625   |
| <b>MFI Structure</b>                         |  |                   |                               |  |   |
| Financing structure                          | Donor grant, subsidized debt from apex institutions <sup>33</sup> and compulsory deposits from clients | Voluntary deposit | Mainly on debt financed       | Largely debt financed                          | Donor financed for NGOs and for specialized institutes and debt financing |
| Delivery Methodologies classification        | Grameen Model  | Cooperatives      | Community-based Organizations | Self-Help Groups, Mixed Model and cooperatives | Rural Support Program   |
| Sustainability level <sup>34</sup>           | Weaning  | Maturing          | Maturing                      | Maturing                                       | Weaning   |
| Outreach <sup>35</sup>                       | High   | High              | Medium                        | Medium   | Low   |

Note: compiled by author from World Bank web site and was collected in October 2011.

<sup>29</sup> Estimated number of inhabitants belongs to each country.

<sup>30</sup> Literacy rates show the percentage of population who can read and write.

<sup>31</sup> The human poverty index shows the standard of living of the country's inhabitants and the values are developed by the United Nations.

<sup>32</sup> Human development indicator is a composite measurement of human progress using some development indicators as knowledge, longevity and standard of living. The value of the HDI Index lies between zero and one. The index close to one for a country shows a higher level of human development; in contrast, an HDI index value close to zero indicates a lower level of human development. This Index is published annually in human development reports by the United Nations Development Programs.

<sup>33</sup> To manage access funding, MFIs partner with international NGOs. These MFIs are registered as wholesale institutions that do not provide services directly to clients, but they do provide to retail MFIs.

<sup>34</sup> Sustainability refers to the financial capacity of the institutions to reduce funding grants and increases to cover operating expenses through profits.

<sup>35</sup> Outreach is the provision of financial services to the poor,

**Appendix 2: Microfinance Regulations in South Asia**

The Financial Intermediary Societies Act (FISA) was passed in 1999 in Nepal. These regulations apply to the activities of MFIs, such as supervision, regulation and licensing. Therefore, MFIs come under the direct regulatory framework of the Bank and Financial Ordinance 2004, but these regulations only cover microfinance banks and NGOs. Microfinance banks provide financial services that are needed by the poor and the microenterprises; these banks are registered with the central bank of the country. NGOs are those financial intermediaries that are not allowed to perform regular banking activities. The central bank of Nepal, NRB, incorporates regulatory supervision and monitors all commercial banks, finance companies, development banks, licensed NGOs and cooperatives that are engaged in microfinance.

According to Haq, Akmal, Shafique, Abbasi and Chaudhry (2009), microfinance in Pakistan is an important poverty alleviation program for the country, and the MFIs Ordinance 2001 provides the regulatory framework for microfinance sectors. This ordinance directs its license holders to focus on the poverty reduction agenda. Pakistan is one of those countries in the South Asian region that has a separate regulatory framework for microfinance banks. However, the legal and policy frameworks do not cover the rural support programs and non-governmental organizations, so institutions other than microfinance banks are free to operate, choosing their own pricing, client segment, source of funding and loan sizes. The State Bank of Pakistan (SBP) is the regulatory authority for the formal banking sector, including microfinance banks. The financial sector of Pakistan is largely regulated by its state bank and security and exchange commission of Pakistan (SECP). All banks are required to register with the SECP, and the sector is

supervised and regulated by the SBP. NBFIs fall under the supervision of the SECP and are regulated under the Companies Ordinance 1984 as non-profit companies.

In Bangladesh, rural credit legislation is the Usurious Loan Act 1918 and the Bengal Money Lenders Act 1933. These rules attempt to prevent the charge of high interest rates, and their maximum limit is 15% for secured and 25% for unsecured loans. However, to date, there is no law for rural credit market governance. The Grameen Bank, established under a specific act, the Grameen Bank Ordinance 1983, has a separate regulatory system from conventional regulatory ones. In India, microfinance activities are covered under a number of regulations; some of them are very old and even not specifically meant for microfinance. For the last ten years, microfinance regulations have had substantial advocacy. In 1999, India established a MFI association that advocates for microfinance regulation. In 2007, a microfinance legal framework was presented to parliament, which is still fulfilling the legal requirements. It is in the process of being enacted. Impediments on the path of financial sustainability and private sector initiatives are the main issues in practice for microfinance in Sri Lanka. That is why most of the suppliers of microfinance programs have not had legal frameworks and have been inadequately supervised or regulated. In 2006, the Sri Lankan parliament approved a draft microfinance regulation, the Micro Credit Regulatory Act 2006, which covered the microfinance activities of NGOs–MFIs.

To balance the objectives of providing financial services to microenterprises and tightening up regulations, new laws for MFIs are being introduced. All larger countries of the region have either developed special regulations under the banking law or their microfinance regulations are in place.

**Appendix 3: Choice of Financial Ratios**

Table A3 shows a list of efficiency ratios, introduced by C-GAP (2003) that are used to assess the performance of MFIs. Some important ratios from Table A3 are described below. Our choice of ratios for final regressions is based on banking ratios as discussed by Koch and MacDonald (2010). Among the portfolio quality category, we have portfolio at risk greater than the 30 days ratio. This indicator is less dependent on accounting policy, so is considered as a more objective measure. A second ratio in this category is the provision expense ratio that is considered as more dependent on the accounting practices, so we find it less suitable to include in our portfolio quality category. This ratio anticipates future loan losses and gives an indication of the expenses incurred by the institution; it is expected to grow with an increase in portfolio growth. A third ratio in this category is risk coverage ratio that measured the actual amount of portfolio risk covered by loan loss reserves. It gives an indication of the financial strength of an institution as to how well it is prepared for the worst case scenario. The write-off ratio is another ratio in the portfolio quality category. It gives us information about the loans that have been removed from the books of the institution because of substantial doubt that they will be recovered.

The second category of performance ratios is cost ratios that are used to measure the efficiency of MFIs and show how well an institution is streamlining its operations. These ratios have an advantage over leverage ratios in that they are not as easily manipulated by the management decisions and are more readily comparable across institutions. However, at the same time, these ratios are a less comprehensive indicator of performance than those of leverage ratios. We chose OER and the operating expenses include in this ratios are depreciation, board fees, administrative and salary expenses, but interest and provision expense and other extraordinary expenses are not included. It measures the

institutional cost of delivering the loan services and is considered the best indicator to measure the overall efficiency of a lending institution. The other cost ratios include cost per borrower, credit officers' productivity, personnel productivity and the personnel allocation ratio. As all of these ratios have number of active borrowers as denominator and we take the number of active borrowers as one of the outreach measures, we excluded these ratios from our models.

Financial management ratios summarize the performance in all areas of the company; low portfolio quality ratios indicate a low efficiency of the institution that is also reflected in profitability or leverage ratios. These ratios are difficult to interpret because they are an aggregate of so many factors; for example, a high value of return on equity says little about the microfinance performance. Performance indicators of profitability have limited use because of the fact that so many MFIs are still receiving grants and subsidized loans, so 'comparing apples with apples' is always a problem with microfinance. We only include the capital to assets ratio in this category, which is closely related to the debt to equity ratio and return on equity ratio. As we are aiming to have a more parsimonious set of variables, we choose only one of them in our regression model. These portfolio quality ratios, cost ratios and leverage ratios are actually measuring the same thing — the MFI's performance — but we find some of the explanatory variables are actually dependent on each other. This correlation does not show up in the correlation matrix as exceptionally high, but they are conceptually related to each other. For example, return on assets is equal to return on equity multiplied by the capital assets ratio; capital assets ratio and debt equity ratio are almost one minus the other.

**Table A3.1: Performance measurement ratios by C-GAP**

| Ratios                             | Explanation  |
|------------------------------------|--|
| Portfolio at risk (PQ 1)           | Portfolio at risk divided by gross loan portfolio. This ratio is the value of all loans outstanding that have one or more instalments of principal past due more than number of days. Portfolio at risk is calculated by 30 and 90 days. |
| Provision expense ratio (PQ 2)     | This ratio is equals to loan loss rate, which is calculated by (write offs –value of loans recovered) divided by average gross loan portfolio.   |
| Risk average ratio (PQ 3)          | This ratio is named as the risk coverage ratio that is calculated by Impairment loss allowance divided by PAR greater than 30 days   |
| Write-off ratio (PQ 4)             | Write offs divided by average portfolio. Write-offs are the total amount of loans written off during the period.   |
| Operating expense ratio(EP 1)      | Operating expense divided by gross loan portfolio This is also called cost per dollar loaned.  |
| Cost per client (EP 2)             | Operating expenses divided by number of clients This ratio is named as cost per borrower.  |
| Personnel productivity (EP 3)      | Number of active borrowers divided by personnel. This ratio is equals to number of borrowers per staff or personnel.   |
| Credit officer productivity (EP 4) | Number of active borrowers divided by number of credit officers This ratio is equals to borrower per loan officers.  |
| Funding expense ratio (FM 1)       | Interest and fee expense divide by gross loan portfolio This ratio is equals to yield on gross portfolio.  |
| Cost of funds ratio (FM 2)         | Interest and fee expenses on funding liabilities divided by average funding liabilities This ratio is equals to cost per loan.   |
| Debt to equity ratio (FM 3)        | Debt to equity ratio is equal to total liabilities divided by total equity.  |
| Return on equity (P 1)             | Return on equity is net income divided by average equity.  |
| Return on assets (P 2)             | Return on assets is equals to net income divided by average assets.  |
| Portfolio yield (P 3)              | Cash financial revenue divided by average gross portfolio  |
| Productivity 1 (Prd 1)             | Productivity 1 is equal to personnel expenses divided by average gross portfolio.  |
| Productivity 2 (Prd 2)             | Productivity 2 is credit officers divided by total personnel. This ratio is equals to personnel allocation ratio.  |
| Productivity 3 (Prd 3)             | Productivity 3 is incentive pay as percent of base salary.   |
| Productivity 4 (Prd 4)             | Percent of staff with less than 12 months of employment.   |
| Others 1 (O 1)                     | Other 1 is equals to average loan balance per borrower and is calculated as gross loan portfolios divided by number of active borrowers.   |
| Others 2 (O 2)                     | Others 2 is current assets divided by current liabilities.   |
| Others 3 (O 3)                     | Others 3 is equity divided by assets.  |

Source: compiled from <http://microrate.com/home/ratings-methodology/microfinance-institution-methodology>. PQ = portfolio quality; EP = efficiency and productivity; FM = financial management; P = profitability; Prd = productivity; and O = others.

**Table A3.2: Financial and social DEA efficiency (technical) scores for South Asian MFIs across sample period of 2005-2012**

|               | Financial efficiency |       |       |       |       |       |       |       |       |       |       |       | Social efficiency |       |       |       |  |  |  |  |  |  |  |  |
|---------------|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------------|-------|-------|-------|--|--|--|--|--|--|--|--|
|               | 2005                 | 2006  | 2007  | 2008  | 2009  | 2010  | 2011  | 2012  | 2005  | 2006  | 2007  | 2008  | 2009              | 2010  | 2011  | 2012  |  |  |  |  |  |  |  |  |
| ASA           | 1.000                | 1.000 | 1.000 | 0.977 | 0.936 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000             | 1.000 | 1.000 | 1.000 |  |  |  |  |  |  |  |  |
| BASTOB        | 0.382                | 0.400 | 0.348 | 0.413 | 0.453 | 0.472 | 0.530 | 0.507 | 0.289 | 0.371 | 0.320 | 0.390 | 0.430             | 0.430 | 0.435 | 0.492 |  |  |  |  |  |  |  |  |
| BEES          | 0.292                | 0.304 | 0.280 | 0.272 | 0.303 | 0.357 | 0.379 | 0.505 | 0.456 | 0.385 | 0.387 | 0.322 | 0.343             | 0.373 | 0.351 | 0.367 |  |  |  |  |  |  |  |  |
| BRAC          | 0.654                | 0.684 | 0.615 | 0.698 | 0.778 | 0.773 | 0.853 | 0.943 | 0.670 | 0.702 | 0.698 | 0.733 | 0.706             | 0.753 | 0.806 | 0.794 |  |  |  |  |  |  |  |  |
| BURO          | 0.434                | 0.343 | 0.330 | 0.409 | 0.429 | 0.416 | 0.477 | 0.638 | 0.419 | 0.355 | 0.343 | 0.354 | 0.276             | 0.330 | 0.388 | 0.419 |  |  |  |  |  |  |  |  |
| CDIP          | 0.524                | 0.319 | 0.362 | 0.440 | 0.527 | 0.544 | 0.585 | 0.577 | 0.549 | 0.338 | 0.335 | 0.406 | 0.464             | 0.474 | 0.496 | 0.573 |  |  |  |  |  |  |  |  |
| COAST Trust   | 0.262                | 0.227 | 0.211 | 0.295 | 0.302 | 0.332 | 0.406 | 0.409 | 0.429 | 0.314 | 0.276 | 0.351 | 0.327             | 0.331 | 0.403 | 0.404 |  |  |  |  |  |  |  |  |
| CSS           | 0.881                | 0.820 | 0.608 | 0.657 | 0.868 | 0.722 | 0.785 | 0.842 | 0.903 | 0.799 | 0.584 | 0.678 | 0.842             | 0.716 | 0.791 | 0.846 |  |  |  |  |  |  |  |  |
| DSK           | 0.248                | 1.000 | 0.577 | 0.291 | 0.424 | 0.481 | 0.495 | 0.583 | 0.364 | 1.000 | 0.250 | 0.334 | 0.390             | 0.450 | 0.493 | 0.583 |  |  |  |  |  |  |  |  |
| ESDO          | 0.265                | 0.328 | 0.353 | 0.290 | 0.285 | 0.387 | 0.436 | 0.554 | 0.587 | 0.583 | 0.378 | 0.356 | 0.363             | 0.412 | 0.438 | 0.556 |  |  |  |  |  |  |  |  |
| Grameen 0     | 0.634                | 0.659 | 0.604 | 0.628 | 0.709 | 0.808 | 0.845 | 1.000 | 0.618 | 0.584 | 0.551 | 0.636 | 0.806             | 0.925 | 0.907 | 0.992 |  |  |  |  |  |  |  |  |
| HEED          | 0.424                | 0.390 | 0.397 | 0.393 | 0.426 | 0.491 | 0.430 | 0.492 | 0.552 | 0.457 | 0.415 | 0.377 | 0.425             | 0.489 | 0.422 | 0.489 |  |  |  |  |  |  |  |  |
| IDF           | 0.379                | 0.376 | 0.376 | 0.364 | 0.392 | 0.392 | 0.426 | 0.470 | 0.526 | 0.422 | 0.402 | 0.392 | 0.411             | 0.384 | 0.378 | 0.409 |  |  |  |  |  |  |  |  |
| JCF           | 0.354                | 0.374 | 0.329 | 0.369 | 0.502 | 0.667 | 0.654 | 0.664 | 0.519 | 0.454 | 0.365 | 0.398 | 0.480             | 0.464 | 0.467 | 0.409 |  |  |  |  |  |  |  |  |
| PMUK          | 0.226                | 0.309 | 0.267 | 0.300 | 0.380 | 0.578 | 0.355 | 0.412 | 0.473 | 0.377 | 0.372 | 0.389 | 0.338             | 0.372 | 0.278 | 0.334 |  |  |  |  |  |  |  |  |
| POPI          | 0.367                | 0.317 | 0.345 | 0.331 | 0.361 | 0.417 | 0.379 | 0.457 | 0.582 | 0.428 | 0.403 | 0.385 | 0.366             | 0.428 | 0.382 | 0.461 |  |  |  |  |  |  |  |  |
| RDRS          | 0.385                | 0.335 | 0.311 | 0.338 | 0.361 | 0.398 | 0.414 | 0.410 | 0.912 | 0.943 | 0.758 | 0.644 | 0.586             | 0.530 | 0.487 | 0.421 |  |  |  |  |  |  |  |  |
| RIC           | 0.338                | 0.240 | 0.190 | 0.393 | 0.417 | 0.475 | 0.558 | 0.557 | 0.298 | 0.171 | 0.145 | 0.392 | 0.416             | 0.466 | 0.529 | 0.427 |  |  |  |  |  |  |  |  |
| RRF           | 0.334                | 0.371 | 0.281 | 0.336 | 0.330 | 0.359 | 0.375 | 0.434 | 0.455 | 0.474 | 0.341 | 0.450 | 0.369             | 0.375 | 0.370 | 0.403 |  |  |  |  |  |  |  |  |
| Sajida        | 0.394                | 0.457 | 0.393 | 0.475 | 0.546 | 0.515 | 0.599 | 0.538 | 0.404 | 0.436 | 0.399 | 0.462 | 0.478             | 0.471 | 0.463 | 0.387 |  |  |  |  |  |  |  |  |
| SDC           | 0.391                | 0.264 | 0.241 | 0.291 | 0.389 | 0.499 | 0.534 | 0.573 | 0.482 | 0.329 | 0.299 | 0.312 | 0.387             | 0.495 | 0.528 | 0.569 |  |  |  |  |  |  |  |  |
| Shakti        | 0.434                | 0.472 | 0.477 | 0.370 | 0.424 | 0.432 | 0.361 | 0.356 | 0.475 | 0.537 | 0.494 | 0.426 | 0.381             | 0.369 | 0.423 | 0.379 |  |  |  |  |  |  |  |  |
| SKS           | 0.348                | 0.370 | 0.329 | 0.339 | 0.347 | 0.401 | 0.399 | 0.375 | 0.736 | 0.555 | 0.574 | 0.399 | 0.337             | 0.421 | 0.406 | 0.374 |  |  |  |  |  |  |  |  |
| SSS           | 0.276                | 0.365 | 0.361 | 0.435 | 0.473 | 0.500 | 0.554 | 0.660 | 0.344 | 0.391 | 0.323 | 0.359 | 0.370             | 0.448 | 0.447 | 0.463 |  |  |  |  |  |  |  |  |
| TMSS          | 0.345                | 0.371 | 0.363 | 0.428 | 0.511 | 0.522 | 0.591 | 0.680 | 0.518 | 0.462 | 0.453 | 0.486 | 0.543             | 0.506 | 0.523 | 0.532 |  |  |  |  |  |  |  |  |
| UDDIPAN       | 0.310                | 0.252 | 0.216 | 0.352 | 0.395 | 0.432 | 0.436 | 0.532 | 0.357 | 0.319 | 0.285 | 0.368 | 0.394             | 0.392 | 0.407 | 0.452 |  |  |  |  |  |  |  |  |
| Wave          | 0.270                | 0.310 | 0.325 | 0.322 | 0.312 | 0.271 | 0.484 | 0.551 | 0.369 | 0.400 | 0.432 | 0.376 | 0.338             | 0.315 | 0.478 | 0.553 |  |  |  |  |  |  |  |  |
| Adhikar       | 0.671                | 0.428 | 0.481 | 0.526 | 0.552 | 0.465 | 0.403 | 0.453 | 0.172 | 0.373 | 0.287 | 0.328 | 0.369             | 0.306 | 0.438 | 0.406 |  |  |  |  |  |  |  |  |
| Bandhan       | 0.311                | 0.482 | 0.657 | 0.775 | 0.872 | 0.935 | 1.000 | 1.000 | 0.415 | 0.480 | 0.450 | 0.433 | 0.669             | 0.797 | 0.945 | 0.898 |  |  |  |  |  |  |  |  |
| BISWA         | 1.000                | 0.692 | 1.000 | 1.000 | 0.595 | 0.548 | 1.000 | 0.341 | 1.000 | 0.731 | 0.451 | 1.000 | 0.495             | 0.409 | 0.322 | 0.301 |  |  |  |  |  |  |  |  |
| BSS           | 0.691                | 0.764 | 0.860 | 0.803 | 0.618 | 0.580 | 0.602 | 0.696 | 0.379 | 0.529 | 0.483 | 0.433 | 0.454             | 0.319 | 0.362 | 0.520 |  |  |  |  |  |  |  |  |
| BWDA Finance  | 1.000                | 0.893 | 0.631 | 0.531 | 0.573 | 0.635 | 0.531 | 0.446 | 1.000 | 0.914 | 0.536 | 0.521 | 0.511             | 0.516 | 0.436 | 0.320 |  |  |  |  |  |  |  |  |
| Cashpor MC    | 0.270                | 0.367 | 0.506 | 0.433 | 0.642 | 0.574 | 0.630 | 0.695 | 0.270 | 0.368 | 0.339 | 0.376 | 0.388             | 0.337 | 0.444 | 0.507 |  |  |  |  |  |  |  |  |
| CCFID         | 1.000                | 0.938 | 0.332 | 0.474 | 0.365 | 0.472 | 0.491 | 0.477 | 1.000 | 0.682 | 0.292 | 0.193 | 0.320             | 0.354 | 0.391 | 0.368 |  |  |  |  |  |  |  |  |
| ESAF          | 0.332                | 0.547 | 0.406 | 0.316 | 0.540 | 0.527 | 0.630 | 0.698 | 0.307 | 0.419 | 0.289 | 0.285 | 0.353             | 0.329 | 0.378 | 0.461 |  |  |  |  |  |  |  |  |
| GFSP          | 0.402                | 0.568 | 0.643 | 0.605 | 0.697 | 0.574 | 0.661 | 0.790 | 0.304 | 0.368 | 0.356 | 0.433 | 0.498             | 0.341 | 0.538 | 0.614 |  |  |  |  |  |  |  |  |
| Grama Vidiyal | 0.425                | 0.556 | 0.634 | 0.608 | 0.806 | 0.684 | 0.567 | 0.644 | 0.232 | 0.421 | 0.395 | 0.304 | 0.524             | 0.347 | 0.390 | 0.412 |  |  |  |  |  |  |  |  |

|               |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|---------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| GU            | 0.415 | 0.475 | 0.591 | 0.499 | 0.497 | 0.517 | 0.482 | 0.389 | 0.414 | 0.477 | 0.517 | 0.464 | 0.445 | 0.391 | 0.377 | 0.341 |
| KBSLAB        | 0.635 | 0.526 | 0.632 | 0.602 | 0.682 | 0.740 | 0.669 | 0.659 | 0.429 | 0.364 | 0.383 | 0.359 | 0.422 | 0.458 | 0.398 | 0.398 |
| Kotalipara    | 0.207 | 0.295 | 0.294 | 0.337 | 0.381 | 0.313 | 0.334 | 0.300 | 0.386 | 0.426 | 0.341 | 0.304 | 0.313 | 0.337 | 0.312 | 0.273 |
| Mahaseamam    | 0.455 | 0.456 | 0.612 | 0.423 | 0.829 | 0.677 | 0.579 | 0.611 | 0.210 | 0.362 | 0.238 | 0.209 | 0.328 | 0.234 | 0.398 | 0.415 |
| Mahashakti    | 0.502 | 0.414 | 0.395 | 0.442 | 0.464 | 0.434 | 0.311 | 0.439 | 0.203 | 0.416 | 0.369 | 0.355 | 0.386 | 0.296 | 0.245 | 0.321 |
| MMFL          | 1.000 | 1.000 | 1.000 | 0.460 | 0.774 | 0.713 | 0.458 | 0.641 | 1.000 | 1.000 | 1.000 | 0.441 | 0.868 | 0.621 | 0.323 | 0.442 |
| NBJK          | 0.520 | 0.485 | 0.524 | 0.479 | 0.551 | 0.622 | 0.697 | 0.559 | 0.567 | 0.491 | 0.518 | 0.468 | 0.520 | 0.496 | 0.428 | 0.470 |
| NEED          | 0.347 | 0.329 | 0.546 | 0.514 | 0.494 | 0.544 | 0.530 | 0.445 | 0.074 | 0.276 | 0.520 | 0.357 | 0.363 | 0.374 | 0.330 | 0.330 |
| PWM/ACS       | 0.443 | 0.479 | 0.576 | 0.599 | 0.631 | 0.569 | 0.543 | 0.555 | 0.403 | 0.401 | 0.428 | 0.426 | 0.466 | 0.383 | 0.399 | 0.384 |
| RASS          | 0.435 | 0.643 | 0.852 | 1.000 | 1.000 | 1.000 | 1.000 | 0.943 | 0.453 | 0.601 | 0.873 | 1.000 | 1.000 | 0.938 | 1.000 | 0.937 |
| RGVN          | 0.323 | 0.375 | 0.522 | 0.494 | 0.531 | 0.570 | 0.653 | 0.651 | 0.366 | 0.351 | 0.388 | 0.370 | 0.392 | 0.567 | 0.411 | 0.386 |
| Sanghamithra  | 0.873 | 0.869 | 0.985 | 0.831 | 1.000 | 0.976 | 0.885 | 0.946 | 1.000 | 0.986 | 1.000 | 0.858 | 0.929 | 0.901 | 0.820 | 0.831 |
| Sarvodaya Na  | 0.338 | 0.458 | 0.629 | 0.586 | 1.000 | 0.454 | 0.277 | 0.297 | 0.398 | 0.538 | 0.742 | 0.718 | 1.000 | 0.531 | 0.314 | 0.392 |
| SCNL          | 0.533 | 0.327 | 0.521 | 0.477 | 0.585 | 0.594 | 0.686 | 0.722 | 0.394 | 0.324 | 0.241 | 0.292 | 0.251 | 0.355 | 0.525 | 0.591 |
| SEWA          | 0.475 | 0.516 | 0.576 | 0.784 | 0.796 | 0.730 | 0.704 | 0.767 | 0.308 | 0.322 | 0.320 | 0.425 | 0.473 | 0.486 | 0.484 | 0.530 |
| SHARE         | 0.877 | 0.663 | 0.750 | 0.890 | 1.000 | 1.000 | 1.000 | 1.000 | 0.488 | 0.657 | 0.506 | 0.606 | 0.780 | 0.931 | 1.000 | 1.000 |
| SKDRDP        | 0.499 | 0.707 | 0.618 | 0.688 | 0.658 | 0.868 | 0.779 | 0.778 | 0.641 | 0.786 | 0.474 | 0.723 | 0.655 | 0.813 | 0.743 | 0.753 |
| SKS           | 0.549 | 0.623 | 0.761 | 0.816 | 1.000 | 0.956 | 0.438 | 0.643 | 0.395 | 0.465 | 0.544 | 0.589 | 0.966 | 0.912 | 0.602 | 0.710 |
| SMSS          | 0.458 | 0.588 | 0.639 | 0.638 | 0.738 | 0.605 | 0.780 | 0.551 | 0.444 | 0.310 | 0.331 | 0.385 | 0.398 | 0.509 | 0.435 | 0.563 |
| SU            | 0.419 | 0.429 | 0.588 | 0.442 | 0.440 | 0.408 | 0.295 | 0.357 | 0.453 | 0.314 | 0.341 | 0.356 | 0.318 | 0.292 | 0.239 | 0.272 |
| Swadhaar      | 0.285 | 0.251 | 0.165 | 0.189 | 0.294 | 0.504 | 0.652 | 0.742 | 0.015 | 0.102 | 0.104 | 0.138 | 0.288 | 0.431 | 0.496 | 0.477 |
| SWA/WS        | 0.704 | 0.519 | 0.556 | 0.649 | 0.934 | 0.741 | 0.999 | 0.654 | 0.731 | 0.542 | 0.400 | 0.486 | 0.540 | 0.560 | 0.198 | 0.502 |
| Ujjivan       | 1.000 | 0.307 | 0.339 | 0.514 | 0.766 | 0.759 | 0.697 | 0.855 | 0.999 | 0.341 | 0.340 | 0.383 | 0.446 | 0.397 | 0.408 | 0.582 |
| VFS           | 0.661 | 0.624 | 0.542 | 0.520 | 0.642 | 0.658 | 0.571 | 0.497 | 0.461 | 0.337 | 0.597 | 0.407 | 0.433 | 0.368 | 0.361 | 0.347 |
| WSE           | 0.490 | 0.233 | 0.288 | 0.911 | 0.911 | 1.000 | 1.000 | 0.883 | 0.926 | 0.458 | 0.313 | 0.886 | 0.994 | 1.000 | 1.000 | 0.887 |
| CBB           | 0.544 | 0.556 | 0.562 | 0.598 | 0.650 | 0.765 | 0.817 | 0.771 | 0.393 | 0.411 | 0.440 | 0.439 | 0.508 | 0.510 | 0.544 | 0.540 |
| CSD           | 0.404 | 0.405 | 0.471 | 0.456 | 0.453 | 0.555 | 0.693 | 0.631 | 0.380 | 0.610 | 0.358 | 0.366 | 0.341 | 0.386 | 0.402 | 0.389 |
| DD            | 0.527 | 0.618 | 0.614 | 0.727 | 0.867 | 0.917 | 0.874 | 0.891 | 0.473 | 0.445 | 0.511 | 0.609 | 0.749 | 0.669 | 0.626 | 0.633 |
| FORWARD       | 0.382 | 0.392 | 0.428 | 0.494 | 0.513 | 0.595 | 0.715 | 0.609 | 0.427 | 0.438 | 0.434 | 0.446 | 0.446 | 0.493 | 0.474 | 0.349 |
| GRNB          | 0.475 | 0.526 | 0.665 | 0.625 | 0.657 | 0.611 | 0.491 | 0.488 | 0.471 | 0.523 | 0.663 | 0.623 | 0.603 | 0.537 | 0.112 | 0.312 |
| JBS           | 0.536 | 0.374 | 0.474 | 0.566 | 0.592 | 0.723 | 0.761 | 0.745 | 0.610 | 0.555 | 0.517 | 0.507 | 0.494 | 0.544 | 0.508 | 0.520 |
| JSCCS         | 0.892 | 0.837 | 0.848 | 0.856 | 0.909 | 0.815 | 0.866 | 0.856 | 0.732 | 0.764 | 0.803 | 0.753 | 0.890 | 0.764 | 0.761 | 0.741 |
| MGBB          | 0.362 | 0.354 | 0.411 | 0.448 | 0.424 | 0.537 | 0.631 | 0.582 | 0.372 | 0.358 | 0.258 | 0.278 | 0.278 | 0.367 | 0.438 | 0.402 |
| MPG/BB        | 0.286 | 0.414 | 0.578 | 0.782 | 0.517 | 0.524 | 0.601 | 0.571 | 0.156 | 0.169 | 0.203 | 0.743 | 0.237 | 0.301 | 0.412 | 0.367 |
| NeRuDO        | 0.494 | 0.462 | 0.560 | 0.623 | 0.681 | 0.716 | 0.699 | 0.615 | 0.210 | 0.220 | 0.176 | 0.234 | 0.236 | 0.291 | 0.317 | 0.364 |
| Nirdhan       | 0.471 | 0.524 | 0.547 | 0.640 | 0.658 | 0.716 | 0.719 | 0.703 | 0.474 | 0.508 | 0.506 | 0.582 | 0.618 | 0.557 | 0.539 | 0.515 |
| NRDSC         | 0.321 | 0.320 | 0.403 | 0.432 | 0.505 | 0.622 | 0.680 | 0.580 | 0.391 | 0.338 | 0.254 | 0.399 | 0.491 | 0.461 | 0.438 | 0.347 |
| PGBB          | 0.472 | 0.489 | 0.456 | 0.608 | 0.608 | 0.685 | 0.726 | 0.655 | 0.438 | 0.482 | 0.454 | 0.570 | 0.533 | 0.521 | 0.501 | 0.418 |
| Sahara Mahila | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 0.936 | 0.968 | 0.970 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 0.818 | 0.944 | 0.902 |
| SB            | 0.469 | 0.500 | 0.621 | 0.551 | 0.606 | 0.708 | 0.772 | 0.678 | 0.428 | 0.478 | 0.477 | 0.412 | 0.454 | 0.492 | 0.497 | 0.395 |
| SCDC          | 1.000 | 0.679 | 0.417 | 0.454 | 0.478 | 0.479 | 0.424 | 0.528 | 1.000 | 0.626 | 0.386 | 0.461 | 0.521 | 0.459 | 0.410 | 0.419 |
| SPGBB         | 0.348 | 0.315 | 0.435 | 0.455 | 0.369 | 0.338 | 0.341 | 0.326 | 0.338 | 0.220 | 0.230 | 0.256 | 0.334 | 0.321 | 0.276 | 0.298 |

|                     |              |              |              |              |              |              |              |              |              |              |              |              |              |              |              |              |              |
|---------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| <b>VIYCCU</b>       | 0.771        | 0.772        | 1.000        | 0.898        | 0.962        | 1.000        | 1.000        | 1.000        | 1.000        | 0.745        | 0.718        | 1.000        | 0.909        | 0.782        | 0.719        | 1.000        | 0.982        |
| <b>Akhuwat</b>      | 1.000        | 0.845        | 0.875        | 0.888        | 0.499        | 1.000        | 1.000        | 1.000        | 1.000        | 1.000        | 0.791        | 0.915        | 1.000        | 0.530        | 0.517        | 1.000        | 1.000        |
| <b>NMF(B)</b>       | 0.522        | 0.534        | 0.588        | 0.411        | 0.642        | 0.550        | 0.533        | 0.528        | 0.528        | 0.341        | 0.328        | 0.331        | 0.261        | 0.251        | 0.209        | 0.211        | 0.200        |
| <b>Asasah</b>       | 0.172        | 0.282        | 0.350        | 0.356        | 0.320        | 0.241        | 1.000        | 0.157        | 0.157        | 0.119        | 0.206        | 0.197        | 0.364        | 0.251        | 0.177        | 1.000        | 0.156        |
| <b>CSC</b>          | 0.424        | 0.427        | 0.424        | 0.358        | 0.294        | 0.480        | 0.409        | 0.555        | 0.555        | 0.261        | 0.414        | 0.281        | 0.256        | 0.244        | 0.237        | 0.224        | 0.256        |
| <b>DAMEN</b>        | 0.347        | 0.344        | 0.486        | 0.453        | 0.529        | 0.586        | 0.538        | 0.698        | 0.698        | 0.274        | 0.286        | 0.333        | 0.327        | 0.365        | 0.261        | 0.260        | 0.286        |
| <b>FMFB -</b>       | 0.732        | 0.536        | 0.486        | 0.462        | 0.616        | 0.596        | 0.676        | 0.672        | 0.672        | 0.545        | 0.382        | 0.282        | 0.280        | 0.219        | 0.183        | 0.234        | 0.257        |
| <b>Kashf</b>        | 0.827        | 0.777        | 0.975        | 0.751        | 0.326        | 0.344        | 0.453        | 0.495        | 0.495        | 0.674        | 0.608        | 0.484        | 0.332        | 0.198        | 0.218        | 0.246        | 0.245        |
| <b>Khushhali</b>    | 0.543        | 0.558        | 0.552        | 0.431        | 0.671        | 0.767        | 0.769        | 0.725        | 0.725        | 0.410        | 0.329        | 0.379        | 0.378        | 0.374        | 0.351        | 0.391        | 0.401        |
| <b>Orangi</b>       | 1.000        | 1.000        | 1.000        | 0.797        | 0.781        | 0.718        | 0.699        | 0.692        | 0.692        | 0.947        | 1.000        | 0.787        | 0.721        | 0.638        | 0.608        | 0.542        | 0.661        |
| <b>Orix Leasing</b> | 0.667        | 0.656        | 0.755        | 0.803        | 0.645        | 0.744        | 0.634        | 0.656        | 0.656        | 0.603        | 0.542        | 0.413        | 0.499        | 0.587        | 0.411        | 0.475        | 0.413        |
| <b>PRSP</b>         | 0.261        | 0.317        | 0.426        | 0.355        | 0.302        | 0.291        | 0.533        | 0.547        | 0.547        | 0.180        | 0.251        | 0.215        | 0.202        | 0.184        | 0.157        | 0.196        | 0.264        |
| <b>SAFWCO</b>       | 0.310        | 0.400        | 0.323        | 0.377        | 0.378        | 0.386        | 0.365        | 0.369        | 0.369        | 0.279        | 0.425        | 0.322        | 0.377        | 0.276        | 0.324        | 0.284        | 0.299        |
| <b>SRSP</b>         | 0.231        | 0.310        | 0.387        | 0.418        | 0.237        | 0.303        | 0.420        | 0.459        | 0.459        | 0.256        | 0.273        | 0.284        | 0.287        | 0.108        | 0.221        | 0.389        | 0.468        |
| <b>TRDP</b>         | 0.563        | 0.448        | 0.553        | 0.327        | 0.378        | 0.448        | 0.433        | 0.361        | 0.361        | 0.582        | 0.433        | 0.352        | 0.303        | 0.291        | 0.351        | 0.372        | 0.309        |
| <b>ACDC</b>         | 0.272        | 0.220        | 0.267        | 0.456        | 0.619        | 0.994        | 0.651        | 0.343        | 0.343        | 0.352        | 0.304        | 0.342        | 0.808        | 0.693        | 0.993        | 0.580        | 0.311        |
| <b>Agro Micro</b>   | 0.580        | 0.880        | 0.578        | 0.435        | 0.433        | 0.479        | 0.506        | 1.000        | 1.000        | 0.366        | 0.722        | 0.541        | 0.413        | 0.391        | 0.394        | 0.397        | 1.000        |
| <b>Arthacharya</b>  | 0.548        | 0.279        | 0.299        | 0.324        | 0.337        | 0.437        | 0.361        | 0.533        | 0.533        | 0.671        | 0.267        | 0.287        | 0.313        | 0.326        | 0.428        | 0.350        | 0.506        |
| <b>Lak Jaya</b>     | 0.177        | 0.374        | 0.390        | 0.385        | 0.315        | 0.431        | 0.548        | 0.474        | 0.474        | 0.411        | 0.201        | 0.217        | 0.310        | 0.331        | 0.368        | 0.403        | 0.373        |
| <b>Sareeram</b>     | 0.422        | 0.409        | 0.404        | 0.764        | 0.979        | 0.779        | 0.568        | 0.664        | 0.664        | 0.396        | 0.379        | 0.384        | 0.753        | 0.962        | 0.764        | 0.545        | 0.647        |
| <b>SDBL</b>         | 0.728        | 0.865        | 0.925        | 1.000        | 1.000        | 1.000        | 1.000        | 1.000        | 1.000        | 0.629        | 0.727        | 0.857        | 0.943        | 0.812        | 0.861        | 0.987        | 1.000        |
| <b>SEEDS</b>        | 0.567        | 0.573        | 0.586        | 0.554        | 0.551        | 0.602        | 0.608        | 0.598        | 0.598        | 0.451        | 0.441        | 0.412        | 0.329        | 0.348        | 0.409        | 0.467        | 0.426        |
| <b>Average</b>      | <b>0.567</b> | <b>0.573</b> | <b>0.586</b> | <b>0.554</b> | <b>0.551</b> | <b>0.602</b> | <b>0.608</b> | <b>0.598</b> | <b>0.598</b> | <b>0.451</b> | <b>0.441</b> | <b>0.412</b> | <b>0.329</b> | <b>0.348</b> | <b>0.409</b> | <b>0.467</b> | <b>0.426</b> |

**Table A3.3: Average efficiency scores**

| Variables                               | Efficiency estimates |       |       |        |              | Bias-corrected efficiency estimates |       |         |        |              |
|---|----------------------|-------|-------|--------|--------------|-------------------------------------|-------|---------|--------|--------------|
|   | Mean                 | SD    | Min   | Max    | Observations | Mean                                | SD    | Min     | Max    | Observations |
| FE using Financial revenues             | 1.754                | 0.594 | 1.000 | 6.221  | 808          | 1.933                               | 0.641 | 1.082   | 6.949  | 808          |
| FE using Interest fee                   | 2.514                | 1.223 | 1.000 | 15.002 | 808          | 2.817                               | 1.340 | 1.069   | 16.270 | 808          |
| SE using number of active borrowers     | 2.382                | 2.276 | 1.000 | 59.214 | 808          | 2.656                               | 3.236 | -1.567  | 88.242 | 808          |
| SE using percentage of female borrowers | 2.000                | 1.259 | 1.000 | 9.158  | 808          | 1.190                               | 1.912 | -11.947 | 11.018 | 808          |

Notes: Efficiency estimates using general method and bias corrected (bootstrap) are reported with different combinations of inputs and outputs. FE denotes financial efficiency, and SE denotes social efficiency.

**Table A3.4: Interaction effects of risk ratios**

|   | Financial         |                   | Social            |                   | Financial         |                   | Social            |                   |
|---|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|   | Method-1          | Method-2          | Method-1          | Method-2          | Method-1          | Method-2          | Method-1          | Method-2          |
| Year  | 0.006<br>(1.88)   | 0.006<br>(2.08)   | -0.009<br>(-2.83) | -0.009<br>(-2.80) | 0.005<br>(1.56)   | 0.005<br>(1.54)   | -0.011<br>(-3.13) | -0.011<br>(-3.28) |
| Dummy of mature   | 0.009<br>(0.41)   | 0.007<br>(0.33)   | 0.026<br>(1.08)   | 0.027<br>(1.09)   | -0.010<br>(-0.49) | -0.021<br>(-0.95) | 0.011<br>(0.45)   | 0.012<br>(0.50)   |
| Log of assets   | 0.038<br>(7.33)   | 0.037<br>(7.07)   | 0.026<br>(4.19)   | 0.026<br>(4.21)   | 0.043<br>(8.61)   | 0.041<br>(8.06)   | 0.034<br>(5.80)   | 0.033<br>(5.61)   |
| Log of real GDP   | -0.088<br>(-3.12) | -0.086<br>(-3.09) | -0.139<br>(-4.37) | -0.138<br>(-4.35) | -0.065<br>(-2.15) | -0.066<br>(-2.13) | -0.137<br>(-4.12) | -0.140<br>(-4.20) |
| Inflation   | -0.002<br>(-0.86) | -0.003<br>(-1.09) | 0.002<br>(0.73)   | 0.002<br>(0.65)   | -0.001<br>(-0.21) | -0.001<br>(-0.37) | 0.005<br>(1.44)   | 0.005<br>(1.52)   |
| Regulated MFIs  | -0.034<br>(-2.10) | -0.037<br>(-2.28) | -0.022<br>(-1.28) | -0.022<br>(-1.27) | -0.033<br>(-2.05) | -0.027<br>(-1.66) | -0.023<br>(-1.34) | -0.020<br>(-1.20) |
| Non-profit-oriented MFIs                                      | -0.009<br>(-0.42) | -0.010<br>(-0.46) | 0.041<br>(1.82)   | 0.041<br>(1.76)   | 0.008<br>(0.42)   | 0.021<br>(1.02)   | 0.054<br>(2.60)   | 0.061<br>(2.96)   |
| Corruption control  | 0.139<br>(3.76)   | 0.139<br>(3.79)   | 0.105<br>(2.56)   | 0.104<br>(2.49)   | 0.117<br>(2.84)   | 0.123<br>(2.97)   | 0.083<br>(1.92)   | 0.095<br>(2.28)   |
| Political stability   | 0.000<br>(0.02)   | -0.006<br>(-0.27) | 0.049<br>(1.86)   | 0.049<br>(1.84)   | 0.006<br>(0.23)   | 0.007<br>(0.26)   | 0.083<br>(3.28)   | 0.077<br>(2.96)   |
| (A) Percentage of female board members (average 2008 to 2012) | -0.013<br>(-0.38) | -0.039<br>(-1.29) | -0.018<br>(-0.39) | -0.029<br>(-0.73) | -0.058<br>(-1.80) | -0.065<br>(-2.15) | -0.072<br>(-1.69) | -0.049<br>(-1.25) |
| (B) Percentage of female loan officers (average 2008 to 2012) | 0.097<br>(3.33)   | 0.095<br>(3.64)   | 0.093<br>(2.60)   | 0.096<br>(3.15)   | 0.072<br>(2.51)   | 0.094<br>(3.35)   | 0.126<br>(3.74)   | 0.124<br>(3.98)   |
| (C) Percentage of female borrowers                            | -0.200<br>(-4.07) | -0.169<br>(-3.99) | -0.200<br>(-3.55) | -0.205<br>(-4.48) | -0.165<br>(-3.31) | -0.166<br>(-3.69) | -0.219<br>(-3.97) | -0.196<br>(-3.86) |
| (D) Portfolios at risk greater than 30 days                   | -0.521<br>(-1.37) | -0.132<br>(-1.55) | 0.013<br>(0.02)   | -0.058<br>(-0.77) | -0.000<br>(-0.01) | 0.000<br>(0.07)   | -0.013<br>(-0.71) | 0.000<br>(0.07)   |
| (A) * (D)   | -0.446<br>(-1.26) | -1.101<br>(-0.26) | -0.173<br>(-0.36) | -1.012<br>(-0.32) | 0.000<br>(0.03)   | 0.038<br>(0.31)   | 0.015<br>(2.23)   | 0.078<br>(0.72)   |
| (B) * (D)   | 0.026<br>(0.08)   | -1.103<br>(-0.40) | 0.057<br>(0.13)   | -0.929<br>(-0.23) | 0.009<br>(1.65)   | -0.003<br>(-0.05) | -0.003<br>(-0.37) | 0.008<br>(0.16)   |
| (C) * (D)   | 0.537<br>(1.28)   | 0.703<br>(0.59)   | -0.027<br>(-0.05) | 0.398<br>(0.28)   | -0.001<br>(-0.07) | -0.040<br>(-1.46) | 0.011<br>(0.60)   | -0.016<br>(-0.44) |

Note: Technical bootstrapped financial efficiency (using variable returns to scale – input oriented) is dependent variable. \*, \*\*, and \*\*\* indicate significance level of coefficients at 10%, 5% and 1%, respectively. The truncated regression analysis with bootstrapping (Simar & Wilson, 2007) results above was derived from 2000 bootstrapped iterations. Method-1 is standard interaction method, and Method-2 is the interaction method as explained in Balli and Sørensen (2013).

**Appendix 4: Research Output**

We work on four studies to compile this thesis. The first study (Bibi, Balli, Matthews, & Tripe, 2014) is about introducing new ways of measuring the social performance of MFIs. The second study (Bibi, Balli, Matthews, & Tripe, 2014a) evaluates the performance of different categories of MFIs using financial ratios in the context of both social and financial performance to further analyze the trade-off between these objectives. In the third study (Bibi, Balli, Matthews, & Tripe, 2014b), we compile the findings from the non-parametric approach of DEA and analyze the link between efficiency, gender and governance. The trade-off of social and financial efficiency is also analyzed in this study. In the final study (Bibi, Balli, Matthews, & Tripe, 2015), we compile the findings from a parametric approach of SFA and analyze the link between efficiency, gender and governance. The trade-off of social and financial efficiency is also part of the analyses in this study.

The first and second studies contained in this thesis have been presented at the following forums:

- 25<sup>th</sup> ASB Australasian Finance and Banking Conference held in Sydney from 15 – 19 December 2012, and my presentation was scheduled on 19 December 2012.
- Doctoral Student Symposium organised by the Pakistan Students' Association (PSA) on 22 November 2012 at Massey University's Turitea Campus, Palmerston North, New Zealand.
- New Zealand Finance Colloquium 2012 held on 8 February 2012 at Massey University's Albany Campus, Auckland, New Zealand.

The third study of efficiency analysis using DEA has been presented at the following forums:

- 19<sup>th</sup> New Zealand Finance PhD Symposium organised by the Department of Finance, Waikato Management School, University of Waikato in Hamilton, New Zealand, on 18 February 2015.
- Presented at Massey University Brown Bag Seminar on 2 December 2013 at School of Economics and Finance, Massey University's Turitea Campus, Palmerston North, New Zealand.
- 4<sup>th</sup> MUPSA Doctoral Symposium on 28 October 2014 at Massey University's Turitea Campus, Palmerston North, New Zealand.
- New Zealand Social Innovation and Entrepreneurship Research Conference (SIERC) 2013 on 28 November 2013 at Massey University's Albany Campus, Auckland, New Zealand.
- 4<sup>th</sup> Research Symposium of Victoria University, Wellington, New Zealand, on 28 February 2013.