PhD Thesis on

A Study on the Efficiency of Microfinance Institutions in Bangladesh

Supervisor:

M. Jahangir Alam Chowdhury, PhD
Professor & Chairperson
Department of Finance
University of Dhaka

Co-Supervisor:

A.H.M. Mahbub Latif, PhD
Professor
Institute of Statistical Research and Training (ISRT)
University of Dhaka

Prepared BY:

Quazi Sagota Samina
PhD Student
Department of Finance
University of Dhaka
Assistant Professor
Department of Business Administration
East West University

Declaration

I, hereby declare that this thesis entitled "**A Study on the Efficiency of Microfinance Institutions in Bangladesh"** is prepared in fulfilment of my PhD Degree under the supervision of M. Jahangir Alam Chowdhury, PhD, Professor and Chairperson, Department of Finance, University of Dhaka. I also declare that this report or part of it has not been published in any journal previously.

Letter of Transmittal

To

M. Jahangir Alam Chowdhury, PhD
Professor & Chairperson
Department of Finance
University of Dhaka

Subject: Submission of PhD Thesis Report.

Dear Sir,

With great pleasure, I would like to submit my PhD Thesis report to you titled "A Study on the Efficiency of Microfinance Institutions in Bangladesh".

In this research, I focused on the cost efficiency of Microfinance institutions in Bangladesh applying both parametric and non-parametric models. Under parametric method, I applied the Stochastic Frontier Approach on a sample of 146 MFIs enlisted with Palli Karma-Shahayak Foundation (PKSF) in which an average cost efficiency of 78% is found meaning that the sample MFIs can save 28% of their cost by adopting a proper mix of inputs. On the other hand, under non-parametric, DEA model, the average cost efficiency is found as to be 73%. The findings indicate that though MFIs in Bangladesh concentrate towards providing comparatively larger loan amounts, they try to achieve their social goal by providing credit to women borrowers who are more efficient in using the loan amount as well as to repay them. Besides, it has been found that there exist economies of scale in the MFIs industry of the country.

I sincerely hope that this report will fulfill your expectations about my research and will create value in the MFI industry of Bangladesh.

Thanking you

Quazi Sagota Samina
PhD Student
Department of Finance
University of Dhaka

Supervisor's Certificate

Quazi Sagota Samina has prepared this report titled "A Study on the Efficiency of Microfinance Institutions in Bangladesh" to accomplish her PhD Degree under my supervision. The research has been conducted under Department of Finance, University of Dhaka. She made two presentations in seminars arranged by the department. She has also completed other requirements of the degree as per the rule of University of Dhaka.

M. Jahangir Alam Chowdhury, PhD
Professor and Chairperson
Executive Director, Center for Microfinance and Development
Department of Finance
University of Dhaka

A.H.M. Mahbub Latif,PhD
Professor
Institute of Statistical Research
and Training (ISRT)
University of Dhaka
Dhaka-1000, Bangladesh

Abstract

With the innovation and rapid expansion of the new concept "Microfinance", researchers, policymakers and donors at the recent time have found it very essential to observe how efficiently Microfinance Institutions are operating in economy. If the MFIs are not able to achieve efficiency, they would not be able to sustain in the long run being lagging behind in achieving their social objective. This PhD report focuses on the issue in respect of MFIs in Bangladesh. This is the first paper that applies both parametric and non-parametric models to measure cost efficiency on a large sample size including 146 MFIs in Bangladesh over 2016-2020. Along with efficiency estimates, the paper analyzes the effect of outreach variables on the level of efficiency. This enlightens the current concern regarding the trade-off between sustainability and efficiency of microfinance institutions. My research finds that the MFIs in Bangladesh are on an average 78% efficient indicating that these institutions have scope to reduce their cost by around 22% to produce the same output level. Also, it is found that outreach is being compromised to achieve efficiency as MFIs are more interested to provide larger loan amounts to the comparatively well-off poor in the society. However, the MFIs in Bangladesh are able to achieve efficiency by concentrating credit disbursement to the women borrowers as women borrowers are more active in utilizing the loan amount and thus creating sufficient earning sources to repay the loan. Moreover, the economies of scale is found in the sector indicating that MFIs here have opportunity to serve the poor at lower cost and thus attain better outreach by expanding their size. Thus, the my thesis will facilitate the MFIs to direct their resources properly and achieve efficiency, policymakers to decide how this sector can be utilized to achieve social welfare as well as donors to decide to which MFIs they want to steer their fund.

Table of Contents

Acknowledgement ---------- 01

Executive Summary ---------- 02

Chapter 1 Introduction

1.1 Introduction ---------- 06

1.2 Background of the Study ---------- 07

1.3 Research Problem ---------- 09

1.4 Research Purpose ---------- 11

1.5 Research Problem ---------- 12

1.6 Rationale of the Study ---------- 12

1.7 Conceptual Framework ---------- 14

1.8 Significance ---------- 15

1.9 Conclusion ---------- 16

Chapter 2 literature Review

2.1 introduction ---------- 18

2.2 Efficiency ---------- 19

2.3 Efficiency of Banks ---------- 20

2.3.1 Bank Efficiency with Parametric Models ---------- 21

2.3.2 Bank Efficiency with Non-parametric Models ---------- 24

2.3.3 Application of Both Parametric and Non-parametric Models--------- 28

2.3.4 Identifying Determinants of Bank Efficiency ---------- 29

2.4 Efficiency of Non-Bank Financial Institutions ---------- 30

2.4.1 Efficiency of Insurance Companies ---------- 30

2.4.2 Efficiency of Credit Union or Cooperative Financial Institutions---- 31

2.5 Empirical Studies on Efficiency of Microfinance Institutions ---------- 32

2.5.1 Efficiency of MFIs with Non-Parametric Test ---------- 33
2.5.2 Efficiency of MFIs with Parametric Test ---------- 34
2.5.3 Factors Affecting Efficiency of MFIs ---------- 35
2.5.4 Study on Microfinance in Bangladesh ---------- 36
2.6 Conclusion ---------- 36

Chapter 3 Microfinance Worldwide

3.1 Introduction ---------- 40
3.2 Evolution of Microfinance Institutions ---------- 40
3.3 Defining Microfinance ---------- 43
3.4 Types of Microfinance Institutions ---------- 45
3.5 Objectives of Microfinance Institutions ---------- 46
3.6 Importance of Microfinance Institutions ---------- 46
3.6.1 Microfinance in Poverty Alleviation & Economic Development-- 48
3.6.2 Microfinance in Increasing Consumption ---------- 49
3.6.3 Reduction of Reliance on Informal Borrowing ---------- 49
3.6.4 Women Empowerment ---------- 50
3.6.5 Microfinance in Educational Development ---------- 51
3.6.6 Microfinance and Health Status ---------- 52
3.6.7 Establishment and Efficiency Increase of Microenterprises ---- 52
3.6.8 Housing Facility & Protect Disaster after Natural Calamity ---- 53
3.7 Present Status of Microfinance Institutions ---------- 53
3.8 Problems with MFIs ---------- 59
3.9 Conclusion ---------- 60

Chapter 4: MFIs in Bangladesh

4.1 Introduction ---------- 62

4.2 History of Microfinance in Bangladesh ---------- 62
4.3 Growth, Outreach & Current Status of Microfinance in Bangladesh --------- 64
4.3.1 No of Licensed MFIs under MRA ---------- 66
4.3.2 No of Branches ---------- 67
4.3.3 No of Employees ---------- 67
4.3.4 No of Members and Amount of Savings ---------- 68
4.3.5 No of Borrowers and Disbursement of Loans ---------- 69
4.3.6 Sources of Fund of MFIs ---------- 70
4.4 Importance of MFIs in Bangladesh Economy ---------- 72
4.4.1 Impact on Income and Assts of MFI members ---------- 73
4.4.2 Increase in Consumption and Poverty Reduction ---------- 73
4.4.3 Reliance on Informal Markets ---------- 73
4.4.4 Improvement in Health, Education & Disaster Management ---------- 74
4.4.5 Women Empowerment ---------- 74
4.5 Challenges in Microfinance Sector in Bangladesh ---------- 74
4.6 Conclusion ---------- 75

Chapter 5: Methodology

5.1 Introduction ---------- 78
5.2 Financial Indicator Analysis ---------- 78
5.3 Efficient Frontier Approach ---------- 79
5.4 Types of Efficient Frontier ---------- 79
5.4.1 Production Efficiency ---------- 79
5.4.2 Profit Efficiency ---------- 80
5.4.3 Cost Efficiency ---------- 80
5.4.4 Choice of Efficient Frontier in this Study ---------- 81
5.5 Measuring Cost Efficiency ---------- 82
5.5.1 Technical Efficiency ---------- 82
5.5.2 Allocative Efficiency ---------- 84
5.6 Approaches of Efficiency Measurement ---------- 86

5.6.1 Intermediation Approach ---------- 86
5.6.2 Production Approach ---------- 87
5.6.3 Approach Used in the Study ---------- 87
5.7 Input-Output Orientation ---------- 88
5.8 Statistical Models Used in Efficiency Measurement ---------- 88
5.8.1 Parametric Test: Stochastic Frontier Approach ---------- 89
5.8.1.1 Importance of Parametric Model ---------- 90
5.8.1.2 Disadvantages of Parametric Model ---------- 90
5.8.2 Non-parametric Model: Data Envelopment Analysis ---------- 90
5.8.2.1 Advantages of DEA Method ---------- 92
5.8.2.2 Disadvantages od DEA Method ---------- 93
5.8.3 Comparative Analysis between Parametric and Non-parametric Model ---------- 93
5.8.4 Statistics Used in the Study ---------- 95
5.9 Model Specification ---------- 96
5.9.1 Cost Efficiency Under Parametric Model ---------- 96
5.9.2 Cost Efficiency Under Non-parametric Model ---------- 102
5.9.2.1 Data Envelopment Analysis ---------- 103
5.9.2.2 Tobit Regression Model ---------- 106
5.10 Data ---------- 106
5.11 Conclusion ---------- 107

Chapter 6: Findings

6.1 Introduction ---------- 109
6.2 Parametric Approach ---------- 109
6.2.1 SFA with PKSF Data ---------- 110
6.2.1.1 Empirical Results in Model 1-7 ---------- 111
6.2.1.2 Efficiency Based on Size of MFIs ---------- 120
6.2.2 SFA with MRA Data ---------- 121
6.2.3 Comparison of Cost Efficiency

between PKSF and MRA Data ---------- 126

6.3 Non-parametric Approach ---------- 131

6.3.1 DEA Model on PKSF Data ---------- 132

6.3.2 Size-wise Efficiency with DEA ---------- 135

6.3.3 Factors Affecting Cost Efficiency Under DEA ---------- 137

6.4 Comparison of Cost Efficiency Measurement

Between SFA and DEA using PKSF Data ---------- 140

Chapter 7: Conclusion ---------- 143

References ---------- 146

Acknowledgement

This report is the end result of my PhD Thesis on the topic "**A Study on Efficiency of Microfinance Institutions in Bangladesh**" under the supervision of Prof. Md. Jahangir Alam Chowdhury (PhD), Professor & Chairperson, Department of Finance, University of Dhaka. At first, I would like to thank Almighty to enable me to complete the research.

I would like to express my heartfelt and sincere gratitude to my supervisor, Professor Jahangir Sir for giving me the opportunity to do the research and providing constant guidance and support. There were several stages of my research when I became jeopardize. But under the constant co-operation of Sir, I felt confident to move forward. At some issues Sir helped me out of the way which I would never forget. I also want to thank Sir for him patience to allow me time to make an effective and fruitful research.

I would also like to thank A H M Mahbub Latif, PhD, Professor, Institute of Statistical Research & Training, University of Dhaka, for his support and guidance in statistical issues. I must express my gratitude to Md. Hasan Khaled, Sr. General Manager (HR), PKSF for his assistance in collecting data on a large sample of MFIs in Bangladesh. I am also indebted to Ms. Jinaat Aman Bonna, Deputy Director, MRA as she arranged a vast dataset on MRA enlisted MFIs.

At the end, I must thank my family for supporting me all along to devote myself for the research work stilling time from them.

Executive Summary

Over the time, financial institutions have been proven as effective element of financial system contributing in financial development of an economy. In spite of this fact, formal financial institutions have failed to reach the depth of an economy to serve the rural poor people. With the inception of momentous concept of group based closely monitored lending system in the form of micro-finance, the gap in the financial system was overcome. Introduced by Dr. Mohammad Yunus in the village Jobra in Chittagong, Bangladesh, the scheme earned success and drew attention of all within short period of time. The concept of microfinance soon was spread all over Bangladesh as well as was adopted in different countries of the world. Millions of people in different countries around the world, specially, the rural poor people got benefitted from these institutions. These microfinance institutions at a time drift towards double objectives, financial objectives and secondly social objective. The financial objective requires microfinance institutions to earn sufficient to cover the expenses. On the other hand, the social objective requires microfinance institutions to expand their services to the poorest in the society. Many researchers found it difficult to achieve both the objectives for MFIs. The same controversy applies for the MFIs in Bangladesh. Being the country of origination of Microfinance concept, the MFIs in Bangladesh has always in the center of attention in the whole world. So, it is a matter of query whether the MFIs in Bangladesh are able to achieve both the doctrines or not. Besides, many MFIs in Bangladesh run on donors fund. As a result, the donors at recent time also concentrate on the cost efficiency of MFIs in Bangladesh. Searching into the literature no single research has been found concentrating to cost efficiency of MFIs in Bangladesh at recent time. The work of Khalily et al. (2014) focuses on the issue but the data covers much early information and also incorporates a small sample size. I, therefore, found the topic as an interesting area for my PhD research. My thesis focuses on the cost efficiency of MFIs in Bangladesh covering the period of 2016 to 2020 and including a large data set. I applied both parametric and non-parametric techniques to conduct the research. Two extensive datasets have been used in my research. The first dataset is collected from Palli Karma-Sahayak Foundation (PKSF) which contains information about 146 MFIs over 5 years period, i.e. 2016-2020. The second dataset is collected from Microcredit Regulatory Authority (MRA) and this dataset consist of 479 MFIs information over 6 years period, i.e. 2013-

2018. So, both the datasets comprise panel data. The MRA data set consists of total 2,874 data which is a quite extensive data set. But unfortunately, in this data set, information on some of the important variables was missing. So, I had to use the PKSF data and later, also applied the model with MRA data to verify my findings. To conduct the analysis, I used the intermediation approach as MFIs act as intermediary in the society. The input-oriented model has been applied as MFIs do not have control on outputs due to geographical, demographical or regulatory restriction and thereby the only possible option of increasing efficiencies is to lower the inputs. In both the SFA and DEA, one output variable has been taken, i.e., gross loan portfolio and three input variables, i.e., fund, labor and capital. As here, I am measuring the cost efficiency, therefore, price of fund, price of labor and price of capital are also considered. At first, I conducted the stochastic frontier approach on the data collected from PKSF. In this approach, I measure cost efficiency in six different models. Two of them ignored the time effect on cost efficiency while the other four models included the time variable. As of SFA I used the Battesi and Coelli (1995) model which is capable of including the determinant variables of efficiency in the same model along with the efficiency measurement. Therefore, in these six different models along with time variable, I included different combinations of determinant variables. These determinant variables mainly focus on the outreach and depth of MFIs. Without time effect the mean cost efficiency was found to be 68.4% whereas with considering the effect of time, the mean cost efficiency came out as 72%-78%. The average loan balance (ALB), a measurement of outreach of MFIs, is found to have a significant negative impact on cost inefficiency indicating that as ALB increases that is outreach reduces, inefficiency reduces. In other words, as outreach reduces, efficiency of MFIs in Bangladesh increases. On the other hand, considering the other outreach variable, i.e. % of women borrower, I found an opposite result. This finding shows that as MFIs increase their outreach by extending loans to a greater number of women participants, their efficiency improves. I also found that older MFIs are less cost efficient compared the new ones. However, the size of MFIs shows a positive impact on cost efficiency indicating the possibility of existence of economies of scale. But the result does not show statistical significance. For this, I divided the whole sample into three groups based on the size of MFIs and measure the cost efficiency of the three groups with the same model. This application resulted with differences in the level of cost efficiency of the different sized MFIs. Interestingly, the findings show that as the size of MFIs increases, the cost efficiency increases indicating the existence of economies of scale in the MFIs of Bangladesh. To verify the

acceptability of my findings, at this stage of my research, I applied the non-parametric DEA model. I applied here the two-stage DEA model where in the first stage, I measured cost efficiency and found that the overall cost efficiency of sample MFIs over the five years period as 73%. This is quite similar to the findings under SFA. Here also the large size MFIs prove to have higher efficiency. To identify the factors effecting cost efficiency of MFIs, I run the Tobit regression model. The findings match with the results under SFA that ALB and Women have positive impact on cost efficiency while age has a negative impact. Thus, from my research I can come up with the findings that in Bangladesh MFIs are on an average 72%-78% cost efficient. A decreasing trend in the cost efficiency is found over the time specially from 2017 to 2020. This result coherent with the finding of age that as time passes and MFIs get older, their efficiency reduces. On the other hand, the results of ALB, a determinant variable shows that in Bangladesh as ALB increases cost efficiency also increases. ALB is a measure of outreach and this finding shows that as MFIs constraint their outreach, they can attain more cost efficiency. That means in terms of this measure, there exists a contradiction between outreach and efficiency in the MFI market in Bangladesh. However, in terms of Women, as MFIs distribute microcredit to a greater number of women borrowers, efficiency of MFIs increases. This result indicates women borrowers are more capable of managing their loan fund and make better use of it leading cost efficiency for their lenders. Thus I found the existence of women empowerment in the country. Also, I found economies of scale in the MFI sector in Bangladesh as large size MFIs prove to have more efficiency compared to small and medium sized MFIs.

Chapter 1

Introduction

1.1 Introduction

Microfinance institutions are specialized financial institutions aiming to fulfill the gap between formal financial institutions and the poor. With their unique operating mechanism, microfinance institutions provide collateral free group-based loans to poor people who were earlier deprived from the benefits of formal credit facility. By availing the financial services of microfinance institutions, poor people of different countries all around the world are now able to change their fate. Imai et. al. (2010) and Zohra and Pandey (2011) have identified Microfinance as an economic development approach, intended to benefit low-income people to reduce poverty. Kaboski and Townsend (2005) and Attanasio et al. (2013) found that MFI members are better able to achieve asset growth and smoothing the consumption pattern. Thus, MFIs acts in social welfare by extending easy loan to poor who can utilize the fund for the improvement of their living standard. But to continue with this role in the society, MFIs need to be sustainable as financial institutions. And sustainability requires an institution to be efficient specially in managing its costs.

There are a number studies on efficiency of banks and other financial institutions. But a few focuses on the efficiency study of microfinance institutions. Nghiem *et al*. (2006), Bassem (2008), Haq *et al*. (2010), Kipesha (2012), Hermes et.al. (2011) etc. have measured efficiency of MFIs using different statistical tools. Some of the studies like Armendariz and Morduch (2005), Morduch (2007), Bassem (2008), Hudon and Traca (2011) have linked efficiency of microfinance with various factors.

Being a pioneer country in the microfinance sector, MFIs in Bangladesh has achieved success over the time by contributing in the development in living standard of poor people in the country. With the passes of time, the number of MFIs has increased in the country for which government has ensured proper monitoring and regulation of the sector by establishing Microcredit Regulatory Authority (MRA) and Palli Karma-Sangsthan Foundation (PKSF). There are lots of studies in literature discussing the significance and impact of microfinance institutions in the economy but little studies have concentrated on the efficiency of these institutions. My thesis fulfills this gap in literature by focusing on the cost efficiency of MFIs in Bangladesh.

1.2 Background of the Study:

The financial sector of an economy comprises of financial market and institutions which has a significant role in the efficient allocation of excess fund in productive sector and thus accelerates the economic growth of a country. Diallo (2017), Abubakar et al. (2015), Omri et. al. (2015), Komal and Abbas (2015), Ductor and Grechyna (2015), Jedidia et. al. (2014), Deltuvaite and Sineviciene (2014), Samargandi et. al. (2014), Gazi et al. (2013), Greenwood et. al. (2013), Menyah (2014), Sanchez (2013), Zhang and Wang (2013), Hsueh (2013), Sassi and Goaied (2013), Narayan and Narayan (2013), Zhang et al. (2012), Sadorsky (2011), Hassan et. al. (2011), Kar et. al. (2011), Fung (2009), Suleiman and Aamer (2008), Ergungor (2008), Deidda (2006), Liang and Teng (2006), Calderon and Liu (2003), Levine and Loayza (2000), Levine (1997), Panicos and Khaled (1996) analyzed the impact of financial development upon economic growth. Among the different financial institutions, commercial banks have a remarkable contribution to the economic growth enhancement through more efficient resource allocation, as has been found in studies like, Weill (2003), Thorsten Beck et al. (2004), Deidda and Fattouh (2008), Fernandez et. al. (2010), Wua et al. (2010); Chang et. al. (2010), Chu (2010), Koetter and Wedow (2010), Luo et al. (2012), Sassi and Goaied (2013), Ueda (2013), Mitchener and Wheelock (2013), Zagarra (2014), Coleman and Feler (2014), Pradhan et. al. (2014) etc. Besides banks, other financial institutions also accelerate economic growth, like- finance companies, insurance companies, credit union and so on (Ihori et. al., 2011; Lee et. al., 2013; Hou, 2012; Alhassan and Fiador, 2014; Cristea et. al., 2014; Pradhan et. al. 2015). In this list a new addition is the microfinance institutions whose main objective is to fill the gap between financial services and the poor people (Modurch and Haley, 2002; Japonica Intersectoral, 2003; Robinson, 2003; Dev, 2006; Coleman, 2006; Qayyum and Ahmad, 2006; Yunus, 2007; Bassem, 2008; Haq et al., 2010; Ahmad, 2011; Balkenhole and Hudon, 2011; Kipesha, 2012; Singh, 2013; Rajbanshi et. al., 2015).

Despite the important role of commercial banks and other financial institutions in economic development and its vast network, the researchers like S. Imai et al. (2010), Coleman (2006), Abdul Qayyum and Ahmad (2006), Hermes and Lensink (2007), Ahmad (2011), Becchetti and Castriota (2011), Singh (2013), Serrano-Cinca and Gutierrez-Nieto (2014), Wijesiri et al. (2015) found that

the formal financial sector have failed to extend financial services to rural people respond to the requirements of the poor because of high risk, high transaction cost and lack of collateral. According to Akpalu et al. (2012) as the poor has inadequate access to credit facility, they cannot come out of poverty. Hence to fulfill the gap, an alternative financial institution named as microfinance institutions emerged with an objective to reduce poverty and improve economic and social welfare of the rural poor people who are deprived from formal financial sector (Oteng-Abayie, 2011). Microfinance institutions offer broad range of financial services such as deposit collection, loan disbursement, money transfer, insurance services etc. (Hung, 1998; Dichter, 1999; Robinson, 2003; ADB, 2000; Dev, 2006; Coleman, 2006; Modurch and Haley, 2002; Japonica Intersectoral, 2003; Abdul Qayyum and Ahmad, 2006; Yunus, 2007; Bassem, 2008; Haq et al., 2010; Ahmad, 2011; Balkenhole and Hudon, 2011; Oteng-Abayie, 2011; Kipesha, 2012; Singh, 2013; Lønborg and Rasmussen, 2014; Barry and Tacneng, 2014; Piot-Lepetit and Nzongang, 2014; Rajbanshi et. al., 2015). The financial services of MFIs to low-income people in rural areas has a positive impact on the economic and social conditions in the area served by fostering economic growth, alleviating poverty and generating employment (Piot-Lepetit and Nzongang, 2014). Mustafa (1996); (2000); Morduch (1998); Ledgerwood (1999), Zaman (2000); McKernan (2002); Simonwtz (2002); Imai et. al. (2010), Zohra and Pandey (2011) have identified Microfinance as an economic development approach. As per Bassem (2008), the financial and banking institutions along with the microfinance institutions fulfils the financial sector of a country accelerating economic development.

At recent time, microfinance industry has become an integral part of financial system consists of thousands of organizations who serve around 203 million people all around the world of which 116 million belong to world's poor living (Barry and Tacneng, 2014; Rajbanshi et al., 2015). As per microfinance experts, microfinance program at one hand improves the financial situation of poor families, on the other hand, brought concomitant improvements for their borrowers in vital humanitarian areas such as health, nutrition and educational attainment (Bassem, 2008; Holland and Wang, 2011). Holland and Wang (2011) further argue that if microfinance would have just help in increasing income level of participants and not in social improvements of the family, especially in the attainment of education children, then the program would have been become non-sustainable. According to CGAP, 2009 the microcredit and savings facility not only help the poor

to smooth consumption, but also to solve health problems, and to grab business opportunities and to make up expenses for education, weddings, or funerals. Naved (1994); Hashemi et. al. (1996); Steele et. al. (1998); Ghosh (2005), Zohra and Pandey (2011) found positive impact of Microfinance program on women empowerment and welfare. Jacoby (1994); Foster (1995); Pitt and Khandker (1996); Marcus et. al. (1999); Barnes et. al. (2001); Littlefield et al. (2003); Holland and Wang (2011) have shown in their study that the number of school enrolling increased after introduction of microfinance program.

Microfinance institutions have become an integral part of the financial system of many countries to serve the poor with their required credit facility which helps the poor to fulfil their daily necessities, create earning sources, ensure education for children, access to better health facilities for family members, acquire assets and thus overall to improve their living standard.

1.3 Research Problem

With the rapid growth of microfinance institutions at the recent time over different countries of the world and its immense impact on economic development, the donors, policymakers and other stakeholders have started to think about the necessity of these institutions' sustainability and efficiency. That is the institutions should earn good enough to cover their operating and financing costs through better allocation of scarce resources (Morduch, 2000; Hermes et al, 2011; Cull et al, 2009; Barres et al, 2005; Haq et al., 2010; Kipesha, 2012). Besides, competition among the huge number of MFIs is forcing them to be efficient (Hermes *et al*, 2011; Kipesha, 2012).

The microfinance institutions have two main sources of fund: deposit and donation (Bassem, 2008). From a report of, it is found that even though the Microfinance sector has managed to collect a remarkable US$ 1b. subsidies from private and public sector per year over the last 20 years (CGAP, 2005), only less than 5% of MFIs has been proven operationally sustainable. That means the other 95% still rely on subsidies to cover their costs and finance their loans (UNCDF, 2005). Armendariz & Morduch (2005); Oteng-Abayie (2011) also focus on the fact mentioning that dozens of MFIs still needs subsidies to cover their high transaction costs though they claim to make profits. Such widespread reliance on subsidy has motivated the donors to learn about the

efficiency of Microfinance Institutions (MFIs) to decide about the continuation of their donation as donors prefer to fund MFIs which are sustainable and efficient (Bassem, 2008; Hudon and Traca, 2011; Barres *et al*, 2005; Kipesha, 2012). Many donors are withdrawing their fund from the inefficient microfinance institutions (F. Fall et al., 2018).

On the other hand, welfarists (like Morduch, 2000; Woller et al., 1999) claim the donations contributed by the donors as equity capital for an MFI while the donors to be considered as social investors. They argue that MFIs do not need financial self-sufficiency to achieve sustainability. On the other hand, institutionalists emphasis that MFIs should achieve sustainability by generating sufficient revenue to cover its operating and financing costs (Piot-Lepetit and Nzongang, 2014). Hulme (1999) stated that the different financial services of MFIs to increasing number of poor people and its positive repayment rate have helped many MFIs to achieve sustainability and generate profit even without any government subsidies. Agarwal and Sinha (2010) stated that the sustainability of microfinance institutions is important to achieve their objectives. But empirical studies found that MFIs that has to concentrate towards financial aspects as of its institutional role has to forgo the social objective while MFIs trying to focus on social welfare has to sacrifice financial aspects and this dilemma has introduced a new dimension for MFIs named as efficiency (Balkenhole and Hudon, 2011).

With the passes of time, the nonprofits Microfinance institutions are scaling up and increasing their outreach through diversified product-offerings and as a consequence of that they are becoming less able, or willing, to achieve the social-development (poverty-reduction) objectives which was their initial objective to be established (Evans, 2010). Studies like Hulme (2000), Navajas et al. (2000), Schonberger and Christen (2001), Simtowe et al. (2006), Coleman (2006), Cull et al. (2007), Hermes et al., (2011) mentioned that microfinance institutions do not reach the poorest households rather they provide services more to the richest people of the area (Christen, 2001; Cull et al., 2007; Hermes et al., 2011). The reason behind this strategy of MFIs is that both micro-saving and microcredit require that the participants do possess resources, involvement, and skills so that the savers have sources of monetary income and borrowers can use their loans in productive ways to repay on time, keep track of their repayment schedules, and manage the risks of borrowing (Lønborg and Rasmussen, 2014). However ultimately a trade-off exists between

financial sustainability and outreach (no. of clients served) of microfinance programs (Piot-Lepetit and Nzongang, 2014). Cheston and Reed (1999) highlighted the necessity of having social audits, with the argument that the impacts of microfinance program on families need be measured as well as monitored on a regular basis. Consequently, many researchers (S. Imai et al., 2010; Coleman, 2006; Khandker, 2005; Weiss and Montgomery, 2005; Goldberg, 2005; Aghion and Morduch, 2005; Mosley, 2001; Abdul Qayyum and Ahmad, 2006) have focused on efficiency measurement of microfinance institutions as a way of finding whether this microfinance program is actually leading financial and social benefits for the "poorest of the poor" because an efficient MFI management should promote both the objectives (Brau and Woller 2004). Besides entrance of commercial banks and other private investors into microfinance business (Chowdhury, 2009; Epstein & Yuthas, 2010; Armendaiz & Morduch, 2010; Hermes *et al*, 2011; Roodman, 2012; Kipesha, 2012), technological change in microfinance industry (Hermes *et al*, 2011), financial liberalization and government regulatory policies (Rhyne and Otero, 2006) also indicate the necessity of measuring efficiency of MFIs. Moreover, as per C. Gonzalez Vega et al. (1996), efficient functioning of MFIs is important for long run sustainability, which refers to the ability of the MFIs to earn good enough to at least pay the price of all inputs as well as assets. As a consequence, the management of MFIs are also preferring efficiency and cost reduction in their strategy (Blanco-Oliver et al., 2016).

1.4 Research Purpose:

From the above discussion, it is clear that the efficiency measurement of microfinance institutions is very important and also a demand of the recent time. In this paper, I focused on this emerging issue by considering the scenario of MFIs in Bangladesh. Being a pioneering country in the microfinance industry, over time Bangladesh has observed a huge expansion of microfinance practice within the small economy. In Bangladesh, there exists 877 MFIs as per 2020 (MRA, 2020). The practice of microfinance has a great impact in poverty alleviation and thus in the economic development of the country (Islam, 2015). Thereby these microfinance institutions need to perform efficiently in their operation to create a rather enhancing role in the economy. Also, the statistics show that the number of MFIs does not have only one way movement, at one hand new MFIs are coming into market whereas on the other hand, some of the existing MFIs exit from

market. That means, all the MFIs are not able to sustain over time. So, it is indeed urgent to identify how many among these huge number of MFIs in the country are able to sustain in the long run and can achieve their social objective. And sustainability can be ensured if the MFIs can achieve cost efficiency which means to produce a given level of output at minimum possible cost given the inputs. In this research, my basic objective is to measure the cost efficiency of the microfinance institutions in Bangladesh. To conduct the research, I used both parametric and non-parametric approach. Researchers found advantages and disadvantages of both the methods which has been discussed in a later part.

Along with efficiency measurement, in my research, I also put light on the recent dilemma of MFIs' mission drifts between social welfarism and financial sustainability. To observe the current status in Bangladesh in this regard, I aimed to analyze the relationship between outreach and breadth of MFIs with cost efficiency along with some other determinant factors.

1.5 Research Question:

The research query that thrived my whole work is, "To what extent the MFIs in Bangladesh are cost efficient and how do the outreach and breadth of MFIs affect the efficiency of MFIs along with considering some other determinant variables?"

1.6 Rationale of the Study:

Observing the importance of microfinance in an economy, many researchers have concentrated on the study of microfinance. In the literature, it is found researchers have focused on various areas of microfinance. Most of these researches are based on the demand side analysis that is how the microfinance practice is affecting the users [a detailed discussion on the impact of MFIs on users worldwide is presented in Chapter 3]. As my main research focus is efficiency of MFIs, I found little literature on this area. Through my previous discussion, I established the necessity of efficiency study of MFIs, however, more of the efficiency analysis in literature is done on

commercial banks [included in Chapter 2, literature review]. I found a few numbers of studies concentrating on the efficiency measurement of MFIs like, Nghiem et al. (2004 & 2006), Abdul Qayyum and Ahmad (2006), Gutiérrez-Nieto et al. (2007 & 2009), Bassem (2008), Sufian (2009), Haq et al. (2010), Hermes et.al. (2011), Kipesha (2012). Applying parametric and non-parametric model, these studies have measured the level of efficiency of microfinance institutions. Some of these studies are based on a single country while some studies have considered multiple countries scenario. Most of these studies rely on the MIX Market database which is most acceptable and dependable dataset. But MIX Market includes only very large and financially strong organizations as MFIs need to qualify to be included into their database. So, if we rely on such data source, there is chance that the research may give a biased result rather than reflecting the true market scenario.

Now, turning to the literature regarding MFIs in Bangladesh, in literature a number of studies are found which mainly discusses the impact of the microfinance trend in the economic development of the country, like, Khan & Rahaman (2007), Khandker and Samad (2014), Islam et al. (2015), Raihan et al. (2017), Rizkiah (2019) [more detailed discussion is given in Chapter 4]. There are some multi-cultural efficiency analyses of MFIs in which some renowned Bangladeshi MFIs were included as sample, like Haq et al. (2010), Conroy (2003) and Qayyum and Ahmad (2006). But in these studies, in comparison to the total sample size, the number Bangladeshi MFIs included was not remarkable enough. To my concern, I found only two standard studies fully focusing on the efficiency study of MFIs in Bangladesh. The first study is by Quayes and Khalily (2014) who measured cost efficiency by using SFA approach. In this study, the researchers took 45 MFIs in 2004, 52 MFIs in 2005, 71 MFIs in 2006 and 70 MFIs in 2007 as sample collecting data from PKSF. The study contains different sample size for different periods and these samples are not extended in size. Also the time covered in the study is of much earlier period and does not reflect the current market condition. The second study is by Ferdousi (2020) where the researcher applied DEA model to find efficiency of 23 MFIs in Bangladesh collecting data from MIX market covering period from 2004 to 2010. In this study, the sample size is too small and as the data is collected from MIX Market, there is high chance of sample biasness. Also, the time period cover does not reflect the current scenario.

In my study, I used a larger sample size concentrating on more recent period. I collected two separate data set, one from PKSF and the other from MRA. From PKSF I collected data on 146 MFIs over the period 2016- 2020. To verify the acceptability of my findings, I also collected an extended data from MRA on 479 MFIs. Both the data set lead me to the same findings. Besides, I applied both SFA and DEA in my research and identified cost efficiency of the sample MFIs under both models following the work of Resti (1997) and Isik and Hassan (2002). Therefore, my research work has significance in the following dimensions:

Sample Size: The sample size I used in my study is much larger than the existing literature both concentrating on Bangladesh market only or based on international comparison. Both the extended data set contains balanced panel data and are substantially representative of the industry as a whole which is not there in any other studies.

Source of Data: The sources of data I used (both PKSF and MRA) include all types of MFIs, in terms of size and financial condition. So, the sample represents the whole industry without any biasness.

Timeframe: My research makes analysis on the efficiency of MFIs in Bangladesh considering a more recent dataset [2017 – 2020] reflecting the current picture of the industry. Other studies cover much early period.

Methods Used: There are studies on banking industry including both parametric and non-parametric models to judge the efficiency. But as per my knowledge, there is no study in the sector of microfinance that incorporates both the two methods together. My research fulfills this gap in literature as I applied both the techniques in measuring cost efficiency of MFIs.

1.7 Conceptual Framework:

To achieve the objectives, I applied both parametric and non-parametric models. Under parametric approach, I used the Stochastic Frontier Model and other non-parametric approach I used the Data Envelopment Analysis. The Battesi and Coelli (1995) model is applied to measure the cost

efficiency under SFA. This model has the advantage that along with cost efficiency measurement, it identifies the effect of various factors' influence on efficiency of a firm.

Both the models assume the intermediation approach as the MFIs act as intermediaries between surplus units and deficit units in a society. As here I am measuring cost efficiency, the input-oriented model is applied in which three inputs are taken, those are deposit, labor and fixed assets and one output, i.e. gross loan portfolio of MFIs.

To conduct the survey, data has been collected from two separate sources. The first set of data is collected from Microcredit Regulatory Authority (MRA) whereas the second data set has been collected from Palli Karma-Sahayak Foundation (PKSF). Both the data set contains panel data information of MFIs in Bangladesh. The cost efficiency estimation has been done on both the data set where I found similar results.

1.8 Significance:

The success story of microfinance institutions has a long list over different countries of the world. However, it is also a fact that there are some failure cases too. The rapid growth of the industry along with dependency on donated fund has drawn attention to regulators, policymakers as well as donors. Besides, recent literature argues that as MFIs reach to the poorest group in the society, their operating cost increases and they have to sacrifice their sustainability. So, to earn sufficient to survive in the market and serve the members with offer wide range of services, MFIs at the recent time are more focused towards comparatively rich part of the poor people leading contradiction between social outreach and financial sustainability (Piot-Lepetit and Nzongang, 2014). My research enlightens this burning issue in the context of microfinance industry of Bangladesh. From this analysis would help the regulators and policymakers to judge the current efficiency condition of the MFIs and thus to take necessary steps as well as implement required policies to drive MFIs for economic development. The donor group can also be benefitted from this study to ensure proper channelizing of their fund.

This study would be useful to individual MFIs in the country as the study can guide them to what extent they can reduce their cost by choosing a proper combination of inputs and still can serve the members with existing loan portfolio. The analysis on how do outreach and breadth affect efficiency would help them to control these variables to serve the society as well as to earn good enough to be sustainable. As my study find that there exists economies of scale in this sector, this finding would give a light to the medium and small scale MFIs to expand operation to achieve cost savings.

1.9 Conclusion:

All the above discussions demonstrate that microfinance sector, which is the emerging industry under financial sector of any developing or underdeveloped country, efficiency study of it is of immense significant for MFI's role in poverty reduction. Some researchers have considered the issue but the number of studies is not too long. Some of these studies measures efficiency of MFIs based in some specific country while some others are based on MFIs located in different countries of a region. The current study will focus on the efficiency measurement of MFIs situated in Bangladesh from where the journey of microcredit was initiated. To be more specific about the research and to facilitate the design of the study, it is needed to look at the previous studies. So, my next chapter discusses about the existing literature on efficiency studies.

Chapter 2

Literature Review

2.1 Introduction

In the first chapter, the basic concept of this study along with the objective of the study and the methodology used for the study has been discussed in brief. Now it is the time to observe the literature concerning efficiency studies. The main objective of this current chapter is to concentrate towards the literature related to efficiency measurement of Microfinance institutions. To focus on this issue at first it is necessary to understand the term "efficiency" and how it has been measured in different studies. In general, the term 'Efficiency' indicates the level up to which a decision-making unit (DMU) would be able to increase its production without changing the input quantities, or reduce the inputs to yield a given level of output (Chen et al. 2005). In this aspect, at first I would focus on the efficiency studies on banking industry. This is done because the number of studies on efficiency of MFIs throughout the world is not too long (Gutiérrez-Nieto et al., 2007; Haq et al., 2010; F. Fall et al., 2018). On the other hand, immense studies have been done regarding the efficiency measurement of banking industry in different countries of the world (Gutiérrez-Nieto et al., 2007; F. Fall et al., 2018). There are some differences between MFIs and commercial banks in the sense that MFIs are significantly smaller in size, providing services only towards the poor households and often provide loans which are collateral-free group loans. However, they have some commonality as both of these work as financial intermediaries in the economy by collecting deposit and providing loans (Gutiérrez-Nieto et al., 2009). For these, the efficiency measurement procedure of banks can be replicated in the case of microfinance sector. So, the literature relating to bank efficiency can give us an in-depth idea about how to measure efficiency in the microfinance sector. In addition, this will allow me to design the models to be used to measure efficiency. However, I will also focus on empirical studies on non-bank financial institutions, like insurance company, credit union etc. and then the literature on efficiency study of MFIs will be analyzed. So the rest of the chapter is arranged as firstly, the definition on efficiency; secondly, the efficiency studies of banks; thirdly, the efficiency studies on non-bank financial institutions; fourthly, literature on efficiency of microfinance institutions followed by conclusion.

2.2 Efficiency:

Riaz and Gopal (2015) in their study on MFIs defined efficiency as "Efficiency is a derivative of production process and productivity. Productivity is a descriptive measure of performance, and Efficiency is a normative measure". A financial institution is efficient if it maximizes the quantity of output for a given quantity of input or minimizes the quantity of input given a quantity of output (Chen et. al., 2005; Balkenhole and Hudon, 2011; Piot-Lepetit and Nzongang, 2014). Therefore, there is always a frontier showing the most attainable results given the set of information. The closure a firm's actual result is to this frontier, the more efficient the firm is (Daraio & Simar, 2007). Both parametric and non-parametric method can be used to construct the frontier and measure efficiency of a financial institution. Under parametric the commonly used method is Stochastic Frontier Approach (SFA) and under non-parametric is the Data Envelopment Analysis (DEA) (Resti, 1997; Drake & Hall, 2003; Havrylchyk, 2006; Das and Ghosh, 2009; Ariff and Can, 2008; Lee and Chih, 2013; Goddard et al., 2014; Svitalkova, 2014). The inputs and output selection of a financial institution to be used to measure efficiency depends on the approach. There are three different approaches to measure efficiency of a financial institution; i.e. production approach, intermediary approach and profit oriented approach.

Chen et. al (2005) classified efficiency into three categories: scale efficiency; scope efficiency; and X-efficiency. X-efficiency measures the ability of management to control costs to produce output utilizing an efficient mix of inputs (Chen et al., 2005). Scale efficiency occurs when a DMU has the same level of efficiency estimate under constant return to scale and variable return to scale (Moradi-Motlagh and Babacan, 2015). Havrylchyk (2006), Assaf et al. (2014), Tsionas et al. (2015) identified two components of cost efficiency, as, allocative efficiency and technical efficiency. Technical efficiency is defined as the ratio of the input quantity utilized by a fully efficient firm producing the same output vector to the input quantity used by a firm under consideration. Allocative efficiency measures the firm's ability to choose input combination that minimizes cost. The technical efficiency is a combination of two components, they are: scale efficiency and pure technical efficiency (Drake & Hall, 2003; Havrylchyk, 2006). Pure technical efficiency refers to the failure of a DMU to extract the maximum output from its given level of input (Isik and Hasan, 2002; Drake and Hall, 2003). Early studies on bank efficiency mainly concentrated on scale and scope efficiency, like Berger, Gilbert (1984); Hancock and Humphrey

(1993); Dietsch (1993); Berger et al. (1993); Zardkoohi & Kolari (1994); Mester (1997); Huang (1998); Zhao & Ling (2000); Zhao & Jiang (2001). However, in recent time many studies have also attempted to measure cost efficiency (Chen et al., 2005).

2.3 Efficiency of Banks:

Technological advancement, financial liberalization, the economic and regulatory integration, information availability, changing corporate culture and the competition have put pressure on banks to find ways to enhance their efficiency over the last two decades (Carvallo & Kasman, 2005; Chortareas, 2013; Fu et al., 2014, Tsionas et al., 2015). Berger et al. (1993); Allen and Rai (1996), stated that for banking and non-banking financial institutions, cost efficiency is a prerequisite for survival. This is because if a bank has to survive in this competitive world with ever changing environment, banks need to produce their output with minimum cost. Berger and Humphrey (1997) and Xiaoqing and Heffernan (2007) argued that from the efficiency studies government regulatory authority can come to know about the causes behind the inefficiency of institutions and initiatives can be adopted to improve the scenario. Thus, bank efficiency studies at one hand can contribute to government policy and research, and on the other hand can facilitate in proper bank management. Considering these necessities, many researchers have put emphasize on efficiency measurement of financial institutions.

Majority of these studies have been done on US and other developed countries (Havrylchyk, 2006). Efficiency of banking industry of developing countries has been analyzed in studies, like Bhattacharyya et al. (1997) for India; Gilbert and Wilson (1998) for Korea; Kraft and Tirtiroglu (1998) for Croatia; Leightner and Lovell (1998) for Thailand; Mertens and Urga (2001) for Ukraine; Hardy and Bonaccorsi di Patti (2001) for Pakistan; Nikiel (2002) for Poland; Rezvanian and Mehdian (2002) for Singapore; Hasan and Marton (2003) for Hungary (early reorganization, privatization and liberal policies enhances efficiency); Grigorian and Manole (2006) for Central and Eastern European countries and so on. In these studies, the researchers have found different level of efficiency of the sample banking institutions and also have found size of bank, deregulation, ownership structure etc. as determinant variables of efficiency. All the literature relating to bank efficiency applied either parametric SFA or non-parametric DEA model. So, the

literature review on bank efficiency has been presented in the following sections based on the methodology used in the study.

2.3.1 Bank Efficiency with Parametric Models:

Aigner et al. (1977), Battese and Corra (1977) and Meeusen and Broeck (1977) introduced the stochastic frontier analysis (SFA). Since then, it has received increasing attention as a parametric test in the literature to measure a single institution's efficiency (Svitalkova, 2014). Fries and Taci (2005) and Bonin et al. (2005) investigate banks in a number of countries in Central and Eastern Europe and the Commonwealth of Independent States; Tsionas et al. (2015) on European banks; Kraft and Tirtiroglu (1998) on Croatia; Mertens and Urga (2001) on Ukraine; Hasan & Marton (2003) on Hungary; Jonghe & Vennet (2009) and Bos et al. (2009) on German savings banks; Karafolas and Mantakas (1996) for Greek banks; Al-Gasaymeh (2016) for Gulf Cooperation Council countries; Tecles and Tabak (2010) on Brazilian banks; Pang-Tien (2005); Sun and Chang (2011) on Asian banks; Berger et al. (2009); Fu & Heffernan (2009), Zhang et al. (2012), Yin et al. (2013) and Fungáčová et al. (2013) on Chineese banks; Kasman and Carvallo (2014) for Caribbean banks, Goddard et al. (2014) on Latin banks and Tabak et al. (2013) on US savings banks applied the SFA model. In most of these studies, researchers focused on X-efficiency which identifies whether banks are producing a given level of output bundle with an efficient mix of inputs by selecting the optimal scale, given the input prices (X. Chen et al., 2005; Heffernan, 2007). It shows the capacity of management to use resources and control costs to produce a given level of output.

However, the different studies with parametric models have focused on different dimensions which somehow affect the efficiency of banks. As some of the studies focused on deregulation and banks' X-efficiency level and tried to find out how they affect efficiency of commercial banks. Chen (2001) for Taiwan's deregulated banking market; Hasan and Marton (2003) for Hungary, Koutsomanoli-Filippaki et al. (2009) and Fang et al. (2011) found that banks' X-efficiency had substantially increased after deregulation and bank reforms. On the other hand, Isik and Hassan (2002); Hardy and Patti (2001) found decreasing X-efficiency in Turky and Pakistan respectively after deregulation. Similar result was found by Zhang (2012). X.(M.) Fu and Heffernan (2007)

found decreasing X-efficiency after the second phase bank reform in China. Whereas Hao et al (2001) reported little or no significant effect of financial reforms on banks' X-efficiency in Korea. In this regard, Pasiouras (2013) makes an analysis on 4000 banks over 80 countries and found that more supervision on banking industry reduces efficiency.

It is not only deregulation or reform in banking industry, rather size of the banks also has been found as an important variable to affect efficiency. Carvallo & Kasman (2005) found size of banks has impact on efficiency level in Latin America and Caribbean countries; Kasuya (1986), Yoshioka and Nakajima (1987), Tachibanaki et al. (1991), Fukuyama (1993), McKillop et al. (1996) found strong evidence of scale economies over a variety range of bank sizes in Japan. Yin et al. (2013) and Tsionas et al. (2015) found in China and Europe respectively economies of scale exists for larger banks but they did not find any economies of scope. In contrast to these findings, Altunbas et al. (2000) found lower scale economy and scale efficiency for Japanese banks by controlling risk and quality factors suggesting that the largest banks can be more effective in lowering cost by reducing output level and not by improving X-efficiency as the X-efficiency score did not change for controlling risk and quality variables. Karafolas and Mantakas (1996) found no scale economy for Greek banks whereas Al-Gasaymeh (2016) found negative relationship in between bank size and efficiency for developing countries which suggest diseconomies of scale. However, his findings were statistically insignificant.

Besides size, ownership structure of a bank is also important. Fu and Heffernan (2007); Yao et al. (2007); Yin et al. (2013) scrutinized the relationship between efficiency and ownership of banks in China and compared to state owned banks, the joint stock banks were found as more efficient and suggested that decontrol of interest rates may stimulate greater efficiency. For Chineese banks Berger et. al. (2009), Fungáčová et al. (2013); for Hungarian banks Hasan and Marton (2003); for banks in Czech Republic and Poland, Weill (2003); for European banks Bonin et al. (2005), Fries and Taci (2005); for Indian banks Tzeremes (2015) found foreign banks as more cost and profit efficient than state owned banks. Claessens et al. (2001) present evidence that entrance of foreign banks increases bank efficiency by reducing margins. Schaeck and Cihak (2010), Zarutskie (2009), Dick and Lehnert (2010) provide evidence that competition enhances banks' efficiency. On the

other hand, Hasan and Hunter (1996), Chang et. al. (1998) in US; Miller and Parkhe (2002) in a study on different countries; Zajc (2006) in six CEE nations; Lensink et. al. (2008) in a study on banks of 105 countries found foreign banks are less cost and profit efficient than local banks.

However, in addition to the above-mentioned variables, there are some more factors whose importance has been found in different literature. As Strum and Williams (2004), Altunbas et al. (2007), Fiordelisi et al. (2011) identified a positive relationship between inefficiency and bank risk-taking. Lang and Welzel (1996) by using translog cost function found evidence of moderate scale economies, economies of scope and reductions in cost with technical progress for all size co-operative banks in Germany. Yin et al. (2013) found capital ratio having negative relation with bank efficiency while management quality shares a positive relationship. On the other hand, Tsionas et al. (2015) found significantly positive relation between capital ratio and efficiency. Tsionas et al. (2015) also found a positive relation between bank liquidity and technical efficiency. They also showed that bank efficiency differs in short run and long run but short-run efficiency has a tendancy to increase or return back to normal in the long-run to protect long-term survival. Williams (2012), Chortareas et al. (2011), Casu and Girardone (2009) observe the relationship between bank efficiency and market power and found a positive relationship. Hao et al. (2001) found that in Korea, banks that operate nationwide with higher rates of asset growth, larger amounts of core deposits, fewer employees, and lower expense ratios were more efficient over the period 1985–1995. Staikouras et al. (2007) applied a stochastic frontier approach on South Eastern European banks incorporating firm-specific and country-related variables. They found a generally low level of cost efficiency, with significant differences in inefficiency level among countries. Christopoulos (2002) used a heteroscedastic stochastic frontier approach on Greek banking industry and showed that economic performance, bank loans and investments have positive relation with the cost efficiency. Gasaymeh (2016) found that banks located in countries with lower level of country risk perform more efficiently. A.N. Rezitis (2008) used a stochastic output distance function for Greek banks and construct a generalized Malmquist productivity index and found that banks technical efficiency and total factor productivity decreased after merger and acquisition. Dietsch and Lozano-Vivas (2000) found environmental factors have influence on efficiency scores across different countries. Kasman and Carvallo (2014) by applying Granger

causality technique verified the relationship between financial stability, efficiency and competition in Caribbean banking industry. In this aspect, Berger and DeYoung (1997) mentioned in their study that competition may adversely affect efficiency through poor management.

2.3.2 Bank Efficiency with Non Parametric Models

Besides the parametric models, the non-parametric method, mainly applied DEA model, has been widely used in measuring the efficiency of commercial banks as has been found in the study like Fukuyama (1993), McKillop et al. (1996), Drake and Hall (2003), Grigorian and Manole (2002), Liu & Tone (2008) and Drake et al. (2009) for Japanese banking industry; Hartman (2001) on Swedish savings and loan bank; Ariff and Can (2008), X. Chen et al.(2005) for Chinese banking industry; Rezvanian and Mehdian (2002) for Singapore; Denizer et al. (2000) for Turkey; Havrylchyk (2006) for Poland; Canhoto and Dermine (2003) for Portugal; Hsiao et al. (2010 and 2011), Liu (2010), Kao and Liu (2014) for Taiwanese banks; Svitalkova (2014) and Chortareas (2013) for European countries; Noulas (1997) and Rezitis (2006) for Greek banks; Havrenak et al. (2016) for Czech banks and Diallo (2017) for multiple countries. Liu and Tone (2006) finds upward trend of efficiency in Japanese banking industry, Tortosa-Ausina (2002) finds savings bank to be more efficient than commercial banks in Spain while Ausina (2004) finds inefficiency of Spanish banks; Pastor et al (1997) finds Belgium, France and Spain as the countries having the most efficient banking systems, whereas Austria, Germany and UK found to be the lowest efficiency levels; Svitalkova (2014) finds Austrian and Czech banking sector to be more efficient among six European countries. Tzeremes (2015) finds in India the efficiency of banks improved from 2004 to 2008. In recent studies, the determinants of bank efficiency have been studied (Garza-Garcı´a, 2012). So now we will concentrate on the different variables with which bank efficiency has been attached with non-parametric models.

Like parametric studies, researchers using non-parametric tests also focus on various factors which may have some influence on bank efficiency. Some studies have focused on the efficiency level of commercial banks with deregulation of banking industry. Berg et al. (1993) and Avkiran (1999) for Norway and Australia; Leightner and Lovell (1998), Gilbert and Wilson (1998) for the Asian region; Canhoto & Dermine (2003) for Portugal; X. Chen et al. (2005) for Chinese banking

industry; Park & Weber (2006) for Korean banking industry; Sahoo and Tone (2009), Zhao et al. (2010) for India show a positive impact of deregulation on banking efficiency. On the other hand, some studies find negative reaction of deregulation upon bank efficiency such as Grabowski et al. (1994), Elyasiani and Mehdian (1995) and Wheelock and Wilson (1999) in US. Whereas Das and Ghosh (2006) in India finds that the banking efficiency is not significantly changed by deregulation or liberalization of banking industry. Pasiouras (2008), Chortareas et al (2012), Lee and Chih (2013), Barth et al. (2013) evaluated the impact of different type of regulation on bank efficiency. Tzeremes (2015) shows in India the efficiency of banking sector declines after Global Financial Crisis. Wang et al. (2014) for Chinese banking industry and Hsiao et al (2010) for Taiwanese banking industry found the efficiency improves after banking reforms. Moreover, Chortareas et al (2013) proves that excessive government intervention has a negative impact on banks' efficient operation.

Besides regulation and reform, bank capital and supervision on capital requirement is an important factor in bank operations. Pasiouras (2008) finds that market discipline significantly improves bank technical efficiency. Pasiouras (2009) further shows that market discipline and supervisory power enhances profit efficiency as well as cost efficiency of banks. Dewatripont and Tirole (1994) state that capital of an organization is a protection against losses and can absorb the possibility of bank failure. Following this thought, Ariff and Can (2008), Pasiouras (2008), Fadzlan (2009), Das and Ghosh (2009), Naceur et al. (2009), Hsiao et al (2010), Chortareas et al. (2012) suggested that higher capitalization and supervisory power are positively associated with bank efficiency. On the other hand, Altanvus et. al. (2007) and Yin et al. (2013) showed higher capital reduces bank efficiency. Barth et al. (2006, 2010) and Lee and Chih (2013) indicate that excessive regulations and strict restrictions on bank activities negatively affect bank efficiency while greater capital restrictions are positively related with efficiency.

Several studies have focused on bank size and cost structure of banks as this relationship can influence the policy implications as per the optimal structure of banking industry (X. Chen et al., 2005). Gilligan et al. (1984) found insignificant cost savings due to increased bank size whereas Shaffer (1985), Hunter and Timme (1986), and Hunter et. al. (1990) found significant scale

economies in cost savings. Berger and Humphrey (1992 and 1997), Tecles and Tabak (2010) for Brazil, Wezel (2010) for Central America found positive relation between bank size and efficiency. On the other hand, Bauer, Berger, and Humphrey (1993) reported negative relationship between asset size and efficiency. Tachibanaki et al. (1991) found evidence of economies of scale for all sizes of banks in Japan whereas Fukuyama (1993) found evidence of only mild economies of scale and Drake & Hall (2003) found that scale efficiency improves with size for smallest banks and pure technical efficiency decreases with size up to the middle ranking banks. In China Huang (1998), Zhao & Ling (2000), Zhao & Jiang (2001) found no economies of scale for state-owned banks and joint-equity banks but X. Chen et al. (2005) found more efficiency for large and small banks whereas Ariff and Can (2008) found that medium-sized banks are the most efficient. Berger, Hancock and Humphrey (1993); Berger, Hunter and Timme (1993); Gilbert (1984); Mester (1997) found that in US small banks enjoy scale efficiency gains to some extent while large banks have constant or slight diseconomies of scale. Dietsch (1993); Zardkoohi & Kolari (1994) indicated stronger evidence of economies of scale and scope economies to a lesser extent in Europe. For Indian banks Das and Ghosh (2009) found evidence of scale efficiency.

Along with capital requirement and bank size, many studies have focused on bank efficiency and ownership structure (Gorton and Schmid, 1999; Ausina, 2004; Havrylchyk, 2006; Berger et al, 2000; Isik and Hassan, 2002; Das and Ghosh, 2006; Zhao et al., 2010; Ray & Das, 2010; Casu et al., 2013; Fujii et al., 2014; Tzeremes, 2015). Studies found that in developed countries foreign banks are less efficient than domestic banks (Havrylchyk, 2006) whereas Berger et al (2000) found an opposite scenario for other developed countries. Supporting to the finding of Berger et. al. (2000), Grigorian and Manole (2002), Isik and Hassan (2002), Hasan and Marton (2003), Jemric and Vujcic (2002), Bhattacharyya et al. (1997), Shanmugam and Das (2004), Havrylchyk (2006), Pasiouras (2008), Fujii et al. (2014) found that in transition and developing markets, foreign banks show higher or in some cases equal efficiency as of domestic banks whereas in this race, the state-owned banks lag behind. Ariff and Can (2008) and Yin et al. (2013) show the joint-stock banks to be more cost efficient and profit efficient than state-owned banks in China. The same was found by Micco et al. (2007) for the developing countries. But Das and Ghosh (2006), Das and Ghosh (2009), Tabak and Tecles (2010), Zhao et al. (2010), Das and Kumbhakar (2012), Bhattacharyya and Pal (2013), Tzeremes (2015) showed in India, compared to the private and foreign banks,

public owned banks performed better. The same was found by Detragiache et al. (2006) for the developing countries.

Though asset size is an important issue in bank efficiency the quality of asset is also vital. The loan loss provision measures the asset quality and has a significant positive effect on bank's efficiency as has been found by Lee and Chih, 2013. Yin et al. (2013) and Hou et al. (2014) found more risk-taking banks are more efficient whereas Ariff and Can (2008) found for Chinese banks more risk-taking banks as to be underperforming. Hsiao et al (2010) found that bank efficiency decreases with higher non-performing loan ratios. Das and Ghosh (2009) found that in India banks with bigger loan portfolio exhibit greater profit efficiencies. In contrast to asset, Adenso-Diaz and Gascon (1997); Beccalli et al. (2006); Fiordelisi (2007); Pasiouras et al. (2008); Jonghe and Vennet (2008); Erdem and Erdem (2008); Liadaki and Gaganis (2010); Fiordelisi and Molyneux (2010) analyzed the relationship between bank efficiency and shareholder value in US and Europe. A positive relation was found between profit efficiency and share return by Chu and Lim (1998) in Singapore; Kirkwood and Nahm (2006) in Australia; Ioannidis et al. (2008) in Asia and Latin American countries; whereas Sufian and Majid (2006) in Malaysia and Fu et. al. (2014) in 14 Asian countries revealed that both cost and profit efficiency improvements are positively affected by bank shareholder value.

Some other variables also have been brought under reflection as determinant of bank efficiency under non-parametric studies; as Ghosh et. al. (2003), Ariff and Can (2008), Xiong and Sun (2009), Lee and Chih (2013) found a negative relationship between bank efficiency and cost to income ratio which is defined as operating expenses divided by operating income and can be used for benchmarking by the bank for reviewing operational efficiency. Weill (2004) in Western Europe, Maudos and Guevara (2007) in Europe, Solis and Maudos (2008) in Mexico, Pruteanu-Podpiera et al. (2008) in Czech Republic found negative relation between competition and efficiency whereas Fungáčová et al. (2013) found no relation of competition to bank efficiency for Chinese banks. On the contrary, Hou et al., 2014 found in Chinese banking sector, efficiency increases with higher market competition. Naceur et al. (2009) showed higher market concentration lowers bank efficiency in MENA countries. Naceur et al. (2009) found that greater liquidity and stock market

developments increase bank efficiency in MENA countries. Fadzlan (2009) for Chineese banking industry found positive relation between diversification, loan intensity and economic growth with bank technical efficiency. Pasiouras (2008) also found that activity, profitability and market share are positively related to the efficiency measures of banks. Delis and Papanikolaou (2009) indicate that foreign ownership, market interest rates and Gross Domestic Product (GDP) growth have positive relation to bank efficiency. Garza-Garcı´a (2012) also found positive relationship between foreign ownership, loan intensity and Gross Domestic Product (GDP) growth and bank efficiency but he found a negative impact of noninterest expenses, nonperforming loans and the inflation rate upon efficiency. Das et al. (2007) showed effect of regional factors upon efficiency of Indian banks whereas Belke et al. (2016) and Diallo (2017) found that bank efficiency is positively and significantly related to regional growth. Beccalli et al. (2006); Chu and Lim (1998) examined the relationship between various efficiency and productivity measures and stock market returns with DEA approach. Fu and Heffernan (2009) in China found no relation between market structure indicators and cost efficiency in China.

2.3.2 Application of Both Parametric and Non-Parametric Models

While the above-mentioned studies either use parametric or non-parametric method, by incorporating both parametric and non-parametric approach Liu and Tone (2006) on Japanese Banking industry, Casu et al. (2013) in India found increasing trend in efficiency score over the study period. The combination of parametric and non-parametric methods have also been applied by Isik and Hassan (2002); Rezvanian and Mehdian (2002); Resti (1997). Resti (1997) found that the efficiency measure does not dramatically show different results due to the two different methods on same sample data.

Bhattacharyya et al. (1997a) by applying both the techniques found in India the public banks are more efficient than foreign banks. Some other similar studies focus on the relationship between bank efficiency and profitability. In this aspect, Ataullah et al. (2004); Casu and Girardone (2004); Chang and Chiu (2006); Ariff and Can (2008) found a positive relation. Yildirim (2002); Casu and

Girardone (2004); Carvallo and Kasman (2005); Ariff and Can (2008) found higher risk taking bank as to be less efficient and Carvallo and Kasman (2005); Casu and Girardone (2004); Chang and Chiu (2006); Ariff and Can (2008) found banks with higher capital ratio as more efficient. Studies like Berger and DeYoung (2001), Berger & Mester (1997, 2003), Clark and Siems (2002), Färe et. al. (2004), Rogers (1998) for banks in U.S.; Bos and Schmiedel (2003), Maudos et al. (2002), Vander-Vennet (2002) for European banking, Isik and Hassan (2002), Maudos & Pastor (2003) for the Turkish and Spanish banking respectively; and Bonin et. al. (2005) for the banking sectors in developing countries; Ariff and Can (2008) for Chineese banks; Ray and Das (2010) for India have concentrated on both cost efficiency and profit efficiency of banks by applying the parametric and non-parametric models. With the exception of the study by Miller and Noulas (1996), all these studies have found profit efficiency to be lower than cost efficiency.

2.3.4 Identifying Determinants of Bank Efficiency

All the literature discussed above show that bank efficiency is affected by the size of the bank, regulatory environment, bank capital and supervision on capital requirement, ownership structure, loan loss provision etc. To identify the different determinant factors of efficiency, the researchers have adopted a second step analysis along with the efficiency measurement. Rezitis (2006), Ariff and Can (2008), Pasiouras (2008), Das and Ghosh (2009), Hsiao et al (2010), Garza-Garcı´a (2012), Lee and Chih (2013), Harris et al. (2013) used Tobit analysis. Whereas Diallo (2017), Gasaymeh (2016), Christopoulos et al. (2002), Lensink et. al. (2008), Hsiao et al (2010), Chortareas et al. (2012), Chortareas et al. (2013), Yin et al. (2013), Lee and Chih (2013), Sun et al (2013), Tzeremes (2015) used regression analysis to locate the factors influencing bank efficiency. Hou et al., 2014 used truncated regression model to evaluate the effect of market structure and risk taking upon efficiency of Chinese banking industry. Chortareas (2013) also used truncated regression model combined with bootstrapped confidence interval to observe the effect of financial freedom upon bank efficiency. On the other hand, Fungáčová et al. (2013) and Kasman and Carvallo (2014) used Granger causality technique to measure relationship between efficiency, competition and financial stability.

2.4 Efficiency of Non-Bank Financial Institutions

As per Berger, *et al. (*1993) most of the studies concerning X-efficiency is based on commercial banks, with very less number of papers measuring the efficiency of non-bank financial institutions. However, by applying the non-parametric method DEA, Sufian (2007) analyzed the efficiency of NBFIs of Malaysia and found that the size and market-share have a negative effect on the efficiency while more efficient NBFIs tend to be more profitable.

2.4.1 Efficiency of Insurance Companies:

Recently, a small number of empirical investigations is focused on efficiency of insurance companies (Jarraya and Bouri, 2014). But increasing globalization of the insurance industry has encouraged many researchers to focus on the efficiency studies of insurance businesses (Huang and Eling, 2013). Earlier in measuring the efficiency of insurance industry, mainly the ratio analysis was applied (Z. Yang, 2006). But because of insignificant information, researchers started to use other statistical approaches to measure efficiency. Among these studies, most of the papers are based on US insurance companies and a limited number are focused on European insurance companies due to the unavailability of required information (Jarraya and Bouri, 2014). Berger et al. (2000) and Ward (2002) by applying the SFA and TFA techniques, estimate cost, revenue and profit efficiency of US and UK insurance companies respectively. By using Stochastic Frontier Approach (SFA), Yuengert (1993) found substantial X-inefficiency. He also identified scale efficiency for larger firms. Greene and Dan Segal (2004) found negative relationship between inefficiency and profitability for US life insurance companies. Gardner and Grace (1993) by applying Distribution Free Approach (DFA), found a positive relationship between size and X-efficiency in US life insurance companies. Whereas Rai (1996) found small insurance companies to be more efficient than larger one and also specialized insurance companies are more efficient than the companies operating for both life and non-life. Eling and Luhnen (2010) found efficiency of insurance companies operating in developed countries is better than companies operating in developing countries. Z. Yang (2006) by applying DEA model found that in Canada the Life and Health insurance companies operate fairly efficiently. Noulas et al. (2001) applying the same DEA method found Greek non-life insurance companies to be inefficient. Cummins and Rubio-Misas (2006) analyzed the effect of European economic integration on efficiency of Spanish insurance

industry. Diacon et al. (2002) used a sample of European life insurance companies of multiple countries and found large differences between countries. Following the same strategy, Fenn et al. (2008) have used a large sample of European insurance companies including both life and non-life companies and found that efficiency scores are meaningfully influenced by the size and market share of individual companies. On the other hand, Fecher et. al. (1993) in France and Cummins and Zi (1998) in US found high correlation between the efficiency scores produced by parametric and non-parametric models.

Studies like, Eling and Luhnen, 2010; Fenn et al., 2008; Diacon et al., 2002; Rai, 1996; Katrishen and Scordis, 1998 attempted to show international comparison of efficiency of insurance companies mainly from developed nations. Eling and Luhnen (2010a) found steady technical and cost efficiency growth in international insurance markets. Zanghieri (2009) investigates cross-country cost and profit efficiency including both life and non-life insurance companies by using SFA technique. Huang and Eling (2013) showed an international comparison among BRIC countries' insurance industry by applying two stage data envelopment analysis DEA where in the first stage, the researchers identified efficiency through DEA and in the second stage applied truncated regression as proposed by Simar and Wilson (2007) to identify efficiency determinants. They found size, profitability, solvency and independence have positive impact on efficiency of insurance companies. On the other hand, H.A. Kader et al. (2014) has analyzed the cost efficiency of Takaful insurance companies, insurance companies being operated through Islamic Shariah.

2.4.2 Efficiency of Credit Union or Cooperative Financial Institutions:

The functions of credit unions and cooperative banks are more similar to microfinance institutions as both organizations mainly operate for a particular group of people (mostly the poor people) and have similar objective, i.e. social welfare (Esho, 2001). Cooperative banks also to some extent rely on subsidized funds to support their operation (Esho, 2001) like MFIs. So the efficiency study of cooperative banks or credit union can be a great help of us in the study of efficiency of MFIs.

Worthington (2000) by using DEA and Esho (2001) by applying SFA analyzed the efficiency of credit unions in Australia. Both the studies used regression analysis in the second step of the study to identify the determinant variables to efficiency of credit unions. Worthington (2000) identified a positive relation between cost efficiency with profit, number of members, technological and marketing expenses and small branch network. On the other hand, Esho (2001) by using Stochastic Frontier approach found a positive relation of efficiency and age of CU, industrially based common bond restriction, capital ratio, deposit size, lower interest rate on loan and higher interest rate on deposit. Altunbas et al. (2007) found that inefficient co-operative banks hold lower levels of capital. In contrast to this finding, Deelchand and Padgett (2009) for Japanese cooperative banks found that institutions with larger capital and more risk are inefficient.

2.5 Empirical Studies on Efficiency of Microfinance Institutions

The efficiency in microfinance institution indicates how well an MFI allocates inputs (like subsidies, assets and staff) to produce the maximum output (like loans, financial self-sufficiency and poverty outreach) (Bassem, 2008). Researchers have denoted two types of efficiency for microfinance institutions: the financial efficiency and social efficiency (Nieto *et al*, 2009). Sanchez (1997) has specified financial efficiency in microfinance institutions focusing on the technical efficiency, which states that the larger the productivity of a microfinance institution, the more efficient it is. Kipesha (2012) states that financial efficiency can be measured through production efficiency or intermediation efficiency based on the inputs and output variables. The production approach assumes microfinance institutions as manufacturers of financial services for the poor. In this aspect, MFIs utilize physical resources of the institution such as land, labor, capital, and incur operating costs to produce savings, loans and revenues (Nghiem *et al*, 2006; Nieto *et al*, 2007 & 2009; Bassem, 2008; Haq *et al*, 2010). On the other hand, under intermediation efficiency, microfinance institutions are considered as financial intermediary whose job is to collect deposits from savers (economic units with excess resources) and channeling them to borrowers (economic units with the deficit) (Kipesha, 2012). On other hands, social efficiency refers to the ability of Microfinance institutions to manage its resources such as assets and personnel in order to alleviate poverty and empower women (Von Stauffenberg *et al*, 2009; Kipesha, 2012).

The list of studies concerning the efficiency measurement of MFIs is not very large (Bassem, 2008; Haq *et al*. 2010). However studies like Nghiem (2004), Gutie´rrez-Nieto et al. (2005), Abdul Qayyum and Ahmad (2006), Nghiem *et al*. (2006), Sufian (2007), , Hermes et.al. (2011), Bassem (2008), Haq *et al*. (2010), Kipesha (2010) have concentrated on the issue. These empirical studies around the world have revealed different results considering different dimensions of efficiency where in most of the cases the Microfinance institutions have been found yet not to be efficient in the use of their input resources to produce output (Kipesha, 2010). Farrington (2000) and Lafourcade et al. (2005) identifies a number of accounting variables (such as source of funds, cost per borrower and cost per saver, number of loans per loan officer and loan officers to total staff, administrative expense ratio, size of portfolio, size of loan, lending methodology, and salary structure) to assess the efficiency of the microfinance institutions. But neither of the studies uses any parametric or non-parametric approach to estimate the efficiency of MFIs. Later on, in studies like, Guitierrez-Nieto et al. (2006), Bassem (2008), Kipesha (2010), Haq et. al. (2010), Debdatta (2010), the DEA: Data Envelopment Analysis has been commonly used as non-parametric approach in evaluating the efficiency of MFIs whereas Hassan and Tufte (2001), Desrochers and Lamberte (2003), Hermes et al. (2011) used Stochastic Frontier Approach as a parametric approach. Gutiérrez-Nieto *et al* (2007) found that the level of efficiency depends on the variable specifications and the model used.

2.5.1 Efficiency of MFIs with Non-Parametric Test:

The non-parametric approach DEA measures the relative efficiency comparing the performance of the particular MFI with the others in the sample. An MFI is efficient if any other observed MFI or combination of observed MFIs cannot produce more output with the given inputs or cannot use less inputs to produce the given output (Piot-Lepetit and Nzongang, 2014). Kipesha (2012), Bassem (2008), Farrington (2000), Nghiem and Laurenuson (2004) found MFIs are relatively efficient in East Africa, Mediterranean zone, Latin America and Vietnam respectively. Lafourcade *et a,* (2005), Hassan & Sanchez, (2009), Haq *et al*, (2010), Kipesha (2012) found that the formal MFIs are more efficient than the informal MFIs across Africa, Asia and Latin America. Lafourcade *et al*, (2005) also concluded that MFIs in Africa region are the most productive on the basis of cost per borrower and cost per saver than other regions. Wijesiri (2015), Oteng-Abayie *et al* (2011),

Baumann (2005) found inefficiency in the MFIs in Srilanka, Ghana and South Africa respectively. Oteng-Abayie *et al* (2011) suggested that MFIs in Ghana should work on diversification of saving products and improve technical training programs to ensure sustainability and also need to enhance social commitment on both staff and clients in order to improve social efficiency. Gutie´rrez-Nieto et al. (2005) by using the non-parametric Multivariate DEA approach found that the efficiency of MFIs is affected by the country effect and the status of the MFI in Latin America.

Qayyum and Ahmad (2006) found that in Pakistan, India, and Bangladesh the MFIs have mainly technical inefficiency and to overcome their efficiencies, these MFIs need to improve managerial expertise and technology. Ahmad (2011) and Singh et. al. (2013) found majority of MFIs under study in Pakistan and India respectively are inefficient and MFIs in Pakistan have a decreasing efficiency trend as compared to previous years. Singh et. al. (2013) mentioned that in India MFIs have scope to increase their efficiency.

2.5.2 Efficiency of MFIs with Parametric Test:

Hassan and Tufte (2001), Desrochers and Lamberte (2003), Hermes et al. (2011) used a parametric approach (stochastic frontier analysis or SFA) to measure efficiency of MFIs. Hassan and Tufte (2001) found that in Bangladesh Grameen Bank's female staffed branches have better operating efficiency than the male staffed branches. Desrochers and Lamberte (2003) found that in the Philippines, cooperative rural bank which have good governance performed more efficiently than the ones with bad governance. Leon (2001) reported that productivity of resources, governance, and business environment were the contributing factors for the cost-efficiency of the Peruvian municipal banks. Whereas Hermes et. al. (2011) found a negative relationship between sustainability and outreach of MFIs to the poor.

2.5.3 Factors affecting efficiency of MFIs:

In all the above-mentioned studies involving either parametric or non-parametric approach to measure efficiency of MFIs, the efficiency has been linked with different factors. Bassem (2008)

found that in Mediterranean zone the MFIs' efficiency has a negative relation with size whereas Hudon and Traca (2011) found a positive impact of size on efficiency of MFIs by taking the advantage of economies of scale. In addition to the size effect, Hudon and Traca (2011) argued that though MFIs are considered as self-sustained development policy, very few MFIs have reached independence from donors' funds. Morduch (1999a) also commented that much of the success of microfinance has been dependent on the role of continuing subsidies. However, in literature there are two-way arguments, in favor and against of the role of subsidy in MFIs' efficiency. As usually donors prevail in geographically distant areas then the MFIs' location, it becomes difficult for them to properly monitor the activities of the MFIs (Hudon and Traca, 2011). As a result, many donors stop to provide subsidy to the less efficient MFIs (Hudon and Traca, 2011; Domes, 2005; Bhutt and Tang, 2001). On the other hand, Armendariz and Morduch (2005), Morduch (2007) and Hudon and Traca (2011) argue that as MFIs have limited access to bank loan and capital market, the subsidy give them a breathing space for MFIs at the start up moment to achieve efficiency. Hudon and Traca (2011) by applying OLS regression model found subsidies have a positive impact on MFIs' efficiency but upto a threshold after which subsidy may reduce efficiency. In contrast to this finding, Bass et al. (2000), Morduch and Haley (2002) mentioned in their study that MFIs that have deposit service and thus have the opportunity to manage micro and small savings gain financial self-sufficiency by reducing their dependency on external sources of fund. Rhyne (1998) also mentioned in his study that MFIs which have to collect their fund from external sources are proven to be less efficient. Along with the source of fund, efficiency of MFIs has been linked with outreach of the MFIs in literature. Outreach indicates to what extent the MFIs are able to spread their services to the poor people. Olivares-Polanco (2005), Makame and Murinde (2006), Navajas et al. (2003), McIntosh et al. (2005), Hermes *et al*, 2011 have found a trade-off between sustainability and efficiency with outreach.

2.5.4 Study on Microfinance in Bangladesh:

As a pioneering country in microfinance sector, many researchers have concentrated on the microfinance industry in Bangladesh, but most of the studies have focused on demand side analysis mainly the micro impact of microfinance in the economy. Hasan (2000), Islam et. al. (2011)

examined technical, economic and allocative efficiency of agricultural microfinance institutions' borrowers and non-borrowers in rice farming. S. Raihan et al. (2017) states that Microfinance in Bangladesh supports enterprise financing, asset accumulation, consumption smoothing, and meeting unexpected shocks. By applying CGE model, they found that in Bangladesh microfinance has about 9-12% contribution to GDP. They also state that MFIs capital in Bangladesh accounts about 9.9% of the total capital stock. the citation has been omitted. Khandker (1998) identifies that with the help of microfinance practice every year 5% borrower comes out of poverty in Bangladesh. Schroeder (2012) and Nawaz (2010) also found reduction in poverty in the country by microfinance. Osmani et al. (2003) mention the significant role of microfinance in the economic development of Bangladesh by engaging the rural and urban poor people in income generating activities. Mazumder and Wencong (2015) proves that microfinance recipients have better access to basic human rights which improves their quality of life. Mazumder and Wencong (2015); Littlefield et al. (2003) and Ahmed et al. (2001) found that people having membership with microfinance attains ability to get regular food and smoothening expenses which reduces their malnutrition, improve living condition, ensure healthcare, better housing, education, sanitation and pure drinking water. Chowdhury and Bhuiya (2004) identifies that the school drop-out rate is much lower in microfinance client houses. Fenton et al. (2017) finds that microcredit enhances the coping capacity of the households against environmental and natural hazards and improves adaptation by overcoming financial barriers.

2.6 Conclusion

This chapter focuses on various studies of efficiency measurement applying both parametric and non-parametric model. Most of the studies found are based on efficiency of banking institutions while some measure efficiency of insurance companies and co-operative banks. In these studies, it is found that the efficiency level of different financial institutions varies in different countries. Also, the studies show that the efficiency of financial institutions is linked with several economic and institutional factors. Some researchers have focused on the efficiency measurement of Microfinance Institutions which is the emerging industry under financial sector of any developing or underdeveloped country. Studies are found on MFIs from Asia, South Asian region, Latin

America, Africa etc. Some of the studies have taken MFIs from different countries (like Haq et al., 2010) while some studies focused on MFIs of only one country (like Piot-Lepetit and Nzongang, 2014). Different studies concerning efficiency of microfinance institutions find that despite having the same objective to include deprived people under financial service throughout the whole world, the performance differs substantially among the MFIs in different countries. While some MFIs have been able to serve millions of borrowers and achieve cost and operational efficiency, others have failed to achieve their target (F.A. Gul, 2017). Moreover, for the policymakers, donors, regulators and all other related parties, efficiency of microfinance institutions is vital. This is because when the policymakers will come to know the exact level of inefficiency of MFIs and the reasons behind the inefficiency, they can identify the remedies in the form of policy formation more effectively. The regulators can decide the proper regulatory environment in which the MFIs should be operated and the donors can decide about whether to extend funds to MFIs. This indicates the necessity of efficiency studies on microfinance institutions. Realizing the fact, many researchers have given attention to this issue at recent time though till now the list is not too long.

In a small economy like Bangladesh, at present 510 MFIs are serving more than 50% of the rural people and also provides benefits to urban people at an increasing rate (Raihan et al., 2017). As per Raihan et al. (2017), Bangladesh is such a country where the microfinance activities have the strongest penetration in the world. This indicates the dynamic role of microfinance in the economic development in Bangladesh. So it is necessary to know the efficiency level of this important sector of our financial system. But While analyzing the existing literature on efficiency of microfinance, only a few literature was found including some renowned MFIs of Bangladesh into their study of efficiency measurement like Conroy (2003); Qayyum and Ahmad (2006); Haq et. al. (2010). But the Bangladeshi MFIs are just a small part of the total sample along with other MFIs from South Asian, South East Asian, African and the Latin American countries in these studies. Here a gap is found in literature which has been tried to be fulfilled through the current study. Only one study, i.e. Quayes and Khalily (2014), has been found which has focused solely on efficiency of MFIs in Bangladesh. In this study, cost efficiency was measured applying SFA model for the period 2004 to 2007. My research will focus to this issue by measuring efficiency of MFIs in Bangladesh applying both parametric and non-parametric model covering the most recent data. So this study

will show the up-to-date information about the efficiency level of MFIs in Bangladesh. To conduct the research, at first it is needed to understand the concept of microfinance, practice of microfinance operation throughout the world as well as in Bangladesh. So, the next chapter discusses about the microfinance practice globally where the perception of microfinance, its history, growth of microfinance practice over time and impact of microfinance have been analyzed.

Chapter: 3
Microfinance Worldwide

3.1 Introduction:

To achieve economic growth, poverty reduction is necessary and that is why it has been taken as the most agreed-upon goal for development aid and is also the first of the Millennium Development Goals (Lonborg and Rasmussen, 2014). To achieve this goal, it is necessary to channelize the surplus fund to each sector of economy even to the poor. This important job of arranging fund for the poor in the society is accomplished by Microfinance Institutions. The road of Microfinance has never been a smooth one. Its journey has been experienced with lots of pitfalls hindering its optimal impact (Oteng-Abayie et al., 2011). In its modern form, the field of Microfinance was conceived by poverty alleviation practitioners in the 1970s as an effective strategy to accelerate credit access by the poor in the developing countries and provide sustainable financial services to them who cannot access into formal financial institutions (Dichter, 1999; Yunus, 2007; Rajbanshi et al., 2015, Wijesiri et al., 2015; Mozumder and Wencong, 2015; Gul et al., 2017). Yunus (1999) states that every poor individual has entrepreneurial skill and if they can be given small loans, they can improve their financial condition by establishing their own business to generate income.

In the previous chapter, different literature has been presented regarding efficiency measurement of banks, other non-bank financial institutions and microfinance institutions. As the main concern of this paper is efficiency measurement of Microfinance Institutions, it is needed to understand at first the basic concept of microfinance, its evolution and importance in economy. The current chapter discusses these topics. This chapter is arranged as firstly defining microfinance institutions, secondly its evolution, thirdly growth of microfinance globally and finally important role played by microfinance institutions.

3.2 Evolution of Microfinance Institutions:

Poverty is one of the main challenges for the world leaders even in this modern era (Chliova, 2015). As per the statistics of World Bank about 1.22 billion people lived under extreme poverty level by the end of 2010. Though poverty is supposed to be reduced with economic growth, unless

the resources are reached to the poorest group of the economy, the goal is not fulfilled (Lønborg and Rasmussen, 2014). People living in poverty also need the support of financial services to operate their businesses, acquiring assets, ease daily consumption, and manage risks. But traditionally the poor in spite of having feasible and promising investment ideas and capabilities that can result in profitable ventures and improve financial condition, did not have access to formal sources of credit like the cooperatives and agricultural and commercial banks (Chliova, 2015; Taiwo and Ojo, 2016). Olusanya & Oyebo, 2012 mention that more than 80 percent of poor people in developing countries do not have access to institutional financial services. This is because of the perceived high risk, high cost involved in small transaction, lack of collateral, infrequent credit history, limited property rights etc. (Stiglitz, 1990; Hollis, 1998; Ghatak, 1999; Gutiérrez-Nieto et al., 2007; Webb et al., 2013). The lack of access of the poor to the formal financial sector has been identified as the main obstacle in the development of their financial condition (Stiglitz, 1990; Yunus, 1998; Chen and Ravallion, 2007; Akpalu, 2012). Thus, the poor always remained deprived of financial support from the formal financial institutions and have to take help from informal financial markets. The informal markets are normally based on small size, short term transactions and have very stiff and high interest rates (CGAP, Masood and Ahmad, 2010; Wijesiri et al., 2015; Taiwo and Ojo, 2016). This high-cost fund draws the poor people to a further poverty. This was like a cycle, the poor group of people could not access to formal lending due to lack of collateral and had to take loan at a high cost from informal market, and so could not come out of poverty. On the other hand, formal financial institutions do not consider the poor people to be a viable market (CGAP) due to their poor financial condition. This trend induced the policymakers and analysts to put their effort to break the cycle and assure fund for the poor so that the economy gets developed from the core.

The government of developing countries came forward and took different initiatives to deliver formal credit to rural areas by setting up special agricultural banks or directing commercial banks to give loan to rural borrowers. But all those efforts could not deliver expected change in the scenario (Adams et al., 1984; Adams and Vogel, 1986; World Development Report, 1989; Imai et. al., 2010). From foreign aid to philanthropy, a variety of traditional approaches were adopted to alleviate poverty, but all of them were just outright failures (Dichter, 1999; Armendariz &Morduch, 2010; Riaz and Gopal, 2015; Wijesiri et al., 2015). The trends named as basic human

needs (BHN) and integrated rural development (IRD) were established with an objective to alleviate poverty as where factors such as the level of development in infrastructure, availability of education and community health were necessary to promote economic development (Dichter, 1999). As a consequence, non-governmental organizations (NGOs) were evolved for the first time. State agencies and inter-governmental organizations such as the World Bank were also facing their own shortcomings such as allegations of corruption or procuring to special interests (Kent & Dacin, 2013). By 1980s the movement of BHN and IRD failed and also the NGOs were unsuccessful to achieve their objectives (Dichter, 1999).

The dream of poverty alleviation was revitalized through the emergence of modern microfinance most famously led by economist and founder of the Grameen Bank, Muhammad Yunus (Khavul, 2010; Khawari, 2004; Riaz and Gopal, 2015). Nobel Laureate Dr. Muhammad Yunus is known as the father of modern microfinance (Yergin et al., 2015). In the after-liberation economy of Bangladesh to find out possible solutions of poverty, Dr. Yunus started to think. At one point of time, he could match the economic theories with the prevailing scenario and came up with a new idea of group lending which he for the first time applied in his native village, named Jobra, in Chittagong with a view to provide collateral free loan to the poor to alleviate poverty. Later on, it took the formal shape in 1983 when Grameen Bank was established officially by Government of Bangladesh. Through Grameen Bank, Muhammad Yunus combined the ideas of entrepreneurship, financial theory, and poverty alleviation (Khavul, 2010; Khawari, 2004). Neoclassical economists and neoliberal policymakers greatly appreciated this model (Gul et al., 2017). The success story of Grameen Bank gave a new dimension of thought for the world people to alleviate poverty by ensuring financial services for the poor. This new type of financial institution is in touch with the local community, that can get information about the borrower at low cost. This new form of institutions along with profit also focused on the creation of jobs, women's employment, development, and green issues. These new financial intermediaries, the MFIs, provide small loans to poor people who can offer little or no collateral assets (Gutiérrez-Nieto et al., 2007). From the inception, the microfinance institutions have grown in a geometric progression and has been spread over almost all the nations, because of its plain, yet successful structure (Riaz and Gopal, 2015). In last four decades, the MFIs have turned into a comprehensive financial service provider starting

from deposit collection, extending loan, facilitate payments, insurance service and so on to the low income (Gul et al., 2017).

Observing the recorded successes in Bangladesh (Yunus, 2007), the concept of microfinance was spread out in different countries of the world. Eventually the practice of Microfinance was proven to be a successful tool to fight against poverty all around the world. The year 2005 was declared as the International Year of Microcredit by UN (Kent & Dacin, 2013). According to Microcredit Campaign by 2007, 154.8 million clients were served by 3350 microfinance institutions worldwide (Armendariz and Morduch, 2010). Due to the highly sophisticated and refined method of lending, the repayment rates among microfinance institutions is better than many commercial banks (Ditcher, 1999). Gietzen (2017) mentioned microfinance as a proven worthy business model which successfully targets the people being deprived from formal financial market.

3.3 Defining Microfinance:

"Lasting peace can not be achieved unless large population groups find ways in which to break out of poverty. Micro-credit is one such means. Development from below also serves to advance democracy and human rights."

–Nobel Committee

In this aspect, Microfinance has increasingly become a popular and most effective tool in the fight against poverty reduction especially in developing countries (Karim and Osada, 1998; Oteng-Abayie et al., 2011; Weber, 2013; Barry and Tacneng, 2014; Riaz and Gopal, 2015; Mamun and Mazumder, 2015). Rooyen et al. (2012) in their study has mentioned microfinance as one of the largest development programs worldwide, in terms of both financial service and the number of poor people served. Microfinance institutions have the aim to capture the gap between the poor and the formal financial market by offering a wide range of financial services, like deposits collection from the members, collateral substitutes, collateral-free loans disbursement, group lending, progressive loan structures, and varied repayment schedules, money transfers and

insurance, to poor and low-income households and their microenterprises to engage in productive activities (Ledgerwood, 1999; Barr, 2004; MIX Market; Gutiérrez-Nieto et al., 2007 & 2009; Bassem, 2008; Haq et al., 2010; Khavul, 2010; Servin et al., 2012; Rooyen et al., 2012; Piot-Lepetit and Nzongang, 2014; Lonborg and Rasmussen, 2014; Quayes and Khalily, 2013; Chirkos, 2014; Taiwo and Ojo, 2016).

Microfinance institutions' main focus is to serve the poor people who have been excluded from excess to service of the formal financial sector (Gutiérrez-Nieto et al., 2007; Armendariz and Morduch, 2010; Bassem, 2008; Nashihin, 2014; Chirkos, 2014; Wondirad, 2020). To fulfil the target, microfinance institutions adopt different business model in lending and portfolio size compared to formal financial institutions Wondirad (2020). Since the clients of microfinance institutions (MFIs) have lower incomes and have limited access to other formal financial services, microfinance loans need to be with smaller monetary amounts than traditional financial services. This has helped to create an inspiring socio-economic environment for many developing countries households (MIX Market; Haq et al., 2010). They offer collateral free group loans to their clients with rigorous monitoring and liability in which members accept joint liability for the individual loans made (Rahman, 1999; Haq et al., 2010; Nashihin, 2014). That means loans were extended to people in self-selecting groups where all the group members would have been responsible for loan taken by any one of the group members (Parvin et al., 2020). Though the collateral free nature makes the loan riskier for MFIs (Brie`re and Szafarz, 2015), the group lending system reduces the risk. The members of a group know each other and their fellow villagers best. Thus, MFIs can obtain information about the loan taker at low cost. Because of this group responsibility practice, there is social collateral and peer pressure, which regularize repayment of loan and thereby there is low levels of default (Morduch, 1999; Barry and Tacneng, 2014; Nashihin, 2014). The field workers of MFIs visit the clients' houses and collects the loan repayment sometimes even in weekly basis. Because of all these attempts, the repayment of loan is quick in MFIs (Parvin et al., 2020). The loans offered by the microfinance institutions have an aim to encourage self-employed and home-based entrepreneurship so that the poor can improve their own financial condition as well as their surrounded ones. The field workers of MFIs provide trade and training services and financial advice to their clients and often are not only interested in profit but also on the creation

of jobs, women's employment, development, and green issues (Gutiérrez-Nieto et al., 2007; Nashihin, 2014; Parvin et al. 2020). However, these extra services increase cost for MFIs which in turn increases the rate of interest charge on credit (Parvin et al. 2020). Besides, there are other dynamic criteria in Microfinance practice which have made the trend so successful; like before taking loan members need to have deposit accounts, gradually increasing loan sizes, and an implied guarantee of future loans on successful loan repayment (Rooyen et al., 2012).

3.4 Types of Microfinance Institutions:

There are basically three different types of MFIs; first formal institutions - i.e. rural banks and cooperatives, semiformal institutions - i.e. nongovernment organizations and informal sources - i.e. money lenders and shopkeepers (ADB website). The formal institutions are licensed and are subject to strict regulatory environment and they mainly deliver credit facilities to their members. However, some of these institutions also deals with savings from non-members (Haq et al., 2010). The semi- formal institutions are usually unregulated but registered under some society legislation (Haq et al., 2010). Finally, the informal MFIs are small in size and often lack of licensing make them difficult to identify. All these three types of institutions have an aim to serve the vulnerable non-poor, upper poor, poor and very poor people in the society. Many MFIs give more concentration to the women in the society. In South Asia MFI clients are almost 100% women where as in Europe and Central Asia women comprise of 50% of clients (CGAP). These clients are mainly small businessmen, workers of small farms, workers of others' businesses or entrepreneurs. Recently MFIs have started to use poverty assessment tools to more accurately measure the number of clients and also are emphasizing more on savings behavior so that the clients graduate out poverty (CGAP).

3.5 Objectives of Microfinance Institutions

MFIs mainly have two operational objectives (Yaron, 1994; Bassem, 2008; Haq et al., 2010; Balkenhole and Hudon, 2011; Serrano-Cinca and Gutierrez-Nieto, 2014; Brie`re and Szafarz, 2015); first, to act as financial intermediary to poor households known as the 'institutionist paradigm' (Woller et al. 1999; Murdoch, 2000; Brau and Woller, 2004; Balkenhole and Hudon, 2011) which states that MFIs should generate enough revenue to meet their operating and financing costs (M. Haq et al., 2010). As financial institution, MFIs has an urge to reduce reliance of the poor on the moneylenders who charge a high interest rate from the poor and thus eat into their savings (A. Islam, 2015). The second objective of MFIs is to serve the society known as the 'welfarists' paradigm' which focuses on poverty alleviation and depth of outreach along with achieving financial sustainability (Brau and Woller, 2004' M. Haq et al., 2010).To achieve the objectives of reaching to the poor and contribute to their social welfare, the microfinance institutions had to depend largely on subsidies and grants from the donors, governments and other development agents to offer financial services at low cost (Zeller & Mayer, 2002; Armendariz & Morduch, 2005; M. Haq et al., 2010; Kipesha, 2012; Piot-Lepetit and Nzongang, 2014).

3.6 Importance of Microfinance:

Microfinance has been one of the important instruments for global poverty alleviation in developing countries over the past three decades (Koveos and Randhawa, 2004; Shaw, 2004; Servin et al. 2012; A. Islam et al., 2015; Mustafa et al. 2018). The poor became empowered and able to swipe away poverty in a sustained and self-determined way with easy and convenient access to financial services (Taiwo and Ojo, 2016). The financial services extended by MFIs enable the poor to take advantage of business opportunity, buy inventories and other assets for business, pay school fees, spent on nutrition, face emergency situation as well as to cope up with natural calamities (Taiwo and Ojo, 2016). MFIs thus have been proven as a source of entrepreneurial finance at the mass level to empower the underprivileged and to enhance their earning capacity. (Riaz and Gopal, 2015; F.A. Gul et al., 2017). Asanke, 2015 remarks Microcredit as an effective tool of social welfare. As a recognition of its success, the year 2005 was declared as the Year of

Microfinance (Islam, 2015). Later in 2006 Dr. Muhammad Yunus (founder of Grameen Bank) and Grameen Bank received the Nobel Peace Prize (A. Islam, 2015). From then the trend has gained substantial attention specially to achieve the Millennium Development Goals (MDG) of halving global poverty in 2015. At present around 3,703 MFIs provide service to 230 million customers in almost 100 countries of which, over 60% were among the poorest when they joined (Barry and Tacneng, 2014; Reed et al., 2014). Some observers have identified the development of microfinance as one of the main innovations in last 25 years (Servin et al. 2012). The OECD (2009) and ILO and WIEGO (2012) estimate that more than 50% of the world's working population, on average, are employed in the informal economy where MFIs play a very important role by providing financial services (Barry and Tacneng, 2014).

A growing body of empirical evidence shows that access to the right financial service at the right time helps households build assets, generate income, smooth consumption, and protect themselves from risks (CGAP). The existence of micro finance has unlocked the possibilities of market extension, poverty reduction and social change. Moreover, the broaden services of microfinance institutions enables the poor to enjoy other facilities in the society like, access to education, health service, food security, nutrition, housing, women empowerment, job creation, social cohesion etc. (Stewart and Wet, 2012). In macro level, the practice of Microfinance has further contribution as it facilitates the flow of fund even from the poor level of the economy who are economically active but financially constrained. This flow of fund through MFIs has an active effect in economic development (Khandker, 2005; Baido, 2008). According to Woodworth (2000) microfinance focuses on informal sector and act as an alternative to macroeconomic solutions and thus lift developing countries out of poverty. Thus, both in micro and macro development is achieved from the appliance of Microfinance. The loan amount helps the poor to regularize their consumption, to have more livestock, can ensure education for their children, and have access to health facilities. Deposits maintained by the clients of MFIs support them to cope up with any shock in future, like natural calamity, health problem, decrease in income etc. The deposit also enhances their mental strength and gives the ability to expand business in future. Some MFIs also offer insurance facilities which help the poor households to mitigate risk and manage shocks. The contribution of MFIs in different segments of economy is discussed below.

3.6.1 Microfinance in Poverty Alleviation and Economic Development:

Studies like, Mustafa (1996), Morduch (1998); Hossain (1988), Panjaitan-Drioadisuryo, Rositan and Cloud (1999), Ledgerwood (1999), Dichter (1999), Yunus (1999, 2007); Remenyi and Quinones Jr., (2000), Zaman (2000), Khandker (1998 and 2003), Morduch and Haley (2002), McKernan (2002), Simonwtz (2002), Japonica Intersectoral (2003), Imai et. al. (2010), Zohra and Pandey (2011) have identified Microfinance as an economic development approach, intended to benefit low-income women and men and reducing poverty. MkNelly and Dunford (2001) in Bolivia; Taiwo and Ojo (2016) in Southwest Nigeria found that clients of MFIs had a substantial improvement in their income level along with diversification in income sources and savings. Rashid et al. (2011) proved that the wealth level of poor increases after a substantial time of microfinance use because it takes time to make production, engage in trade and thus to get the advantage of microfinance. Similar conclusion was found in India in a study by Simonwitz (2002). Mittal & Srivastava, 2014 finds MFIs' contribution in improving income level and thus in living standard of people in developing countries like India, Bangladesh, Srilanka etc. Positive impact of microfinance in improving living standard of members was also found by Imoisi, et al., (2014) in Nigeria, Sayed et al (2015) in Malaysia, Abel et al. (2014) in Zambia, Idowu & Salami, (2011) in Oyo state; Kaluarachchi and A.Jahfer (2014) in Srilanka. Khandker (1998); Marcus, et. al (1999); Chowdhury and Bhuiya (2001); Barnes, Gaile and Kimbombo (2001); Barnes (2001); Chen and Snodgrass (2001) have found positive impact of microfinance program to enrich human resource among the participants. Taiwo ND Ojo (2016) mentioned microfinance as an effective poverty alleviation strategy. Bassem (2008) state that the existence of microfinance institutions along with financial and banking institutions make the financial sector of an economy complete and accelerate economic growth. Khandker (2005) found a sustained impact of microfinance program in reducing poverty among the participants in Bangladesh, especially for female participants. The study also found contribution of Microfinance program in enhancing economic growth Bangladesh.

3.6.2 Microfinance in Increasing Consumptions

Pitt and Khandker (1998), Karlan and Zinman (2009), Imai and Azam (2012), Kaboski and Townsend (2012), Boonperm et al. (2013) and A. Islam (2015) found that access to microcredit allow the rural people in self-employed activities improving the income level of borrowers and thereby increasing the expenses for consumption purposes. Some studies also found that some borrowers use the credit amount for their consumption purpose. Kaboski and Townsend (2005) and Attanasio et al. (2011) found that MFIs with good policies accelerates asset growth and smoothing the consumption pattern of borrowers. Hemtanon and Gan (2021) found in village areas of Thailand, the farms food expenditure improves due to Microfinance facilities.

3.6.3 Reduction of Reliance on Informal Borrowing:

In general, the poor people did not have any access to formal financial institutions like, commercial banks. So, to meet up their financing requirements, they do had to go to the informal market where the interest rate is very high. A. Islam et al. (2015) found the average interest rate in informal market as high as 72%. In this aspect, the microfinance institutions evolved as a grassroots alternative to reliance on informal lenders for the poor (McDermott, 2001). The loan from microfinance institutions has given an alternative source of fund for the poor which is expected to reduce the reliance upon informal market for borrowing. Besely et al. (2012); Mookherjee and Motta (2013), Kaboski and Townsend (2005) and Khandker (2000) found that access to MFI loans reduces the borrowing from informal market. However, Khandker (2000) found that the reduction in informal borrowing takes place mainly for male members rather than the female ones. On the other hand, A. Islam et al. (2015) found that borrowing from microfinance institutions reduces the tendency of borrowing from informal market, not the amount of borrowing. The researchers state that the borrowing from informal market reduces for those households who are engaged in business and agricultural works. But the MFI members, who are wage earner labor, feel motivated to set their own business for which they need more money had to borrow from informal market.

3.6.4 Women Empowerment

Armendariz and Morduch (2010) mentioned female borrowers as the largest market for MFIs and lending to women as one of the main reasons of MFI's success. Strom (2014) in their research found that 44% of their Sample MFIs have a preference towards female borrowers. This microcredit programs have opened credit access for women which earlier was very much restrictive for them and the access to credit has reduced poverty and enhanced women empowerment (Hashemi, Schuler and Riley, 1996; Ganle et al. 2015). Wellalage and Thrikawala (2021) found that women empowerment through microcredit facilitate women led firms to apply for loan and also to get approval for the loan. As per MIX, 2009 women empowerment is defined as strengthening woman's control on her own life and thus enhancing her self-esteem in family as well as in society through financial stability. Kabeer (2001) and Noponen (2003) identified indicator of empowerment as realization of self-respect and value, receiving better treatment at home and in the society, contribution in family decision making and gaining control over family assets. For this many donor driven microfinance institutions (MFIs) prefer to sanction credit to women borrowers, specially those who spend the loan amount for the purpose of education, health, water and infrastructure. Thus women act as agents in the fight against poverty (Akpalu et al., 2012). Woodworth (2000) in his survey found that 65% of the microcredit were distributed to women to start their own business or to maintain an existing one. Norwood (2005) mentioned that the biggest promise of microcredit is poverty alleviation and women empowerment. Muhammad Yunus, founder of Grameen Bank in Bangladesh, has suggested microcredit as an instrument to eradicate global poverty among women (Hulme and Mosley, 1996).

An impact assessment survey in Vietnam showed that more than 50% of the women taking part in a microcredit program were able to attain more power in household decision makings (CEP, 2006). From different researches it is also found that women who takes microcredit gain power to make financial decisions in family. And these women after getting the financial liberty usually allocate a greater part of their income for the purpose of education and nutrition of their kids, better health facilities of their family members and for housing (Duflo, 2003). Lakwo (2006) found in Uganda that women microcredit users gain financial management skill, get access to bank accounts, enjoys better mobility outside their home, contribute to household income and gain ownership to some assets. Similarly, positive impact on women empowerment and welfare in family because of

microfinance program was found by Amin et. al. (1994); Naved (1994); and Hashemi et. al. (1996); Todd (1996); Rajarshi Ghosh (2005); Swain and Wallentin (2009); Chowdhury and Chowdhury (2011); Zohra and Pandey (2011); Ngo and Wahhaj (2012); Akpalu et al. (2012) and Weber and Ahmad, (2014). Akpalu et al. (2012) found that in Ghana, the women led enterprises are more efficient than those where the male of the family have some involvement. But Ganle (2015) found that with the microcredit facility those women are more benefitted who already were involved in some sort of business and have power to decide about the use of the credit amount. According to him women who try to start a new business with the credit amount or who has to handover the money to their family members do not achieve any empowerment.

On the other hand, some studies have focused on the fact that when women take part in the top management of the MFI, its governance and financial performance improves. This positive relationship between female top manager or CEO and MFIs' corporate governance and financial performance has been proven in the studies, like Shrader et al. (1997), Teigen (2000), Bertrand and Schoar (2003), Welbourne et al. (2007), Mersland and Strom (2009), Adams and Ferreira (2009) and Strom et al. (2014).

3.6.5 Microfinance in Educational Development:

many microfinance institutions set their primary social goal as to improve educational outcomes of the poor children of the areas. So, Microfinance operates in poor communities where educational levels are low (Holland and Wang, 2011). Jacoby (1994); Foster (1995); Pitt and Khandker (1996); Marcus et. al. (1999); Barnes et. al. (2001); Littlefield et al. (2003); Holland and Wang (2011) have shown in their study that the number of school enrolling increased after introduction of microfinance program. A number of studies prove that longer period of schooling leads to better occupational opportunities and income, improved health etc. (Karene and Dougherty, 2005). Some studies recommend that higher educational attainment creates stronger civic values among people, promotes greater happiness, and lower birth-rates (Sen, 1999). As per SPTF indicator poor people who can improve their earnings using loans microenterprises, usually invest more for their children's future along with affording the costs of post-secondary schools (Holland and Wang,

2011). But Stewart and Wet (2012) found a mixed impact of Microcredit on education in sub-Sahara Africa where some studies show a positive impact and others show negative impact.

3.6.6 Microfinance and Health Status:

Many households in developing countries face health risk creating opportunity for micro insurance (Rai and Ravi 2011). But because of high transaction cost and disparity in using the health insurance in between men and women, many microfinance institutions in South Asia offer health insurance schemes along with their regular credit facility (Roth et al. 2005). The micro health insurance program offered by MFIs contributes in increasing awareness of important health problems and to the probability of seeking formal care (Hamid, Roberts & Mosley, 2011). Stewart and Wet (2012) found that in sub-Sahara Africa Microfinance has a positive impact over health status of poor people in terms of number of episodes of sickness, duration of sickness, nutrition level, increase investment in health care, expenditure for health service etc. Wendy J. Werner (2009), former consultant to ICDDR,B, Bangladesh in a case study found that micro-insurance for health as currently offered in Bangladesh increased access to, and use of, basic health services among excluded populations. Moreover, the deposit kept at MFIs and regular income from the micro-enterprises provide the opportunity to take the medical facilities which was earlier not reachable for them. Miller and Rodgers (2009) argue that as with microfinance women get a better and stronger position in family, they can bargain for a greater share of household resources to be allocated toward expenditures that improve the health and well-being of children. Gertler, Levine, and Moretti (2009) find that access to micro credit enables families to increase expenses for adult illness. Foster (1995) states that small-scale lending programs positively affect child health outcomes.

3.6.7 Establishment and Efficiency Increase of Microenterprises:

Augsburg et al. (2014) and Crepon et al. (2013) found that microcredit creates more business opportunities for borrowers and thus they have more self-employment. Micro-enterprises who get access to credit facility through microfinance institutions are able to improve efficiency by overcoming liquidity constraints. The availability of liquid fund makes them able to purchase and

utilize inputs and implement management decisions on time which ultimately increases their efficiency (Abdulai and Binder, 2006). With the help of the credit extended to the poor, they can arrange working capital for their enterprises, which may bring better profit for these people. Akpalu et al. (2012) found that in Ghana those agro-based businesses are more efficient who have access to micro loans compared to those who do not have the access. de Mel et al. (2008), de Mel et al. (2009), Lensink and Pham (2012) found that microcredit accelerates profits in businesses of the borrowers.

3.6.8 Housing Facility & Protect Disaster after Natural Calamity:

Barnes Gaile et al. (2001), Lacalle Calderon et al. (2008), Brannen (2010) found that the microcredit recipients are more able to own their own house and also to invest for quality houses compared to the non-recipient group. Along with housing facility, deposits maintained by the clients of MFIs support them to cope up with any shock in future, like natural calamity. Besides, the micro insurance service offered by MFIs provides financial protection to clients at the time of natural hazards. Becchetti and Castriota (2011) found loans from MFIs significantly improved the financial condition of borrowers damaged by natural calamity. Kumar et al. (2005) have mentioned microfinance as one of the risk management strategies in natural calamity. Foster (1995) found that, in Bangladesh household with access to micro credit were better able to smooth household consumption following the floods of 1988.

3.7 Present Status of Microfinance Institutions:

Microfinance today is a major industry including thousands of organizations serving millions of people (Armendariz and Morduch, 2010). Throughout the world, microfinance has been proven as a success story by contributing towards economic development and poverty reduction through sustainable financial services (Gietzen, 2017). In 2016, Microfinance Institutions served around 132 million low-income people by distributing loan of 102 billion Dollar (MRA, 2016). Different types of financial services providers for poor people have emerged - non-government

organizations (NGOs); cooperatives; community-based development institutions like self-help groups and credit unions; commercial and state banks; insurance and credit card companies; telecommunications and wire services; post offices; and other points of sale - offering new possibilities (CGAP). Observing the sincerity in loan repayment and urge to save to break the poverty cycle, these different types of institutions have introduced different variety of services for the poor. Starting from loan for child education, health emergencies to business loans for both working capital and long term assets have been brought up by these institutions to fulfill all sort of financial needs of the poor. Not only this, the poor have also been motivated towards savings behavior by making various savings products available to them. Throughout the whole world, MFIs achieved 9.4% annual growth in loan portfolio and 9.6% growth in number of borrowers in 2016 (MRA, 2016). Among the different regions of the world, South Asia achieved the highest growth in terms of loans and clients. We can observe a synopsis of the current situation of MFIs through the following table:

Table: 3.1
Microfinance at a Glance

Year	No. of Reporting MFIs	No. of Branches (nb)	No. of Personnel (nb)	Total Assets (in US$)
2014	1,064	52,685	545,212	107,125,400,000
2015	1,033	54,304	614,559	118,848,500,000
2016	774	54,118	635,774	123,875,000,000
2017	762	51,160	607,737	146,264,400,000

Source: MIX Market

The above table shows that though the number of MFIs branches and the no. of employees working in them increased over the time, a slight decrease took place from 2016 to 2017. On the other hand, total asset size in Microfinance sector increased by 10.94% in 2015, 4.23% in 2016 and 18.07% in 2017. The below table shows the outreach of MFIs throughout the world.

Table: 3.2

Outreach of MFIs

Year	Number of Active Borrowers (nb)	Percentage of Women Borrower (%)	No. of Loan Outstanding (nb)	Gross Loan Portfolio (US$)	Average Loan Balance per Borrower (US$)	No. of Depositors (nb)	Deposits (US$)	Average Deposit Balance per Depositor (US$)
2014	112,589,000	81	101,373,700	87,349,800,000	748	100,506,900	52,325,900,000	418
2015	116,691,300	84	123,156,000	92,442,900,000	674	98,419,800	58,993,600,000	411
2016	115,010,600	83	112,693,400	96,673,500,000	719	98,806,400	64,051,800,000	439
2017	119,985,200	80	117,537,700	111,568.300,000	840	140,611,900	80,411,000,000	422

Source: MIX Market

In 2016, 762 MFIs distributed altogether US$ 111,568,300,000 of credit among 117,537,700 number of active borrowers. Among the borrowers, 80% was women borrowers and average loan balance per borrower was US$ 840. On the other hand, about 140,611,900 depositors kept a total deposit of US$ 80,411,000,000 with an average deposit balance per depositor is US$ 422. All these statistics of outreach of MFIs shows an increasing trend from 2014 to 2017. The gross loan portfolio increases by 5.83% from 2014 to 2015, 4.58% in 2016 and 15.41% in 2017. Deposit collection of the reporting MFIs under MIX Market achieves 12.74% growth in 2015, 8.57% growth in 2016 and 25.54% growth in 2017. Looking at the number of active borrowers and depositors, it is found that from 2014 to 2017, the number of active borrowers increases by 6.57% and the number of depositors increases by 39.9%.

Table: 3.3
Financial Performance of MFIs

Year	Return on Equity	Financial Expense/Assets	Financial Revenue/ Assets	Operating Expense/ Loan	Yield on Gross Loan Portfolio	Risk Coverage
2014	14.1%	4.7%	22.5%	15.5%	21.9%	88.4%
2015	13.2%	4.9%	19.1%	12.0%	21.0%	94.3%
2016	12.6%	5.2%	18.3%	11.1%	20.9%	72.7%
2017	11.5%	4.8%	16.8%	10.6%	19.2%	82.9%

Source: MIX Market

Table 3.3 shows the financial performance of MFIs all over the world as per report of MIX Market. The profitability of MFIs in terms of ROE is reported above 11.0% in all the years from 2014 to 2017 though the rate decreased slightly over the period. The same decreasing trend is also found in the ratio of financial revenue over total assets and yield on gross loan portfolio. On the other hand, the ratio of financial expense to total assets increased from 2014 to 2016 and then reduces in 2017. Similar to the revenue trend, operating expense to loan ratio shows a decreasing pattern over the time. The risk coverage of the MFIs was 88.4% in 2014 which has a fluctuating trend over time and is reported as 82.9% in 2017.

As per the statistics of MIX Market, the largest asset sized and the most efficient MFIs are found in Asia because of the large population densities and lower wages in this area. Moreover, strong outreach and preservation of low operating expenses have also made the Asian MFIs more efficient than other parts of the world (Micro-banking Bulletin 2004). Table: 4.4 shows a comparative scenario of MFIs over the regions as per 2017. The statistics reported in Table:4.4 shows that in terms of total asset size, gross loan portfolio and deposit collections, South Asian MFIs surpasses the MFIs in other areas of the world. Number of active borrowers as well as number of depositors

are also highest in this area. Moreover, this region reports the highest percentage of women borrower.

Table: 3.4

Regional Comparative Analysis

	Africa	EAP	ECA	LAC	MENA	South Asia	Grand Total
No of Reporting MFIs	113	82	105	244	28	190	762
Assets(USD) m	19,002.2	23,809.0	8,169.2	56,159.2	1,590.6	37,534.3	146,264.4
Gross Loan Portfolio (USD) m	9,453.2	19,295.2	4,634.5	45,246.4	1,297.3	31,641.7	111,568.3
Number of Active Borrowers(000)	5,399.1	18,401.4	2,037.2	20,706.7	2,315.8	71,125.1	119,985.2
% of Female Borrowers	64%	73%	49%	63%	60%	89%	80%
Average Loan Balance Per Borrower (USD)	991	1,048	2,275	2,092	560	378	840
Deposits	13,098.1	10,991.0	3,981.5	38,401.3	432.9	13,506.2	80,411.0
Number of Depositors (000)	26,770.5	23,380.8	4,368.4	27,510.2	750.7	57,831.2	140,611.9
Average Deposit Balance per Depositor	199	470	825	1,227	576	92	422

In the South Asian region, India achieved the top position among all the countries in the world through 2014-2017 in terms of active number of borrowers. The second position was attained by Bangladesh again from the same region and Vietnam achieved the third position for the same period. The statistics of the top 10 MFIs for the period 2017 is given in the following table.

Table: 3.5
Top Ten Countries by Active Borrowers, 2017

Country	Active No. of Borrowers (000)	Gross Loan Portfolio (US$) m
India	37,891.7	21,033.0
Bangladesh	26,916.4	7,896.5
Vietnam	7,317.3	8,675.8
Mexico	6,465.0	3,068.8
Philippines	5,187.4	1,043.6
Pakistan	5,062.2	1,681.2
Peru	4,921.4	12,443.3
Colombia	2,743.1	6,334.6
Cambodia	2,172.9	7,713.1
Brazil	2,090.8	998.6

Source: Mix Global Benchmark Report, 2017

As the number of active borrowers is highest in India, the amount of gross loan portfolio is also highest here. The second largest loan portfolio is found in Peru. Though Bangladesh has the second largest base of borrowers, the gross loan portfolio amount lags behind many countries in the top ten chart. Among the top ten countries, Kenya has the lowest number of borrowers with the lowest loan portfolio.

In terms of number of depositors, Bangladesh has the highest position while Peru has the highest amount of deposits collected from the depositors. Vietnam has the second largest number of depositors while Bolivia has the second highest deposit collection. Though India stands number 1 in terms of active number of borrowers and gross loan portfolio, the deposit-holders number as well as the amount of deposit collection is not that much good here among the top ten countries. This differences in performance may result from the various lending methodologies applied by the

Asian MFIs. For example, MFIs in India and Bangladesh reduce their staffing costs by lending to self-help groups rather than to the individual borrowers (Haq et al., 2010)

3.8 Problems with MFIs:

Besides the success stories of MFIs, some failure stories are also found (Bateman, 2011; Economists, 2009; El-Zonghbi and Martinez, 2011; Karnani, 2007). In India, Bosnia, Morocco, Pakistan, Nigeria, Nicaragua etc, thousands of over-indebted people are found with serious implications on their livelihood and communities. Specially in India, the number of business failure and suicide cases increased (Stewart and Wet, 2012). The incapability of MFI borrowers to derive productive use of loan amount leads them into rather indebtedness (CGAP 2010, Rosenberg 1999). On the other hand, Ademoh and Zivkovic, 2017 mentioned that lack of collateral, unawareness of businesses about the microfinance facilities, and high interest rates are the main causes for not taking services of microfinance banks. Practitioners and industry observers argue that to achieve quick growth created a pressure on microfinance organizations to increasingly seek clients who are easiest to assess (Rogaly, 1996; Simanowitz, 2011; Dichter, 1999; Hermes et al., 2011; Chowdhury, 2009; Epstein and Yuthas, 2010; Stewart and Wet, 2012) which leads microfinance institutions to leave behind their social mission. Many MFIs have drifted from their mission by reaching out to unbanked wealthier individuals which is more profitable while at the same time crowding out poor clients (Armenda´ riz and Szafarz, 2011; Copestake, 2007, Mersland and Strøm, 2010; Augsburg and Fouillet, 2010; Armenda´ riz and Szafarz, 2011; Hermes, Lensink, & Meesters, 2011, Stewart and Wet, 2012). This trend is ultimately making the two pillars of microfinance (Ditcher, 1999) – outreach and sustainability under question. Besides the efficiency of the MFIs is also a burning issue for the policy makers as well as practitioners.

3.9 Conclusion:

The success stories of MFIs have proved that low-income individuals are capable of lifting themselves out of poverty if given access to financial services. And it is obvious that when financial services are accessible at the right time, it helps households to build assets, generate income, smooth consumption, and protect themselves from risks. From its inception MFIs in different countries have helped the poor to recover their financial condition and ensure better facilities for themselves as well as for their families. Women empowerment in this aspect is rather an important addition. With access to microcredit, women in rural areas could start their story of bread earning which gave them a strong position in their family as well as now they can take part in decision making. At the macro level, all these lead more development and growth for the economy. Observing the enriched contribution of microfinance its practice has been spread over the world. As the pioneering country, in Bangladesh also the expansion of microfinance practice has taken place over the years. As the main focus of this study is MFIs in Bangladesh, it is necessary to know about the microfinance market in Bangladesh. So our next chapter discusses about the Microfinance practice in Bangladesh.

Chapter: 4
Microfinance in Bangladesh

4.1 Introduction:

Bangladesh is world renowned as the birth land of microcredit (Kumar e al., 2012; CDF, 2015). In 2017, as per the World Economic Forum (WEF) Competitiveness Report, out of 137 countries, Bangladesh ranked 77th based on availability and 86th based on affordability of financial services (MRA, 2017). According to Global Outreach and Financial Benchmark report 2017-18 of MIX Market, Bangladesh stands at second position among all the reporting MFIs in the world in terms of active borrowers. Salim (2013) remarked Bangladesh microfinance industry as the largest and most mature in the world. The microfinance institutions in Bangladesh serve the unbanked people with variety of financial services to accelerate the economic growth of the country. The main target of microfinance institutions is poor people of society who cannot access to the formal financial sector, specially, women, small producers and entrepreneurs. As per Microcredit Regulatory Authority Act 2006, section.2 (22), 'The term Microcredit means loan facilities offered by microcredit organization certified under the Act for poverty alleviation, employment generation and facilitate a small entrepreneur" and under the Act section no. 24(2) (a) "microcredit institution shall have the authority to accept deposit from members of the institution." The microfinance sector mainly has focus on poverty alleviation, creating employment opportunities and thus leading a social change. With the passes of time the dimension of financial services offered by MFIs has expanded to a great extent. With the help of MFIs' services, about 65% of total rural population is getting facilities of institutional financial services (MRA, 2018). As a result, Microfinance has become an integral part of Bangladesh's economy and the growth of financial sector.

In the previous chapter, the background, evolution, growth and present status of Microfinance Institutions worldwide were discussed. In this current chapter, I am going to focus on the scenario of microfinance institutions in Bangladesh as well as its development over the years and its importance in economic development of the country.

4.2 History of Microfinance in Bangladesh

In the after-liberation economy, Nobel Laureate Dr. Muhammad Yunus, known as the father of modern microfinance (Yergin et al., 2015), started to think about the escape away from poverty

observing the desperate poverty surrounding him. Dr. Yunus made repeated trips with his students in nearby villages to develop practical solutions (Kent & Dacin, 2013). One day, Dr. Yunus went to a nearby village and met Sufiya who used to make and sell chairs to earn livelihood for her family. Dr. Yunus found that Sufiya relied upon the local moneylenders for her capital and the hard term and conditions of the credit did not give her any chance to improve her condition. Observing the fact, Dr. Yunus lent Tk. 856 (around $27) to some micro-entrepreneurs who then utilized the money to grow their business. This gave him the spirit to continue to provide microcredit to more number of people (Yergin et al., 2015). So, Dr. Yunus started a pilot project in his native village in Chittagong with a view to provide collateral free loan to the poor to alleviate poverty. The Grameen-model, named as the 'Jobra' experiment was tested first centering on group-based credit delivery with peer monitoring. During the late 1970s, when the Jobra project was underway, Bangladesh Bank also introduced a new project named as Dheki Rin Prokolpa in collaboration with the Swanirvar Bangladesh. Besides this several other pilot schemes were initiated at that time by a handful of the NGOs which were active then. Eventually the pilot project of Dr. Yunus shaped into formal Institution as Grameen Bank which was established in 1983 by government of Bangladesh under Grameen Bank Ordinance (S. Raihan et al., 2017).

Initially microcredit was introduced to distribute small loans to groups of poor women to invest in local home-based businesses. The loans were mainly provided in groups where each member of a group guarantees the repayment by all members (Quayes and Khalily, 2014). The program was to initiate credit channelizing towards income generating activities along with mandatory savings by members targeting the ultra-poor people of society.

By 1990s, the country observed a massive success and expansion of the microcredit program all over the country. This drew attention to all policymakers and academia. In 1992, the Palli Karma-Sahayak Foundation (PKSF) was founded as a wholesale fund provider to MFIs in the country (Faruqee and Badruddoza, 2012). In 2006, the government of Bangladesh established the Microcredit Regulatory Authority (henceforth MRA) in order to give license, monitor and oversee the Bangladeshi MFIs. Over the years the MFIs have achieved success in reaching to more people with the financial services, increasing the volume of loan and savings as well as in many other

areas. According to PKSF statistics 2006, Bangladesh microfinance market is the largest and most mature in the world.

4.3 Growth, Outreach & Current Status of Microfinance in Bangladesh:

The journey of microfinance originated in Bangladesh with the establishment of Grameen Bank and BRAC in 1970s. Eventually the new trend of financial service to the poor expanded in terms of both scale and scope (Khandker and Samad, 2014). This growth of microfinance practice was accelerated in 1990s with the establishment of NGO-MFIs throughout the country and also with the formation of Palli Karma Sahayak Foundation (PKSF). Subsequently more number of branches reach almost every rural area of the country creating job opportunities for more people, including more members, creating more borrowers by extending more loans for the poor people of the country. In Bangladesh and other developing countries, the main target of MFIs is women, small scale entrepreneurs, and landless farmers (Quayes and Khakily, 2014). Bangladesh has achieved 37% outreach in Microfinance sector (MIX Market). The outreach of the MFIs can be seen through its institutional and financial strength, such as, number of branches of the agencies, loan coverage, net savings and loans outstanding (Bangladesh Microfinance Statistics 2010). Its expansion all over the country has drawn attention to all especially, the policymakers. As per MRA (2020), in total 877 MFIs got license from MRA out of which in 2020 759 MFIs are in operation. By 2020 total 20,898 branches all over the country engaging 171,110 employees and serving about 33.31 million saver and providing loan to 26.15 million borrowers. The growth and outreach of microfinance sector in Bangladesh over the years is presented in Table 5.1

Table: 4.1 Bangladesh Microfinance Statistics of MFIs

Year	No: of Licensed NGO-MFIs	No. of Branches	No. of Employee	Active Members	Net Savings (in million Tk))	Number of Active Borrowers	Loan Portfolio (in million Tk)
2008	293	15,077	98,896	23,450,000	47,386	17,790,000	134,681
2009	419 (43.00%)	16,851 (11.77%)	107,175 (8.37%)	24,850,000 (5.97%)	50,610 (6.80%)	18,890,000 (6.18%)	143,134 (6.28%)
2010	516 (23.15%)	17,252 (2.38%)	109,597 (2.25%)	25,280,000 (1.73%)	51,360 (1.46%)	19,910,000 (5.39%)	145,023 (1.32%)
2011	576 (11.63%)	18,066 (4.71%)	111,828 (2.04%)	26,080,000 (3.16%)	63,300 (23.24%)	20,650,000 (3.72%)	303,180 (109.06%)
2012	590 (2.43%)	17,977 (-0.49%)	108,654 (-2.84%)	24,640,000 (-5.52%)	75,250 (18.88%)	19,310,000 (-6.49%)	456,020 (50.41%)
2013	650 (10%)	14,674 (-18.37%)	110,734 (1.91%)	24,600,000 (-0.16%)	93,990 (24.90%)	19,270,000 (-0.21%)	432,280 (-5.21%)
2014	742 (14.33%)	14,730 (0.38%)	109,628 (-1%)	25,110,000 (2.07%)	106,990 (13.83%)	19,420,000 (0.78%)	462,000 (6.88%)
2015	753 (1.48%)	15,609 (5.97%)	110,781 (1.05%)	26,000,000 (3.54%)	135,410 (26.56%)	20,350,000 (4.79%)	634,000 (37.23%)
2016	758 (0.66%)	16,284 (4.32%)	127,820 (15.38%)	27,790,000 (6.88%)	171,190 (26.42%)	23,280,000 (14.39%)	787,000 (24.13%)
2017	783 (3.30%)	17,120 (5.13%)	139,526 (9.16%)	29,910,000 (7.63%)	216,710 (26.59%)	24,850,000 (6.74%)	1,046,120 (32.93%)
2018	805 (2.81%)	18,196 (6.29%)	153,919 (10.32%)	31,220,000 (4.38%)	262,960 (21.34%)	25,400,000 (2.21%)	1,201,910 (14.89%)
2019	842 (4.59%)	18,977 (4.29%)	162,175 (5.36%)	32,370,000 (3.68%)	306,190 (16.44%)	25,760,000 (1.42%)	1,403,200 (16.75%)

2020	877 (4.16%)	20,898 (10.12%)	171,110 (5.51%)	33,310,000 (2.90%)	373,900 (22.11%)	26,150,000 (1.51%)	1,362,750 (-2.88%)

Source: MRA

4.3.1 No of Licensed MFIs under MRA:

Table 4.1 shows that during the period 2008 to 2020 the total number of Licensed MFIs with MRA increased from 292 to 877. The number shows a total growth of 200.34% in the no of licensed MFIs over a period of 12 years. However, the number shows total how many MFIs got license from MRA. But the number is not a one way move. Every year some new MFIs got license whereas some MFIs' license is cancelled. Table 4.2 shows the statistics over the period 2015 to 2020. The reason here I am showing the statistics from 2015 is that the data regarding the number of cancelled license is not available in MRA reports before this period. Now looking at the table it can be observed that over the period a total of 135 MFIs got license newly. However about 73 MFIs license was cancelled during this period. The highest inclusion took place in 2019 and the highest cancellation held in 2016. Specially the number of cancellations is a matter of concern and one of the prime reasons of this study. Through the study I want to observe whether this cancellation can be due to the cost inefficiency of MFIs.

Table: 4.2
Changes in the Licensed MFI Number

Year	Existing no of licensed MFI at the beginning of the year	No of MFIs newly licensed in the year	No of MFIs license cancelled in the year	Existing No of licensed MFIs at the end of the year
2015	697	11	11 (1.58%)	697
2016	697	5	22 (3.16%)	680

2017	680	25	6 (0.88%)	699
2018	699	22	16 (2.29%)	705
2019	705	37	18 (2.55%)	724
2020	724	35	0 (0.00%)	759
Total		135	73	

4.3.2 No of Branches:

Total number of branches of the licensed MFIs was 15,077 in 2008 which increased up to 2011 after which there is a downward trend till 2014. After 2014, the branch number increases gradually. The highest growth in branch number occurred in 2009 (11.77%) whereas the highest decrease took place in 2013 (18.37%). If data is compared from 2008 to 2020, a 38.61% increase is found in the number of branches. This shows through branch diversification, MFIs are trying to reach more and more to their target group.

4.3.3 No. of Employees

Number of employees working in the licensed MFIs of MRA was 98,896 in 2008 which became 171,110 in 2020. Number of employees changes with the change of MFIs number and also branch number. Comparing the employee number over the period of 2008 to 2020, a growth of 73.02% is found. If we look at the year by year growth rate, it is observed that in 2016, the highest growth occurred. In 2018 also there is a substantial growth (10.32%) in employment number in these institutions.

4.3.4 No. of Members and Amount of Savings:

As the MFIs has expanded their operation by establishing new branches in new areas, the number of members and the amount of savings increases over time. Number of members of licensed MFIs was 23,450,000 in 2008 which increased to 33,310,000 in 2020 indicating a 42.05% increase of members. With the increase in number of members, the amount of savings collection also increased from BDT 47,386 million in 2008 to BDT 373,900 million in 2020. That means from 2008 to 2020, the amount of savings increased by 689.05%. This is a great achievement of MFIs that they create the initiative and urge among poor to save money through institutional format. Table 4.3 below shows the contribution of top 10 MFIs in Bangladesh along with other MFIs in savings collection over 2014-2020.

Table: 4.3

Top 10 MFI's saving share in total saving (BDT in million)

Year	Deposit of top 10 MFIs	Rest of MFIs
2014	79.41 (74.22%)	27.58 (25.78%)
2015	97.5 (72.00%)	37.91 (28.00%)
2016	123.33 (72.96%)	45.71 (27.04%)
2017	157.04 (72.06%)	60.89 (27.94%)
2018	188.19 (71.54%)	74.85 (28.46%)
2019	212.56 (70.40%)	90.63 (29.60%)
2020	269.09 (71.97%)	104.81 (28.03%)

Source: MRA, 2018

The above statistics shows that the top 10 MFIs in the country collects the major part of total savings collections during a year. The same scenario is found all over the time from 2014 to 2020. Moe than 70% of the total savings is collected by these top 10 MFIs whereas all other MFIs collect only near by 30% savings.

4.3.5 No. of Borrowers and Disbursement of Loan:

Over the time as more and more MFIs comes into field and extend their operation in the distinct areas of the country, more number of deprived people takes the loan advantages from them. As a result, the number of borrowers as well as the disbursed loan amount, both increases over the time. Number of borrowers increased from 17,790,000 in 2008 to 26,150,000 in 2020 indicating a 46.99% growth over 12 years. On the other hand, 911.84% increase is found in the amount of loan portfolio during the same period. The amount of loan was 134,681 million Taka in 2008 which became 1,362,750 million Taka in 2020.

Table 4.4 shows the 10 main sectors in which MFIs in Bangladesh distribute loan. The table contains information for 2017 and 2016 as mentioned by CDF, 2017. Among the 10 sectors, the first three sectors (cultivation, livestock, dairy and poultry and fisheries) relate to agriculture which is the backbone of our economy. In these categories, MFIs have put the highest concentration by distributing in total Tk. 595,956.80 million in 2017 and Tk. 477,659.38 million in 2016 which is almost 50% of the total allocated loan amount in both the years. Next to agriculture, the business sector has received attention as in 2017 and 2016 MFIs allocated 34% and 31% respectably of their fund in this sector. Besides agriculture and business, in transport sector distributed loan amount is 4.07% in 2017 and 3.72% in 2016 followed by small & cottage industries (2.29% in 2017 and 1.97% in 2016), housing sector (1.55% in 2017 and 1.8% in 2016), health (0.72% in 2017 and 1.76% in 2016) and lastly education (0.33% in 2017 and 0.37% in 2016). 7.61% of the loan in 2017 and 10.58% in 2016 is delivered for other categories of loan. This analysis shows that MFIs are more intent to provide loan for income generating sectors rather than consumption (housing, health, education etc.) purposes.

Observing the number of MFIs apportioning loans in the different categories, it is found that in 2017, 495 MFIs out of 510 MFIs that is 97% of all MFIs provided loan in business sector while 459 MFIs that is 90% MFIs provided loan in cultivation, agriculture and equipment sector. In the same year, 447 MFIs (87.65%) provided loan for livestock, dairy and poultry sector, 399 MFIs (78.24%) provided loan in fisheries, 353 MFIs (69.22%) provided loan for transport sector, 340

MFIs (66.67%) distributed loan in small & cottage industries, 241 MFIs (47.25%) provided loan for housing sector and so on.

Table: 4.4 Sector-wise Disbursement of Loan during 2016-17

Name of Sector	Disbursed Loan Amount in 2017 (in million)	Number of financing MFIs	Disbursed Loan Amount in 2016 (in million)	Number of financing MFIs
Crops Cultivation & Agriculture, Equipment	411,392.41	459	335,777.28	466
Livestock, Dairy & Poultry	135,491.56	447	107,642.18	451
Fisheries	49,072.83	399	34,239.92	392
Business	411,501.05	495	295,416.95	513
Small & Cottage Industries, Handicrafts	27,696.40	340	18,832.21	342
Health	8,686.08	191	6,865.57	194
Education	3,957.00	140	3,508.19	147
Housing	18,684.37	241	16,816.81	250
Transport	49,179.25	353	35,599.63	346
Others	91,877.14	183	101,073.44	190
Total	1,207,538.08	510	955,772.18	527

Source: CDF-BM Statistics 2016-2017

4.3.6 Sources of Fund of MFIs

MFIs in Bangladesh mainly arrange their funds by collecting savings from members and through cumulative surplus. As Table 4.5 shows, from 2014 to 2020, every year these two sources have the highest proportions of fund collection. These two sources provide 66% to 70% of total fund of

MFIs. Along with members' savings and cumulative surplus, MFIs also collect funds through borrowing from commercial banks. As is shown in figure 4.1, 20.02% of total fund of MFIs were collected by taking loans from commercial banks in 2020. Besides loan from commercial banks, MFIs also collect loan from PKSF. From 2014 to 2020, on an average 7.65% of fund is collected in the form of loan from PKSF. However, MFIs dependency on PKSF loan decreases over time from 2014 to 2020. A very small portion of total fund comes from donors' located in home and abroad. In 2020, only 0.57% of total fund was contributed by donors. If we look at the data from 2014 to 2020, a decreasing trend is also found in the proportion of donors' fund. Besides, savings, cumulative surplus, loans and donors' fund, some other sources are also utilized by MFIs which have been brought together under the heading of 'other fund'. The proportion of other funds is 1.77% out of total fund collection in 2018.

The overall composition of sources of fund of MFIs reveals that from 2014 to 2020 MFIs have reduced their dependency on PKSF loan and donors' fund and have increased their fund collection through savings collection and cumulative surplus. On the other hand, loans from commercial banks increased from 2014 to 2016 and then MFIs manages to reduce this proportion.

Table: 4.5
Sources of Fund

Sources	2014		2015		2016		2017		2018		2019		2020	
	BDT (in million)	%	BDT (in million)	%	BDT (in million)	%	BDT (in million)	%	BDT (in million)	%	BDT (in million)	%	BDT (in million)	%
Members' Savings	106999	34.21	135410.4	33.94	170670	32.34	216723	34.93	262963.81	35.44	306325.71	34.63	372169	37.20
Loan from PKSF	34523.5	11.04	37769.68	9.47	40762	7.72	43922	7.08	47830.82	6.45	52835.75	5.97	57916	5.79
Loan from Banks	51495.9	16.47	68574.2	17.19	132664	24.14	133381	21.50	152190.59	20.51	193507.27	21.87	200295	20.02
Donors' Fund	6855.04	2.19	5218.45	1.31	4974	0.94	5381	0.87	7457.25	1.01	5465.48	0.62	5722	0.57
Cumulative Surplus	100943.95	32.28	137706.3	34.52	168295.5	31.89	210673	33.95	258326.04	34.82	310823.98	35.13	346190	34.60

Other Funds	11914.57	3.81	14242.07	3.57	10318	1.96	10417	1.68	13137.16	1.77	15714.28	1.78	18256	1.82
Total	312731.96	100	398921.1	100	527683.53	100	620497	100	741905.68	100	884672.47	100	1000547	100

Source: MRA, 2020

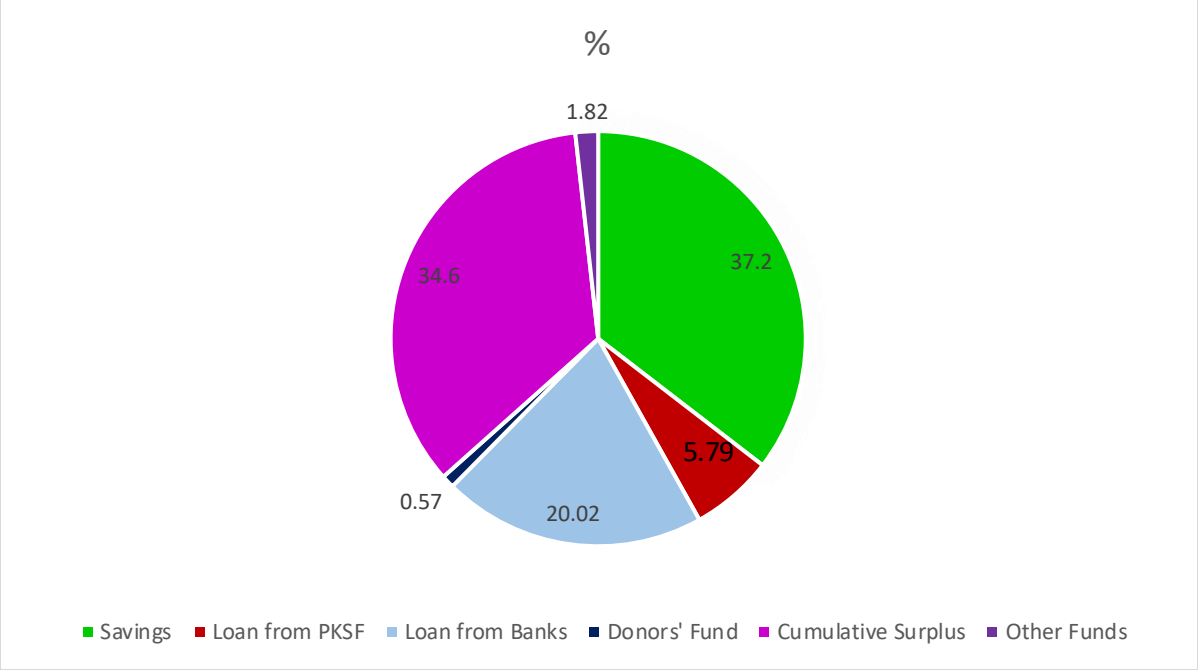

Figure: 4.1 Structure of Sources of Fund as of 2018
Source: MRA, 2020

4.4 Importance of MFIs in Bangladesh Economy

From the very beginning microfinance has been proved as one of the tools of economic development by extending credit to poor people (Kumar et al., 2012). At the recent time, Microcredit has become an important tool to reduce poverty and accelerate economic development (Islam, 2015). In Bangladesh Microfinance has a direct as well as an indirect impact on economy as this sector covers more than half of rural population and also increasing number of people from urban areas (Raihan et al., 2017). Islam, 2015 mentioned Bangladesh's microcredit sector having remarkable speed of development. According to Khandker and Samad, 2014 the poverty level of Bangladesh has been substantially reduced in last three decades.

4.4.1 Impact on Income and Assets of MFI members:

Mosley and Hulme, 1998 by conducting a study on 13 MFIs in 7 developing countries including Bangladesh found that the income level and asset acquisition of MFI borrowers increased after they get involved with MFIs in their area. A. Islam et al., 2015 has found that in Bangladesh the poor people specially the wage earners started to have their own business after getting loans from microfinance institutions. Raihan et al., 2017 found improved productivity in microenterprises. Thus, MFI members in Bangladesh enjoy better income level and their living standard and life style improves due to the financial service of MFIs (Khan & Rahaman, 2007; Khandker and Samad, 2014 and Rizkiah, 2019). Raihan et al., 2017 also found improvement in asset accumulation of MFI members in Bangladesh.

4.4.2 Increase in Consumption and Poverty Reduction:

Pitt and Khandker (1998), Khandker (2005) and Imai and Azam (2012) and A. Islam (2015) found that in Bangladesh people taking microcredit are able to increase their consumption pattern and thereby the poverty is reduced. Khandker (2005) made a comparison over the period 1991/92 to 1998/99 and found that moderate poverty level decreased by 40% due to Microfinance activities. He also identified 2.2% reduction in extreme poverty level per year and 1.6% in moderate poverty level per year. Ahmed et al. (2000) revealed that mobility is low for BRAC members compared to others. Khandker and Samad (2014) found that the MFI participants' poverty rate decreases at a greater pace compared to the non-participants.

4.4.3 Reliance on Informal Market:

Islam et al. (2015) have found that in Bangladesh in general poor people who take loans from microfinance institutions have less propensity to borrow from informal market though the amount of loan from informal market has not decreased. Raihan et al. (2017) finds higher intensity of financial inclusion of poor people due to microfinance activity.

4.4.4 Improvement in Health, Education & Disaster Management:

As through microcredit, borrowers become able to increase their income, they can spend more for their health purpose. Islam and Maitra (2012) found that microcredit act as a protecting shield against health shocks. Along with the better capacity to spend in health sector, MFI members are able to send their children to school. Thus the rate of school going children increases among the MFI members (Chowdhury and Bhuiya, 2004). Besides Brown & Nagarajan (2000) mentioned about pre-disaster management in Bangladesh by MFIs along with central bank to distribute loans to construct flood resilient concrete and tin houses.

4.4.5 Women Empowerment:

Pitt and Khandker (1998) found that microcredit accelerates women labor supply. Zaman (1999) showed that BRAC's women borrowers achieve higher income and decision making power. A study conducted by World Bank and Bangladesh Institution of Development Studies found that microcredit facilities have a greater positive impact on women participants compared to men participants (Kandker and Samad, 2014). The study also found that microcredit increases women empowerment. Kumar and Hossain (2015) found that women MFI participants in Bangladesh can take part in different economic activities which help them to improve their family income. This ultimately give the women the capability to take part in family decision and also access to assets and rights.

4.5 Challenges in Microfinance Sector in Bangladesh

As it is observed in Table: 4.2, the number of newly licensed MFI with MRA increases substantially over time. It is not only the licensed MFI number is increasing, rather the overall MFI number is also increasing which increases the competition among the MFIs (Kumar et al., 2012). In this competitive environment, to survive, MFIs have to trade-off between sustainability and financial performance. Rizkiah (2019) found that the depth of outreach has a significant negative impact on financial performance of MFIs in Bangladesh. That is, as MFIs increase outreach their

ROA and operating margin goes down. Besides Parvin et al. (2020) mention that as the MFIs maintain group-based lending system where the field workers have to visit groups and give them different trade based training and financial advices, cost per loan for MFIs are quite high. Also for small MFIs funding source becomes an acute trouble as usually, the small MFIs have less access to funding sources. They have to arrange fund at a higher cost, sometimes by arranging a costly bank loan. To keep up with these situations, many MFIs in Bangladesh have focused on the comparatively well-off families for providing loan. As a result, the poorer in the economy becoming deprived of the micro finance services.

On the other hand, due to extended service of MFIs, borrowers get the option to choose from which MFI to borrow. Some borrowers take advantage of this option and borrow from multiple MFIs at a time which creates the problem of overlapping loans (Kumar et al., 2012). Even sometimes borrowers take a new loan to pay off the previously taken loan. This tendency among the borrowers always keeps them indebted with multiple loans and creates hindrance to come out of poverty. Apart from this issue, Natural Disaster becomes a great problem in the rural areas. Almost every year, rural areas specially in the northern, north-east and southern part of the country get affected by flood. Cyclone is a big problem in the southern districts. Due to these various natural calamities, the poor people get affected in their income flow which also creates problem for them to pay off loans taken from MFIs. As an addition to this the attack of current pandemic (Covid 19) lead a rather difficult situation for the poor. Many people had to discontinue their business; some lost their job. The daily earners income sources were eloped. Thus, overall it had a terrible effect on the financial condition of poor either in urban or rural areas.

4.6 Conclusion

In spite of various challenges, MFIs in Bangladesh have overcome a long way with ups and down, with pits and falls. Success stories attract the new comers to start their journey. However, time has arrived when shortfalls and failure stories of MFIs also need to be taken under consideration. This study puts light on this issue as it scrutinizes the cost effectiveness of MFIs in Bangladesh and also

relates the inefficiency with some MFIs related factors. So, from the study, the MFIs would get an indication that to what extent it can reduce its cost to be financially viable. MFIs would also get to learn that by controlling which areas, they will be able to reduce that cost. To fulfil this objective, in the next section, I am going to discuss the methodology used to conduct this research.

Chapter: 5
Methodology

5.1 Introduction:

Efficiency means how well an organization is able to manage its resources (inputs) to generate output. Two approaches are mainly applied in measuring efficiency of financial institutions, they are- financial indicators analysis and economic efficiency analysis (Lee and Chih, 2013). The former approach is applied mainly through ratio analysis which benefits comparison of institutions irrespective of size and industry (Piot-Lepetit and Nzongang, 2014). The economic efficiency analysis includes efficient frontier approach which is more recent and has drawn attention of many researchers at the current time. The two approaches are discussed below:

5.2 Financial Indicator Analysis (Ratio Analysis):

Financial indicator analysis which is mainly done through ratio analysis sets a proportional relationship between two factors. The proportional relationship overcomes the effect of size differences and makes it possible to assess about the financial strengths and weaknesses of a company. This process is simple and widely used one in literature. However, this approach has some demerits, as it depends on benchmark ratios which can be random and may misguide an analyst (Yeh, 1996). Financial ratios disregard management value and do not capture operational performance in the long term (Sherman & Gold, 1985; Lee and Chih, 2013). Financial ratios do not consider the current market value of the organization (Kohers et al., 2000) and do not study the price of input and the output mix (Berger and Humphrey, 1992). Besides, as per Wijesiri et al. (2015), the measurement of efficiency using ratios is distorted unless they have been properly adjusted. Wijesiri et al. (2015) further mentions that adjustments to the ratios are not always easy to make and the required data are not available. Moreover, Athanassoloulos and Ballantine (1995) states when the effect of economies of scale is considered, the ratios in isolation provide less indication to estimate overall performance measures of firms. Because of these problems, Berger and Humphrey (1997) and Wijesiri et al. (2015) identified efficient frontier approaches as superior in comparison to the on-going financial ratio analysis in respect of measuring institutions' performance as efficient frontier approaches include overall numerical objective and a ranking.

5.3 Efficient Frontier Approach:

The concept of efficient frontier was initiated with the celebrated work of Farrel (1957) (Masood and Ahmad, 2010). At recent time, researchers have concentrated on this approach. Though this approach suffers from the similar problems as of financial ratios as it relis on accounting data and does not consider market value of firms (Halkos & Salamouris, 2004), the frontier approach can handle multiple-inputs and multiple-outputs cases as well as with factors beyond the control of managerial issues of financial institutions (Piot-Lepetit and Nzongang, 2014). Following the frontier approach, different types of efficiency can be measured which are discussed below.

5.4 Types of Efficient Frontier:

Efficient frontier analysis mainly deals with the input-output combination of production system. It observes and compares the input-output mix of different organizations. This model can be applied in the cases where the observed output of a unit deviates from its potential output in one direction (Kumbhakar et al., 2015). Depending on the way we are trying to look at the deviation, different sorts of efficiency measurement (Production, cost or profit efficiency) is possible (Riaz and Gopal, 2015). In each case there is a maximum or minimum or potential level which forms the frontier and the actual scenario is compared with the frontier to find the inefficiency (Kumbhakar et al., 2015). In literature I found studies on production efficiency, cost efficiency and profit efficiency. The different efficient frontier is discussed below:

5.4.1 Production Efficiency (Technical Efficiency):

The transformation process in which inputs are converted into output is known as the production function (Kumbhakar et al., 2015). Given a production technology, if we plot the maximum level of output for different input levels, the line formed will represent the production function. Production efficiency is the ratio of actual output to potential output which is the maximum possible output given the inputs and technology (Kumbhakar et al., 2015). With the maximum

possible output level, the frontier is formed and if any observed output falls below the potential one, it is because of the technical inefficiency. Technical efficiency can be defined as to find the minimum input level to obtain a given level of output (Yin et al., 2013) or to find the maximum output level given a level of input (Masood and Ahmad, 2010).

5.4.2 Profit Efficiency:

Profit efficiency is the ratio of the firm's actual profits to optimal profits where optimal profit is the amount a firm could have earned at full efficient. Profit efficiency measures given an amount of inputs and outputs level and their prices, how close a firm comes to generating the maximum profit amount (Ariff and Can, 2008; Sun et al, 2013). Profit efficiency synchronizes with the economic goal of profit maximization, in which managers need to raise a marginal amount of revenue and reduce a marginal amount of costs (Berger and Mester, 1997, p. 900). Profit efficiency is measured by comparing actual profit with the maximum achievable profit (Kumbhakar et al., 2015). This approach is followed in studies like, Lozano (1997), Gaganis and Pasiouras (2013), Sun et al. (2013) with parametric model while Berger and Mester (1997), Vander-Vennet (2002), Sathye (2002), Isik and Hassan (2002), Maudos et al. (2002), Maudos & Pastor (2003), Bos and Schmiedel (2003), Sturm and Williams (2004), Liu and Tone (2006), Paul and Kourouche (2008) Ariff and Can (2008), Das and Ghosh (2009), Cummins et al. (2010), Lee and Chih (2013), Moradi-Motlagh and Babacan (2015).

5.4.3 Cost Efficiency:

Cost efficiency observes the capacity of a firm to produce a given level of output with the input mix which leads to minimum cost. If we plot the minimum cost required by firms to produce a given level of output with the input mix, the curve derived will be the cost frontier. Individual unit's efficiency scores are computed by observing the extent to which the actual costs deviate from the cost frontier estimated by the potential minimum cost given an output level and inputs used from the sample data (Carvallo and Kasman, 2005; Kumbhakar et al., 2015). Therefore, all firms are either on or above the frontier. Firms which exist on the frontier can produce a given level of output with the lowest cost and are regarded as cost efficient whereas firms that stays above the frontier have a higher cost to produce the same quantity of output and faces cost

inefficiency (Quayes and Khalily, 2014). The cost efficiency measurement has been applied in a number of studies. Some studies followed parametric approach whereas some studies adopted non-parametric one. Studies like Karafolas and Mantakas (1996), Carvallo and Kasman, (2005), Lensink et al. (2008), Fungáčová et al. (2013), Kasman and Carvallo (2014) measured cost efficiency for banks while Hermes et al. (2011); Oteng-Abayie (2011); Quayes and Khalily (2014) measured cost efficiency using parametric model for Microfinance Institutions. On the other hand, Resti (1997), Worthington (2000), Isik and Hassan (2002), Maudos et al. (2002), Vander-Vennet (2002), Maudos & Pastor (2003), Bos and Schmiedel (2003), Tortosa-Ausina (2004), Chen et al. (2005), Havrylchyk (2006), Das et. al (2007), Ariff and Can (2008), Das and Ghosh (2009) used non-parametric approach to measure cost efficiency.

5.4.4 Choice of Efficient Frontier in this Study:

My focus in this study is microfinance institutions in Bangladesh who has the main objective to eradicate poverty from the country. These MFIs are service oriented organizations who offer variety of financial services for the poor and deprived people in the society like deposits collection from the members, substitution of collateral, group lending, collateral-free loans disbursement, progressive loan structures, and varied repayment schedules, and insurance services, to poor and low-income households and their microenterprises to engage in productive activities (Gutiérrez-Nieto et al., 2007 & 2009; Bassem, 2008; Haq et al., 2010; Khavul, 2010; Servin et al., 2012; Rooyen et al., 2012; Piot-Lepetit and Nzongang, 2014; Lonborg and Rasmussen, 2014; Quayes and Khalily, 2013; Taiwo and Ojo, 2016). Because of this pattern of operation, I have not consider the production efficiency frontier which is more applicable for manufacturing industries. Also, as the MFIs act as non-profit organization aiming the welfare of the members and society, I have not focused on the profit efficiency frontier.

On the other hand, from the record (MRA, 2020), it is been found that the number of MFIs are increasing substantially over time by making the industry more competitive. To survive, in this competitive situation, MFIs need to be cost effective. Also, in literature the issue of sustainability of MFIs has receive much attention by researchers at the recent time. And to sustain in the long run, there is no other way for the MFIs but to be cost effective. In my study, I, therefore, focused

on the cost efficiency measurement of MFIs in Bangladesh. The rest of the chapter discusses on the cost efficiency measurement and the methods used in this research.

5.5 Measuring Cost Efficiency:

For a given firm, cost efficiency is defined as the ratio of the costs of a such a firm which is fully efficient (a firm that operates on the cost efficient frontier) to the actual cost of a given firm which produces the same output quantities given the input prices. A firm can achieve cost efficiency by reducing costs proportionally by implementing the best practice technology (becoming technically efficient) and selecting the optimal mix of inputs (becoming allocatively efficient (AE)) (Banker and Maindiratta, 1988; Isik and Hassan, 2002; Ariff and Can, 2008; Lensink et al., 2008; Widiarto and Emrouznejad, 2015). Thus, cost efficiency can be decomposed as into technical efficiency and allocative efficiency (Isik and Hasan, 2002; Widiarto and Emrouznejad, 2015). In other words,

Cost efficiency = Technical Efficiency X Allocative Efficiency (1)

The technical efficiency further can be decomposed into pure technical efficiency and scale efficiency. Thus, the cost efficiency function can be rewritten as below:

Cost Efficiency = (Pure Technical Efficiency X Scale Efficiency) X Allocative Efficiency

The details of these different measurement of efficiency is given in below discussion.

5.5.1 Technical efficiency:

The transformation process through which inputs are converted into output is known as the production function (Kumbhakar et al., 2015). Technical efficiency indicates the capacity to yield the maximum outputs using a given level of inputs, or to use the minimum level of inputs to produce a given level of outputs (Widiarto and Emrouznejad, 2015; Hou et al., 2014; Havrylchyk, 2006; Isik and Hassan, 2002; Worthinton, 2000). Given a production technology, if we plot the

maximum level of output for different input levels, the line formed will represent the production function. Production efficiency is the ratio of actual output to potential output which is the maximum possible output given the inputs and technology (Kumbhakar et al., 2015). With the maximum possible output level, the frontier is formed and if any observed output falls below the potential one, it is because of the technical inefficiency. Technical efficiency can be defined as to find the minimum input level to obtain a given level of output (Yin et al., 2013) or to find the maximum output level given a level of input (Masood and Ahmad, 2010).

Under Stochastic Frontier Approach, technical efficiency has been measured in studies like, Yin et al. (2013); Tsionas et al (2015) for banks and Masood and Ahmad (2010); Servin et al. (2012); Riaz and Goapl (2015), Mor and Kumari (2015) for Microfinance Institutions. Following non-parametric model, technical efficiency has been measured in studies like Wei and Wang (2000), Zhao (2000), Worthington (2000), Sathye (2001), Sathye (2002), Isik and Hassan (2002), Canhoto and Dermine (2003), Tsionas et al. (2003), Drake and Hall (2003), Sturm and Williams (2004), Tortosa-Ausina (2004), Neal (2004), X. Chen et al. (2005), Havrylchyk (2006), Das and Ghosh (2006), Pasiouras (2008); Paul and Kourouche (2008), Cummins et al. (2010), Garza-Garcı´a (2012), Řepková, 2014; Tsionas et al. (2015), Moradi-Motlagh and Babacan (2015), Wijesiri et al., (2015). The technical efficiency is decomposed in two components: pure technical efficiency (PTE) and scale efficiency (SE) (Řepková, 2014).

Scale efficiency: As per Drake and Hall (2003) scale efficiency is created when a firm is at an input–output mix-up which is different from the equivalent constant returns to scale situation. So, it is the distance between the VRS frontier and the CRS frontier (Cummins et al., 2010). The scale efficiency of a firm is calculated by dividing its efficiency score under Constant Returns to Scale (CRS) by its efficiency score under Variable Returns to Scale (VRS) (Banker et al., 1984). Thus if the result of CRS/ VRS scores is 1, then the firm is considered as scale efficient, otherwise, it is scale inefficient (Moradi-Motlagh and Babacan, 2015). Scale efficiency has been measured in studies, like Isik and Hassan (2002), Drake and Hall (2003), Sturm and Williams (2004), X. Chen et al. (2005), Havrylchyk (2006), Pasiouras (2008); Cummins et al., (2010), Garza-Garcı´a (2012), Řepková, 2014; Moradi-Motlagh and Babacan (2015).

Pure Technical Efficiency: Pure technical efficiency is arisen when a firm fails to produce maximum output by using its adopted input levels, and thus, it indicates the unproductive use of resources (Isik and Hassan, 2002; Drake and Hall, 2003). This sort of efficiency has been measured in studies like Isik and Hassan (2002), Drake and Hall (2003), Havrylchyk (2006), Garza-Garcı´a (2012), Řepková, 2014; Moradi-Motlagh and Babacan (2015).

5.5.2 Allocative Efficiency:

Allocative efficiency indicates the ability of a firm to achieve proportional reduction in costs by selecting the optimal mix of inputs to produce a given level of outputs considering the given input prices (Isik and Hassan, 2002; Qayyum and Ahmad, 2006; Widiarto and Emrouznejad, 2015). Allocative efficiency has been measured in studies like Havrylchyk (2006), Zhao (2000), Worthinton (2000), Sathye (2001), Isik and Hassan (2002), Tsionas et al. (2003), Tortosa-Ausina (2004), Neal (2004), X. Chen et al. (2005), Havrylchyk (2006), Tsionas et al. (2015).

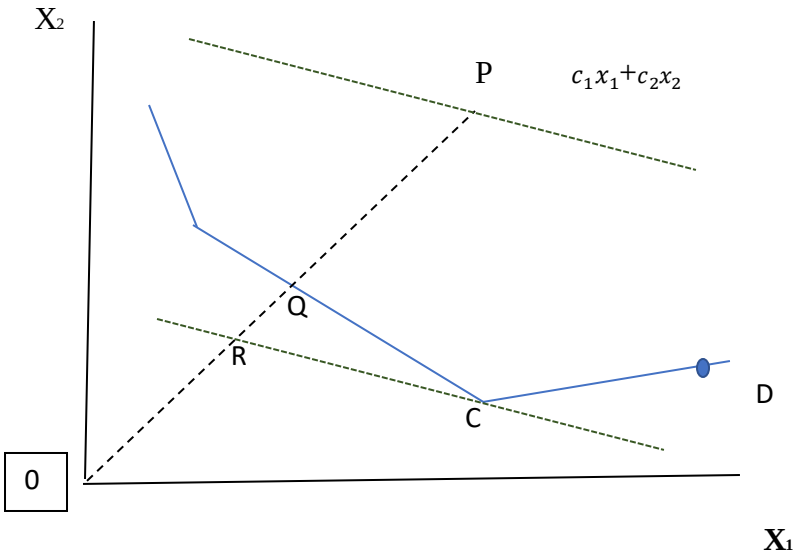

Figure: 3.1 Technical, Allocative and Cost Efficiency

In the above graph, the solid line is an isoquant showing all possible combinations of input variables with which a given level of output can be produced. Point P exists outside the production possibility curve indicating that the particular MFI needs to use greater amount of both inputs (x1 and x2) to produce the same level of a single output. The point 'P', exists out of the production

possibility curve, represents a firm that requires both the inputs in greater volume to produce the same level of output. Following Farrell, the performance of firm P can be mentioned as the distance between proportion between origin (0) to Q and origin (0) to P. Q represents a point at which the connecting line of 0 and P intersects the efficient frontier. Thus, the efficiency of firm P can be presented as below:

$$0 < \frac{d\,(0,Q)}{(0,P)} < 1$$

This form of efficiency is known as technical efficiency. To incorporate the price-cost consideration in the scenario, the dotted line has been drawn passing through P. This dotted line through P consists the equation as $c_1x_1 + c_2x_2 = k_1$, where $c_1\ and\ c_2$ represent the price of input variables $x_1\ and\ x_2$ and k_1 is the total cost. But this total cost can be minimized by changing the combination of both the inputs. To derive the minimum cost combination, I did parallelly shift the cost curve until it touches the efficient frontier which occurs at point C. If I shift the line further, the output level decreases. That means, at point C, the firm can produce the same level of output as point P but with the minimum cost. The input combination that makes the cost minimum can be mentioned as $x_1^*\ and\ x_2^*$. Thus, the cost function can be expressed as $c_1x_1^* + c_2x_2^* = k_0$. The k_0 is the minimum cost. The difference between $k_0\ and\ k_1$ indicates the amount of cost that can be reduced by reaching to optimal input combination.

Now if we look at the dotted line touching the efficient frontier at point C, we can find that the same line intersects the line from origin (0) to P at point R. The ratio between the distance of (0, R) and the distance of (0, Q) is the allocative efficiency. This allocative efficiency shows to what extent the technical efficient point Q fails to achieve the minimum cost by reallocating the input mixes and thus shifting from Q to C along the efficient frontier. Now by considering both the technical efficiency and allocative efficiency, cost efficiency can be measured by considering the distance between 0 and R as a proportion of the distance between 0 and P. The whole concept is presented as below:

Cost Efficiency = Technical Efficiency X Allocative Efficiency

$$\frac{d\ (0,\ R)}{d\ (0,\ P)} = \frac{d\ (0,Q)}{d\ (0,P)}\ x\ \frac{d\ (0,R)}{d\ (0,Q)}$$

where the cost efficiency is

$$0 < \frac{d\ (0,R)}{d\ (0,P)} = \frac{cx^*}{cx_0} < 1$$

5.6 Approaches of Efficiency Measurement:

The inputs and output selection of a financial institution to be used to measure efficiency depends on the approach. There are two different approaches to measure efficiency of a financial institution; i.e. production approach and intermediary approach. They are discussed below:

5.6.1 Intermediation Approach:

The intermediation approach treats financial institutions as an intermediary that collect deposits from economic units having surplus fund and transform these inputs into outputs of loans and other financial services to economic units in deficit to earn profit by using labor and capital (Sealey and Lindley, 1977; Gutiérrez-Nieto et al., 2007; Bassem, 2008; Pasiouras, 2008; Liu, 2008; Kao and Liu, 2014; Hou et al., 2014; Řepková, 2014; Piot-Lepetit and Nzongang, 2014; Fujii et al., 2014; Widiarto and Emrouznejad, 2015). With the intermediation approach, deposit, labor and capital are considered as inputs while loans and investments of financial institutions are taken as output (Sealey and Lindley, 1977; Gutiérrez-Nieto et al., 2007; Yin et al., 2013; Tzeremes, 2015). Studies that followed the intermediation approach in measuring efficiency of banks under SFA are Tsionas et al (2015): Bayesian dynamic frontier model, Zhang et al. (2012), Fungáčová et al. (2013), Yin et al. (2013), Gaganis and Pasiouras (2013), Goddard et al. (2014), Lensink et al. (2008), Jaffry et al. (2008), Apergis and Rezitis (2004). Under non-parametric model, his approach has been applied by Grabowski et al. (1990), Zaim (1995), McKillop et al. (1996); Noulas (1997), Resti (1997), Berger and Mester (1997), Gilbert and Wilson (1998), Kraft and Tirtiroglu (1998), Altunbas et al.

(2001), Rezvanian and Mehdian (2002), Lin (2002), Isik and Hassan (2002), Tortosa-Ausina (2002), Canhoto and Dermine (2003), Drake and Hall (2003); Chen et al. (2005); Bonin et al. (2005), Havrylchyk (2006), Das and Ghosh (2006), Gregoire & Tuya (2006), Das et. al (2007), Paxton (2007), Pasiouras (2008), Mohamad et al. (2008), Das and Ghosh (2009), Ray & Das (2010), Liu (2010), Haq et al. (2010); Garza-Garcı´a (2012), Piot-Lepetit and Nzongang (2014), Chortareas et al. (2012), Chortareas et al (2013), Lee and Chih (2013); Wang et al. (2014); Kao and Liu (2014); Fujii et al. (2014), Řepková, (2014).

5.6.2 Production Approach:

The production approach considers a financial institution as a firm that produces deposits, loans and provides other services to customers by using capital and labor as inputs (Tortosa-Ausina, 2002; Gutiérrez-Nieto et al., 2007; Pasiouras, 2008; Bassem, 2008; Liu, 2010; Servin et al. 2012; Piot-Lepetit and Nzongang, 2014; Fuji et al., 2014; Kao and Liu, 2014; Widiarto and Emrouznejad, 2015). Under this approach deposits are taken as outputs because it is considered that banks serve their customers with deposit accounts (Piot-Lepetit and Nzongang, 2014). So, under this approach the number of deposits and loan transactions are treated as the best measure of output. Benston and Smith, 1976; Berger and Humphrey, 1991; Park & Weber, 2006; Wang et al. (2014) applied this approach in their studies of measuring bank efficiency whereas Hassan & Tufte, 2001; Nghiem, Coelli, & Rao, 2006; Bassem, 2008; Haq et al., 2010; Piot-Lepetit and Nzongang, 2014 and Widiarto and Emrouznejad, 2015 used this method to measure efficiency of microfinance institutions. However, one limitation of this approach is that the data on individual transaction are not easily available for which it becomes difficult to implement this approach (Yin et al., 2013).

5.6.3 Approach Used in the Study:

MFIs are financial institutions act as intermediary in the society. They collect deposits from members and provide loan to the poor in the society. According to MRA reports, more than 35% fund of MFIs' come from deposits collected from their members. After collecting the deposits, MFIs provide loans to the poor for various purposes, specially to develop their own business,

acquiring domestic animals, do farming or create other earning sources. Because of this intermediary role, played by MFIs, in this study, I applied the intermediation approach to measure the cost efficiency of MFIs.

5.7 Input-Output Orientation

All the economic frontier models focus the input output relationship. The financial institutions use inputs to deliver outputs. Based on the assumption on input-output, the efficiency study can be of two types: Input Oriented Model and Output Oriented Model. The input-oriented model measures inefficiency if a firm can produce a given level of output by using fewer quantity of resources (inputs). The output-oriented model, on the other hand, measures inefficiency if a firm can produce more output with the given level of inputs (Kumbhakar, 2015). In this research, I used the input-oriented model. This is because in most of the cases, MFIs cannot increase their output levels due to geographical, demographical or regulatory restriction and thereby the only possible option of increasing efficiencies is to lower the inputs. Moreover, in cost minimization model, the input-oriented approach focusing on input overuse is intuitive and appropriate (Kumbhakar, 2015). An inefficient MFI incurs additional cost due to the excessive use of inputs and thereby the cost can be reduced by avoiding the excess usage of inputs.

5.8 Statistical Models Used in Efficiency Measurement

The economic efficiency analysis can be done following both parametric and non-parametric approach (Resti, 1997; Tortosa-Ausina, 2002; Drake & Hall, 2003; Havrylchyk, 2006; Das et al., 2007; Gutiérrez-Nieto et al., 2007; Ariff and Can, 2008; Masood and Ahmad, 2010; Holod and Lewis, 2011; Oteng-Abayie, 2011; Yin et al., 2013; Svitalkova, 2014; Goddard et al., 2014; Wijesiri et al., 2015; F. Fall et al., 2018). In a study made by Berger and Humphrey (1997) on 130 frontier efficiency studies of financial institutions in 21 countries, the researchers found that 69 studies applied non-parametric approach while 60 were done using parametric approaches (some

papers used more than one approach). Under parametric approach the available methods are stochastic frontier approach (SFA), thick frontier approach (TFA) and distribution-free approach (DFA) while under non-parametric approach the methods are data envelopment analysis (DEA) and free disposal hull (FDH) (Bassem, 2008; Pasiouras, 2008; Masood and Ahmad, 2010; Lee and Chih, 2013; Yin et al., 2013; Jarraya and Bouri, 2014; Riaz and Gopal, 2015). Among these different available methods, the two most commonly adopted methods are SFA for parametric and DEA for nonparametric (Drake and Hall, 2003; Oteng-Abayie, 2011; Lee and Chih, 2013). As per Resti (1997) and Tortosa-Ausina (2002) both parametric and non-parametric approaches provide same sort of efficiency result if they are applied on the same sample

5.8.1 Parametric Test: Stochastic Frontier Approach (SFA)

In parametric models, a parametric technique is used to estimate the characteristics of a best-practice unit from the efficient frontier. The method of estimating frontier function, f(x), depends on the assumption of the error component (Kumbhakar et al., 2015). There are two approaches applied in this aspect. One approach, named as Distribution Free (DF) Approach, developed by Schmidt and Sickles (1984), depicts no particular distributional assumption on the error component (Berger, 1993). The other approach known as parametric approach makes a specific distributional assumption on the error component applying the maximum likelihood.

The major problem with the Distribution Free approach is that the statistical error of the frontier function is not possible to be separated from the inefficiency effect of the model and thereby it cannot allow for both error term and inefficiency effect in the model (Kumbhakar et al., 2015). On the other hand, the SFA method, introduced by Aigner et al. (1977), Battese and Corra (1977) and Meeusen and Broeck (1977) (Yin et al., 2013), incorporates two random variables u_i and v_i by imposing parametric distributions on them. The variable u_i represents the inefficiency term and v_i indicates error term. The error term, v_i, representing shocks outside the control of a firm is assumed to have a zero mean normal distribution and independent from u_i. The main issue of this model is to make a choice regarding distributional assumption of the inefficiency term, u_i. The distribution of u_i must be in the nonnegative domain and if the two distributions of u_i and v_i are joined together,

it would ideally have a closed form. After making the distributional assumptions, the log-likelihood function of the model is formed and finally numerical maximization procedures are used to obtain the ML estimates of the model parameters (Kumbhakar et al., 2015).

5.8.1.1 Importance of Parametric Model

Firstly, the parametric model incorporates two random variables u_i and v_i by imposing parametric distributions on them. The variable u_i represents the inefficiency term and v_i indicates error term. the stochastic frontier comprises a specific functional assumption about inefficiency and error term. The measurement of inefficiencies cannot be negative, therefore it is assumed that the inefficiency term follows an asymmetrical distribution, while random errors follow a symmetrical distribution. Therefore, each functional form of inefficiency term is different as they separate inefficiency from the random error (Riaz and Gopal, 2015). Secondly, under parametric model hypotheses testing is possible (Masood and Ahmad, 2010). Thirdly, SFA identify a function in which along with inputs and outputs, other variables can also be incorporated that can describe the construction of the function (Riaz and Gopal, 2015). And finally, this technique can be applied on unbalanced panel data (Servin et al., 2012)

5.8.1.2 Disadvantages of Parametric Model

One of the main disadvantages of parametric model is the estimation of functional form. Tariq et al., 2008 and Masood and Ahmad, 2010 state that the efficiency measurement is highly dependent on the reality of functional form.

5.8.2 Non-Parametric Model: Data Envelopment Analysis (DEA):

It is complicated to measure efficiency of large firms as it needs to involve a complex multi-input/output structure (Moradi-Motlagh and Babacan, 2015). The concept of best-practice frontier, first was formulated by Farrell (1957) and later was presented by Charnes et al. (1978) as an algorithm for measuring efficiency, which is now known as data envelopment analysis (DEA)

(Canhoto and Dermine, 2003; Kao and Hwang, 2008; Bassem, 2008; Das and Ghosh, 2009; Haq et al., 2010; Holod and Lewis, 2011; Huang and Eling, 2013; Řepková, 2014). Data envelopment analysis (DEA) model, by design, account for multi-input/output structure efficiently and effectively (Emrouznejad et al., 2008; Das and Ghosh, 2009; Haq et al., 2010; Holod and Lewis, 2011; Harris et al., 2013; Řepková, 2014; Piot-Lepetit and Nzongang, 2014). The non-parametric, DEA approach, provides a piecewise linear frontier by enveloping the observed data points (Das and Ghosh, 2009; Haq et al. 2010; Lee and Chih, 2013). DEA estimates an efficient frontier including the set of the most efficient institutions, which allows a direct comparison to the best performers. All the firms on the frontier are peers and surpasses the performance MFIs that are not on the efficient frontier (Piot-Lepetit and Nzongang, 2014; Holod and Lewis, 211). DEA frontier thus represents the set of efficient observations for which no other production unit or linear combination of units employs as little or less of every input without changing the output quantities generated or produces as much or more of every output without altering the input quantities used (Isik and Hassan, 2002; Holod and Lewis, 2011; Piot-Lepetit and Nzongang, 2014). Hence, this technique has come to be termed DEA (Drake and Hall, 2003). It is based on the linear programming and has the purpose of identifying empirical functions of productions (Bassem, 2008). The method has been proven to be a powerful benchmarking technique to measure the relative efficiency of business organizations in different industries, sectors, portfolios, and even economic efficiency of countries (Kirigia et al., 2002; Emrouznejad, 2003; Boubakri et al., 2005; Christopoulos, 2007; Emrouznejad and Anouze, 2009, 2010; Khodabakhshi, 2009; Moffat and Valadkhani, 2011; Lo, 2013; Peng et al., 2013; Miningou and Vierstraete, 2013; Thilakaweera, 2014; Moradi-Motlagh and Babacan, 2015). The structure of DEA model ensures that an inefficient MFI and its efficient peers would produce a similar bundle of products using similar resources under the same environmental conditions. As a result, the efficient firms can be easily compared with the inefficient one which helps them to improve the performance of MFIs (Berger & Humphrey, 1997).

DEA approach measures efficiency by comparing each firm in an industry to the ‘‘best-practice’’ frontier derived from the best firms in the industry (Huang and Eling, 2013; Cummins et al., 2010; Pasiouras, 2008). Every firm is considered as a decision-making unit (DMU) who transforms

inputs into outputs. Every DMU thus consumes 'm' amount of various inputs to produce 's' amount of outputs. The DMU (j) consumes an amount X (ij) of inputs (i = 1, … m) and produces an amount Y (rj) of outputs (r = 1, … s) (Bassem, 2008). The method uses linear programming method to construct a piecewise linear surface over the observed data. DEA connects the point representing the lowest cost to produce a given output level to form the efficiency frontier. It assumes the production possibility curve to be convex and both inputs and outputs are freely disposable. The method constructs the efficient frontier surface considering the given set of decision-making units (DMUs) and assumes all DMUs onto this frontier. A firm standing on the frontier is considered as fully efficient (efficiency of 1.0) and if the firm exists outside the frontier, it is considered as inefficient (efficiency < 1) (Das and Ghosh, 2009; Cummins et al., 2010).

5.8.2.1 Advantages of DEA Method:

Frontier efficiency analysis is capable to measure a firm's performance by considering different variables in a single measure controlling the differences among firmswhich is not possible in traditional ratio analysis (Huang and Eling, 2013; Cummins and Weiss, 2000). The DEA approach contains some attractive statistical characteristics. First, Banker (1993) mentions DEA as equivalent to the maximum likelihood estimation. Second, the DEA estimators are unbiased when there is no underlying model or reference technology. If one believes in an underlying model, then the problem of biasness in DEA estimates arises which is again deceases with sample size (Kittelsen, 1998). Third, DEA estimators are consistent and converge faster than estimators from other frontier methods (Grosskopf, 1996). Fourth, according to Banker and Natarajan (2008) DEA performs better than parametric procedures in estimating productivity of individual decision making unit. Fifth, as per Cooper et al (2007) DEA does not require the user to prescribe weights to be attached to each input and output, as in the usual index number approaches. Sixth, for the DEA method, researchers need not to assume the functional form relating inputs to outputs (Diallo, 2017; Barth et al., 2013; Lee and Chih, 2013; Haq et al., 2010; Das and Ghosh, 2009; Pasiouras, 2008; Bassem, 2008; Canhoto and Dermine, 2003). Seventh, no information of price is required in DEA as is required for parametric approaches (Haq et al., 2010). Finally, DEA approach can be applicable for small sample size (Pasiouras, 2008; Haq et al., 2010).

5.8.2.2 Disadvantages of DEA Method:

One of the major problems with DEA model is that it is not able to segregate the statistical noise or the measurement errors from random errors. Thus, the efficiency scores obtained from DEA model may be contribution of uncontrollable factors (Canhoto and Dermine, 2003; Worthington, 2004; Pasiouras, 2008; Lee and Chih, 2013; Moradi-Motlagh and Babacan, 2015). In other words, DEA features any deviation from the efficient frontier as being fully related to inefficiency. Therefore, DEA may overstate the true levels of relative inefficiency in some cases (Drake and Hall, 2003; Berger and Mester, 1997; Grosskopf, 1996). However, Banker and Natarajan (2008) show that the two-stage approach of DEA (DEA followed by regressions) is statistically consistent in a composed error framework, i.e., like SFA, DEA in such way can incorporate one and two-sided random errors. Another problem of DEA is that it gives the efficiency score only considering the given sample and the efficiency of the same firm may change if the sample is changed (Řepková, 2014).

5.8.3 Comparative Analysis between Parametric Model and Non-Parametric Model:

Superiority of Parametric Model:

(1) The non-parametric model cannot separate the statistical noise from random errors and defines the overall deviation of observed variable from the frontier as inefficiency. Thus, the relative efficiency scores obtained from DEA may include the effects from the uncontrollable factors (Moradi-Motlagh and Babacan, 2015; Lee and Chih, 2013; Pasiouras, 2008; Worthington, 2004; Canhoto and Dermine, 2003). In other words, DEA attributes any deviation from the efficient frontier fully as inefficiency and thus may overstate the actual levels of inefficiency for some units (Drake and Hall, 2003; Berger and Mester, 1997; Grosskopf, 1996). On the other hand, parametric model distinguishes the deviation into two parts, one is due to inefficiency and the other part is due to statistical noise (Gregoire and Tuya, 2006; Masood and Ahmad, 2010; Servin et al., 2012).

(2) Under non-parametric model hypotheses testing cannot be done which is possible for the parameters estimated by parametric methods (SFA) (Masood and Ahmad, 2010).

(3) The stochastic frontier comprises a specific functional assumption about inefficiency and error term. Inefficiencies are assumed to follow an asymmetrical distribution, either half normal or truncated normal, whereas random errors follow a symmetrical distribution called standard normal. Therefore, each functional form of inefficiency term is different in the way they separate inefficiency from the random error (Riaz and Gopal, 2015).

(4) In SFA other variables can be incorporated to describe the structure of the function apart from input and output variables (Riaz and Gopal, 2015).

(5) This technique can be applied on unbalanced panel data (Servin et al., 2012)

Superiority of Non-Parametric Model:

Banker and Natarjan (2008) proves in their study that DEA performs better than the parametric models in respect of estimating productivity of individual decision making unit. Cummins et al. (2010) has mentioned several advantages of DEA model over SFA:

(1) The SFA approach requires to specify a functional form linking the independent variables with one or several dependent variables (Bassem, 2008). Such assumptions can create specification errors (Berger & Humphrey, 1997; Bassem, 2008; Das and Ghosh, 2009; Yin et al., 2013). But DEA requires no such distributional assumptions for the technical, cost, or revenue function.

(2) DEA provides efficiency estimation based on individual-firm which makes it easier to understand efficiency pattern by firm. This facilitates the study of scope economies.

(3) Through DEA it is convenient to decompose cost and revenue efficiency into further efficiency components like pure technical, scale, and allocative efficiency.

(4) Parametric techniques provide reliable estimates when the sample size is large enough (Isik & Hassan, 2002). On the other hand, the DEA-based technique, gives better measurement on a small sample size (Ariff and Can, 2008). However, Sturm and Williams (2004) has applied both parametric and non-parametric model in their study.

5.8.4 Statistics Used in the Study:

In general, the microfinance institutions consider multiple inputs and produce multiple outputs and attempt to alleviate poverty and achieve sustainability. To measure the cost efficiency of MFIs in Bangladesh, in this study, I have used both parametric and non-parametric models. Under parametric approach, Stochastic Frontier Approach (SFA) and under non-parametric approach, Data Envelopment Analysis (DEA) have been has been applied. The study includes both parametric and non-parametric model following the studies of Resti, 1997; Isik and Hassan, 2002; Rezvanian and Mehdian, 2002; Sturm and Williams (2004); Liu and Tone, 2006 and Casu et al., 2013.

5.9 Model Specification:

5.9.1 Cost Efficiency Under Parametric Model: SFA

The cost function of a firm can be expressed as

$$C^*(w,y) = \sum w_{ij}\, x_{ij}\, e^{-\eta} \qquad \text{.....(1)}$$

The above equation can be taken as the minimum cost function for the problem:

$$\min_{x_j e^{-\eta}} w' x e^{-\eta} \qquad s.t.\ y = f(x\, e^{-\eta}) \qquad \text{.....(2)}$$

The cost function C* (.) indicates the minimum attainable cost to produce output y given the vector of input prices w. Here the minimum cost is attainable by adjusting the inputs to produce y level

of output. Thus, the actual cost will be greater than the minimum cost. Therefore, the actual cost can be expressed as below:

$$C^a = \sum_{ij} w_{ij}\ x_{ij} = C^* \exp(\eta) \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

$$or \quad lnC^a = lnC^*(w,y) + \eta \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

Equation (4) above shows that log actual cost differs from log minimum cost by the amount of η which incurs because of overuse of inputs. The efficiency index for an MFI can be formed by taking the ratio of minimum cost to actual cost as follows:

$$\exp(-\eta) = \frac{C^*}{C^a} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (5)$$

By construction, the value of exp (-η) should be in between 0 to 1 where the higher values indicating higher level of efficiency.

The parametric technique estimates individual MFI's efficiency scores by measuring deviations of costs from the cost frontier estimated from the sample data. The stochastic frontier approach (SFA) assumes that total cost deviates from the optimal cost by a random disturbance or measurement error, v, and an inefficiency term, u (Holod and Lewis, 2011; Fungáčová et al., 2013; Lee and Chih, 2013; Carvallo and Kasma, 2005). That means the stochastic frontier approach disentangles inefficiency from random error by assuming a normal distribution for the random error and a one-sided distribution for the inefficiency term.

In this study, panel data set has been used to measure efficiency of MFIs in Bangladesh. To conduct the research, I have used the approach suggested by Battese and Coelli (1995) where the mean inefficiency component is a function of a set of observable variables. Also, the model assumes that time itself has an impact on cost efficiency of MFIs. That means over time the efficiency level of firms change. Thus following the model, the cost function becomes as following:

$$\ln TC_{ij} = \ln f(y_{ij}, w_{ij}, z_{ij}, t; B) + v_{ij} + u_{ij}$$

where i = 1,…….N and j = 1,……T (6)

where tc_{ij} indicates total cost of MFI i over j period, $y_{ij}$is the vector of output, w_{ij} is the vector of input prices, t is the time trend that measures intangible technical progress and z_{ij} are the control variables. B is the set of unknown parameters which need to be estimated. v_{ij} represents classical statistical error term that reflects the effect of errors of measurement of the variables, bad luck, etc. It can have both positive and negative values, therefore has a two-sided normal or symmetric distribution as $N(0, \sigma_{vi}^2)$. The distribution of v_{ij} is independent from that of u_{ij}. u_{ij} is the measurement of cost inefficiency which includes both technical inefficiency (using excessive amounts of the inputs to produce a given level of outputs) and allocative inefficiency (failure to maintain optimally mix of input relative to prices of inputs) (Carvallo and Kasman, 2005). The inefficiency measurement u_{ij} cannot have a value less than 0, that means it is a one-sided, non-negative ($u_{ij} \geq 0$) stochastic element. The best-practice firm will have the minimum value of u_{ij} over the sample. The SFA needs specific distributional assumptions for the inefficiency measurement. The specification and econometric estimation of a statistical or parametric function/frontier may create hurdles for researchers (Lee and Chih, 2013; Holod and Lewis, 2011; Bassem, 2008; Drake and Hall, 2003). And the exactness of the efficiency estimates in the parametric approach is depends on the appropriate choice of the functional forms (Drake and Hall, 2003; Sun et al, 2013). The alternative assumptions mentioned by Kumbhakar et al., 2015 about inefficiency measurement are half-normal distribution, truncated normal distribution and exponential distribution. As in this study, I am following the Battese and Coelli (1995) approach, the model assumes truncated normal distribution of inefficiency term. Maximum Likelihood method is used to measure the parameters of the cost frontier as well as the cost inefficiency specification.

In line with most of the cost efficiency literature, I adopted a Translog functional form in modeling the cost function, since it does not require too many restrictive assumptions about the nature of the technology. Besides the cost function is homogeneous of degree 1in the input prices. So it has to satisfy the following additional parameter restrictions:

$$\sum_j \beta_j = 1, \qquad \sum_j \beta_{jk} = 0 \; \forall \; k, \qquad \sum_j \beta_{jy} = 0 \qquad \ldots\ldots\ldots\ldots\ldots\ldots (7)$$

An easier way to impose the price homogeneity condition is to use w_{ij} for an arbitrary choice of j and normalize C_{ij}^{a} and other input prices by it. After adjusting the homogeneity requirements, the cost function would have the following format:

$$\ln\left(\frac{tc_{ij}}{w_{1,ij}}\right) = \beta_o + \beta_y \ln y_{ij} + \beta_2 \ln(\frac{w_{2,ij}}{w_{1,ij}}) + \frac{1}{2}\beta_{yy} (\ln y_{ij})^2 + \frac{1}{2}\beta_{22} \ln(\frac{w_{2,ij}}{w_{1,ij}})^2 + \beta_{2y} \ln(\frac{w_{2,ij}}{w_{1,ij}}) \ln y_{ij} + z_{ij} + t + v_{ij} + u_{ij}$$

…….. (8)

The above equation is equivalent to the one obtained by dividing C_{ij}^{a} and other input prices (w_{2ij} in this case) by w_{1ij}. We can also express β_2, β_{12}, and β_{22} as functions of β_1 and β_{11} considering the price homogeneity conditions, and derive a similar model that has w_{2ij} appearing as the normalizing price. That is, price homogeneity can be built into the model by an arbitrary choice of w_{1ij} and w_{2ij} as the normalizing price.

To assess efficiency, following equation (8), one output and three inputs have been considered. The details of the selected input-output is given in Table: 5.1

Table: 5.1

List of Input & Output Variables under SFA

Input/ Output	Variable Name	Studies Included the Variable
Output (y)	Gross Loan Portfolio	Berger and Humphrey (1992, 1997), Canhoto & Dermine (2003), Drake & Hall (2003), Drake & Park (2003), Carvallo and Kasman (2005),Weber (2006), Lensink et al. (2008), Lee and Chih (2013), Fungáčová et al. (2013), Goddard et al. (2014), Tsionas et al. (2015), Liu and Tone (2006), Zhang et al. (2012), Yin et al. (2013)

Input	Labor (no. of Employees)	Berger and Humphrey (1992, 1997), Canhoto & Dermine (2003), Park & Weber (2006)
	Fund (Deposit)	Berger and Humphrey (1992, 1997), Drake & Park (2003), Drake & Hall (2003), Park & Weber (2006), Drake et al. (2007), Lee and Chih (2013), Yin et al. (2013), Tsionas et al. (2015)
	Capital (Fixed Assets)	Berger and Humphrey (1992, 1997), Canhoto & Dermine (2003), Park & Weber (2006), Lee and Chih (2013), Drake & Park (2003), Drake & Hall (2003), Zhang et al. (2012), Yin et al. (2013), Tsionas et al. (2015)
Input Prices	Price of Labor (w_l) (Personnel expense/ No. of employees)	Carvallo and Kasman (2005), Lensink et al. (2008), Fungáčová et al. (2013), Goddard et al. (2014)
	Price of Fund (w_f) (Finance expense/ Deposit)	Carvallo and Kasman (2005), Fungáčová et al. (2013), Goddard et al. (2014)
	Price of Capital (w_k) (Operating expense/ Fixed Assets)	Carvallo and Kasman (2005), Lensink et al. (2008), Fungáčová et al. (2013), Goddard et al. (2014),

As I have used Battese and Coelli (1995) Model, the model includes control variables and determinant variables in the same cost function. As control variables, I have considered two variables. First, loan loss reserve (LLR) as a proportion of gross loan outstanding to control for differences in the risk-taking attitude of MFIs (Fries & Taci, 2005; Lensink, Meesters, & Naaborg, 2008). The second control variable taken is the equity to total assets ratio (EQUITY) as a measure of the differences in risk taking by MFIs as is suggested by Berger and De Young (1997), Dietsch and Lozano-Vivas (2000), Lozano-Vivas, Pastor, and Hasan (2001), Grigorian and Manole (2006)

and Hermes et al. (2011). Altunbas et al. (2007), Fiordelisi et al. (2011) reported a positive relationship between inefficiency and bank risk-taking.

In equation (8), any input price can be chosen as $w_{1,i}$ to divide the total cost C^a as well as the other input prices. In this study, the cost of fund (w_f) has been used to divide cost and other input prices and thereby the cost function would turn as below:

$$ln\left(\frac{tc_{ij}}{w_f}\right) = \beta_0 + \beta_y lny_{ij} + \beta_l \ln(\frac{w_l}{w_f})_{ij} + \beta_k \ln(\frac{w_k}{w_f})_{ij} + \frac{1}{2}\beta_{yy} lny_{ij}\, lny_{ij} + \frac{1}{2}\beta_{ll} \ln(\frac{w_l}{w_f})_{ij} \ln(\frac{w_l}{w_f})_{ij} + \frac{1}{2}\beta_{kk}\, ln\,(\frac{w_k}{w_f})_{ij} ln(\frac{w_k}{w_f})_{ij} + \beta_{lk}\, ln\,(\frac{w_l}{w_f})_{ij} ln(\frac{w_k}{w_f})_{ij} + \beta_{ly}\, ln\, y_{ij}\, ln(\frac{w_l}{w_f})_{ij} + \beta_{ky}\, ln\, y_{ij}\, ln(\frac{w_k}{w_f})_{ij} + year + (year)^2 + year * ly_{ij} + year * \ln\left(\frac{w_l}{w_f}\right) ij + year * (\frac{w_k}{w_f})_{ij} + llr + equity + v_{ij} + u_{ij}$$

…….(9)

In the above equation, time trend variable has been considered as the variable year. As per Battese and Coelli (1995) model, the variable, year, has been considered individually, in square form and also as having interaction with input and output variables.

Along with the efficiency measurement, another objective of this research paper is to examine the trade-off between efficiency and outreach of MFIs in Bangladesh. For this purpose, I have taken an empirical model, where the measurement of inefficiency has been considered as dependent variable (μ_{ij}) and a number of outreach measures as independent variables. The model specification is as follows:

$$\mu_{ij=}\, \delta_0 + \delta_1 ALB_{ij} + \delta_2 Women_{ij} + \delta_3 Age_{ij} + \delta_4 Size_{ij} \qquad (10)$$

In equation (10), μ_{ij} is the first moment of the inefficiency measure for MFI i at time j, as is derived from the cost function. The higher value of μ_{ij} , indicates more inefficiency of the MFI. The first two variables ALB and Women indicate outreach of MFIs as is found in literature, like Ferro Luzzi and Weber, 2006; Makame & Murinde, 2006; Olivares-Polanco, 2005; Paxton, 2007; Hermes et al., 2011. As per Hermes et al. (2011), these two variables are the best indicator of outreach of MFIs. The first independent variable, ALB, stands for average loan balance per borrower which is derived by dividing the gross loan amount with the number of borrowers. To conduct the function, log value of average loan balance per borrower has been utilized. Higher is the value of ALB, the less is the depth of outreach of MFI as it indicates that the MFI has provided fewer loans to the poor borrowers. So, in case of ALB, I expect a negative relation between ALB and inefficiency of MFI. This is because, as ALB increases, outreach of MFI decreases which leads to increase in efficiency or in other words duction in inefficiency.

The second variable, Woman denotes the percentage of female borrowers in the total loan portfolio of the MFI, which is calculated as number of women borrowers divided by total number of borrowers. The higher is the proportion of women borrowers, the more depth of outreach it reflects for the MFIs, since lending to women means lending to poor borrowers. It is expected here that the independent variable women will have a positive relation with dependent variable. This would imply that with the increase in women borrower proportion as outreach of MFIs increases, the inefficiency of MFIs will also increase.

Besides, the outreach measurement, two other variables have been included in the model, i.e. Age and Size. Age indicates for how many years the MFI is in operation. Adding this variable will let the opportunity to verify whether older, more experienced MFIs are more efficient. Alternatively, it may happen that older MFIs may prove to be less efficient as they need to learn how to cope with microfinance practices by trial and error. Whereas newly established MFIs may profit from the knowledge with respect to microfinance practices that has been built-up during the past few decades. In first case, the coefficient of Age should have been negative and for the second case positive. Hermes et al., 2011; Oteng-Abayie, 2011; Quayes and Khalily, 2014 judged the effect of Age on MFI efficiency in their studies.

A number of studies on bank efficiency with parametric model has linked size of banks with efficiency level of the bank, like Carvallo & Kasman (2005); Kasuya (1986); Yoshioka and Nakajima (1987); Tachibanaki et al. (1991); Fukuyama (1993); McKillop et al. (1996); Yin et al. (2013); Tsionas et al. (2015); Altunbas et al. (2000); Gasaymeh (2016). Even in the efficiency studies on MFIs, Bassem (2008); Hermes et al. (2011); Hudon and Traca (2011); Quayes and Khalily (2014) have shown impact of size on the efficiency level of MFIs. This variable will help me to judge economies of scale if exists any.

5.9.2 Cost Efficiency Under Non-Parametric Model: DEA

In this part the non-parametric model, DEA, has been explained to examine the cost efficiency of MFIs in Bangladesh. In this section, I used the two-stage model as has been followed by Banker and Natarajan (2008), Cummins et al. (2010), Lee and Chih (2013). In the first stage, the non-parametric model, DEA, has been chosen to apply to measure the efficiency of selected MFIs in Bangladesh. In the second step, I applied Tobit regression model to observe the impact of the determinant variables on cost efficiency. In this regard, I took the same variables as I chose for SFA model. In this section, therefore, at first I will explain the DEA model and then will mention about the Tobit model.

5.9.2.1 Data Envelopment Analysis

DEA is a linear programming technique that forms the production possibility curve as the piecewise linear combinations connecting the set of best practice firms. In this method, the production possibility curve comes out as a convex one. Therefore, DEA does not require the explicit specification of the form of the underlying production relationships (Charnes, Cooper, Lewin, & Seiford, 1995; Bauer, Berger, Ferrier, & Humphrey, 1998). The DEA model has been chosen because of the comparative advantages of the model as already has been discussed earlier. Moreover, our main concern of this study is microfinance institutions and in general the microfinance institutions consider multiple inputs and produce multiple outputs including poverty

alleviation and sustainability achievment. The DEA model is particularly well-suited for incorporating these multiple inputs and outputs (Haq et al., 2010). The DEA model can provide information to the supervisors to improve the productive efficiency of the organization (Haq et al., 2010). Finally in different literature on non-profit organizations' efficiency measurement, this model has been applied (Sherman and Gold 1985). In general, a cost function could be expressed as:

$$C = C\ (p, y, v, \varepsilon) \qquad (11)$$

here C is the total cost of MFI, p the vector of input prices, y is the vector of outputs, v represents the inefficiency term that captures the difference between the efficient level of cost for a given output level and input prices and the actual level of cost, and lastly, ε is the random error term. In DEA, either constant returns to scale (CRS) or variable returns to scale (VRS) assumption can be hold. The CRS assumption can be applied if all the decision making units (DMUs) are operating at an optimal scale (Banker, Charnes, & Cooper, 1984). But the MFIs in Bangladesh are not fully developed and therefore perfect competition does not exist. So, in this study, I used the VRS assumption. Under the VRS assumption, the cost efficiency is estimated by using the input-orientated model as MFIs are unable to change outputs due to demographical, geographical, or regulatory restriction thus only face option of lowering inputs to increase efficiencies. Following the assumptions, the linear programming cost function becomes as follows:

$$Min_{x_{js}} \ \sum_{j=1}^{N} \ w_{js} \ x_{js} \qquad \ldots\ldots\ldots\ldots\ldots\ldots(12)$$

subject to:

$$y_{is} \ \leq \ \sum_{s=1}^{S} \lambda_s \, y_{is} \qquad i = 1, \ldots\ldots, m$$

$$x_{js} \geq \sum_{s=1}^{S} \lambda_s \, x_{js}, \qquad j = 1, \ldots\ldots\ldots, n$$

$$\sum_{s=1} \lambda_s = 1; \quad \lambda_s \geq 0; \quad s = 1,2 \ldots\ldots\ldots\ldots S$$

In the above equation s is the no of MFIs in sample that use a vector of inputs $x = (x_1, x_2, \ldots\ldots\ldots, x_n)$ for which they pay prices $w = (w_1, w_2, \ldots\ldots\ldots w_n)$ to produce a vector of

outputs $y_{ij} = (y_1, y_2, \ldots\ldots\ldots y_m)$. In order to compute the cost efficiency scores, equation (12) has to be solved for each s firm in each time period. The solution is provided by a cost minimizing vector, $x_s^* = (x_{s1^*} \ldots\ldots\ldots\ldots\ldots\ldots, x_{jS^*})$, from a linear combination of firms that minimizes cost of MFIs to produce at least as much outputs as firm s does, using the same or less amount of inputs given the input prices. This hypothetical firm that attains cost efficiency then would have a cost $C_s^* = \sum\ w_{js}\ x_{js}^*$ which, by definition would be less than or equal to that of firm s ($C_s = \sum\ w_{js}\ x_{js}$). The cost efficiency for firm s (CE_s) then can be calculated as follows:

$$CE_s = \frac{C_s^*}{C_s} = \frac{\sum\ w_{js}\ x_{js}^*}{\sum\ w_{js}\ x_{js}} \qquad \ldots\ldots\ldots\ldots\ldots\ldots(13)$$

Where CE_s indicates the ratio between the minimum costs (C_s^*) using the input vector (x_s^*) and the observed costs (C_s) for firm s. As per the format of the equation, the efficiency score ranges from 0 to 1, and equals to one for the best-practice MFI in the sample. On the other hand, if I want to know about the inefficiency score, that can be found from the following way:

$$\text{Cost Inefficiency} = \frac{1}{CE_s} - 1 \qquad \ldots\ldots\ldots\ldots\ldots\ldots(14)$$

The above equation shows the extent to which firm s incurs higher cost to produce the same level of output for operating out of the efficient frontier. To get to the solution to the above equations, at this level, it is important to identify the input and output variables. As in this study, I have applied both parametric and non-parametric models, to establish homogeneity in findings, I used the same input-output variables in both the two models. Also in literature of non-parametric studies, much support is found behind the selection of the variables which are presented in Table: 5.2.

Table: 5.2

List of Input & Output Variables under DEA

Input/ Output	Variables	Study Included the Variable
Output	Loans	Resti (1997), Worthington (2000), Isik and Hassan (2002), Tortosa-Ausina (2002), Ausina (2004), Chen et al. (2005), Havrylchyk (2006), Das et. al (2007), Ariff and Can (2008), Das and Ghosh (2009)

Input/ Output	Variables	Study Included the Variable
Input	Deposit	Worthington (2000), Isik and Hassan (2002), Tortosa-Ausina (2002), Ausina (2004), Havrylchyk (2006), Ariff and Can (2008), Das and Ghosh (2009)
	Labor (no. of employees)	Worthington (2000), Resti (1997), Isik and Hassan (2002), Tortosa-Ausina (2002), Ausina (2004), Havrylchyk (2006), Das et. al (2007), Ariff and Can (2008), Das and Ghosh (2009)
	Physical Capital (Fixed Assets)	Resti (1997), Worthington (2000), Isik and Hassan (2002), Tortosa-Ausina (2002), Ausina (2004), Havrylchyk (2006), Ariff and Can (2008), Das and Ghosh (2009)
Input Prices	Price of capital (operating expense/ fixed assets)	Resti (1997), Worthington (2000), Isik and Hassan (2002), Tortosa-Ausina (2002), Ausina (2004), Chen et al. (2005), Havrylchyk (2006), Ariff and Can (2008), Das and Ghosh (2009)
	Price of labor (labor expense/ no. of employee)	Resti (1997), Worthington (2000), Isik and Hassan (2002), Tortosa-Ausina (2002), Ausina (2004), Chen et al. (2005), Havrylchyk (2006), Das et. al (2007), Ariff and Can (2008), Das and Ghosh (2009)
	Price of fund (interest expense)/ total deposit fund)	Worthington (2000), Isik and Hassan (2002), Tortosa-Ausina (2002), Ausina (2004), Chen et al. (2005), Havrylchyk (2006), Ariff and Can (2008), Das and Ghosh (2009)

5.9.2.2 Tobit Regression Model

As has already been mentioned with literature reference in SFA discussion, in my analysis I chose four determinant factors of cost efficiency and have observed their dimension and parameter of influence. To do this second line of analysis here I have applied Tobit regression model in which the cost efficiency score, derived in step 1, has been taken as dependent variable and the outreach variables (average loan balance per borrower (ALB) and percentage of women borrower (Women),

age and size have been used as explanatory variables. These independent variables are same as I used in SFA analysis. From literature review, these four variables have been found to influence the efficiency of financial institutions as well as MFIs in different countries. The literature support behind these selected variables have already been mentioned in earlier discussion. Here, Tobit Regression analysis has been used as the dependent variable (cost efficiency measure) lies in between 0 to 1. Rezitis (2006), Ariff and Can (2008), Pasiouras (2008), Das and Ghosh (2009), Hsiao et al (2010), Garza-Garcı´a (2012), Lee and Chih (2013), Harris et al. (2013) used the same Tobit analysis in their second step of research to find the determinant factors of efficiency. Thus, I can express the equation as follows where my null hypothesis is that none of the independent variables have any impact on MFIs' cost efficiency.

$$\text{C. E.} = \beta_0 + \beta_1 ALB + \beta_2 Women + \beta_3 Age + \beta_4 Size$$

5.10 Data

To conduct the research, I collected data from two prominent and reliable sources, one is Palli Karma-Sahayak Foundation (PKSF) and the other is Microcredit Regulatory Authority (MRA). PKSF is a mot for profit organization, established by the Government of Bangladesh in 1990 with an objective to achieve sustainable poverty reduction. The other source, MRA was established by the Government of Bangladesh in 2006 with an objective to bring all the MFIs in the country under regulatory framework. An extensive panel data set of 481 MFIs over 6 years (2013-2018) has also been collected from MRA. But unfortunately, MRA could not provide me all required information. So, I collected panel data on 146 MFIs over 5 years period (2016 to 2020). Both the data source was secondary, i.e. the financial report provided by the members MFIs. However, in applying the SFA approach, I used both the two data set to verify the acceptability of the results.

5.11 Conclusion:

To evaluate the MFIs in Bangladesh, in this research, I measured cost efficiency. In literature, efficiency measurement is mainly done through parametric and non-parametric method. This

chapter discussion focuses on the pros and cons of both the two methods. As each method has its own superiority over the other, in this study I applied both the approaches. Under both parametric and non-parametric method, intermediation approach has been adopted as MFIs act as intermediary collecting deposit from the small savers and providing loan to borrowers. The input-oriented model has been used. To apply the statistics, data has been collected from both MRA and PKSF. The SFA model has been applied on both the data set. The findings of my study is discussed in the next section.

Chapter: 6
Findings

6.1 Introduction:

In my research, I measured cost efficiency which indicates the ability of an MFI to produce a given level of output with minimum cost following a given input combination. In other words, cost efficiency shows that if an MFI is allocative and technically efficient, then at what reduced cost the MFI could have produced the same level of output (Hermes et al., 2011). The cost efficiency of individual MFI is calculated by comparing a given MFI's cost structure with that of the best practice MFI. Most of the literature regarding the cost efficiency either uses Stochastic Frontier (SFA) model as a parametric test or uses Data Enveloped Analysis (DEA) model as a non-

parametric test. The details of the two models along with a comparative scenario has been discussed in the previous chapter. In this chapter, the findings of my study are presented following both SFA and DEA models. The findings show resemblance with the study of Resti (1997) that the cost efficiency under both the parametric and non-parametric approaches does not differ substantially.

6.2 Parametric Approach:

Under parametric approach the stochastic frontier approach (SFA) proposed by Aigner et al. (1977) has been used to measure cost efficiency of each MFI. The Translog format of SFA following log likelihood model of Cobb Douglas is used in modeling the cost function. The same model has been used in literature of cost efficiency by Carvallo and Kasman (2005). The details discussion about the cost function is presented in Methodology Chapter. To conduct the analysis, the Bettesi & Coelli (1995) model has been applied following Fiordelisi (2007), Duygun et al. (2013), Gaganis and Pasiouras (2013), Kasman and Carvallo (2014), Riaz and Gopal (2015), Quayes and Khalily (2014) and Hermes et al. (2011). The advantage of the model is that it measures cost frontier with panel data along with inefficiency equation (Hermes et al., 2011). I considered the intermediation approach as MFIs act as intermediary by collecting deposit and generating loan facilities to its members (Carvallo and Kasman, 2005). The input-oriented model has been applied which assumes that an MFI faces additional cost due to overuse of inputs (Kumbhakar et al., 2015). The results of the SFA model are described below in two parts. At first the model is applied on the data set collected from PKSF and then a comparative study has been done based on the two separate data set i.e., PKSF data and MRA data.

6.2.1 SFA with PKSF Data

The cost efficiency has been measured on a panel data set of 146 MFIs of Bangladesh over 5 years (i.e. 2016- 2020) period with a total 780 observations. The data has been collected from Palli Karma-Shahayak Foundation (PKSF), a financial institution established by government for the purpose of sustainable poverty reduction through generating self-employment opportunities.

Following the intermediation approach, loan amount extended by MFIs is considered as the only input whereas price of fixed assets, price of deposit collected and price of labor are the three inputs used in the cost measurement (Carvallo and Kasman, 2005). Here I have taken loan loss reserve and equity financing as the control variables. The Battesi and Coelli (1995) model specifies the cost structure by considering the control variables and also includes the effect of determinant variables in the same cost function. The translog format of cost function has been applied by dividing the total cost, output variable, price of labor and price of capital by price of fund and then taking log of the results. This is done to ensure the price homogeneity condition (Kumbhakar et al., 2015).

As the study focuses on microfinance institutions, it is well established that there exists a paradigm between efficiency and outreach in microfinance institutions. To investigate the trade-off between outreach and efficiency, a specific to general approach as suggested by Brooks (2002) has been applied in this study where the two outreach variables average loan balance and percentage of women borrowers are first considered separately and then together in one regression. Average loan balance per borrower and percentage of women borrower have been taken as measure of outreach of MFIs following Widiarto and Emrouznejad (2015), Piot-Lepetit and Nzongang (2014), Hermes et al. (2011); Bassem (2008) and Lapneu and Zeller (2002). The first three models in Table 6.1 (1-3) consider no time frame assuming that time trend has no impact on cost efficiency. The rest of the four studies (4-7) include time frame by considering year dummy variable assuming that time has no significant influence over the cost efficiency of microfinance institutions in Bangladesh. In these models [4-7] under the specific to general model, along with average loan balance per borrower and percentage of women borrower, age and size of MFIs have been included as determinant variables. Thus total 7 models are conducted considering the same cost function by changing some parametres following Hermes et al. (2011).

6.2.1.1 Empirical Results in Model 1-7:

Under Panel A, model 1-7 shows the cost frontier which indicates how the output variable, input prices i.e. price of capital, price of labor and price of fund and control variables i.e. loan loss

reserve and equity capital relate with the dependent variable i.e. the total cost of MFIs. All the models show same effect of the independent variables upon the cost structure. The output variable i.e. gross loan portfolio of MFIs has a significant positive impact on total cost indicating that as MFIs disburse more loan amount in society, the cost of MFI increases. This result matches with the findings of Quayes and Khalily (2014) who also applied SFA model on MFIs in Bangladesh. Among the two input prices, price of labor has a negative effect on cost whereas price of capital has a positive effect. Both these two factors have statistically significant relationship with the cost. The negative relation of price of labor indicates that as the remuneration of each employee of MFIs increases, the total cost reduces. As Brigham states higher compensation motivates employees to be more efficient and loyal towards the organization, this can reduce the overall cost of MFIs. On the other hand, with the increase in the price of capital which is the operating expense over fixed assets, the total cost of MFIs increases. This is quite logical as with the increase in operating expense over fixed assets, total cost is supposed to increase. This result also matches with the findings of Quayes and Khalily (2014). However, cost of labor and cost of capital combinedly reduces the cost of MFIs. When both gross loan amount and cost of labor increase together, the cost of MFIs reduces. This also follows the previous concept of managerial compensation that as employees of an MFI are rewarded with higher compensation, they work more efficiently and distributes more loan resulting lower cost for the MFI. On the other hand, when the loan amount increases along with increase in cost of capital, the cost of MFI increases.

Among the two control variables, loan loss reserve has a positive and significant impact on total cost. That is with increase in the amount of loan loss reserve, cost of MFIs increases. Loan loss reserve is maintained against non-performing loan of a financial institution which is related with the quality of loan. As MFIs' disbursed loan amount losses quality, the cost for the MFI surges. The other control variable, equity does not have a statistically significant influence over the cost structure of MFIs and also the direction of impact varies with model. In model 3 & 6, equity has a negative impact on cost indicating with increase in equity financing cost of MFI reduces. Whereas in model 1, 2, 4 & 5, it has a positive impact depicting that as the amount of equity capital goes up, the cost of MFI also rises. This means as MFIs are exposed to more risky fund (debt financing), the overall cost of MFIs reduces. Similar finding was received by Duygun et al. (2013) on UK

banks. Like equity, the constant term in the cost equation of each model shows insignificant coefficient.

Table: 6.1
Findings of Cost Function with SFA

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	No Trend + ALB	No Trend + ALB+ Women	Trend + ALB	Trend+ ALB+ Women+	Trend+ ALB+ Women+ Age	Trend + ALB + Women + Age + Size
Panel A	Cost Frontier					
Ly	2.3276*** (0.2185)	2.3167*** (0.2115)	1.9798*** (0.2741)	2.1915*** (0.2169)	2.1971*** (0.2132)	2.1231*** (0.2579)
Ly2	-0.0491*** (0,0098)	-.0472*** (0.0097)	-0.0422*** (0.0108)	-0.0469*** (0.0099)	-0.0453*** (0.0099)	-0.04479*** (0.0109)
lwlD	-3.1218*** (0.3262)	-3.1056*** (0.3229)	-3.0181*** (0.3968)	-3.1927*** (0.3188)	-3.2184*** (0.3169)	-3.2013*** (0.3730)
lwkD	1.9110 *** (0.2220)	1.9193*** (0.2167)	1.8103*** (0.2666)	1.9068*** (0.2158)	1.8719*** (0.2156)	1.8459*** (0.2401)
lwlD2	0.3344*** (0.0210)	0.3337*** (0.0206)	0.3175*** (0.0339)	0.3399*** (0.0211)	0.3459*** (0.0212)	0.3316*** (0.0291)
lwkD2	0.0928*** (0.0108)	0.0932*** (0.0107)	0.0901*** (0.0117)	0.0955*** (0.0107)	0.0929*** (0.0107)	0.0915*** (0.0114)
lwlkD	-0.1802*** (0.0117)	-0.178*** (0.0114)	-0.1692*** (0.0184)	-0.1787*** (0.0118)	-0.1749*** (0.0118)	-0.1699*** (0.0155)
lylwlD	-0.0291*** (0.0111)	-0.0299*** (0.0111)	-0.0172 (0.0119)	-0.0236** (0.0107)	-0.0269** (0.0106)	-0.0179 (0.0112)
lylwkD	0.0327*** (0.0076)	0.0308*** (0.0074)	0.0269*** (0.0076)	0.0283*** (0.0073)	.0278*** (0.0073)	0.0256*** (0.0076)

Llr	1.6168*** (0.4158)	1.4633*** (0.4004)	1.8218*** (0.3870)	1.5779*** (0.4203)	1.5146*** (0.4152)	1.7217*** (0.4088)
Equity	0.0043 (0.0121)	0.0066 (0.0118)	-0.0003 (0.0112)	0.0046 (0.0114)	0.0023 (0.0115)	-0.0009 (0.0115)
Year			0.1516 (0.1826)	0.2635 (0.1726)	0.2237 (0.1716)	0.1847 (0.1819)
Year2			0.0066 (0.0074)	0.0049 (0.0073)	0.0046 (0.0073)	0.0067 (0.0073)
Year*ly			0.0079 (0.0062)	0.0068 (0.0063)	0.0084 (0.0063)	0.0077*** (0.0.0062)
Year*lwlD			-0.0310*** (0.0115)	-0.0354*** (0.0109)	-0.0350*** (0.0108)	-0.0331*** (0.0112)
Year*lwkD		0.0727 0.0577	0.0196 *** (0.0074)	0.0199*** (0.0073)	0.0195*** (0.0073)	0.0195*** (0.0073)
Constant	1.8709 (3.3553)	1.7932 (3.2876)	4.7385 (3.2669)	3.3293 (3.2222)	3.6576 (3.1567)	4.4241 (3.1758)
σ_u	.2989*** (0.048)	0.2697*** (0.0443)	0.6604 (0.4839)	0.3176*** (0.0575)	0.3159*** (0.0647)	0.4618* (0.2419)
σ_v	.2397*** (0.025)	0.2402*** (0.0254)	0.2364*** (0.0164)	0.2298*** (0.0184)	0.2339*** (0.0182)	0.2392*** (0.0147)
Lambda (λ)	1.2470*** (0.0683)	1.1227*** (0.0665)	2.7932*** (0.4781)	1.3818*** (0.0671)	1.3501*** (0.075)	1.9304*** (0.2421)
γ	0.6083	0.5575	0.8864	0.6563	0.6459	0.7885
Mean Efficiency	0.6840	0.6839	0.7805	0.7213	0.7349	0.7805

St Dev of Eff	0.1327	0.1309	0.1247	0.1292	0.1251	0.1207
Minimum Eff	0.2671	0.2784	0.2612	0.2870	0.3009	0.2891
Maximum Eff	0.9332	0.9266	0.9471	0.9361	0.9397	0.9538
No of Obs	730	715	730	715	710	720
Panel B	Cost Inefficiency Equation					
ALB	-0.4497*** (0.0699)	-0.4470*** (0.0639)	-0.7665 (0.7125)	-0.4336*** (0.835)	-0.4533*** (0.0948)	-0.5904* (0.3273)
Women		-0.2677*** (0.0657)		-0.3049*** (0.0851)	-0.3383*** (0.0968)	-0.7878 (0.7224)
Age					0.2589** (0.1135)	0.5133** (0.4797)
Size						-0.1919 (0.2457)
Constant	4.8053*** (0.6475)	4.7786*** (0.6016)	6.5056 4.5645	4.5008*** (0.7516)	3.8028*** (0.7477)	4.655*** (1.7501)

Model 3-6 in Panel A of Table 6.1 considers the time factor by including year dummy variable in the cost structure. The coefficient of year variable has a positive impact on cost indicating that with the passes of time, cost increases. But none of the models show statistically significant result. That means time actually has no significant impact over the cost of MFIs.

Model 1: Without Time Variable and ALB as Determinant Variable

Model 1 in Table 6.1 reflects only the effect of average loan balance on the cost efficiency of MFIs with no time effect consideration. Average loan balance has been considered as a measure of

outreach of MFIs following Widiarto and Emrouznejad (2015). The log likelihood test result shows rejection of null hypothesis (i.e. there is no existence of inefficiency) and acceptance of alternative hypothesis of existence of inefficiency. The λ value shows the strength of the evidence of the presence of inefficiency in the data. The λ value is calculated by dividing the standard deviation of efficiency measure by the standard deviation of error term. The higher the value, the strong is the evidence of existence of inefficiency (Oteng-Abayie et al., 2011). In this model, the λ value of 1.2470 shows goodness of fit of the model. The same thing is reflected through γ value which is calculated as $\frac{\sigma_u^2}{\sigma_{u+}^2 + \sigma_v^2}$. Usually the value of γ ranges from 0 to 1. The higher the value of γ approaches to 1, the stronger is the evidence of cost inefficiency in the total cost variation (Oteng-Abayie et al., 2011). In this model, the γ value is 0.6083 meaning that 60.83% of the total variation in the level of total cost is due to the existence of inefficiency. This result also proves the acceptability of the model.

When I considered average loan balance as the determinant variable of cost, the mean cost efficiency of the sample MFIs comes as 68.40% with a standard deviation in this cost efficiency measurement of 13.27%. The minimum efficiency is 26.71% whereas under this model the maximum cost efficiency is 93.32%. This means the cost inefficiency ranges from 73.29% to 6.68%. The results show that the sample MFIs can produce the same level of output with an average 31.6% cost savings by improving their technical and allocative efficiency. Even if the average MFIs were at the maximum efficiency level from the sample MFIs, on an average they could save cost by 26.7% [1-68.40/93.32] (Oteng-Abayie et al., 2011). Similarly, the MFI with the lowest efficiency can generate the same amount of loan with a 71.38% reduced cost.

Panel B of Table 6.1 depicts the impact of determinant variable which is ALB (average loan amount per borrower) in this model upon the cost inefficiency. Average loan per borrower is a measure of outreach of MFIs as has been used in different literature as Ferro Luzzi and Weber, 2006; Makame & Murinde, 2006; Olivares-Polanco, 2005; Paxton, 2007; Hermes et al., 2011. An increased amount of ALB shows lower depth of outreach of MFIs as the higher value shows that MFIs are distributing loans to less poor people or comparatively well off people in the society (Hermes et al., 2011). In methodology chapter, I formed an expectation to have a negative moment

coefficient measure for this variable ALB. The result of this model explains a significantly negative impact of ALB on inefficiency at 1% confidence level. This indicates with an increase in the average loan amount per borrower (ALB), the inefficiency of MFIs reduces, that is efficiency increases. In other words, as outreach of MFIs in Bangladesh decreases, they become more cost efficient. This is because as ALB increases, as has been mentioned earlier, it indicates that MFIs are providing loans to comparatively well of people in society, for this the overall number of loan reduces and also the cost per borrower reduces which ultimately helps the MFIs to achieve cost efficiency.

Model 2: Without Time Variable and Average Loan Balance and % of Women Borrower as Determinant Variables

To observe the effect of outreach on MFIs' efficiency, in this model along with average loan balance per borrower (ALB), I added another outreach variable, i.e., percentage of women borrowers (Women) in the list of determinant variables in the cost function. Like the previous model, the λ value (1.1227) and the γ value (0.5575) show the acceptability of the model. The mean efficiency here is 68.39% with a standard deviation of 13.09%. The minimum efficiency of MFIs under the model is 27.84% and the maximum efficiency is 92.66%.

Looking at the coefficient of the two determinant variables (average loan balance and percentage of women borrower), it is found that both of them have negative impact on cost inefficiency. That means when both average loan balance per borrower and percentage of women borrower increase combinedly, the cost efficiency of MFIs goes up. This finding supports the result I found in Model 1 regarding the outreach variable ALB which indicates that as outreach of MFIs in the form of ALB decreases, cost efficiency of them increases which is also as following the expected one as is found in some literature. But about the other outreach variable Women, here we have an opposite result from our expectation. In methodology part, I built up a positive coefficient expectation for this variable, but here I found in this model a negative result. Being an outreach variable, increase percentage of women borrowers indicates more depth of outreach of MFIs as providing more loan to women borrowers is a reflection of providing loan to more poor people in the society (Hermes

et al., 2011). The negative magnitude of this variable shows with increase in women borrower cost inefficiency decreases that is efficiency increases. This reflects that as MFIs' outreach increases in the form of women borrowers, their cost efficiency increases. This result indicates the importance of women empowerment. Armendariz and Morduch, 2010 and Strom, 2014 in their studies have drawn attention to MFIs' preference towards women borrowers. Amin et. al. (1994); Naved (1994); and Hashemi et. al. (1996); Todd (1996); Rajarshi Ghosh (2005); Swain and Wallentin (2009); Chowdhury and Chowdhury (2011); Zohra and Pandey (2011); Ngo and Wahhaj (2012); Akpalu et al. (2012) and Weber and Ahmad, (2014) mentioned that microcredit facility enhances women empowerment in family as well as in social level which improves their family income and enables them to spend more for the purpose of education, nutrition, health etc. This success story of MFIs help them to achieve efficiency when they distribute loans to more number of women borrowers.

Model 3-6: Considering Time Effect

Model 3-6 consider the effect of time on cost efficiency. Through these models I tried to analyze whether total cost of MFIs changes over time. My null hypothesis in this case is that time has no significant impact over cost of the MFIs. To judge the hypothesis at first in model 3, I considered time effect along with only one determinant variable, i.e., average loan balance per borrower (ALB). Secondly, in model 4, along with average loan balance per borrower (ALB), I included percentage of women borrower (Women) as determinant variable and observed how these two variables influence cost inefficiency when time factor is inherent in the model. Thirdly, in model 5, three determinant variables are considered with time factor, those are average loan balance (ALB), percentage of women borrower (Women) and age of MFIs (Age). At last, in model 6, four variables have been considered to observe their effect on cost inefficiency. Along with the previous three factors, in this model size of MFIs (Size) has been added in the list of determinant variables to observe whether with size the cost inefficiency fluctuates or not.

All the four models [3-6] appears statistically fit by considering the λ value and the γ value. Model 3 explains the cost deviation to the greatest extent (88.64%). The rest of the three models explain

cost variation 62% to 65%. All the models show a positive impact of time on the total cost indicating that over time, the total cost of MFIs in Bangladesh increases. Duygun et al. also found that in UK, the cost inefficiency of commercial banks increases with time trend. However, none of the model, shows a significant result for time variable. Even when I took the square of dummy variable year, the coefficient shows positive but insignificant impact on total cost of MFIs. This result proves acceptance of null hypothesis and rejection of alternative hypothesis and establishes the fact that the total cost of MFIs in Bangladesh does not changes significantly over time. The same result is found by (Carvallo and Kasman, 2005) on banks of 16 countries in Latin America and Caribbean area.

The mean efficiency ranges from 72% to 78% with the highest average efficiency under model 3 [ALB as the only determinant]. The minimum efficiency ranges between 26% to 29.88% and the maximum efficiency score prevails around 93%. Panel B of Table 6.1 shows the influence of different factors upon the cost inefficiency. Along with time, at first it has been observed the effect of outreach variable ALB on cost inefficiency. The coefficient of the variable ALB is negative just as I got in Model 1 in which the time frame was not considered. Not only in Model 3, the same magnitude is found in rest of the models for the variable ALB. In all the models, ALB shows a negative impact on inefficiency indicating that with increase in ALB, cost inefficiency of MFIs decreases. Increase in ALB means that MFIs are not reaching to the mass marginal rural people rather are confronting themselves to the lesser number of comparatively well off rural people. This indicates a lower level of outreach. Thus, the negative relationship between ALB and inefficiency shows as ALB increases outreach goes down which leads to decrease in MFIs' inefficiency or increases in efficiency. The reason behind this relationship has already been discussed in Model 1 that as MFIs focus on the better off customers, they can manage the loan more efficiently with lower cost. And also, as MFIs are distributing loan to a lesser number of borrowers, their overall cost reduces. Hermes et al. (2011) and Oteng-Abeyie (2014) also found a negative impact of ALB upon cost inefficiency. Wondirad (2020) mentioned that some MFIs address wealthier clients and profitable business segments and thus instead of outreach.

In model 4, I add the second outreach variable Women along with ALB and it shows how both the two outreach variables, i.e., ALB and Women affect the cost inefficiency along with time variable. The results of the model shows, just like ALB, Women also has a statistically significant negative impact on cost inefficiency of MFIs in Bangladesh. The same pattern of effect is found in both Model 5 & 6. Increase in the proportion of women borrowers indicate greater outreach for MFIs. Here the negative sign indicates that as MFIs outreach in terms of women borrowers increases, their inefficiency goes down and they become more cost efficient. Hashemi et al., 1996, Ganle et al., 2015, Wellalage and Thrikawala, 2021 ensures that microcredit facilities empower women who have better capability to manage the loan amount and reduce their poverty. This also ensures easy management of credit for the MFIs which reduces their cost. This finding shows that over time as ALB and women borrower proportion increase, the MFIs become more cost efficient.

In the next step [Model 5], age of MFIs is added in the cost inefficiency equation. The first two outreach variables (ALB and women proportion) show the same relationship as found in the previous model. But age shows a significantly positive impact on cost inefficiency. This indicates that as MFIs in Bangladesh grow older with the passes of time, its cost efficiency reduces. Duygun et al (2013) found in his study on UK commercial banks that older banks are not necessarily more cost efficient. Finally, in the last model [Model: 6], size of MFIs is added with the other variables. This model finds that size has negative influence on cost inefficiency reflecting that larger MFIs are more cost efficient than the smaller MFIs. However, the coefficient of size variable is not statistically significant. To investigate this issue, that whether size of MFIs has any influence on MFIs' efficiency, in the next section, I have divided the sample MFIs based on their size and measured efficiency of individual group.

6.2.1.2 Efficiency Based on Size of MFIs

In section 6.2.1.1, it was found that size of MFIs has a statistically insignificant positive impact on cost efficiency reflecting that as MFIs grow in size, they achieve more cost efficiency. To observe the relationship more intensely, in this section, all the sample MFIs are segregated into three categories based on their size following (Carvallo and Kasman, 2005). The size of any organization is usually reflected by the total asset amount. So based on the total asset amount, the MFIs are

divided into three sizes. MFIs with assets size below 500 million Tk is categorized as small size MFIs. MFIs whose total asset amount is more than 500 million Tk but less than 1500 million Tk is considered as medium size. And the large MFIs are those which have total assets more than 1500 million Tk. The summary of my findings based on size of MFIs is as follows:

Table: 6.2
Categorization of MFIs based on size

Total Asset Amount (in million Tk)	0 – 500	500 - 1500	>1500
Size of MFIs	Small	Medium	Large
No of MFIs in the size category	53	45	46
Mean Efficiency	0.7865	0.8582	0.9037
St Dev of Eff	0.1532	0.0912	0.0764
Minimum Eff	0.2204	0.1477	0.5417
Maximum Eff	0.9559	0.9692	0.9722

Based on the above stated size of MFIs, I conducted the cost efficiency model on each size category separately. The same Coelli and Battesi (1995) model is applied considering the Translog format of cost efficiency. The result shows that the average cost efficiency of small sized MFIs is 78.65%, that of medium size is 85.82 and 90.37% for large MFIs. It is found here that the small MFIs have the lowest cost efficiency whereas the large MFIs have the highest efficiency. Thus, it is clear from this analysis that as size of MFIs increases, their cost efficiency also increases. This indicates the existence of economies of scale that as MFIs expand their operation and becomes larger in size their unit cost reduces which also reduces their overall cost leading making them more efficient in terms of cost management. Carvallo & Kasman, 2005; Kasuya, 1986; Yoshioka and Nakajima, 1987, Tachibanaki et al., 1991; Fukuyama, 1993; McKillop et al., 1996; Yin et al., 2013 and Tsionas et al., 2015 found strong evidence of scale economies in banking industry while Hudon and Traca, 2011 found a positive impact of size on efficiency of MFIs.

6.2.2 SFA with MRA Data:

As is mentioned earlier, I have collected data about MFIs from two separate sources (PKSF and MRA). The above analysis is based on the data collected from PKSF. To verify the correctness of my findings, in this section, I conducted the same model based on data collected from MRA. From MRA an extensive data set has been collected on 479 MFIs over six years period, i.e., 2013-2018. A total 2,874 observations are included in the panel data set. But MRA could not provide me the total asset amount, fixed asset amount and the amount of salary expenses for the employees. For the lacking of required information, it was not possible for me to get the price of capital. So, while conducting the cost efficiency model, in this section, I had to include the price of two inputs, i.e., price of labor and price of fund following Hermes e al. (2011) and Oteng-Abayie (2011). Besides, as MRA could not provide the data on salary expense, to find the price of labor, operating expense has been divided by no of employees following ……However as here only two input prices have been included in the study, the input prices, output and total cost was not divided by one o the input prices to establish the price homogeneity. Again the same procedure was adopted by Hermes e al. (2011) and Oteng-Abayie (2011) as they also included two input prices in their model.

Just like the cost function of PKSF data, here also two control variables have been considered, equity financing and loan loss reserve. To identify the variable for which an MFIs efficiency level may fluctuate, under this study two determinant variables have been included average loan balance per borrower (ALB) and percentage of women borrower (women). The age of sample MFIs is not included in MRA data set and also as the amount of total asset is missing, it was not possible to identify size of MFIs. The result of the cost efficiency model is presented in Table: 6.4 below.

Table: 6.3

Cost Efficiency measurement with MRA data

Variables	Model 1	Model 2
	No consideration of Time Effect and Two Determinant Variables	Considering Time with Two Determinant Variables
	No Time+ ALB+ Women	Time+ ALB+ Women
ly	1.2461*** (0.0931)	1.067348*** (0.0999)
lwl	0.3290* (0.1923)	-0.1090 (0.2063)
lwf	0.3310* (0.1749)	0.5513*** (0.1815)
ly2	0.0208*** (0.0029)	0.0202*** (0.0029)
lwl2	0.0908*** (0.0164)	0.1103*** (0.0182)
lwf2	-0.0160 (0.122)	-0.0223* (0.0126)
lwlf	-0.0016 (0.0117)	-0.0215* (0.0126)
lylwl	-0.0555*** (0.0081)	-0.0419*** (0.0091)
lylwf	-0.0176** (0.0072)	-0.0191** (0.0074)
Equity	-0.0556***	-0.0594***

	(0.0065)	(0.0064)
Llr	-0.0170 (0.1943)	-0.4381** (0.2157)
Year		0.2171** (0.0896)
Year2 (t2)		-0.0034 (0.0021)
Year*ly		0.0031 (0.0021)
Year*lwl		-0.0209*** (0.0079)
Year*lwf		0.0075 (0.0071)
Constant	-7.3109*** (1.6406)	-3.0503* (1.7582)
σ_u	0.2390*** (0.171)	0.4196*** (0.0632)
σ_V	0.2357*** (0.0055)	0.2346*** (0.0053)
Lambda	1.0138*** (0.0198)	1.7883*** (0.06446)
Mean Efficiency	0.8265	0.8675

St Dev of Eff	0.0965	0.0846
Minimum Eff	0.1397	0.0706
Maximum Eff	0.9785	0.9784
No of Observation	2703	2703
Determinant Variable		
ALB	-0.4666*** (0.0418)	-1.0491*** (0.2130)
Women	0.2553*** (0.0959)	0.5553** (0.2385)

Model 1 in Table 6.4 shows the cost frontier without considering the time effect on the total cost of MFIs along with the effect of ALB and women proportion. In the second model, the time variable is included to verify with the passes of time what changes occur in the total cost of MFIs. Both the two models show positive impact of gross loan amount on total cost meaning that with the increase in the loan disbursement total cost of MFIs increases. The same relationship is found on the analysis conducted on PKSF data. The price of labor shows two opposite relationships in the two models. With the fixed time effect, it shows that as price of labor increases total cost of MFIs increases. But with the passes of time as price of labor increases, total cost reduces. Though this relationship is insignificant, the study on PKSF data showed the same effect. The price of fund is found to have a significant positive relation with total cost. That is as MFIs have to pay higher interest cost on deposit collection fund, the overall cost increases. When both the price of labor and price of fund increases simultaneously, total cost decreases. However, this relation is not statistically significant when I do not consider the time effect and is significant when I consider the effect of time changes. Increase in both output and price of labor create a significant decrease in the cost level of MFIs. The same effect is also found on the cost structure of PKSF. Besides, the total cost is negatively affected due to a combined increase in loan portfolio and price in fund. This shows as MFIs collect costly deposit to support increase loan amount to customers, the total cost

has in increased result. Unlike the models run with PKSF data, both the two models here show that equity financing has a significant influence on the cost of MFIs. Both the model excluding time effect and including time effect, show that increase in equity financing reduces cost level. This is logical as stronger equity amount enables the MFIs to look for expensing funding sources and thus the overall cost reduces. However, with the PKSF data, it is found that some of the models show this negative relation though the finding was not statistically significant. On the other hand, the other control variable, i.e., loan loss reserve (llr) has a negative relation with total cost. The result is insignificant when time variable is ignored whereas it shows significant result with the time effect consideration. However, this conclusion does not seem logical as when the quality of loan falls the cost should increase which we found in all the models with PKSF data. Finally, the sample MFIs registered with MRA shows that with the passes of time, cost of MFIs significantly increases. Such strong evidence of time variable is missing in PKSF data.

After the individual variable's influence, now if I turn to the existence of cost inefficiency of MFIs, the first model shows σ_u is 0.2390 and σ_v is 0.2357 a lambda value of 1.0138. The gamma value of 0.5068 shows that 50.68% deviation in cost structure is due to cost inefficiency. This result does not show good acceptability of the result. However, when time variable is included into the model (model 2), the result shows σ_u value of 0.4196, σ_v value of 0.2346 and a λ value of 1.7883. The gamma value shows that 76.19% deviation in cost is due to inefficiency of sample MFIs. This result ensures the acceptability of the model.

The mean cost efficiency under the first model is 82.65% meaning that if I do not consider the time dominance, then the sample MFIs on an average can provide same amount of loan to their customers with a 17.35% lower cost. The inefficiency of sample MFIs ranges from 86.03% to 2.15%. This shows if the average efficient MFIs would have at the highest efficient level, they could have saved 15.53% cost. On the other hand, the least efficient MFI reaching at the most efficient MFI level, can save 85.72% cost. The other model, where I considered the time variable in the cost structure, the average efficiency level is slightly improved to 86.75%. This reflects that over time cost efficiency of MFIs increases. The cost efficiency level under this study ranges from 7.06% to 97.84%. So, the least efficient MFIs can save cost by 92.94% and the most

efficient MFI can save cost by 2.16%. Also the average efficient MFIs can save cost up to 11.33% by upgrading themselves to the highest efficient MFIs in the sample.

To verify the issue of outreach and efficiency, I included two outreach variables to find their impact on cost inefficiency. The first variable, the average loan balance per borrower (ALB), shows that as MFIs increase the size of loan for each borrower, their cost inefficiency decreases. This finding reflects the fact that as MFIs achieve more outreach, their efficiency improves. This finding is statistically significant at 1% confidence level. But the other outreach variable, i.e., percentage of women borrower (women) shows a significant positive influence on cost inefficiency. That is as the percentage of women borrowers increases, the inefficiency of MFIs also increases and thus efficiency has a downward movement. In case of my findings with PKSF data set, ALB has a positive relation with cost inefficiency which I also found on this MRA data set. However the result with women proportion is different under the two different data set. PKSF data shows with increase in women borrowers cost efficiency increases, whereas MRA data set shows the opposite.

6.2.3 Comparison of Cost Efficiency between PKSF and MRA Data

The conclusions I found from the two different data set are not directly comparable as the time period covered by the two data set are totally different. PKSF data set covers information from 2016-2020 whereas MRA data set provides information from 2013-2018. Also, the sample size under MRA is greater than that of PKSF. As from MRA, I got data on more number of MFIs, I did not want to make it shorter so that I can apply my models on a wider data set. So, to make the two data set comparable, I considered the same time dimension covered by both the data set, i.e., 2016-2018. After making this new sample size based on the common time era, I decided to apply the model on them. But here again, I found a new problem. In MRA data set, due to availability of some information, I could not include three input prices, rather worked with only two input prices (price of labor and price of fund). Because of this, price homogeneity condition was not applied too in the model. On the other hand, on PKSF data set I could apply all the three input prices. Along with the previous two mentioned prices, here I could include price of capital in my model. Also, the price homogeneity condition was fulfilled by dividing the costs and output variables by

one of the input prices (price of fund). To observe the correctness of my findings, I therefore, applied the model in both the two formats on PKSF data. Once I did the calculation on PKSF data in the same way as has been done with MRA data [Model 3&4]. The findings are presented in Table: 6.4.

Table: 6.4
Comparison Between MRA and PKSF Data

	MRA Data		PKSF Data	
Variables	Model 1	Model 2	Model 3	Model 4
	No Time Trend + ALB + Women	Time Trend+ ALB + Women	No Time Trend + ALB+ Women	Time Trend + ALB+ Women
ly	1.3512***	1.2299***	2.4509***	1.6142***
	(0.1319)	(0.142)	(0.2205)	(0.3182)
lwl	-0.2588	-0.3570	1.6920***	-0.2131
	(0.4703)	(0.4857)	(0.5912)	(0.8343)
lwf	0.5392*	0.6816**	0.1367	0.1359
	(0.2936)	(0.3122)	(0.4281)	(0.4172)
ly2	0.0185***	0.0165***	0.0073	-0.0031
	(0.0039)	(0.0039)	(0.449)	(0.0099)
lwl2	0.1395***	0.1317***	0.0843***	0.1062***
	(0.0386)	(0.0423)	(0.0324)	(0.0331)
lwf2	-0.0059	0.0027	0.0209	0.0191
	(0.0150)	(0.858)	(0.0157)	(0.0149)
Lwlf	-0.0282	-0.0375*	-0.0156	-0.0138
	(0.0212)	(0.0210)	(0.0408)	(0.0401)
Lylwl	-0.0627***	-0.0472***	-0.1301***	-0.0474
	(0.0118)	(0.0135)	(0.0245)	(0.0349)
Lylwf	-0.0080	-0.0093	0.0063	0.0059

	(0.0092)	(0.0096)	(0.0083)	(0.0080)
Llr		0.0704	0.4634	1.7814***
		(0.3463)	(0.2937)	(0.4934)
Equity		-0.0693***	0.0039	-0.0251*
		(0.0093)	(0.0096)	(0.0135)
Year		0.1355		-0.3171
		(0.2553)		(0.3558)
Year2 (t2)		0.0234		0.0443**
		(0.0151)		(0.0200)
Year*ly		0.0141**		0.0135
		(0.0056)		(0.0091)
Year*lwl		-0.0408*		-0.0136
		(0.0219)		(0.0283)
Year*lwf		0.0043		-0.0111
		(0.028)		(0.0125)
Constant	-4.4713	-2.3787	-27.4088***	-7.0022
	(3.3705)	(3.4115)	(4.9762)	7.7504)
σ_u	0.6346***	0.6613***	0.8769	1.0021**
	(0.0638)	(0.0626)	(0.5702)	(0.4654)
σ_V	0.2578***	0.2314***	0.1735***	0.1665***
	(0.0069)	(0.0075)	(0.0081)	(0.0077)
Lambda (λ	2.4619***	2.8574***	5.0553***	6.0175***
	(0.0665)	(0.0657)	(0.5702)	(0.4647)
Gamma (γ)	0.8583	0.8908	0.9623	0.9732
Mean Efficiency	0.8972	0.8849	0.8968	0.9050
St Dev of Eff	0.0523	0.0657	0.0655	0.0597

Minimum Eff	0.3200	0.2653	0.3563	0.3398
Maximum Eff	0.9771	0.9778	0.9802	0.9816
No of Obs	1431	1357	435	425
Determinant Variable				
ALB	-1.9766*** (0.0752)	-1.9954*** (0.0866)	-2.1908 (2.6215)	-2.6968 (2.3496)
Women	0.4189 (0.3869)	0.3092 (0.5403)	-3.2940 (4.3569)	-2.9533 (4.5435)

The results in Table 6.4 shows that the mean efficiency in all the models seems very close. When I did not consider the effect of time, the mean efficiency under MRA data is 89.72% while that under PKSF data is 89.68%. So, under the same assumption about time, both the data set give same efficiency measurement. Now, as I consider the effect of time variable upon cost efficiency, it shows a mean efficiency level of 88.49% with MRA data set and 90.50% with PKSF data set. Though the results are not exactly same but very close again showing similarity in the findings of the two data sets. The similarity in results is also found in the level of minimum and maximum efficiency under both the data sets. Thus, the efficiency measures under both the data sets give a support to my findings about the cost efficiency level of MFIs in Bangladesh.

Now, apart from the efficiency measures, if I focus on the other variables in the cost function, I find the same pattern of relationship of them with the total cost of MFIs in all the models. All the four models show that with increase in gross loan amount, the cost of MFIs increases. The price of labor mostly shows a negative impact on total cost on both MRA data and PKSF data when the same methodology is used. This result shows as price of labor increases, total cost decreases but insignificantly. But Model 3 shows a significant positive effect of labor price on total cost which shows that for the MFIs licensed with MRA, without time constraint, an increase in labor price significantly increases the total cost. However, when I took the square of log value of labor price, all the four models show significant positive impact on cost function establishing the similarity in finding on both the data set. Next to price of labor is the price of fund which is found to show the

same direction of impact under Model 1-4. The results show that price of fund has a positive impact on total cost indicating that as price of fund increases, total cost increases. But this effect of price of fund is significant only with MRA data set. The time variable shows a positive impact on total cost on MRA data indicating over time total cost of MFIs increases. On the other hand, both the models with PKSF data shows negative relation reflecting that as time passes total cost of MFIs decreases. However, none of the results are statistically significant. And this proves that over the common time frame, time actually does not affect cost of MFIs significantly.

The outreach variable, ALB, shows same face in all the models that MFIs are able to achieve more cost efficiency by increasing the average loan amount. This result supports my earlier findings about the trade-off between outreach and efficiency of MFIs. Increase in average loan balance indicates less depth of outreach. Thus, under both the data set, it is established that as MFIs reduce their depth of outreach, they can attain more cost efficiency. The other outreach variable, percentage of women borrower, shows different impact on cost inefficiency with different data set. The MRA data set shows, increase in percentage of women borrowers increases cost inefficiency or in other words, reduces efficiency of MFIs. As percentage of women borrower is an indication of broader outreach, the result proves the same fact as I found earlier, i.e. increase in outreach costs efficiency level of MFIs. For PKSF data set, on the contrary, the women factor shows a negative relation indicating increase number of women borrowers reduces cost inefficiency. That is here, outreach in the form of increased women borrowers leads improvement in efficiency. However, both these outcomes with women variable are statistically insignificant.

The above findings and discussion show much similarity in the results came out from both the data sets. It is obvious that we cannot predict to have 100% same result from two different data set. The similarities ultimately prove that my findings are meaningful and effective enough to judge the cost efficiency of MFIs operating in Bangladesh. However, to scrutinize the findings, at this level, I am going to conduct the efficiency analysis through non-parametric method. This analysis is discussed in the next part.

6.3 Non-parametric Analysis

Under the non-parametric model, the most commonly used approach is the Data Envelopment Analysis (DEA) which is a linear programming approach. DEA compares the performance of each firm to the best practice frontier given the combination of input and output variables (Havrylchyk, 2006). The model was initially developed by Charnes et al. (1978) followed by Banker et al. (1984) to measure technical productivity (Tortosa-Ausina, 2002; Havrylchyk, 2006). Later on, the model was extended to measure cost efficiency. Tortosa-Ausina (2002), Isik and Hassan (2002), Chen et al. (2005), Havrylchyk (2006), Tortosa-Ausina (2004) have used the DEA model to measure cost efficiency of banks. The advantage of the model is it does not require a functional form of input output variables (Chen et al., 2005; Havrylchyk, 2006). The details of the model specification have been discussed in the methodology chapter.

The same intermediation approach has been considered here as I did under parametric test. Also input oriented cost efficiency has been measured to keep alignment with parametric study. The DEA can be operated with the consideration of both constant return to scale as well as variable return to scale. The constant return to scale assumes that all the concerned firms are operating at an optimal scale (Banker, Charnes and Cooper, 1984). The microfinance industry in Bangladesh still has not achieved perfect competition and therefore I chose to use variable return to scale following Havrylchyk, 2006 who used the same model to judge cost efficiency of banks in China.

6.3.1 DEA Model on PKSF Data

Under the SFA model as I used data of 146 MFIs over 5 years period (2016-2020), in DEA I used the same set of data. Three input prices have been considered as price of fund, price of labor and price of capital following Resti (1997), Isik and Hasan (2002), Ausina (2002), Chen et al. (2005), Havrylchyk (2006). The gross loan portfolio has been taken as the only output variable. Resti (1997), Altunbas et al. (2001), Canhoto & Dermine (2003), Isik and Hasan (2002), Drake & Hall (2003), Drake & Park (2003), Ausina (2002), Chen et al. (2005), Weber (2006), Havrylchyk (2006), Drake et al. (2007), Lee and Chih (2013), Tsionas et al. (2015) have used loan portfolio as

the output variable in their studies. Using the variables, cost efficiency has been measured for each year separately following Chen et al. (2005). The DEA models specifies technical efficiency and allocative efficiency. The cost efficiency is the product of technical efficiency and allocative efficiency. The findings of the model are presented in Table 6.5

Table: 6.5
Data Envelopment Analysis (Input Oriented VRS Model)

Efficiency/ Year	**2016**	**2017**	**2018**	**2019**	**2020**	**Average**
Technical Efficiency	0.949	0.958	0.958	0.955	0.955	0.955 (0.001)
S. D.	0.038	0.036	0.034	0.038	0.036	0.036
Minimum Efficiency	0.844	0.852	0.838	0.82	0.846	0.84
Maximum Efficiency	1	1	1	1	1	1
No of Efficient MFIs	31	35	30	31	28	31
Allocative Efficiency	0.743	0.793	0.766	0.762	0.747	0.762 (0.018)
S.D.	0.191	0.161	0.159	0.166	0.180	0.171
Minimum Efficiency	0.012	0.013	0.012	0.009	0.01	0.011
Maximum Efficiency	1	1	1	1	1	1
No of Efficient MFIs	11	17	13	16	15	14
Cost Efficiency	0.709	0.763	0.736	0.730	0.717	0.731 (0.019)
S.D.	0.198	0.171	0.164	0.175	0.188	0.179
Minimum Efficiency	0.011	0.012	0.011	0.008	0.009	0.010
Maximum Efficiency	1	1	1	1	1	1

No of Efficient MFIs	10	17	13	15	15	14

Technical efficiency refers to the ability to produce the maximum outputs at a given level of inputs (Widiarto and Emrouznejad, 2015; Hou et al., 2014; Havrylchyk, 2006; Isik and Hassan, 2002; Worthinton, 2000). The mean technical efficiency of sample MFIs over the year 2016-2020 is 0.955. This means the sample MFIs could disburse 4.5% more loan with the given input mix. Technical efficiency does not have that much fluctuation over the time. The mean technical efficiency of all the MFIs varies only 0.1% over the years. The lowest technical efficiency is found in the year of 2016 that is 0.949 and the highest is in the year 2017 and 2018 that is 0.958. Highest number of MFIs attained technical efficiency compared to allocative efficiency and cost efficiency. On an average 31 MFIs achieved technical efficiency over the years. In 2016, the year in which the highest technical efficiency score is found, 35 MFIs achieved technical efficiency (efficiency score 1). This is the highest no of efficient MFIs among all the years. On the other hand, the average minimum technical efficiency score is 0.84. Over the years, the minimum technical efficiency score ranges from 0.82 to 0.852 whereas the highest score is 1. Thus an average deviation between minimum efficiency and maximum efficiency is found of 3.6%.

Allocative efficiency on the other hand refers to the ability to achieve proportional reduction in costs by selecting the optimal mix of inputs in light of given prices in order to produce a given level of outputs (Isik and Hassan, 2002; Qayyum and Ahmad, 2006: Widiarto and Emrouznejad, 2015). The mean allocative efficiency over 2016-2020 of the sample MFIs 0.762. The score of allocative efficiency is lower than technical efficiency in all the years. The highest allocative efficiency (0.793) is found in the year of 2017 in which time the technical efficiency is also reached to its peak. The lowest allocative efficiency score (0.743) also matches the timing of the lowest technical efficiency, that is 2016. Just like technical efficiency, allocative efficiency of MFIs does not vary to a great extent over the time. The standard deviation of the mean allocative efficiency score over the time is 1.8%. However, under the allocative efficiency the minimum score drops down to even 0.009 in the year of 2019 with an average minimum efficiency of 0.011. The maximum efficiency value is 1 indicating full allocative efficiency. The no of MFIs attaining to full allocative efficiency (efficiency score 1) is comparatively lower than MFIs achieving technical

efficiency in all the years. In 2017, the highest no of MFIs (17) achieved full allocative efficiency whereas in 2016, the lowest no of MFIs accomplished the highest score. Thus, I found an average 17.1% deviation in between the maximum and minimum allocative efficiency.

Combining the results of technical efficiency and allocative efficiency, the average cost efficiency of the sample MFIs comes out as 0.731. This means the MFIs on an average can produce the same output level with the given input mix and input prices with a 26.9% reduced cost. The cost efficiency of MFIs remain closure over the time ranging from 0.709 to 0.763 with a standard deviation of 1.9% in the efficiency score over the time. The highest cost efficiency is achieved in 2017. This result follows the findings of technical efficiency and allocative efficiency as both these two efficiencies reached to the highest point in the same year. On the other hand, the lowest cost efficiency is found in 2016 in which time both technical efficiency and allocative efficiency were at the lowest. If we now concentrate on the minimum cost efficiency in each year, the values range from 0.009 to 0.012 with an average minimum cost efficiency of 0.010. On the other hand, in each year some of the MFIs found to reach at the optimum level of efficiency with an efficiency measurement of 1. In 2017, the maximum number of MFIs (17 MFIs) attained cost efficiency whereas in 2016 the lowest number of MFIs achieved full efficiency which is the lowest MFIs number among all the years. The minimum value of cost efficiency and the maximum value shows a wide difference with an average standard deviation of 17.9%.

6.3.2 Size-wise Efficiency with DEA

As I analyzed the cost efficiency in terms of size of MFIs under SFA approach, I did the same size-wise cost efficiency analysis under DEA approach. Here I followed the same procedure to categorize the MFIs in terms of size as I did under SFA method. Based on total asset amount, the sample MFIs are divided into four sizes; very small, small, medium and large. MFIs who have total asset size less than Tk 500 million are categorized into small group, Tk 500 million -1500 million are categorized into medium group and Tk 1,500 million above as large sized. The size-wise efficiency measures over the time are presented in Table: 6.7

Table: 6.6

Size-wise Cost Efficiency with DEA

Efficiency	Size	2016	2017	2018	2019	2020	Average	S.D.
Technical Efficiency	Small	0.954	0.970	0.970	0.962	0.965	0.964	0.0059
	Medium	0.966	0.960	0.969	0.967	0.959	0.964	0.0039
	Large	0.967	0.973	0.967	0.973	0.973	0.9706	0.0029
Allocative Efficiency	Small	0.772	0.859	0.832	0.810	0.816	0.818	0.028
	Medium	0.741	0.760	0.743	0.750	0.700	0.739	0.0205
	Large	0.855	0.831	0.808	0.826	0.836	0.831	0.0152
Cost Efficiency	Small	0.738	0.834	0.809	0.781	0.789	0.790	0.0319
	Medium	0.718	0.733	0.722	0.728	0.673	0.7148	0.0215
	Large	0.830	0.810	0.783	0.806	0.816	0.818	0.0153
S. D.		0.078959	0.066575	0.076284	0.099723	0.114443	0.081457	

The results of the above table shows that the technical efficiency of the small MFIs ranges from 95% to 97% over the years with an average efficiency of 96.4%. Though there are ups and downs in the technical efficiency level from year to year, the deviation is very low which is also reflected in the value of standard deviation (0.0059). This shows over time the technical efficiency of small

firms does not change substantially. The allocative efficiency of the small MFIs ranges from 77% to 85.9% over 2016 to 2020 with an average of 81.8%. The allocative efficiency increases from 2016 to 2017 substantially but then reduces with a standard deviation of 2.8%. Considering both technical efficiency and allocative efficiency, the cost efficiency of small sized MFIs have value from 73% to 83%. The deviation mainly is due to the allocative efficiency deviation and therefore I found same pattern of movement in the cost efficiency scores as of allocative efficiency. The average cost efficiency of this group is 79% and the standard deviation is 3.19%.

The medium sized MFIs' technical efficiency remains nearby 96% over the time ensuring the earlier findings that the technical efficiency does not change with time. The average technical efficiency of medium MFIs is 96.4% and the standard deviation is 0.39%. The allocative efficiency on the other hand, remains between 70% to 76% with an average of 73.9% and standard deviation of 2.05%. The individual year scores show ups and down deviation in the allocative efficiency which creates an impact on the cost efficiency. The cost efficiency of medium sized firms ranges from 67% to 73% with the same pattern of movement as of allocative efficiency. The average value here is 71.48%. Looking at the technical efficiency scores, it is observed that on an average the large firms achieve 97% technical efficiency over the time with very little fluctuation. The allocative efficiency of this group ranges from 80% to 85%. Whereas, the overall cost efficiency ranges between 78% to 83% with an average of 81.8%.

Now, if I draw a comparative scenario among the three groups, it is found that the technical efficiency is almost same for small and medium MFIs over time with a slightly higher scores for large firms. The same fact is found by looking at the average value of technical efficiency of the three groups. In terms of allocative efficiency, small firms prove to have better condition in the year of 2017 and 2018. But for other years, the large firms have the most efficiency in allocating resources. However, considering the mean value, the large firms are found to be the most efficient one. Now, turning to the overall cost efficiency, it is observed that in 2017 and 2018, the small MFIs is the most cost-effective group, whereas in other years, it is the large firms who achieve the highest cost efficiency. This shows that the cost efficiency of the three groups of MFIs are more influenced by their allocative efficiency. To get the more concrete scenario, as I consider the

average value, I found that the large MFIs are more cost efficient considering the whole period of study. This supports my previous finding from SFA analysis that large MFIs are more cost efficient which indicates the existence of economies of scale for MFIs in Bangladesh.

6.3.3 Factors Affecting Cost Efficiency Under DEA

In SFA model, the determinant factors of cost efficiency were included within the model as I followed the Battesi and Coelli (1995) Model. So, through the analysis I judged the impact of some outreach and other variables in cost efficiency of MFIs in Bangladesh. In DEA model, the determinants factors cannot be considered along with the efficiency calculation. So, here I have used the two-stage model following Banker and Natarajan (2008), Cummins et al. (2010), Lee and Chih (2013). In the first step, the cost efficiency has been measured and the results have been already discussed in the previous section. In second step, Tobit regression analysis has been made in which the cost efficiency score, derived in step 1, has been taken as dependent variable and the outreach variables (average loan balance per borrower (ALB) and percentage of women borrower (Women), age and size have been used as explanatory variables. These independent variables are same as I used in SFA analysis. From literature review, these four variables have been found to influence the efficiency of MFIs in different countries. Specially, the first two variables (ALB and Women) which are indicator of outreach of MFIs help me to observe the recent concern in the world of microfinance, the trade off between outreach and efficiency. The third variable (Age) shows with the years of experience whether MFIs become more efficient in controlling costs to provide services to their members. The last and fourth variable has been considered to observe the existence of economies of scale. As has been mentioned in methodology chapter, here my null hypothesis is that none of the variables have any significant impact on cost efficiency of the sample MFIs. The findings of the analysis are presented in table: 6.7 and is discussed below:

Table: 6.7

Results of Tobit Regression Analysis

Variables	Measures	P values	S. E.	Hypothesis

ALB	0.0834***	0.000	0.0129	H_0: *Rejected* H_1: *Accepted*
Women	0.0083	0.499	0.0123	H_0: *Accepted* H_1: *Rejected*
Age	-0.1414***	0.006	0.0519	H_0: *Rejected* H_1: *Accepted*
Size	-0.0025	0.890	0.0183	H_0: *Accepted* H_1: *Rejected*

From the above table, it is found that ALB has a positive significant impact on cost efficiency indicating that with increase in the average loan balance, the cost efficiency of MFIs increases. ALB is an indicator of outreach and increase in ALB reflects that MFIs are more interested to provide bigger amount of loan to some specific comparatively well-off people in the locality. This prohibits the MFIs to reach more poor people and leads to a decrease in outreach. So, through this variable, it is establishing the fact that as MFIs can improve their efficiency to manage costs by reducing outreach to more poor people. I found the similar pattern of relationship in SFA also. In terms of the second outreach variable, percentage of women borrower, I find here a positive but insignificant relationship. The positive dimension indicates that as the percentage of women borrower increases, MFIs' cost efficiency increases. As the proportion of women borrower increases, it shows that MFIs are trying to reach more to the vulnerable people which indicates depth in outreach. So, here I find a different picture that as MFIs in term of women borrowers increase their outreach, they attain more efficiency. This proves the women empowerment fact that women borrowers are more efficient in managing their loans and makes the loan schemes of MFIs more successful and reduce cost behind them. Similar conclusion was also found in SFA model.

Now, the third variable Age shows a significant negative impact on efficiency meaning that as MFIs achieve more experience through the passes of their age time, their efficiency reduces. In SFA model also, I found the same pattern of relationship between age and efficiency. This means, in Bangladesh comparatively new MFIs are more efficient in managing costs to produce loans by using the input mix. Whereas, the older MFIs are less efficient. Lastly, the variable size shows a negative but insignificant influence over efficiency indicating that as MFIs' size increases their efficiency reduces. But already in previous in-depth analysis, I found the existence of economies of scale for the MFIs in Bangladesh. And also, this result regarding Size variable in statistically insignificant, so we cannot draw any specific relationship here.

It is hereby found that out of four determinant variables, two have very specific significant impact on cost efficiency of MFIs whereas the other two factors do not have that significant influence. Therefore, as table 6.7 shows, for two variable (ALB and Age) the null hypothesis is rejected and for other two variables (Women and Size), the null hypothesis is accepted.

6.4 Comparison of Cost Efficiency Measurements Between SFA and DEA using PKSF Data:

In the earlier discussion of this chapter, the findings have been discussed under SFA and DEA separately. Now in this section, I make a comparison of the two approaches results. Table 6.7 shows a contrast picture of cost efficiency measurement of MFIs under both parametric and non-parametric approach in terms of size differences as well as overall efficiency. The findings in the table shows that among the different sized MFIs, large MFIs are the most cost efficient under both SFA and DEA method. Under SFA model, the least efficient group is the small sized MFIs, next comes the medium sized and finally the large MFIs contain the highest efficiency measurement. Under the DEA model, medium sized MFIs are the least efficient one while large MFIs are the

most cost efficient. Thus, both SFA and DEA method shows a positive impact of size on cost efficiency indicating that as size of MFI increases, the cost efficiency of MFIs also increases.

Table: 6.8
Comparison of Findings Between SFA and SEA

Size	**Cost Efficiency under SFA**	**Cost Efficiency under DEA**
Small	0.787	0.790
Medium	0.858	0.715
Large	0.904	0.818
S. D.	0.0691	0.082
Overall Cost Efficiency	**0.7277**	**0.731**

Now, observing the overall cost efficiency of sample MFIs, it is found that both parametric as well as non-parametric model shows very similar cost efficiency measurement. Under SFA, the overall cost efficiency is 72.77% whereas under DEA the overall cost efficiency of sample MFIs is 73.1%. This empirical result shows that on the same sample size, parametric and non-parametric model give similar result of efficiency. Isik and Hassan (2002); Rezvanian and Mehdian (2002); Resti (1997). Resti (1997) found that the efficiency measure does not dramatically show different results due to the two different methods on same sample data. Although the results are closure, still, the efficiency measure under parametric model shows a higher efficiency value compared to the non-parametric model. On the other hand, standard deviation of efficiency measures is higher under non-parametric. Berger and Mester (1997) also mentions the same comparison of findings under

parametric and non-parametric models. The researchers mentioned that the standard deviation becomes higher under non-parametric as here random error is included along with the efficiency level.

Chapter: 7
Conclusion

In my PhD research, I focused on the microfinance institutions in Bangladesh, the sector in the economy, which has made a remarkable influence in the financial development of rural and poor people in the country. These financial institutions who are uplifting the poor into the belt of financial services, need to serve their clients with more sustainability which is possible only when these MFIs achieve efficiency in managing costs. That is MFIs should have the ability to provide services to their customers at the minimum cost given the resources. To judge such ability, the way is to look at the cost efficiency of an institution. Therefore, in my research I measured the cost efficiency of sample MFIs in Bangladesh and also have identified the factors which can help MFIs to accelerate their efficiency. In this regard, I also verified whether the trade off between outreach and efficiency exists in the MFI sector of our country. To reach to my goal I applied both parametric as well as non-parametric approach. I used both the approaches as from literature I got pros and cons on both sides. Under parametric, I used Stochastic Frontier Approach (SFA) and

under non-parametric, I used the Data Envelopment Analysis (DEA). In respect of SFA, the Battesi and Coelli (1995) model has been applied with translog format. On the other hand, in case of DEA, the two-stage model has been applied. To conduct the models, data has been collected from two separate sources. The first dataset is collected from Palli Karma-Sahayak Foundation (PKSF) and the second dataset is collected from Microcredit Regulatory Authority (MRA). Both the datasets comprise panel data.

Under SFA, the analysis with PKSF data finds that the MFIs in our country are 78% cost efficient. This means that the sample MFIs can produce the same amount of loan to their clients with a 22% reduced cost by selecting a proper input quantity and mix. Also, the analysis finds that MFIs in Bangladesh has a contradiction between outreach and efficiency. That means more efficient MFIs constraint themselves around a less number of comparatively well-off poor in the society. And thus, avoid to reach to the poorest section in society to serve them. Comparatively recently developed MFIs are found to be more efficient as they can get a learning observing the older ones and also can start up with better technology. And finally, it is found that size of MFIs has a positive impact on cost efficiency. To verify this finding, I clustered the sample MFIs into three groups based on size. The size has been defined based on the total asset volume of MFIs as has been applied by many researchers in literature. By applying the SFA, the mean efficiency is measured for each size group where it is seen that the efficiency is highest for large size MFIs and lowest form small size MFIs. This result establishes the fact that the MFIs in Bangladesh face economies of scale that is with the increased size the MFIs are better able to manage their cost. Now if I link this finding with the outreach variable, it is clear here that as MFIs grow bigger in size, they are more capable of providing loan. In this case, the MFIs target relatively richer people in the poor society and concentrate their loans only to this group, increasing the average loan balance. This attempt of MFIs, makes it possible for them to lower the number of borrowers and also conducting operation with lower number of employees as they have concentrated operations. This ultimately makes the MFIs achieving cost efficiency. However, under the SFA model, I did not find any MFI having 100% cost efficiency. After completing my analysis with PKSF data, I applied the same model on MRA data set and found their similar results. The mean efficiency level found to be quite similar under both the two datasets. This similarity in results shows that even if I apply the analysis

on an extended data set like that I got from MRA, the findings are similar which supports my comments on the microfinance industry of our country.

After SFA, as I turn to DEA model, here, I used the two-stage model. In the first stage I conducted the DEA analysis for cost efficiency and in the second stage I run the Tobit regression analysis to observe the impact of determinant variables upon cost efficiency. The DEA model measures both technical efficiency and allocative efficiency over the years by considering which I can reach to the overall cost efficiency. The results show that MFIs are technically more efficient. The average technical efficiency is 95% indicating that MFIs in Bangladesh can reduce cost by 5% by minimizing the input quantities with the same level of output. On the other hand, sample MFIs have less allocative efficiency. The mean value of allocative efficiency is 76% indicating that these MFIs can reduce their cost by 24% through choosing the proper combination of inputs. By combining the technical and allocative efficiency, the overall cost efficiency has found as 73% which is very close to the efficiency level found under SFA (72%). Thus, both the approaches give me the comparable assessment of cost efficiency. However, the efficiency level of MFIs does not change abruptly over time. Just like SFA, here also I measured DEA for the three size of MFIs and found the similar report as of SFA. From the DEA results of the three sized MFIs, it is proved that large size MFIs are more cost efficient than the small and medium sized MFIs which establishes the economies of scale for MFIs in Bangladesh. Through the Tobit analysis, it is found that outreach contradicts with efficiency of MFIs and recently established MFIs are more efficient compared to the older ones.

At the end of all the analysis, it can be said that the MFIs in Bangladesh have scope to reduce their cost by selecting the right volume of input and deciding the right combination of them. Under SFA, though none of the MFIs were found to be fully efficient, under DEA, highest 17 MFIs were found to be fully cost efficient (CE = 1) in 2017. The non-efficient firms should realize the fact and should move to reduce cost to move themselves as much as possible towards full efficiency. In this aspect, they should remember that they can have better control over cost by focusing on women borrowers and concentrating loans by offering bigger loans to fewer number of borrowers. Thus, MFIs can change their strategies to reach to a more efficient position in the industry. But

focusing on less number of borrowers will create trouble for MFIs to meet up their social objective. Just for the sake of achieving efficiency, an MFI should not forego their social commitment. Therefore, MFIs should keep trying to reach to more vulnerable people in the society through women borrowers.

My research will help the MFIs to identify their level of efficiency and to locate the measures that will improve them. MFIs will be able to locate where the problem lies, in choosing the allocation of resources or in using input techniques. Through this cost efficiency analysis, the MFIs can also realize their sustainability prospect and therefore, can take steps to exist in the long run. This will make the overall industry stronger and more effective in providing financial services to the poor. The policyholders can also use this research to understand the loopholes of the microfinance institutions and thereby adopting regulations which will be benefit the service receivers of MFIs and also protect their interest.

References

- Abdulai, A., Binder, C.R., 2006. Slash-and-burn cultivation practice and agricultural input demand and output supply. Environment and Development Economics 11, 201–220.
- Abu-Bader, S. and Abu-Qarn, A.S., 2008. Financial development and economic growth: The Egyptian experience. Journal of Policy Modeling, 30(5), pp.887-898.
- Abubakar, Abdulsalam; Kassim, Salina & Yusoff, Mohammed. (2015). Financial Development, Human Capital Accumulation and Economic Growth: Empirical Evidence from the Economic Community of West African States (ECOWAS). Procedia - Social and Behavioral Sciences. 172. 10.1016/j.sbspro.2015.01.341.
- Adams, D. W.; Graham, D. H.; and von Pischke, J. D. (1984). Undermining rural development with cheap credit. Boulder: Westview Press
- Adams, Dale W; Vogel, Robert C. (1986): Rural Financial Markets in Low-Income Countries: Recent Controversies and Lessons, in: World Development, Vol. 14, No. 4, pp. 477–487.
- Adams, R.B., Ferreira, D., 2007. A theory of friendly boards. Journal of Finance. 62(1), 217-250.

- Ademoh, F. and Zivkovic, J., 2017. Hindrances to microfinancing: A Nigerian case study. International Journal of Development and Economic Sustainability, 5(1), pp.45-60.

- Adenso-Diaz, B. and Gascon, F., 1997. Linking and weighting efficiency estimates with stock performance in banking firms. The Wharton Financial Institutions Center.

- Ahmad, U., 2011. Efficiency analysis of micro-finance institutions in Pakistan. MPRA Paper No. 34215, posted 1. November 2011 16:39 UTC
  http://mpra.ub.uni-muenchen.de/34215

- Ahmed, S. M., Adams, A. M., Chowdhury, M., & Bhuiya, A. (2000). Gender, socioeconomic development and health-seeking behaviour in Bangladesh. Social Science & Medicine, 51(3), 361-371.Available at: https://doi.org/10.1016/s0277-9536(99)00461
- Ahmed, S.M., Chowdhury, M. and Bhuiya, A., 2001. Micro-credit and emotional well-being: experience of poor rural women from Matlab, Bangladesh. World development, 29(11), pp.1957-1966.

- Agarwal, P.K. and Sinha, S.K., 2010. Financial performance of microfinance institutions of India. Delhi business review, 11(2), pp.37-46.

- Aigner D., Lovell C.A.K., Schmidt P., 1977. Formulation and estimation of stochastic frontier production function models. Journal of Econometrics vol. 6, no. 1, pp. 21-37

- Akpalua, W., Alnaab, S. E., and Aglobitse, Peter B. (2012), Access to microfinance and intra household business decision making: Implication for efficiency of female owned enterprises in Ghana. The Journal of Socio-Economics, Vol. 41, pp 513– 518.

- Al-Gasaymeh, A., 2016. Bank efficiency determinant: Evidence from the gulf cooperation council countries. Research in International Business and Finance, 38, pp.214-223.

- Alhassan, A.L. and Fiador, V., 2014. Insurance-growth nexus in Ghana: An autoregressive distributed lag bounds cointegration approach. Review of Development Finance, 4(2), pp.83-96.

- Allen, L. and Rai, A., 1996. Operational efficiency in banking: An international comparison. Journal of banking & Finance, 20(4), pp.655-672.

- Al-Mamun, A. and Mazumder, M.N.H., 2015. Impact of microcredit on income, poverty, and economic vulnerability in Peninsular Malaysia. Development in practice, 25(3), pp.333-346.

- Altunbas, Y., Liu, M.H., Molyneux, P. and Seth, R., 2000. Efficiency and risk in Japanese banking. Journal of Banking & Finance, 24(10), pp.1605-1628.

- Altunbas, Y., S. Carbo, E.P.M. Gardener and P. Molyneux (2007), "Examining the Relationships between Capital, Risk and Efficiency in European Banking", European Financial Management, Vol. 13, No. 1, pp. 49–70.

- Amin, R. and Becker, S., 1998. NGO-promoted microcredit programs and women's empowerment in rural Bangladesh: quantitative and qualitative evidence. The journal of developing areas, 32(2), pp.221-236.

- Anis Chowdhury, 2009. Microfinance as a Poverty Reduction Tool—A Critical Assessment. Working Papers 89, United Nations, Department of Economics and Social Affairs.

- Apergis, N., Rezitis, A., 2004. Cost structure, technological change, and productivity growth in the Greek banking sector. Int. Adv. Econ. Res. 10 (1), 1–15.

- Ariff, M. and Luc, C., 2008. Cost and profit efficiency of Chinese banks: A non-parametric analysis. China economic review, 19(2), pp.260-273.
- Armendariz de Aghion, B. and Morduch, J., 2005. The Economics of Microfinance. MIT Press, Cambridge, 352 p.
- Armendáriz B. and Morduch J., 2010. The economics of microfinance. MIT Press.
- Armendáriz, B. and Szafarz, A., 2011. On mission drift in microfinance institutions. The handbook of microfinance, pp.341-366.
- Asanke, Y.A, 2015. Loan Utilization and Repayment Practices of Rural Microfinance Clients: The Case of Wereilu District-Amhara Regional State of Ethiopia. Research Journal of Finance and Accounting, 6(23), pp.20-33.
- Asian Development Bank, 2000. Microfinance Development Strategy 2000: Sector Performance and Client Welfare. Reference Number: SES:REG 2012-10, Independent Evaluation: SS-116
- Assaf, A.G., Gillen, D. and Tsionas, E.G., 2014. Understanding relative efficiency among airports: A general dynamic model for distinguishing technical and allocative efficiency. Transportation Research Part B: Methodological, 70, pp.18-34.
- Ataullah, A., Cockerill, T. and Le, H., 2004. Financial liberalization and bank efficiency: a comparative analysis of India and Pakistan. Applied Economics, 36(17), pp.1915-1924.
- Attansio, O., Augsburg, B., de Haas, R., Fitzsimons, E. and Harmgart, H., 2011. Group lending or individual lending? Evidence from a randomized field experiment in Mongolia. Working Paper, W11/20 London: Institute of Fiscal Studies.
- Augsburg, B., De Haas, R., Harmgart, H. and Meghir, C., 2014. Microcredit at the margin: Experimental evidence from Bosnia and Herzegovina. No. SP II 2014-304, Discussion Paper. Social Science Research Center Berlin (WZB)
- Akhavein, J.D., Berger, A.N. and Humphrey, D.B., 1997. The effects of megamergers on efficiency and prices: Evidence from a bank profit function. *Review of industrial Organization*, *12*(1), pp.95-139.
- Apergis, N. and Rezitis, A., 2004. Cost structure, technological change, and productivity growth in the Greek banking sector. International Advances in Economic Research, 10(1), pp.1-15.
- Argent, J., Augsburg, B. and Rasul, I., 2014. Livestock asset transfers with and without training: Evidence from Rwanda. Journal of Economic Behavior & Organization, 108, pp.19-39.
- Armendáriz, B. and Szafarz, A., 2011. On mission drift in microfinance institutions. The handbook of microfinance, pp.341-366.
- Athanassopoulos, A. D., & Ballantine, J. A. (1995). Ratio and frontier analysis for assessing corporate performance: evidence from the grocery industry in the UK. Journal of the Operational Research Society, 46(4), 427–440.
- Attanasio, O., Augsburg, B., De Haas, R., Fitzsimons, E. and Harmgart, H., 2013. Group Lending or Individual Lending? Evidence from a Randomized Field Experiment in Rural Mongolia. Forthcoming in the American Economic Journal: Applied Economics, CentER Discussion Paper Series No. 2013-074, Available at SSRN: https://ssrn.com/abstract=2365432 or http://dx.doi.org/10.2139/ssrn.2365432

- Augsburg B. & Fouillet C. (2010) Profit Empowerment: The Microfinance Institution's Mission Drift. Perspectives on Global Development and Technology [Special Issue: Microfinance and Institutions], 9 (3-4): 327-355.

- Avkiran, N.K., 1999. The evidence on efficiency gains: The role of mergers and the benefits to the public. Journal of banking & finance, 23(7), pp.991-1013.

- Baido, L. (2008). Women in Uganda benefit by freedom from hunger's microcredit/education program, Freedom from hunger. Bay Area International Development Organization.

- Balkenhol, B. and Hudon, M. (2011), "Efficiency", in: Armendariz, B. and Labie, M. (eds.), The Handbook of Microfinance, World Scientific Publishers, 383-396.

- Banker, R.D., Charnes, A. and Cooper, W.W., 1984. Some models for estimating technical and scale inefficiencies in data envelopment analysis. Management science, 30(9), pp.1078-1092.

- Banker RD and A Maindiratta, 1988. Nonparametric Analysis of Technical and Allocative Efficiencies in Production. Econometrica 56(6): 1315-1332.

- Banker, R.D. (1993). "Maximum Likelihood, Consistency and Data Envelopment Analysis: A Statistical Foundation." Management Science, Oct. 1265–1273.

- Banker, R. D. and Natarajan, R., 2008. Evaluating contextual variables affecting productivity using data envelopment analysis. Oper. Res. 56, 48-58

- Barnes, C., 2001. Microfinance Program Clients and Impact: An Assessment of Zambuko Trust, Zimbabwe. USAID-AIMS Paper. Washington, D.C.

- Barnes, C., Gaile, G., & Kibombo, R. (2001a). The impact of three microfinance programs in Uganda. Washington, DC: Development Experience Clearinghouse, USAID.

- Barr, M. S., 2004. Microfinance and Financial Development.Michigan Journal of International Law, Vol. 26, 271

- Barry, Thierno & Tacneng, Ruth. (2014). The Impact of Governance and Institutional Quality on MFI Outreach and Financial Performance in Sub-Saharan Africa. World Development. 58. 1–20. 10.1016/j.worlddev.2013.12.006.

- Barth, J., Caprio, G., Levine, R. (2006), Rethinking Bank Regulation: Till Angels Govern. Cambridge University Press.

- Barth, M.E. and Landsman, W.R., 2010. How did financial reporting contribute to the financial crisis?. European accounting review, 19(3), pp.399-423.

- Barth, J. R., Lin, C., Ma, Y., Seade, J., Song, FM., 2013. Do bank regulation, supervision and monitoring enhance or impede bank efficiency. Journal of Banking & Finance, Volume 37, Issue 8, pg2879-2892

- Bass, J. and Henderson, K., 2000. Leasing: A New Option for Microfinance Institutions. Weidemann Associates (Arlington, VA) and Development Alternatives Inc.(Bethesda, MD), Technical Note, 6.

- Bassem, B.S., 2008. Efficiency of microfinance institutions in the Mediterranean: an application of DEA. Transition Studies Review, 15(2), pp.343-354.

- Bateman, M. ed., 2011. Confronting microfinance: Undermining sustainable development. Kumarian Press.

- Battese, G. E., & Corra, G. S. (1977). Estimation of production frontier model: With application to the pastoral zone of Eastern Australia. Australian Journal of Agricultural Economics, 21(3), 169e179.
- Battese, G.E. and Coelli, T.J., 1995. A model for technical inefficiency effects in a stochastic frontier production function for panel data. Empirical economics, 20(2), pp.325-332.
- Bauer, P. W.; Berger, A. N.; and Humphrey, D. B. 1993. Efficiency and productivity growth in US banking. In H. O. Fried, C. A. K. Lovell, and S. S. Schmidt (eds). The Measurement of Productive Efficiency: Techniques and Applications. Oxford University Press, Oxford. 386-413.
- Baumann, T., 2005. Pro-poor microcredit in South Africa: Cost-efficiency and productivity of South African pro-poor microfinance institutions. Journal of Microfinance/ESR Review, 7(1), p.7.
- Beccalli, E., Casu, B. and Girardone, C., 2006. Efficiency and stock performance in European banking. Journal of Business Finance & Accounting, 33(1-2), pp.245-262.
- Becchetti, L. and Castriota, S., 2011. Does microfinance work as a recovery tool after disasters? Evidence from the 2004 tsunami. World Development, 39(6), pp.898-912.
- Beck, T. and Levine, R., 2004. Stock markets, banks, and growth: Panel evidence. Journal of Banking & Finance, 28(3), pp.423-442.
- Belke, A.H., Haskamp, U. and Setzer, R., 2016. Bank efficiency and regional growth in Europe: new evidence from micro-data.
- Benston, G.J. and Smith, C.W., 1976. A transactions cost approach to the theory of financial intermediation. The Journal of finance, 31(2), pp.215-231.
- Berg, S.A., Førsund, F.R., Hjalmarsson, L. and Suominen, M., 1993. Banking efficiency in the Nordic countries. Journal of Banking & Finance, 17(2-3), pp.371-388.
- Berger, A. N., & Humphrey, D. B. (1992). Measurement and efficiency issues in commercial banking. In Z. Griliches (Ed.), Measurement issues in the service sectors (pp. 245–279). National Bureau of Economic Research, University of Chicago Press.
- Berger, A.N., Hancock, D. and Humphrey, D.B., 1993. Bank efficiency derived from the profit function. Journal of Banking & Finance, 17(2-3), pp.317-347.
- Berger, A.N., Hunter, W.C. and Timme, S.G., 1993. The efficiency of financial institutions: A review and preview of research past, present and future. Journal of Banking & Finance, 17(2-3), pp.221-249.
- Berger, A.N. and DeYoung, R., 1997. Problem loans and cost efficiency in commercial banks. Journal of Banking and Finance 21, 849–870.
- Berger, A.N. and Mester, L.J., 1997. Efficiency and productivity change in the US commercial banking industry: A comparison of the 1980s and 1990s (No. 97-5).
- Berger, A.N., 2000. The integration of the financial services industry: Where are the efficiencies? North American Actuarial Journal, 4(3), pp.25-45.
- Berger, A.N. and DeYoung, R., 2001. The effects of geographic expansion on bank efficiency. Journal of financial services research, 19(2), pp.163-184.

- Berger, A.N. and Mester, L.J., 2003. Explaining the dramatic changes in performance of US banks: technological change, deregulation, and dynamic changes in competition. Journal of financial intermediation, 12(1), pp.57-95.

- Berger, A.N., Hasan, I. and Zhou, M., 2009. Bank ownership and efficiency in China: What will happen in the world's largest nation?. Journal of Banking & Finance, 33(1), pp.113-130.

- Bertrand, M. and Schoar, A., 2003. Managing with style: the effect of managers on firm policies. Quarterly Journal of Economics. 118(4), 1169-1208.

- Besely, T., Burchardi, K., Ghatak, M., 2012. Incentives and the De Soto Effect. Quarterly Journal of Economics. Volume 127, pp 237-282

- Bhatt, N. and Tang, S.Y., 2001. Delivering microfinance in developing countries: Controversies and policy perspectives. Policy studies journal, 29(2), pp.319-333.

- Bhattacharyya, A., Lovell, C.K. and Sahay, P., 1997. The impact of liberalization on the productive efficiency of Indian commercial banks. European Journal of operational research, 98(2), pp.332-345.

- Bhattacharyya, A. and Pal, S., 2013. Financial reforms and technical efficiency in Indian commercial banking: A generalized stochastic frontier analysis. Review of Financial Economics, 22(3), pp.109-117.

- Blanco-oliver, A., Irimia-dieguez, A., & Reguera-alvarado, N. (2016). Prediction- oriented PLS path modeling in microfinance research. Journal of Business Research, 69 (10), 4643-4645

- Bi, Z. and Pandey, S.L.D., 2011. Comparison of performance of microfinance institutions with commercial banks in India. Australian Journal of Business and Management Research, 1(6), pp.110-120.

- Bonin, J.P., Hasan, I. and Wachtel, P., 2005. Bank performance, efficiency and ownership in transition countries. Journal of banking & finance, 29(1), pp.31-53.

- Boonperm, J., Haughton, J. and Khandker, S., 2013. Does the village fund matter in Thailand? Evaluating the impact on incomes and spending. Journal of Asian Economics. 25C, 3-16.

- Boubakri, N., Cosset, J.C., Fischer, K. and Guedhami, O., 2005. Privatization and bank performance in developing countries. Journal of Banking & Finance, 29(8-9), pp.2015-2041.

- Bos, J. W. B., and Schmiedel, H. (2003). Comparing Efficiency in European Banking: A Meta Frontier Approach. De Nederlandsche Bank Research Papers, 57.

- Brannen, C, (2010). An impact study of the Village Savings and Loan Association (VSLA) program in Zanzibar, Tanzania. BA Dissertation, Wesleyan University.

- Brau, J.C. and Woller, G.M., 2004. Microfinance: A comprehensive review of the existing literature. The Journal of Entrepreneurial Finance, 9(1), pp.1-28.

- Brière, Marie & Szafarz, Ariane. (2015). Does Commercial Microfinance Belong to the Financial Sector? Lessons from the Stock Market. World Development. 67. 10.1016/j.worlddev.2014.10.007.

- Brown, W. & Nagarajan, G. (2000). Bangladesh experience in adapting financial services to cope with floods: Implication for the microfinance industry. Washington, DC: Development Alternatives Inc.

- Bruett, T., Barres, I., Curran, L., Escalona, A., Nelson, E.P., Norell, D. and Stephens, M., 2005. Measuring performance of microfinance institutions. Washington: SEEP Network.

- Calderón, C. and Liu, L., 2003. The direction of causality between financial development and economic growth. Journal of development economics, 72(1), pp.321-334.
- Canhoto, Ana and Dermine, Jean, 2003. A note on banking efficiency in Portugal, New vs. Old banks. Journal of Banking & Finance 27 (2003) 2087–2098
- Carbó-Valverde, S. and Sánchez, L.P., 2013. Financial stability and economic growth. In Crisis, risk and stability in financial markets (pp. 8-23). Palgrave Macmillan, London.
- Carvallo, O. and Kasman, A., 2005. Cost efficiency in the Latin American and Caribbean banking systems. Journal of international financial Markets, Institutions and Money, 15(1), pp.55-72.
- Casu, B. and Girardone, C., 2004. Financial conglomeration: efficiency, productivity and strategic drive. Applied Financial Economics, 14(10), pp.687-696.
- Casu, B. and Girardone, C., 2004. Large banks' efficiency in the single European market. The Service Industries Journal, 24(6), pp.129-142.
- Casu, B. and Girardone, C., 2009. Testing the relationship between competition and efficiency in banking: A panel data analysis. Economics Letters, 105(1), pp.134-137.
- Casu, B. and Ferrari, A., 2013. Dynamics of Bank Efficiency in the EU and Southern Mediterranean: Is there a convergence?.
- CDF, 2010. Bangladesh Microfinance Statistics. Credit Development Forum, Dhaka.
- CDF, 2014. Bangladesh Microfinance Statistics. Credit Development Forum, Dhaka.
- CDF, 2015. Bangladesh microfinance statistics. Credit Development Forum, Dhaka.
- CDF, 2018. Bangladesh microfinance statistics. Credit Development Forum, Dhaka.
- CEP, 2006. An Impact Assessment of the Microfinance Institution. A Report Submitted to the Australian Agency for International Development and the Labor Confederation of Ho Chi Minh City, Vietnam. Retrieved from: http://www.mixmarket.org/sites/default/files/medialibrary/20501.885/CEP Impact Assessment Report February 2006.pd.
- CGAP, 2005. Annual Report. Consultative Group to Assist the Poor. www.cgap.org/sites/default/files/organizational-documents/CGAP-Annual-Report-Dec-2005.pdf
- CGAP, 2009. CGAP Annual Report 2009. www.cgap.org/about/key-documents/cgap-annual-report-2009
- CGAP, 2010. CGAP Funder Survey 2010. Washington, D.C.: CGAP.
- Chang, T.C. and Chiu, Y.H., 2006. Affecting factors on risk-adjusted efficiency in Taiwan's banking industry. Contemporary Economic Policy, 24(4), pp.634-648.
- Chang, P.C., Jia, C. and Wang, Z., 2010. Bank fund reallocation and economic growth: Evidence from China. Journal of Banking & Finance, 34(11), pp.2753-2766.
- Chaves R, González-Vega C. The design of successful financial intermediaries: evidence from Indonesia. World Development 1996;24(1):65–78.
- Chen, Y.K., 2001. Three essays on bank efficiency. Drexel University.

- Chen, G. and Rasmussen, S., 2005. Emerging Issues for National Microfinance Associations. Washington, DC: ShoreBank Advisory Services and Pakistan Microfinance Association.

- Chen, M.A. and Snodgrass, D., 2001. Managing resources, activities, and risk in urban India: The impact of SEWA Bank. Washington, DC: AIMS.

- Chen, Xiaogang and Skully, Michael and Brown, Kym, 2005. Banking efficiency in China: Application of DEA to pre- and post-deregulation eras: 1993–2000. China Economic Review 16 (2005) 229 – 245

- Chen, S. and Ravallion, M., 2008. The Developing World is Poorer Than We Thought, but No Less Successful in the Fight Against Poverty. Policy Research Working Paper; No. 4703. Washington, DC: World Bank. © World Bank. https://openknowledge.worldbank.org/handle/10986/6322 License: CC BY 3.0 IGO.

- Cheston, S. and Reed, L., 1999. Measuring transformation: assessing and improving the impact of microcredit. Journal of Microfinance/ESR Review, 1(1), p.3.

- Chirkos, A. Y., 2014. The Impact of Microfinance on Living Standards, Empowerment and Poverty Alleviation of the Poor People in Ethiopia, A Case Study in ACSI. Research Journal of Finance and Accounting, 5(14).

- Chliova M, Brinckmann J, Rosenbusch N (2015) Is microcredit a blessing for the poor? A meta-analysis examining development outcomes and contextual considerations. Journal of Business Venturing 30(3): 467–487.

- Christopoulos, D.K., Lolos, S.E.G., Tsionas, E.G., 2002. Efficiency of the Greek banking system in view of the EMU: a heteroscedastic stochastic frontier approach. J. Policy Model. 24, 813–829.

- Chortareas, G.E., Girardone, C. and Ventouri, A., 2011. Financial frictions, bank efficiency and risk: evidence from the Eurozone. Journal of Business Finance & Accounting, 38(1-2), pp.259-287.

- Chortareas, G.E., Girardone, C. and Ventouri, A., 2012. Bank supervision, regulation, and efficiency: Evidence from the European Union. Journal of financial stability, 8(4), pp.292-302.

- Chortareas, G., Girardone, C., Ventouri, A., 2013. Financial Freedom and bank efficiency: Evidence from European Union, Journal of Finance & Banking, Volume 37, pp 1223-1231

- Chowdhury, A.M.R. and Bhuiya, A., 2004. The wider impacts of BRAC poverty alleviation programme in Bangladesh. Journal of international development, 16(3), pp.369-386.

- Chowdhury, A., 2009. Microfinance as a poverty reduction tool: a critical assessment.

- Chowdhury, S. S., and Chowdhury, S. A., 2011. Microfinance and women empowerment: A panel data analysis using evidence from rural Bangladesh. International Journal of Economics and Finance. 3 (5), 86-96

- Chu, K.H., 2010. Bank mergers, branch networks and economic growth: Theory and evidence from Canada, 1889–1926. Journal of macroeconomics, 32(1), pp.265-283.

- Chu, Sing Fat and Lim, Guan Hua, (1998), Share performance and profit efficiency of banks in an oligopolistic market: evidence from Singapore, Journal of Multinational Financial Management, 8, issue 2-3, p. 155-168.

- Clark, J.A. and Siems, T.F., 2002. X-efficiency in banking: Looking beyond the balance sheet. Journal of Money, Credit and Banking, pp.987-1013.

- Claessens, S., Demirgüç-Kunt, A. and Huizinga, H., 2001. How does foreign entry affect domestic banking markets?. Journal of banking & finance, 25(5), pp.891-911.
- Coleman, B.E., 2006. Microfinance in Northeast Thailand: Who benefits and how much?. World development, 34(9), pp.1612-1638.
- Coleman, N. and Feler, L., 2015. Bank ownership, lending, and local economic performance during the 2008–2009 financial crisis. Journal of Monetary Economics, 71, pp.50-66.
- Conroy, J.D., 2003. The challenges of microfinancing in Southeast Asia. Foundation for Development Cooperation.
- Consultative Group to Assist the Poorest (CGAP). 2010. "Andhra Pradesh 2010: Global Implications of the Crisis in Indian Microfinance," Focus Note 67, Washington, DC: CGAP. http://www.cgap.org/gm/document-1.9.48945/FN67.pdf
- Cook WD, Zhu J. Modeling performance measurement: applications and implementation issues in DEA. New York: Springer Science Business Media; 2005.
- Cooper, W.W., Seiford, L.M., Zhu, J., 2004. Data envelopment analysis: history, models and interpretations. In: Cooper WW, Seiford LM, Zhu J, editors. Handbook on data envelopment analysis. Dordrecht: Kluwer Academic Publishers Group. p. 1e39.
- Cooper, W.W., Seiford, L.M., Tone, K. and Zhu, J., 2007. Some models and measures for evaluating performances with DEA: past accomplishments and future prospects. Journal of Productivity Analysis, 28, pp.151-163.
- Copestake, J., 2007. Mainstreaming microfinance: Social performance management or mission drift?. World development, 35(10), pp.1721-1738.
- Crepon, B., Devoto, F., Duflo, E. and Parienti, W., 2013. Estimating the impact of microcredit on those who take it up: Evidence from a randomized experiment in Morocco. MIT Working Paper, Department of Economics
- Cristea, M., Marcu, N. and Carstina, S., 2014. The relationship between insurance and economic growth in Romania compared to the main results in Europe–a theoretical and empirical analysis. Procedia Economics and Finance, 8, pp.226-235.
- Cull, R., Demirgüç-Kunt, A. and Morduch, J., 2009. Microfinance meets the market. Journal of Economic perspectives, 23(1), pp.167-92.
- Cummins, John and Rubio-Misas, Maria, (2006), Deregulation, Consolidation, and Efficiency: Evidence from the Spanish Insurance Industry, Journal of Money, Credit and Banking, 38, issue 2, p. 323-355, https://EconPapers.repec.org/RePEc:mcb:jmoncb:v:38:y:2006:i:2:p:323-355.
- Cummins, J.D. and Zi, H., 1998. Comparison of frontier efficiency methods: An application to the US life insurance industry. Journal of productivity analysis, 10(2), pp.131-152.
- Cummins, J.D., Weiss, M.A., Xie, X. and Zi, H., 2010. Economies of scope in financial services: A DEA efficiency analysis of the US insurance industry. Journal of Banking & Finance, 34(7), pp.1525-1539.
- Daraio, C. & Simar, L. (2007). Advanced Robust and Nonparametric Methods in Efficiency Analysis, Methodology and Applications. Springer, New York, USA.

- Das, Abhiman & Shanmugam, K., (2004). Efficiency of Indian commercial banks during reform period. Applied Financial Economics. 14. 681-686. 10.1080/0960310042000233458.

- Das, A., & Ghosh, S., 2006. Financial deregulation and efficiency: An empirical analysis of Indian banks during the post reform period. Review of Financial Economics, 15, pp.193–221.

- Das, A. and Ghosh, S., 2007. Determinants of credit risk in Indian state-owned banks: An empirical investigation.

- Das, A. and Ghosh, S., 2009. Financial deregulation and profit efficiency: A nonparametric analysis of Indian banks. Journal of Economics and Business, 61(6), pp.509-528.

- Das, A. and Kumbhakar, S.C., 2012. Productivity and efficiency dynamics in Indian banking: An input distance function approach incorporating quality of inputs and outputs. Journal of Applied Econometrics, 27(2), pp.205-234.

- Deelchand, T. and Padgett, C., 2009. The relationship between risk, capital and efficiency: Evidence from Japanese cooperative banks. Capital and Efficiency: Evidence from Japanese Cooperative Banks (December 18, 2009).

- De Jonghe, O. and Vander Vennet, R., 2008. Competition versus efficiency: What drives franchise values in European banking?. Journal of Banking & Finance, 32(9), pp.1820-1835.

- De Leon, J., 2001. The Bank of Canada's Management of Foreign Currency Reserves. Bank of Canada Review, 2000(Winter), pp.13-21.

- Deidda, L.G., 2006. Interaction between economic and financial development. Journal of Monetary Economics, 53(2), pp.233-248.

- Deidda, L. and Fattouh, B., 2008. Banks, financial markets and growth. Journal of Financial Intermediation, 17(1), pp.6-36.

- Delis, M.D. and Papanikolaou, N.I., 2009. Determinants of bank efficiency: evidence from a semi-parametric methodology. Managerial finance.

- Deltuvaitė, Vilma & Sineviciene, Lina, 2014. Research on the Relationship between the Structure of Financial System and Economic Development. Procedia - Social and Behavioral Sciences. 156. 10.1016/j.sbspro.2014.11.235.

- De Mel, S., McKenzie, D. and Woodruff, C., 2008. Returns to capital in microenterprises: evidence from a field experiment. The quarterly journal of Economics, 123(4), pp.1329-1372.

- De Mel, S., McKenzie, D.J. and Woodruff, C., 2009. Measuring microenterprise profits: Must we ask how the sausage is made?. Journal of development Economics, 88(1), pp.19-31.

- Demetriades, P.O. and Hussein, K.A., 1996. Does financial development cause economic growth? Time-series evidence from 16 countries. Journal of development Economics, 51(2), pp.387-411.

- Denizer, C., Dinc, M. and Tarimcilar, M., 2000. Measuring banking efficiency in the pre-and post-liberalization environment: evidence from the Turkish banking system (Vol. 2476). World Bank Publications.

- Desrochers, M. and Lamberte, M., 2003. Efficiency and Expense Preference in Philippines' Cooperative Rural Banks.

- Detragiache, E., Tressel, T., & Gupta, P. (2006). Foreign banks in poor countries: Theory and evidence. IMF working paper WP/06/18.
- Dev, S.M., 2006. Financial inclusion: Issues and challenges. Economic and political weekly, pp.4310-4313.
- Dewatripont, M. and Tirole, J., 1994. A theory of debt and equity: Diversity of securities and manager-shareholder congruence. The quarterly journal of economics, 109(4), pp.1027-1054.
- DeYoung, R. and Hasan, I., 1998. The performance of de novo commercial banks: A profit efficiency approach. Journal of Banking & Finance, 22(5), pp.565-587.
- Diacon, S.R., Starkey, K. and O'Brien, C., 2002. Size and efficiency in European long-term insurance companies: An international comparison. The Geneva Papers on Risk and Insurance. Issues and Practice, 27(3), pp.444-466.
- Diallo, Ibrahima; Mendy, Isatou (2017). Impact of financial development on economic growth in the WAMZ: A heterogeneous panel data approach, West African Journal of Monetary and Economic Integration, ISSN 0855-594X, West African Monetary Institute (WAMI), Accra, Vol. 17, Iss. 1, pp. 1-18
- Dichter, Thomas W., 1999. "Globalization and Its Effects on NGOs: Efflorescence or a Blurring of Roles and Relevance?" Nonprofit and Voluntary Sector Quarterly 28 (1999): 38 - 58.
- Dick, A.A. and Lehnert, A., 2010. Personal bankruptcy and credit market competition. The Journal of Finance, 65, pp. 655-686.
- Dietsch, M., 1993. Economies of scale and scope in French commercial banking industry. Journal of Productivity Analysis, 4(1), pp.35-50.
- Dietsch, M. and Lozano-Vivas, A., 2000. How the environment determines banking efficiency: A comparison between French and Spanish industries. Journal of Banking & Finance, 24(6), pp.985-1004.
- Domes, D., 2005. The European Commission's approach to microfinance, European Dialogue Conference -- Luxembourg Round Table on Microfinance, 17 October 2005.
- Drake, L. and Hall, M., 2003. Efficiency in Japanese Banking: An Empirical Analysis. Journal of Banking and Finance 27, 891–917
- Drake, L., Hall, M.J. and Simper, R., 2009. Bank modelling methodologies: A comparative non-parametric analysis of efficiency in the Japanese banking sector. Journal of International Financial Markets, Institutions and Money, 19(1), pp.1-15.
- Duflo, E. and Kremer, M., 2003. Use of Randomization in the Evaluation of Development Effectiveness[1]. Evaluating development effectiveness, 7, p.205.
- Ductor, L. and Grechyna, D., 2015. Financial Development, Technological Progress and Economic Growth. International Review of Economics & Finance. 10.1016/j.iref.2015.01.001.
- Edward Chang, C., Hasan, I. and Hunter, W.C., 1998. Efficiency of multinational banks: an empirical investigation. Applied Financial Economics, 8(6), pp.689-696.
- Eisenbeis, R., Ferrier, G.D. and Kwan, S.H., 1999. The informativeness of stochastic frontier and programming frontier efficiency scores: Cost efficiency and other measures of bank holding company performance.

- Eling, M. and Luhnen, M., 2010. Efficiency in the international insurance industry: A cross-country comparison. Journal of Banking & Finance, 34(7), pp.1497-1509.

- Elyasiani, E. and Mehdian, S., 1995. The comparative efficiency performance of small and large US commercial banks in the pre-and post-deregulation eras. Applied economics, 27(11), pp.1069-1079.

- El-Zoghbi, M. and Martinez, M., 2011. Measuring Changes in Client Lives through Microfinance: Contributions of Different Approaches (Spanish).

- Emrouznejad, A., 2003. An alternative DEA measure: a case of OECD countries. Applied Economics Letters, 10(12), pp.779-782.

- Emrouznejad A, Anouze AL., 2009. A note on the modeling the efficiency of top Arab banks. Expert Syst Appl; 36(3):5741e4.

- Epstein, M.J. and Yuthas, K., 2010. Mission impossible: diffusion and drift in the microfinance industry. Sustainability Accounting, Management and Policy Journal.

- Erdem, C. and Erdem, M.S., 2008. Turkish banking efficiency and its relation to stock performance. Applied Economics Letters, 15(3), pp.207-211.

- Ergungor, O.E., 2008. Financial system structure and economic growth: Structure matters. International Review of Economics & Finance, 17(2), pp.292-305.

- Esho, N., 2001. The determinants of cost efficiency in cooperative financial institutions: Australian evidence. Journal of Banking & Finance, 25(5), pp.941-964.

- Evans, J. (2010). Microfinance's midlife crisis. The Wall Street Journal.

- Fadzlan, S. 2009. The determinants of efficiency of publicly listed Chinese banks: evidence from two-stage banking models. Macroeconomics and Finance in Emerging Market Economies, 2: 93–133. [Taylor & Francis Online], [Google Scholar]

- Fall, F., Akim, A.M. and Wassongma, H., 2018. DEA and SFA research on the efficiency of microfinance institutions: A meta-analysis. World Development, 107, pp.176-188.

- Fang, Y., Hasan, I. and Marton, K., 2011. Bank efficiency in transition economies: recent evidence from South-Eastern Europe. Bank of Finland Research Discussion Paper, (5).

- Färe, R., Grosskopf, S. and Weber, W.L., 2004. The effect of risk-based capital requirements on profit efficiency in banking. Applied Economics, 36(15), pp.1731-1743.

- Fare, R and S. Grosskopf. 1996. Intertemporal Production Frontiers: With Dynamic DEA. London: Kluwer Academic Publishers. 1996.

- Farrell, M. J., 1957. The Measurement of Productive Efficiency. Journal of the Royal Statistical Society. Series A (General), 120(3), 253–290.

- Farrington, T., 2000. Efficiency in microfinance institutes. Micro Bank. Bull.. 4. 18-23.

- Faruqee, R., Badruddoza, S., 2012. Microfinance in Bangladesh: past, present and future. Institute of Microfinance, Dhaka.

- Fecher, F., Kessler, D., Perelman, S. and Pestieau, P., 1993. Productive performance of the French insurance industry. Journal of Productivity analysis, 4(1), pp.77-93.

- Ferro-Luzzi, G. and Weber, S., 2006. Measuring the performance of microfinance institutions. Available at SSRN 918750.

- Fenn, P., Vencappa, D., Diacon, S., Klumpes, P. and O'Brien, C., 2008. Market structure and the efficiency of European insurance companies: A stochastic frontier analysis. Journal of Banking & Finance, 32(1), pp.86-100.

- Fenton, A., Paavola, J. and Tallontire, A., 2017. The role of microfinance in household livelihood adaptation in Satkhira District, Southwest Bangladesh. World Development, 92, pp.192-202.

- Fernández, A.I., González, F. and Suárez, N., 2010. How institutions and regulation shape the influence of bank concentration on economic growth: International evidence. International Review of Law and Economics, 30(1), pp.28-36.

- Fiordelisi, F., 2007. Shareholder value efficiency in European banking. Journal of Banking & Finance, 31(7), pp.2151-2171.

- Fiordelisi, F. and Molyneux, P., 2010. The determinants of shareholder value in European banking. Journal of Banking & Finance, 34(6), pp.1189-1200.

- Foster, A. (1995) "Prices, Credit Markets, and Child Growth in Low-income Areas, "Economic Journal 105, No. 430: 551-570.

- Fries, S. and Taci, A., 2005. Cost efficiency of banks in transition: Evidence from 289 banks in 15 post-communist countries. Journal of Banking & Finance, 29(1), pp.55-81.

- Fu, Xiaoqing and Heffernan, Shelagh, (2007), Cost X-efficiency in China's banking sector, China Economic Review, 18, issue 1, p. 35-53, https://EconPapers.repec.org/RePEc:eee:chieco:v:18:y:2007:i:1:p:35-53.

- Fu, X.M. and Heffernan, S., 2009. The effects of reform on China's bank structure and performance. Journal of Banking & Finance, 33(1), pp.39-52.

- Fu, X.M., Lin, Y.R. and Molyneux, P., 2014. Bank efficiency and shareholder value in Asia Pacific. Journal of international financial markets, institutions and money, 33, pp.200-222.

- Fukuyama, H., 1993. Technical and scale efficiency of Japanese commercial banks: a non-parametric approach. Applied economics, 25(8), pp.1101-1112.

- Fujii, H., Managi, S. and Matousek, R., 2014. Indian bank efficiency and productivity changes with undesirable outputs: A disaggregated approach. Journal of banking & finance, 38, pp.41-50.

- Fung, M.K., 2009. Financial development and economic growth: convergence or divergence?. Journal of international money and finance, 28(1), pp.56-67.

- Fungáčová, Z., Pessarossi, P. and Weill, L., 2013. Is bank competition detrimental to efficiency? Evidence from China. China Economic Review, 27, pp.121-134.

- Gaganis, C., and Pasiouras, F., 2013. Financial supervision regimes and bank efficiency: International evidence. Journal of Banking & Finance, 37(12), pp. 5463-5475.

- Ganle, J.K., Afriyie, K. and Segbefia, A.Y., 2015. Microcredit: Empowerment and disempowerment of rural women in Ghana. World development, 66, pp.335-345.

- Gardner, L.A. and Grace, M.F., 1993. X-efficiency in the US life insurance industry. Journal of Banking & Finance, 17(2-3), pp.497-510.

- Garza-García, J.G., 2012. Determinants of bank efficiency in Mexico: A two-stage analysis. Applied Economics Letters, 19(17), pp.1679-1682.

- Gertler, P., Levine, D.I. and Moretti, E., 2009. Do microfinance programs help families insure consumption against illness?. Health economics, 18(3), pp.257-273.

- Ghatak, M. and Guinnane, T. W., 1999. The economics of lending with joint liability: theory and practice. Journal of Development Economics, Vol. 60 1999 195–228

- Ghosh, S., Nachane, D.M., Narain, A. and Sahoo, S., 2003. Capital requirements and bank behaviour: An empirical analysis of Indian public sector banks. Journal of International Development: The Journal of the Development Studies Association, 15(2), pp.145-156.

- Ghosh, R., 2005. Microfinance in India: A critique. Available at SSRN 735243.

- Gietzen, T., 2017. The exposure of microfinance institutions to financial risk. Review of Development Finance. Vol. 7, pp 120–133.

- Gilbert, R.A., 1984. Bank market structure and competition: a survey. Journal of Money, Credit and Banking, 16(4), pp.617-645.

- Gilbert, R.A. and Wilson, P.W., 1998. Effects of deregulation on the productivity of Korean banks. Journal of economics and business, 50(2), pp.133-155.

- Gilligan, T.W., Michael Smirlock and William Marshall, 1984, Scale and scope economies in the multiproduct banking firm. Journal of Monetary Economics, 13, pp.393-405.

- Goaied, Mohamed & Sassi, Seifallah. (2013). Financial development, ICT diffusion and economic growth: Lessons from MENA region. Telecommunications Policy. 37. 252-261. 10.1016/j.telpol.2012.12.004.

- Goddard, J., Molyneux, P. and Williams, J., 2014. Dealing with cross-firm heterogeneity in bank efficiency estimates: Some evidence from Latin America. Journal of Banking & Finance, 40, pp.130-142.

- Goldberg, N., 2005. Measuring the impact of microfinance: taking stock of what we know. Grameen Foundation USA publication series, pp.1-56.

- Gonzalez-Vega, C., Schreiner, M., Meyer, R.L., Rodriguez-Meza, J. and Navajas, S., 1996. BancoSol: The challenge of growth for microfinance organizations (No. 1209-2016-98497).

- Gonzalez-Vega, C. (2003). Deepening Rural Financial Markets: Macroeconomic, Policy and Political Dimensions. Paving the Way Forward for Rural Finance: An International Conference on Best Practices. Washington, D.C.: USAID/BASIS-CRSP/WOCCU.

- Gorton, G. and Schmid, F., 1999. Corporate governance, ownership dispersion and efficiency: Empirical evidence from Austrian cooperative banking. Journal of Corporate Finance, 5(2), pp.119-140.

- Grabowski, R., Kraft, S., Pasurka, C. and Aly, H.Y., 1990. A ray-homothetic production frontier and efficiency: Grain farms in Southern Illinois. European Review of Agricultural Economics, 17(4), pp.435-448.

- Grabowski, R., 1994. The successful developmental state: Where does it come from?' World Development, 22(3), pp.413-422.
- Greene, W.H. and Segal, D., 2004. Profitability and efficiency in the US life insurance industry. Journal of Productivity Analysis, 21(3), pp.229-247.
- Gregoire, J. and Tuya, O., 2006. Cost efficiency of microfinance institutions in Peru: A Stochastic Frontier Approach. Latin America Business Review 7, 41-70.
- Grigorian, D. A., and V. Manole, 2002, Determinants of commercial bank performance in transition: an application of data envelopment analysis, IMF Working Paper No. 02/146.
- Grigorian, D.A. and Manole, V., 2006. Determinants of commercial bank performance in transition: An application of data envelopment analysis. Comparative Economic Studies, 48(3), pp.497-522.
- Gul, F.A., Podder, J. and Shahriar, A.Z.M., 2017. Performance of microfinance institutions: does government ideology matter?. World Development, 100, pp.1-15.
- Guitierrez-Nieto, B. S.-C. (2006). Microfinance institutions and efficiency. .International Journal of Management Science, Pp.131-142.
- Gutiérrez-Nieto, B., Serrano-Cinca, C. and Mar Molinero, C., 2007. Microfinance institutions and efficiency, Omega, 35, issue 2, p. 131-142.
- Gutiérrez-Nieto, B., Serrano-Cinca, C. and Mar Molinero, C., 2009. Social efficiency in microfinance institutions. Journal of the operational research society, 60(1), pp.104-119.
- Hamid, S.A., Roberts, J. and Mosley, P., 2011. Evaluating the health effects of micro health insurance placement: Evidence from Bangladesh. World Development, 39(3), pp.399-411.
- Hao, J., Hunter, W.C. and Yang, W.K., 2001. Deregulation and efficiency: the case of private Korean banks. Journal of economics and business, 53(2-3), pp.237-254.
- Haq, M., Skully, M. and Pathan, S., 2010. Efficiency of microfinance institutions: A data envelopment analysis. Asia-Pacific Financial Markets, 17(1), pp.63-97.
- Hardy, D. and Bonaccorsi di Patti, E., 2001. Bank reform and bank efficiency in Pakistan.
- Harris, O., Huerta, D. and Ngo, T., 2013. The impact of TARP on bank efficiency. Journal of International Financial Markets, Institutions and Money, 24, pp.85-104.
- Hartman, T.E., Storbeck, J.E. and Byrnes, P., 2001. Allocative efficiency in branch banking. European Journal of Operational Research, 134(2), pp.232-242.
- Hasan, I. and Hunter, W.C., 1996. Management efficiency in minority-and women-owned banks. Economic Perspectives-Federal Reserve Bank of Chicago, 20, pp.20-28.
- Hasan, I. and Marton, K., 2003. Development and efficiency of the banking sector in a transitional economy: Hungarian experience. Journal of Banking & Finance, 27(12), pp.2249-2271.
- Hashemi, S. M., Schuler, R. S., & Riley, A., 1996. Rural Credit and Women Empowerment in Bangladesh. World Development, 24(4), pp 635-653.
- Hassan, M.K. and Tufte, D.R., 2001. The x-efficiency of a group-based lending institution: The case of the Grameen Bank. World development, 29(6), pp.1071-1082.

- Hassan, M.K., Sanchez, B. and Yu, J.S., 2011. Financial development and economic growth: New evidence from panel data. The Quarterly Review of economics and finance, 51(1), pp.88-104.
- Halkos G.E and. Salamouris D.S (2004). Efficiency Measurement of the Greek Commercial Banks with the Use of Financial Ratios: A Data Envelopment Analysis Approach. Management Accounting Research" 15(2): 201-224.
- Harris, O., Huerta, D. and Ngo, T., 2013. The impact of TARP on bank efficiency. Journal of International Financial Markets, Institutions and Money, 24, pp.85-104.
- Havrylchyk, O., 2006. Efficiency of the Polish banking industry: Foreign versus domestic banks. Journal of Banking & Finance, 30(7), pp.1975-1996.
- Havranek, T., Irsovab, Z., Lesanovska, J., 2016. Bank efficiency and interest rate pass through: evidence from Czech loan products. Economic Modelling, Volume 54, pp 153-169
- Hemtanon, W. and Gan, C. (2021), "Impact of microfinance programs in Thailand", Agricultural Finance Review, Vol. ahead-of-print No. ahead-of-print. https://doi.org/10.1108/AFR-02-2020-0026
- Hermes, N. and Lensink, R. (2007), The empirics of microfinance: what do we know?. The Economic Journal, 117: F1-F10. https://doi.org/10.1111/j.1468-0297.2007.02013.
- Hermes, N. and Lensink, R., 2011. Microfinance: its impact, outreach, and sustainability. World development, 39(6), pp.875-881.
- Hermes, N., Lensink, R. and Meesters, A., 2011. Outreach and efficiency of microfinance institutions. World development, 39(6), pp.938-948.
- Holland, T. and Wang, L., 2011. Avoiding the perils and fulfilling the promises of microfinance: A closer examination of the educational outcomes of clients' children in Nicaragua. International Journal of Educational Development, 31(2), pp.149-161.
- Hollis A. and Sweetman A., 1998. Microcredit: what can we learn from the past? World Development. 26(10), pp. 1875–91.
- Holod, D. and Lewis, H.F., 2011. Resolving the deposit dilemma: A new DEA bank efficiency model. Journal of Banking & Finance, 35(11), pp.2801-2810.
- Hossain, M. (1988) Credit for the Alleviation of Rural Poverty: The Grameen Bank in Bangladesh, Research Report No. 55 (Washington, D.C.: IFPRI).
- Hou, H., Cheng, S.Y. and Yu, C.P., 2012. Life insurance and Euro Zone's economic growth. Procedia-Social and Behavioral Sciences, 57, pp.126-131.
- Hou, X., Wang, Q. and Zhang, Q., 2014. Market structure, risk taking, and the efficiency of Chinese commercial banks. Emerging Markets Review, 20, pp.75-88.
- Hsiao, H.C., Chang, H., Cianci, A.M. and Huang, L.H., 2010. First financial restructuring and operating efficiency: Evidence from Taiwanese commercial banks. Journal of Banking & Finance, 34(7), pp.1461-1471.
- Hsiao, B., Chern, C.C., Chiu, Y.H. and Chiu, C.R., 2011. Using fuzzy super-efficiency slack-based measure data envelopment analysis to evaluate Taiwan's commercial bank efficiency. Expert Systems with Applications, 38(8), pp.9147-9156.

- Hsueh, S.J., Hu, Y.H. and Tu, C.H., 2013. Economic growth and financial development in Asian countries: A bootstrap panel Granger causality analysis. Economic Modelling, 32, pp.294-301.
- Huang, H.Q. and Nanson, G.C., 1998. The influence of bank strength on channel geometry: an integrated analysis of some observations. Earth Surface Processes and Landforms: The Journal of the British Geomorphological Group, 23(10), pp.865-876.
- Huang, W. and Eling, M., 2013. An efficiency comparison of the non-life insurance industry in the BRIC countries. European Journal of Operational Research, 226(3), pp.577-591.
- Hudon, M. and Traca, D., 2011. On the efficiency effects of subsidies in microfinance: An empirical inquiry. World development, 39(6), pp.966-973.
- Hulme D, Mosley P. 1996. Finance Against Poverty, Vols. I and II. Routledge: London.
- Hulme, D., 1999. Impact assessment methodologies for microfinance: Theory, experience and better practice. Institute for Development Policy ansd Management, University of Manchester.
- Hulme, D., 2000. Impact assessment methodologies for microfinance: theory, experience and better practice. World development, 28(1), pp.79-98.
- Hung, H. 1998. A typology of the theories of the roles of governing boards. Corporate Governance: An International Review,6:101–111.
- Hunter, W.C. and Timme, S. G. 1986. Technical change, organizational form, and the structure of bank production. Journal of Money, Credit, and Banking 18, 152-166.
- Hunter, W.C., Timme, S.G. and Yang, W.K., 1990. An examination of cost subadditivity and multiproduct production in large US banks. *Journal of Money, Credit and Banking*, *22*(4), pp.504-525.
- Idowu, A. & Salami, A., 2011. Impact of microfinance bank on standard of living of hairdresser in Ogbomoso North local government of Oyo State, Nigeria. American journal of social and management sciences,2(1), pp. 34-40.
- Ihori, T., Kato, R.R., Kawade, M. and Bessho, S.I., 2011. Health insurance reform and economic growth: Simulation analysis in Japan. Japan and the World Economy, 23(4), pp.227-239.
- Imai, K., Keele, L., & Tingley, D. (2010). A general approach to causal mediation analysis. Psychological Methods, 15(4), 309–334. https://doi.org/10.1037/a0020761
- Imai, K.S., Arun, T. and Annim, S.K., 2010. Microfinance and household poverty reduction: New evidence from India. World development, 38(12), pp.1760-1774.
- Imai, K and Azam, S., 2012. Does Microcredit reduces poverty in Bangladesh? New evidence from household panel data. Journal of Development Studies. 48(5), 633-653
- Imoisi, Anthony, L. &Opara, G., 2014. Microfinance and its Impact on Poverty Alleviation: A Case Study of some Microfinance Banks in Edo State. Nigeria American Journal of Humanities and Social Sciences, Volume 2(1), pp. 27-41.
- Ioannidis, C., Molyneux, P. and Pasiouras, F., 2008. The relationship between bank efficiency and stock returns: evidence from Asia and Latin America. University of Bath, School of Management, Working Paper, (2008.10).

- Isik, I., and Hassan, M. K., 2002. Cost and profit efficiency of the Turkish banking industry: An empirical investigation. The Financial Review, 37(2), 257–279.

- Islam, A. and Maitra, P., 2012. Health shocks and consumption smoothing in rural households: Does microcredit have a role to play? Journal of Development Studies. 97(2), 232-243

- Islam, A., 2015. Heterogeneous effects of microcredit: Evidence from large-scale programs in Bangladesh. Journal of Asian Economics. 37, 48-58

- Islam, A., Nguyen, C., Smyth, R., 2015. Does Microfinance Change Informal Lending in Village Economics: An Evidence from Bangladesh. Journal of Banking and Finance. Vol. 50, pp 141-156

- Jacoby, H. (1994) "Borrowing Constraints and Progress Through School: Evidence from Peru," Review of Economics and Statistics 76, No.: 1 151-160.

- Jaffry, S., Ghulam, Y. and Cox, J., 2008. Labour use efficiency in the Indian and Pakistani commercial banks. Journal of Asian Economics, 19(3), pp.259-293.

- Japonica Intersectoral (2003) Impact of microfinance on poverty reduction

- Jarraya, B. and Bouri, A., 2014. Optimal production plan and profit efficiency in European non-life insurance companies. Procedia Economics and Finance, 13, pp.69-81.

- Jemric, I. & Vujčić, Boris. (2002). Efficiency of banks in Croatia: A DEA approach. Comparative Economic Studies. 44. 169-193.

- Jeremy Greenwood & Juan M. Sanchez & Cheng Wang, 2013. Quantifying the impact of financial development on economic development, Review of Economic Dynamics, Volume 16, Issue 1, Pages 194-215, ISSN 1094-2025, https://doi.org/10.1016/j.red.2012.07.003.

- Kabeer, N., 2001. Conflicts over credit: Re-evaluating the empowerment potential of loan to women in rural Bangladesh. World Development, 29 (1), 63-84

- Kaboski, J. and Townsend, R., 2005. Policies and impact: An analysis of village level microcredit institutions. Journal of the European Economic Association. 3(1), 1-50.

- Kaboski, J. and Townsend, R., 2012. The impact of microcredit on village economics. American Economic Journal: Applied Economics, 4, 98-133

- Kader, H.A., Adams, M., Hardwick, P. and Kwon, W.J., 2014. Cost efficiency and board composition under different takaful insurance business models. International Review of Financial Analysis, 32, pp.60-70.

- Kaluarachchi, D.P.G. and Jahfer, A., 2014. Micro Finance and Poverty alleviation in SriLanka. Business and Management , 4, pp. 371-377.

- Kao, C. and Liu, S.T., 2014. Multi-period efficiency measurement in data envelopment analysis: The case of Taiwanese commercial banks. Omega, 47, pp.90-98.

- Kar, M., Nazlıoğlu, Ş. and Ağır, H., 2011. Financial development and economic growth nexus in the MENA countries: Bootstrap panel granger causality analysis. Economic modelling, 28(1-2), pp.685-693.

- Karafolas, S. and Mantakas, G., 1996. A note on cost structure and economies of scale in Greek banking. J. Bank. Financ.20, 377–387.

- Karim, R. and Osada, M., 1998. Dropping out: An emerging factor in the success of microcredit-based poverty alleviation programs. Development Economics, Vol 36, pp 257–288.

- Karlan, D. and Zinman, J., 2009. Expanding microenterprise credit access: Using randomized supply decisions to estimate the impacts in Manila, Working Papers. Yale University.

- Karlan, D. and Zinman, J., 2010. Expanding credit access: Using randomized supply decisions to estimate the impacts. Review of Financial Studies. 23(1), 433-464.

- Karnani, A., 2007. The mirage of marketing to the bottom of the pyramid: How the private sector can help alleviate poverty. California management review, 49(4), pp.90-111.

- Kasman, A. and Carvallo, O., 2014. Financial stability, competition and efficiency in Latin American and Caribbean banking. Journal of Applied Economics, 17(2), pp.301-324.

- Kasuya, M., 1986. Economies of scope: Theory and application to banking. BOJ Monetary and Economic Studies 4, 59–104.

- Katrishen, F.A. and Scordis, N.A., 1998. Economies of scale in services: a study of multinational insurers. Journal of International Business Studies, 29(2), pp.305-323.

- Kent, D. and Dacin, M.T., 2013. Bankers at the gate: Microfinance and the high cost of borrowed logics. Journal of Business Venturing, 28(6), pp.759-773.

- Khan, M. A. & Rahaman, M. A., 2007. Impact of Microfinance on Living Standards, Empowerment and Poverty Alleviation of Poor People: A Case Study on Microfinance in the Chittagong District of Bangladesh, s.l.: s.n

- Khandker, S., 1998. Fighting Poverty with Micro-credit: Experience from Bangladesh. New York: Oxford University Press for the World Bank.

- Khandker, S. R., 2000. Savings, informal borrowings and microfinance. The Bangladesh Development Studies. 49-78.

- Khandker, S., 2003. Micro-finance and Poverty: Evidence Using Panel Data from Bangladesh, World Bank Policy Research Paper 2945, World Bank, Washington.

- Khandker, S. R. 2005. Fighting poverty with microcredit: Experience in Bangladesh. New York, NY: Oxford University

- Khandker, S.R. and Samad, H. A., 2014. Microfinance Growth and Poverty Reduction in Bangladesh: What Does the Longitudinal Data Say?. Bangladesh Development Studies, Vol XXXVII, March - June 2014, Nos 1&2.

- Khavul, S., 2010. Microfinance: Creating Opportunities for the Poor? Academy of Management Perspectives, 24(3), 58–72. http://www.jstor.org/stable/29764974

- Khawari, A., 2004. Microfinance: Does it Hold its Promises? A Survey of Recent Literature. Available at SSRN: https://ssrn.com/abstract=556213 or http://dx.doi.org/10.2139/ssrn.556213

- Khodabakhshi, M., 2009. Estimating most productive scale size with stochastic data in data envelopment analysis. Economic Modelling, 26(5), pp.968-973.

- Khoutem, B. J.; Boujelbene, T. and Kamel, H., 2014. Financial Development and Economic Growth: New Evidence from Tunisia. Journal of Policy Modeling. 36. 10.1016/j.jpolmod.2014.08.002.

- Kipesha, E.F., 2012. Efficiency of microfinance institutions in East Africa: a data envelopment analysis. European Journal of Business and Management, ISSN 2222-1905 (Paper), ISSN 2222-2839 (Online), Vol 4, No.17, 2012

- Kirigia, J.M., Emrouznejad, A. and Sambo, L.G., 2002. Measurement of technical efficiency of public hospitals in Kenya: using data envelopment analysis. Journal of medical systems, 26, pp.39-45.

- Kirkwood, Joshua and Nahm, Daehoon, 2006. Australian Banking efficiency and its relation to stock returns. The Economic Records. Volume82, Issue258, Pages 253-267

- Kittelsen, S. A. C., 1998. Using Data Envelopment Analysis to Measure Production Efficiency in the Public Sector. Økonomiske Doktoravhandlinger, Universitetet i Oslo.

- Koetter, M. and Wedow, M., 2010. Finance and growth in a bank-based economy: Is it quantity or quality that matters?. Journal of international money and finance, 29(8), pp.1529-1545.

- Kohers, T., Huang, M., Kohers, N., 2000. Market perception of efficiency in bank holding company mergers: The roles of the DEA and SFA models in capturing merger potential. Review of Financial Economics, 9, 101–120.

- Komal, Rabia and Abbas, Faisal. 2015. Linking financial development, economic growth and energy consumption in Pakistan. Renewable and Sustainable Energy Reviews. 44. 10.1016/j.rser.2014.12.015.

- Korth, M., Stewart, R., Van Rooyen, C. and De Wet, T., 2012. Microfinance: development intervention or just another bank?. Journal of agrarian change, 12(4), pp.575-586.

- Koutsomanoli-Filippaki, A., Margaritis, D. and Staikouras, C., 2009. Efficiency and productivity growth in the banking industry of Central and Eastern Europe. Journal of Banking & Finance, 33(3), pp.557-567.

- Koveos P, Randhawa D., 2004. Financial services for the poor: assessing microfinance institutions. Managerial Finance. 30(9):pp. 70-95.

- Kraft, E. and Tırtıroğlu, D., 1998. Bank efficiency in Croatia: A stochastic-frontier analysis. Journal of comparative economics, 26(2), pp.282-300.

- Kuumuori Ganle, J., Afriyie, K., and Yao Segbefia, A., 2015. Microcredit: Empowerment and Disempowerment of Rural Women in Ghana, World Development. Vol. 66, pp 335-345.

- Kumar, T.S.A. and Newport, J. K., 2005. Role of Microfinance in Disaster Mitigation. Disaster Prevention and Management. Vol. 14(2), pp 176-182

- Kumar K, N., 2012. Dynamic incentives in microfinance group lending: An empirical analysis of progressive lending mechanism. Sage Open, 2(2), p.2158244012444280.

- Kumar, D., Hossain, A., and Gope, M. C., 2015. Role of micro credit program in empowering rural women in Bangladesh: A study on Grameen Bank Banglades. Asian Business Review, 3(4). doi:10.18034/abr.v3i2.94

- Kumbhakar, S.C., Wang, H. and Horncastle, A.P., 2015. A practitioner's guide to stochastic frontier analysis using Stata. Cambridge University Press.

- Lacalle Calderon, M., Rico Garrido, S., and Duran Navarro, J., 2008. Estudio piloto de evaluacion de impacto del programa de microcreditos de Cruz Roja Espanola en Ruanda. Revista de Economia Mundial, 19, 83-104.

- Lafourcade, A.L., Isern, J., Mwangi, P. and Brown, M., 2005. Overview of the outreach and financial performance of microfinance institutions in Africa. Microfinance Information eXchange, Washington, DC. http://www. mixmarket. org/medialibrary/mixmarket/Africa_Data_Study. pdf.

- Lang, G. and Welzel, P., 1996. Efficiency and technical progress in banking Empirical results for a panel of German cooperative banks. Journal of Banking & Finance, 20(6), pp.1003-1023.

- Lakwo, A., 2006. Microfinance, rural livelihood, and women's empowerment in Uganda. (African Studies Centre Research report no. 85). Ph.D. Thesis, submitted at the Redboud Universiteit, Nijmegen.

- Ledgerwood, J., 1999. Sustainable Banking with the Poor Microfinance Handbook: An Institutional and Financial Perspective. The World Bank, Washington, D. C.

- Lee, C.C., Lee, C.C. and Chiu, Y.B., 2013. The link between life insurance activities and economic growth: Some new evidence. Journal of International Money and Finance, 32, pp.405-427.

- Lee, Tung-Hao and Chih, Shu-Hwa, 2013. Does financial regulation affect the profit efficiency and risk of banks? Evidence from China's commercial banks. The North American Journal of Economics and Finance. 26. 705–724.

- Leightner, J.E. and Lovell, C.K., 1998. The impact of financial liberalization on the performance of Thai banks. Journal of economics and business, 50(2), pp.115-131.

- Lensink, R., Meesters, A. and Naaborg, I., 2008. Bank efficiency and foreign ownership: Do good institutions matter?. Journal of Banking & Finance, 32(5), pp.834-844.

- Lensink, R. and Pham, T, 2012. The impact of microcredit on self-employment profits in Vietnam. Economics of Transition. 20(1), 73-111.

- Levine, R., 1997. Financial development and economic growth: views and agenda. Journal of economic literature, 35(2), pp.688-726.

- Levine, R., Loayza, N. and Beck, T., 2000. Financial intermediation and growth: Causality and causes. Journal of monetary Economics, 46(1), pp.31-77.

- Liadaki, A. and Gaganis, C., 2010. Efficiency and stock performance of EU banks: Is there a relationship?. Omega, 38(5), pp.254-259.

- Liang, Q. and Jian-Zhou, T., 2006. Financial development and economic growth: Evidence from China. China economic review, 17(4), pp.395-411.

- Lieu, Pang-Tien & Yeh, Tsai-lien and Chiu, Yung-ho, 2005. Off-balance sheet activities and cost inefficiency in Taiwan's Banks. The Service Industries Journal. 25. 925-944. 10.1080/02642060500134196.

- Littlefield, E., Murduch, J. and Hashemi, S., 2003. Is Microfinance an Effective Strategy to Reach the Millennium Development Goals? CGAP

- Liu, J. and Tone, K., 2008. A multistage method to measure efficiency and its application to Japanese banking industry. Socio-Economic Planning Sciences, 42(2), pp.75-91.

- Lo Storto, C., 2013. Evaluating technical efficiency of Italian major municipalities: a Data Envelopment Analysis model. Procedia-Social and Behavioral Sciences, 81, pp.346-350.

- Lønborg, J. H. and Rasmussen, O. D., 2014. Can Microfinance Reach the Poorest: Evidence from a Community-Managed Microfinance Intervention. World Development, 64:460–472.

- Makame, A.H. and Murinde, V., 2006, Empirical findings on cognitive dissonance around microfinance outreach and sustainability. unpublished paper, Birmingham, University of Birmingham.

- Mamatzakis, E., Staikouras, C. and Koutsomanoli-Filippaki, A., 2008. Bank efficiency in the new European Union member states: Is there convergence?. International Review of Financial Analysis, 17(5), pp.1156-1172.

- Mamun, A. and Mazumder, M., 2015. Impact of microcredit on income, poverty, and economic ulnerability in Peninsular Malaysia. Development in Practice. 25. 333-346. 10.1080/09614524.2015.1019339.

- Manole, M.V. and Grigorian, M.D.A., 2002. Determinants of commercial bank performance in transition: an application of data envelopment analysis (No. 2002/146). International Monetary Fund.

- Marcus, R., Beth, P. and Caroline, H., 1999. Money Matters: Understanding Microfinance. Save the Children. London.

- Masood, T. and Ahmad, M., 2010. Technical efficiency of microfinance institutions in india-a stochastic frontier approach. Technical Efficiency of Microfinance Institutions in India-A Stochastic Frontier Approach (October 8, 2010).

- Maudos, J., Pastor, J., Perez, F., and Quesada, J., 2002. Cost and profit efficiency in European banks. Journal of International Financial Markets Institutions and Money, 12, 33–58.

- Maudos, J., and Pastor, J. M., 2003. Cost and profit efficiency in the Spanish banking sector (1985–1996): A non-parametric approach. Applied Financial Economics, 13(1), 1–12.

- Maudos, J. and De Guevara, J.F., 2007. The cost of market power in banking: Social welfare loss vs. cost inefficiency. Journal of Banking & Finance, 31(7), pp.2103-2125.

- Mavhungu, M. A., Grace , K., and Willie D., 2014. Factors Influencing Poverty Alleviation amongst Microfinance Adopting Households in Zambia. International Journal of Research in Business and Social Science, 3(2)(IJRBS), 1-19

- Mazumder, Mohummed and Wencong, Lu., 2013. Micro-Credit and Poverty Reduction: A Case of Bangladesh. Prague Economic Papers. 22. 403-417. 10.18267/j.pep.459.

- Mazumder, M.S.U. and Wencong, L., 2015. Does Microfinance Impact on Rural Empowerment in Bangladesh? Differences Between Governmental and Non-Governmental Microfinance Programs. Sustainable Development, 23(3), pp.135-152.

- McDermott, P., 2001. Globalization, women and development: Microfinance and factory work in perspective. Journal of Public Affairs. XIII, 65-79

- McIntosh, C., De Janvry, A. and Sadoulet, E., 2005. How rising competition among microfinance institutions affects incumbent lenders. The economic journal, 115(506), pp.987-1004.

- McKernan, Signe-Mary, 2002. The Impact of Micro-credit Programs on Self-employment Profits: Do Non-credit Program Aspects Matter? The Review of Economic and Statistics 84(1): 93-115.

- McKillop, D.G., Glass, J.C. and Morikawa, Y., 1996. The composite cost function and efficiency in giant Japanese banks. Journal of Banking & Finance, 20(10), pp.1651-1671.
- Meeusen, W., and Van den Broeck, J., 1977. Efficiency estimation from Cobb-Douglas production functions with composed error. International Economic Review, 18(2), 435e444
- Mersland, R. and Strom, R.O., 2009. Performance and governance in microfinance institutions. Journal of Banking and Finance. 33(4), 662-669
- Mersland, R. and Strøm, R.Ø., 2010. Microfinance mission drift?. World development, 38(1), pp.28-36.
- Mertens, A. and Urga, G., 2001. Efficiency, scale and scope economies in the Ukrainian banking sector in 1998. Emerging Markets Review, 2(3), pp.292-308.
- Menyah, Kojo, Nazlioglu, Saban and Wolde-Rufael, Yemane, 2014. Financial development, trade openness and economic growth in African countries: New insights from a panel causality approach, Economic Modelling, 37, issue C, p. 386-394, https://EconPapers.repec.org/RePEc:eee:ecmode:v:37:y:2014:i:c:p:386-394.
- Mertens, A. and Urga, G., 2001. Efficiency, scale and scope economies in the Ukrainian banking sector in 1998. Emerging Markets Review, 2(3), pp.292-308.
- Mester, L.J., 1997. Measuring efficiency at US banks: Accounting for heterogeneity is important. European Journal of Operational Research, 98(2), pp.230-242.
- Micco, A., Panizza, U., and Yanez, M., 2007. Bank ownership and performance: Does politics matter? Journal of Banking and Finance, 31, 219–241.
- Microbanking Bulletin, 2004. Benchmarking Latin American microfinance. The MIX Market, www.mixmarket.org. (accessed in Jan 2014).
- Microcredit Regulatory Authority, 2016. NGO-MFIs in Bangladesh. A Statistical Publication of Microcredit Regulatory Authority.
- Microcredit Regulatory Authority, 2017. NGO-MFIs in Bangladesh. A Statistical Publication of Microcredit Regulatory Authority.
- Microcredit Regulatory Authority, 2018. NGO-MFIs in Bangladesh. A Statistical Publication of Microcredit Regulatory Authority.
- Microcredit Regulatory Authority, 2020. NGO-MFIs in Bangladesh. A Statistical Publication of Microcredit Regulatory Authority.
- Miller, S.M. and Noulas, A.G., 1996. The technical efficiency of large bank production. Journal of banking & finance, 20(3), pp.495-509.
- Miller, S.R. and Parkhe, A., 2002. Is there a liability of foreignness in global banking? An empirical test of banks' X-efficiency. Strategic management journal, 23(1), pp.55-75.
- Miller, Jane E. and Rodgers, Y., 2009. Mother's Education and Children Nutrional Status: New Evidence from Cambodia. Asian Development Review 26 (1), pp. 131-165.
- Miningou, É.W. and Vierstraete, V., 2013. Households' living situation and the efficient provision of primary education in Burkina Faso. Economic modelling, 35, pp.910-917.

- Mitchener, Kris James and Wheelock, David, 2013. Does the structure of banking markets affect economic growth? Evidence from U.S. state banking markets, Explorations in Economic History, 50, issue 2, p. 161-178, https://EconPapers.repec.org/RePEc:eee:exehis:v:50:y:2013:i:2:p:161-178.

- Mittal, S. and Srivastava, P., 2014. Contribution of Micro-finance Institutions for the Development of Rural Community Region- Its Critical Aspects of the Success. International Journal of Innovative Research in Engineering & Management (IJIREM), 1(II).

- MkNelly, B. and Dunford, C., 1999. Impact of Credit with Education on Mothers and Their Young Children's Nutrition: CRECER Credit with Education Program in Bolivia. Freedom from Hunger Research Paper No. 5. Freedom from Hunger. Davis, CA.

- Moffat, B.D. and Valadkhani, A., 2011. Efficiency of Botswana's financial institutions: A data envelopment analysis. Applied Economics Letters, 18(7), pp.697-702.

- Mohamad, S., Hassan, T. and Bader, M.K.I., 2008. Efficiency of conventional versus Islamic Banks: international evidence using the Stochastic Frontier Approach (SFA). Journal of Islamic economics, banking and finance, 4(2), pp.107-130.

- Mookherjee, Dilip and Motta, A., 2014. A theory of interactions between MFIs and informal lenders. Journal of Development Economics. 121. 10.1016/j.jdeveco.2014.11.009.

- Mor, S., & Goyal, S. and Sharma, S., 2013. Technical efficiency and its determinants in microfinance institutions in India: A firm level analysis. Journal of Innovation Economics. 11. 15-31. 10.3917/jie.011.0015.

- Moradi-Motlagh, A. and Babacan, A., 2015. The impact of the global financial crisis on the efficiency of Australian banks. Economic Modelling, 46, pp.397-406.

- Morduch, J., 1998. Does Micro-finance Really Help the Poor?" New Evidence from Flagship Programs in Bangladesh, Harward University and Stanford University Manuscript

- Morduch, J., 1999. The microfinance promise. Journal of economic literature, 37(4), pp.1569-1614.

- Morduch, J., 2000. The microfinance schism. World development, 28(4), pp.617-629.

- Morduch, J. and Haley, B., 2002. Analysis of the Effects of Microfinance on Poverty Reduction. NYU Wagner Working Papers No. 1014.

- Morduch, J., 2007. Smart subsidies. Microfinance and public policy: Outreach, performance and efficiency, pp.72-85.

- Mookherjee, D., Motta, A., 2013. A Theory of Interactions Between MFIs and Informal Lenders. Working Paper.

- Mosley, P., and Hulme, D., 1998. Microenterprise finance: Is there a conflict between growth and poverty alleviation? World Development, 26(5), 783-790.Available at: https://doi.org/10.1016/s0305-750x(98)00021-7

- Mosley, P., 2001. Microfinance and poverty in Bolivia. Journal of development studies, 37(4), pp.101-132.

- Mustafa, S.I. A., et al., 1996. Beacon of Hope: An Impact Assessment of BRAC's Rural Development Programme (Dhaka, Bangladesh: BRAC, 1996).

- Mustafa, F., Khursheed, A. and Fatima, M., 2018. Impact of global financial crunch on financially innovative microfinance institutions in South Asia. Financial Innovation, 4(1), pp.1-11.

- Naceur, S.B. and Kandil, M., 2009. The impact of capital requirements on banks' cost of intermediation and performance: The case of Egypt. Journal of Economics and Business, 61(1), pp.70-89.

- Narayan, P.K. and Narayan, S., 2013. The short-run relationship between the financial system and economic growth: New evidence from regional panels. International Review of Financial Analysis, 29, pp.70-78.

- Nashihin, Muhammad, 2014. Analysis of potential demand for Microfinance services in West Java by district areas. Procedia: Social and Behavioral Sciences. 115, 91-101.

- Navajas, S., Schreiner, M., Meyer, R.L., Gonzalez-Vega, C. and Rodriguez-Meza, J., 2000. Microcredit and the Poorest of the Poor: Theory and Evidence from Bolivia. World development, 28(2), pp.333-346.

- Navajas, S., Conning, J., and Gonzales-Vega, C., 2003. Lending technologies, competition, and consolidation in the market for microfinance in Bolivia. Journal of International Development, 15, pp. 747-770.

- Naved, R., 1994. Empowerment of Women: Listening to the Voices of Women in The Bangladesh Development Studies "Special issue on Women, Development and Change", Vol. Xxii, No. 2&3, pp. 121-155 pp. 155-179 edited by S. Amin, BIDS, Dhaka.

- Nawaz, A., 2010. Issues in subsidies and sustainability of microfinance: An empirical investigation. Universite Libre de Bruxelles CEB Working Paper, 32, pp.0-33.

- Neal, P., 2004. X-efficiency and productivity change in Australian banking. Australian Economic Papers, 43(2), pp.174-191.

- Nghiem, HS., 2004. Efficiency and effectiveness of micro-finance in Vietnam: evidence from NGO schemes in the North and Central regions, CEPA, School of Economics, UQ

- Nghiem, H. S., and Laurenceson, J. 2004. The nature of NGO microfinance in Vietnam and stakeholders perception of effectiveness, Australia

- Nghiem, H., Coelli,T. and Rao, D. S. P., 2006. The efficiency of microfinance in Vietnam: evidence from NGO schemes in the north and the central regions. International Journal of Environmental, Cultural, Economic and Social Sustainability 2 (5), 71-78.

- Ngo, T. M. P. and Wahhaj, Z., 2012. Microfinance and gender empowerment. Journal of Development Economics, Vol 99(1), 1-12.

- Nikiel, E.M. and Opiela, T.P., 2002. Customer type and bank efficiency in Poland: Implications for emerging market banking. Contemporary Economic Policy, 20(3), pp.255-271.

- Noponen, H., 2003. 12. The international learning system- A tool for tracking and enhancing empowerment outcomes and wider social impacts of microfinance. IDS Bulletin, Vol 34(4). 121-132

- Norwood, C., 2005. Macro promises of microcredit: A case of a local eSusu in rural Ghana. Journal of International Women Studies, Vol 7, 1.

- Noulas, A.G., 1997. Productivity growth in the Hellenic banking industry: state versus private banks. Applied Finance and Economics, Vol. 7, 223–228.

- Noulas, A.G., Lazaridis, J., Hatzigayios, T. and Lyroudi, K., 2001. Non-parametric production frontier approach to the study of efficiency of non-life insurance companies in Greece. Journal of financial management & analysis, 14(1), p.19.

- Olivares-Polanco, F., 2005. Commercializing microfinance and deepening outreach? Empirical evidence from Latin America. Journal of Microfinance/ESR Review, 7(2), p.5.

- Olusanya, S. & Oyebo, A., 2012. Impact of Microfinance Bank on Standard Of Living of Hairdresser in Oshodi-Isolo Local Government of Lagos State. IOSR Journal of Humanities and Social Science, 1(4), pp. 26-35.

- Omri, Anis; Saida, Daly; Rault, Christophe and Chaibi, Anissa, 2015. Financial Development, Environmental Quality, Trade and Economic Growth: What Causes What in MENA Countries?. Energy Economics. 10.2139/ssrn.2573609.

- Osmani, S. R. 2003. The macroeconomics of poverty reduction: The case study of Bangladesh. http://www.ipc-undp.org/publications/reports/Bangladesh.pdf

- Oteng-Abayie, E. F., Amanor, K. and Frimpong, J. M., 2011. The Measurement and Determinants of Economic Efficiency of Microfinance Institutions in Ghana: A Stochastic Frontier Approach. African Review of Economics and Finance, Vol. 2, No. 2, June 2011.

- Pal, D., 2010. Measuring technical efficiency of microfinance institutions in India. Indian Journal of Agricultural Economics, 65(902-2016-66762).

- Panjaitan-Drioadisuryo, D.M. Rositan, and Kathleen Cloud, 1999. Gender, Self-Employment, and Microcredit Programs: An Indonesian Case Study. Quarterly Review of Economics and Finance, Vol. 39

- Park, K.H. and Weber, W.L., 2006. A note on efficiency and productivity growth in the Korean banking industry, 1992–2002. Journal of Banking & Finance, 30(8), pp.2371-2386.

- Parvin, S. S., Hossain, B., Mohiuddin, M. and Cao, Q., 2020. Capital Structure, Financial Performance, and Sustainability of Micro-Finance Institutions (MFIs) in Bangladesh. Sustainability, Vol 12, 6222.

- Pasiouras, F., Liadaki, A. and Zopounidis, C., 2008. Bank efficiency and share performance: Evidence from Greece. Applied Financial Economics, 18(14), pp.1121-1130.

- Pasiouras, F., Tanna, S. and Zopounidis, C., 2009. The impact of banking regulations on banks' cost and profit efficiency: Cross-country evidence. International review of financial analysis, 18(5), pp.294-302.

- Pastor, J., Perez, F. and Quesada, J., 1997. Efficiency analysis in banking firms: An international comparison. European Journal of Operational Research, 98(2), pp.395-407.

- Pastor, J.T., Lozano, A. and Pastor, J.M., 1997. Efficiency of European banking systems: A correction by environment variables. Instituto Valenciano de Investigaciones Económicas.

- Paxton, J., 2007. Technical efficiency in a semi-formal financial sector: The case of Mexico. Oxford Bulletin of Economics and Statistics, 69(1), pp.57-74.

- Paul, S. and Kourouche, K., 2008. Regulatory policy and the efficiency of the banking sector in Australia. Australian economic review, 41(3), pp.260-271.

- Peng, Z., Wang, T., He, Y., Yang, X. and Lu, L., 2013. Analysis of environmental and economic benefits of integrated Exhaust Energy Recovery (EER) for vehicles. Applied energy, 105, pp.238-243.

- Piot-Lepetit, I. and 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(1), pp.319-330.

- Pitt, Mark M. and Khandker, Shahidur R., 1996. Household and Intrahousehold Impact of the Grameen Bank and Similar Targeted Credit Programs in Bangladesh. Washington, DC: The World Bank, Discussion Paper No. 320.

- Pitt, M. and Khandker, S., 1998. The impact of group-based credit programs on poor households in Bangladesh: Does the gender of participation matter? Journal of Political Economy. 106(5), 958-996.

- Pradhan, R.P., Arvin, M.B., Hall, J.H. and Bahmani, S., 2014. Causal nexus between economic growth, banking sector development, stock market development, and other macroeconomic variables: The case of ASEAN countries. Review of Financial Economics, 23(4), pp.155-173.

- Pradhan, R.P., Arvin, M.B. and Norman, N.R., 2015. The dynamics of information and communications technologies infrastructure, economic growth, and financial development: Evidence from Asian countries. Technology in Society, 42, pp.135-149.

- Pruteanu-Podpiera, A. and Podpiera, J., 2008. The Czech transition banking sector instability: the role of operational cost management. Economic Change and Restructuring, 41(3), pp.209-219.

- Qayyum, A. and Ahmed, M., 2006. Efficiency and sustainability of micro finance institutions in South Asia. 1- 34.

- Quayes, S., and Khalily, B., 2014. Efficiency of Microfinance Institutions in Bangladesh. Economics Bulletin, 34(3), pp. 1512-1521.

- Rahman, A., 1999. Microcredit initiatives for equitable and sustainable development: Who pays? World Development, 27(1), 67-82

- Rai, A., 1996. Cost efficiency of international insurance firms. Journal of Financial Services Research, 10(3), pp.213-233.

- Rai, A. and Ravi, S., 2011. Do spouses make claim? Empowerment and Microfinance in India. World Development, Vol. 39, No. 6, pp 913-921

- Raihan, S., Osmani, S.R. and Khalily, M.B., 2017. The macro impact of microfinance in Bangladesh: A CGE analysis. Economic Modelling, 62, pp.1-15.

- Rajbanshi, R., Huang, M. and Wydick, B., 2011. Measuring Microfinance: Assessing the Conflict between Practitioners and Researchers with Evidence from Nepal. World Development, 68. DOI: 10.1016/j.worlddev.2014.11.011

- Rajbanshi, R., Huang, M. and Wydick, B., 2015. Measuring microfinance: Assessing the conflict between practitioners and researchers with evidence from Nepal. World Development, 68, pp.30-47.

- Ray, S.C. and Das, A., 2010. Distribution of cost and profit efficiency: Evidence from Indian banking. European Journal of Operational Research, 201(1), pp.297-307.

- Remenyi, Joe and Benjamin, Quinones Jr., 2000. Microfinance and Poverty Alleviation: Case Studies from Asia and the Pacific (New York: Pinter Publishers, Ltd.), 79: 131-34; 253-64.

- Řepková, I., 2014. Efficiency of the Czech banking sector employing the DEA window analysis approach. Procedia Economics and Finance, 12, pp.587-596.

- Resti, A., 1997. Evaluating the cost-efficiency of the Italian banking system: What can be learned from the joint application of parametric and non-parametric techniques. Journal of banking & finance, 21(2), pp.221-250.

- Rezitis, A., 2006. Productivity growth in the Greek banking industry: a non-parametric approach. J. Appl. Econ. 9 (1), 119–138.

- Rezitis, A.N., 2008. Efficiency and productivity effects of bank mergers: Evidence from the Greek banking industry. Economic Modelling, 25(2), pp.236-254.

- Rezvanian, R. and Mehdian, S., 2002. An examination of cost structure and production performance of commercial banks in Singapore. Journal of Banking & Finance, 26(1), pp.79-98.

- Rhyne, E., 1998. The Yin and Yang of microfinance: Reaching the poor and sustainability. MicroBanking Bulletin, 2, pp. 6–9

- Rhyne, E. and Otero, M., 2006. Microfinance through the next decade: Visioning the who, what, where, when and how (pp. 5-45). Boston, MA: Accion International.

- Riaz, M., and Gopal, P. S., 2015. In competency Aspects of Microfinance Industry: Via SFA approach. Journal of Economics and Behavioral Studies, 7(1), 1.

- Rizkiah, S.K., 2019. The effect of social outreach on financial performance of microfinance institutions in Bangladesh. International Journal of Economics, Management and Accounting, 27(1), pp.123-140.

- Robinson, M., 2003. The microfinance revolution: Sustainable finance for the poor.Vol. 1, Washington D.C.: World Bank.

- Rogaly B., 1996. Micro-Finance Evangelism, "Destitute Women", and the Hard Selling of a New Anti-Poverty Formula. Development in Practice, 6(2).

- Rogers, K.E., 1998. Nontraditional activities and the efficiency of US commercial banks. Journal of Banking & Finance, 22(4), pp.467-482.

- Roodman, D., 2012. Due diligence: An impertinent inquiry into microfinance. CGD Books.

- Rosenberg, Richard, 1999. Measuring Microcredit Delinquency: ratios can be harmful to your health. CGAP-Consultative Group to Assist the Poorest, Washington. Occasional Paper No.3.

- Rosenberg, R. and Littlefield, E., 2004. Microfinance and the Poor: Breaking Down Walls between Microfinance and Formal Finance. Finance and Development, CGAP

- Rosenberg, R. 2010. Does Microcredit Really Help Poor People? The Consultative Group to Assist the Poor Focus Note No 59. CGAP, Washington, D.C.

- Roth, J., Churchill C., Gabriele, R., and Namerta, 2005. Microinsurance and Microfinance Institutions: Evidence from India. CGAP Working Group on Microinsurance, Case Study No. 15

- Sabin, N. and Reed-Tsochas, F., 2014. The Structure of Social Collateral: Embeddedness and Economic Performance in Microfinance.

- Sadorsky, P., 2011. Financial development and energy consumption in Central and Eastern European frontier economies. Energy policy, 39(2), pp.999-1006.

- Sahoo, B. K., and Tone, K., 2009. Radial and non-radial decompositions of profit change: With an application to Indian banking. European Journal of Operational Research, 196, 1130–1146.

- Salim, M.M., 2013. Revealed objective functions of microfinance institutions: evidence from Bangladesh. Journal of Development Economics, 104, pp.34-55.

- Samargandi, Nahla & Fidrmuc, Jan & Ghosh, Sugata, 2014. "Financial development and economic growth in an oil-rich economy: The case of Saudi Arabia," Economic Modelling, Elsevier, vol. 43(C), pages 267-278.

- Sánchez-Robles, B., 1997. Financial efficiency and economic growth: The case of Spain. International Advances in Economic Research, 3(4), pp.333-351.

- Sassi, S. and Goaied, M., 2013. Financial development, ICT diffusion and economic growth: Lessons from MENA region. Telecommunications Policy, 37(4-5), pp.252-261.

- Sathye, M., 2001. X-efficiency in Australian banking: An empirical investigation. Journal of Banking & Finance, 25(3), pp.613-630.

- Sathye, M., 2002. Measuring productivity changes in Australian banking: An application of Malmquist indices. Managerial finance, 28(9), pp.48-59.

- Sayed, S., 2015. The Impact of Microfinance on Poverty Reduction: Empirical Evidence from Malaysian Perspective. Malaysia, Elsevier Ltd, pp. Procedia - Social and Behavioral Sciences.

- Schaeck, K. and Čihák, M., 2010. Competition, efficiency, and soundness in banking: An industrial organization perspective. European banking center discussion Paper, (2010-20S).

- Schonberger, S.N. and Peck Christen, R., 2001. A multilateral donor triumphs over disbursement pressure: the story of microfinance at Banco do Nordeste in Brazil.

- Schroeder, R.A., 2012. Africa after apartheid: South Africa, race, and nation in Tanzania. Indiana University Press.

- Sealey, C. and Lindley, J.T., 1977. Inputs, outputs and a theory of production and cost at depository financial institution. Journal of Finance 32, 1251–1266.

- Sen, A., 1999. Development as Freedom, Oxford University Press, Oxford.

- Serrano-Cinca, C. and Gutiérrez-Nieto, B., 2014. Microfinance, the long tail and mission drift. International Business Review, 23(1), pp.181-194.

- Servin, R., Lensink, R. and Van den Berg, M., 2012. Ownership and technical efficiency of microfinance institutions: Empirical evidence from Latin America. Journal of Banking & Finance, 36(7), pp.2136-2144.

- Shaw J. Microenterprise occupation and poverty reduction in microfinance programs: evidence from Sri Lanka. World Dev 2004;32(7):1247e64.

- Sherman, H. D., and Gold, F., 1985. Bank branch operating efficiency: Evaluation with data envelopment analysis. Journal of Banking and Finance, 9, 297–315.

- 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

- Simar, L. and Wilson, P.W., 2007. Estimation and inference in two-stage, semi-parametric models of production processes. Journal of econometrics, 136(1), pp.31-64.

- Simonwitz, A., 2002. Appraising the Poverty Outreach of Micro-finance: A Review of the CGAP Poverty Assessment Tool (PAT). Brighton, UK: Imp-Act, Institute of Development Studies, www.imp-act.org.

- Simanowitz, A., 2011. Challenges to the Field and Solutions: Over-Indebtedness, Client Drop-Outs, Unethical, Collection Practices, Exorbitant Interest Rates, Mission Drift, Poor Governance Structures and More. New pathways out of poverty, pp.53-120.

- Simtowe, F., Zeller, M. and Phiri, A., 2006. Determinants of moral hazard in microfinance: Empirical evidence from joint liability lending programs in Malawi. African review of money finance and banking, pp.5-38.

- Singh, S., Goyal, S.K. and Sharma, S.K., 2013. Technical efficiency and its determinants in microfinance institutions in India: a firm level analysis. Journal of Innovation Economics Management, (1), pp.15-31.

- Solis, L. and Maudos, J., 2008. The social costs of bank market power: Evidence from Mexico. Journal of Comparative Economics, 36(3), pp.467-488.

- Steele, F., Amin, S. and Naved, R.T., 1998. The impact of an integrated micro-credit programme on women's empowerment and fertility behavior in rural Bangladesh.

- Stiglitz, J. E., 1990. Peer Monitoring and Credit Markets. The World Bank Economic Review, 4(3), 351–366. http://www.jstor.org/stable/3989881

- Strom, R.O., D'Espallier, B, Mersland, R., 2014. Female leadership, governance and performance in microfinance institutions. Journal of Banking and Finance. 42, 60-75.

- Sturm, J.E. and Williams, B., 2004. Foreign bank entry, deregulation and bank efficiency: Lessons from the Australian experience. Journal of Banking & Finance, 28(7), pp.1775-1799.

- Sufian, Fadzlan and Majid, Muhamed., 2007. Bank Ownership, Characteristics and Performance: A Comparative Analysis of Domestic and Foreign Islamic Banks in Malaysia.

- Sufian, F. and Habibullah, M.S., 2009. Bank specific and macroeconomic determinants of bank profitability: Empirical evidence from the China banking sector. Frontiers of Economics in China, 4(2), pp.274-291.

- Sun, J., Harimaya, K., and Yamori, N., 2013. Regional economic development, strategic investors, and efficiency of Chineese city commercial banks. *Journal of Banking & Finance*, 37, 1602-1611.

- Sun, L. and Chang, T.P., 2011. A comprehensive analysis of the effects of risk measures on bank efficiency: Evidence from emerging Asian countries. Journal of Banking & Finance, 35(7), pp.1727-1735.

- Svitalkova, Z., 2014. Comparison and evaluation of bank efficiency in selected countries in EU. Procedia Economics and Finance, 12, pp.644-653.

- Swain, R. B., and Wallentin, F. Y., 2009. Does microfinance empower women? Evidence from self-help groups in India. International Review of Applied Economics, 23 (5), 541-556

- Tachibanaki, T., Mitsui, K. and Kitagawa, H., 1991. Economies of scope and shareholding of banks in Japan. Journal of the Japanese and International Economies, 5(3), pp.261-281.

- Tachibanaki, T., S. Ozaki and H. Kasamatsu, 1997. Portfolio and Managerial Efficiency in Trust Banks. Financial Review, 43, pp.134—157. (in Japanese)

- Tabak, B. M., Miranda, R. B., and Fazio, D. M., 2013. A geographically weighted approach to measuring efficiency in panel data: The case of US saving banks. Journal of Banking and Finance, 37, 3747– 3756.
- Taiwo J.N. and Ojo, J. A. T., 2016. Does Microfinance Improve the Standard of the Poor? European Journal of Accounting, Auditing and Finance Research, Vol.4, No.5, pp.1-21, May 2016
- Tariq, M., and Mohd, A. I., 2008. Technical Efficiency of Microfinance Institutions in India- A Stochastic Frontier Approach. Unpublished. Online at http://mpra.ub.unimuenchen.de/25454/MPRA Paper No. 25454, posted 26. September 2010
- Tecles, P.L. and Tabak, B.M., 2010. Determinants of bank efficiency: The case of Brazil. European Journal of Operational Research, 207(3), pp.1587-1598.
- Teigen, M., 2000. The affirmative action controversy. NORA- The Nordic Journal of Women Studies. 8(2), 63-77.
- Thilakaweera, B., Harvie, C. and Arjomandi, A., 2014. Bank ownership and efficiency in post-conflict era: Evidence from Sri Lanka. In I n SITE 2014: Informing Science+ IT Education Conference (Vol. 14, pp. 391-407).
- Todd, H., 1996. Women at the center. Boulder, CO: Westview Press.
- Tortosa-Ausina, E., 2002. Bank cost efficiency and output specification. Journal of Productivity Analysis, 18(3), pp.199-222.
- Tortosa-Ausina, E., 2004. An alternative conditioning scheme to explain efficiency differentials in banking. Economics Letters, 82(2), pp.147-155.
- Tsionas, E.G., Lolos, S.E.G., Christopoulos, D.K., 2003. The performance of the Greek banking system in view of the EMU: results from a non-parametric approach. Econ. Model. 20, 571–592.
- Tsionas, E.G., Assaf, A.G. and Matousek, R., 2015. Dynamic technical and allocative efficiencies in European banking. Journal of banking & finance, 52, pp.130-139.
- Tzeremes, Nickolaos G., 2015. Efficiency dynamics in Indian banking: A conditional directional distance approach. European Journal of Operational Research, Elsevier, vol. 240(3), pages 807-818.
- Uddin, G.S., Sjö, B. and Shahbaz, M., 2013. The causal nexus between financial development and economic growth in Kenya. Economic Modelling, 35, pp.701-707.
- Ueda, K., 2013. Banks as coordinators of economic growth and stability: Microfoundation for macroeconomy with externality. Journal of Economic Theory, 148(1), pp.322-352.
- UNCDF, 2005. International Year of Microcredit 2005. Impact Capital for Development. https://www.uncdf.org/admin/editors/ArticleItem/Index/590?articleTitle=international-year-of-microcredit-2005-migration
- Van Rooyen, C., Stewart, R. and De Wet, T., 2012. The impact of microfinance in sub-Saharan Africa: a systematic review of the evidence. World development, 40(11), pp.2249-2262.
- Vander-Vennet, R. V., 2002. Cost and profit efficiency of financial conglomerates and universal banks in Europe. Journal of Money, Credit and Banking, 34(1), 254–282.

- Von Stauffenberg, S., von Stauffenberg, D., Brown, S. and Beles Effio, M., 2009. Cautious Resilience: The Impact of the Global Financial Crisis on Latin American and Caribbean Microfinance Institutions (No. publication-detail, 7101. html? id= 8291). Inter-American Development Bank.

- Wang, K., Huang, W., Wu, J. and Liu, Y.N., 2014. Efficiency measures of the Chinese commercial banking system using an additive two-stage DEA. Omega, 44, pp.5-20.

- Ward, D., 2002. The costs of distribution in the UK life insurance market. Applied Economics, 34(15), pp.1959-1968.

- Webb, J.W., Bruton, G.D., Tihanyi, L. and Ireland, R.D., 2013. Research on entrepreneurship in the informal economy: framing a research agenda. J Bus Ventur 28(5):598–614. https://doi.org/10.1016/j.jbusvent.2012.05.003

- Weber, O., 2013. Impact measurement in microfinance: Is the measurement of the social return on investment an innovation in microfinance? Journal of Innovation Economics and Management, Vol 11, pp 149

- Weber, O., and Ahmad, A., 2014. Empowerment through Microfinance: The relation between olloan cycle and level of empowerment. World Development, Vol 62, pp 75-87

- Weerasinghe, IMS, Dedunu, HH, 2017. Impact of Micro Finance on Living Standard With Reference to Microfinance Holders in Kurunegala District. International Journal of Business Marketing and Management (IJBMM), Volume 2 Issue 7August 2017, P.P.16-23, ISSN: 2456-4559, www.ijbmm.com

- Weill, L., 2003. Banking efficiency in transition economies: The role of foreign ownership. Economics of transition, 11(3), pp.569-592.

- Weill, L., 2004. Measuring cost efficiency in European banking: A comparison of frontier techniques. Journal of Productivity Analysis, 21(2), pp.133-152.

- Weiss, J. and Montgomery, H., 2005. Great expectations: microfinance and poverty reduction in Asia and Latin America. Oxford Development Studies, 33(3-4), pp.391-416.

- Welbourne, T.M., Cycyota, C.S., Ferrante, C.J., 2007. Wall street reaction to women in IPOs: an examination of gender diversity in top management teams. Group and Organization Management. 32(5), 524-547

- Wellalage, N.H. and Thrikawala, S., 2021. Bank credit, microfinance and female ownership: Are women more disadvantaged than men?. Finance Research Letters, 42, p.101929.

- Werner, W.J., 2009. Micro-insurance in Bangladesh: Risk protection for the poor?. Journal of health, population, and nutrition, 27(4), p.563.

- Wezel, T., 2010. Bank efficiency amid foreign entry: Evidence from the Central American region. International Monetary Fund.

- Wheelock, D.C. and Wilson, P.W., 1999. Technical progress, inefficiency, and productivity change in US banking, 1984-1993. Journal of Money, Credit, and Banking, pp.212-234.

- Widiarto, I. and Emrouznejad, A., 2015. Social and financial efficiency of Islamic microfinance institutions: A Data Envelopment Analysis application. Socio-Economic Planning Sciences, 50, pp.1-17.

- Wijesiri, M., Vigano, L., Meoli, M., 2015. Efficiency of microfinance institutions in Srilnka: a two-stage double bootstrap DEA approach. Economic Modelling, Volume 47, pp 74-83.

- Williams, J., 2012. Efficiency and market power in Latin American banking. Journal of Financial Stability, 8(4), pp.263-276.

- Woller, G.M., Dunford, C. and Woodworth, W., 1999. Where to microfinance? International Journal of Economic Development, 1(1), pp.29-64.

- Wondirad, H.A., 2020. Competition and microfinance institutions' performance: evidence from India. International Journal of Corporate Social Responsibility, 5(1), pp.1-19.

- Woodworth, W. P., 2000. Third world economic empowerment in the new millennium: Microenterprise, micro-entrepreneurship and microfinance. SAM Advanced Management Journal, 65, 19, 2000/09/30/.

- World Bank. 1989. World Development Report 1989. Financial Systems and Development. New York: Oxford University Press. © World Bank. https://openknowledge.worldbank.org/handle/10986/5972 License: CC BY 3.0 IGO."
  http://hdl.handle.net/10986/5972

- Worthington, A.C., 2000. Cost efficiency in Australian local government: a comparative analysis of mathematical programming anf econometrical approaches. Financial Accountability & Management, 16(3), pp.201-223.

- Wu, D.D., Yang, Z. and Liang, L., 2006. Using DEA-neural network approach to evaluate branch efficiency of a large Canadian bank. Expert systems with applications, 31(1), pp.108-115.

- Xiaogang, C., Skully, M. and Brown, K., 2005. Banking efficiency in China: Application of DEA to pre-and post-deregulation eras: 1993–2000. China Economic Review, 16(3), pp.229-245.

- Xiaoqing Maggie, F.U. and Heffernan, S., 2007. Cost X-efficiency in China's banking sector. China economic review, 18(1), pp.35-53.

- Yao, S. and Jiang, C., 2007. The effects of governance changes on bank efficiency in China: A stochastic distance function approach. Available at SSRN 980935.

- Yao, S., Luo, D. and Rooker, T., 2012. Energy efficiency and economic development in China. Asian Economic Papers, 11(2), pp.99-117.

- Yaron, J., 1994. What makes rural finance institutions successful?" The World Bank ResearchObserver, 9 (1): 49-70.

- Yeh, Q., 1996. The application of data envelopment analysis in conjunction with financial ratios for bank performance evaluation. Journal of Operational Research Society, 47, 980–988.

- Yergin, Haluk, Mercan, Mehmet, Erol, Abdullah, 2015. Assessment of Efficiency and Effectiveness of Micro Credit Application from Socio-Economic and Political Perspectives: The Case of Hakkari. Procedia Economics and Finance, 23 (2015), 176 – 179

- Yildirim, C., 2002. Evolution of banking efficiency within an unstable macroeconomic environment: the case of Turkish commercial banks. Applied Economics, 34(18), pp.2289-2301.

- Yin, H., Yang, J. and Mehran, J., 2013. An empirical study of bank efficiency in China after WTO accession. Global Finance Journal, 24(2), pp.153-170.

- Yoshioka, K. and Nakajima, T., 1987. Economies of scale In Japan's banking industry. BOJ Monetary and Economic Studies, 5: 35–70. [Google Scholar]

- Yuengert, A.M., 1993. The measurement of efficiency in life insurance: estimates of a mixed normal-gamma error model. Journal of Banking & Finance, 17(2-3), pp.483-496.

- Yunus, M. and Jolis, A., 1998. Banker to the Poor - The Autobiography of Muhammad Yunus, Founder of the Grameen Bank. The University Press Limited.

- Yunus M, 1999. The Grameen Bank. Scientific American 281(5): 114–119.

- Yunus, M., 2007. Creating a World without Poverty: Social Business and the Future of Capitalism. Public Affairs, New York.

- Zaim, O., 1995. The effect of financial liberalization on the efficiency of Turkish commercial banks. Applied Financial Economics, 5(4), pp.257-264.

- Zajc, P., 2006. A comparative study of bank efficiency in central and eastern Europe: The role of foreign ownership. In Emerging European Financial Markets: Independence and Integration Post-Enlargement. Emerald Group Publishing Limited.

- Zaman, H., 1999. Assessing the impact of micro-credit on poverty and vulnerability in Bangladesh. Worldbank.org. 1. Retrieved from: http://documents.worldbank.org/curated/en/630461468741915080/Assessing-the-impact-of-micro-credit-onpoverty-and-vulnerability-in-Bangladesh.

- Zaman, Hassan, 2000. Assessing the Poverty and Vulnerability Impact of Micro-Credit in Bangladesh: A Case Study of BRAC (Washington, D.C.: World Bank).

- Zanghieri, P., 2009. Efficiency of European insurance companies: Do local factors matter?. Available at SSRN 1354108.

- Zardkoohi, A. and Kolari, J., 1994. Branch office economies of scale and scope: Evidence from savings banks in Finland. Journal of Banking & Finance, 18(3), pp.421-432.

- Zarutskie, R., 2009. Competition and specialization in credit markets. Paper presented at the 45th Bank Market Structure Conference. Federal Reserve Bank of Chicago.

- Zegarra, L.F., 2014. Bank laws, economic growth and early banking in Latin America: 1840–1920. Explorations in Economic History, 53, pp.101-119.

- Zeller, M., and R. Meyer. 2002. The Triangle of Microfinance: Financial Sustainability, Outreach and Impact. Washington, USA: International Food Policy and Research Institute.

- Zhao, X., 2000. Empirical Analysis of State-Owned Commercial Bank Efficiency. Economic Science, No. 6, 55-62.

- Zhao, T., Casu, B. and Ferrari, A., 2010. The impact of regulatory reforms on cost structure, ownership and competition in Indian banking. Journal of Banking & Finance, 34(1), pp.246-254.

- Zhang, J., Wang, L. and Wang, S., 2012. Financial development and economic growth: Recent evidence from China. Journal of Comparative Economics, 40(3), pp.393-412.

- Zhang, M. and Wang, W., 2013. Decouple indicators on the CO2 emission-economic growth linkage: The Jiangsu Province case. Ecological Indicators, 32, pp.239-244.