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Impact of Regulation on the Cost Efficiency of Microfinance Institutions in Bangladesh

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Abstract

Bangladesh lagged in microfinance regulation until 2006 when it established Microcredit Regulatory Authority (MRA). So far, MRA has granted license to around 650 Microfinance Institutions (MFIs); and has been supervising them with prudential and non-prudential regulations. We assessed the impact of regulation on cost efficiency using from pre-regulation and post-regulation data of 182 MFIs. Panel data analyses robustly show that regulation improves cost efficiency; directly through changing behavior of the MFIs, and indirectly through increasing staff productivity and portfolio size. We found partners of PKSF—the wholesale lending agency in Bangladesh—and unsubsidized MFIs are more efficient than others.

Keywords: microfinance, cost efficiency, regulation, Bangladesh

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1. Introduction

The increasing recognition of microfinance as an instrument of poverty alleviation has created numerous microfinance institutions (henceforth, MFIs) in Bangladesh. Over the past two decades, these institutions have grown both horizontally and vertically. Some 750 plus MFIs are operating with a network of over 17 thousand branches in Bangladesh, but only top five MFIs control around 60 percent of the microcredit market. Although there were dominating arguments for regulation, MFIs in Bangladesh were less interested in formal regulatory framework as they perceived self-regulation as effective mechanism and apprehended that a formal regulation will limit their independence, make them less cost effective, and might affect their ultimate goal of poverty alleviation and sustainability. Despite such concerns, a formal regulatory framework became effective in Bangladesh with the establishment of Microcredit Regulatory Authority (henceforth, MRA) in 2006. The MRA is now six years old. It has enacted many rules and regulations over the period. The critical question is, how regulation affects performance and efficiency of MFIs in Bangladesh? In this paper, we address the question of impact of regulation on cost efficiency of MFIs in Bangladesh using the financial information of some 182 licensed MFIs covering both pre and post licensing periods.

Regulation refers to a set of enforceable rules that aim to restrict or direct the economic behavior of market participants (Chavez and Gonzalez-Vega, 1994). The primary argument for regulation originates from the asymmetric distribution of information between borrowers and investors. The objective of regulation must be to match the actions of the agent with the interests of the principals (see Smith and Warner, 1979; Stiglitz and Weiss, 1981). However, the regulation on MFIs and their borrowers is a public good. Any private organization is reluctant to regulate and thus it is normally scarce in a pure market system. This gives the MFIs scope for opportunistic behavior. For example, Khalily and Imam (2001) showed that MFIs with access to subsidized funds had higher expense behavior implying inefficient use of resources. So a third party, i.e. an independent supervisory agency must control the behavior of the agents and protect interests of the principals.

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The secondary argument for regulation, as Diamond and Dybvig (1983) have shown, panic-led withdrawals arising from expected bankruptcy can be perfectly rational behavior on the part of depositors. As MFI clients belong to the poor sections of the society, a bankruptcy would be particularly harmful. This problem can be mitigated by a regulatory assurance. On the other hand, when borrowers are the agents of MFIs, the concern is to protect borrowers from exploitation by MFIs. Thus, regulation is expected to play a crucial role to protect members' savings, ensure sustainability of lenders, improve efficiency of microcredit markets, reduce expense preference behavior of subsidized MFIs, and overall to safeguard the stability of financial systems. Through regulation, MFIs are expected to be transformed into full-fledged financial intermediaries (Chavez and Gonzalez-Vega, 1994; Khalily and Imam, 2001).

Regulation can be prudential (for example, fixing interest rates) or non-prudential (such as, recommending elective system in governing body). Prudential regulation includes rules on reporting, as well as capital adequacy and liquidity requirements. Deposit-taking MFIs should be subject to prudential rules and regulation to make sure that deposits are protected. Hence, prudential regulation must pursue two prime objectives: (1) preventing excessive risk taking, and (2) providing assurance (Chavez and Gonzalez-Vega, 1994). Non-prudential rules allow the MFIs to evolve within a structure of regulatory requirements and guidelines and to operate sustainably with higher degree of efficiency. The ultimate beneficiaries of regulation, whether prudential or non-prudential, are the microfinance clients and the MFIs.

Previous research studies in Bangladesh mainly covered impact analysis and program performance based on household level, that is, demand-side data. Research on supply-side issues of microfinance program in Bangladesh are quite limited. A few studies have been done on performance and sustainability of MFIs, and those were constrained by the absence of reliable and extensive datasets. These studies broadly covered outreach, efficiency, sustainability, governance and market structure (for example, see Khandker *et al*., 1995; Khalily *et al*., 2000; Hulme, 2008; Sinha, 2011). Several studies attempted to answer the situation once subsidy is off the sector; and some of them advocated subsidization for the industry to save it from 'mission drift' (as did Khandker, 1996). Most of the MFIs, nonetheless, continued to operate introducing innovative services for both poor and non-poor. However, throughout the path of escalation, MFIs were on their own and the overall sector was not guarded. Therefore, the government's concern was increasingly growing with the spread of NGO-MFI operations – that the sector needed scrutiny of the entire system and operation (Khaled, 2001). This brought the concept of regulation into Bangladeshi microfinance market. As of May 2012, Microcredit Regulatory Authority (MRA) announced 14 circulars and several notices. In the most important fifth circular, MRA sets guidelines on interest rates of microcredit and relevant issues.

The objectives of the paper are to: (1) examine the cost efficiency of Bangladeshi microfinance institutions (MFIs) and (2) assess the impact of MRA regulation on cost efficiency of the MFIs. There are several studies that have focused on the relation of MFI performance with regulation and governance in other countries. Nevertheless, the present study is discrete in three senses: (1) the data we use here is not from self-reported global portal, rather from reliable archive of apex microfinance regulatory and supervising bodies, and are cross-checked, (2) the methodology is distinct and logical; it does not use conventional ratios of performance. Rather, it generates a more comprehensive score of cost efficiency and examines it on the determinants of efficiency. Further, (3) it does not depend only on dummy variables to measure the impact of regulation, and tells the reader the dynamics of efficiency when an MFI is regulated.

2. Approaches to Regulation: The Bangladesh Experience

Bangladesh, even as a pioneering country in microfinance, lagged behind many countries in enacting regulatory framework for microfinance institutions. The global experiences of regulatory

framework for the MFIs show evidence of several approaches. In most of the countries , microfinance is regulated by the central bank under the existing laws for non-bank financial institutions or through extension of existing act or law. Some other countries have introduced separate act for MFIs to be executed and implemented by the central bank. Quite a number of countries have been regulating operations of MFIs under the existing banking laws. This method of regulation is dominating in African countries. In Nigeria, for instance, the Central Bank of Nigeria (CBN) and the Nigeria Deposit Insurance Corporation (NDIC) have introduced stricter regulations for microfinance. The regulatory framework issued by CBN appears fairly elaborate; and provides wide scope of permissible activities for microfinance banks. In Ethiopia, the National Bank of Ethiopia (NBE) became responsible to regulate the microfinance sector under MFI licensing and supervision law of 1996. There are also examples of regulating microfinance through a distinct entity established under an act or ordinance. In Bolivia, Superintendence of Banks and Financial Entities (SBFE) is the only authority for regulating and supervising the entire financial sector. Until 1987, it was functioning as part of the Central Bank of Bolivia. In 1988 the SBFE was given the sole authority to permit any unregulated financial institutes (FI) or any entity to set up a regulated FI (both MFIs and other FIs) in the country. Peru, among others, established a framework for MFIs through a 1995 amendment of its banking regulations, providing for an entity called 'Entidad de Desarollopara la Pequena y Microempresa'. The entity is conceived as a vehicle for the conversion of NGOs to the status of regulated financial institutions.

The government of Bangladesh has pursued a different approach – creating an independent regulatory authority under a separate act enacted by the parliament with a formal link to the central bank. It established Microcredit Regulatory Authority (MRA) under the Microcredit Regulatory Act 2006. Before the act, microfinance industry was quasi-formal, and microfinance institutions (MFIs) were registered under various acts for non-government organizations (such as Societies Registration Act 1860). MRA has been established as a role model for microfinance regulation due to its distinct characteristics and operation. It has a separate governing body with the governor of the central bank (Bangladesh Bank) as its chairman. While this makes MRA independent, it helps the central bank to establish linkage between formal credit market and microcredit market, and thereby to ensure the effectiveness of monetary policy since a considerable part of credit market in Bangladesh is occupied by MFIs and their clients.

The spontaneous and exponential growth of microfinance sector in the past three decades increasingly recommended a regulatory framework to bring heterogeneous systems and practices under a single umbrella. Further, it was essential to evaluate the role of MFIs on the basis of transparency and accountability since they deal with substantial amount of money collected from the poor. Several studies had presented the necessity of a regulatory body; for instance, Khalily and Imam (2001) observed an absence of expense preference behavior among MFIs that were financed by Palli Karma-Sahayak Foundation (PKSF) – a microfinance wholesale lending agency in Bangladesh. PKSF provides its member MFIs (called partner organizations or POs) with subsidized funds to implement designated programs, and practices some prudential and non-prudential regulation to ensure proper utilization of the subsidy.[1]

Thus, the necessity of MRA was mainly two-fold: (1) formalizing the microfinance industry, (2) regulating and monitoring the MFIs. With the licensing system under MRA, MFIs in Bangladesh have emerged as specialized formal financial institutions. As of August 5, 2011, the MRA had issued licenses to 649 MFIs. As per the MRA Act of 2006, the requirements for getting MRA license were minimum four Million Taka[2] of loan outstanding plus 1,000 borrowers. Under these

[1] PKSF started its operation in 1990, and has about 250 POs as of July 2012, all of which have already received license from MRA.

[2] Bangladeshi currency, 1 Taka=0.01259 USD as of 14 May 2013. Taka and Tk. are alternatively used here.

requirements, about 73 percent of the licensed MFIs got MRA license. However, quite a number of MFIs failed to achieve these minimum requirements. As a result, the requirements were revised in December 2009: a minimum loan outstanding was reduced to Tk. three Million and the number of active borrowers was reduced to 800. Under the modified requirements, some 184 small MFIs were granted licenses between January 2010 and August 5, 2011.

3. Regulatory Framework for Microfinance in Bangladesh

Being established in 2006, the Microcredit Regulatory Authority (MRA) published several rules, circulars and notices. Until the second half of 2010, no major and comprehensive rules affecting financial performances of the licensed MFIs were formulated. Prior to this period, licensed MFIs were subject to off-site and on-site monitoring. The off-site monitoring mechanism was more limited to analysis of half-yearly and yearly financial statements and outreach information. The focus of such analysis was on cost efficiency and revenue performance. MFIs were given necessary operational directions to correct certain situations. The on-site monitoring was directed towards validation of information provided and structuring or restructuring of financial system and monitoring mechanism. It was warranted in serious situations. In addition, MRA staff annually visit the licensed MFIs. All these interventions of the MRA are focused directly on improving efficiency and performances of the licensed MFIs through changes of intra-MFI behavior and environment. The first set of licenses was issued in 2007. Not all applicants were granted licenses. Some could not meet the licensing requirements but they were not left alone. The MRA provided suggestive guidelines or advisory directions to the non-qualified applicants so that over time they can improve and be granted licenses. Such initiative or counseling may have impact on the compliance of the licensing requirements of the MRA and performances of the institutions.

Prior to MRA's most comprehensive fifth circular on November 10, 2010, MFIs used to charge different amounts for application fee, non-judicial stamp fee for micro enterprise loans, and resorted to different deductions from loan amount either as compensatory balances or as forced savings. The MRA introduced uniformity vide the circular five. The rules require all licensed MFIs to charge maximum amount of Tk.15 as loan application, membership fees, passbook sales, etc., and a maximum amount of Tk. 50 as non-judicial stamp fee for Micro Enterprise loan. Similarly, MRA brought another major change in the common practice of repayment of first installment in one week; it increased the grace period of 15 days. As there were different practices of the number of installments, the MRA set the number of weekly installments to 46 vide circular number eight. Similarly, the circular requires MFIs to pay interest at the minimum rate of six percent on members' savings. Two major historical decisions were made – prohibition of all forms of deductions from principal loan amount, and required MFIs to charge lending interest rate of maximum 27 percent per annum under declining balance method. Finally, the circular requires all MFIs to maintain a definite salary structure that has to be revealed to MRA.

Though MRA recommended MFIs to comply with these rules from November 10, 2010, the deadline of full implementation of circular five was June 30, 2011. Hence, we expect both direct and indirect changes in the operations and performance of MFIs from November 2010. Rational MFIs were gradually taking preparation for the full implementation of circular five. These changes include, but are not limited to, a decline in service charge, a rise in general and administrative expenses, more fair salary structure, homogeneity of operations and thereby performance, an increase in loans outstanding, interest paid on member savings and borrowing.

Another significant set of rules is compacted in 'Microcredit Authority Rules 2010' on December 19, 2010. It defines licensing procedure, condition for license, temporary suspension or withdrawal of approval, cancellation of license and licensing charges. MRA broadly divided MFIs into four categories by the number of borrowers and set differentiated licensing charges for each. The licensing fee of MFIs that have up to 25 thousand borrowers is 10 thousand Taka, from 25 thousand to 100 thousand borrowers it is 25 thousand Taka, for MFIs that have more than 100

thousand but up to one million borrowers it is 200 thousand Taka, and if the number of borrowers exceeds a million, the licensing fee is 500 thousand Taka. Moreover, the annual fee for licensed MFI starts from five thousand Taka, and increases by five thousand Taka successively for each higher level—except for the highest one (25 thousand Taka for MFIs that have more than one million borrowers).

In order to improve efficiency of MFIs and protect interest of members (savers), the rules of 2010 require all licensed MFIs to maintain cash liquidity at 15 percent of total net deposits. It also allows MFIs to mobilize voluntary deposits if the organization has a minimum five years of experience in conducting microcredit operations, if it is profitable consecutively for last three years, accumulated loan recovery rate is at least 95 percent and current loan recovery rate is at least 90 percent provided total voluntary deposits mobilized should not exceed 25 percent of the total capital of the organization, and total deposit balance cannot exceed 80 percent of the principal loan outstanding at any given time. For term deposits, the requirements are even higher. The rules also have touched upon governance structure of the MFIs. As this aspect is not an issue of interest in this paper, we are not discussing the governance related rules here. Interested readers can visit the web page of MRA to know more about these rules.

All these rules and regulations that we have discussed have direct bearing on efficiency of the licensed institutions. On the one hand, reducing interest rate and charging interest on declining balance method will have negative impact on revenue from lending. On the other hand, increasing deposit interest rate to six percent will make it costly for the MFIs but the approval of public deposits mobilization in some cases will reduce dependency on borrowed funds. The most important implication of prohibition of all forms of deductions from principal loan will be a decrease in lower fund for the MFIs. Moreover, these rules make licensed MFIs more preferable to a possible microfinance client than non-licensed MFIs. Given all these rules, the only major way the licensed MFIs can be on the path of sustainability will be through becoming cost efficient.

The regulation is likely to positively affect efficiency, sustainability and transparency among microfinance institutions. However, often it takes a long period to capture some outcomes of licensing and regulation.

4. Literature Review

(a) Efficiency of MFIs in Bangladesh

Efficiency is not a novel concept in the microcredit industry. However, studies that evaluated the efficiency of Bangladeshi microfinance institutions (MFIs) in large scale are very rare to find. In Bangladesh Microfinance Review, Sinha (2011) analyzed performances of the largest ten microfinance institutes. Three of them were very large: Grameen Bank, BRAC and ASA. Sinha found that, active borrowers and portfolio size have increased steadily over time and their contribution to financial inclusion is substantial. Average loan balance has increased in real terms. MFIs are diversifying to include micro insurance services. In Bangladesh, cost per borrower is one of the lowest worldwide, operational efficiency is high, and the yield has been stable in recent years, well below the interest cap of 27 percent (under declining balance method) as set by Microcredit Regulatory Authority of Bangladesh.

In earlier stage of microfinance, the prime concern about the industry was sustainability. Donors and policymakers were concerned about the continuation of the program if the subsidization would end. Several studies focused on the sustainability of microfinance program. A study on Grameen Bank by Khandker *et al*. (1995) showed, Grameen Bank was profitable and it had enjoyed built-in subsidy in the form of low cost funds. But the situation has changed. Khalily *et al*. (2000) showed lesser dependency of Grameen Bank on subsidized fund. The Bank can now fully finance its loan portfolio with deposits mobilized from the members and public.

Hudon and Traca (2011) derived the impact of subsidy intensity on the efficiency of Microfinance Institutions using the data of 73 MFIs from various countries. They show that in the long run MFIs that do not receive subsidies are more efficient than those who receive subsidies. One of the possible reasons for the inefficiency of the latter group can be the existence of expense preference behavior. For instance, Khalily and Imam (2001) assessed the impact of subsidy on expense preference behavior among Bangladeshi MFIs. They found the more subsidized MFIs to have higher expense preference behavior. Such MFIs tend to spend more compared to the non-subsidized MFIs, and thereby they are less efficient. The underlying reason is, as they explained, that the top management did not have profit in their utility function.

Quayes and Khalily (2010) showed that, size of the MFIs matters and larger MFIs are more efficient than smaller ones. Amongst the big three, Grameen Bank and ASA are very close to the efficient frontier compared to BRAC. As smaller MFIs survive and grow, they undergo the process of learning efficiency. There is also some evidence of learning by all MFIs over time. However, proper utilization of resources deserves more importance than the scale of operation.

Quasi-formal microfinance institutions precede formal ones in ranking on sustainability and efficiency. Khalily *et al*. (2000) developed the Efficiency and Subsidy Intensity Index (ESII) to examine the sustainability and efficiency of the two MFIs: Grameen Bank and ASA. These two institutions have been operating with high degree of cost and financial efficiency. However, ASA being a quasi-formal organization was found to be more cost effective and sustainable than Grameen Bank, a formal organization. This is attributed to low salary base and high lending interest rate of ASA. If ASA had to operate with the average salary of Grameen, given the present level of operation, it would be very worse-off. On the contrary, Grameen Bank would be much better-off at a low salary base of ASA.

Hermes *et al*. (2008) used stochastic frontier analysis to examine whether there is a trade-off between outreach to the poor and efficiency of microfinance institutions. Using a sample of more than 1300 MFIs across the world, they find strong evidence that outreach is negatively related to efficiency of MFIs. Quayes and Khalily (2010) also found a trade-off between depth of outreach (inverse of average loan balance per borrower) and cost efficiency in Bangladesh. They further showed that PKSF POs were more efficient than the other MFIs. The efficiency of PKSF partners can be attributed to their uniform disclosure and organizational practice.

Gonzalez (2007), based on the analysis of MFI characteristics, found the three main drivers of operating expense ratio (OER) are relative loan sizes, ages and scale. They found a 'U' shaped average cost curve with respect to number of borrowers. The MFIs with up to 2,000 borrowers enjoyed economies of scale, and beyond this size, average cost per borrower tended to increase. The findings suggest that size matters in cost efficiency.

The review of selected studies shows that efficiency of a microfinance institution is mainly determined by subsidy, loan size, number of borrowers, and salary structure of employees. The critical question is, to what extent efficiency is affected by regulation. There are only few studies that have addressed this question. We shall focus on them in the next section.

(b) Studies on Regulatory Impact on MFIs

There are a handful studies on impact of regulation on the performance, in particular on cost efficiency of MFIs probably because of the fact that the history of regulation for the microfinance sector is quite short. The findings of these studies are mixed.

Hartarska and Nadolnyak (2007) analyzed data of 114 MFIs from 62 countries to establish that regulatory involvement does not directly affect performance either in terms of operational self-sufficiency or outreach. Therefore, they concluded that MFIs' transformation into regulated financial institutions might not lead to improved financial performance and outreach. However, they also argued that regulation could have indirect benefits.

Mersland and StrØm (2009) tried to examine the relationship between firm performance and regulations of 278 microfinance institutions (MFIs) from 60 countries, using a constructed global dataset collected from third party rating agencies. They took bank regulation in a country as an indirect measure of MFI regulation. Analysis showed that operational self-sufficiency and return on asset are increasing in local director, internal board auditor, and in female chief executive officer (CEO). This result is similar to Welbourne (1999) and Smith *et al*. (2006) that, women in management have a positive impact on firm performance. Since microcredit members are mainly women, a female CEO knows better what products women want and sets terms that appeal to women. However, Mersland and StrØm (2009) found no significant result about the impact of regulation on operational cost, which is in line with Hartarska and Nadolnyak (2007). On the other hand, Barry and Tacneng (2011) found that regulation and audit does not necessarily enhance portfolio quality, albeit it might lead to better efficiency and productivity.

Regulation has a cost per se that can affect the cost efficiency of MFIs. Cull *et al*. (2011) analyzed income statements and balance sheets of 245 of the world's largest MFIs to test if they could remain profitable at the advent of regulatory cost, and if they do so by shedding 'costly' borrowers off. In other words, they were to test if the MFIs remain cost efficient by increasing their productivity. Results show that, an MFI under strict and regular supervision was not 'less profitable', but it tended to larger average loan size (which means microenterprise) and less lending to costly borrowers. This indicates, as they argued, a reduced outreach to segments of the population that are more costly to serve.

Thus, literature is not abundant with studies of regulatory impact on MFIs' cost efficiency. These studies, however, broadly adopted dummy variables to capture regulation; and used conventional ratios as a measure of performance and/or efficiency.

5. Methodology

(a) Concept and Measurement of Cost Efficiency

In general, the concept of efficiency relates to quantities and costs of inputs and outputs. A firm is efficient if it is able to maximize the quantity of an output for given quantity of inputs, or in other words, it can operate at the lowest cost of inputs for a given quantity of output.

The efficiency frontiers are estimated using various methods over the years. Available literature mostly revolves around parametric approach like Stochastic Frontier Analysis (SFA) and non-parametric approach like Data Envelopment Analysis (DEA). There have been a number of papers, which have compared parametric and non-parametric approach to efficiency analysis such as Bjurek *et al*. (1990), Ferrier and Lovell (1990), Giokas (1991), Resti (1997), and Cooper and Tone (1997). Jacobs summarized the trade-off in the following words:

'Non-statistical approaches such as DEA have the disadvantage of assuming no statistical noise, but have the advantage of being non-parametric and requiring few assumptions about the underlying technology. SFA models on the other hand have the attraction of allowing for

statistical noise, but have the disadvantage of requiring strong assumptions as to the form of the frontier' (Jacobs, 2000 p. 3).

Nevertheless, carefully looking at the purpose and the pattern of our dataset, we wish to use SFA in this analysis. As Masood and Ahmad (2008) mentioned, Stochastic Frontier Approach (SFA) has at least two advantages over nonparametric approaches. First, nonparametric methods assume that the variations in firm performance are all attributed to inefficiency. This assumption is problematic as it ignores the measurement errors, omitted variables and exogenous shocks in the measurement. Second, one can test related hypotheses for the estimated parameters under parametric methods (such as SFA). Major disadvantage of using parametric methods is its restrictions on the observed datasets through the imposition of functional form. Additionally, efficiency measurement is also highly dependent on whether the functional form reflects the reality or not.

(b) Specification of the Cost Frontier

We want to look at efficiency of Bangladeshi MFIs 'before' and 'after' regulation of Microcredit Regulatory Authority (MRA). For this, we use the Stochastic Frontier Analysis (SFA) model that Battese and Coelli (1995) specified for panel data:

$$\ln C_{it} = c(x_{it};\beta) + v_{it} + u_{it} \qquad (1)$$

where, C_{it} is total operating cost of i^{th} MFI (i=1, 2, ... , N) at time t (t=1, 2, ... ,T) and $c(x_{it};\beta)$ is the cost frontier. x_{it} is the $(1 \times k)$ vector of logarithm of input prices and product quantities of MFI i at time t. β is the $(k \times 1)$ vector of unknown parameters to be estimated. v_{it} is the random variable, and is assumed $v_{it} \sim iidN(0,\sigma_v^2)$, while u_{it} is non-negative random variable that shows technical inefficiency in cost with $u_{it} \sim N^{+}(z_{it}\alpha,\sigma_u^2)$.

The exact structure of the aforementioned cost function is unknown to us. Hence, to allow flexibility to that function, we use Transcendental Logarithmic (translog) cost function. Benston *et al*. (1982) first applied the translog cost model to analyze cost characteristics of depository institutions. Subsequent studies by Benston *et al*. (1983), Murray and White (1983), Gilligan and Smirlock (1984), and Gilligan *et al*. (1984) have employed this type of flexible functional form. Translog cost function is specified as follows:

$$\ln C_{it} = \alpha_0 + \sum_i^n \alpha_i \ln Y_{it} + \sum_j^m \beta_j \ln P_{jit} + \frac{1}{2}\sum_i^n \sum_k^n \sigma_{ik} \ln Y_{it} \ln Y_{kit} + \frac{1}{2}\sum_j^m \sum_h^m \gamma_{jh} \ln P_{jit} \ln P_{hit} + \sum_i^n \sum_j^m \delta_{ij} \ln Y_{it} \ln P_{jit} + u_{it} + v_{it} \qquad (2)$$

Where C refers to total operating costs, Y_i is the quantity of i^{th} output, and P_j is unit price of j^{th} factor input. Generally, a microfinance institution (MFI) provides its clients with two types of service: saving and lending. However, we consider 'loan', not member savings, as end output. Since MFIs do not mobilize public deposits in Bangladesh, the role of intermediation is somewhat limited. They collect only member savings which is to a great extent tied to loans. Moreover, net savings account for roughly 40 percent of loans outstanding for Bangladeshi MFIs. They are largely financed by institutional borrowings. Further, we include three variables as input prices: labor wages *(w)*, interest rate on institutional borrowing *(rb)*, and interest rate on members' savings *(rs)*.

As a regularity condition, the translog cost model should be linearly homogenous in all input prices. Therefore, homogeneity requires that:

$$\sum_{j}^{m} \beta j = 1, \ \sum_{j}^{m} \delta ij = 0, \text{ and } \sum_{j}^{m} \gamma_{jh} = 0 \text{ where } \gamma_{jh} = \gamma_{hj} \text{ by symmetry} \quad (3)$$

Thus, the cost must equal the expenses incurred to employ the inputs (some combination of labor and capital with w, rb and rs), to produce a certain amount of output (y). If the cost is more than the expenses, u and v will be greater than zero—that is, some unobserved factors that are contributing to its cost more than they do for an average Bangladeshi MFI. Of these unobserved factors $(u+v)$, we define that u is the part that can be eliminated if the MFI could be efficient. On the other hand, v is the part that is truly unobserved and is idiosyncratic to that institution.

Variables to be included in the cost function are very obvious. However, for the translog model we defined earlier, Table 1 shows the variables and their definition. Technically, for a given amount of outstanding loan, total operating cost equals to the sum of expenses on employees and capital. To resolve the 'stock' and 'flow' problem, we take the mean of each variables reported in the financial statements at the end of current fiscal year and that of previous fiscal year. In practice, there is a deviation that can be broken down to some unobserved average MFI-specific characteristics and cost inefficiency. Several factors might contribute to the cost inefficiency of a particular MFI. We shall try to address them in the following section.

Table 1
Definition of Cost Variables

Variables	Definitions
Total operating cost	Total expenditure excluding financial expenses and depreciation and all provisions
Outstanding loan	Loans due for recovery including the overdue portfolio
Annual salary per employee	Ratio of salary plus other allowances and the number of staff
Interest rate on member savings	Ratio of total interest paid on member savings to total member savings
Interest rate on institutional borrowings	Ratio of total interest paid on institutional borrowings to total institutional borrowings

(c) Specification of Stochastic Cost Inefficiency Models

As we discussed earlier, we obtain the unobserved factors $(u+v)$ once we run the cost stochastic frontier model. We then regress the predicted term $(u+v)$ on various factors that can contribute to the inefficiency of MFI. Thus, we will be able to predict the inefficiency scores (u). An MFI is perfectly efficient if the inefficiency score is zero, and it will be positive otherwise.

Now we define the stochastic inefficiency term as:

$$u_{it} = z_{it}\alpha + \varepsilon_{it} \text{ (Inefficiency Model)}$$

Where z_{it} is a $(1 \times m)$ vector of exogenous variables that affect technical inefficiency of MFI, including regulation variable. In addition, α is the $(m \times 1)$ vector of unknown parameters to be estimated. ε_{it} is a random variable and $\varepsilon_{it} \geq -z_{it}\alpha$, because we set earlier that $u_{it} \geq 0$ this makes $\varepsilon_{it} \sim N^{+}(z_{it}\alpha, \sigma_u^2)$. To summarize, a set of variables (z_{it}) will contribute to the inefficiency, u_{it}, and thereby raising the cost (C_{it}) comparatively more than the average expenses required to produce a certain amount of microfinance service.

It is important to understand the factors that can affect inefficiency (u) of an MFI in Bangladesh. For the scope of this study, we consider the number of years the MFI is under the regulation (REG). As MRA is authorized to supervise and monitor the activities of Bangladeshi MFIs, cost efficiency of an MFI might improve due to regular auditing, accountability in documentation, transparency in governance, and proper guidance for microfinance operation. As licensing has a cost, regulation may add to cost escalation, but the licensed MFI is expected to respond to such cost increase by being more efficient over time. To control the effect of time and to capture the process of 'learning by doing', we include age of microfinance institution (AGE).

Among the other variables, we include a dummy that represents the gender of the executive director of the MFI (MED: Male=1, 0 female) following Mersland and StrØm (2009). So the coefficient of the dummy for male executive director might be negative. The variable 'number of borrowers per staff' (BPS) indicates the capacity of MFI employees in handling borrowers. An increase in the productivity of employees implies an improvement in cost efficiency, ceteris paribus. So the relation between 'number of borrowers per staff' and 'cost inefficiency' is expected to be negative. With direct income subsidy (DIS), the subsidized MFIs might exhibit expense preference behavior, as discussed earlier. Therefore, the subsidized MFIs are likely to be more inefficient. Edwards (1977) showed that an expense preference theoretical framework better explains the behavior of regulated firms than a profit-maximization framework does. Khalily and Imam (2001) advocated for a regulatory framework for microfinance industry of Bangladesh as they found that the subsidized MFIs have more expense preference behavior and are relatively less efficient. We also control for MFI size (MFSIZE), as larger MFIs enjoy economies of scale and thereby tend to be efficient compared to the smaller ones. Hence, we expect cost inefficiency to decrease in MFI size.

We took savings to loan outstanding ratio (SAVLOR) to explain a part of cost inefficiency because cost inefficiency might decrease with increasing share of member savings in loans outstanding. The MFIs with greater share of member savings in loans financing are expected to be more prudent in investment decision because of assumed deposit liability. Therefore, we expect the relationship between savings-loans outstanding ratio and inefficiency to be negative. On the contrary, cost inefficiency might increase in due to investment to asset ratio (INVASSR) because, MFIs can only invest in relatively low return generating long term deposits because of restriction on commercial investment. In microfinance sector of Bangladesh, Palli Karma-Sahayak Foundation (PKSF) has important role in various aspects of the industry. Therefore, it is expected that PKSF will be an important determinant. To control for the effect of POs of PKSF on the level of inefficiency of microfinance sector, we have incorporated a variable (PKS) that shows number of years as PKSF partner organization as specified in the following equation (4).

Since PKSF has been practicing non-prudential regulation before the emergence of MRA, its partner MFIs are likely to be more cost efficient, and can respond to the regulatory measures with higher degree of efficiency. Until we control for the influence of PKSF, it will be difficult to relate cost efficiency to regulation.

On the basis of the discussion above, the model is specified as follows:

$$u_{it} = \gamma_0 + \gamma_1 REG_{it} + \gamma_2 AGE_{it} + \gamma_3 MED_{it} + \gamma_4 BPS_{it} + \gamma_5 DIS_{it} + \gamma_6 MFZ_{it} + \gamma_7 SAVLOR_{it} + \gamma_8 INVASSR_{it} + \gamma_9 PKS_{it} + \varepsilon_{2it} \quad (4)$$

In the model, we put emphasis on the change in inefficiency level due to changes in institutional characteristics and the years passed under MRA regulation.

Given the impact of MRA regulation on cost efficiency, we are also interested to know the mechanism through which the regulation might have worked. The MRA regulation might work in two ways towards cost efficiency. The 'direct effect' of regulation will be through setting social and administrative atmosphere in favor of MFIs. The licensing and regulation have provided Bangladeshi MFIs with improved environment for their operation. Acceptance of MFI activities has been increased, especially for the MFIs with license (Latif *et al*., 2013). This might have ameliorated their financing options and the outreach of operations. The 'indirect effect' of regulation on cost efficiency will be through factor productivity. A floor for saving interest rate and a ceiling for lending interest rate, set by MRA, have worked as a 'spread cut' for the MFIs. This reduction in revenue forces them to revisit their expenses for survival. Nevertheless, existing cost structure of a firm is usually rigid and difficult to tighten. So, the only possible option for MFIs was to improve their productivity, such as productivity of staff. It is expected that to be cost effective, the microfinance institutions have to change the output – labor ratio, that is, the loan productivity per staff or borrower productivity per staff. Therefore, regulation is likely to improve cost efficiency through improving staff productivity. We have already set 'borrowers per staff' (BPS) as a measure of labor productivity for the MFIs. Therefore, in order to assess the mechanism through which regulation affects cost efficiency, we specify a productivity equation:

$$BPS_{it} = \mu_0 + \mu_1 REG_{it} + \mu_2 AGE_{it} + \mu_3 MED_{it} + \mu_4 MFZ_{it} + \mu_5 PKS_{it} + \mu_6 TRNEXP_{it} + \varepsilon_{3it} \quad (5)$$

That is, labor productivity is also some function of number of years under regulation (REG), age of MFI (AGE), gender of the CEO of the institute (MED), share of members in the industry (MFZ), years of partnership with PKSF (PKS), and the log of training expenses per staff (TRNEXP). Substituting the parameter for staff productivity of borrowers in equation (4) by equation (5), we get the following reduced form equation:

$$u_{it} = \vartheta_0 + \vartheta_1 REG_{it} + \vartheta_2 AGE_{it} + \vartheta_3 MED_{it} + \vartheta_4 DIS_{it} + \vartheta_5 MFZ_{it} + \vartheta_6 SAVLOR_{it} + \vartheta_7 INVASSR_{it} + \vartheta_8 PKS_{it} + \varepsilon_{4it} \quad (6)$$

Where ϑ_1 estimates the effect of years under regulation on inefficiency, and the term can be decomposed into two parts: $\vartheta_1 = \gamma_1 + \mu_1\gamma_4$. The first part (γ_1) shows the 'direct effect', where the second part $(\mu_1\gamma_4)$ shows the 'indirect effect' of regulation.

Generally, impact of any intervention is the difference between factual and counter-factual outcomes of the homogenous group of firms or households. This is observed in panel data set. It also tackles the problem of influence of unobservable heterogeneous characteristics (at firm level) and selection bias as they remain constant over time. In this paper, we have used panel data set of 182 MFIs including balanced panel data of 96 MFIs. Licensed MFIs were selected randomly. Our analysis is based on analysis of balanced panel data set, but we complement the findings with the analysis of unbalanced panel data set as a part of testing robustness of our findings.

6. Sources of Data

We shall see the dynamics of cost efficiency of some Bangladeshi MFIs for a number of years. Reliability of data becomes an important issue in supply-side studies of microfinance. In order

to ensure dependability, researchers have generally used data from rating agencies, which is self-reported by MFIs (for instance, see Hermes et al., 2008; Huq *et al*., 2009; Cull *et al*., 2011). As Mersland and StrØm (2009) argue, the use of rating data may induce bias, as they broadly cover commercially and professionally oriented institutions that have decided to be rated to improve access to funding, benchmark themselves among others, and increase transparency.

Hence, we use financial information and outreach related data of 182 Bangladeshi MFIs for the period 2005-2011 collected from MRA and PKSF. Probability of reliability is very high here due to regulatory and monitoring mechanism of these institutions. MFIs affiliated under these two organizations are required to submit their 'audited financial statement' for continuation of their membership. As MFIs have been providing data biannually for years, chance of discrepancy is very low in our dataset. We also combined outreach and performance related variables to the audited financial statements. Further, we crosschecked data sets to make our statistical inference strong.

7. Results and Discussions

(a) Descriptive Statistics

We have the financial and outreach information of 103 MFIs for 2006—the year prior to the beginning of licensing—and 95 of them are PKSF POs. All of our sampled MFIs gradually licensed with MRA over the observed years. On the other hand, every PKSF PO became licensed with MRA by 2011. The total number of observation for the unbalanced panel is 923. We have the information of 182 MFIs for unbalanced panel; and 96 MFIs for the balanced panel regression who got licensed either in 2007 or 2008.

Table 2 shows the summary statistics of key variables for the pre-licensing year and 2011 of the MFIs licensed between 2007 and 2010 so that we are able compare the 'ex-ante' and 'ex-post' scenario of regulation. One of the important regulatory interventions has been on interest rate. Prior to regulation, lending interest rate was 20 percent charged on flat method (approximately 36 percent under declining balance method, and it has been reduced to maximum 27 percent to be charged on declining balance method). This means, there has been a decline in lending interest rate of around 9 to 10 percentages point. Such significant change in lending interest will certainly have impact on cost structure and efficiency of MFIs. As Table 2 shows, MFIs that got licenses from the MRA in 2007 or 2008 were relatively large MFIs, and the smallest were the ones that got licenses in 2010. Some significant achievements have taken place during the post regulation period. The major outputs (loans outstanding, savings, and members) of all the licensed MFIs have increased from the pre-licensing period. However, the effect on efficiency is perhaps found through productivity. Substantial improvements in average loans per staff and average loan size have taken place; higher intensity is found for the licensed MFIs in 2007. Both member savings and institutional borrowing have increased. A licensing with MRA might have installed faith among their lenders (such as commercial banks). Hence, institutional borrowing increased for all licensing batches. Consequently, dependence on direct income subsidy has diminished. However, as per MRA rules, MFIs cannot take public (non-members) deposits now. They can only lend from their own fund and hence savings-outstanding ratio decreased for older licensed MFIs. It seems they are matching this up with their investment.

Table 2

Summary statistics

(Monetary figures are in Million Taka. Figures indicate MFI averages. Year ending on June 30)

	Licensed in 2007 N=32		Licensed in 2008 N=98		Licensed in 2009 N=29		Licensed in 2010 N=23	
	Pre-license year–2006	2011	Pre-license year–2007	2011	Pre-license year-2008	2011	Pre-license year-2009	2011
Members	238,671	331,483	45,239	62,001	15,904	18,281	1,460	4,229
Borrowers	204,014	240,450	40,404	50,307	13,886	14,436	1,254	2,894
Staff	1,764	1,082	314	353	104	92	23	23
Borrowers per staff	116	222	128	142	134	157	55	126
Outstanding loans	137.00	619.00	190.28	411.91	70.28	110.33	11.98	16.99
Member savings	415.96	931.88	67.71	142.67	27.11	44.10	4.75	7.36
Total asset	1538.78	3600.63	267.81	519.61	73.5	137.53	15.5	21.03
Operating cost	27.5	96.00	42.61	81.46	12.58	17.60	2.08	4.37
Institutional Borrowing	471.40	1002.09	100.62	243.60	41.8	54.25	6.03	6.28
% of MFIs receiving direct income subsidy	30	20	18	15	6	1	19	4
Operating cost per 100 Tk loans outstanding	20	15	23	20	18	16	17	26
Outstanding loans per staff	0.51	2.11	0.61	1.17	0.67	1.21	0.52	0.74
Average size of loan outstanding	4,427	9,506	4,709	8,187	5,061	7,642	9,553	5,870

Source: CDF and InM (2006-2011), MRA (2005-2011), PKSF (2011)

To sum up, licensed MFIs have improved their performance. Nevertheless, due to the conditions of licensing, smaller and weaker MFIs got the chance later than strong and large MFIs. Thus, it is only natural that they will not be able to reap the benefits of regulation like their predecessors.

(b) Econometric Findings

(i) Stochastic Frontier and Cost Efficiency

We first run the translog cost function model and generate the unobserved terms ($u+v$). Once the terms are estimated, we run the inefficiency model (as specified in equation 4) to find out which part of the unobserved terms is due to MFI's inefficiency compared to an average Bangladeshi MFIs (u), and which part of them is actually the stochastic disturbance (v). To estimate the cost inefficiency score, we first estimate the stochastic cost frontier model. We present the results of Stochastic Frontier model using both balanced panel and unbalanced panel data in Table 3.

Table 3

Estimates of the Stochastic Frontier (Cost) in 2006-2011

(Dependent variable: log(operating cost)

Explanatory variables	Balanced Panel		Unbalanced Panel	
	coef.	se.	coef.	se.
Log of outstanding loan (loanout)	-0.013	0.242	0.018	0.242
Log of annual salary (salary)	-0.038	1.044	0.015	1.046
Log of interest rate on member savings (savrate)	1.831***	0.668	1.718***	0.666
Log of interest rate on borrowings (borrate)	1.584***	0.563	1.587***	0.562
Squared log (loan out)	0.031***	0.009	0.031***	0.009
Squared log (salary)	-0.037	0.085	-0.039	0.085
Squared log (savrate)	-0.079*	0.047	-0.079*	0.047
Squared log (borrate)	-0.039	0.036	-0.039	0.036
Log (loanout)*Log (salary)	0.082**	0.039	0.078**	0.039
Log (loanout)*Log (savrate)	0.007	0.042	0.008	0.042
Log (loanout)* Log (borrate)	-0.030	0.028	-0.029	0.028
Log (salary)* Log (savrate)	-0.238**	0.097	-0.222**	0.097
Log (salary)* Log (borrate)	-0.169**	0.084	-0.171**	0.084
Log (savrate) *Log (borrate)	-0.249**	0.100	-0.247**	0.100
Constant	4.678	6.825	4.188	6.836
σ_v	0.20***	0.270	0.75***	0.03
σ_u	0.50 ***	0.161	0.34***	0.060
$\lambda = \frac{\sigma_u}{\sigma_v}$	2.45***	0.069	0.45***	0.124
Number of observation	576		923	
Number of MFIs	96		182	

Note: *** p<0.01, ** p<0.05, * p<0.1
coef.: coefficient
se: standard error

The standard deviations of the two error components—random (v) and inefficiency (u)—are respectively 0.75, and 0.34 in the unbalanced data, while they are 0.2, and 0.5 in the balanced data. The estimate of total error variance is 0.68 for unbalanced data, 0.29 for the balanced data. The estimates of the ratio of the standard deviation of the inefficiency component to the standard deviation of the idiosyncratic component are 0.45 and 2.45 for unbalanced and balanced data, respectively. We have tested if there is any inefficiency component in the model (H_0: σ_u=0) The null hypothesis (H_0) is rejected as the calculated test statistics exceeds the critical test statistics. The result suggests that the component of inefficiency does exist.

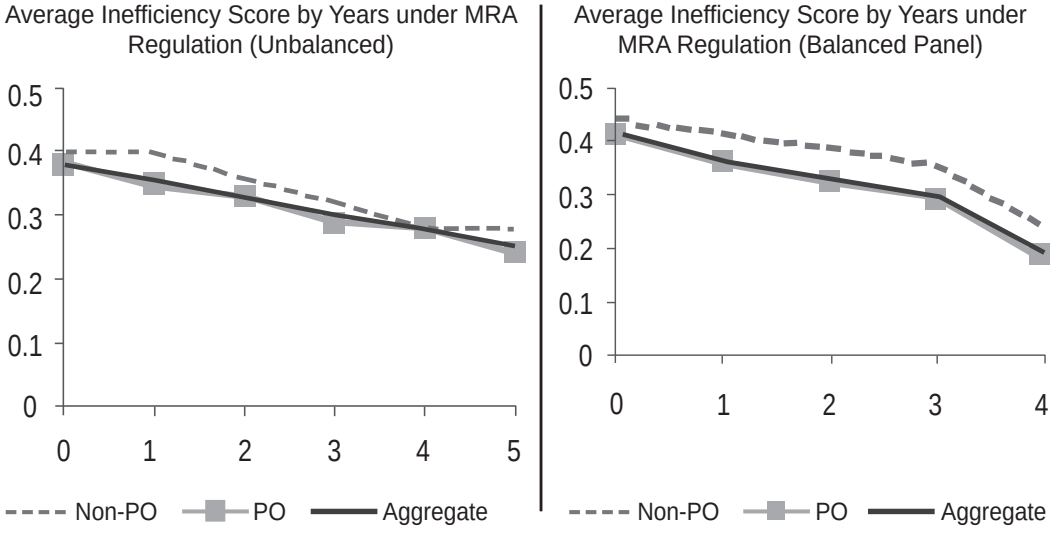
(ii) Determinants of Cost Inefficiency

Since all microfinance organizations do not enter into the regulatory framework at a time, it is plausible that a dummy variable for regulation may not capture the effect completely. Therefore, we tried to find out the impact over the years under MRA regulation using both balanced and unbalanced panel data sets.

First, we have a simple graphic approach to see the relationship between the cost efficiency of microfinance institutions of Bangladesh and years under regulation (see Figure 1). In our sample, the MFIs that got license in 2007or 2008—the first two years of MRA regulation—have the lowest level of inefficiency compared to the other MFIs licensed in 2011. The decline in inefficiency is evident from the very first year after licensing. Thus, the inefficiency of microfinance sector in Bangladesh has been declining gradually over the regulation years. This may not fully reflect the impact of MRA regulation. As argued earlier, PKSF POs, even before regulation, had been under non-prudential monitoring that may make them more efficient. Figure 1 shows PKSF POs are more efficient than non-PKSF POs. Non-POs have also enjoyed declining inefficiency over the regulation years.

Figure 1

Inefficiency Scores Obtained in Unbalanced and Balanced Panel Models

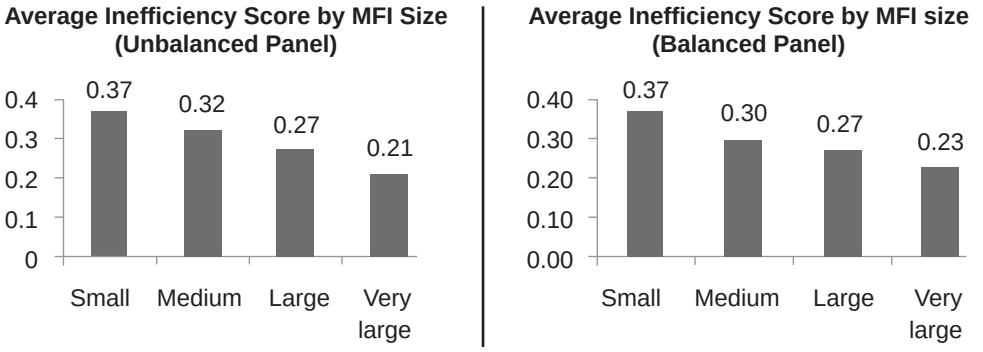


Note: To construct the balanced panel, we kept MFIs that were licensed in 2007 or 2008; and had information for the period of 2006 to 2011. This gave us a panel of 96 MFIs.

Inefficiency appears to be influenced by scale of operations, defined in terms of number of borrowers, of the MFIs. It is more pronounced among the smaller MFIs (see Figure 2). Average inefficiency score for the small MFIs was around 43 percent higher than the very large MFIs, and about 14 percent higher than that of medium MFIs.

Figure 2

Graphical representation of inefficiency by MFI Size



Note: The MFI size is defined based on total borrowers. The numbers of borrowers for small, medium, large and very large MFIs are up to 25 thousand, 25 to 100 thousand, 100 to 500 thousand, and above 500 thousand, respectively.

From the stochastic frontier analysis, we generated technical inefficiency score that shows level of inefficiency of a particular MFI. The score is non-negative. It is equal to zero if the MFI is perfectly efficient. We also observed the dynamics of cost inefficiency over the years, categorizing the MFIs by their years of licensing. Table 4 shows a consistent decrease in inefficiency (a consistent rise in efficiency) for MFIs under regulation for five years. A clear reducing pattern in the cost inefficiency is very evident for each group of licensed MFIs, but the rate of decrease in inefficiency is higher for the early licensed ones. MFIs licensed later than 2007 also became cost efficient.

Table 4

Dynamics of Cost Inefficiency over the Years under MRA Regulation (2006-2011)

License year	Pre-licensing/ Unregulated	Years under Regulation					% Decline in inefficiency (pre-license to 2011)
		1st year	2nd year	3rd year	4th year	5th year	
2007	0.38	0.36	0.34	0.30	0.28	0.25	34.21
2008	0.37	0.33	0.30	0.29	0.28		24.32
2009	0.38	0.38	0.37	0.34			10.53
2010	0.45	0.44	0.39				13.33

Source: cost frontier based estimates.

Both the figure and table exhibit that, years passed under regulation matters in cost inefficiency of microfinance institutions. As argued earlier, since MRA has recently capped lending interest rates, inefficiency may have reduced through higher employee productivity like number of borrowers per employee, and increasing market share. Similarly, firms with higher dependency on income grant will be more inefficient. In addition, we incorporated gender of MFI head as a dummy variable, ratio of investment in FDR to total assets, and member savings to loans outstanding ratio. We also included regional dummies to control for regional variations. The estimated parameters are particularly important to assess the sources of inefficiency of microfinance sector and the role of regulation.

To find the robustness and consistency of estimates, we have estimated the parameters using both balanced and unbalanced panel data sets. In analyzing the balanced panel data, we have constricted the MFIs which have data for a given time interval (2006-2011). The second approach (unbalanced panel) deals with the entire data set, where MFIs have acquired licenses from the MRA at different time. Since regulation is a dynamic process, it will be logical to measure the impact using the balanced data set. The first approach, therefore, will be the principal approach, whereas the findings from the unbalanced data set will complement the results in the first approach if they are robust.

We have information on different parameters measuring cost inefficiency and its determinants for the period 2006-2011. As the data set is pooled cross-sectional panel data in nature, we used the random effect model following the Hausman specification test. Table 5 presents estimated results, where the parameters of equation (4) were estimated using the balanced data set of 96 MFIs.

Table 5
Parameter Estimates of Reduced Form Equation (Balanced Panel Data)

Explanatory variables	Inefficiency Equation (eq. 4)		Productivity Equation (eq. 5)		Reduced Form Equation (eq. 6)	
	coef.	se.	coef.	se.	coef.	se.
Years under regulation	-0.021***	0.007	0.055***	0.014	-0.025***	0.007
Log of borrower per staff	-0.065***	0.022				
Age of MFIs	0.004	0.003	0.028***	0.007	0.002	0.003
Gender of ED: Male=1	-0.041	0.046	-0.011	0.117	-0.044	0.046
Receive any income grant: yes=1	0.143***	0.029			0.138***	0.029
Log of share of members	-0.030***	0.011	-0.406***	0.017	-0.010	0.009
Member savings to outstanding ratio	0.004***	0.001			0.004***	0.001
Investment to asset ratio	0.151	0.120			0.163	0.121
Age of partnership with PKSF	-0.010***	0.004	0.031***	0.009	-0.012***	0.004
Log of training expenses			0.037***	0.008		
Constant	0.425***	0.139	0.828**	0.323	0.313**	0.135

Note: *** p<0.01, ** p<0.05, * p<0.1. Regional dummies are also included but not reported.
coef.: coefficient
se: standard error

All the coefficients of the explanatory variables except years of microfinance operation of the microfinance, gender of the microfinance institution, and investment-asset ratio in the random effect model are statistically significantly different from zero, suggesting that they have important role in making the MFIs cost effective. The result reveals that the MFIs receiving direct income grant are relatively cost inefficient. Staff productivity and market share of members improve cost efficiency of the microfinance institutions. PKSF partner organizations (POs) are more cost efficient. The result conspicuously shows that the years under regulation improve cost efficiency of microfinance institutions. It reduces cost inefficiency by 2.1 percent for each year of regulation holding other things constant. This is net of the effects of PKSF POs. Passing each year as a PKSF PO reduces inefficiency by one percent.

We also dropped the variable 'PKSF PO', and re-estimated the model (results are not reported). We found that effect of regulation was higher and significant. The coefficient for regulation improved from 2.1 percent to 3.6 percent. Therefore, the real effect of MRA regulation is 2.1 percent per annum as reported in Table (5). The results unequivocally suggest that regulation does contribute to reducing inefficiency, and PKSF POs are more efficient than the non-POs. The size of the MFI is important in determining the level of efficiency of the microfinance institutions. The market share of members is used to capture the size effect. The coefficients of the size variable show that as the market size of an institution increases, it tends to become efficient. The coefficient of size variable is negative and significant at one percent level. Subsidized MFIs appear to be more inefficient.

There will be both direct and indirect effects of regulation. The coefficient of number of years under regulation (REG) in the inefficiency equation (eq. 4) in Table 5 is the direct effect of regulation on cost inefficiency, and the coefficient of the regulation in the productivity equation (eq. 5) shows the direct effect of regulation on staff productivity. Both regulation and productivity contributes to decrease inefficiency. Based on the parameters as explained above, we find that total effect of regulation on cost inefficiency. Regulation reduces inefficiency by 2.5 percent as shown in reduced form equation (eq. 6). Of the total effect, direct effect was estimated to be 2.1 percentage points, as specified in inefficiency equation. The difference between these two estimates is the indirect effect of regulation on cost efficiency through productivity (about 0.4 percent per annum). We can derive also by multiplying the coefficient of number of years under regulation in productivity equation with the coefficient of productivity in 'inefficiency equation'. The results show that regulation contributes to efficiency directly (through improvement in regulatory environment) and indirectly through its effect on productivity. Training expenses as well as learning by doing, as reflected in age of MFIs, have positive impact on staff productivity.

(c) Checking the Robustness of Findings

The balanced panel regression results show that effect of partnership of some MFIs with PKSF, an additional year under regulation reduces cost inefficiency. The effect is found to be significant at about one percent level. The estimates are robust because it controls for PKSF and unobservable characteristics of the firms and the areas they operate in. Robustness and stability of the estimates can be tested in several ways such as dropping or adding variables, or changing form of equation or data. We test the validity of the estimates by using unbalanced data set.

Since it is difficult to maintain a balanced panel set from repeated cross-sectional observations due to various random and non-random causes, it will not be too much problematic to go with the unbalanced data from the perspective of modeling. Baltagi (2008) suggested that if the variance of the unobserved component equals to zero, the OLS of the unbalanced panel will be BLUE (Best Linear Unbiased Estimator), and even it is positive, the OLS estimates are still unbiased and consistent, but its standard errors are biased. However, researchers may have fascination for balanced data, assuming that the sample non-response or dearth of data point may be problematic. To deal with the case, we have balanced the data set for the years in between 2006 and 2011. To check the robustness of findings, we have estimated parameters of the model using unbalanced panel data set using random effect model. Table 6 shows the results.

There has not been any change in the direction of the estimates. The results obtained from the unbalanced panel are analogous to that of balanced panel. The estimated coefficients are almost same, and the results are similar. Regulation does contribute to reducing inefficiency of the licensed MFIs.

Table 6
Parameter Estimates of Reduced Form Equation (Unbalanced Panel)

Explanatory variables	Inefficiency Equation		Productivity Equation		Reduced Form Equation	
	coef.	se.	coef.	se.	coef.	se.
Years under regulation	-0.020***	0.008	0.034**	0.014	-0.022***	0.008
Log of borrower per staff	-0.048***	0.018				
Age of MFIs	0.010***	0.003	0.034***	0.007	0.009***	0.003
Gender of ED: Male=1	-0.042	0.052	0.058	0.112	-0.046	0.053
Receive any income grant: yes=1	0.142***	0.032			0.137***	0.032
Log of share of members	-0.035***	0.010	-0.436***	0.012	-0.015**	0.007
Member savings to outstanding ratio	0.001	0.002			0.001	0.002
Investment to asset ratio	0.002	0.132			0.016	0.132
Age of partnership with PKSF	-0.009**	0.004	0.051***	0.008	-0.012***	0.004
Log of training expenses			0.019***	0.007		
Constant	0.226*	0.129	-0.202	0.273	0.226*	0.131

Note: *** p<0.01, ** p<0.05, * p<0.1
coef.: coefficient
se: standard error

One of the arguments we made earlier that regulation affects cost efficiency partly through staff productivity. If this holds, we will find that the estimate of staff productivity in inefficiency equation will capture partly the effect of regulation if we drop the regulation from the inefficiency equation and re-estimate the model using balanced data. We would expect the coefficient to be higher. This is exactly found when we re-estimated equation (6). This also validates our argument that regulation influences cost efficiency also through staff productivity. We report the results in Table 7. Coefficients of other parameters had expected signs and were significant as before. Therefore, we can conclude that our results and the specification are robust.

Table 7
Parameter Estimates of the Modle without Controlling for Regulation

Explanatory variables	Inefficiency Equation		Reduced form Equation	
	coef.	se.	coef.	se.
Years under regulation			-0.025***	0.007
Log of borrower per staff	-0.078***	0.021		
Age of MFIs	0.002	0.003	0.002	0.003
Gender of ED: Male=1	-0.041	0.046	-0.044	0.046
Receive any income grant: yes=1	0.144***	0.029	0.138***	0.029
Log of share of members	-0.029***	0.011	-0.010	0.009
Member savings to outstanding ratio	0.004***	0.001	0.004***	0.001
Investment to asset ratio	0.155	0.121	0.163	0.121
Age of partnership with PKSF	-0.014***	0.003	-0.012***	0.004
Constant	0.544***	0.133	0.313**	0.135
Number of observations	570		570	

Note: *** p<0.01, ** p<0.05, * p<0.1
coef.: coefficient
se: standard error

8. Conclusion and Policy Implications

Despite of being a pioneering country in microfinance, Bangladesh lagged behind in regulation until it established the Microcredit Regulatory Authority (MRA) in 2006.MRA started licensing the institutions from 2007 and granted license to around 650 institutions as of August 5, 2011. In this study, we assessed the impact of MRA regulation on cost efficiency of MFIs using the data of 182 institutions covering the period from the pre-regulation year (year preceding the year of licensing) to 2011. We had panel data of 96 MFIs licensed in either 2007 or 2008, and unbalanced panel data of 182 MFIs.

We found that regulation contributed to reduce cost inefficiency by 2.1 percent for each year of regulation. PKSF POs are more efficient than the non-POs as partnership year with PKSF decreases cost inefficiency by another one percent. The direct impact of regulation is through changing behavior of the MFIs, while the indirect impact is through increasing staff productivity. Our result showed that total effect of regulation was 2.5 percent, of which the direct effect was 2.1 percentages point. The remaining was through increasing productivity. Subsidized MFIs have more expense preference and are more inefficient. MFI size and staff training positively contribute towards efficiency. We have also shown that our econometric results are robust.

The findings have implications for both regulator and regulatee. First, findings of this study firmly suggest that regulation of MFIs is warranted and justified. Second, regulations have changed the behavior of the licensed MFIs. It has forced them to adopt some strategies to be more efficient. Efficient MFIs have relatively higher loan size. It might also indicate that licensed MFIs may trade-off between 'social objective' and 'commercial objective'. This needs to be examined more rigorously. In some countries, regulation caused the MFIs move towards commercialization.

This is often regarded as indirect cost of regulation (for example, see Cull *et al*. 2011). The regulatory agency in Bangladesh needs to decide that in what role it wants to see the MFIs in future—commercial or social; that is, in 'profit maximizing behavior' or 'profit satisficing behavior'. However, considering the prime mission of poverty alleviation, the latter one is preferred. The argument for 'satisficing level of profit' is justified from the broad perspective of 'social mission'.

Third, regulation should make microcredit market competitive. It is more likely that smaller MFIs will have lesser ability to cope with regulatory requirements. They appeared to be relatively less cost efficient. Some small MFIs might be able to grow but some others might falter. In such a situation, merger of some small MFIs might take place. Fourth, as microfinance sector is under regulation and training has positive impact on increasing productivity of staff, MFIs should stress upon training of the staff.

All the aforementioned implications bring forth a critical policy debate. Bangladeshi microfinance market is mostly occupied by the largest MFIs. The rest of the part is served by small MFIs, some of which are very small and they can neither avail convenient finance, nor become cost efficient. Interestingly, many of them are already licensed, so abolishing these MFIs remains no longer an option. Nevertheless, there are two arguments in favor of nurturing small MFIs: (1) their comparative advantage in ameliorating the outreach to remote places and (2) their efficiency in handling local clients and enterprises.

Researchers studied impact of governance on performance, and cost efficiency of MFIs disjointedly, but did not establish any linkage between regulation and cost efficiency. This study is the pioneering one to measure the impact of 'regulation' on 'cost efficiency' of MFIs in Bangladesh. There are not many papers on this issue prepared on the experiences in other countries. One of the reasons is, perhaps, the short history of regulation of MFIs globally. Lack of organized data was another factor. We had financial statements and outreach information for the period covering both pre-regulation and post-regulation from two apex organizations of microfinance sector in Bangladesh. We also crosschecked the data sets to minimize the probability of non-sampling error. The best way the effect of regulation could be ascertained is to have primary data from the management in addition to financial information. Nevertheless, this study shows that regulation matters in improving efficiency of MFIs in Bangladesh. The effect that we have found can be considered as short run impacts. Long run data set including both primary and secondary financial and non-financial information should be used to assess long run impact of regulation.

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