Institutional factors and efficiency performance in the global microfinance industry

Md Aslam Mia
School of Management, Universiti Sains Malaysia, Penang, Malaysia and Department of Business Administration, Daffodil International University, Dhaka, Bangladesh
Gary John Rangel
School of Management, Universiti Sains Malaysia, Penang, Malaysia
Mohammad Nourani
The University of Waikato Joint Institute at Zhejiang University City College, University of Waikato, Hangzhou, China, and
Rajesh Kumar
Institute of Management Technology, Dubai, UAE

Received 12 June 2021
Revised 28 November 2021
26 January 2022
Accepted 19 February 2022

Abstract

Purpose – Measuring the success of microfinance institutions (MFIs) using a single efficiency value and then exploring its determining factors might be misleading. Hence, this study decomposed the efficiency measure into three divisions, namely operational, financial sustainability and social outreach. Subsequently, the authors identified factors affecting these efficiencies in the second stage regression analysis.

Design/methodology/approach – This study employed the network data envelopment analysis approach to evaluate each division of efficiency of 90 MFIs from 2013 to 2018 and used second-stage regression techniques (Tobit and Truncated) to examine the effect of institutional factors.

Findings – The authors' efficiency analysis revealed that financial sustainability and social outreach were responsible for the low overall efficiency. The second stage analysis revealed the negative influence of institutional factors such as efficiency wage (particularly among small MFIs) on financial sustainability, social outreach and overall efficiencies. Staff turnover reduced operational, financial and overall efficiencies, particularly for large MFIs. The presence of female board members and staff improved the efficiency of MFIs, thus highlighting the pivotal role of women in the success of MFIs. Besides, the effects of regional location of MFIs, regulation and legal status on efficiencies were further discussed.

Originality/value – The study has uniquely evaluated three different types of efficiency in MFIs and employed conventional techniques for the second-stage regression to identify the determinants of efficiency. The findings will enable managers to make appropriate decisions to enhance their organisational efficiency.

Keywords Microfinance efficiency, Network data envelopment analysis, Second stage analysis, Social outreach, Financial sustainability

Paper type Research paper

The authors greatly acknowledge the constructive comments and suggestions from the two anonymous reviewers on the earlier version of the paper. The authors also strongly believe that the quality of the paper has been improved substantially after addressing the recommended revisions. The first author (Md Aslam Mia) is currently a visiting professor (research) at Department of Business Administration, Daffodil International University, Dhaka, Bangladesh. The authors also acknowledge the short-term research grant from Universiti Sains Malaysia, Penang, Malaysia (Grant No: 304/PMGT/6315547). Any remaining errors are the authors' own. The usual caveats apply.

Benchmarking: An International Journal
Vol. 30 No. 2, 2023
pp. 433-459

1463-5771
DOI 10.1108/BIJ-06-2021-0326

1. Introduction

Microfinance institutions (MFIs) are recognised as the major informal financial institutions fighting poverty through the provision of financial and non-financial services to the unbanked population (Shaw, 2004). The global microfinance industry has experienced unprecedented growth with the emergence of new MFIs, larger market capitalization and greater client outreach (D'Espallier *et al.*, 2017). The data provided by MIX also revealed that the number of MFIs around the world has increased substantially in the last 10 years and has expanded their outreach to around 140 million poor people (Microfinance Barometer, 2019; MIX, 2018). The overall impact of more players in the industry is higher competition and increased structural changes among MFIs around the globe (Hossain *et al.*, 2020). According to the Center of Financial Inclusion (MIX, 2018), "Despite the operational challenges, sustainability and efficiency improved globally as measured by the operating expense/loan portfolio ratio which declined to 10.6% in FY 2017 from 11.1% in FY 2016".

As a result of increased access to microfinance, developing countries in particular have witnessed a favourable reduction in poverty rates (Agbola *et al.*, 2017; Khandker, 2005). Despite the long-held positive view of general microfinance operations as being successful entities, the academic community still considers exploring the factors affecting the performance of MFIs. This growing body of literature aims to elucidate the dynamics of MFI success, as measured by a performance indicator. This stream of research has unveiled several challenges, which include the efficiency encountered in the general operation of MFIs. However, the consideration of microfinance as a single production unit to measure efficiency may provide an inaccurate estimate of the impact of institutional characteristics. This is because the concept of a single production process fails to consider the internal activities of an MFI. Hence, this paper estimates three divisional efficiencies and examines institutional factors that could affect these different efficiency parameters, as a measure of an MFI's success.

In this regard, efficiency evaluation has been recognised as a suitable analysis to assess the success of MFIs (Mia and Ben Soltane, 2016). For example, social outreach (reaching out to the poor) remains the underlying objective of MFIs, it also represents a measure of their success. Shankar (2007) highlighted that, nowadays, MFIs also need financial sustainability in order to expand their operations and consequently reach out to more poor and unbanked populations. Therefore, these two objectives of MFIs – social outreach and financial sustainability – symbolise the operational activities from which the overall success of an MFI can be measured through efficiency analysis. Nonetheless, how efficiently MFIs are generating financial capital to continuously provide banking financial support to the poor has also become an issue in recent years due to a lack of funding, subsidies and fierce competition in the industry (Mia *et al.*, 2019a).

Practically, the continuous achievement of efficiency in business activities reflects the self-sustainability of MFIs. Utilising the limited resources to efficiently generate optimal outcomes is the goal of MFIs' stakeholders. However, various stakeholders of MFIs, such as donors, funders, investors, borrowers, governments and NGOs, do not acknowledge a single success factor to gauge the efficiency of an MFI. Rather, a multilayer efficiency evaluation in agreement with the operational activities of MFIs offers a more robust and accurate success measure for various stakeholders. This approach, i.e. multilevel efficiency evaluation, provides a better picture of institutional factors that might influence each efficiency measure.

As an efficiency evaluation technique, Data Envelopment Analysis (DEA) is a multilayer analysis, capable of handling multiple inputs and outputs simultaneously using its network models. More specifically, the Network Data Envelopment Analysis (NDEA) approach, consisting of various models depending on the efficiency analysis objective, evaluates the efficiency of Decision-Making Units (DMUs), i.e. MFIs, by opening the black box of the production process and decomposing the overall efficiency into two or more divisions. While

there is an extensive literature on the efficiency evaluation of MFIs using DEA (Fall *et al.*, 2018), the application of NDEA in microfinance literature is rather limited. Moreover, the second-stage efficiency analysis, which examines the influence of institutional factors on the decomposed efficiency scores as a determinant of MFIs' success or failure, could be a major discovery in the microfinance literature.

Hence, this study makes the following contributions to the microfinance literature: First, it proposes a multi-divisional production process for MFIs considering the dual objectives of microfinance-operating activities – social outreach and financial sustainability along with inner operational efficiency. This is particularly important, given the recent attacks on the microfinance industry regarding the achievement of its key objective of reaching the poor. In this regard, we identified several reliable measures of efficiency based on the objectives of an MFI. Second, this study examines the institutional characteristics of MFIs regressed on four efficiency measures, which include the three inner divisions (see Figure 1) and overall efficiency. By unveiling the contributing factors to the efficiency of MFIs as reflected in each success measure, this research will provide a useful input into the assessment of mechanisms by which underlying characteristics may improve the efficiency of each division within the microfinance operation. To be more specific, we have integrated some of the institutional

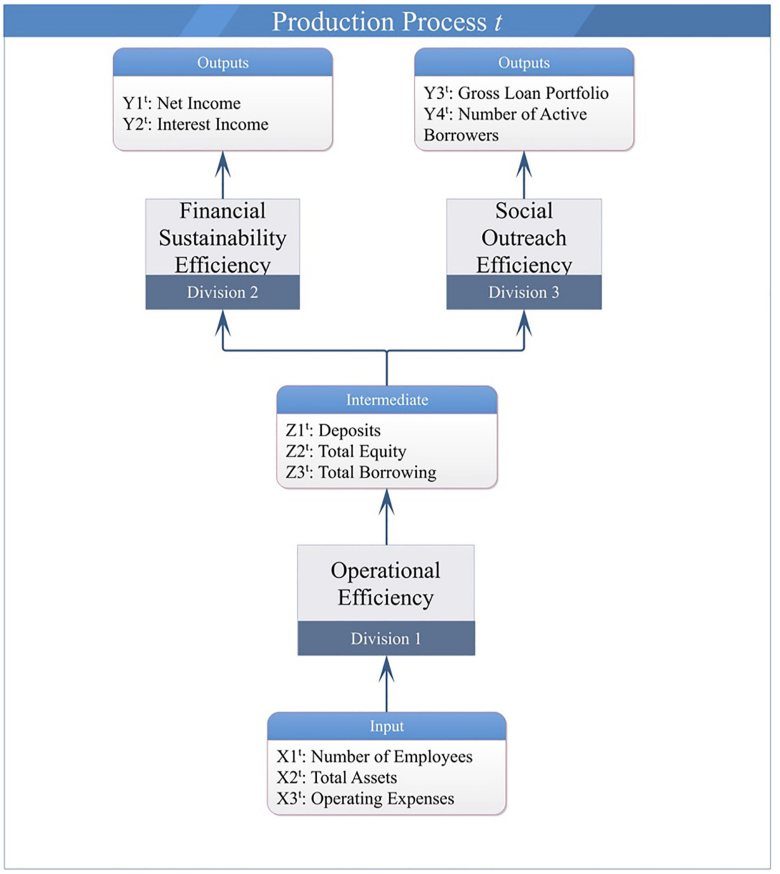

Figure 1.
The network efficiency measurement framework for MFIs

factors of MFIs (e.g. efficiency wage, borrower retention rates) that were not given sufficient attention or failed to incorporate them in the past efficiency literature (e.g. determinants of efficiency) of microfinance as per our knowledge (Bibi *et al.*, 2018; Khan and Shireen, 2020; Wijesiri *et al.*, 2015, 2017). For example, we have included the efficiency-wage hypothesis to examine if paying wages above the market level could enhance the various efficiency levels of MFIs. Another important institutional characteristic that has been included in this study is the staff turnover rates. Since the microfinance mechanism is based on relationship banking principles, staff turnover will not only increase the operating expense but could also ignite borrower turnover (Mia *et al.*, 2022). Therefore, it will affect the overall production process and have consequences for the efficiency levels. Third, the use of the relatively latest dataset of 90 MFIs from 2013 to 2018 in this study provides a relatively recent and global representation of MFIs' performance. In terms of the robustness of our second stage regression analysis, we have also employed two different estimators (Tobit and Truncated) and conducted sub-sample analysis based on the size of MFIs to ensure that our findings are robust and reliable.

The remaining sections of this study unfold as follows: Section 2 reviews some existing theories to contextualise the research, followed by a brief literature review in Section 3; Section 4 outlines the research methodology and dataset; Section 5 discusses the findings of efficiency and regression analyses; and Section 6 concludes the study.

2. Research context

Microfinance is viewed as an instrument of poverty alleviation and economic growth in developing regions of the world rather than simply a banking tool (Ledgerwood, 1998). As per the sustainability concept, the performance of MFIs must be analysed from both social and financial perspectives, as they are mostly interdependent. More importantly, microfinance can be viewed as a dimensional concept, comprising a double bottom line of financial services to the poor (outreach) and financial sustainability. Microfinance is rapidly becoming an investment prospect for many potential investors due to its high return too. Therefore, the dual goal of outreach and financial sustainability has become an important agenda for MFIs to satisfy stakeholders' concerns for social impact and financial return.

While social performance is a critical component of microfinance's core characteristics, obtaining a close balance between outreach (particularly to the poor) and financial sustainability is a difficult issue for many MFIs. This is due to the high operating expenses and low-value loans, as well as the substantial risk associated with collateral-free lending to the poor. As a result, MFIs are in a dilemma and must decide the focus of their operations, whether poor outreach, financial success, or a combination of both. If MFIs are losing money while providing services to the poor, their business model will eventually become unsustainable, especially when access to subsidies or donations becomes restricted or limited. As a result, the notion of "a double bottom line mission" has gained attention in the microfinance industry to enhance the lives of disadvantaged people while remaining independent of donor funding (Armendariz and Labie, 2011).

In recent years, there has been a higher emphasis on financial sustainability by donors, legislators, and other microfinance stakeholders due to increased competition. This has led to the commercialization of the microfinance industry in recent years, which trumps the initial goal of social outreach. This shifting pattern has been referred to as "mission drift" (Copestake, 2007; Mersland and Strøm, 2010).

While past DEA-based studies have mostly investigated the determinants of MFI efficiency based on a single efficiency framework, this study explores the determining factors based on a three-dimensional efficiency framework that captures the overall business strategies of MFIs. Hence, the objectives of this study are twofold: First, we evaluate the

efficiency of selected MFIs by considering three different dimensions of efficiency, namely operational, financial sustainability and social outreach. Second, we examine the determinants of these efficiencies through a non-parametric approach that considers various organisational factors of MFIs as per the availability of data.

3. Literature review

3.1 Understanding financial and social outreach sustainability of MFIs

The microfinance industry is an important conduit for financing the urban and rural poor, especially in less developed countries. The international community considers MFI an acceptable and effective avenue by which abject poverty can be minimised (Armendáriz and Morduch, 2010). MFIs, particularly, assist the poor in improving their livelihoods and enabling them to acquire productive assets, empowering women and reducing their sensitivity to economic difficulties (Khan and Gulati, 2021). However, in achieving MFIs' goal of financing the urban and rural poor, two main issues arise: financial sustainability and social outreach efficiency. These are further complicated by the challenge of operational efficiency.

In recent years, different types of institutions have resorted to a form of financial intermediation as a means to boost their market share and/or profits; this can be termed the last frontiers of the financial intermediation market. This industry has a myriad of players. Microbanks and non-bank financial institutions (NBFIs) are typically shareholder-oriented and are thus required to fulfil traditional financial performance metrics (Liñares-Zegarra and Wilson, 2018). Microbanks have a flexible capital structure and are regarded as financially oriented institutions as they are funded by socially and financially motivated investors (Krauss and Walter, 2009). The NBFIs exhibit an operating structure similar to that of microbanks except that they do not partake in deposit taking and the sales of insurance products (Liñares-Zegarra and Wilson, 2018). Cooperatives and credit unions are frequently classified as non-profit organisations because their members typically own the organisations and have significant decision-making power over strategic decisions (Galema *et al.*, 2012). The organisations tend to utilise their surpluses to sustain operations or return surpluses to members in the form of cash dividends or low-cost access to credit and deposit services. These entities have limited access to external funding and typically involve the owners in the management of the institution.

However, not-for-profit institutions or non-governmental organisations (NGOs) differ from credit unions in that they have a non-distribution constraint (Servin *et al.*, 2012) and enjoy the greatest leeway in terms of managerial discretion (Galema *et al.*, 2012). The range of services offered by NGOs is limited due to their non-acceptance of deposits (in most cases) and heavy reliance on external sources of funds in the form of grants and subsidies, which make them vulnerable to changes in supply and demand conditions. The extant literature has also reported that NGOs are often associated with lower profitability, smaller loan sizes and higher operational costs (per dollar spent) compared to commercially oriented microbanks (Cull *et al.*, 2009).

With these diverse organisational forms operating within the microfinance sphere, the determination of the aspect of efficiency to emphasise is of great importance to the researchers. In fact, the microfinance business has experienced tremendous growth in recent years as a result of the advent of numerous forms. In order to increase efficiency and sustainability, a variety of structural and organisational modifications have been implemented in this industry. Therefore, a standard performance measurement framework has the potential to be a useful tool in evaluating the efficiency and productivity of MFIs (Mohini and Vilvanathan, 2021).

The most difficult challenge an analyst has when modelling the efficiency performance framework is selecting appropriate inputs and outputs (Arora *et al.*, 2018; Gulati, 2015;

Kweh *et al.*, 2018; Nourani *et al.*, 2020). Further confounding the issue of MFI efficiency is the input element and its connection to the overall efficiency of an MFI. Moreover, operational efficiency of MFIs is an important element to consider, given its effects on financial sustainability and social outreach efficiencies. Among some of the important input elements of operational efficiency include the number of employees of an MFI, total assets and the level of operational expenses. For example, an MFI with a large number of employees is likely to achieve a higher social outreach efficiency. Also, an MFI with a larger asset base stands a better chance of attaining financial sustainability efficiency, which in turn improves the social outreach efficiency. Therefore, operational efficiency reflects how well an MFI utilises its resources, particularly its assets and personnel (GGAP, 2003).

From the standpoint of financial sustainability efficiency, two important output variables stand out, namely the net and interest income of an MFI; these ensure longevity for an MFI. Obviously, these output variables, which were employed and evaluated in this paper using the DEA approach, also depend on the heterogeneity in the types of services and products provided by MFIs (Wijesiri *et al.*, 2017). Financial sustainability efficiency, as defined by Ayayi and Sene (2010), relates to the level of capability of an MFI to cover its overall expenses with its revenue, thereby generating a margin for its growth and becoming independent of subsidies such as concessional loans and unfettered by the whims of donors (Thapa *et al.*, 1992). Therefore, financial sustainability refers to the MFI's ability to self-sustain its operations and maximises its profit.

Despite the significance of achieving financial sustainability efficiency, MFIs should equally emphasise social outreach by focusing on their core clients–the poor. The efficiency of outreach can be measured by the breadth and depth of social outreach (Conning, 1999). In other words, the breadth of MFIs is defined – in line with their stated goal of minimising the marginalization of the unbanked population – as the number of reachable clients. Nevertheless, the extant literature is not in agreement with regards to the true proxy for the depth of social outreach. Hulme and Mosley (1996) argued that the depth of the outreach should not be measured by the number of clients of MFIs but rather be based on the number of poor clients. In this regard, the depth of social outreach can provide an indication of whether an MFI lends to relatively rich or poor clients (Rizkiah, 2019). Although such a proxy would have been the ideal measurement, the extant literature posited the number of borrowers as an alternative for measuring the depth of financial outreach in the event of data constraints.

Although, conceptually, a contest exists between financial sustainability and social outreach efficiency, there has been empirical evidence indicating otherwise. Whether a trade-off or agreement exists between financial and social outreach sustainability remains a question for MFI researchers, and a possible solution or answer can be proposed by studying the success factors of MFIs.

3.2 Factors influencing the success or failure of MFIs

An MFI's survival, growth and ability to accomplish its social aims will be enhanced if the performance metrics are thoroughly investigated over time (Bardhan *et al.*, 2021). The extant literature has shown that a myriad of factors can influence the success or failure of MFIs. Wijesiri *et al.* (2017) found that the location of regional MFIs' operations can affect financial and social outreach efficiencies. Also, the possible effects of size and age on financial and social efficiencies were observed, as evidenced by older and larger MFIs performing better on both dimensions (Wijesiri *et al.*, 2015).

Furthermore, Wijesiri *et al.* (2015) and Chikalipah (2017) discovered that apart from age, the type of MFI and Return on Assets (ROA) also have a significant effect on social and financial efficiencies. In terms of the ROA, a trade-off effect exists between financial and social efficiencies, as better social performance can only be attained at the expense of financial

stability. Using the rural-urban dichotomy, Lopez and Winkler (2018) found that MFIs with a higher share of rural borrowers do experience a higher level of sustainability as opposed to MFIs with largely urban clients. This indicates that lending activities in rural areas confer better outcomes for an MFI than doing the same in cities.

Governance factors also play a significant role in attaining efficiency in terms of financial sustainability and social outreach. Van Damme *et al.* (2016) tested several governance factors and found that the presence of smaller and more gender-diverse boards increases financial efficiency. On the other hand, it was discovered that the assignment of significant positions, such as chief executive officer (CEO) position and board chairperson, to a woman leads to a lower level of social outreach for an average MFI. This suggests the importance of sound governance policies in fulfilling the dual objectives of MFIs.

The extant literature also shows that the legal status, whether profit-oriented or non-profit oriented, also contributes significantly to the social performance of MFIs. Tchakoute-Tchuigoua (2010) found that profit-inclined MFIs perform better in terms of social outreach, in accordance with the findings of Cull *et al.* (2007) and Mersland and Strøm (2008) but at variance with those of Mersland and Strøm (2008). Others have looked at the importance of government ideology as a determinant factor for MFIs' success. Gul *et al.* (2017) analysis indicated that MFIs that operate in left-wing regimes have higher portfolio growth rates, lower funding costs, reduced operation costs and lower default costs relative to those operating under right-wing or centrist regimes. However, left-wing regimes curtail the ability of MFIs to increase financial revenue. Therefore, the overall sustainability of MFIs at any time is dependent on the ideology of the existing regime as well.

The success of an MFI in terms of financial sustainability also depends on the risk-return relationship. Loan quality as measured by Portfolio at Risk (PAR) significantly impacts financial sustainability (Chikalipah, 2017). As a result, the administration of suitable pre-screening mechanisms was suggested to assess the creditworthiness of borrowers, in an effort to improve the loan portfolio performance and reduce loan default rates (Chikalipah, 2017).

The success of this assessment program in increasing the capacity of MFIs to meet their stated objectives also depends on the ability to efficiently monitor borrowers via workforce motivation (higher pay) and a reduction in their turnover rates. Hence, we introduced the efficiency-wage hypothesis to reflect the need for a motivated workforce, as an MFI's clientele would be better served by a workforce motivated by higher pay. Such a framework has been found to have better outcomes, as indicated by the results of Ayayi and Sene (2010), in which higher management efficiency facilitates the attainment of financial sustainability. In this paper, we proxied this effect (motivated workers) using the wage bill of an MFI, as well as staff turnover rates.

4. Methodology

In this study, we have adopted two-step procedures to achieve our research objectives. First, we employed a non-parametric approach, Network Data Envelopment Analysis (NDEA), to compute various dimensions of efficiency. Second, we adopted a conventional parametric approach to identify the determinants of efficiency. A detailed discussion of these procedures is given in the following section.

4.1 Network data envelopment analysis

Data Envelopment Analysis (DEA) is one of the most popular efficiency analysis techniques used in microfinance literature (Fall *et al.*, 2018). In contrast to the existing studies that used traditional DEA models, we employed a Network DEA (NDEA) approach to define the production process of MFIs through an accurate evaluation of the activities connecting the

dimensions of microfinance production. We estimated the efficiency using variable returns to scale [1] Network Slacks-Based Measure (NSBM), a non-radial NDEA developed by Tone and Tsutsui (2009), which allows for input excesses and output shortfalls without making any assumptions on the proportional changes of inputs and outputs (Nourani *et al.*, 2019).

We developed a three-divisional productivity unit of MFIs–operational, financial sustainability, and social outreach efficiencies – in line with the activities and general objectives of microfinance. This approach embraces intermediation in modelling the efficiency of financial institutions; they are considered as intermediary units between sourced funds and their eventual utilization. Accordingly, these funds represent the connecting resources between the divisions of efficiency within the microfinance business. In line with the existing literature on the utilization of inputs and outputs in the microfinance literature (Bibi *et al.*, 2018; Gutiérrez-Nieto *et al.*, 2007, 2009; Hartarska *et al.*, 2013; Wijesiri *et al.*, 2017), this study identified the input/output combination for MFIs' efficiency analysis.

The first division is operational efficiency, whereby MFIs utilise three commonly used inputs (number of personnel, total assets and operating expenses) to generate intermediates (deposits, total equity and total borrowing) that will in turn be utilised as inputs in the second and third divisions – financial sustainability and social outreach efficiencies, respectively. The financial sustainability division will generate the outputs, namely net income and interest income, while the social outreach efficiency will produce the gross loan portfolio and the number of active borrowers. Figure 1 illustrates the network production process of MFIs, and Table 1 provides the definitions of inputs, intermediates and outputs used in the efficiency analysis.

Variable	Symbol	Definition	Unit
Input			
Number of personnel	X1	The number of individuals who are actively employed by an MFI	Number
Total asset	X2	The total value of resources acquired by MFIs from past events and from which future economic benefits are expected	USD
Operating expense	X3	This includes expenses not related to financial and credit loss impairment, such as personnel expenses, depreciation, amortization, and administrative expenses	USD
Intermediate			
Deposits	Z1	The total value of funds placed in an account with an MFI and payable to a depositor. This includes current/transactional, term, interest-bearing, and e-money accounts	USD
Total equity	Z2	The residual interest in the assets of the financial institution after deducting all its liabilities	USD
Total borrowing	Z3	The principal balance for all funds received through a loan agreement	USD
Output			
Net income	Y1	The total revenue minus total expenses during a given period and includes both operating and non-operating income	USD
Interest income	Y2	The interest generated by the loan portfolio net of any expenses to reduce accrued interest, whose payment is uncertain	USD
Gross loan portfolio	Y3	All outstanding principals due for all outstanding client loans including current, delinquent, and renegotiated loans, but not loans that have been written off	USD
Number of active borrowers	Y4	The number of individuals who currently have an outstanding loan balance with the MFIs or are primarily responsible for repaying any portion of the gross loan portfolio	Number

Source(s): Authors compilation from the World Bank

Table 1. Definitions of variables used for efficiency analysis

The results of descriptive statistics and correlation estimation for all inputs, intermediates and outputs are provided in Table A1. It should be noted that the range (differences between minimum and maximum) for all variables is fairly large, indicating the differences in operating scales of the sampled MFIs. Given the large differences, Du *et al.* (2014) argue that the use of unit-invariants in efficiency analysis is justified. The DEA analysis requires an "isotonic" assumption, indicating a positive correlation of input and output variables (Golany and Roll, 1989). Hence, the correlation coefficients among the input and output variables revealed that all variables (between input and output) have significant positive correlations, thus fulfilling the isotonic assumption of using the DEA. As a result, the developed network framework for microfinance efficiency holds high construct validity.

4.2 Modelling determinants of MFIs' efficiency

There is a considerable amount of literature that has used second-stage regression analysis to investigate the effects of environmental factors on the efficiency of microfinance and banking (Khan and Gulati, 2019; Mia *et al.*, 2019a; Miah *et al.*, 2019; Sufian *et al.*, 2016; Wijesiri *et al.*, 2017). The study of the second-stage regression provides managers and policymakers with a better understanding of the role of factors other than input and output in the efficiency of MFIs. Besides, considering external factors permits the realization of an optimal mix of input-output combinations. The empirical expression of the model is as follows:

$$\begin{aligned}\text{Efficiency}_{i,t} = {} & \beta_0 + \beta_1 \text{EW}_{i,t} + \beta_2 \text{STR}_{i,t} + \beta_3 \text{PFBM}_{I,t} + \beta_4 \text{PFS}_{i,t} + \beta_5 \text{RISKCOV}_{I,t} \\ & + \beta_6 \text{BRR}_{i,t} + \beta_7 \text{ROA}_{i,t} + \beta_8 \text{LNNFAST}_{i,t} + \beta_9 \text{Regulation}_t \\ & + \beta_{10} \text{Legal Status}_i + \beta_{11} \text{Region}_i + \varepsilon_{i,t} \end{aligned} \quad (1)$$

where i is the respective MFIs, t is the time period, and $\varepsilon_{i,t}$ is the error term. We have considered four different sets of efficiencies as dependent variables, namely operational efficiency (OPE), financial efficiency (FINE), social outreach efficiency (OUTE) and overall efficiency (OVE), all of which were estimated using network-DEA at the initial stage.

We have chosen a set of independent variables in light of the existing literature and conventional microfinance practices. According to the efficiency-wage (EW) hypothesis, paying an employee more than the market rate increases their overall productivity and efficiency. Shapiro and Stiglitz's (1984) "shirking" model explains the concept of efficiency wage theory. Under this model, employees are paid more than the average market-clearing rate, which deters them from shirking and ultimately motivates them to stay in their jobs while giving their best effort (Mankiw, 2019). Furthermore, by offering high wages, firms can recruit, filter and retain reasonably talented people from a pool of diverse and heterogeneous personnel (Stiglitz, 1976). Krassoi Peach and Stanley (2009) noted that salary increment can be simply regarded as a "gift exchange" between employers and employees, where, according to Solow (1979) and Akerlof (1982), the latter gives improved loyalty, productivity, and efficiency in return. Hence, in light of the aforementioned, we anticipate possible support for the efficiency-wage [2] hypothesis in this study.

Similarly, we have included an important variable, i.e. staff turnover rate (STR), due to its relevance to the study of MFIs' efficiency performance. It is often viewed that higher turnover of employees results in a reduction in overall firms' efficiency due to the cost of hiring and training new employees (Saher *et al.*, 2015; Wynen *et al.*, 2019). The effect is more pronounced in MFIs because employees play a crucial role in promoting microfinance activities via marketing, client identification, collection of instalments and after-service monitoring. The worst-case scenario of employee turnover might result in a reduction of the client base as borrowers may lose interest in the MFI following the departure of their loan officer, and this threatens the overall financial and outreach performance of the MFI.

Till date, the majority of the MFIs' activities worldwide are women-centred, considering their vulnerability and limited accessibility to the financial market (Mia *et al.*, 2019b). However, it is observed that women's roles at any level of the organisation ladder are impactful and often unnoticed (Augustine *et al.*, 2016). Furthermore, Adusei *et al.* (2017) state that "the homo-social reproduction theory suggests that groups in charge of organisations reproduce their own characteristics and … [because] more women are on the board of an MFI, they will reproduce themselves below". The study by Hartarska *et al.* (2014) provided empirical evidence suggesting a better financial performance of MFIs with women loan officers, as loans authorised by them usually have lower default rates compared to their male counterparts. Hence, we represented the presence of women in MFIs in two dimensions, namely, percentage of female board members (PFBM) and percentage of female staff (PFS), and examined their contribution to the efficiency of MFIs.

Furthermore, MFIs face a significant amount of risk as they provide loan services to the poor without physical collateral. To capture the possible effect of risk on MFIs' efficiency, we have considered risk coverage (RISKCOV) in the model, similar to other past studies (Mia and Ben Soltane, 2016). Recently, MFIs are experiencing intense competition from their peers in the industry, and having more MFIs in the market enables a typical borrower to switch from one MFI to another (Mia, 2018). Apart from voluntary and involuntary reasons (Rusiana and Escalante, 2016), the types of loan products, pricing of loans, and operational mechanisms may also motivate borrowers to switch to an MFI (Cozarenco *et al.*, 2016; Mia *et al.*, 2019b). Having said that, borrowers may also be victims of MFIs and regulatory authorities' policies, whereby some borrowers are systematically dropped due to bad repayment records and multiple borrowing behaviour (Debnath, 2020). Since MFIs retain their borrowers and clients by investing in the development of their products and providing them with quality services, excluding more borrowers might result in poor financial performance, as exploring new markets and clients is expensive. Thus, we anticipate a positive effect of a higher borrower retention rate (BRR) on the efficiency of MFIs.

In line with the past study (Wijesiri *et al.*, 2017), we have included ROA to measure the capability of an MFI asset to generate a higher profit and reflect the overall financial performance of MFIs. An MFI with better ROA can channel some of their return to research and development, product innovations, and internal human capital improvement programs, all of which will ultimately improve the efficiency of the MFI. To account for the effect of size on efficiency, we have utilised the natural logarithm of net fixed assets (LNFASST) as a proxy. The inclusion of this variable is crucial to capture the competitive capacity of MFIs, market awareness, technological variation, diversification, opportunities and networking capability (Berger and Di Patti, 2006; Cava *et al.*, 2016; Nhung and Okuda, 2015; Wijesiri *et al.*, 2017). Generally, it is understood that large-scale MFIs often lead the industry from various angles; hence, a positive association is envisaged between MFIs' size and efficiency.

In addition, we have also included three dummy variables, namely, regulation, legal status and location of MFIs. In terms of regulations, two broad views are often cited in the banking literature, viz., the "public interest view" and "private interest view" (Barth *et al.*, 2013). The first view argues that government regulation protects the interests of the public by enacting rules and laws that favour banking activities and, in turn, enhance their efficiency. In contrast, the second view claims that certain regulations are designed to serve only a group of people rather than the public, resulting in a decline in overall efficiency. Regardless of the context, compliance with regulation comes at a financial cost to MFIs in most cases. Hence, regulation is likely to have mixed effects on efficiency (Haque and Brown, 2017).

MFIs nowadays have metamorphosed into different banking institutions, such as NBFIs, commercial banks, credit union/cooperatives and NGOs. According to the MIX Market report, which is cited by Djan and Mersland (2021), around 49% of the global MFIs belong to NGOs and cooperatives. While each form of MFI is tasked with providing service to poor clients in various dimensions, their objectives may still differ to some extent. For example, owing to the presence of a trade-off between financial sustainability and social outreach, the relative weight

of the two objectives decided by various types of MFIs could be different (Servin *et al.*, 2012). Consequently, this will have a varying effect on the overall and divisional efficiencies. In terms of the location of MFIs, we have divided all samples into various regions as classified by the MIX Market. The location variables will capture the role of region-specific characteristics and differences such as demographics, culture, level of economic development, and technology on the efficiency of MFIs (Gutiérrez-Nieto *et al.*, 2009; Wijesiri *et al.*, 2017). The definitions of each of the variables used in the study are reported in Table 2. The key determining factors of MFI efficiencies used in prior studies are reported in Table 3.

Although Eq (1) can be estimated in a couple of ways, we have decided to use truncated bootstrapping (Pal and Singh, 2021) and Tobit regression (Haq *et al.*, 2010; Segun and Anjugam, 2013) techniques, in line with the existing literature. The usage of these techniques for the second-stage analysis is prominent within the banking and microfinance literature (Eyceyurt Batir *et al.*, 2017; Haq *et al.*, 2010; Segun and Anjugam, 2013). Moreover, these methods are often preferred over others because their values of the dependent variables (efficiency score) only range between 0 and 1 (or 0 and 100%), with a higher score indicating greater efficiency.

4.3 Data and its sources

The data for this study was collected from the MIX Market database, which is now available from the World Bank catalog (https://datacatalog.worldbank.org/dataset/mix-market). This is one of the reliable and extensive databases for various information on global MFIs and has been extensively utilised by past researchers (Galema *et al.*, 2011; Hartarska, 2009; Mia and Ben Soltane, 2016; Zhao and Kittilaksanawong, 2018). For the first-stage efficiency estimate

Variable	Definition	Unit
OPE	Operational efficiency score estimated by NDEA at the first stage	0–1
FINE	Financial efficiency score estimated by NDEA at the first stage	0–1
OUTE	Outreach efficiency score estimated by NDEA at the first stage	0–1
OVE	Overall efficiency score estimated by NDEA at the first stage	0–1
EW	Average personnel expense/GNI per capita of an MFI minus industry mean value of the same variable	Number
STR	Staffs (permanent and contract) that have left the financial institution during the last reporting year divided by the average number of permanent and contract staffs for the period	Ratio
PFBM	Percentage of female board members	%
PFS	Percentage of female staffs	%
RISKCOV	Impairment loss allowance/PAR > 30 Days	%
BRR	Active borrowers at the end of the reporting period divided by the sum of active borrowers at the beginning of the reporting period and new borrowers during the reporting period	Ratio
ROA	(Net operating income – taxes)/Average total assets	%
LNNFAST	The natural logarithm of tangible assets that are held by an MFI for use in the production or supply of goods, or services, or for administrative purposes	Number
Regulation	Dummy variable. If an MFI is regulated, then gets the value 1, otherwise 0	0, 1
Legal status	Equal to 1 if an MFI is BANK, otherwise 0; equal to 1 if an MFI is credit union/ cooperatives (CU/COOP), otherwise 0; equal to 1 if an MFI is NBFI, otherwise 0; equal to 1 if an MFI is NGO, otherwise 0; equal to 1 if an MFI is OTHER, otherwise 0	0,1
Region	Equal to 1 if an MFI is located in African continent (Africa), otherwise 0; equal to 1 if an MFI is located in East Asia and Pacific (EAP), otherwise 0; equal to 1 if an MFI is located in Eastern Europe and Central Asia (EUCA), otherwise 0; equal to 1 if an MFI is located in Latin America and the Caribbean (LAC), otherwise 0; equal to 1 if an MFI is located in South Asian region (SOUTHASIA), otherwise 0	0,1

Source(s): Authors' compilation from the World Bank metadata

Table 2. Definitions of variables used in the second stage regression

Table 3.
Main sources of the determinants

Variable	References
EW	Solow (1979), Akerlof (1982), Shapiro and Stiglitz (1984), Mankiw (2019)
STR	Saher *et al.* (2015), Adusei *et al.* (2017), Wynen *et al.* (2019)
PFBM	Adusei *et al.* (2017)
PFS	Hartarska *et al.* (2014)
RISKCOV	Mia and Ben Soltane (2016)
BRR	Cozarenco *et al.* (2016), Mia (2018), Mia *et al.* (2019a, b)
ROA	Wijesiri *et al.* (2017)
LNNFAST	Berger and Di Patti (2006), Nhung and Okuda (2015), Cava *et al.* (2016), Wijesiri *et al.* (2017)
Regulation	Barth *et al.* (2013), Haque and Brown (2017)
Legal status	Servin *et al.* (2012)
Region	Gutiérrez-Nieto *et al.* (2009), Wijesiri *et al.* (2017)

via the NDEA technique, all the chosen input and output must be observed throughout the study period (meaning, no missing data). In other words, the dataset must be a balanced panel. Hence, we had to exclude MFIs that possess incomplete data and are thus unfit for our efficiency framework. Consequently, we are left with a total of 90 MFIs that have a complete dataset for the estimation of efficiency during the period 2013–2018. It is worth mentioning that at the time of collecting data (2020), the required data for most MFIs was found only in the years from 2013 to 2018 (the maximum DMUs available during this period). Thus, we relied on this timeframe than any other combination.

For the second-stage regression analysis, the availability of data for all years for all the variables (as per the modelling above) was not mandatory. Hence, our overall sample has more than enough observations to run the regression analysis. Having said that, the period and/or number of MFIs used in our first-stage (efficiency) and second-stage regression analysis is relatively greater than those utilised in some of the recent studies (Bharti and Malik, 2021; Khan and Shireen, 2020; Mohamad Anwar *et al.*, 2021). Also, the relatively lower number of MFIs used as a DMU in our study is justified considering the framework of the study. For example, to be included in our sample, MFIs must generate deposits from their clients. Meanwhile, many MFIs across the world (e.g. India) are prohibited by the regulatory authorities from generating deposits from the public, which ultimately reduces the overall number of MFIs in our sample. Hence, the number of MFIs and time period used in this study were not arbitrarily chosen; rather, they were motivated by the framework of the study and the availability of the secondary data. Moreover, the regulation variable was obtained from the earlier MIX Market dataset and merged (based on MFIs' unique ID) with the recent one, since this variable is no longer updated by the World Bank. The selection of country-wise MFIs is reported in Table A2.

5. Findings and discussion

5.1 Efficiency analysis

Table 4 reports the average overall and three divisional efficiencies of MFIs from 2013 to 2018. The values of efficiency scores are between 0 and 1 (or 0 and 100%). As shown in Table 4, a comparison of average efficiency scores revealed that operational efficiency (OPE) had a maximum efficiency level of 75.53%. In other words, there is a 24.47% chance of improving to achieve unity efficiency. On the other hand, overall efficiency (OVE), presented a weak and below average divisional score of 33.83%. This highlights the general weakness in the efficiency of MFIs and indicates the large potential (66.17) of MFIs in improving their efficiency. This result is not surprising, as similar outcomes (low efficiency score of MFIs) have been observed in various past studies (for example, Adusei, 2019; Fall *et al.*, 2018). Adusei (2019) concluded that the overall technical efficiency of MFIs remained extremely low. The divisional

efficiency analysis in our study further revealed the sources of the weak overall efficiency of MFIs. From the average scores of divisions, we can attribute MFIs' inefficiency to mainly financial sustainability and social outreach, leaving operational efficiency out of the picture.

The yearly comparison analysis suggests that OPE attained the highest (79.3%) efficiency level in the year 2018, having exhibited an increasing trend from 2013 to 2018. In 2014, the maximum financial efficiency (FINE) and outreach efficiency (OUTE) of 39.4 and 37%, respectively, were achieved, indicating that there is more than 60% room for improvement in both variables. The overall efficiency had shown a fluctuating trend between 2013 and 2018.

5.2 Second-stage analysis

Table 5 provides the descriptive statistics of the variables used in the second-stage regression analysis. The mean statistics of efficiency-wage (EW) reflect the insignificance of the average personnel expense intensity in terms of matched GNI per capita compared to the industry

	Average efficiency score						
Efficiency	2013	2014	2015	2016	2017	2018	Average
Operational efficiency (OPE)	0.7747	0.7047	0.7360	0.7608	0.7626	0.7931	0.7553
Financial sustainability efficiency (FINE)	0.3776	0.3941	0.3715	0.3151	0.3803	0.3475	0.3644
Social outreach efficiency (OUTE)	0.3638	0.3712	0.3115	0.3463	0.3549	0.3557	0.3506
Overall efficiency (OVE)	0.3440	0.3377	0.3216	0.3235	0.3555	0.3476	0.3383

Table 4. Yearly efficiency scores for microfinance institutions

Variable	Obs.	Mean	SD	Min	Max
OVE	540	0.340	0.244	0.076	1.000
OPE	540	0.756	0.169	0.468	1.000
FINE	540	0.366	0.252	0.066	1.000
OUTE	540	0.351	0.309	0.040	1.000
EW	519	0.000	2.119	−3.212	3.788
STR	486	0.163	0.109	0.023	0.428
PFBM	497	0.348	0.230	0.000	0.875
PFS	519	0.416	0.171	0.122	0.732
RISKCOV	525	1.768	2.102	0.370	9.379
BRR	406	0.794	0.118	0.574	0.996
ROA	539	0.023	0.023	−0.012	0.079
LNNFASST	540	14.443	1.472	11.363	16.873
Regulated (no)	540	0.089	–	0	1
Regulated (yes)	540	0.911	–	0	1
BANK	540	0.322	–	0	1
CU/COOP	540	0.233	–	0	1
NBFI	540	0.167	–	0	1
NGO	540	0.233	–	0	1
OTHER	540	0.022	–	0	1
Africa	540	0.044	–	0	1
EAP	540	0.211	–	0	1
EUCA	540	0.067	–	0	1
LAC	540	0.444	–	0	1
SOUTHASIA	540	0.222	–	0	1

Note(s): All variables (except dummy) were winsorized at 5 and 95% percentile levels to treat outliers. For dummy variables, we have excluded the standard deviation (SD) as the value is either 0 or 1
Source(s): Authors' estimate based on the World Bank data

Table 5. Descriptive statistics

average. The average staff (employee) turnover ratio/rates of 0.16 suggests a relatively high average turnover. In terms of gender diversification, the percentage of female board members is only 34.8% globally; however, the percentage of female staff members is relatively higher, accounting for 41% of the average MFI workforce. Furthermore, the borrower retention rate remained on the higher side (mean value of 0.79), while the profitability position of MFIs prevailed on the lower side, with a ROA mean value of 2.3%. The natural logarithm of tangible asset intensity and the risk coverage defined as the impairment loss allowance were 14.4 and 1.78, respectively, on average. The descriptive statistics revealed that approximately 90% of the MFIs were regulated. The correlation analysis in Table 6 suggests the absence of multicollinearity, owing to the existence of weak correlations between all the independent variables.

For confirmation, we have also analysed the variance inflation factor (VIF) to detect multicollinearity among predictors in the regression model (Table 7). The maximum VIF value observed for all independent variables was 1.4 (PFBM), suggesting a lack of correlation among the different independent variables.

As highlighted in Section 3.2, we have estimated Eq (1), and the results, which are plausible, are reported in Table 8. On the one hand, a positive association was observed between efficiency-wage and operational efficiency (OPE) under truncated and Tobit regressions, albeit its insignificance in any of the models. On the other hand, we found a negative and statistically significant effect of efficiency-wage on financial (except under truncated regression), outreach, and overall efficiencies. This result is unexpected, with the efficiency-wage hypothesis being negatively related to all dimensions of efficiency except for operational efficiency. The observation provides more insight into the role of efficiency-wage among MFIs, and is contrary to the efficiency-wage hypothesis (Schlicht, 2016; Stiglitz, 1976).

Table 6.
Pairwise correlation among main independent variables (excluding dummy)

	EW	STR	PFBM	PFS	RISKCOV	BRR	ROA	LNNFASST
EW	1.000							
STR	−0.071	1.000						
PFBM	−0.270	−0.260	1.000					
PFS	−0.221	−0.033	0.287	1.000				
RISKCOV	0.043	−0.172	0.157	0.107	1.000			
BRR	0.049	−0.214	0.196	0.151	0.053	1.000		
ROA	−0.046	−0.167	−0.023	−0.327	0.233	−0.069	1.000	
LNNFASST	0.265	0.160	−0.401	−0.036	−0.138	−0.071	0.065	1

Source(s): Authors' estimate based on the World Bank data

Table 7.
Variance Inflation factors (VIF) (excluding dummy)

Variable	VIF	SQRT VIF	Tolerance	*R*-Squared
EW	1.230	1.110	0.815	0.185
STR	1.170	1.080	0.855	0.145
PFBM	1.420	1.190	0.706	0.294
PFS	1.390	1.180	0.719	0.281
RISKCOV	1.210	1.100	0.824	0.176
BRR	1.110	1.050	0.900	0.100
ROA	1.370	1.170	0.731	0.269
LNNFASST	1.270	1.130	0.788	0.212
Mean VIF	1.270			

Source(s): Authors' estimate based on the World Bank data

Table 8.
Determinants of efficiency

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Truncated regression				Tobit regression			
	OPE	FINE	OUTE	OVE	OPE	FINE	OUTE	OVE
EW	0.006 (0.006)	−0.018 (0.012)	−0.051*** (0.011)	−0.041*** (0.010)	0.006 (0.005)	−0.021** (0.010)	−0.042*** (0.009)	−0.031*** (0.009)
STR	−0.333*** (0.064)	−0.186 (0.127)	−0.099 (0.116)	−0.162 (0.111)	−0.343*** (0.065)	−0.237* (0.124)	−0.161 (0.112)	−0.226** (0.107)
PFBM	0.009 (0.033)	0.109* (0.065)	0.143** (0.059)	0.113** (0.057)	0.014 (0.035)	0.091 (0.066)	0.128** (0.060)	0.100* (0.057)
PFS	0.223*** (0.080)	0.360** (0.159)	0.435*** (0.144)	0.481*** (0.138)	0.271*** (0.080)	0.240 (0.153)	0.279** (0.138)	0.342*** (0.132)
RISKCOV	−0.006* (0.004)	0.002 (0.007)	0.002 (0.006)	0.000 (0.006)	−0.007* (0.004)	0.005 (0.007)	0.004 (0.006)	0.001 (0.006)
BRR	0.095* (0.050)	0.088 (0.100)	0.099 (0.091)	0.067 (0.087)	0.123** (0.050)	−0.007 (0.096)	0.007 (0.086)	−0.013 (0.083)
ROA	1.427*** (0.336)	3.792*** (0.666)	1.049* (0.605)	3.035*** (0.579)	1.485*** (0.335)	4.089*** (0.646)	1.056* (0.582)	3.081*** (0.557)
LNNFASST	0.022*** (0.006)	0.010 (0.011)	−0.010 (0.010)	0.010 (0.010)	0.023*** (0.005)	−0.001 (0.010)	−0.022** (0.009)	−0.001 (0.009)
REGULATED(YES)	−0.120** (0.048)	−0.010 (0.096)	−0.062 (0.087)	−0.035 (0.083)	−0.095** (0.044)	−0.139* (0.084)	−0.207*** (0.076)	−0.165** (0.072)
BANK	−0.369*** (0.125)	0.294 (0.247)	0.875*** (0.225)	0.393* (0.215)	−0.257*** (0.075)	−0.264* (0.145)	0.277** (0.131)	−0.135 (0.125)
CU/COOP	−0.255** (0.126)	0.181 (0.249)	0.726*** (0.227)	0.274 (0.217)	−0.144* (0.077)	−0.380** (0.148)	0.127 (0.134)	−0.255** (0.128)
NBFI	−0.406*** (0.128)	0.236 (0.254)	0.879*** (0.231)	0.390* (0.221)	−0.297*** (0.086)	−0.315* (0.165)	0.303** (0.149)	−0.115 (0.142)
NGO	−0.372*** (0.071)	0.300** (0.141)	0.672*** (0.128)	0.335*** (0.122)	−0.321*** (0.059)	0.043 (0.114)	0.429*** (0.103)	0.128 (0.098)
OTHER	−0.301*** (0.091)	0.072 (0.180)	0.352** (0.163)	0.012 (0.156)	−0.250*** (0.079)	−0.187 (0.152)	0.210 (0.138)	−0.071 (0.132)
Africa	−0.311*** (0.064)	0.499*** (0.127)	0.121 (0.115)	0.192* (0.110)	−0.316*** (0.056)	0.536*** (0.108)	0.072 (0.097)	0.151 (0.093)
EAP	−0.371*** (0.129)	0.160 (0.255)	0.442* (0.232)	0.290 (0.222)	−0.305*** (0.088)	−0.239 (0.168)	−0.099 (0.152)	−0.228 (0.145)
EUCA	−0.281*** (0.052)	0.325*** (0.103)	0.096 (0.093)	0.155* (0.089)	−0.273*** (0.053)	0.312*** (0.103)	0.052 (0.093)	0.115 (0.089)
LAC	−0.140* (0.074)	0.246* (0.147)	0.226* (0.134)	0.258** (0.128)	−0.151** (0.073)	0.274* (0.140)	0.235* (0.127)	0.277** (0.121)
SOUTHASIA	−0.150** (0.065)	0.245* (0.128)	0.276** (0.117)	0.281** (0.112)	−0.137** (0.068)	0.212 (0.130)	0.254** (0.118)	0.267** (0.112)
Country dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cons	0.963*** (0.182)	−0.623* (0.361)	−0.773** (0.328)	−0.642** (0.314)	0.771*** (0.005)	0.358*** (0.010)	0.294*** (0.009)	0.317*** (0.009)
# of observations	358	358	358	358	358	358	358	358
χ^2	829***	239***	706***	383***	406***	165***	378***	250***

Note(s): Standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{**}p < 0.01$
Source(s): Authors' estimate based on the World Bank data

A couple of explanations could be offered to support this finding. According to the agency theory, when employees (agents) are paid more than the existing market average salary, they will strive towards achieving better and sound financial performance for their MFIs (principals). To sustain this objective, the employees may target relatively wealthier clients for a better chance of timely repayment of instalments. Ultimately, this could restrict the number of clients (especially the poorer ones) being served, thereby restricting the overall outreach goal of MFIs. Furthermore, paying higher wages also results in an overall increase in input prices (e.g. operational and administrative expenses) and, consequently, a lower financial efficiency score, as observed in this study against the expected.

Staff turnover rate (STR) has a negative coefficient across the models. Considering the significance levels, we found that STR was negatively related to OPE at 1% statistical significance under truncated regression. Furthermore, under Tobit regression, STR exhibits a negative and statistically significant effect on all efficiencies except OUTE. In general, these findings suggest that higher turnover of employees results in lower OPE of MFIs due to additional costs incurred during the recruitment and training of new employees. Because the microfinance industry is an informal, labour-intensive, and relationship-based lending industry (Nourani *et al.*, 2021), therefore, employees play a crucial role in the execution and attainment of its goals and objectives. Hence, staff attrition is certainly disadvantageous to the MFIs, as it leads to lower efficiencies.

On the contrary, the percentage of female board members (PFBM) was positively related to outreach and overall efficiencies in both regression techniques. This indicates that increased representation of women in the boards enhances the outreach and overall efficiencies of MFIs, supporting the observation of Strøm *et al.* (2014) on the connection between female board members and improved MFI performance. Similarly, Ghosh and Guha (2019) posited that the presence of more females on the board of directors increases the cost per borrower due to the influx of more female clients. This observation agrees with our findings on OUTE, which showed that women's domination in the microfinance sector is better served with females on boards. Additionally, truncated regression revealed that having female on boards could also enhance the financial sustainability (FINE) of MFIs. The PFS variable, denoting the female representation of staff, was positively associated with OPE, OUTE, and OVE. In the truncated model, we also found the positive effect of female staff on FINE. Complementary to the female board effect and the findings of Bibi *et al.* (2018) and Ghosh and Guha (2019), female staff enhanced the efficiency aspects of the microfinance business. These findings suggest that female representation at the organisational level, with significant involvement in strategic decision-making forums and staff level in MFIs, is crucial in reaching the poor and ultimately improving the overall efficiency of MFIs.

The variable for risk coverage (RISKCOV) is significantly and negatively related to OPE only. This implies that higher risk coverage in terms of impairment loss allowance will only reduce the operational efficiency. This result is expected as the risk coverage will increase the expenses of MFIs and thus lower their operational efficiency. Our finding is also partly consistent with the study of Bibi *et al.* (2018), whereby a negative association between risk and efficiency is observed. When an MFI has large risky assets and borrowers, it will affect the overall cost of operation and deposit generation, therefore a negative effect on operational efficiency is evident. Moreover, the insignificant positive effect of RISKCOV on other dimensions of efficiency is also consistent with the findings of Mia and Ben Soltane (2016). The discovery of a positive and statistically significant relationship between the borrower retention rate (BRR) and OPE suggests the importance of borrower retention in MFIs. Usually, a higher borrower retention rate simply means a better lender-borrower relationship (Mia *et al.*, 2022), and MFIs can capitalise on this relationship to generate internal capital through various deposit products. Therefore, it has a positive effect on the overall operational efficiency. However, BRR is statistically insignificant to all other aspects of MFI efficiencies.

The profitability variable of ROA was also observed to be positively related to OPE, FINE, OUTE, and OVE, indicating the relevance of financial performance in determining the efficiency of MFIs. In other words, the higher the profitability potential of a firm, the better its efficiency. A stronger financial position enables MFIs to invest in product and service innovation and expand market coverage to remote and outlying areas. Therefore, MFIs will not only serve more clients but also generate more revenues from an untapped market. Our findings also partly (depending on the types of efficiency dimensions) support the studies of Mia and Ben Soltane (2016) and Mia *et al.* (2019a), but contrast with Wijesiri *et al.* (2015). Furthermore, this study also documents the statistically significant positive effect of size on OPE and the negative effect on OUTE of MFIs (under Tobit regression-Model-7), which is somehow (partly) in contrast to the findings of Khan and Shireen (2020). Larger MFIs may have a more diverse set of savings and deposits related products, and at the same time, they may be more concerned about their quality client base. That is why a contrasting effect is observed in different dimensions of efficiency.

Using the Tobit regression technique, we found that regulation, measured by a dummy variable of regulated and non-regulated MFIs, has a statistically significant negative effect on all types of efficiencies. However, this finding did not hold true when truncated regression was used (except for OPE, Model 1). This finding reiterates that the current regulatory mechanism is unsupportive of MFIs' efficiency improvement, probably because MFIs need to bear additional expenses to comply with the stringent requirements of regulatory authorities (Ayayi and Peprah, 2018; Ghose *et al.*, 2018). It could also be that the cost of regulatory compliance of the studied MFIs outweighs its benefits, thereby resulting in a negative effect on various dimensions of efficiency. Our findings conform with the argument of Ayayi and Peprah (2018) and Saraswathy Amma *et al.* (2019) that regulation has a negative effect on the efficiency of MFIs but contradict the findings of Hartarska and Nadolnyak (2007), who concluded that regulation does not necessarily affect the performance (sustainability or outreach) of MFIs. We have also included various legal statuses in our model to observe their effects on the types of efficiencies of MFIs, and the results are mixed. The results showed that the legal status of MFIs (e.g. CU/COOP, NBFI, NGO, and others) displayed a negative and significant effect on OPE (base category is bank), at least in the truncated regression technique. On the contrary, using the same regression technique, we observed that all legal types of MFIs improve the OUTE (base is bank). Although the findings indicate the significant role of legal status in determining the efficiency level of MFIs, no conclusive deduction can be made.

The findings of location on the different efficiencies of MFIs are also mixed. MFIs located in Africa, East Asia Pacific, Eastern Europe and Central Asia, Latin America and the Caribbean, and South Asia were negatively related to the dependent variable of OPE. On the other hand, MFIs in Africa, Eastern Europe and Central Asia, and Latin America and the Caribbean had higher FINE. However, only firms located in Latin America and the Caribbean, and South Asian regions exhibited better OUTE and OVE in both regression results.

5.3 Subsample analysis by size of MFIs

In this section of the analysis, we have separated our sample into small and large MFIs and re-estimated Eq (1) [3]. The results are reported in Table 9. The large discrepancy observed between small and large MFIs signals the need to separate the sample and check the robustness of our findings (in Section 4.2). Since we have split our sample into two based on the size (LNNFASST) of the MFIs, the size variable was excluded here. Similar to our finding in the total sample, EW negatively and significantly influenced OUTE in both small and large MFIs. However, the subsampling analysis further revealed that EW reduced FINE and OVE of small MFIs only. The negative effect of STR on OPE in the subsamples remained

Table 9.
Sub-sample analysis by size of MFIs

	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
	Truncated regression										Tobit regression					
	OPE		FINE		OUTE		OVE		OPE		FINE		OUTE		OVE	
	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small
EW	0.013 (0.010)	0.004 (0.007)	0.006 (0.018)	−0.031* (0.016)	−0.033* (0.019)	−0.068*** (0.012)	−0.020 (0.017)	−0.055*** (0.013)	0.009 (0.010)	0.003 (0.008)	0.006 (0.018)	−0.033** (0.017)	−0.033* (0.019)	−0.068*** (0.012)	−0.020 (0.017)	−0.055*** (0.013)
STR	−0.210*** (0.093)	−0.346*** (0.087)	−0.556*** (0.172)	0.081 (0.188)	−0.246 (0.181)	0.103 (0.142)	−0.395** (0.161)	0.095 (0.152)	−0.265*** (0.098)	−0.341*** (0.092)	−0.566*** (0.176)	0.077 (0.196)	−0.246 (0.181)	0.103 (0.142)	−0.395** (0.161)	0.095 (0.152)
PFBM	−0.075 (0.049)	0.019 (0.041)	−0.045 (0.091)	0.154* (0.088)	0.152 (0.096)	0.120* (0.066)	0.068 (0.085)	0.089 (0.071)	−0.084 (0.053)	0.026 (0.043)	−0.045 (0.093)	0.162* (0.091)	0.152 (0.096)	0.120* (0.066)	0.068 (0.085)	0.089 (0.071)
PFS	0.233 (0.179)	0.301*** (0.086)	0.626* (0.332)	0.435** (0.186)	0.591* (0.350)	0.480*** (0.140)	0.672** (0.310)	0.546*** (0.151)	0.267 (0.190)	0.334*** (0.091)	0.596* (0.339)	0.458** (0.193)	0.591* (0.350)	0.480*** (0.140)	0.672** (0.310)	0.546*** (0.151)
RISKCOV	−0.002 (0.005)	−0.004 (0.005)	−0.005 (0.010)	0.003 (0.011)	−0.003 (0.010)	0.005 (0.009)	−0.003 (0.009)	0.001 (0.009)	−0.003 (0.006)	−0.004 (0.006)	−0.005 (0.010)	0.004 (0.012)	−0.003 (0.010)	0.005 (0.009)	−0.003 (0.009)	0.001 (0.009)
BRR	−0.057 (0.071)	0.187*** (0.066)	0.084 (0.132)	0.045 (0.142)	0.040 (0.139)	0.170 (0.107)	0.051 (0.123)	0.057 (0.115)	−0.052 (0.075)	0.195*** (0.069)	0.081 (0.134)	0.059 (0.148)	0.040 (0.139)	0.170 (0.107)	0.051 (0.123)	0.057 (0.115)
ROA	2.646*** (0.579)	0.940** (0.384)	6.077*** (1.077)	2.392*** (0.827)	4.248*** (1.136)	−0.687 (0.623)	5.596*** (1.006)	1.585** (0.670)	2.949*** (0.617)	0.929** (0.402)	6.162*** (1.100)	2.492*** (0.861)	4.248*** (1.136)	−0.687 (0.623)	5.596*** (1.006)	1.583** (0.670)
REGULATED (YES)	0.330*** (0.108)	−0.074* (0.044)	−0.153 (0.200)	0.044 (0.096)	−0.077 (0.211)	−0.023 (0.072)	−0.046 (0.187)	0.023 (0.078)	0.314*** (0.114)	−0.072 (0.046)	−0.142 (0.204)	0.045 (0.099)	−0.077 (0.211)	−0.023 (0.072)	−0.046 (0.187)	0.023 (0.078)
Legal status dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cons	0.395*** (0.129)	0.730*** (0.179)	0.093 (0.240)	−0.574 (0.385)	−0.120 (0.253)	−0.708** (0.290)	−0.089 (0.224)	−0.617** (0.312)	0.374*** (0.136)	0.693*** (0.187)	0.094 (0.245)	−0.617 (0.400)	−0.120 (0.253)	−0.708** (0.290)	−0.089 (0.224)	−0.617** (0.312)
# of observations	182	176	182	176	182	176	182	176	182	176	182	176	182	176	182	176
χ^2	411***	534***	168***	129***	286***	631***	249***	200***	207***	235***	116***	94***	172***	268***	157***	133***

Note(s): Standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Since we have used size (LNNFASST) of the MFIs to divide our sample into two, the size variable is not included here. To conserve space, coefficient values of legal status dummy, regional dummy, and country dummy are not included here. However, they can be obtained from the corresponding author

Source(s): Authors' estimate based on the World Bank data

consistent with that of the total sample. However, STR has a deteriorating effect on FINE and OVE of large MFIs only. Although the presence of female boards played a significant role in small MFIs, the level of female staff participation was generally impactful in both small and large MFIs. Specifically, the larger MFIs experience better FINE, OUTE and OVE from the participation of female staff, as opposed to the OPE improvement enjoyed by small MFIs. Similar to the total sample, the presence of female board members has no impact on the OPE and OVE of MFIs but only influences the FINE and OUTE of small firms.

Although risk coverage was significant in the total sample, the effects were weak in the subsample, and no statistically significant coefficient was observed. Higher BRR has proved beneficial to the OPE of small MFIs. Despite profitability being a determining factor for the improvements of OPE, FINE, and OVE for both small and large MFIs, it only influenced the OUTE of large MFIs. With regards to the regulatory status of MFIs, we found an insignificant effect of regulation on MFIs' efficiencies, with the exception of OPE in large firms.

6. Conclusion

While the main mission of MFIs is to reach out to the poor and unbanked populations, they are also required to be financially stable to sustain their services. Therefore, social outreach and financial sustainability represent the two main goals of microfinance businesses, and their attainment depends on the operational activities of MFIs. Hence, the measurement of MFIs' efficiency must capture the actual production processes to allow identification of institutional factors that favour or frustrate the microfinance operation. By decomposing the efficiency of MFIs into three divisions, this paper investigates the influence of institutional factors in each dimension.

The results of the efficiency analysis indicate that the inefficiency of MFIs is mainly due to financial sustainability and social outreach efficiencies, as operational efficiency showed a comparatively better mean score. The decomposition of efficiency allowed an in-depth examination of institutional factors affecting each efficiency component. For example, the EW hypothesis (a positive relationship between wages above the market average and productivity/efficiency) was found to be unsupported; rather, higher wages were found to reduce all categories of efficiencies except operational efficiency, particularly among small MFIs. Moreover, the staff turnover rate reduced the operational efficiency of all MFIs and the financial sustainability and overall efficiencies of large MFIs.

With regards to female variables, we discovered that the presence of females on the boards increased the financial sustainability and social outreach of small MFIs, while the presence of female staff improved all types of efficiencies. Our findings revealed that MFIs under regulatory control performed poorly; regulation exhibited a negative effect on all categories of MFIs' efficiencies.

The findings of our study can be utilised by the managers of MFIs and policy makers to make optimal decisions on the combination of input and output for varying institutional characteristics of MFIs. Regardless, our findings are limited to the study of 90 MFIs from different countries due to the paucity of data. Therefore, caution should be exercised in extrapolating the study outcomes to the global microfinance industry. The available data of MFIs in the MIX Market database is up to 2018. An avenue for future studies could be to re-examine the model to confirm the findings when more data becomes available. The current pandemic situation has affected many financial institutions, including MFIs. It would be desirable to investigate how the COVID-19 pandemic has influenced the efficiency of MFIs and also their determinants. Finally, a survey-based study in a single microfinance market such as Bangladesh (the hub of MFIs) could be considered to furnish the positive influence of females on boards and female staff on different dimensions of the efficiencies of MFIs highlighted in this study.

Notes

1. The variable returns to scale technology is appropriate, as it offsets the possible influence of different scales of inputs and outputs on the efficiency results (Lu *et al.*, 2016).
2. We have estimated the efficiency wage by taking the average wage of an MFI minus the industry mean of the same variable. A positive EW indicates that an MFI pays wage more than the industry average, while a negative value reflects otherwise. The exact definition of the variable is given in Table 2.
3. The mean value of size has been used as an indicator to classify MFIs into either big or small.

References

Adusei, M. (2019), "Board gender diversity and the technical efficiency of microfinance institutions: does size matter?", *International Review of Economics and Finance*, Vol. 64, pp. 393-411, doi: 10.1016/j.iref.2019.07.008.

Adusei, M., Akomea, S.Y. and Poku, K. (2017), "Board and management gender diversity and financial performance of microfinance institutions", *Cogent Business and Management*, Vol. 4 No. 1, p. 1360030, doi: 10.1080/23311975.2017.1360030.

Agbola, F.W., Acupan, A. and Mahmood, A. (2017), "Does microfinance reduce poverty? New evidence from Northeastern Mindanao, the Philippines", *Journal of Rural Studies*, Vol. 50, pp. 159-171, doi: 10.1016/j.jrurstud.2016.11.005.

Akerlof, G.A. (1982), "Labor contracts as partial gift exchange", *The Quarterly Journal of Economics*, Vol. 97 No. 4, pp. 543-569, doi: 10.2307/1885099.

Armendáriz, B. and Morduch, J. (2010), in *The Economics of Microfinance*, 2nd ed., The MIT Press, Cambridge, MA.

Armendariz, B. and Labie, M. (2011), *The Handbook of Microfinance*, World Scientific, London, Singapore.

Arora, N., Arora, N.G. and Kanwar, K. (2018), "Non-performing assets and technical efficiency of Indian banks: a meta-Frontier analysis", *Benchmarking: An International Journal*, Vol. 25 No. 7, pp. 2105-2125, doi: 10.1108/BIJ-03-2017-0040.

Augustine, D., Wheat, C.O., Jones, K.S., Baraldi, M. and Malgwi, C.A. (2016), "Gender diversity within the workforce in the microfinance industry in Africa: economic performance and sustainability", *Canadian Journal of Administrative Sciences/Revue Canadienne des Sciences de l'Administration*, Vol. 33 No. 3, pp. 227-241.

Ayayi, A.G. and Peprah, J.A. (2018), "Cost implications of microfinance regulation: lessons from Ghana", *Journal of Sustainable Finance and Investment*, Vol. 8 No. 3, pp. 259-274, doi: 10.1080/20430795.2018.1462633.

Ayayi, A.G. and Sene, M. (2010), "What drives microfinance institutions financial sustainability", *The Journal of Developing Areas*, Vol. 44 No. 1, pp. 303-324.

Bardhan, A.K., Nag, B., Mishra, C.S. and Tarei, P.K. (2021), "An integrated framework for analysing performance indicators of Indian microfinance institutions: a multi-stakeholder perspective", *Benchmarking: An International Journal*, Vol. 28 No. 9, pp. 2711-2740, doi: 10.1108/BIJ-09-2020-0470.

Microfinance Barometer (2019), "10 years already! A look back at the trends in microfinance", available at: https://www.convergences.org/wp-content/uploads/2019/09/Microfinance-Barometer-2019_web-1.pdf.

Barth, J.R., Lin, C., Ma, Y., Seade, J. and Song, F.M. (2013), "Do bank regulation, supervision and monitoring enhance or impede bank efficiency?", *Journal of Banking and Finance*, Vol. 37 No. 8, pp. 2879-2892.

Berger, A.N. and Di Patti, E.B. (2006), "Capital structure and firm performance: a new approach to testing agency theory and an application to the banking industry", *Journal of Banking and Finance*, Vol. 30 No. 4, pp. 1065-1102.

Bharti, N. and Malik, S. (2021), "Financial inclusion and the performance of microfinance institutions: does social performance affect the efficiency of microfinance institutions?", *Social Responsibility Journal*, Vol. ahead-of-print, No. ahead-of-print, doi: 10.1108/SRJ-03-2020-0100.

Bibi, U., Balli, H.O., Matthews, C.D. and Tripe, D.W.L. (2018), "Impact of gender and governance on microfinance efficiency", *Journal of International Financial Markets, Institutions and Money*, Vol. 53, pp. 307-319, doi: 10.1016/j.intfin.2017.12.008.

Cava, P.B., Salgado Junior, A.P., Branco, A. and De Freitas, M. (2016), "Evaluation of bank efficiency in Brazil: a DEA approach", *RAM. Revista de Administração Mackenzie*, Vol. 17 No. 4, pp. 62-84.

Chikalipah, S. (2017), "Financial sustainability of microfinance institutions in sub-Saharan Africa: evidence from GMM estimates", *Enterprise Development and Microfinance*, Vol. 28 No. 3, pp. 182-199.

Conning, J. (1999), "Outreach, sustainability and leverage in monitored and peer-monitored lending", *Journal of Development Economics*, Vol. 60 No. 1, pp. 51-77, doi: 10.1016/S0304-3878(99)00036-X.

Copestake, J. (2007), "Mainstreaming microfinance: social performance management or mission drift?", *World Development*, Vol. 35 No. 10, pp. 1721-1738, doi: 10.1016/j.worlddev.2007.06.004.

Cozarenco, A., Hudon, M. and Szafarz, A. (2016), "What type of microfinance institutions supply savings products?", *Economics Letters*, Vol. 140, pp. 57-59.

Cull, R., Demirguc-Kunt, A. and Morduch, J. (2007), "Financial performance and outreach: a global analysis of leading microbanks", *The Economic Journal*, Vol. 117 No. 517, pp. F107-F133, doi: 10.1111/j.1468-0297.2007.02017.x.

Cull, R., Demirgüç-Kunt, A. and Morduch, J. (2009), "Microfinance meets the market", *Journal of Economic Perspectives*, Vol. 23 No. 1, pp. 167-192, doi: 10.1257/jep.23.1.167.

Debnath, K. (2020), "To lend or not to lend: identifying habitual multiple-borrowers", *Applied Economics Letters*, Vol. 27 No. 6, pp. 455-458, doi: 10.1080/13504851.2019.1631435.

Djan, K.O. and Mersland, R. (2021), "Are NGOs and cooperatives similar or different? A global survey using microfinance data", *Journal of Management and Governance*, Vol. ahead-of-print No. ahead-of-print, doi: 10.1007/s10997-021-09567-9.

Du, J., Wang, J., Chen, Y., Chou, S.-Y. and Zhu, J. (2014), "Incorporating health outcomes in Pennsylvania hospital efficiency: an additive super-efficiency DEA approach", *Annals of Operations Research*, Vol. 221 No. 1, pp. 161-172, doi: 10.1007/s10479-011-0838-y.

D'Espallier, B., Goedecke, J., Hudon, M. and Mersland, R. (2017), "From NGOs to banks: does institutional transformation alter the business model of microfinance institutions?", *World Development*, Vol. 89, pp. 19-33, doi: 10.1016/j.worlddev.2016.06.021.

Eyceyurt Batir, T., Volkman, D.A. and Gungor, B. (2017), "Determinants of bank efficiency in Turkey: participation banks versus conventional banks", *Borsa Istanbul Review*, Vol. 17 No. 2, pp. 86-96, doi: 10.1016/j.bir.2017.02.003.

Fall, F., Akim, A.-m. and Wassongma, H. (2018), "DEA and SFA research on the efficiency of microfinance institutions: a meta-analysis", *World Development*, Vol. 107, pp. 176-188, doi: 10.1016/j.worlddev.2018.02.032.

Galema, R., Lensink, R. and Spierdijk, L. (2011), "International diversification and microfinance", *Journal of International Money and Finance*, Vol. 30 No. 3, pp. 507-515.

Galema, R., Lensink, R. and Mersland, R. (2012), "Do powerful CEOs determine microfinance performance?", *Journal of Management Studies*, Vol. 49 No. 4, pp. 718-742, doi: 10.1111/j.1467-6486.2012.01046.x.

GGAP (2003), *Microfinance Consensus Guidelines: Definitions of Selected Financial Terms, Ratios and Adjustments for Microfinance*, Washington, DC.

Ghose, B., Paliar, S.J. and Mena, L. (2018), "Does legal status affect performance of microfinance institutions?: empirical evidence from India", *Vision*, Vol. 22 No. 3, pp. 316-328.

Ghosh, C. and Guha, S. (2019), "Role of gender on the performance of Indian microfinance institutions", *Gender in Management: An International Journal*, Vol. 34 No. 6, pp. 429-443, doi: 10.1108/GM-03-2019-0036.

Golany, B. and Roll, Y. (1989), "An application procedure for DEA", *Omega*, Vol. 17 No. 3, pp. 237-250.

Gul, F.A., Podder, J. and Shahriar, A.Z.M. (2017), "Performance of microfinance institutions: does government ideology matter?", *World Development*, Vol. 100, pp. 1-15, doi: 10.1016/j.worlddev.2017.07.021.

Gulati, R. (2015), "Trends of cost efficiency in response to financial deregulation", *Benchmarking: An International Journal*, Vol. 22 No. 5, pp. 808-838, doi: 10.1108/BIJ-06-2013-0065.

Gutiérrez-Nieto, B., Serrano-Cinca, C. and Mar Molinero, C. (2007), "Microfinance institutions and efficiency", *Omega*, Vol. 35 No. 2, pp. 131-142, doi: 10.1016/j.omega.2005.04.001.

Gutiérrez-Nieto, B., Serrano-Cinca, C. and Mar Molinero, C. (2009), "Social efficiency in microfinance institutions", *Journal of the Operational Research Society*, Vol. 60 No. 1, pp. 104-119, doi: 10.1057/palgrave.jors.2602527.

Haq, M., Skully, M. and Pathan, S. (2010), "Efficiency of microfinance institutions: a data envelopment analysis", *Asia-Pacific Financial Markets*, Vol. 17 No. 1, pp. 63-97.

Haque, F. and Brown, K. (2017), "Bank ownership, regulation and efficiency: perspectives from the Middle East and North Africa (MENA) region", *International Review of Economics and Finance*, Vol. 47, pp. 273-293, doi: 10.1016/j.iref.2016.10.015.

Hartarska, V. (2009), "The impact of outside control in microfinance", *Managerial Finance*, Vol. 35 No. 12, pp. 975-989, doi: 10.1108/03074350911000034.

Hartarska, V. and Nadolnyak, D. (2007), "Do regulated microfinance institutions achieve better sustainability and outreach? Cross-country evidence", *Applied Economics*, Vol. 39 No. 10, pp. 1207-1222, doi: 10.1080/00036840500461840.

Hartarska, V., Nadolnyak, D. and Xuan, S. (2013), "A cost function approach to MFI efficiency: the role of subsidy and social output measures", in Manos, R., Gueyié, J.-P. and Yaron, J. (Eds), *Promoting Microfinance: Challenges and Innovations in Developing Countries and Countries in Transition*, Palgrave Macmillan UK, London, pp. 132-147.

Hartarska, V., Nadolnyak, D. and Mersland, R. (2014), "Are women better bankers to the poor? Evidence from rural microfinance institutions", *American Journal of Agricultural Economics*, Vol. 96 No. 5, pp. 1291-1306.

Hossain, S., Galbreath, J., Hasan, M.M. and Randøy, T. (2020), "Does competition enhance the double-bottom-line performance of microfinance institutions?", *Journal of Banking and Finance*, Vol. 113, p. 105765, doi: 10.1016/j.jbankfin.2020.105765.

Hulme, D. and Mosley, P. (1996), *Finance against Poverty*, Vol. 1, Routledge, London.

Khan, A. and Gulati, R. (2019), "Assessment of efficiency and ranking of microfinance institutions in India: a two-stage bootstrap DEA analysis", *International Journal of Business Forecasting and Marketing Intelligence*, Vol. 5 No. 1, pp. 23-55.

Khan, A. and Gulati, R. (2021), "Productivity growth, catching-up and technology innovation in microfinance institutions in India: evidence using a bootstrap Malmquist Index approach", *Benchmarking: An International Journal*, Vol. ahead-of-print No. ahead-of-print, doi: 10.1108/BIJ-10-2020-0535.

Khan, A. and Shireen, S. (2020), "Drivers of financial and operational efficiency of MFIs: empirical evidences from Eastern Europe and Central Asia", *Benchmarking: An International Journal*, Vol. 27 No. 9, pp. 2679-2697, doi: 10.1108/BIJ-11-2019-0515.

Khandker, S.R. (2005), "Microfinance and poverty: evidence using panel data from Bangladesh", *The World Bank Economic Review*, Vol. 19 No. 2, pp. 263-286, doi: 10.1093/wber/lhi008.

Krassoi Peach, E. and Stanley, T.D. (2009), "Efficiency wages, productivity and simultaneity: a meta-regression analysis", *Journal of Labor Research*, Vol. 30 No. 3, pp. 262-268, doi: 10.1007/s12122-009-9066-5.

Krauss, N. and Walter, I. (2009), "Can microfinance reduce portfolio volatility?", *Economic Development and Cultural Change*, Vol. 58 No. 1, pp. 85-110.

Kweh, Q.L., Lu, W.-M., Nourani, M. and Ghazali @ Mohd Zain, M.H. (2018), "Risk management and dynamic network performance: an illustration using a dual banking system", *Applied Economics*, Vol. 50 No. 30, pp. 3285-3299, doi: 10.1080/00036846.2017.1420889.

Ledgerwood, J. (1998), *Microfinance Handbook: An Institutional and Financial Perspective*, World Bank Publications, Washington, DC.

Liñares-Zegarra, J. and Wilson, J.O.S. (2018), "The size and growth of microfinance institutions", *The British Accounting Review*, Vol. 50 No. 2, pp. 199-213, doi: 10.1016/j.bar.2017.11.006.

Lopez, T. and Winkler, A. (2018), "The challenge of rural financial inclusion – evidence from microfinance", *Applied Economics*, Vol. 50 No. 14, pp. 1555-1577, doi: 10.1080/00036846.2017.1368990.

Lu, W.-M., Kweh, Q.L., Nourani, M. and Huang, F.-W. (2016), "Evaluating the efficiency of dual-use technology development programs from the R&D and socio-economic perspectives", *Omega*, Vol. 62, pp. 82-92, doi: 10.1016/j.omega.2015.08.011.

Mankiw, N. (2019), *Principles of Macroeconomics*, Cengage Learning, Boston, MA.

Mersland, R. and Strøm, R.Ø. (2008), "Performance and trade-offs in microfinance organisations—does ownership matter?", *Journal of International Development*, Vol. 20 No. 5, pp. 598-612, doi: 10.1002/jid.1432.

Mersland, R. and Strøm, R.Ø. (2010), "Microfinance mission drift?", *World Development*, Vol. 38 No. 1, pp. 28-36, doi: 10.1016/j.worlddev.2009.05.006.

Mia, M.A. (2018), "Evolution of market concentration and competition in the microfinance industry of Bangladesh", *International Journal of Social Economics*, Vol. 45 No. 6, pp. 989-1007, doi: 10.1108/IJSE-10-2016-0281.

Mia, M.A., Banna, H., Noman, A.H.M., Alam, M.R. and Rana, M.S. (2022), "Factors affecting borrowers' turnover in microfinance institutions: a panel evidence", *Annals of Public and Cooperative Economics*, Vol. 93 No. 1, pp. 55-84, doi: 10.1111/apce.12325.

Mia, M.A. and Ben Soltane, B.I. (2016), "Productivity and its determinants in microfinance institutions (MFIs): evidence from South Asian countries", *Economic Analysis and Policy*, Vol. 51, pp. 32-45, doi: 10.1016/j.eap.2016.05.003.

Mia, M.A., Dalla Pellegrina, L., Van Damme, P. and Wijesiri, M. (2019a), "Financial inclusion, deepening and efficiency in microfinance programs: evidence from Bangladesh", *The European Journal of Development Research*, Vol. 31 No. 4, pp. 809-835, doi: 10.1057/s41287-018-0188-6.

Mia, M.A., Lee, H.-A., Chandran, V.G.R., Rasiah, R. and Rahman, M. (2019b), "History of microfinance in Bangladesh: a life cycle theory approach", *Business History*, Vol. 61 No. 4, pp. 703-733, doi: 10.1080/00076791.2017.1413096.

Miah, M.D., Uddin, H. and Ahmed, N.N. (2019), "Determinants of efficiency and stability: evidence from private commercial banks in Bangladesh", *International Journal of Accounting and Finance*, Vol. 9 Nos 2-4, pp. 152-169.

MIX (2018), "Global outreach & financial performance benchmark report - 2017-2018", Retrieved from Microfinance Information Exchange, Center for Financial Inclusion, available at: https://content.centerforfinancialinclusion.org/wp-content/uploads/sites/2/2021/07/MIXMarket_GlobalOutreachFinancialBenchmarkReport_2017-2018.pdf.

Mohamad Anwar, N.A., Iqbal Hussain, H., Kamarudin, F., Sufian, F., Zainal, N. and Wong, C.M. (2021), "Impact of regulatory efficiency and market openness to social and financial efficiency: empirical evidence from microfinance institutions", *Society and Business Review*, Vol. 16 No. 3, pp. 374-397, doi: 10.1108/SBR-04-2020-0056.

Mohini, M.S. and Vilvanathan, L. (2021), "Efficiency assessment of microfinance institutions: using DEA with weighted Russell directional distance model", *Benchmarking: An International Journal*, Vol. 28 No. 3, pp. 769-791, doi: 10.1108/BIJ-06-2020-0288.

Nhung, L.T.P. and Okuda, H. (2015), "Effects of state ownership on companies' capital structure and profitability: estimation analysis before and after the Lehman shock", *Journal of Asian Economics*, Vol. 38, pp. 64-78.

Nourani, M., Ting, I.W.K., Lu, W.-M. and Kweh, Q.L. (2019), "Capital structure and dynamic performance: evidence from ASEAN-5 banks", *The Singapore Economic Review*, Vol. 64 No. 03, pp. 495-516, doi: 10.1142/s021759081650034x.

Nourani, M., Kweh, Q.L., Devadason, E.S. and Chandran, V.G.R. (2020), "A decomposition analysis of managerial efficiency for the insurance companies: a data envelopment analysis approach", *Managerial and Decision Economics*, Vol. 41 No. 6, pp. 885-901, doi: 10.1002/mde.3145.

Nourani, M., Mia, M.A., Saifullah, M.K. and Ahmad, N.H. (2021), "Brain drain in microfinance institutions: the role of gender and organizational factors", *Gender in Management: An International Journal*, Vol. ahead-of-print No. ahead-of-print, doi: 10.1108/GM-04-2021-0092.

Pal, A. and Singh, P.K. (2021), "Do socially motivated self-help groups perform better? Exploring determinants of micro-credit groups' performance in Eastern India", *Annals of Public and Cooperative Economics*, Vol. 92, pp. 119-146.

Rizkiah, S.K. (2019), "The effect of social outreach on financial performance of microfinance institutions in Bangladesh", *International Journal of Economics, Management and Accounting*, Vol. 27 No. 1, pp. 123-140.

Rusiana, H.D. and Escalante, C.L. (2016), *Factors Affecting Either the Voluntary Exit or Forced Eviction of Borrowers from Microfinance Loan Networks*, in *Paper presented at the 2016 Annual Meeting*, July 31–August 2, Boston, Massachusetts.

Saher, N., Khan, D.M., Shahzad, F. and Qadri, S. (2015), "The impact of employees' turnover at the productivity of a software", *International Journal of Natural and Engineering Science*, Vol. 9 No. 3, pp. 23-37.

Saraswathy Amma, K.P., Kannan, G. and Parthasarathy, L. (2019), "Do regulations and governance quality impact performance of MFIs in India?", *Decision*, Vol. 46 No. 1, pp. 3-14, doi: 10.1007/s40622-018-0199-3.

Schlicht, E. (2016), *Efficiency Wages: Variants and Implications*, Vol. 275, IZA World of Labor, doi: 10.15185/izawol.275.

Segun, K.R.S. and Anjugam, M. (2013), "Measuring the efficiency of Sub-Saharan Africa's microfinance institutions and its drivers", *Annals of Public and Cooperative Economics*, Vol. 84 No. 4, pp. 399-422.

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 and Finance*, Vol. 36 No. 7, pp. 2136-2144.

Shankar, S. (2007), "Transaction costs in group microcredit in India", *Management Decision*, Vol. 45 No. 8, pp. 1331-1342, doi: 10.1108/00251740710819069.

Shapiro, C. and Stiglitz, J.E. (1984), "Equilibrium unemployment as a worker discipline device", *The American Economic Review*, Vol. 74 No. 3, pp. 433-444.

Shaw, J. (2004), "Microenterprise occupation and poverty reduction in microfinance programs: evidence from Sri Lanka", *World Development*, Vol. 32 No. 7, pp. 1247-1264, doi: 10.1016/j.worlddev.2004.01.009.

Solow, R.M. (1979), "Another possible source of wage stickiness", *Journal of Macroeconomics*, Vol. 1 No. 1, pp. 79-82, doi: 10.1016/0164-0704(79)90022-3.

Stiglitz, J.E. (1976), "The efficiency wage hypothesis, surplus labour, and the distribution of income in L.D.C.s 1", *Oxford Economic Papers*, Vol. 28 No. 2, pp. 185-207, doi: 10.1093/oxfordjournals.oep.a041340.

Strøm, R.Ø., D'Espallier, B. and Mersland, R. (2014), "Female leadership, performance, and governance in microfinance institutions", *Journal of Banking and Finance*, Vol. 42, pp. 60-75, doi: 10.1016/j.jbankfin.2014.01.014.

Sufian, F., Kamarudin, F. and Nassir, A.m. (2016), "Determinants of efficiency in the malaysian banking sector: does bank origins matter?", *Intellectual Economics*, Vol. 10 No. 1, pp. 38-54, doi: 10.1016/j.intele.2016.04.002.

Tchakoute-Tchuigoua, H. (2010), "Is there a difference in performance by the legal status of microfinance institutions?", *The Quarterly Review of Economics and Finance*, Vol. 50 No. 4, pp. 436-442, doi: 10.1016/j.qref.2010.07.003.

Thapa, G.P., Chalmers, J., Taylor, K.W. and Conroy, J. (1992), *Banking with the Poor: Report and Recommendations Based on Case Studies Prepared by Leading Asian Banks and Nongovernmental Organizations*, Brisbane, Australia.

Tone, K. and Tsutsui, M. (2009), "Network DEA: a slacks-based measure approach", *European Journal of Operational Research*, Vol. 197 No. 1, pp. 243-252.

Van Damme, P., Wijesiri, M. and Meoli, M. (2016), "Governance and efficiency of microfinance institutions: empirical evidence from Sri Lanka", *South Asia Economic Journal*, Vol. 17 No. 2, pp. 236-247, doi: 10.1177/1391561416650102.

Wijesiri, M., Viganò, L. and Meoli, M. (2015), "Efficiency of microfinance institutions in Sri Lanka: a two-stage double bootstrap DEA approach", *Economic Modelling*, Vol. 47, pp. 74-83, doi: 10.1016/j.econmod.2015.02.016.

Wijesiri, M., Yaron, J. and Meoli, M. (2017), "Assessing the financial and outreach efficiency of microfinance institutions: do age and size matter?", *Journal of Multinational Financial Management*, Vol. 40, pp. 63-76, doi: 10.1016/j.mulfin.2017.05.004.

Wynen, J., Van Dooren, W., Mattijs, J. and Deschamps, C. (2019), "Linking turnover to organizational performance: the role of process conformance", *Public Management Review*, Vol. 21 No. 5, pp. 669-685, doi: 10.1080/14719037.2018.1503704.

Zhao, H. and Kittilaksanawong, W. (2018), "Does lending to women lower sustainability of microfinance institutions? Moderating role of national cultures", *Gender in Management: An International Journal*, Vol. 33 No. 3, pp. 187-202, doi: 10.1108/GM-11-2015-0098.

Appendix

Table A1. Summary statistics of inputs, intermediates, and outputs and correlation coefficients (2013–2018)

	Mean ('000)	SD ('000)	Range ('000)	X1	X2	X3	Z1	Z2	Z3	Y1	Y2	Y3	Y4
X1	1.68	3.30	26	1	0.672**	0.681**	0.327**	0.915**	0.534**	0.914**	0.774**	0.670**	0.949**
X2	267,509.03	442,945.44	2,897,757	0.742**	1	0.629**	0.886**	0.739**	0.571**	0.681**	0.703**	0.994**	0.552**
X3	25,439.11	60,398.89	586,652	0.836**	0.941**	1	0.314**	0.613**	0.804**	0.759**	0.977**	0.638**	0.538**
Z1	145,610.37	273,972.46	1,800,993	0.567**	0.924**	0.825**	1	0.428**	0.249**	0.316**	0.362**	0.877**	0.225**
Z2	50,529.27	137,392.09	1,564,332	0.748**	0.951**	0.924**	0.847**	1	0.423**	0.916**	0.721**	0.724**	0.925**
Z3	51,837.64	110,903.90	981,293	0.746**	0.754**	0.760**	0.564**	0.712**	1	0.601**	0.824**	0.594**	0.329**
Y1	8,429.77	27,492.50	302,715	0.761**	0.839**	0.803**	0.733**	0.873**	0.666**	1	0.859**	0.683**	0.877**
Y2	46,685.07	108,552.53	965,645	0.831**	0.958**	0.980**	0.847**	0.927**	0.791**	0.832**	1	0.714**	0.639**
Y3	210,645.86	350,060.65	1,958,675	0.741**	0.987**	0.933**	0.907**	0.934**	0.773**	0.827**	0.968**	1	0.545**
Y4	227.21	685.06	6,794	0.909**	0.615**	0.689**	0.441**	0.641**	0.674**	0.713**	0.701**	0.623**	1

Note(s): Please refer to Table 1 for the definition of variables
The top and bottom triangles represent the results of Pearson correlation and Spearman's rho correlation, respectively
** Correlation is significant at the 0.01 level (2-tailed)

Country	Freq	Percent	# of MFIs
Afghanistan	6	1.110	1
Azerbaijan	6	1.110	1
Bangladesh	72	13.330	12
Benin	6	1.110	1
Bolivia	36	6.670	6
Cambodia	48	8.890	8
Colombia	24	4.440	4
East Timor	12	2.220	2
Ecuador	132	24.440	22
El Salvador	6	1.110	1
Haiti	6	1.110	1
Honduras	12	2.220	2
India	6	1.110	1
Indonesia	6	1.110	1
Macedonia	6	1.110	1
Mexico	12	2.220	2
Nepal	24	4.440	4
Nigeria	12	2.220	2
Pakistan	12	2.220	2
Panama	6	1.110	1
Paraguay	6	1.110	1
Philippines	30	5.560	5
Tajikistan	24	4.440	4
Tanzania	6	1.110	1
Vietnam	18	3.330	3
Yemen	6	1.110	1
Total	540	100	90

Source(s): Authors' estimate

Table A2. Country wise observations

Corresponding author
Mohammad Nourani can be contacted at: pnourani@waikato.ac.nz