Article

The Effect of Financial Development and MFI's Characteristics on the Efficiency and Sustainability of Micro Financial Institutions

Mário Nuno Mata [1], Sayyed Sadaqat Hussain Shah [2,*], Nida Sohail [2] and Anabela Batista Correira [1,*]

[1] ISCAL-Instituto Superior de Contabilidade e Administração de Lisboa, Instituto Politécnico de Lisboa, Avenida Miguel Bombarda 20, 1069-035 Lisbon, Portugal

[2] Faculty of Arts and Social Science, Department of Commerce and Finance, Government College University Lahore, Lahore 54000, Pakistan

* Correspondence: shah.sadaqat@gcu.edu.pk (S.S.H.S.); ambatista@iscal.ipl.pt (A.B.C.);
Tel.: +92-333-445-3189 (S.S.H.S.)

Abstract: The Micro Financial Institutions (MFIs) have been touted as development strategies for Emerging Markets and Developing Economies (EMDEs) which merits research into the effect of financial development on the efficiency and sustainability of the MFIs. The Efficient and sustainable MFIs significantly paved the way for the economic development of a country particularly in developing countries. Surprisingly there are very rare studies that examine the nexus of financial development, MFIs efficiency, and sustainability. Also, these studies are confined to the impact of financial development either on the efficiency or sustainability of MFIs. Addressing this gap, the study attempts to explore the country-specific and MFIs-specific factors which significantly affect the efficiency and sustainability of the MFIs. For this purpose, the study first determines whether financial development contributes to the efficiency and sustainability of MFI. Secondly, the effect of MFIs' specific characteristics such as credit risk, market risk, liquidity risk, lending strategy, Development Financial Institutions (DFIs) funds management, financial outreach, and poverty alleviation on the efficiency and sustainability of MFIs. The study has been conducted for Bangladesh, India, and Pakistan consisting of a panel data set of 12 MFIs over a period spanning from 2008–2018 using Stochastic Frontier Analysis and Cobb Douglas production function regression analysis. Overall empirical analysis reveals that financial development has significantly affected the efficiency and sustainability of the MFIs. While specific characteristics such as poverty alleviation and DFIs funds management have been shown to improve MFIs efficiency whereas an increase in credit risk, lending strategy, and market risk decrease MFIs sustainability and liquidity risk along with an increase in financial outreach leads to a decrease in MFIs efficiency. The directions and magnitudes of the findings suggest the stakeholders for all three countries for the significant direction leads to the efficiency and sustainability of MFIs. Moreover, future research could strive to understand the aspects of financial development which negatively correlate with the MFIs' efficiency and sustainability such as stringent tax policies, creditor rights protection, and implementation of rules and regulations.

Keywords: Micro Financial Institutions; Emerging Markets and Developing Economies; sustainability; Development Financial Institutions; Stochastic Frontier Analysis; Cobb Douglas production function; market risk

1. Introduction

The Global Financial System with its vast and interconnected financial institutions constituting central banks, commercial banks, insurance corporations, investment companies, capital markets, money markets, and finance ministries holds immense importance in the financial stability of the world economy through managing public money being created

by economic sectors ensuring its' suitable use for beneficial objectives promoting the expansion of economic activity (Khawja 2013). However, financial development defined as ensuring creditor's rights protection, reducing agency-related costs, alleviating imbalance in information, easing information accessibility, improving financial institution quality, commitment to accounting policies, and financial disclosure transparency has primarily been concentrated in developed economies (Lei et al. 2018).

The non-prevalence of financial development in the Emerging Markets and Developing Economies (EMDEs) has resulted in the financial exclusion of the 1.7 billion world population from the formal financial sector defined as the inability of certain population segments from availing finances due to their socioeconomic circumstances and the challenges they have in meeting the requirements of conventional financial institutions, their involvement in the financial sector is restricted (Demirguc-Kunt et al. 2017). Development Financial Institutions (DFIs) primarily function to provide capital for economic development projects serving as drivers of industrialization which necessitates their presence for economic growth. Micro Financial Institutions (MFIs) services are an extension of DFIs operating for the provision of financial services to the Micro, Small, and Medium Enterprises (MSMEs) which form an integral part of the developing economies (PIDE 2021).

As a result of the initiative taken by Muhammad Yunus of Bangladesh in the 1970s in the form of Grameen Bank to mainstream the marginalized sectors of the economy by providing financial services tailored to the credit needs of the poor, the world's first microfinance institution with the dual functionality of social and financial inclusion emerged MSMEs (Mainsah et al. 2004). The only objective of establishing MFIs was to combat the informal intermediation impeding the economic development of MSMEs, a significant economic sector in the Emerging Markets and Developing Economies (EMDEs) (IBRD IDA 2022). Lack of considerable collateral, borrower quality evaluation, and high expenses associated with processing small loans have rendered MFIs the only source for granting microloans to borrowers without collateral and credit checks, making it difficult to remove credit restrictions on low-income MSMEs (World Bank 2015).

Traditional financial institutions are highly regulated due to their vital role in the financial stability of a nation. Therefore, MFIs that aim to increase financial inclusion while contributing to poverty alleviation must demonstrate financial sustainability and profitability in their portfolio quality (Basharat et al. 2014; Falcone 2018). The issue of shadow banking has led to the financial exclusion of MSMEs in emerging markets and growing countries such as India, Pakistan, and Bangladesh. However, MSMEs that have the potential to contribute to economic growth need financial support, and MFIs serve the goal of integrating impoverished households and MSMEs into the financial sector, contributing to the development of the financial sector (Falcone 2020; Jassim and Khawar 2018; Wu 2022).

To generate insights for the MFIs, it is necessary to investigate the cause-and-effect relationship between financial development and the sustainability and efficacy of the microfinance sector to the MFIs' mission of broadening financial integration through poverty alleviation and expanding the reach of an economy's financial sector. The Efficient and sustainable MFIs significantly paved the way for the economic development of a country particularly in developing countries (Barr 2004). But most of policymakers and scholars conduct separate conversations about financial development and microfinance (Barr 2004). While financial development and MFIs are inseparable that guide the stakeholders to devise the policyholder for substantial future financial development goals. For bridging the gap of these unnoticed phenomena, the study attempts to evaluate the effect of financial development on the efficiency and sustainability of micro-financial institutions. Also, this study incorporated MFI-specific characteristics such as financial outreach, poverty alleviation, lending strategy, and DFIs' funding management to of financial risks such as market risk, credit risk, and liquidity risk on the efficiency and sustainability of MFIs to identify the significant grass root factors that lead to economics progress.

2. Literature Review

Financial sector development assessed on four key dimensions of size, access, efficiency, and sustainability focusing on increasing inclusiveness in the financial systems while improving access to financial services for the underserved validates the role of MFIs in eliminating the constraints to growth of MSMEs (World Bank 2009). Financial integration of the shadow banking sector can assist the financial sector in the management of liquidity, maturity, and credit risk thereby improving the financial system stability of Emerging Markets and Developing Economies (EMDEs) (Ghosh et al. 2012). Financial development leads to a reduction in liquidity risk, protecting creditor rights and facilitating possession of collateral in case of default allowing intangibles such as patents to be pledged as collateral for securing financial borrowing (Lei et al. 2018).

The importance of microfinance in reaping the benefits of an inclusive financial system has been implemented in Islamic finance through the innovation of Islamic microfinance currency encouraging financial stability while creating a community for Islamic microfinance providers, participating merchants, Zakat and Waqf institutions providing capital assistance to allow recipients in achieving poverty reduction and become Zakat payer in the future (Rozzani et al. 2015). The theory of economic growth postulates the Growth Model to analyze the effect of changes in technological progress modeled as production function augmentation on the level of output Y in a production function over time. Capital augmentation includes efficiency parameters in the production function through multiplication by Capital K and can be used to assess the effect of changes in technological factors such as financial development on the productivity of the inputs in the production of output (Mankiw 2012). Taking this into account, it seems possible to formulate the following hypotheses:

Hypotheses 1 (H1). *Financial development leads to a decrease in the technical efficiency of the MFIs.*

Hypotheses 2 (H2). *Financial development results in the deterioration of the sustainability of MFIs.*

The uniqueness of microfinance in fulfilling social objectives as well as contributing to financial development through serving productive sectors of the economy dominated by MSMEs in developing economies has shown to be affected by the national income and development stage of the country (Maksudova 2010). The impact of the financial crisis of 2008 across different ownership types of MFIs showed that microfinance banks showed a productivity drop due to a decline in technology, NBFIs showed decreased productivity due decline in technology and inefficiency, cooperatives showed decreased productivity due to a reduction in efficiency and innovation while among all the ownership types, NGOs showed the lowest productivity decline (Wijesiri 2016). The effect of financial development in terms of MFI ownership transition from state-owned to privately owned banks on the profit and cost efficiency of MFIs showed better internal technical efficiency as well as allocative efficiency of privately owned MFIs along with reforms such as listing on stock exchanges and macroeconomic conditions such as growth rate and GDP per capita (Mutarindwa et al. 2021).

Economic growth indicative of the developed financial sector increases demand for credit due to the expansion of profitable opportunities for microenterprises allowing MFIs to charge higher interest rates thereby lowering the cost of funds along with bolstering financial sustainability through reducing default as Private Credit to GDP is negatively associated with Portfolio at Risk for more than 30 days (PAR-30) which is a major indicator of MFIs' sustainability (Ahlin et al. 2011). Recent financial developments in microfinance such as increasing competition, commercialization, technological advancement, financial liberalization, and regulation policies of government have resulted in increasing focus on the financial sustainability of the MFIs to reduce the cost of lending money and cover

it from the outstanding loan portfolio (Hermes and Lensink 2011). Compliance with prudential regulations and supervision can be especially costly for MFIs equaling 12–13% of their non-interest payments as MFI supervision has a causal effect on the trade-off between profitability and outreach with profit-oriented MFIs facing prudential supervision responding through curtailing their outreach (Cull et al. 2011). The following hypothesis is as follows:

Hypotheses 3 (H3). *MFIs' sustainability is affected by the market risk arising from the extent of financial development in the economy.*

The intersection of microfinance at three points renders MFIs viable as a development strategy with firstly the primary purpose served by MFIs being poverty alleviation, secondly providing intermediation channels for financial inclusion and thirdly regulating MFIs having access to capital markets and taking deposits to ensure an increase in the financial outreach (Otero 1999). Profit-oriented MFIs have been shown to operate efficiently setting more appropriate loan prices due to being able to easily access investment into the sector regardless of 'Mission Drift' concerns of trading-off social impact for financial performance while not-for-profit organizations have been assumed to be insulated from competitive pressures and hence prone to inefficiencies (Roberts 2013). The success of MFIs in a country is determined by the incumbent government's political ideology as financial inclusion of the poorly received attention in the political agendas of governments in developing economies while MFIs under right-wing governments or centrist regimes have higher efficiency than MFIs operating under left-wing governments due to government intervention forcing charging of lower interest rates on loans (Gul et al. 2017).

MFIs' outreach is negatively correlated with their efficiency, and MFIs with a lower average loan balance, which is a measure of the depth of outreach, and more women borrowers, which is a measure of the breadth of outreach, are less efficient, indicating that MFIs striving for efficiency while registering decreased outreach to the poor led to greater poverty reduction (Hermes et al. 2011). One of the main functions of MFIs is the provision of financial services to the excluded segments of the economy measured as financial outreach and MFIs pursuing higher levels of outreach can be achieved through an increase in total assets and the number of active borrowers (Liñares-Zegarra and Wilson 2018). The strength of corporate governance is considered a major determinant of MFI efficiency after indebtedness as the efficiency of the Board of Directors in its monitoring and advising roles is positively associated with its independence, board expertise, audit committee, and separation of CEO and Chairman while it is negatively associated with the size of the board (Tchuigoua 2015). Taking this into the account, it seems possible to formulate the following hypothesis:

Hypotheses 4 (H4). *MFIs' objectives of poverty alleviation and improving the outreach of the financial sector affect MFIs' efficiency.*

The analysis of the impact of microfinance on the MSMEs as compared to other sources of credit such as bank loans and informal credit showed that microfinance loans have the advantage of meeting the working capital expenditure of MSMEs which raises the issue of the 'Financial systems' approach stressing MFIs to improve operational self-sufficiency vs. 'Poverty lending' approach focusing on poverty eradication through subsidized credit on low-interest rates (Hermes and Lensink 2011). The importance of Comprehensive Group Training in microfinance can be assessed through Microfinance Client Awareness Index used to gauge the financial literacy of the customers of MFIs which allows respondents to score their understanding of services being availed from the MFI. (Kalra et al. 2015).

The diversification of MFIs' revenue sources deals with high operational costs associated with smaller loans; however, diversified MFIs may have to deal with monitoring difficulties and operational inefficiencies while MFIs employing group lending strategy show improved operational sustainability although regulation negatively affects

sustainability (Zamore 2018). Social capital is favorably connected with European MFIs' repayment, profitability, outreach, and efficacy. through lowering credit risk while increasing financial performance and social outreach as the intensity of social capital increases (Chmelíková et al. 2018). The tradeoff between the microfinance institutionalist approach for sustainability and welfarist approach for outreach stresses appropriate lending strategy along with optimum loan amount maximizing efficiency for the three loan techniques of individual lending, group lending, and village banking, or a combination of the three loan methods (Widiarto et al. 2017). Taking this into consideration, it seems possible to formulate the following hypothesis:

Hypotheses 5 (H5). *Credit risk arising from MFIs' lending strategy affects the sustainability of MFIs.*

International institutions' funding South Asian MFIs emphasize the social objective of high operational costs for loan generation hurt the breadth and depth of outreach, while the breadth of outreach has a positive correlation with performance determinants of MFIs and depth of outreach has a negative association with performance determinants of MFIs (Bibi et al. 2013). The provision of financial services to the micro-enterprises requires subsidies for financial efficiency as efficient MFIs show better performance than commercial banks in portfolio quality facilitating the rate of loan recovery by increasing financial literacy and group monitoring (Koveos and Randhawa 2004). MFIs' transformation from NGOs into shareholder-owned financial institutions for independence from donors and gaining access to commercial funding caused an average reduction in operational costs and volatility in funding costs while overall profits decreased due to enforcing compliance on regulations imposing stricter risk management (D'Espallier et al. 2017).

The business model of MFIs is categorized as profit-oriented and self-sustaining businesses or subsidized and not-for-profit organizations choosing between maximizing their financial revenue or yield which again can be segregated into output that maximizes average loan size or output that maximizes the number of loans (Bos and Millone 2015). The social cost of subsidies granted to MFIs, as measured by the Subsidy Dependent Index, is an input for subsidized MFIs, whereas outreach is the social output, as measured by the Outreach Index. The financial sustainability of MFIs improves through learning by doing, which makes mature MFIs financially efficient (Wijesiri et al. 2017). The recent developments in microfinance such as increasing commercialization, the decline in subsidies, and the intensification of global competition have created an uncertain environment in the microfinance industry with the MFI size variable having a negative and significant relationship with the social efficiency as compared to financial efficiency (Fall et al. 2018). The microfinance sector of developing economies is exposed to three main types of financial risk, namely liquidity risk, interest rate risk, and foreign exchange (FX) risk, necessitating increased financial assistance from international donors and DFIs for risk mitigation, as banks offering microcredit facilities face greater liquidity risk and lower FX risk, whereas MFIs operating as NGOs, Credit Unions, and cooperatives have high-interest rate risk and FX risk (Gietzen 2017). In line with the above-cited literature, it seems possible to formulate the following hypothesis:

Hypotheses 6 (H6). *MFIs' exposure to liquidity risk due to the Development of Financial Institutions' funding management affects the efficiency of MFIs.*

3. Methodology

The research will determine the impact of financial sector development on the efficiency and sustainability of Micro Financial Institutions, with MFIs' efficiency and sustainability as the response or dependent variables and financial development as the predictor or independent variable, while assessing the impact of MFIs' financial risk management, financial outreach, poverty alleviation, advancing methodology, and DFIs' funds. with

MFIs' efficiency and sustainability as the dependent variables and poverty alleviation, financial outreach, market risk, credit risk, and liquidity risk as the independent variables while moderating variables are the MFIs' market risk × financial development, credit risk × advancing methodology and liquidity risk × DFIs' fund's management. A detailed explanation of the variables and their constructs is provided in Table 1 below:

Table 1. Explanation of variables and their constructions.

Variables	Indicators	Financial Ratios
Financial Development	Bank Deposits/GDP	$\frac{\text{Bank Deposits}}{\text{GDP}}$
MFI Efficiency	Return on Equity	$\frac{\text{Profit After Tax}}{\text{Total Equity}}$
MFI Sustainability	Operational Self Sufficiency	$\frac{\text{Operating Revenue}}{\text{Loan loss provision}+\text{Financial Exp.}+\text{Operating Exp.}}$
Credit Risk	Loans Written Off	$\frac{\text{Loans Written Off}}{\text{Avg. Loans Outstanding}}$
Market Risk	Debt to Equity Ratio	$\frac{\text{Total Liabilities}}{\text{Total Equity}}$
Liquidity Risk	Cash Position Indicator	$\frac{\text{Cash and Deposits}}{\text{Total Assets}}$
Lending strategy	Operating Expense Ratio	$\frac{\text{Operating Expense}}{\text{Avg. Gross Portfolio}}$
DFIs' Funds Management	Funding Expense Ratio	$\frac{\text{Interest Expense}}{\text{Avg. Gross Portfolio}}$
Financial Outreach	Cost per borrower	$\frac{\text{Operating Expense}}{\text{No. of borrowers}}$
Poverty Alleviation	GNI per capita	Gross National Income Per Capita

Note: See Appendix A—Characteristics of Variables.

3.1. Stochastic Frontier Analysis

Previous research has primarily employed stochastic frontier analysis to estimate the efficiency of production functions. It is a parametric frontier technique based on the theory that no economic agent can exceed the ideal frontier, and it estimates efficiency, which is defined as the maximization of output with a given level of input or production technology. Statistically, frontier parameters and inefficiency can be deduced by providing a production, cost, or profit function and differentiating between measurement error and residual term expressing inefficiency. SFA presupposes the quasi-concavity of the production function and predicts a declining marginal rate of technical substitution, as the entity is considered technically efficient when it is working at the best practice level or producing maximum output with resources equal to its capacity. The optimal production function for bank performance has the following functional form and taking into account the above, it is possible to construct the following expressions for testing the relevant hypotheses:

$$y_{it} = \beta x_{it} + \varepsilon_{it} \tag{1}$$

$$\text{where } \varepsilon_{it} = v_{it} + u_i \tag{2}$$

The abovementioned equation indicates y_{it} as the observed dependent variable or MFIs' efficiency which has been measured through ROE, β is the parameter vector of inputs, x_{it} is our independent variables i.e., poverty alleviation, financial outreach, market risk, credit risk, and liquidity risk, ε_{it} is the error term, v_{it} is time-variant random error and u_i is the time-invariant firm specific parameter (Mutarindwa et al. 2021). A stochastic production function with output-oriented technical inefficiency is specified as:

$$\ln y_i = \ln y_i{}' - u_i \tag{3}$$

$$\ln y_i = x_i\beta + v_i \tag{4}$$

The presence of constraints will reduce observed ROE from efficient ROE $y_i{}'$ or optimal ROE by non-negative term u_i and the percentage difference is attributed to the presence of technical inefficiency. The interpretation of u is u times 100 measures the percentage shortfall of the desired frontier level of output due to technical constraints. The value of u is equal to inefficiency having a distribution with mean μ and variance σ^2 exponentially

distributed ($\mu = \sigma^2$) where modeling of inefficiency variance is a function of exogenous covariates (Kumbhakar et al. 2015). SFA will be applied to evaluate the first and the second hypothesis to assess the impact of financial development on the efficiency and sustainability of the Micro Financial Institutions.

Hypotheses 1 (H1). *Financial development leads to a decrease in the technical efficiency of the MFIs.*

$$\ln\left(\frac{\text{PAT}}{\text{Equity}}\right)_{it} = \alpha_1 + \beta_1 \ln\left(\frac{\text{Bank Dep.}}{\text{GDP}}\right)_{ct} + v_{it} + u_i \tag{5}$$

In Equation (5), the PAT/Equity is the ratio between profit after tax and the total equity of microfinance organizations as a proxy of MFI Efficiency, i.e., observed dependent variable while Bank Deposit/GDP is the ratio between total bank deposit of microfinance organization to the gross domestic product of the country as a proxy of financial development. α_1 is a constant, β_1 is a co-efficient of financial development, v_{it} is the time-variant error term, and u_i is the time-invariant firm-specific term.

Hypotheses 2 (H2). *Financial development results in the deterioration of the sustainability of MFIs.*

$$\ln(\text{OSS})_{it} = \alpha_2 + \beta_2 \ln\left(\frac{\text{Bank Dep.}}{\text{GDP}}\right)_{ct} + v_{it} + u_i \tag{6}$$

In Equation (6), OSS is the Operational Self Sufficiency as an indicator of MFI Sustainability while Bank Deposit/GDP is the ratio between total bank deposits of microfinance organization to the gross domestic product of the country as an indicator of financial development to test H2 mentioned above.

Stochastic Frontier Analysis will be employed to examine the effect of financial development on the sustainability and efficacy of MFIs operating in Pakistan, India, and Bangladesh. MFIs and to test the relevant hypothesis we developed above.

3.2. Cobb Douglas Production Function

The Cobb-Douglas production function in economics illustrates the technological relationship between two or more inputs and the output that can be produced by those inputs. It is a method for calculating the effect of changes in a production function's inputs, relevant efficiencies, and outputs. Considering the above, it is possible to construct the following expressions for testing the relevant hypotheses:

$$Y_t = \alpha_0 \times L_t^{\alpha_1} \times K_t^{\alpha_2} \tag{7}$$

$$\text{Ln } Y_t = \alpha_0 + \alpha_1 \text{ Ln } L_t + \alpha_2 \text{ Ln } K_t + u_t \tag{8}$$

The above equation denotes Y_t as the output, α_0 as the constant, L_t as the labor input, K_t as the capital input, α_1 and α_2 are the elasticity parameters and u_t as a random disturbance (Zellner et al. 1966). Cobb Douglas production function was used to develop the mathematical guidelines for estimating the sustainability of MFIs through the impact of financial development on the market risk those MFIs face and the impact of credit risk depending on the lending strategy while determining the efficiency of MFIs through the impact of poverty alleviation and financial outreach as well as the impact of liquidity risk brought on by DFIs' funding management using Generalized Least Squares

Hypotheses 3 (H3). *The effect of the market risk arising from the extent of the financial development of the economy on MFIs' sustainability.*

To test the relation in H3, the following equation is constructed;

$$\ln(\text{OSS})_{it} = \beta_0 + \beta_1 \ln\left(\frac{\text{Liabs}}{\text{Equi.}}\right)_{it} + \beta_2\left(\frac{\text{Bank Dep.}}{\text{Gross Domestic Product}} \times \frac{\text{Liabs}}{\text{Equi.}}\right)_{ct} + \varepsilon_{it} \quad (9)$$

In Equation (9), OSS is the Operational Self Sufficiency as an indicator of MFI Sustainability while Bank Deposit/GDP is the ratio between the total bank deposit of microfinance organization to the gross domestic product of the country as an indicator of financial development to the test H3 mentioned above.

Hypotheses 4 (H4). *The effect of improving the outreach of the financial sector and MFIs' objective of poverty alleviation on MFIs' efficiency.*

$$\ln\left(\frac{\text{PAT}}{\text{Equity}}\right)_{it} = \beta_0 + \beta_3 \ln(\text{GNI Per Capita})_{ct} + \beta_4 \ln(\text{Cost Per Borrower})_{it} + \varepsilon_{it} \quad (10)$$

Above constructed Equation (10) addresses the relation in H4 where PAT/Equity is the ratio between profit after tax and the total equity of microfinance organizations as a poxy of MFI Efficiency, i.e., observed dependent variable while GNI Per Capita as a proxy for poverty alleviation and Cost Per Borrower is an indicator for financial outreach.

Hypotheses 5 (H5). *The effect of the credit risk arising from MFIs' lending strategy on the MFIs' sustainability.*

$$\ln(\text{OSS})_{it} = \beta_0 + \beta_1 \ln\left(\frac{\text{Loans Written Off}}{\text{Avg. Loans Outstanding}}\right)_{it} + \beta_2\left(\frac{\text{LiabsLoans Written Off}}{\text{Avg. Loans Outstanding}} \times \frac{\text{Cash and Deposits}}{\text{Total Assets.}}\right)_{ct} + \varepsilon_{it} \quad (11)$$

Equation (11) explains the association of H5, where OSS is the Operational Self Sufficiency as an indicator of MFI Sustainability while Loans Written Off/Avg. Loans Outstanding is the ratio between loans written by microfinance organizations with their outstanding average loans for the poxy of credit risk. Further, the Cash and Deposits/Total Assets are used for assessing the liquidity risk associated with the MFI.

Hypotheses 6 (H6). *The effect of the MFIs' exposure to liquidity risk due to the Development of Financial Institutions' funding management on MFIs' efficiency.*

$$\ln\left(\frac{\text{PAT}}{\text{Equi.}}\right)_{it} = \beta_0 + \beta_7 \ln\left(\frac{\text{Cash and Deposits}}{\text{Total Assets}}\right)_{it} + \beta_8\left(\frac{\text{Interest Expense}}{\text{Avg Gross Portfolio}} \times \frac{\text{Cash and Deposits}}{\text{Total Assets}}\right)_{it} + \varepsilon_{it} \quad (12)$$

Equation (12) attempts to explain the logical relation of H6, where PAT/Equity is the ratio between profit after tax and the total equity of microfinance organizations as a poxy of MFI Efficiency i.e., observed dependent variable while Cash and Deposits/Total Assets are used for assessing the liquidity risk associated with the MFI and Interest Expense/Avg Gross Portfolio is used for DFIs'.

3.3. Data Collection Procedure

The research data consists of panel data from twelve MFIs chosen from Bangladesh, India, and Pakistan over 10 years. The selected MFIs were ranked highest in each individual and financial data were obtained from the World Bank's Microfinance Information Exchange (MIX)[1] data for the period FY2008 to FY2018. For the period of FY2008–FY2018, data for country-specific variables such as financial development and poverty alleviation were collected from the World Bank[2] and incorporated into efficiency estimation using the Meta frontier technique to generate comparative efficiency scores for each economy.

4. Results and Discussion

The section provides a detailed estimation of the tests we ran on our dataset. Models 5 to 12 were run for all three countries Bangladesh, India, and Pakistan. The tables below provide the output of the variable and a detailed explanation is provided against each table that satisfies our hypotheses. Tables 2 and 3 describe the effects of financial development on the efficiency and sustainability of MFIs, whereas Tables 4–7 describe the unique effects of MFIs' specific characteristics on those outcomes.

In Table 2, the Stochastic Frontier Analysis (SFA), shows a log-likelihood value for all three countries is less than the value of Wald chi-square, which means that the financial development does not result in technical inefficiency in Bangladesh, India, and Pakistan and paved the ways for determining the impact of financial development on the financial resources of MFIs similar to loans, DFIs' funds, cash and the financial services of MFIs.

Table 2. SFA of Financial development and MFI efficiency.

MFI Efficiency	Bangladesh		India		Pakistan	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Financial Development	−1.638	0.000	8.429	0.001	−9.741	6.376
_cons	0.447	0.001	−41.326	0.006	28.451	21.926
p > |z|	0.000	0.000	0.000	0.000	0.127	0.194
Sigma_v	0.000	0.000	0.000	0.000	0.635	0.321
Sigma_u	1.309	0.395	3.102	0.935	1.372	0.587
Wald Chi	264		381		233	
Log-likelihood	−13.960		−23.452		−18.642	
Years	Yes		Yes		Yes	

The coefficient value for financial development in Bangladesh is −1.637 meaning that return on equity of the Bangladesh MFIs decreases by 1.637 with a 1 unit increase in financial development indicating that in Bangladesh financial markets are more established than the MFIs which may lead to MFI clients taking up multiple loans, reducing efficiency (Hermes et al. 2011). While the value for constant is 0.447 which means that assuming financial development is absent in the production function then the value for MFI efficiency will be 44 percent. While in India, the financial development coefficient is 8.429 implying an increase in MFI efficiency by 8.429 percent with a 1 unit increase in financial development signifying increased creditor rights' protection. Results are in line with the findings of Hermes et al. (2011) that MFI efficiency is positively associated with the level of financial market development. The value of the coefficient for constant is −41.325 which shows that MFIs' will decrease 41.325 percent with a lack of financial development implying that the financial development leads to technical efficiency for MFIs. Lastly, in Pakistan, the coefficient suggests that the efficiency of MFI Pakistan decreases by 9.740 percent with a 1 unit increase in financial development (Hermes et al. 2011). The coefficient value for constant is 28.45 which shows that the MFIs' efficiency will increase in the absence of financial development. Whereas, the minimum value of sigma_v and sigma_u, the time-variant and invariant random errors indicate the least shortfall of MFIs' efficiency (Hartarska and Nadolnyak 2007).

The effect of financial development on the sustainability of MFIs shows that financial development does not negatively impact MFI characteristics such as write-off ratio, financial leverage, and lending strategy to assess its influence on Operational Self-Sufficiency (OSS) which has been used to gauge MFI sustainability for each of the economies namely Bangladesh, India, and Pakistan (Nurmakhanova et al. 2015). In Table 3, Financial development has been shown to improve MFIs' loan portfolio and repayment rates for Bangladesh and India consequently improving MFIs' sustainability as 1 unit change in financial development for Bangladesh causes a 1.571 unit increase in MFI sustainability means that the MFIs on the welfare of the poor in Bangladesh are sustainable due to its good financial performance (Hossain and Khan 2016) and 1 unit change in financial development for

Pakistan causes 10.590 unit increase in MFI sustainability whereas the sustainability of MFIs for India is irrelevant of the financial development as the MFI sustainability decreases 4.25 unit with an increase in financial development instead depending on loan recovery and borrower retention (Njeru 2016).

Table 3. MFI sustainability and SFA of Financial development.

MFI Sustainability	Bangladesh		India		Pakistan	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Financial Development	1.571	0.000	−4.253	0.000	10.591	0.000
_cons	−4.179	0.000	18.764	0.000	−35.761	0.001
p > |z|	0.000	0.000	0.000	0.000	0.000	0.000
Sigma_v	0.000	0.000	0.000	0.000	0.000	0.000
Sigma_u	0.281	0.085	0.509	0.153	1.034	0.312
Wald Chi^2	121		212		639	
Log-likelihood	2.947		−3.566		−11.365	
Years	Yes		Yes		Yes	

In Table 4, the regression analysis of MFI sustainability as the dependent variable and market risk as the independent variable with market risk × financial development as moderating variable shows that Bangladesh has a negative relationship between market risk and MFI sustainability implying MFI sustainability decreases by 0.10 unit with 1 unit change in market risk. MFI sustainability increases by 0.029 units with a 1 unit increase in the effect of financial development on the market risk faced by MFIs. The coefficient value for the market risk of India is −0.146 showing increase in market risk causes a 0.146-unit decrease in MFI sustainability while the coefficient value for market risk × financial development is –0.301 showing an increase in market risk due to financial development leads to a decrease in MFI sustainability (Bich 2016). The coefficient value for the market risk of Pakistan is −0.114 showing increase in market risk causes a 0.114-unit decrease in MFI sustainability while the coefficient value for market risk × financial development is −0.118 implying a 0.118 unit decrease in MFI sustainability with a 1 unit increase in the market risk due to financial development (Illangakoon et al. 2022).

Table 4. MFI Sustainability and Market risk.

MFI Sustainability	Bangladesh		India		Pakistan	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Ln Market Risk	−0.109	0.093	−0.146	0.037	−0.115	0.099
Market Risk × FD	0.029	0.051	−0.302	0.072	−0.119	0.225
_cons	1.527	0.088	0.214	0.036	−0.375	0.215
p > |t|	0.247	0.566	0.000	0.000	0.255	0.602
R^2	0.472		0.273		0.002	
Sigma_u	0.273		0.072		0.346	
Sigma_e	0.146		0.159		0.474	
Years	Yes		Yes		Yes	

In Table 5, the coefficient value for poverty alleviation in Bangladesh is 0.170 meaning MFI efficiency increases by 0.170 unit with 1 unit change in poverty alleviation while the coefficient value for financial outreach of MFIs is −0.151 showing 1 unit increase in financial outreach decreases MFI efficiency by 0.151 unit (Hermes et al. 2011). The coefficient value for poverty alleviation in India is 0.610 showing a 1-unit increase in poverty alleviation causing MFI efficiency to increase by 0.610 units while the value for financial outreach is −0.699 showing a 1-unit increase in MFI financial outreach causing a 0.699 unit decrease in MFI efficiency. The coefficient value for poverty alleviation in Pakistan is 1.028 showing 1 unit increase in poverty alleviation causes a 1.028-unit increase in MFI efficiency. The

coefficient value of financial outreach is 0.1613 showing 1 unit increase in financial outreach causes a 0.1613-unit increase in MFI efficiency (Kamarudin and Anwar 2020).

Table 5. MFI efficiency and Poverty Alleviation.

MFI Efficiency	Bangladesh		India		Pakistan	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Ln Poverty Alleviation	0.170	0.122	0.610	0.836	1.028	0.436
Ln Financial Outreach	−0.152	0.097	−0.700	0.463	0.161	0.273
_cons	−0.523	0.593	−5.081	6.026	−7.661	2.721
$p > |t|$	0.170	0.127	0.470	0.139	0.023	0.558
R^2	0.011		0.065		0.038	
Sigma_u	0.115		0.330		0.345	
Sigma_e	0.105		1.094		0.385	
Years	Yes		Yes		Yes	

In Table 6, the coefficient value for credit risk faced by MFIs of Bangladesh is 0.163 showing an increase in MFI sustainability by 0.163 units with a 1 unit increase in MFI credit risk, and the value for moderating variable of credit risk × lending strategy is 0.048 implying 1 unit increase in the effect of MFI's lending strategy on credit risk increases MFI sustainability by 0.048 unit. The coefficient value for credit risk for MFIs of India is −0.1641 showing 1 unit increase in credit risk causes a 0.164-unit decrease in MFI sustainability while the value for the moderating variable of credit risk × lending strategy is 0.2400 which shows a 1 unit increase in the effect of credit risk on lending strategy decreases MFI sustainability by 0.24007 pc. The value of credit risk for MFIs of Pakistan is −1.221 showing a 1 unit increase in credit risk causes a 1.221-unit decrease in MFI sustainability while the value for credit risk × lending strategy is 0.038 showing a 1 unit increase in moderating variable of credit risk × lending strategy causes 0.038 unit increase in MFI sustainability.

Table 6. MFI sustainability and Credit risk and Lending strategy.

MFI Sustainability	Bangladesh		India		Pakistan	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Ln Credit Risk	0.163	0.022	−0.164	0.051	−1.221	1.202
Ln Credit Risk × Lending strategy	0.048	0.063	0.240	0.062	0.039	0.013
_cons	0.331	0.064	1.153	0.054	0.692	0.107
$p > |t|$	0.467	0.451	0.003	0.000	0.316	0.004
R^2	0.281		0.712		0.705	
Sigma_u	0.225		0.058		0.282	
Sigma_e	0.104		0.185		0.257	
Years	Yes		Yes		Yes	

In Table 7, the coefficient value for liquidity risk faced by MFIs of Bangladesh is −0.296 showing 1 unit increase in liquidity risk causes MFI efficiency to decrease by 0.296 units. While the value for moderating variable of liquidity risk × DFI funding management is −0.028 showing a 0.028-unit decrease in MFI efficiency with a 1-unit increase in the effect of liquidity risk on DFI funding management. The coefficient value of liquidity risk for MFIs of India is 0.916 showing 1 unit increase in liquidity risk measured by the cash position indicator causes a 0.916-unit increase in MFI efficiency. The coefficient value for moderating variable of liquidity risk × DFI funding management is 1.412 which shows that MFI efficiency increases by 1.412 units with a 1 unit increase in the effect of DFI funding management on the liquidity risk. The coefficient value for the liquidity risk of Pakistan is −0.523 showing 1 unit increase in liquidity risk causes MFI efficiency to decrease by 0.523 units and the moderating variable of liquidity risk × DFI funding management has a

coefficient value of −0.272 showing a 1 unit increase in the effect of liquidity risk on DFI funding management causes 0.272 unit decrease in MFI efficiency.

Table 7. MFI efficiency and Liquidity risk.

MFI Efficiency	Bangladesh		India		Pakistan	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Ln Liquidity Risk	−0.296	0.349	0.917	0.625	−0.523	0.190
Ln Liquidity Risk × DFIs Fund Manag	−0.288	0.285	1.411	1.234	−0.273	0.071
_cons	0.221	0.140	−2.584	0.826	0.237	0.242
p > |t|	0.401	0.317	0.151	0.260	0.009	0.000
R^2	0.025		0.051		0.109	
Sigma_u	0.081		0.364		0.323	
Sigma_e	0.107		1.093		0.367	
Years	Yes		Yes		Yes	

5. Conclusions

The efficiency and sustainability of MFIs are dependent on the financial development of the economy as a result of improvements in the quality of financial disclosures, creditor rights protection, and the quality of financial institutions, which provide MFIs with a competitive advantage in terms of timely loan repayment, increased poverty alleviation, and continued provision of microloans, thereby expanding the financial reach of the MFIs (Lensink et al. 2018).

According to the regression analysis, market risk stemming from unfavorable movements in equity prices, interest rates, and FX rates has a detrimental influence on the sustainability of MFIs. Bangladesh, Pakistan, and India are classified as EMDEs in need of financial development to enhance the financial integration and inclusion essential for economic success. Due to a growth in the debt-to-equity ratio, the influence of financial development on market risk is detrimental to the sustainability of MFIs as suggested by (Ayayi and Sene 2010).

The increase in the credit risk of MFIs causes a decrease in MFI sustainability, while the increase in the effect of credit risk on MFIs' lending strategy (Hossain and Khan 2016), as measured by the operating expense ratio, also causes a decrease in MFI sustainability, resulting in a debate over the optimal lending strategy for ensuring that subsidized credit reaches eligible households. MFIs have relied mostly on group lending and village banking, which include a formal agreement between a group of borrowers to borrow and repay money as a single entity, hence reducing borrowing costs (Hermes et al. 2011). Effective microfinance techniques for individual lending depend on allowing micro borrowers to apply for a larger loan based on the repayment history of their existing loan and frequent monthly installments, regardless of the return on investments that may be earned over longer periods (Augsburg et al. 2015).

The influence of poverty alleviation on the efficiency of MFIs demonstrates that growth in GNI per capita is positively correlated with the efficiency of MFIs as a result of an increase in the proportion of an economy's savings to its income, which raises the level of national income per capita. The rise in financial outreach leads to a drop in MFI efficiency, which can be ascribed to an increase in cost per borrower, as impoverished borrowers cannot afford to pay a high-interest rate given their realistic business potential as consistent with the study of Awaworyi Churchill (2020).

An increase in the liquidity risk of MFIs, as evaluated by the cash position indicator, diminishes MFI efficiency in India and Bangladesh while increasing MFI efficiency in Pakistan, hence boosting economic growth. The influence of liquidity risk on the DFI's funding management, as measured by the funding expense ratio, increases the MFI's efficiency in Pakistan and decreases the likelihood of insolvency. Unlike the previous studies (Barr 2004; Hermes et al. 2011; Hossain and Khan 2016), the objective of the current study is to not only comprehend the impact of financial development on the

efficiency and sustainability of MFIs but also to inform potential users about the impact of the MFIs' specific characteristics on these outcomes and point them in the direction of beneficial outcomes.

Overall results are consistent with the findings of (Barr 2004; Hermes et al. 2011; Hossain and Khan 2016) and reveal that Indian MFIs relatively more efficient and sustainable due to the well-established financial markets but this effect is adversely affected MFIs due to high market risk and low financial outreach. Whereas, in Bangladesh and Pakistan MFIs efficiency are relatively lower than India but more sustainable in progress which means that both countries are achieving good financial performance than India. Additionally, the moderate factor of risk exhibits the success of MFIs in Bangladesh more than in Pakistan. In Pakistan MFIs' efficiency and sustainably are subject to the constraints of market risk, poverty alleviation, and liquidity risk.

The regularity authorities, responsible for the efficiency and sustainability of the MFIs such as the Reserve Bank of India (RBI) for India, the Microcredit Regulatory Authority (MRA) for Bangladesh, and the State Bank of Pakistan (SBP) for Pakistan, are the probable users of this study. Hence, the findings of the study enlighten the ways to the competent authorities for strengthening the MFIs leading to the economic progress of the country. More precisely, this study advises RBI to create a policy to reduce market and credit risk pressures on MFI sustainability, which may be accomplished by further enhancing the lending strategy. The study recommends MRA develop a strategy to get over the MFIs' limitations on financial outreach, market risk, and liquidity risk. Also, the study advises MRA to take better financial development and lending practices into account if it wants to reap favorable results consistently. Although MFI policies in Pakistan are effective at reducing poverty and providing financial assistance, these effects do not appear to be long-lasting. The study makes the recommendation that SBP alters the policies, particularly through growing financial institutions and their financial growth mechanisms. As a result of these enhanced financial developments, SBP would be able to manage the market, credit, and liquidity risk by strengthening its lending strategy.

The research was conducted with the utmost effort in ensuring transparency and accuracy involving the collection of data, analysis via the application of econometric models, and the presentation of the statistical results notwithstanding the limitations due to unavailability of resources along with difficulties in accessing the data regarding differences in policy implementation across the selected countries along with tax regulations governing the financial institutions. Furthermore, the heterogeneity in the corporate governance mechanisms and the financial strength of the analyzed Micro Financial Institutions provided another challenge to the reliability of the results.

The scope for future research should encompass a selection of the MFIs based on their ranking in the financial sector of their respective economies, their corporate governance mechanisms, and their legal status such as MFB, NBFCs, NGOs, etc. Furthermore, data regarding the ease of policy implementation and stringent tax implementation should guide further studies in the field investigating the adverse impact of financial development on MFIs. There is also a need the distinguishing MFI-specific characteristics within the selected MFIs for data collection to determine their effect on the efficiency and sustainability of the MFIs.

Appendix A

Characteristics of Variables	
Financial Development	Financial Development concerns the protection of creditor rights, contract enforcement, reducing agency costs, eliminating information asymmetry, and promoting transparency and compliance with accounting standards.
MFI Efficiency	MFI efficiency relates to the financial inclusion of excluded economic divisions, the expansion of the financial sector's reach, and the alleviation of poverty. An MFI's inputs consist of its equity, customer deposits, and interest on advances, while its output is its after-tax net income.
MFI Sustainability	Financial viability is vital for MFIs to meet the credit needs of excluded economic sectors without excessive reliance on subsidies and cash. Thus, the sustainability of MFIs refers to continuing repayments of loans by its borrowers, which is why the MFI's survival is not affected by questionable debts and defaults.
Credit Risk	Credit risk is the borrower's incapacity to meet its commitments by the pre-decided terms, necessitating a focus on lending principles and an evaluation of the borrowing capacity of the borrower.
Market Risk	Market risk is the risk of loss owing to unpropitious fluctuations in the market, and influenced factors, such as interest rate and FX rate, resulting in an increase in the debt or liabilities of MFIs as a result of an increase in market interest rates.
Liquidity Risk	Liquidity risk is the probability of loss owing to a financial institution's inability to meet its obligations without incurring unacceptable expenses, resulting in a loss of repute, loss of faith between depositors, and nonpayment to creditors.
Poverty Alleviation	One of the key objectives of MFIs is the financial inclusion of impoverished borrowers who are unable to provide adequate collateral or have a valid legal status, as well as the supply of credit to help development by reducing poverty.
Financial Outreach	Conventional financial service providers experience high costs while attempting to bring services to far-flung rural areas with low cash liquidity, seasonality of incomes, outdated infrastructure, and little literacy rates, whereas MFIs aim to provide micro-credit to the underprivileged by expanding the financial sector's reach.
Lending Strategy	The lending strategy of microfinance institutions (MFIs) plays a key role in the institution's continued survival, as its primary objective is to alleviate poverty through the provision of loans and other financial services to financially excluded sectors.
DFIs' Funds Management	MFIs have the same objective of financing economic growth and development initiatives as DFIs, whose capital is derived from resources provided by national or global organizations to invest in private sector sustainable projects. Therefore, MFIs that receive assistance from DFIs to support the development of MSMEs should use these funds appropriately.

Notes

1   https://datacatalog.worldbank.org/dataset/mix-market (accessed on 12 July 2022).
2   https://data.worldbank.org/ (accessed on 12 July 2022).

References

Ahlin, Christian, Jocelyn Lin, and Michael Maio. 2011. Where does microfinance flourish? Microfinance institution performance in macroeconomic context. *Journal of Development Economics* 95: 105–20. [CrossRef]

Augsburg, Britta, Ralph De Haas, Heike Harmgart, and Costas Meghir. 2015. The impacts of microcredit: Evidence from Bosnia and Herzegovina. *American Economic Journal: Applied Economics* 7: 183–203. [CrossRef]

Awaworyi Churchill, Sefa. 2020. Microfinance financial sustainability and outreach: Is there a trade-off? *Empirical Economics* 59: 1329–50. [CrossRef]

Ayayi, Ayi Gavriel, and Maty Sene. 2010. What drives microfinance institution's financial sustainability. *The Journal of Developing Areas* 44: 303–24. [CrossRef]

Barr, Michael S. 2004. Microfinance and financial development. *Michigan Journal of International Law* 26: 271.

Basharat, A., Ammar Arshad, and Raza Khan. 2014. *Efficiency, Productivity, Risk and Profitability of Microfinance Industry in Pakistan*. Islamabad: Pakistan Microfinance Network.

Bibi, Uzma, Hatice Ozer Balli, Claire D. Matthews, and David W. L. Tripe. 2013. New approaches to measure the social performance of Microfinance Institutions (MFIs). *International Review of Economics and Finance* 53: 88–97. [CrossRef]

Bich, Ngoc Nguyen. 2016. The effect of capital structure and legal status on financial sustainability of mfis in developing countries. *Review of Business and Economics Studies* 2: 53–64.

Bos, Jaap W. B., and Matteo Millone. 2015. Pratice What You Preach: Microfinance Business Models and Operational Efficiency. *World Development* 70: 28–42. [CrossRef]

Chmelíková, Gabriela, Annette Krauss, and Ondřej Dvouletý. 2018. Performance of microfinance institutions in Europe—Does social capital matter? *Socio-Economic Planning Sciences* 68: 100670. [CrossRef]

Cull, Robert, Asli Demirgüç-Kunt, and Jonathan Morduch. 2011. Does Regulatory Supervision curtail Mirofinance Profitability and Outreach? *World Development* 39: 949–65. [CrossRef]

D'Espallier, Bert, Jann Goedecke, Marek Hudon, and Roy Mersland. 2017. From NGOs to Banks: Does Institutional Transformation alter the business model of Microfinance Institutions? *World Development* 89: 19–33. [CrossRef]

Demirguc-Kunt, Asli, Leora Klapper, Dorothe Singer, Saniya Ansar, and Jake Hess. 2017. *The Global Findex Database 2017*. Washington DC: World Bank Group.

Falcone, Pasquale Marcello. 2018. Green investment strategies and bank-firm relationship: A firm-level analysis. *Economics Bulletin* 38: 2225–39.

Falcone, Pasquale Marcello. 2020. Environmental regulation and green investments: The role of green finance. *International Journal of Green Economics* 14: 159–73. [CrossRef]

Fall, François, Al-mouksit Akim, and Harouna Wassongma. 2018. DEA and SFA research on the efficiency of microfinance institutions: A meta-analysis. *World Development* 107: 176–88. [CrossRef]

Ghosh, Swati, Ines Gonzalez del Mazo, and İnci Ötker-Robe. 2012. *Chasing the Shadows: How Significant is Shadow Banking in Emerging Markets?* Washington, DC: The World Bank.

Gietzen, Thomas. 2017. The exposure of microfinance institutions to financial risk. *Review of Development Finance* 7: 120–33. [CrossRef]

Gul, Ferdinand A., Jyotirmoy Podder, and Abu Zafar M. Shahriar. 2017. Performance of Microfinance Institutions: Does Government Ideology Matter? *World Development* 100: 1–15. [CrossRef]

Hartarska, Valentina, and Denis Nadolnyak. 2007. Do regulated microfinance institutions achieve better sustainability and outreach? Cross-country evidence. *Applied Economics* 39: 1207–22. [CrossRef]

Hermes, Niels, and Robert Lensink. 2011. Microfinance: Its Impact, Outreach and Sustainability. *World Development* 39: 875–81. [CrossRef]

Hermes, Niels, Robert Lensink, and Aljar Meesters. 2011. Outreach and Efficiency of Microfinance Institutions. *World Development* 39: 938–48. [CrossRef]

Hossain, Md Sharif, and Mohd Azam Khan. 2016. Financial sustainability of microfinance institutions (MFIs) of Bangladesh. *Developing Country Studies* 6: 69–78.

IBRD IDA. 2022. *Small and Medium Enterprises (SMEs) Finance*. The World Bank. Available online: https://www.worldbank.org/en/topic/smefinance (accessed on 15 March 2022).

Illangakoon, Anurudha Gishan, S. M. Azam, and Adam Amril Jaharadak. 2022. Impact of Risk Management towards Sustainability of Microfinance Industry in Sri Lanka: A Case Study. *International Journal of Social Sciences and Economic Review* 3: 1–7. [CrossRef]

Jassim, J., and Maham Khawar. 2018. *Defining Micro, Very Small and Small Enterprises: Moving towards a Standard Definition-Continuum*. Islamabad: Pakistan Microfinance Network.

Kalra, Vinita, Himendu P. Mathur, and P. V. Rajeev. 2015. A Measure of Awareness and Skills of Microfinance Clients. *IIMB Management Review* 27: 252–66. [CrossRef]

Kamarudin, Fakarudin, and Nazratul Aina Mohamad Anwar. 2020. *Dimensions of Voice and Political Stability to the Efficiency of Microfinance Institutions*. Kajang: Academia Industry Networks, p. 29.

Khawja, Ahmad Hafeez. 2013. *Introduction to Economics & Finance*. Islamabad: Khawja & Khawja Publishing House.

Koveos, Peter, and Dipinder Randhawa. 2004. Financial services for the poor: Assessing Microfinance Institutions. *Managerial Finance* 30: 70–95. [CrossRef]

Kumbhakar, Subal C., Hongren Wang, and Alan P. Horncastle. 2015. *A Practitioner's Guide to Stochastic Frontier Analysis Using Stata*. New York: Cambridge University Press.

Lei, Jin, Jiaping Qiu, and Chi Wan. 2018. Asset tangibility, cash holdings and financial development. *Journal of Corporate Finance* 50: 223–42. [CrossRef]

Lensink, Robert, Roy Mersland, Nhung Thi Hong Vu, and Stephen Zamore. 2018. Do microfinance institutions benefit from integrating financial and nonfinancial services? *Applied Economics* 50: 2386–401. [CrossRef]

Liñares-Zegarra, José, and John O. S. Wilson. 2018. The size and growth of Microfinance Institutions. *The British Accounting Review* 50: 199–213. [CrossRef]

Mainsah, Evaristus, Schuyler R. Heuer, Aprajita Kalra, and Qiulin Zhang. 2004. Grameen Bank: Taking Capitalism to the Poor. *Chazen Web Journal of International Business* 1: 28.

Maksudova, Nargiza. 2010. *Contribution of Microfinance to Financial Sector Development and Growth*. Prague: Center for Economic Research and Graduate Education, Economics Institute.

Mankiw, N. Gregory. 2012. *Macroeconomics*. Cambridge: Harvard University.

Mutarindwa, Samuel, Ibrahim Siraj, and Andreas Stephan. 2021. Ownership and Bank Efficiency in Africa: True Fixed Effects Stochastic Frontier Analysis. *Journal of Financial Stability* 54: 100886. [CrossRef]

Njeru, Caroline M. 2016. Effect of Micro Factors on Financial Sustainability of Informal Finance Groups in Mwea Constituency. Doctoral dissertation, KCA University, Nairobi, Kenya.

Nurmakhanova, Mira, Gavin Kretzschmar, and Hassouna Fedhila. 2015. Trade-off between financial sustainability and outreach of microfinance institutions. *Eurasian Economic Review* 5: 231–50. [CrossRef]

Otero, Maria. 1999. *Bringing Development Back into Microfinance*. Frankfurt: Goethe University.

PIDE. 2021. Development Finance Institution. In *Pakistan Institute of Development Economics*. Islambad: PIDE.

Roberts, Peter W. 2013. The profit orientation of Microfinance Instititions and effective interest rates. *World Development* 41: 120–31. [CrossRef]

Rozzani, Nabilah, Rashidah Abdul Rahman, Intan Salwani Mohamed, and Sharifah Norzehan Syed Yusuf. 2015. Development of Community Currency for Islamic Microfinance. *Procedia Economics and Finance* 31: 803–12. [CrossRef]

Tchuigoua, Hubert Tchakoute. 2015. Determinants of the governance quality of Microfinance Institutions. *The Quarterly Review of Economics and Finance* 58: 32–43. [CrossRef]

Widiarto, Indra, Ali Emrouznejad, and Leonidas Anastasakis. 2017. Observing choice of loan methods in not-for-profit microfinance using data envelopment analysis. *Expert Systems with Applications* 82: 278–90. [CrossRef]

Wijesiri, Mahinda. 2016. Weathering the storm: Ownership structure and performance of microfinance intitutions in the wake of the global financial crisis. *Economic Modelling* 57: 238–47. [CrossRef]

Wijesiri, Mahinda, Jacob Yaron, and Michele Meoli. 2017. Assessing the financial and outreach efficiency of microfinance institutions: Do age and size matter? *Journal of Multinational Financial Management* 40: 63–76. [CrossRef]

World Bank. 2009. *Global Monitoring Report*. Washington, DC: The International Bank for Reconstruction and Development/The World Bank.

World Bank. 2015. Microfinance: A critical literature survey. In *IEG Working Paper 2015*. Edited by T. Beck. Washington DC: Independent Evaluation Group, World Bank.

Wu, Hong. 2022. Trade openness, green finance and natural resources: A literature review. *Resources Policy* 78: 102801. [CrossRef]

Zamore, Stephen. 2018. Should microfinance institutions diversify or focus? A global analysis. *Researach in International Business and Finance* 46: 105–19. [CrossRef]

Zellner, Arnold, Jan Kmenta, and Jacques Dreze. 1966. Specification and Estimation of Cobb Douglas Production Function Models. *Econometrica* 34: 784–95. [CrossRef]