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Does Microfinance Impact Sectoral Growth?: A Case Study of Bangladesh

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Purpose: This research examined the impact of microfinance loans on sector-specific outputs—agriculture, services, and industry—and their contribution to Bangladesh's economic growth from 2008 to 2022.
Methodology: The unit root test result gave mixed-order of stationarity—three variables followed I(0), and three followed I(1). Therefore the study employed the Autoregressive Distributed Lag (ARDL) model to analyze the effects of microfinance loans on the selected sectors. Data had been taken from the Bangladesh National Portal, the Bangladesh Bureau of Statistics, the Bangladesh Economic Review, and the World Bank database.
Findings: The results showed that microfinance loans positively affected the agriculture and service sectors, promoting growth and productivity. However, a negative impact was found in the

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industrial sector, suggesting inefficiencies in utilizing financial support. Regarding sector contributions to overall economic growth, the service and industrial sectors showed positive and statistically significant impacts, aligning with Bangladesh's economic objectives. Surprisingly, the agricultural sector did not significantly contribute to economic growth, indicating potential structural challenges.

Originality: This study provided a comprehensive sector-wise analysis of microfinance's influence on Bangladesh's economic growth, offering new insights into how different sectors responded to microfinance interventions. The findings contributed to understanding the disparities in the utilization and effectiveness of microfinance across sectors.

Keywords: Microfinance; sectoral growth; economic growth and Bangladesh; autoregressive distributed lag (ARDL) model.

1. INTRODUCTION

The development of microfinance in Bangladesh is characterized by a succession of transformative moments that have impacted the country's economic environment. The initial development of microfinance dates back to the 1970s, when significant social and economic instability occurred (Hollis & Sweetman, 2001). As a consequence of widespread impoverishment and the need for financial assistance for those who are underprivileged, novel concepts started popping up.

The concept gained popularity when Mr. Muhammad Yunus initiated the Grameen Bank in 1983 (Goldsworthy, 2010). The Grameen model was remarkable; it offered small loans without collateral to disadvantaged people, primarily focusing on women. This emphasis on female borrowers was based on the idea that empowering women could result in broader community advantages and poverty reduction (Nawaz, 2019a). The success of Grameen Bank not only affirmed the effectiveness of microfinance and acquired international recognition, placing Bangladesh as a global pioneer in this domain (Khandker et al., 1995). During the 1990s, the microfinance sector encountered extensive growth (Banto & Monsia, 2021). Many non-governmental organizations (NGOs) have arisen, embracing microfinance as a mechanism for development. These organizations presented several financial services, including savings, insurance, training, and loans (Nawaz, 2019b). The Microcredit Regulatory Authority (MRA) was founded in 2006 to regulate the expanding sector, providing transparency and supporting best practices among microfinance institutions (MFIs). This framework of regulations was crucial in mitigating concerns such as high interest rates and the potential for borrower over-indebtedness (Ahmed, 2004). By the early 2000s, microfinance was a crucial financial instrument for stimulating economic development, especially in developing nations like Bangladesh (Bel-hadj & Ben Rejeb, 2018). Microfinance facilitates access to credit for low-income individuals and unbanked communities, allowing these marginalized groups to participate in productive activities, enhance their lives, and disrupt the cycle of poverty (Hartarska, 2005; Karlan, 2006; Kyereboah-Coleman & Osei, 2008).

Despite the developments, concerns appeared regarding the efficacy of microfinance in attaining sustainable economic growth (Ferdousi, 2015). Some studies argued that microfinance favorably impacts economic growth in developing nations by improving financial inclusion and alleviating poverty (Adhikary & Papachristou, 2014; Beck et al., 2009; Hamada, 2010). Nevertheless, other researchers noted that its effects may be less advantageous in more muscular banking systems, where microfinance may only sometimes contribute to significant expansion of the economy (Ahlin et al., 2011; Vanroose & Espallier, 2013). These disparities are frequently identified as insufficient access to financial services, especially in more developed nations, where specific populations continue to be oppressed by formal financial systems (Sinclair, 2001; World Bank Group, 2015). Moreover, some studies have raised questions about its effectiveness in alleviating poverty and highlighted the necessity for more thorough evaluations of its sector-specific effects. Addressing these sectoral effects is crucial for formulating targeted policies that improve the efficacy of microfinance operations. Examining these associations may provide significant insights into the responses of several businesses to microcredit which highlighting opportunities for enhancement in financial services and economic development (Khandker & Koolwal, 2016).

2. LITERATURE REVIEW

Many studies have explored the relationship between microfinance and economic development and analyzed its impact using different methods and geographic contexts. Maksudova (2010) found that microfinance contributed to GDP growth in less developed economies with underdeveloped financial systems, though its impact diminished as these economies advanced. Similarly, Donou and Sylwester (2017) observed a significant positive impact of microfinance on economic growth in 71 developing countries but found limited effects on investment and education. Lacalle-Calderón et al. (2015) compared microfinance with official development aid across 67 developing countries from 2001 to 2011 and concluded that microfinance was more effective in promoting economic growth. Brune (2009) analyzed African and Asian countries and observed a positive association between microfinance and economic development in a cross-regional analysis.

In specific country contexts, Sultan and Masih (2016) used the ARDL model in Bangladesh to show both short- and long-run positive effects of microfinance on economic growth. Mohd (2018) demonstrated a positive correlation between microfinance and economic growth in India. In Tunisia, Barguellil and Bettayeb (2020) observed a positive effect of microfinance on economic development using a VAR model, while Kulinich et al. (2022) reported similar findings for Ukraine through regression analysis. In Nigeria, Murad and Idewele (2017) found that microfinance positively impacted economic growth in the short run but had a negative effect in the long run. Similarly, Ochonogor (2020) observed a positive relationship between microfinance and economic growth in Nigeria. Sulemana and Adjei (2015) highlighted that microfinance significantly improved agricultural productivity.

Broader analyses offered mixed results. Miled and Rejeb (2018) analyzed 97 developing nations and found a negative relationship between microfinance and the poverty gap using OLS and 2SLS. Alimi (2015) found no causal link between financial development and economic growth in seven Sub-Saharan African countries. Woolley (2008) observed no significant link between microfinance and GDP growth and attributed this to sample bias and the ability of microfinance institutions to function effectively in low-growth environments. Buera et al. (2012) indicated the redistributive effects of microfinance and found more substantial impacts in general equilibrium but minimal contributions to aggregate output. Ahlin and Maio (2011) emphasized that macroeconomic growth played a crucial role in shaping microfinance outcomes and noted that economic conditions heavily influenced its effectiveness.

The existing literature has mostly looked at how microfinance affects economic growth in Bangladesh and other countries. However, no study has specifically examined how microfinance loan distribution affects different sectors in Bangladesh. This study seeks to fill this gap by analyzing the role of microfinance loan distribution in specific sectors such as agriculture, services, and industry, as well as examining their sector-specific role in driving overall economic growth.

3. RESEARCH METHODOLOGY

This research paper investigates the impact of microfinance on sector-specific outputs—agriculture, services, and industry—and their contributions to Bangladesh's economic growth from 2008 to 2022. The study is divided into two parts: the first part focuses on analyzing the effects of microfinance loan distributions on these three sectors (agriculture, services, and industry). On the other hand the second parts examine their role in driving overall economic growth during the specified period. Data on microfinance loan distributions (MLD) were gathered from the Bangladesh National Portal, Bangladesh Bureau of Statistics, and the Bangladesh Economic Review whereas, sector-specific economic growth and gross capital formation (GCF) data were sourced from the World Bank database.

After gathering the data the next step is to examine the stationarity of the selected variables. This is done using two methods: the Augmented Dickey-Fuller (ADF) test proposed by Dickey and Fuller (1979) and the Phillip and Perron (PP) test, introduced by Phillip and Perron (1988). Moreover, in both tests the variables AGR, IND and EGR are stationarity at level I (0) whereas, SVR, GCF and MFL are stationary at their first differences I (1). The combinations of I (0) and I (1) provide the framework for the ARDL model (Adil et al. (2021). Moreover, this approach has several benefits over other methods of cointegration. First, it is more reliable for determine cointegration in small samples (Pesaran et al., 1999). Second, it takes a significant number of

lags to capture the process of data generation (Laurenceson and Chai, 2003). Third, a simple transformation can be used to create an error correction model that combines short-term changes with long-run equilibrium without losing important long-run information (Pesaran et al., 1999). Additionally, it does not require all variables to have the same lag length; different variables can have different lags in the model. Laidler (1993) stated that leaving out short-run effects from long-run models may cause instability.

Thus, the present study used autoregressive distributed lag model (ARDL) for both short-run and long-run analysis as proposed by Pesaran and Shin (1995), Pesaran (1997), and Pesaran et al. (2001), using gross capital formation as a control variable. The analysis followed the application of unrestricted long-run equations to examine the relationships. Equations 1 to 3 are expressed within the ARDL framework as an unrestricted error correction model (UECM) as follow:

Part-1

$$\Delta AGR_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i}\,\Delta AGR_{t-1} + \sum_{i=0}^{p} \beta_{2i}\,\Delta MFL_{t-1} + \sum_{i=0}^{p} \beta_{3i}\,\Delta GCF_{t-1} + \theta_1 AGR_{t-1} + \theta_2 MFL_{t-1} + \theta_3 GCF_{t-1} + \epsilon_t \quad 1$$

$$\Delta SVR_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i}\,\Delta SVR_{t-1} + \sum_{i=0}^{p} \beta_{2i}\,\Delta MFL_{t-1} + \sum_{i=0}^{p} \beta_{3i}\,\Delta GCF_{t-1} + \theta_1 SVR_{t-1} + \theta_2 MFL_{t-1} + \theta_3 GCF_{t-1} + \epsilon_t \quad 2$$

$$\Delta IND_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i}\,\Delta IND_{t-1} + \sum_{i=0}^{p} \beta_{2i}\,\Delta MFL_{t-1} + \sum_{i=0}^{p} \beta_{3i}\,\Delta GCF_{t-1} + \theta_1 IND_{t-1} + \theta_2 MFL_{t-1} + \theta_3 GCF_{t-1} + \epsilon_t \quad 3$$

Part-2

$$\Delta EG_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i}\,\Delta EG_{t-1} + \sum_{i=0}^{p} \beta_{2i}\,\Delta AGR_{t-1} + \sum_{i=0}^{p} \beta_{3i}\,\Delta SVC_{t-1} + \sum_{i=0}^{p} \beta_{4i}\,\Delta IND_{t-1} + \theta_1 EG_{t-1} + \theta_2 AGR_{t-1} + \theta_3 SVC_{t-1} + \theta_4 IND_{t-1} + \epsilon_t \quad 4$$

We performed a bounds test to investigate the presence of co-integration among the variables. The null hypothesis in this test assumes that the long-run coefficients all equal zero, indicating no co-integration. If the null hypothesis is rejected, it suggests a long-run relationship exists between the variables. This analysis sheds light on the interdependencies and long-term dynamics among the variables over time.

Null hypothesis: $\boldsymbol{H_0}: \boldsymbol{\delta_1 = \delta_2 = \delta_3 = 0}$ and $\boldsymbol{H_0}: \boldsymbol{\delta_1 = \delta_2 = \delta_3 = \delta_4 = 0}$

Alternative hypothesis: $\boldsymbol{H_1}: \boldsymbol{\delta_1 \neq \delta_2 \neq \delta_3 \neq 0}$ and $\boldsymbol{H_1}: \boldsymbol{\delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq 0}$

The presence of cointegration is determined by the joint significance of the F-statistics, which are compared against two sets of critical values at various significance levels. If the calculated F-statistic exceeds the upper bound of the critical values, it suggests the presence of cointegration among the variables. Conversely, if the F-statistic falls below the lower bound, it indicates no cointegration. The cointegration result is inconclusive when the F-statistic lies between the upper and lower bounds. To determine the appropriate lag length for our analysis, we used the Akaike Information Criterion (AIC). Once cointegration is confirmed, we apply the Error Correction Model (ECM), which captures short-run dynamics while accounting for long-run adjustments. The estimated model is as follow. For a detailed discussion on ARDL model read Adil et al. (2021).

$$\Delta AGR_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i}\,\Delta AGR_{t-1} + \sum_{i=0}^{p} \beta_{2i}\,\Delta MFL_{t-1} + \sum_{i=0}^{p} \beta_{3i}\,\Delta GCF_{t-1} + \lambda ECT_{t-1} + \varepsilon_t \quad 5$$

$$\Delta SRV_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i}\, \Delta SRV_{t-1} + \sum_{i=0}^{p} \beta_{2i}\, \Delta MFL_{t-1} + \sum_{i=0}^{p} \beta_{3i}\, \Delta GCF_{t-1} + \lambda ECT_{t-1} + \varepsilon_t \quad (6)$$

$$\Delta IND_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i}\, \Delta IND_{t-1} + \sum_{i=0}^{p} \beta_{2i}\, \Delta MFL_{t-1} + \sum_{i=0}^{p} \beta_{3i}\, \Delta GCF_{t-1} + \lambda ECT_{t-1} + \varepsilon_t \quad (7)$$

$$\Delta EG_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i}\, \Delta EG_{t-1} + \sum_{i=0}^{p} \beta_{2i}\, \Delta AGR_{t-1} + \sum_{i=0}^{p} \beta_{3i}\, \Delta SVR_{t-1} + \sum_{i=0}^{p} \beta_{4i}\, \Delta IND_{t-1} + \lambda ECT_{t-1} + \varepsilon_t \quad (8)$$

(Where Δ represents the first operator of differentiation, β_0 is intercept in respective equations, AGR= agriculture sector, SVR= service sector, IND= industry sector, MFL= microfinance loan, EG= economic growth and GCF= gross capital formation, (β_{i1} - β_{i4}) indicates the short-run coefficients, whereas ($\theta_1 - \theta_4$) represent the long-run coefficients, ECT= error correction term, λ= speed of adjustment parameter with a negative sign and $\boldsymbol{\varepsilon_t}$ = error term).

Finally, diagnostic and stability tests were conducted to ensure the robustness of our findings, and the results are presented in the results and discussion section, specifically in Panel (C) of Table 4 and Fig. 3.

4. RESULTS AND DISCUSSION

Table 1 provides the descriptive and correlation analysis, offering a detailed examination of the data used for estimation purposes. The descriptive analysis highlights those variables such as SRV, MFL, and AGR exhibit low variability and normal distribution, with no significant outliers, while EG and IND show deviations, as indicated by their higher kurtosis values, suggesting potential outliers. Meanwhile, the correlation matrix reveal strong positive relationships between SRV and other variables like GCF, MFL, and AGR, emphasizing that these sectors are closely interconnected, with no negative correlations detected.

Fig. 1 summarizes Bangladesh's economic growth from 2008 to 2022. The blue line shows the annual growth rate in percentage, but the red dotted line illustrates the overall trend over the period. Around 2008, the growth rate experienced a slight decrease in the initial years, succeeded by a consistently increasing trajectory. Beginning in 2010, there was a steady growth trend, but with some problems over this period. This phase of mild fluctuations persists until 2019, with the general trend indicating upped momentum. By 2019, Bangladesh experienced one of its peak growth rates in the entire historical period.

Table 1. Analysis of Data

Panel (A): Descriptive Analysis						
Statistics	**SRV**	**MFL**	**IND**	**GCF**	**EG**	**AGR**
Mean	25.38	6.48	8.79	29.32	6.31	24.08
Std. Dev.	0.26	0.72	2.03	2.19	1.07	0.15
Skewness	0.01	-0.02	-0.99	-0.14	-1.20	-0.14
Kurtosis	1.75	1.59	3.83	1.61	4.61	1.91
Panel (B): Correlation Matrix						
Variable	**SRV**	**IND**	**AGR**	**EG**	**GCF**	**MFL**
SRV	1.00	0.29	0.99	0.29	0.96	0.99
IND	0.29	1.00	0.30	0.94	0.37	0.31
AGR	0.99	0.30	1.00	0.29	0.96	0.99
EG	0.29	0.94	0.29	1.00	0.39	0.32
GCF	0.96	0.37	0.97	0.39	1.00	0.98
MFL	0.99	0.31	0.99	0.32	0.98	1.00

Source: Author Calculation based on data obtained from Bangladesh National Portal, Bangladesh Bureau of Statistics, and the Bangladesh Economic Review and World Bank (2008-2022)

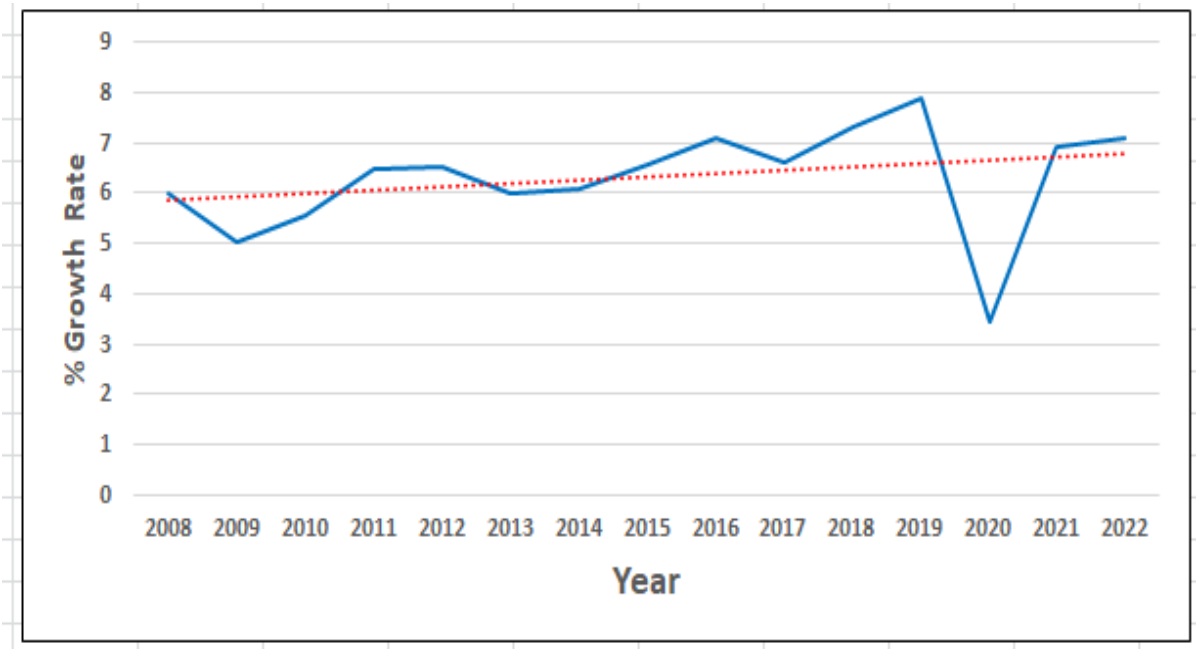


Fig. 1. Economic Growth

Source: Author Calculation based on data obtained from World Bank covering the period from 2008 to 2022.

Nonetheless, 2020 signifies a significant reduction in the growth rate, characterized by a steep decrease presumably associated with the worldwide economic recession resulting from the COVID-19 pandemic. This significant decline illustrates the economic disturbances resulting from lockdowns, decreased global demand, and restrictions on business activities experienced worldwide. In 2021, the economy saw a significant revival, recovering much of the previous year's losses. This robust recovery underscores the tenacity of the Bangladeshi economy in rebounding from the pandemic-induced downturn. By 2022, the growth rate will stabilize, although slightly less than the pre-pandemic peak. The red dotted line illustrates the long-term trend of economic growth over 15 years. Despite the yearly variances, the overarching trend is ascending, indicating steady economic growth.

Similarly, Fig. 2 illustrates the growth rates of three critical sectors of the Bangladeshi economy from 2008 to 2022: Agriculture (AGR), Industry (IND), and Services (SVR). Each sector is represented by a distinctive line, accompanied by dotted trend lines that illustrate the general growth trend over time.

The orange line indicates that agriculture experienced mild and uneven growth. The growth rate of this industry ranges from 2% to 5% in most years, signifying a gradual expansion pace. The trend line for the agricultural sector indicates a mild downward path, implying a progressive drop in growth over time. This may be ascribed to climate variability, changing labor patterns, or structural economic transformations. The industry sector, denoted by the green line, exhibits a significantly more volatile pattern. This sector experiences substantial fluctuations in growth rate, with peaks above 12% in certain years, notably in 2017 and 2019. However, there was a significant decline, particularly in 2020, coinciding with the worldwide economic recession induced by the COVID-19 pandemic. The industrial sector is recovering significantly, achieving a high growth rate by 2021. The industrial trend line continues to grow higher, reflecting a generally good trajectory and signifying that the industry has been a vital contributor to economic growth in Bangladesh. The service sector, represented by the blue line, exhibits a comparatively stable growth rate with less volatility than the industrial sector. The growth rate for services generally fluctuates between 5% and 7%, demonstrating a steady contribution to the economy. Nonetheless, similar to other sectors, services experienced a significant downturn in 2020 due to the pandemic, succeeded by an upsurge in the following year. The trend line for services demonstrates moderate and consistent growth over time, indicating that this sector has

consistently contributed to Bangladesh's economy. Overall, the graphic illustrates the distinctive growth directions of the three sectors. Agriculture continues to experience slow and declining growth; industry exhibits greater dynamism with significant fluctuations, whereas services sustain a consistent but moderate growth rate. The pandemic's effects in 2020 are evident across all sectors; nevertheless, industry saw the most significant volatility, whereas services and agriculture exhibited a more moderated response. The trend lines indicate that although agriculture may encounter difficulties sustaining growth, the industrial and service sectors are expected to continue promoting Bangladesh's economic development.

On the other hand, the agriculture sector experienced greater volatility, specifically post-2010. Growth exhibited a declining tendency after an initial increase, observing a significant decline around 2020, followed by a gradual regaining in the years following. The graph illustrates the significant effects of external shocks, like the pandemic, on all sectors, with the industrial sector exhibiting the most volatility, whereas the service and agriculture sectors saw more steady trends.

Fig. 2. Sector-wise Growth

Source: Author Calculation based on data obtained from World Bank covering the period from 2008 to 2022.

Table 2. Stationarity Results

	ADF-Unit Root		PP- Unit Root		
Variables	**Level (with Constant)**	**First Difference (with Constant)**	**Level (with Constant)**	**First Difference (with Constant)**	**Order of Integration**
	t- Statistics	**t-statistics**	**t-statistics**	**t-statistics**	
AGR	-6.034316**	-----	-4.784507***	------	**I (0)**
SVR	-------	-3.585621**	------	-5.439329***	**I (1)**
IND	-3.213209**	------	-4.533528**	-------	**I (0)**
GCF	------	-3.534066**	-3.446332**	-------	**I (1)**
MFL	-------	-4.496300**	---------	-5.680482***	**I (1)**
EGR	-3.961078***	-------	-3.961316***	-------	**I (0)**

Source: Author Calculation based on data obtained from Bangladesh National Portal, Bangladesh Bureau of Statistics, and the Bangladesh Economic Review and World Bank covering the period from 2008 to 2022.

Table 2 displays the results of the stationarity tests obtained from ADF and PP unit root methods. The ADF findings indicate that agriculture (AGR), industrial sector (IND) and economic growth rates (EGR) are stationary at levels whereas service sector (SVR), microfinance loans (MFL) and gross capital formation (GCF) exhibit stationarity at their first differences. Moreover, the ADF findings are further supported by PP test. Both tests indicate a mixed order of integration among variables at the 5% significance level. Thus the mixed order of integration provides the basis for using the ARDL approach to estimate both long-run and short-run coefficients (Pesaran et al., 2005), and the estimated results are reported in Table 3.

We employed the bound test to assess the association's importance over a long period. Table 4 presents the outcomes for four distinct equations, with F-values of 10.26, 14.60, 10.95, and 55.32 for Equation 1, Equation 2, Equation 3, and Equation 4 of Part 2, respectively. The F-statistics exceed the lower and upper bounds at the 1% significance level, demonstrating a long-run connection among the variables.

Table 3. ARDL Bound Result

Part-1			
Level of Significance	**Lower Bound I(0)**	**Upper Bound I(1)**	**F-Statistics (Part-1)**
10%	3.17	4.14	
5%	3.79	4.85	Eq.1 (10.26)
2.5%	4.41	5.52	Eq. 2 (14.60)
1%	5.15	6.36	Eq. 3 (10.95)
Part- 2			
10%	2.72	3.77	
5%	3.23	4.35	
2.5%	3.69	4.89	Eq. 4 (55.32)
1%	4.29	5.61	

Source: Author Calculation based on data obtained from Bangladesh National Portal, Bangladesh Bureau of Statistics, and the Bangladesh Economic Review and World Bank covering the period from 2008 to 2022.

Table 4. Empirical Estimation

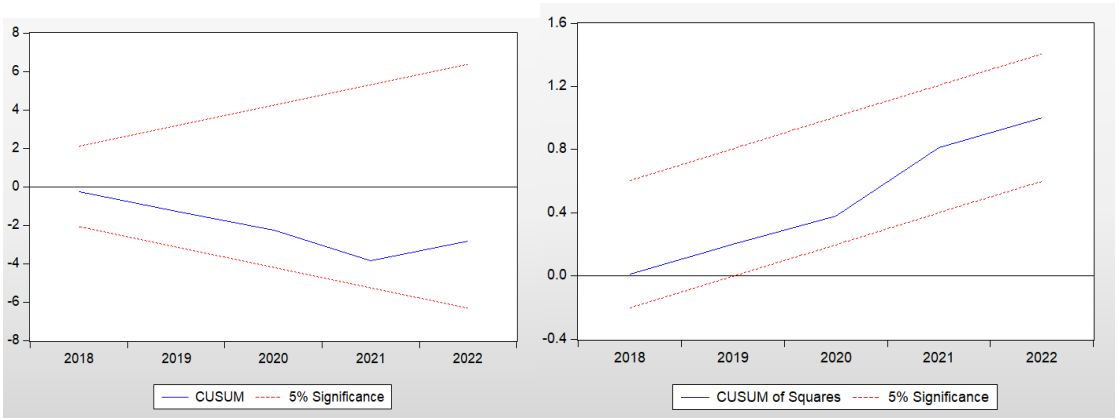
Panel (A): Long-run & Short-run coefficients of Part- 1					
Long-Run Estimates			**Short-Run Dynamic**		
Summary Statistics For Equation 1			**Summary Statistics For Equation 5**		
Variable	Coefficient	Prob.	Variable	Coefficient	Prob.
MFL	0.186702	0.0340	ECM	-0.359344	0.0012
GCF	-0.001669	0.9381	R-Squared		0.87
Summary Statistics For Equation 2			**Summary Statistics For Equation 6**		
MFL	0.161248	0.0405	ECM	-0.082176	0.0000
GCF	0.070642	0.0111	R-Squared		0.84
Summary Statistics For Equation 3			**Summary Statistics For Equation 7**		
MFL	-4.038714	0.0105	ECM	-2.196657	0.0003
GCF	1.533994	0.0005	R-Squared		0.89
Panel (B): Long-run & Short-run coefficients of Part- 2					
Summary Statistics For Equation 4			**Summary Statistics For Equation 8**		
AGR	-4.721761	0.0741	ECM	-0.976826	0.0000
SVR	4.092251	0.0145	R-Squared		0.94
IND	0.157914	0.0000			
Panel (C): Diagnostic Results					
		Part-1			**Part-2**
Test	Test Name	Prob. Eq1	Prob. Eq2	Prob. Eq3	Prob. Eq4
Serial Correlation	Breusch-Godfrey	0.79	0.72	0.97	0.81
Heteroscedasticity	Breusch-Pagan	0.48	0.62	0.37	0.06
Normality Test	Jarque-Bera	0.59	0.88	0.81	0.59

Source: Author Calculation based on data obtained from Bangladesh National Portal, Bangladesh Bureau of Statistics, and the Bangladesh Economic Review and World Bank covering the period from 2008 to 2022.

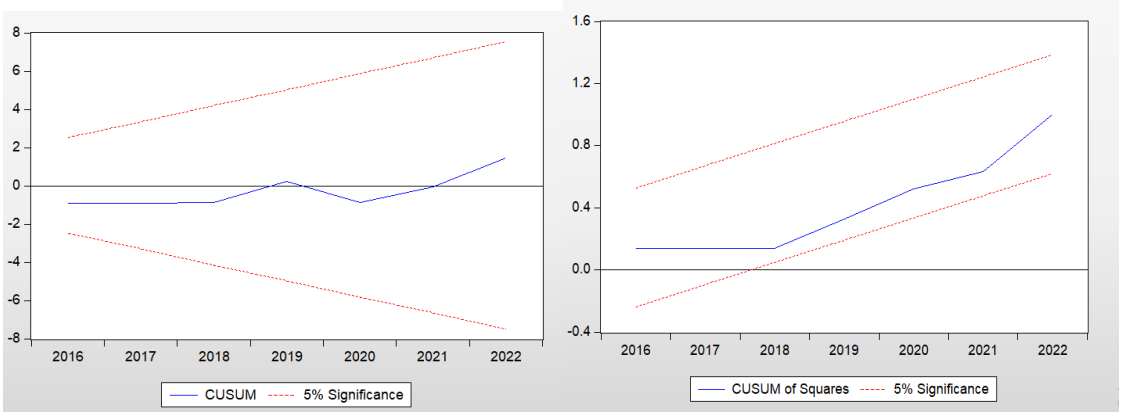
Table 4 presents the long-term estimations and short-term dynamics for all specified equations. In Equation 1, with the agriculture sector as the dependent variable and microfinance loan distribution (MFL) and gross capital formation as independent variables, the findings demonstrate that a 1% increase in MFL results in a 0.19% rise in agricultural production. In Equation 2, with the service sector as the dependent variable, a 1% increase in MFL results in a 0.16% rise in the service sector. In Equation 3, using the industrial sector as the dependent variable, a 1% rise in MFL leads to a 4.038% reduction in industrial output in the long term. The significant adverse effect of microfinance lending on the industrial sector emphasizes the substantial disparity between microfinance programs and the industrial sector in Bangladesh (Alauddin & Chowdhury, 2015; Hasan & Islam, 2008). Furthermore, the positive and statistically significant outcomes for the agriculture and service sectors emphasize the significance of microfinance loan allocation in Bangladesh.

Following an analysis of the effects of load distribution on the agriculture, service, and industry sectors, a subsequent investigation was performed to assess the contributions of these sectors to Bangladesh's economic growth. The empirical findings in Table 4 of Part 2 reveal that the service and industry sectors positively influence economic growth, but the agriculture sector has a negative effect. The positive and statistically significant influence of the service and industrial sectors affirms the prior findings of Islam et al. (2020) and Yousuf et al. (2019). Nonetheless, the service sector proved to be the more significant determinant, as seen by its higher coefficient values relative to the industrial sector in the long term.

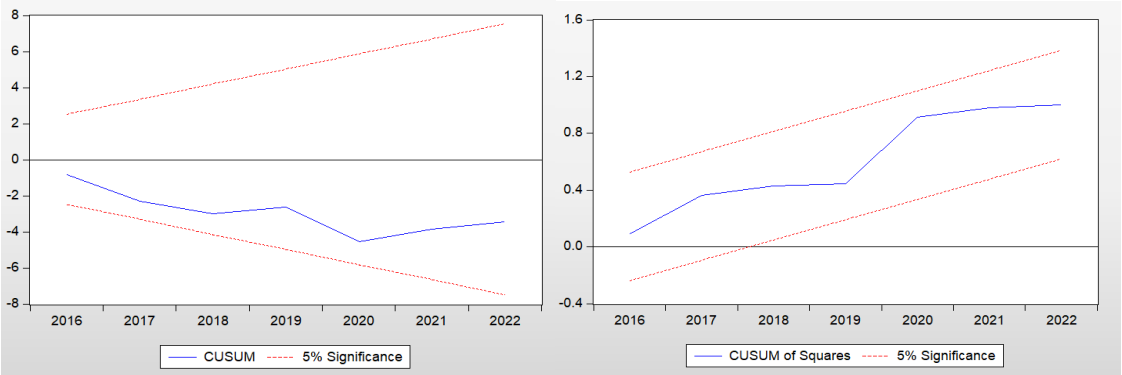
Furthermore, the model demonstrates significant explanatory power, as the corresponding R-squared values. The error correction model (ECM) for Equations 1, 2, and 3 in Part 1 and Equation 4 in Part 2 exhibits negative and statistically significant coefficients. These suggest that any short-term disequilibrium can be rectified within a year at rates of 0.36, 0.08, 2.20, and 0.97, respectively.



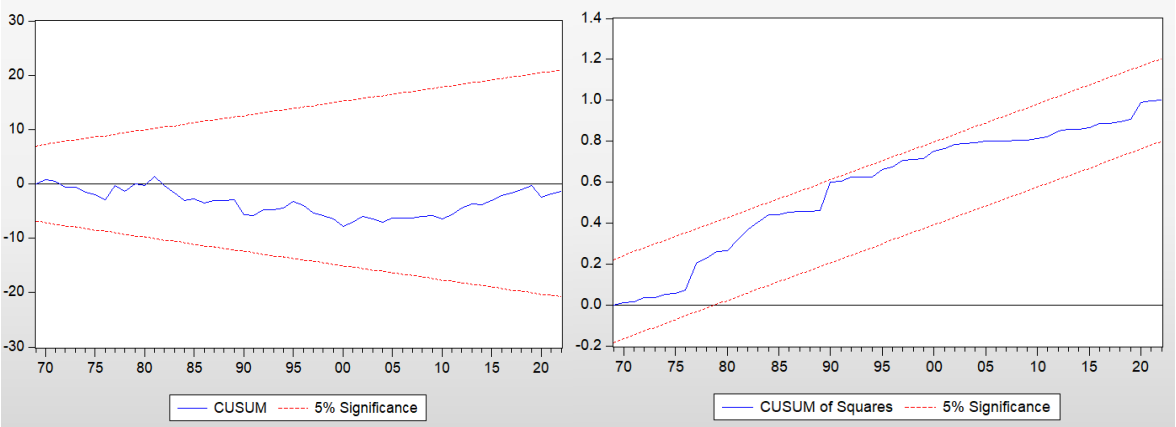
Equation 1



Equation 2



Equation 3



Equation 4

Fig. 3. Stability Results

Moreover, the diagnostic tests have been conducted to validate the long-run and short-run ARDL model findings, with results displayed in Table 4 of panel C. The Breusch-Godfrey Lagrange Multiplier (LM) test validated the absence of serial correlation in the model, while the Breusch-Pagan test demonstrated a presence of homoscedasticity. The Jarque-Bera test further confirmed that the residuals follow a normal distribution, proven by their corresponding p-values.

The CUSUM and CUSUMSQ plots in Fig. 3 remain inside the 5% critical boundaries, signifying model stability (Brown et al., 1975). Consequently, all diagnostic and stability assessments validate that the model has favorable econometric characteristics, providing it appropriate for policy implications.

5. CONCLUSION

The Autoregressive Distributed Lag model results demonstrate that microfinance loans positively impact both the agriculture and service sectors, enhancing growth and productivity in these domains. The results indicate the adverse impact of microfinance on the industrial sector, implying that the financial assistance intended to foster growth may not be efficiently employed in this area. The service and industrial sectors exhibit a favorable and statistically significant impact on total economic growth. This signifies that expansion in these sectors aligns with Bangladesh's broad economic goals. Contrary to predictions, the agricultural sector does not significantly influence economic growth, emphasizing potential inefficiencies and problems within this vital sector. These findings illustrate the necessity for policymakers and government officials in Bangladesh to tackle the minimal impact of microfinance on the industrial sector and the agricultural sector's insufficient contribution to economic growth. Formulating suitable regulations that improve the efficacy of microfinance in these regions is crucial for optimizing its capacity as an instrument for

economic development. By enhancing techniques that address the distinct requirements of each sector, the government can more effectively utilize microfinance's potential to promote sustainable growth and enhance overall economic performance. Extending the scope of the study would explain microfinance's function in sector-specific loan allocation and its influence on the economic growth of various sectors in Bangladesh.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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