Do Institutional Characteristics of Microfinance Institutions Matter for External Sources of Funds? Evidence from Bangladesh

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Abstract

This study mainly aims to examine whether the institutional characteristics matter for external sources of funds of microfinance institutions (MFIs) in Bangladesh considering unbalanced panel data of 258 MFIs for the period of 2009-2014. The study considers four institutional characteristics of MFIs, namely, the number of branches, profitability measured by return on assets, location, and age of MFIs as well as several macroeconomic variables such as interest rate cap, economic growth, and inflation. The external sources of funds are decomposed into five sub-panels, that is, government funds, loans from commercial banks, loans from Palli Karma Sahayak Foundation, donors' funds, and loans from other MFIs in order to draw more conclusive evidence. It also helps provide a comparative analysis on the effects of each institutional characteristic of MFIs on different types of external sources of funds. The study employs the Poisson pseudo maximum likelihood method which is supposed to be more appropriate in the present case for avoiding the problem associated with zero value of dependent variable. The estimation results suggest that institutional characteristics of the MFIs contribute considerably in supporting the growth and development of the industry by drawing funds from external financial sources albeit some indicators of institutional characteristics refer to adverse impact on a few external sources of funds. In the case of macroeconomic factors, market intervention through the interest rate cap limits the operation of microfinance institutions making funds scarce for them. Additionally, the comparative analysis of alternative funding both from the debt and equity sources will help policymakers and managers to adopt an appropriate policy to attain the cost-effectiveness of MFIs of Bangladesh which is one of the important policy implications of the study.

Keywords: Microfinance institutions, institutional characteristics, Poisson pseudo maximum likelihood estimation approach, Bangladesh

I. Introduction

The longstanding history of the microfinance industry in Bangladesh approves the optimal utilization of the sources of funds which has a significant impact on the overall performance of microfinance institutions (MFIs) (Mia & Rana, 2018). The number of borrowers in the microfinance industry, as illustrated in Table 1, reaches over 25 million in 2018 that covers nearly 16% of Bangladesh's total population. The amount of loans disbursed by the MFIs in Bangladesh is over 14 billion dollars in the same period. Such a remarkable development of the microfinance industry in Bangladesh is owing to its rapid transformation from a grant-based small operation to a loan-based large operation. It helps the industry reach more than 31 million clients in 2018 which is mainly

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attributed to the inclination of the dominant microfinance institutions to move towards a loan-based more commercial-type financing structure.

Table 1: Overview of the Microfinance Sector (2014-2018)

Particulars	2014	2015	2016	2017	2018
Number of Licensed NGO-MFIs	742	753	758	783	805
Number of Branches	14730	15609	16284	17120	18196
Number of Employees	109628	110781	127820	139526	153919
Number of Clients (Thousand People)	25.110	26.000	27.790	30.820	31.220
Total borrowers (Thousand People)	19.420	20.350	23.280	24.940	25.400
Loan Disbursement (USD Million)	5.440	7.460	9.260	12.310	14.140
Amount of Savings (USD Million)	1.260	1.590	2.010	2.550	3.090
Loan Recovery Rate	95.95	82.41	91.11	90.74	92.54

Note: NGO-MFIs indicates the microfinance institutions of non-government organizations.
Source: Microcredit Regulatory Authority database (2020).

The major external sources of funds (ESF) are loans from the government (GOVT), loans from Palli Karma Sahayak Foundation (PKSF), loans from commercial banks (BANK), donors' funds (DON), and loans from other MFIs (MFIB) while the internal sources of funds are savings of the depositors and cumulative surplus (profit). The mix of the fund in microfinance as both value and share of total non-government funds is shown in Table 2.

Table 2: Source of fund of Non-Government-MFIs in Bangladesh

Items	2014		2015		2016		2017		2018	
	Value	%	Value	%	Value	%	Value	%	Value	%
Clients' Savings	1.378	34.21	1.737	33.94	2.175	32.34	2.694	34.93	3.151	35.44
Cumulative Surplus	1.301	32.28	1.766	34.52	2.144	31.89	2.619	33.95	3.094	34.82
Loan from Commercial Banks	663	16.47	879	17.19	1.691	25.14	1.658	21.50	1.823	20.51
Loan from PKSF	444	11.04	484	9.47	519	7.72	546	7.08	573	6.45
Donors' Fund	88	2.19	66	1.31	63	0.94	66	0.87	89	1.01
Other Funds	153	3.81	182	3.57	131	1.96	129	1.68	157	1.77
Total	4.027	100	5.117	100	6.725	100	7.714	100	8.888	100

Note: Values of funds are in thousand dollars. PKSF is Palli Karma Sahayak Foundation.
Source: Microcredit Regulatory Authority database (2020).

As seen in Table 2, MFIs are intensely financed by the internal sources of funds, namely savings of depositors and cumulative surplus. The most important ESF turned out to be loans from commercial banks. Besides, microfinance wholesale funding agency PKSF delivered a sizeable amount of loan funds at a subsidized rate. Grants from the national and international donor agencies are found to have the smallest share in the ESF. Commonly, while the total fund increased significantly over time, the composition of funds remained almost unaltered with exception of the increasing share of commercial bank loans.

Institutional characteristics like profitability, location choice, and outreach of the MFIs appear to be imperative in empirical literature as they largely determine the cost-effectiveness and thereby sustainability of these institutions. Cull et al. (2007) consider MFIs as micro banks' operations of which is aiming to earn profit and alleviate poverty. For promoting these targets, MFIs should rely on external sources of funding (Tchuigoua, 2015). Financing choices of small businesses (Aktas et al., 2011), small and medium-sized enterprises (Degryse et al. 2012), and large organizations (Rajan & Zingales, 1995; Frank & Goyal, 2009) are substantially influenced by institutional characteristics of these organizations. For instance, De Sousa-Shields and Frankiewicz (2004) identify the effects of institutional life cycle and maturity on financing choice to the MFIs which have later been supported by Ledgerwood and White (2006). Mersland and Urgeghe (2013) investigate the factors influencing the international funding of microfinance and find that profitability of MFIs and their outreach play a crucial role in enhancing the likelihood of MFIs to appeal to international commercial debt. Despite the move towards the

loan-based more commercial-type financing structure from the very beginning of the inception of MFIs in Bangladesh, whether the institutional characteristics of these organizations matter in drawing the attention of funds from external sources has not yet been addressed in empirical research.

Apart from the institutional characteristics, sources of funds of MFIs are also influenced by the interest rates (Fernando, 2006; Rosenberg et al. 2013; Khafagy & Mersland, 2013). The interest rate on microloans is largely determined by the costs associated with the financing of MFIs. In other words, costs of funds depend on the sources of funds, which ultimately determine interest rates of MFIs (Roberts, 2013; Ghosh, 2013; Assefa & Meesters, 2013; Dorfleitner et al., 2013; Janda & Zetek, 2014; Al-Azzam & Mimouni, 2016). The use of external debt by MFIs, for instance, the commercial bank's debt, leads to an increase in the cost of funds which eventually increases the interest rate. And it could restrict the outreach of MFIs and thus become a financial burden as well as a barrier to getting access funds for borrowers (Sun & Im, 2015). Miller (2013) argues that setting the microfinance industry free in determining the interest rates on microloans will bring about an unjust result due to the desire for excessive return on the financing of the financial institutions by charging high interest rates to clients. However, Mia (2016) doesn't suggest intervening in the market by setting an interest rate ceiling as it works as a threat to the sustainability of newborn and high-cost MFIs. Therefore, the impact of market intervention through the interest rate cap introduced in the microfinance industry of Bangladesh in 2011 is also an empirical issue. The study, therefore, aims to investigate the factors determining the capital structure of MFIs with particular reference to institutional characteristics. It will primarily investigate the responsiveness of ESF towards the key factors that delineate the institutional characteristics of MFIs along with the impact of some macroeconomic factors. The external sources of funds are decomposed into five sub-panels, that is, government funds, loans from commercial banks, loans from Palli Karma Sahayak Foundation, donors' funds, and loans from other MFIs in order to draw more conclusive evidence.

This study will assist the policymakers and managers to minimize the cost of funds by offering alternative funding both from debt and equity sources. The organization of the rest of the study is as follows: Conceptual framework and related literature are discussed in section 2. The econometric model and data used for the empirical analysis are presented in section 3. Section 4 is devoted to the analysis and empirical findings. The study ends with the conclusion part.

II. Conceptual Framework and Literature Review

Microfinance has been recognized as one of the growing flexible means of spreading financial services to the poor confirming their access to it at affordable terms and thereby help alleviate poverty (Armendáriz & Morduch, 2010). However, what makes the businesses of MFIs more challenging is their limited access to the commercial sources of funds particularly in the medium to long-term which would be sustainable. The sources of funds of MFIs are shareholders funds, customer's deposits, grants or donations from individuals, organizations, government, and international sources, debenture, qualifying medium to long-term loans (Anyanwu, 2004).

Currently, an increasing number of non-governmental microfinance organizations are focusing more on deposit collections than giving credit for providing saving services to low-income people which helps them support their capacity to mobilize and intermediate voluntary savings (Ledgerwood & White, 2006). But, most of the MFIs are trying to alleviate poverty by providing credit to poor households mostly based on subsidies (Morduch, 1999). Analyzing Kyrgyzstan as a case study, Alkhan and Hassan (2020) concluded that Islamic microfinance contributes to poverty reduction, economic improvement, increasing social condition of society, wealth distribution and circulation, and enhancing intellectual levels of society.

Hasan and Ahmed (2009), while pointing out the future sources of funds of MFIs, give importance to the mobilization of members' and non-members' saving deposits, commercial sources of funding from the financial and stock markets. Their study finds the prevailing system of directing funds to MFIs, particularly funds from the government and donors, to be inefficient in achieving the objective of poverty alleviation as it is fairly arduous to figure out the amount that goes to the underprivileged. Some predictions suggest that a marginal amount, nearly about 10 to 25 percent of funds from the donor reach the underprivileged, and the greatest portion is spent on management and administration, overhead, institution building, training, and consultants which sets the MFIs into the challenge of their sustainability issue (Yunus, 1999).

The self-sustainability of MFIs is indirectly affected by the regulatory variables. There is a negative relation between the sustainability of MFIs and their financial leverage ratio (Hartarska & Nadolnyak, 2007). Financial leverage is one of the external sources of capital. Thus, external sources of capital influence the sustainability of MFIs. MFIs' level of sustainability varies due to the capital formation process and large dependency on donor funds decreases the self-sustainability (Bogan, 2012). Along with the sources of funds, other factors as development strategies, and harmonization of microfinance interventions influence the sustainability of microfinance institutions (Annim, 2012). Only a few MFIs can sustain based on their earnings but most of the MFIs need to depend on other sources of capital. Therefore, such dependency influences heavily enduring sustainability (Pollinger et al., 2007).

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The source of funds of MFIs is gradually receiving more importance to the experts considering its role in addressing the issue of financial exclusion. The varying degrees of sustainability of MFIs are primarily because of the capital constraints which limit the ability of these institutions in expanding their microfinance programs. Hence, how best these organizations are to be financed is a key concern (Bogan, 2012). Hartarska and Nadolnyak (2008) mention that all the rating agencies do not influence MFIs' sources of funds. But the commercial investment is essential to support the growth of microfinance (Cull et al., 2009). Zaman (2004) argues that poors' access to financial resources could largely be determined by the strategic donor investments in an MFI. Adongo and Stork (2006) identify a positive association between donor involvement in providing start-up funds for the loan portfolio and financial sustainability. Hartarska and Nadolnyak (2008) find leverage of MFIs hurts their sustainability. Garmaise and Natividad (2010) mention two reasons for differing financing sources of MFIs from banks. Firstly, the demand deposit is not the main source of finance. They got the mean ratio of demand deposits to assets only 0.08, and the median zero. Secondly, non-commercial lenders (development agencies, governments, co-operatives, and other MFIs) provide the debt financing of MFIs in addition to the usual commercial sources.

The cost of funds is an important issue for all MFIs in Bangladesh. For example, Rosenberg et al. (2009) find that cost of funds is one of the four influencing factors of interest rates in MFIs. They also explored that the operating costs of MFIs represent about 60% of the total cost, which usually depends on the institutional characteristics as loan size, age of the MFIs, location and client rating, etc. Besides, the cost of funds, as Jayadev and Rao (2012) claim, is the most influencing element for fixing the interest rate of MFIs that are less leveraged than commercial banks.

Like any other financial institution, the sources of funds of MFIs are debt and equity. The unique nature of the sources of funds of MFIs is that a part of MFIs' external financing is subsidized (Tchuigoua, 2015). The fund of donors, some charities, and socially responsible investors are still the sources of funds of many MFIs in the world (Armendáriz & Morduch, 2010). The sources of fund composition of MFIs in Bangladesh are client's savings, loans from the government, loans from other MFIs, loans from commercial banks, cumulative surplus, loans from PKSF, and donor's funds. There is no significant study found on the impact of institutional characteristics on sources of funds in MFIs in Bangladesh that the study is going to address. The study considers four institutional characteristics of MFIs in Bangladesh, namely, the number of branches, profitability measured by return on assets, location, and age of MFIs.

III. Econometric Model and Data

For deriving an econometric model, an approach similar to that of Janda and Zetek (2014) has been followed in the study. Hence, the econometric model could be defined as follows:

$$ESF_{it} = \alpha_0 + \beta_1 NOB_{it} + \beta_2 ROA_{it} + \beta_3 LOC_{it} + \beta_4 AGE_{it} + \beta_5 (AGE_{it})^2 + \Theta Z_{it} + \varepsilon_{it} \quad (1)$$

In equation 1, i represents the MFIs with a period t and ε_{it} denotes the stochastic error term. For a dependent variable, this study used the ESF as a proxy to capture all the major external sources. The major ESF are GOVT, BANK, PKSF, MFIB, and DON. In this way, we decompose the ESF in the econometric model. So, we estimate five different models. This analysis process is healthier and robust in terms of examining of ESF of MFIs. According to the results, the factors that affect different types of ESF of MFIs will be determined.

To examine the impact of institutional characteristics on ESF, the model considers four factors, namely, the size of MFIs that are represented by the number of branches (NOB), profitability measured by return on assets (ROA), location (LOC), and age of MFIs (AGE). Generally, there is a positive association between profitability and debt financing. So, it is expected that ROA has a positive effect on sources of funds. Location is included to examine what location chooses induce what type of financing more. The number of branches, namely the size of MFIs has also a positive effect on external financing according to theoretical expectations. Besides, the age of MFIs is included to examine how the experience, as well as longevity, affect the financing policy. Generally, higher age refers to a greater experience of MFIs and the external financing policy is more likely to be affected by the experience of MFIs. Moreover, this study also included a quadratic of AGE (AGE^2) to identify the likelihood of a non-linear association with external funding policy to apprehend the 'learning curve' effect (Mia & Rana, 2018).

The model also includes three macroeconomic variables, namely interest rate cap (INTCAP), growth rate of gross domestic product (GDPGR) and rate of inflation (INF) (Ahlin et al. 2011). These variables are the control variables as shown in equation 2:

$$ESF_{it} = \alpha_0 + \beta_1 NOB_{it} + \beta_2 ROA_{it} + \beta_3 LOC_{it} + \beta_4 AGE_{it} + \beta_5 (AGE_{it})^2$$
$$+ \beta_6 INTCAP_{it} + \beta_7 GDPGR_{it} + \beta_8 INF_{it} + \varepsilon_{it} \quad (2)$$

The INTCAP, introduced to the microfinance sector in 2011 in Bangladesh, functions as a dummy variable. As the INTCAP is launched to check the interest rates in the microfinance sector, a negative impact of

INTCAP on external funding is expected. Moreover, the GDPGR demonstrates the overall prosperity of an economy, it may signal the MFIs to collect more funds from the ESF. Like Janda and Zetek (2014), INF is also included in the model as an explanatory variable. As per expectation, there should be a negative relationship between INF and ESF. Hence, the alternative hypotheses include $\beta_1, \beta_2, \beta_3, \beta_4, and \beta_7 > 0, \beta_6, \beta_8 < 0$ and $\beta_5 \neq 0$, where a positive (negative) value of β_5 indicates a direct (inverse) non-linear association between ESF and its determinants.

The definitions and explanations of the variables are reported in Table 3.

Table 3: Variables and Descriptions

Variables	Descriptions
	Dependent variables
ESF	External sources of funds (this variable is decomposed into five compounds as stated below)
GOVT	Government funds. Amount of government loans (state-owned bank) and concessionary funds divided by the total amount of fund of an MFI*100
BANK	Loans from commercial banks. The total amount of borrowed capital from commercial banks divided by the total funds of an MFI*100
PKSF	Loans from Palli Karma Sahayak Foundation. Amount of PKSF funds divided by the total funds of an MFI*100
MFIB	Peer borrowing. The total amount of borrowed capital from peer MFIs divided by the total amount of funds of an MFI*100
DON	Donors' fund. The total amount of donations divided by the total funds of an MFI*100
	Explanatory variables
NOB	Number of Branches. The size of an MFI is based on the total number of branch
ROA	Return on the asset. Total earnings divided by total asset
LOC	Location. Dummy variable 1 if the MFI was registered in the capital city of Dhaka, otherwise 0
AGE	Age of MFI. Year of the establishment (registration) of an MFI
INTCAP	Interest-rate cap. Dummy variable 0 before the interest rates cap in 2011, dummy variable 1 after 2011
GDPGR	Growth rate. The annual gross domestic product growth rate
INF	Inflation rate. Rate of price change in the economy as a whole

This study uses only secondary data which includes annual reports (Non-Governmental Organization-MFIs statistics in Bangladesh) of the Microcredit Regulatory Authority, Bangladesh. The study has included a period of six years, from 2009 to 2014. During this period those MFIs existed and completed datasets are considered for the study as the number of MFIs is not equal throughout the time. Accordingly, one hundred sixty-nine samples are finalized for the study. And the samples are well representative of the whole sector. For instance, considering 2009 as a base year, it represents 85.87% (clients), 85.79% (borrower), 86.92% (total loan outstanding), and 86.74% (total net savings) of the microfinance institutions in Bangladesh.

IV. Analysis and Empirical Results

The winsorized observations are used in descriptive statistics and regressions. Descriptive statistics of the variables are given in Table 4.

Table 4: Descriptive statistics of the variables

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
GOVT	1011	1.546	4.706	0.000	28.360
MFIB	1011	1.585	4.832	0.000	28.420
BANK	1011	4.627	11.082	0.000	54.130
PKSF	1011	22.610	27.618	0.000	89.540
DON	1011	2.097	7.453	0.000	43.990
NOB	1014	56.512	229.056	1.000	2029
ROA	1012	3.226	3.956	-10.170	16
LOC	1014	0.290	0.454	0.000	1.000
AGE	1014	16.878	7.582	4	38

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INTCAP	1014	0.500	0.500	0.000	1.000
GDPGR	1014	5.950	0.525	5	6.5
INF	1014	7.498	1.678	5.423	10.705

Source: Authors' computations.

From the descriptive statistics, we find that PKSF is the largest source among all the ESF. It has a mean value of 22.62% whereas its maximum value is 89.54%. The second highest ESF is BANK and its mean value and highest value are 4.63% and 54.13% respectively. The other external sources are DON, MFIB, and GOVT, and their mean values are 2.1%, 1.59%, and 1.55% respectively. It is also found that there are MFIs that do not use external funds having zero percentages. Therefore, some of the MFIs only depend on internal sources of funds. On the contrary, some MFIs depend mostly on external sources. Because their maximum values are more than 50%. In terms of the macroeconomic situation, the sample period has a moderate GDPGR with a mean value of 5.95%, while a double-digit inflation rate (10.7%) was also observed during the study period. In Table 5, correlation coefficients between variables are reported. From the pairwise correlation analysis, it is found that there is no multicollinearity between explanatory variables.

Table 5: Pairwise correlation between variables

Variables	NOB	AGE	INTCAP	INF	GDPGR	ROA	LOC
NOB	1						
AGE	0.4086	1					
INTCAP	0.024	0.2204	1				
INF	0.0033	0.0184	-0.3496	1			
GDPGR	0.0186	0.1641	0.4762	0.5176	1		
ROA	0.079	0.0277	0.0632	0.011	0.06	1	
LOC	-0.09	-0.1619	0	0.0002	-0.0001	0.017	1

Source: Authors' computations.

The unbalanced panel data analysis procedure is followed to estimate the regression model in equation 2. The choice of the estimator to be used in the process of analyzing panel data is of great importance in terms of the consistency and effectiveness of the findings. The regression relationships between dependent variables and their predictors in panel data that includes cross-section (i) and time (t) dimensions are traditionally estimated with the ordinary least squares (OLS) method using the estimators like the pooled OLS, fixed effects, and random effects. In this process, the econometric model is linearized through logarithmic transformation and estimated using the OLS method where the error term variance is assumed to be constant between observations (Burger et al., 2009, p.169; Gómez-Herrera, 2013, p.1088). However, linearization with logarithmic transformation causes that the expected value of the error term depends on the explanatory variables if the error term variance is not constant (a situation is often seen in practice). This situation may violate the exogeneity assumption of the OLS method and lead to biased and inconsistent estimation results. As a consequence, the results of the heteroscedasticity tests conducted for the econometric model shown in equation 2 are presented in Table 6.

The results in Table 6 indicate the existence of a heteroscedasticity problem in all model specifications. The main criticism of Santos Silva and Tenyerno (2006) to the related empirical literature is that the parameter coefficients obtained from the estimation of linear logarithmic models with the OLS method may be highly biased under the presence of heteroscedasticity. Santos Silva and Tenyerno (2006) have concluded that heteroscedasticity can lead to quite strikingly different estimation findings if the econometric model is transformed into a linear logarithmic form rather than estimated at the original form. Besides, Santos Silva and Tenyerno (2006), by drawing attention to the problems created by zero values of the dependent variable in the estimation process of the econometric model, suggested that econometric models should be estimated in multiplicative form using Poisson pseudo maximum likelihood (PPML) estimator[v].

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[v] The interpretation of the coefficients obtained from the PPML estimator is similar to that of the OLS. Although the dependent variable is defined at the level value, the parameter coefficients can be interpreted as simple elasticities if the independent variables are defined in logarithmic form. If the independent variables are defined in level values, the parameter coefficients are interpreted as semi-elasticities (Shepherd, 2016, p.38).

Table 6: Results of Heteroscedasticity Tests

DON			
	Tests	*Statistics*	*Probabilities*
Pooled OLS	Breusch-Pagan / Cook-Weisberg Test	$X^2(8) = 188,39$***	0,000
	Breusch-Pagan / Cook-Weisberg Test (based F test)	$F(1,1007) = 10,29$***	0,001
Fixed Effects	Modified Wald test for group wise	$X^2(169) = 7100,16$***	0,000
Random Effects	W0	df (168, 840) = 12,061***	0,000
		df (168, 840) = 3,691***	
	W50	df (168, 840) = 12,062***	0,000
	W10		0,000

BANK			
	Tests	*Statistics*	*Probabilities*
Pooled OLS	Breusch-Pagan / Cook-Weisberg Test	$X^2(8) = 227,40$***	0,000
	Breusch-Pagan / Cook-Weisberg Test (based F test)	$F(1,1007) = 34,09$***	0,000
Fixed Effects	Modified Wald test for group wise	$X^2(169) = 2200,05$***	0,000
Random Effects	W0	df (168, 840) = 12,061***	0,000
		df (168, 840) = 3,691***	
	W50	df (168, 840) = 12,062***	0,000
	W10		0,000

GOVT			
	Tests	*Statistics*	*Probabilities*
Pooled OLS	Breusch-Pagan / Cook-Weisberg Test	$X^2(8) = 293,87$***	0,000
	Breusch-Pagan / Cook-Weisberg Test (based F test)	$F(1,1007) = 6,21$**	0,013
Fixed Effects	Modified Wald test for group wise	$X^2(169) = 2200,05$***	0,000
Random Effects	W0	df (168, 840) = 12,061***	0,000
		df (168, 840) = 3,691***	
	W50	df (168, 840) = 12,062***	0,000
	W10		0,000

PKSF			
	Tests	*Statistics*	*Probabilities*
Pooled OLS	Breusch-Pagan / Cook-Weisberg Test	$X^2(8) = 44,06$***	0,000
	Breusch-Pagan / Cook-Weisberg Test (based F test)	$F(1,1007) = 20,10$***	0,000
Fixed Effects	Modified Wald test for group wise	$X^2(169) = 8300,05$***	0,000
Random Effects	W0	df (168, 840) = 12,061***	0,000
		df (168, 840) = 3,691***	
	W50	df (168, 840) = 12,062***	0,000
	W10		0,000

MFIB			
	Tests	*Statistics*	*Probabilities*
Pooled OLS	Breusch-Pagan / Cook-Weisberg Test	$X^2(8) = 411,83$***	0,000
	Breusch-Pagan / Cook-Weisberg Test (based F test)	$F(1,1007) = 24,17$***	0,000
Fixed Effects	Modified Wald test for group wise	$X^2(169) = 1400,06$***	0,000
Random Effects	W0	df (168, 840) = 12,061***	0,000
		df (168, 840) = 3,691***	
	W50	df (168, 840) = 12,062***	0,000
	W10		0,000

Note: *** and ** show that statistics are significant at the level of 1% and 5% respectively.

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Burger et al. (2009) stated that the PPML method produces the most efficient and consistent results in the presence of heteroscedasticity. Santos Silva and Tenyerno (2011), who expanded the simulation results of Santos Silva and Tenyerno (2006) and took the data with zero value to the focus of their studies, concluded that PPML is a very resistant estimator even in the presence of zero value data. While this issue has commonly been ignored by the earlier and contemporary studies in this area, this is the first study that deems PPML[vi] fits better in the current circumstances due to the presence of zero value data and accordingly employs it in the estimation of the econometric model of the study.

Evaluating the performance of alternative estimators in the presence of zero-value data, heteroscedasticity and potentially neglected variables, Martin and Pham (2015) stated that biased estimation results can be obtained under these conditions and the PPML estimator can be an effective method to solve these problems. Egger and Tarlea (2015) stated that despite the potential endogeneity problem of linear logarithmic models due to estimation with OLS, such a problem is not encountered in the estimation process with PPML. Prehn et al. (2016) stated that the PPML estimator is a superior analysis technique to other estimators in the face of problems such as heteroscedasticity, incorrect model identification, and the presence of data with zero value.

All these explanations provide strong support for employing the PPML method in the estimation process to obtain more reliable results. Therefore, the PPML method is followed in the estimation of the econometric model. In the PPML method, the econometric model is defined in an exponential form (Santos Silva & Tenyerno, 2006):

$$y_i = \exp(x_i \beta)\, \eta_i \qquad (3)$$

In this context, the exponential specification of the panel regression model in equation 2 is as follows:

$$ESF_{it} = \exp(\alpha_0 + \beta_1 NOB_{it} + \beta_2 ROA_{it} + \beta_3 LOC_{it} + \beta_4 AGE_{it} + \beta_5 (AGE_{it})^2$$
$$+ \beta_6 INTCAP_{it} + \beta_7 GDPGR_{it} + \beta_8 INF_{it})\, \varepsilon_{it} \qquad (4)$$

In equation 4, *exp* expresses the exponential function and all the rest terms are as defined in Table 3. Eventually, the estimation results of the PPML are reported in Table 7.

Table 7: Determinants of External Sources of Funds: Findings from PPML

Variables	Models				
	DON (1)	BANK (2)	GOVT (3)	PKSF (4)	MFIB (5)
NOB	0.001***	0.001***	-0.009*	-0.001***	-0.006***
	(0.002)	(0.000)	(0.089)	(0.000)	(0.006)
ROA	0.036**	-0.054***	-0.037***	-0.023**	0.042***
	(0.015)	(0.000)	(0.000)	(0.036)	(0.004)
LOC	-0.231	0.041	-0.748***	-0.026	-0.349
	(0.472)	(0.784)	(0.001)	(0.776)	(0.170)
AGE	-0.129***	-0.003	0.262***	0.216***	0.044
	(0.008)	(0.943)	(0.003)	(0.000)	(0.471)
AGE^2	0.004***	-0.001	-0.009***	-0.004***	-0.002
	(0.000)	(0.544)	(0.000)	(0.000)	(0.319)
INTCAP	-0.732	1.203***	-0.143	-0.402***	-0.288
	(0.144)	(0.000)	(0.714)	(0.004)	(0.449)
GDPGR	0.264	-0.169	0.179	0.091	-0.388
	(0.577)	(0.481)	(0.689)	(0.527)	(0.338)
INF	-0.129	0.175**	-0.003	-0.061	0.016
	(0.362)	(0.019)	(0.986)	(0.154)	(0.890)
constant	1.265	0.834	-1.504	1.051*	2.668

[vi] The PPML estimator, which defines the coefficients from the Poisson distribution using the same first-order conditions used by the maximum likelihood estimator, is another version of the non-linear OLS. However, the PPML estimator does not require the series to have a Poisson distribution and gives consistent results regardless of how the distribution is. Therefore, although Poisson is an estimator commonly used in count data models, it can also be used for estimating nonlinear models. It is also stated that the PPML estimator is a resistant estimator against the problem of incorrect model identification (Arvis and Shepherd, 2013, p. 516; Fally, 2015, p. 78. -79).

	(0.469)	(0.493)	(0.443)	(0.091)	(0.114)
Wald X^2 (8)	52.47***	118.30***	48.27***	131.24***	37.10***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Note: ***, **, and * show that statistics are significant at the level of 1%, 5%, and 10% respectively. Probabilities are in parentheses.

The modeling of determinants of ESF is robust in the sense that the overall fitness of the estimates is reasonably good. Wald X^2 statistics remain significant despite the varying level of statistical significance. The study will first summarize the impact of institutional characteristics on different external sources of funds of MFIs followed by the impact of macroeconomic policy variables.

The size of MFIs is expected to have a positive impact on financing sources, meaning that, large MFIs draw greater attention to funding sources. The results of the study suggest that size of MFIs measured by the NOB is a crucial factor that receives importance to the financing sources irrespective of their types as the coefficients are found significant across the models. The theoretical expectation is met only for the donation model (model 1) and bank model (model 2) as the coefficients are positive. Hence, donors and banks pay attention to the size of the MFIs. This finding of the donation model is supported by Tchuigoua (2015) as he finds that donors' attention is high on the effective use of their grants and expansion. Large MFIs enjoy better reputations, better manage their risks, and consequently less risky. The result of the bank model is consistent with Hartarska and Nadolnyak (2008) and Gropp and Heider (2010) who find that large banks are well known in the market and hold a small amount of buffer capital. The result is also supported by the experimental (Buchheit & Parsons, 2006) and empirical researches (Tinkelman, 1998; Trussel & Parsons, 2007). However, negative significant coefficients of the rest of the model for NOB indicate that size of MFIs has an adverse impact on funds from government sources (model 3), PKSF (model 4), and other MFI (model 5). Nevertheless, such an adverse impact of the size of MFIs on their funding sources is not also unusual as Almeida and Campello (2007) find that the size of MFIs is determinant for MFIs debt financing by bank-loan when the institution is small or has a little number of branches.

In general, profitability promotes debt financing, and hence the profitability variable proxied by ROA is expected to bear a positive significant coefficient for different models. As per the results of the study, all the profitability coefficients are found significant meaning that it plays a crucial role in attracting funds from various sources. ROA has an expected positive impact on the number of donations (model 1) and funds from MFIB. Concerning the donation model, the result is consistent with the empirical literature on the value relevance of accounting information in the decision to make donations, which supports the positive relationship between financial stability and donations (Trussel & Parsons 2007). On the contrary, ROA hurts loans from commercial banks, government sources, and PKSF. This negative relation of ROA with debt financing is in the same direction as those of previous studies (Hartarska & Nadolnyak, 2008; Gropp & Heider, 2010; Tchuigoua, 2015). It suggests that MFIs should use retained earnings as the new financing that will reduce the dependency on borrowing.

Concerning the impact of location choice of MFIs in attaining funds from different sources, the study identifies that location choice adversely affects debt from the government in contrast to theoretical expectations. Results for the donation model, PKSF model, and MFIB model are similar to that of the government model with the exception that the coefficients are insignificant. Though location acts as an important factor in motivating commercial banks to give loans to MFIs that meet the academic dogma, the results are not significant.

The last institutional variable, the age of MFIs included in the models to examine the effect of experience and longevity on the financing policy. Generally, the higher the age, the greater the experience of MFIs; it is thus more likely to have hands-on experience which may affect the external financing policy. The age of MFIs has a positive effect on loans from the government and PKSF and their coefficients are statistically significant. Hence, the age of MFIs is an important determinant for MFIs' debt financing from these two financing sources. The age of MFIs also matters positively for funding from MFIB though the result is insignificant. However, the adverse effect of AGE on donors' funds and funds from commercial banks doesn't comply with traditional theory. Additionally, the learning curve effect is found present for the government and PKSF model confirmed by the negative significant coefficient of AGE in quadratic form, which stands to mean that there prevails a non-linear inverse relationship with ESF, particularly for funds from government and PKSP.

Turning to the macroeconomic policy variables, the INTCAP variable that controls the maximum limit of the interest rate on funds in the microfinance industry is supposed to harm funding sources of MFIs in Bangladesh. A consistent result is found for the donation, government, PKSF, and MFIB models meaning that higher INTCAP acts as a regulatory constraint for ESF. However, only the results of the PKSF model are found to be significant among these four models. Moreover, the empirical result of the donation model is right the opposite to the supposed relationship as Demirguc-Kunt and Maksimovic (1999) identifies a positive relation between regulation and donation, and argue that regulatory constraints that govern the practice of microfinance activities offer implicit guarantees. Interestingly, such a guarantee is obvious for commercial banks' funds as the study identifies a positive significant impact of INTCAP in attaining funds from banks.

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Economic prosperity measured by the GDPGR variable is an indicator of the MFIs to raise more funds from ESF. Despite the insignificant relationship for all the estimated models, one might even argue that the indication works properly in raising funds from donors, government sources, and PKSF but fails to provide the right signal to MFIs in accumulating funds from banks and other MFIs.

Inflation, raising the cost of funds, exerts an adverse impact on ESF. The study fails to identify INF as a significant determinant for the funds from donors, government, PKSF, and MFIB. The only significant coefficient associated with the bank model, however, abandons the traditional expectation showing a positive relationship between INF and bank funds.

V. Conclusion

Microfinance has been recognized as one of the growing flexible means of spreading financial services to the poor confirming their access to it at affordable terms and thereby help alleviate poverty. The microfinance industry of Bangladesh has been able to give coverage to a good number of borrowers and MFIs due to the rapid transformation of its grand-based financing by loan-based large-scale operation. The efficiency of MFIs largely depends on the nature of the financing based upon internal and external funds. The major external sources of funds are loans from the government, loans from Palli Karma Sahayak Foundation, loans from commercial banks, donors' funds, and loans from other MFIs while the internal sources of funds are savings of the depositors and cumulative surplus (profit). While external sources of funds significantly matter for doing of business of MFIs, the institutional characteristics of MFIs might affect the degree to which MFIs are funded by external sources. The study analyses the effects of MFIs' institutional characteristics on their external sources of funds using unbalanced panel data of 258 MFIs from 2009 through 2014. Institutional characteristics of MFIs are represented by the number of branches, profitability measured by return on assets, location, and age of MFIs. Besides the institutional characteristics, several macroeconomic variables, such as, interest rate cap, economic growth, and inflation rate are included in the econometric model of the study as control variables.

Overall results show that the institutional characteristics of the MFIs of Bangladesh contribute significantly in supporting the growth and development of the industry by drawing funds from external financial sources like donors, commercial banks, government, Palli Karma Sahayak Foundation, and other MFIs. More specifically, the study finds that donors and commercial banks consider the scale of operation of MFIs in taking their financing decision. Hence, donors and commercial banks deem large MFIs better manage their risk. The profitability of the MFIs is a crucial determinant for the donors and other MFIs to invest in this industry. Contrary to the theoretical expectation, location choice adversely affects debt from the government, while it has no significant impact on the decisions of other sources of funds. The experience and longevity of the MFIs have a significant and positive impact on the financing policy of the government and Palli Karma Sahayak Foundation. Additionally, the learning curve effect is found present for these sources of funds confirmed by the negative significant coefficient of MFIs' age in quadratic form, which stands to mean that there prevails a non-linear inverse relationship between MFIs' age and the funds from government and Palli Karma Sahayak Foundation.

Concerning the intervention in the microfinance industry through the introduction of interest rate ceiling is found to be injurious for most of the cases except bank lending and is justified due to the stylized fact of MFIs in Bangladesh. The majority of the MFIs in Bangladesh are small in size but involve high costs. Consequently, control over these sorts of variable-rate credit products is a challenge for the survival of small-sized high-cost MFIs in Bangladesh. The prosperity of the economy does not have a significant influence on the funding sources despite the persistent growth of over 5.5 percent throughout the last two decades. This ailing scenario might have alternative interpretations. From the economic perspective, it has important implication on income distributional consequences of the economy that the policymakers should address. From the commercial point of view, either the MFIs have failed to curb the poverty-stricken community to a substantial extent to keep them rolling in their businesses or private businesses are more worthy to the funding sources in terms of their profitability and moral suasion by the Microcredit Regulatory Authority works poorly. Last but not the least, the study finds no meaningful evidence on the deterrent role of inflation on the external sources of funds of MIFs in Bangladesh.

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