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Factors determining the operational self-sufficiency of microfinance institutions

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Abstract
The main aim of this paper is to explore the factors determining Microfinance institutions (MFIs) self-sufficiency. The data on selected variables for this research were obtained from the public MIX Market Database and cover the year of 2017. The empirical model is constructed with application of a Principal Component Analysis (PCA) and Logistic regression analysis. Sample is consisted of 342 MFIs from all around the world, with 21 independent variables grouped into eight factors/components, and OSS (operational self-sufficiency) as dependent variable. The obtained results suggest that higher revenue and MFIs profitability combined with decrease of credit risk lead to higher probability of MFI to be self-sufficient. These results also confirm widespread belief that MFIs will not be able to achieve their social goals without achieving sustainable profitability. In addition, results also confirm importance of MFIs core mission as with increase in outreach, probability of MFIs achieving self-sustainability also increases.

Keywords: determinants, exploratory factor analysis, logistic regression, microfinance institutions, operational self-sufficiency.

JEL classification: G21, L31.
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Introduction
Since their foundation, microfinance institutions (MFIs) are promoted as institutions specialized for financial inclusion of unbanked population (Ernst & Young, 2014a). What once started as the local phenomenon and a single project of Grammeen bank made by Mohammed Yunus in Bangladesh has spread to the thousands of the institutions worldwide (Ernst & Young, 2014b). Today MFIs provide a variety of financial products and services to the low-income population especially in developing countries (Bassem, 2014). The percentage of the poor in one country is often the result of previous conflicts and crisis happened. Accordingly, MFIs double bottom line objectives: outreach and financial sustainability (Gutiérrez-Nieto, Serrano-Cinca,

Molinero, 2007), makes them different from other financial institutions. Therefore, the social role of MFIs measured in their client's outreach is equally important as their financial performance (Efendic, Hadziahmetovic, 2019).

However, there is a widespread belief that MFIs will not be able to achieve their social goals without achieving sustainable profitability (Efendic, Hadziahmetovic, 2017). MFIs need to strike a proper balance between social performance on one side and financial performance on the other side (Diéguez, Blanco-Olivera, Oliver-Alfonso, 2016). To be self-sustainable, MFIs need to make radical changes and to break their dependence on financial subsidies or private and public donations which are becoming smaller and smaller and even disappearing in some areas (Ayayi, Sene, 2010). According to Tehulu (2013) it is better not to have MFIs at all than having unsustainable ones. Taking all the above mentioned into account, important question arises, when MFIs are self-sustainable and what are the key determinants of their self-sustainability?

The significance of factors affecting the operational and financial sustainability of MFIs varies with studies and countries (Mahapatra, Dutta, 2016). While some of the determinants are identified as significant in one country or within one MFI, they may not be found as significant for others (Cull, Demirguc-Kunt, Morduch, 2007; Woller, Schreiner, 2002). This research will try to identify and summarize all the variables that affect sustainability of MFIs based on the sample that includes institutions from six major regions of the world. Model derived from this research could be used by the microfinance industry as a business tool that will help MFIs to move from the condition where they are dependent on external sources of financing to one where they will become self-sufficient.

The present study is organized as follows: Section 2 provides the literature review with special focus on financial and operational self-sufficiency. Section 3 discusses the methodology and data used in the analysis, whereas section 4 provides overview of the empirical results. The last section of the study contains an assessment and discussion of the findings and ends with the conclusions and recommendations for further research.

Literature Review

Sustainability refers to the ability of an MFI to cover its operating and other costs from generated revenue, to earn profits and finally to operate without subsidies or donation from government or other donors (Mahapatra, Dutta, 2016). Literature identifies two more specific definitions of sustainability: i) operational sustainability refers to the ability of an MFI to cover all its costs i.e., financial, operational and costs of loan loss provisions, while ii) financial sustainability relates to the capacity of MFIs, in addition to covering their costs, to make profit for its shareholders (Quayes, 2012).

Financial sustainability of MFIs in the world was analysed by Ayayi, Sene (2010). Sample included 271 MFIs with 5 diamond ratings from MIX Market database and cover time period of 9 years, commencing with 1998. In their paper authors analysed the effects of selected independent variables: portfolio at risk, interest rate, good management, productivity ratio, client outreach and age of microfinance on MFIs financial sustainability. Results indicated the following: credit portfolio of high quality, accompanied with sufficiently high interest rated and sound management have strong positive influence on achievement of financial sustainability. In addition, age of microfinance institutions and its client outreach have positive but rather weak influence on achievement of financial sustainability. Nadiya et al. (2012) in their study identified factors affecting operational self-sustainability (OSS) of Indian Microfinance institutions. Sample included 50 Indian MFIs and database covered period from 2005-

2009. With application of multiple regression analysis authors identified that revenue generation factor, cost efficiency factor and growth factor have a positive influence on the OSS, while portfolio risk factor and development factor were identified as ones with negative impact on the OSS. Authors emphasized that mismanagement of the above-mentioned factors can shift MFIs away from fulfilment of their social mission. Pati (2012) trough application of regression model showed that the operating expenditure is found to be the forecaster of sustainability and profitability of MFIs, while the role of regulation of MFIs and its impact is clearly negated. Similarly, Sekabira (2013) conducted a study on the effects of capital structure on the performance of microfinance institution. Author used panel data from 14 MFIs in Uganda and found that debt and grants were negatively correlated to both operational and financial sustainability. Author concluded that MFIs must reduce dependence on debts and grants and focus on accumulating share capital if they plan to achieve long-term financial sustainability. Rahman and Mazlan (2014) in their study on Determinants of Financial Sustainability of Microfinance Institutions in Bangladesh derived similar conclusion. On sample of 5 MFIs and 6-year period, regression results indicated the following: size of MFIs, cost per borrower, personnel productivity ratio and yield on gross loan portfolio positively explain the financial self-sufficiency of MFIs in Bangladesh. On the other hand, variables of average loan balance per borrowers, age of MFIs, debt to equity ratio, operating expense ratio and number of active borrowers proved to have negative effect on the financial self-sufficiency of MFIs in Bangladesh.

Some of the more recent studies, derived similar conclusions. Study conducted by Shkodra (2019) showed that for MFIs located in Kosovo, size, year, inflation, and GDP have important influence on their financial performance. Study also implies that among most significant coefficients, to reflect financial performance is certainly gross portfolio yield which is revealed as positively significant across all three financial performance indicators, namely OSS, Return on Assets (ROA) and Profit Margin (PM).

Data and Methodology

Principal Component Analysis and Binary Logistic Regression

Empirical part of the study will be conducted in two stages, with application of two complementary statistical analyses. In the first stage, Principal Component Analysis will be applied as one of the oldest multivariate analyses. This method was introduced by Pearson (1901) and later it was developed by the Hotelling (1933). The key idea behind Principal Component Analysis is to reduce the dimensionality of a data set in which large number of interrelated variables exist, while at the same time retaining as much as possible of the variation present in the data set (Jolliffe, 2002). This reduction is achieved by transforming to a new set of variables, the principal components, which are uncorrelated. First few components retain most of the variation present in all original variables (Jolliffe, 2002). Computation of the principal components reduces to the solution of an eigenvalue-eigenvector problem for a positive-semidefinite symmetric matrix.

The data reduction is accomplished via a linear transformation of the observed variables, such that:

$$y_i = a_{i1}x_1 + a_{i2}x_2 + \ldots + a_{ip}x_p; \text{ where } i=1..p \quad (1)$$

where the y's are the principal components, which are uncorrelated to each other, and where each a_{ip} coefficient is obtained from the component analysis performed

with application of SPSS program. Considering number of variables, further analysis will be conducted to analyse the exact contribution of each factor on sustainability.

In line with the approach used in previous research on MFIs OSS (Quayes, 2012, Diéguez, Blanco-Olivera, Oliver-Alfonso, 2016), Binary logistic regression will be used in the second-stage analysis. Logistic regression was developed by statistician David Cox in 1958, and in statistics, "logistic regression", or "logit regression", or just "logit model" represents the regression model where the dependent variable is categorical or binary dependent variable (commonly called in the literature as dummy variable) (Jote, 2018). Mathematically, dependent variable in the logit model can have two possible values, marked as "0" and "1". The binary logistic model is used to estimate the probability of a binary response based on one or more predictor (or independent) variables. Hoshmer, Lemeshow, (2000), Gujarati (1995) pointed out that the logistic distribution has got advantage over the other methods ((e.g., Probit regression, Linear Probability Model (LPM)) in the analysis of dichotomous outcome due to its extreme flexibility and simplicity from mathematical point of view.

Logit model will be applied as follows:

$$\log\left[\frac{P}{1-P}\right] = \beta_0 + \beta_{1x1} + \beta_{2x2} + \cdots + \beta_{ixi} \quad (2)$$

where p is the probability of occurrence of the event studied, β_i (i = 1,..., N) represents the coefficients associated with each independent variable, represented by X_i (i = 1,..., n) (Hosmer, Lemeshow, 2000; Pampel, 2000). Given the value of the independent variables, the probability of occurrence of the dependent variable, or the probability that a particular MFI will be operationally self-sustainable (p(Y=1)) can be predicted using the following equation:

$$\text{p}= \frac{e^z}{1-e^z} = \frac{1}{1-e^{(-z)}} \quad (3)$$
$$\text{z}=\beta_0 + \beta_{1x1} + \beta_{2x2} + \cdots + \beta_{ixi}$$

Operational sustainability given the way of its calculation can be considered as a previous step to financial sustainability (Diéguez, Blanco-Olivera, Oliver-Alfonso, 2016). Operational self-sufficiency is defined as: total financial revenue as a percentage of the sum of financial expense, operating expense and loan loss provision expense (Bogan, 2012, Quayes, 2012, Diéguez, Blanco-Olivera, Oliver-Alfonso, 2016). OSS represents an important measure of sustainability of the lending operation of the MFIs (Mahapatra, Dutta, 2016):

$$Operational\ self-sufficiency = \frac{Financial\ Revenue}{Financial\ expense + Operating\ expense + Loan\ Loss\ Provision} \quad (4)$$

To be able to apply Binary logit regression, the dependent variable (OSS) will be transformed into dummy variable (Quayes, 2012, Bogan, 2012, Diéguez, Blanco-Olivera, Oliver-Alfonso 2016). Based on the MIX market definitions and available literature MFI is considered operationally sustainable if its OSS is 100 percent or more. Therefore, our dependent variable is either 1 if MFI is operationally sustainable or zero if MFI is operationally not sustainable.

Database and description of independent variables

Database is consisted of 342 MFIs from all around the world and number of selected independent variables is 21. Selection of variables is conducted after detailed review of available literature related to MFIs sustainability. Independent variables are summarized in Table 5 (Appendix 1) while descriptive statistics for all variables is provided in Table 6 (Appendix 2). Data are referring to the 2017 as the last year where

all the needed data were available. Before conducting statistical analysis, and to get robust and non-biased sample extreme values have been removed and MFIs with missing data were also removed from the sample. All monetary data are expressed in US dollars (US$). Sample is distributed over six regions as presented in the Table 1, with majority of MFIs located in the Latin America and the Caribbean. The data were obtained from the "Mix Market" Microfinance Information Exchange which is a web-based platform containing extensive financial and outreach information for MFIs. Data on the platform have been collected and reported in line with broadly recognized reporting standards within microfinance and inclusive finance. MIX Market Database is widely used as a reliable source of information on Microfinance sector (among others: Hartarska, Nadolnyak (2007), Hisako (2009), Manos, Yaron (2009), Haq, Skully, Pathan (2009), Quayes (2012), Bassem (2014), Mahapatra, Dutta (2016), Wijesiri (2016), Efendic, Hadziahmetovic (2017;2019)).

Table 1 MFIs Distribution over regions

Region	Percentage of MFIs belonging to respective region
Africa	14.9%
East Asia and Pacific	13.2%
Eastern Europe and Central Asia	14.6%
Latin America and Caribbean	33.6%
Middle East and North Africa	4.1%
South Asia	19.6%

Source: Author's work.

The significance of selected variables and their link to available literature is given below:

- Size of the MFI: Size of an MFI is recognized as an important factor of OSS. Measured by the value of its assets it is found to be significantly positively linked to MFIs performance and profitability. It is assumed that with an increase in assets MFIs benefit from the activities and earnings related to the total assets (Singh, Goyal, Sharma, 2013, Bogan, 2012, Hermes, Lensink, Meesters, 2011, Mersland, Storm, 2009).
- Loan intensity: It is determined by the Gross Loan portfolio, which represent main source of income for MFIs. Gross Loan Portfolio is a key reflection of how well MFIs perform their role in the process of financial intermediation (Efendic, Hadziahmetovic, 2017), and other things being equal, higher the loan higher is the interest income for MFIs (Mahapatra, Dutta, 2016).
- Portfolio yield: It is interpreted as ability of MFI to generate revenue from its outstanding portfolio. For MFI to remain its sustainability, high level of attention should be put on how much interest income is being earned by its operations (Crombrugghe, Tenikue, Sureda, 2007).
- Risk of the portfolio: Regarding portfolio riskiness, quality and level of risk taken, PAR 30 and PAR 90 have been used in the study. These indices are broadly used asset riskiness indicator (Kar, Deb, 2017, Bibi, Balli, Matthews, Tripe, 2018).
- Debt to equity ratio: There is a strong and significant negative correlation in Debt/Equity Ratio (capital structure) to Operational Self-Sufficiency Ratio, meaning that change in D/E ratio is negatively contributing to changes in OSS ratio.
- Capital to asset ratio: The capital is one of the key variables of the production function, and when it comes to the financial institutions it is one of the most important sources of financing as well as the protection against risks (Kablan, 2012; Bibi et al., 2018). The higher the capital is, the less risky the institution is. Accordingly,

a decrease in capital may have a negative impact on MFIs performance (Kablan, 2012).

- Number of Active Borrowers: As the number of borrowers that MFIs reach increases, MFIs are more efficient in fulfilling their initial mission of helping the unbanked population (Efendic, Hadziahmetovic, 2017). In addition, Crombrugghe, Tenikue, Sureda (2007) concluded that increasing number of borrowers would help the MFI to lower the average operating cost. This indicates that an increase in number of borrowers will help to raise the sustainability indicators in OSS.
- Personnel: This input is extensively used in most of the previous analysis (among others: Kipesha, 2012, Haq, Skully, Pathan, 2009, Sedzro, Keita, 2009, Hassan, Sanchez, 2009). The number of employees in our model reflects the efficiency in managing the human resources, what means that MFI which produces given level of outputs with less employees is considered as more efficient institution and is expected to have better financial performance.
- Return on assets: ROA reflects a firm's ability to generate revenue from its assets and is also a measure of the asset's performance (Efendic, 2014). Accordingly, increase in ROA should also be positively related to changes in the performance of MFIs (Ferdousi, 2013). A financial institution that has a negative financial result can't be considered as successful nor as sustainable one (Efendic, 2014).

Empirical findings

Following Lattin, Carroll, Green (2003), the two main assumptions of a factor analysis, the multivariate normality and sampling adequacy should be tested prior to factor extraction. Test should be performed to confirm the data suitability. Before proceeding with PCA, adequacy of the sample for factor analysis was tested. Kaiser-Meyer-Olkin (KMO) test measures the sampling adequacy. The aim of the KMO test is to assess the sampling adequacy or whether the values distribution is appropriate for the factor analysis. The range of values for KMO measure of sampling adequacy is 0.7 to 0.8. A value close to 0.5 was recommended as the minimum value for proceeding with factor analysis. Bartlett's test is an indication of the strength of relationship among variables and it was used to test the null hypothesis that the variables of this study are not correlated. In order to reject the null hypothesis that the correlation matrix is an identity matrix, Bartlett's Test of Sphericity should be significant i.e., the p value should be less than 0.05. In our case both KMO (KMO=0.725) and Bartlett's test of Sphericity (p-value (Sig.) of $0.000 < 0.05$) showed that sample is both valid and adequate.

With application of Principal Component Analysis (PCA) following results were obtained: the values in communalities table (see Table 2) indicate the proportion of each variable's variance that can be explained by the retained factors. Variables with high values are well represented in the common factor space, while variables with low values are not well represented. When analysing communalities table, among 21 variables included in the model, 20 of them have value above 0.6 (based on literature on PCA if communalities for a particular variable are low (between 0.0-0.4), then that variable may struggle to load significantly on any factor)).

Table 3. shows the number of factors extractable from the factor analysis along with their Eigen values. Those eight factors can be extracted considering the factors with Eigen values greater than "1" (Kaiser criterion) Braeken, Assen (2017). The label "extraction sum of squared loadings" shows that the first factor accounted for a variance of 5.216 (24.839%); the second factor accounted for a variance of 3.632 (17.297 %) and so on. The eight components extracted accounted for a total cumulative variance of 85.912 percent.

Table 2 Communalities table

Communalities		
	Initial	Extraction
Personnel	1.000	0.934
Offices	1.000	0.939
Gross Loan Portfolio	1.000	0.956
Number of active borrowers	1.000	0.908
Assets	1.000	0.947
Equity	1.000	0.894
Operating expense	1.000	0.876
Capital asset ratio	1.000	0.710
Debt to equity ratio	1.000	0.931
Return on assets	1.000	0.698
Return on equity	1.000	0.705
Financial revenue assets	1.000	0.889
Yield on gross portfolio real	1.000	0.911
Yield on gross portfolio nominal	1.000	0.926
Financial expense assets	1.000	0.665
Administrative expense assets	1.000	0.801
Borrowers per loan officer	1.000	0.990
Loans per loan officer	1.000	0.990
Portfolio at risk 30days	1.000	0.990
Portfolio at risk 90days	1.000	0.987
Loan loss rate	1.000	0.394
Extraction Method: Principal Component Analysis.		

Source: Author's work.

Table 3 Total Variance explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.216	24.839	24.839	5.216	24.839	24.839	3.822	18.202	18.202
2	3.632	17.297	42.137	3.632	17.297	42.137	3.433	16.346	34.548
3	2.343	11.157	53.294	2.343	11.157	53.294	2.590	12.335	46.883
4	1.889	8.996	62.289	1.889	8.996	62.289	2.006	9.551	56.434
5	1.531	7.289	69.578	1.531	7.289	69.578	2.003	9.538	65.972
6	1.259	5.993	75.571	1.259	5.993	75.571	1.719	8.188	74.160
7	1.155	5.498	81.070	1.155	5.498	81.070	1.434	6.831	80.991
8	1.017	4.842	85.912	1.017	4.842	85.912	1.033	4.921	85.912

Source: Author's work.

In column Rotation Sums of Squared Loadings distribution of the variance after the Varimax rotation is presented. The Varimax rotation was conducted in order to maximise the factor loadings variance and reduce the number of variables with high loadings over each other, following Pallant (2013). Based on the item loadings in rotated factor matrix (Table 4), the extracted factors were labelled as presented in Appendix 1.

Results of the binary logistic regression are summarized in Table 5. Out of 8 predictors three are proved to be significant at 5%: Revenue structure, Credit risk and MFIs profitability. Given results suggest that higher revenues and MFIs profitability combined with decrease of credit risk lead to higher probability of MFI to be self-sufficient. Results are in line with the findings of previous studies Mersland, Strom (2009), Quayes (2012), Mahapatra, Dutta (2016). These results also confirm widespread belief that MFIs will not be able to achieve their social goals without achieving sustainable profitability.

These findings are also in line with results presented by Efendic, Hadziahmetovic (2017, 2019). In their research authors stressed that even though primary goal of MFIs is not to earn profits, they will not be able to promise access to funds for low-income population if they struggle with covering their costs. In addition, results imply that sustainability of MFIs is significantly reduced when the credit risk they bear is high, which is in line with findings presented in Diéguez, Blanco-Olivera, Oliver-Alfonso (2016). Furthermore, specification of the model is also tested, and result of the linktest ((hatsq (p=0.877) is not significant)) shows that there is no specification error.

Table 4 Rotated Component Matrix

	Component							
	1	2	3	4	5	6	7	8
Personnel	0.508		**0.815**					
Offices			**0.940**					
Gross Loan Portfolio	**0.941**							
Number of active borrowers	0.321		**0.892**					
Assets	**0.946**							
Equity	**0.889**							
Operating expense	**0.881**		0.303					
Capital asset ratio						0.381	**0.701**	
Debt to equity ratio								**0.962**
Return on assets						**0.818**		
Return on equity						**0.805**		
Financial revenue assets		**0.910**						
Yield on gross portfolio real		**0.944**						
Yield on gross portfolio nominal		**0.946**						
Financial expense assets							**-0.719**	
Administrative expense assets		**0.799**				-0.370		
Borrowers per loan officer					**0.990**			
Loans per loan officer					**0.989**			
Portfolio at risk 30 days				**0.978**				
Portfolio at risk 90 days				**0.982**				
Loan loss rate							**0.582**	
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.								

Source: Author's work.

Table 5 Binary Logistic Regression results

Number of observations: 342 LR chi² (8) =130.96 Prob> chi² 0.0000 Pseudo R² =0.5062		
Component	Coefficient	p-value
Component one - Size	0.1930	0.486
Component 2-Revenue structure	0.8206	**0.007**
Component 3 -Scale	0.5837	0.329
Component 4-Credit risk	-1.2879	**0.000**
Component 5-Productivity	0.5435	0.291
Component 6-MFIs Profitability	5.4698	**0.000**
Component 7-Financing structure/Revenues and expenses	0.5451	0.085
Component 8- Financing structure	0.1176	0.829
Constant	3.639	

Source: Author's work.

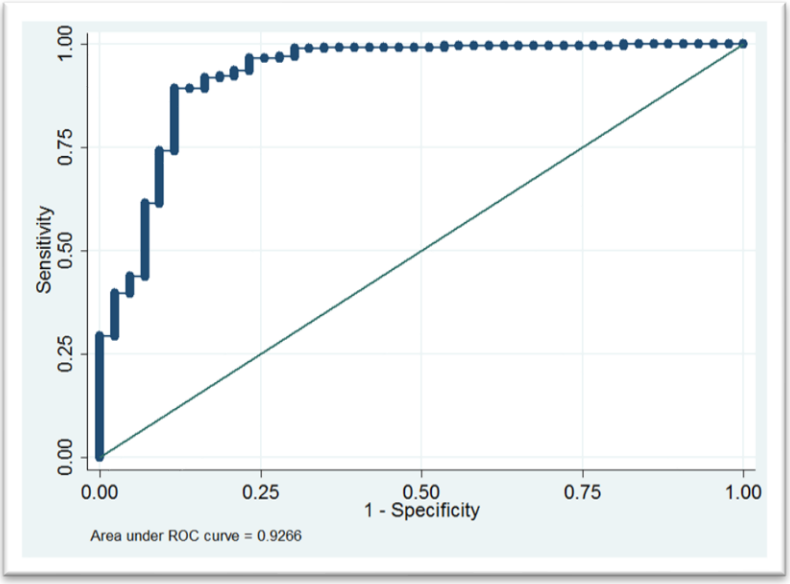

Figure 1 Area under the ROC Curve

Source: Author's work.

In addition, model performance is also analysed using ROC (Receiver Operating Curve). ROC curve represents probability curve while AUC (Area Under the Curve) represents degree or measure of separability. It tells us how much model is capable of distinguishing between classes and it is widely accepted method for evaluation of binary classification models (Diéguez, Blanco-Olivera, Oliver-Alfonso, 2016). AUC ranges in value from 0 to 1. Model whose predictions are 100% wrong has an AUC of 0 while one whose predictions are 100% correct has an AUC of 1(perfect model). For developed model AUC=0.926 (see Figure 1), and according to classification given by Hosmer, Lemeshow (2000) this model has outstanding discrimination.

Conclusion

In last decade microfinance sector passed through a number of changes, mainly marked by a deep global financial crisis and increased competition in the sector. One of the important changes was also the reduction of aid, donations and/or subsidies that were traditionally used for MFIs financing (Diéguez, Blanco-Olivera, Oliver-Alfonso, 2016). In order to be self-sustainable, MFIs need to make radical changes and to break their dependence on financial subsidies or private and public donations which are becoming smaller and smaller and even disappearing in some areas (Ayayi, Sene, 2010).

Taking above mentioned in the account, self-financing becomes the more accessible and less expensive source of financing for MFIs. However, there is no clear definition which factors determine MFIs self-sufficiency. Consequently, the main aim of this research was to analyse what are the determinants of MFIs OSS. Study employed two techniques, Principal Component Analysis and Binary Logistic regression. Sample included 342 MFIs from all around the world and number of selected independent variables was 21. Data are referring to year 2017 as the last year for which all needed data were available. Out of 8 identified predictors three are significant at 5%: Revenue structure, Credit risk and MFIs profitability. Given results suggest that higher revenue and MFIs profitability combined with decrease of credit risk lead to higher probability of MFI to be self-sufficient. These results also confirm widespread belief that MFIs will not be able to achieve their social goals without

achieving sustainable profitability (Efendic, Hadziahmetovic, 2017). Results further imply that sustainability of MFIs is significantly reduced when the credit risk they bear is high Diéguez, Blanco-Olivera, Oliver-Alfonso (2016). Therefore, institutions should pay particular attention to the monitoring of credit risk. These findings have important application for the MFIs since their survival in the microfinance sector largely depends on the level of their self-sufficiency. Only sustainable MFIs can commit on fulfilment of their primary mission-reaching the poor and serving as a tool for poverty alleviation.

Study was limited by the lack of available data for more recent years. Hence, further research should be focused on making additional efforts to compile data for 2019 or 2020 and to compare results with results given in this study. In addition, it would be useful to do the cluster analysis as well, in the first place with respect to: the geographic position of MFI, type of MFI (non-for profit vs. for profit ones), size and ownership of the MFIs,

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About the author

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Appendix

Table A1 Descriptive Statistics

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Personnel	342	2.00	7,653.00	682.55	1,125.31
Offices	342	0.00	1,000.00	53.49	111.76
Gross Loan Portfolio	342	16,482.00	834,785,740.00	81,127,427.50	140,881,323.12
Number of active borrowers	342	22.00	2,401,701.00	87,916.41	201,203.60
Assets	342	23,660.00	1,256,162,308.00	107,309,393.63	187,565,256.42
Equity	342	-7,574,698.00	171,409,601.00	19,938,907.54	30,375,830.14
Operating expense	342	1,083.00	95,558,487.00	9,851,342.34	15,565,493.25
Capital/asset ratio	342	-0.51	1.00	0.28	0.21
Debt to equity ratio	342	-4.64	1,245.33	8.38	67.51
Return on assets	342	-0.31	1.42	0.03	0.09
Return on equity	342	-10.70	1.67	0.06	0.63
Operational self sufficiency	342	0.00	3.29	1.17	0.31
Financial revenue assets	342	0.00	0.78	0.24	0.12
Yield on gross portfolio real	342	-0.09	1.00	0.23	0.14
Yield on gross portfolio nominal	342	0.00	1.21	0.30	0.16
Financial expense/assets	342	0.00	0.26	0.06	0.04
Administrative expense assets	342	0.00	0.46	0.06	0.05
Borrowers per loan officer	342	9.00	4,676.00	325.42	393.59
Loans per loan officer	342	9.00	4,676.00	347.80	418.84
Portfolio at risk 30 days	342	0.00	0.96	0.07	0.13
Portfolio at risk 90 days	342	0.00	0.95	0.06	0.12
Loan loss rate	342	-0.12	1.47	0.02	0.09
Valid N (listwise)	342				

Table A2 List of Principal Components and Description of Independent Variables

Component	Variable description
Component one - Size	
Assets	For calculation purposes, assets are the sum of each individual asset account listed.
Gross Loan Portfolio	This includes current, delinquent, and renegotiated loans, but not loans that have been written off.
Equity	The residual interest in the assets of the financial institution after deducting all its liabilities (IAS 1).
Operating expense	Includes expenses not related to financial and credit loss impairment, such as personnel expenses, depreciation, amortization, and administrative expenses.
Component 2-Revenue and expenses	
Financial revenue/assets	Financial Revenue / Average Total Assets
Yield on gross portfolio(real)	(Yield on Gross Portfolio (nominal) - Inflation Rate) / (1 + Inflation Rate)
Yield on gross portfolio(nominal)	Financial Revenue from Loan Portfolio / Average Gross Loan Portfolio
Administrative expense/assets	Administrative Expense / Average Total Assets
Component 3 -Scale	
Personnel	The number of individuals who are actively employed by an entity.
Offices	The number of staffed points of service and administrative sites / branches used to deliver or support the delivery of financial services and wide array of face-to-face and automated services to clients.
Number of active borrowers	The number of individuals who currently have an outstanding loan balance with the financial institution or are primarily responsible for repaying any portion of the gross loan portfolio.
Component 4-Credit risk	
Portfolio at risk 30 days	Outstanding balance, portfolio overdue > 30 Days + renegotiated portfolio / Gross Loan Portfolio
Portfolio at risk 90 days	Outstanding balance, portfolio overdue > 90 Days + renegotiated portfolio / Gross Loan Portfolio
Component 5-Productivity	
Borrowers per loan officer	Number of Active Borrowers / Number of Loan Officers
Loans per loan officer	Number of Loans Outstanding / Number of Loan Officers
Component 6-MFIs	
Profitability	(Net Operating Income - Taxes) / Average Total Assets
Return on Assets	(Net Operating Income - Taxes) / Average Total Equity
Return on Equity	
Component 7 Financing Structure/Revenues and expenses	
Capital to Asset ratio	Total Equity / Total Assets
Financial expense/assets	Financial Expense / Average Total Assets
Loan loss rate	(Write-offs - Value of Loans Recovered) / Average Gross Loan Portfolio
Component 8- Financing structure	
Debt to Equity ratio	Total Liabilities / Total Equity