Innovations

The Effect of Capital Structure on Financial Sustainability of Microfinance Institutions in Ethiopia: A Panel Data Approach

Berhanu Shanco Wubeno
Lecturer, Lunar International College, Department of Accounting and Finance
PB.1474, Code 1250, Addis Ababa, Ethiopia.
Corresponding Author: **Berhanu Shanco Wubeno**

Abstract

This study examined the effect of capital structure on the financial sustainability of microfinance institutions (MFIs) in Ethiopia using panel fixed effect regression model during the 2011-2020 period. Due to data availability, out of a total of 49 MFIs in Ethiopia, only 20 MFI panels are included. The purposive non-probability sampling was used to select samples based on the availability of financial data and the duration of the microfinance institutions' existence. The data analysis included both descriptive and inferential statistics. The study used operational self-sufficiency (OSS) as a measure of financial sustainability as dependent variable and four capital structure measures including capital-to assets (CAR), debt-to-equity ratio (DER), deposit-to-loan ratio (DLR) and deposit-to-assets ratio (DAR) as independent variable. Size of the MFIs, age of the MFIs and risk (measured by portfolio at risk) were used as control variables. The study discovered that financial sustainability is positively correlated with CAR and DLR, at a 5% level, this association is statistically significant. On the other hand, the DERand DARhave very little bearing on OSS. According to the findings, operational self-sufficiency (OSS) for MFIs will typically rise by 2.8% for every percentage increase in DER while falling by 5.7% for every percentage increase in DAR. MFIs in Ethiopia must take prudence while building portfolios because the choice of a portfolio had a negative effect on sustainability. From the findings, it is strongly recommended that microfinance institutions in Ethiopia should also work to increase their repayment rates.

Key words: *1.Capital structure,2.financial sustainability.*

1. Introduction

MFIs has a long history of operating using donor funds, and the business is now about 40 years old. There is a heated debate about whether MFIs should continue to be supported by donors or be free of them and stand on their own. There is one school of thought that believes MFs should be able to survive on donor funds (welfarists), and another that believes MFs should create enough revenue to cover their own expenditures because donor monies are unreliable (institutionalists) (Brau&Woller, 2004). As a result, the topic of developing a sustainable MF industry that can operate without donor money is being investigated empirically.The composition of the capital structure is crucial for MFIs financial sustainability (Bogan, 2007). This is because superior capital structure choices made by MFIs would lower risk, maximize financial flexibility, and promote the long-term solvency necessary to provide affordable financial services to the underprivileged (CGAP, 2007). Client trust is predicated on a MFIs' potential for long-term survival based on the composition of its capital (Sekabira, 2013). A strong sustainable capital basis makes MFIs more competitive, which benefits her clients more (Wright and Rippey, 2003). Therefore, it was crucial to evaluate how capital structure affected the financial sustainability of MFIs. This study considers the capital structure of Ethiopian

microfinance institutions and will examine how it affects the financial sustainability of these institutions. Traditional financial measures like as return on assets (ROA) and return on equity (ROE) are inadequate to assess the financial viability of a microfinance institution. This is because these metrices are based on adjusted accounting information for subsidy (Yaron and Manos, 2007). The MFI's ROE and ROA are measures of how effectively it uses its equity capital and total assets to generate profits. Financial self-sufficiency and operational self-sufficiency were developed to measure financial sustainability to identify inadequate traditional unadjusted financial indicators (idid). Barrels (2006), however, asserts that the standard concept of financial sustainability can be easily tied to operating self-sufficiency rather than financial self-sufficiency. He further argued that OSS made it possible to obtain a subjective and comprehensive picture of the institutions' financial sustainability. So, in this study, OSS was used to gauge financial sustainability. This measure of financial sustainability is popular and has been used in numerous recent studies, including those by Bogan, 2012; Chauhan, 2022; Mwongeli and Ariemba, 2018; Sekabira, 2013; and Tehulu, 2013.

2. Problem Statement

MFIs serve low-income, economically active borrowers seeking relatively small amounts to finance their enterprises, manage emergencies, acquire assets, or smooth consumption. Due to a lack of credit history, collateral, or both, many borrowers are unable to obtain funding from traditional commercial banks. As a result, MFIs are perceived as aiding in the establishment of economic opportunities and the alleviation of poverty (CGAP, 2003). MFIs must be able to provide long-term financial services to achieve their primary goal of poverty alleviation. In order to be sustainable, MFIs must earn enough revenue to cover their financial costs, administrative costs, and loan loss reserves. Except for the clients it serves, an MFI aiming toward sustainability on market principles is like a traditional bank. As a result, it will face a struggle like that faced by a conventional bank in attaining its goals (Hartungi, 2007).Obo (2009) indicated that the majority of MFIs in Ethiopia are not yet financially and operationally sustainable. In particular, he concluded that MFIs controlled by the government perform better than MFIs sponsored by NGOs in terms of their financial and operational sustainability. Ethiopian MFIs backed by NGOs can only reach out to the project areas where they carry out their development efforts. Lack of rural microfinance institutions, which provide financial services to the poor, is one of the factors limiting productivity in many developing nations. Poor farmers have little access to financial markets. Microfinance institutions have been founded and are now operating in Ethiopia with the ultimate objective of reducing poverty (Pius, 2005).Previous research in the field of microfinance has focused more on the sustainability of microfinance and tried to evaluate the link between capital structure and the sustainability of microfinance institutions. The majority of them have been undertaken in nations with more advanced or established financial and capital markets (Abeywardhana, 2015; Bogan, 2008; Khachatryan and Avetisyan, 2017; Lislevan, 2012; Tailab, 2014; and Tchuigoua, 2015) Companies in these nations have the option to quickly generate new capital through the issuance of new shares and/or new debt securities from the market, which can be used to modify their capital structure. However, business organizations found it difficult to raise new capital other than from restricted lines of credit extended by depository institutions in less developed or nonexistent capital markets, such as Ethiopia. This makes it difficult for managers to maintain their capital structure, and Ethiopia has few studies in this area that have primarily focused on the factors that determine capital structure. (Asfaw, 2020; Deneke and Gujral, 2021; Feyisa, 2017; Mohammed, 2014; Tadesse, 2021). Even though those local studies who examined the effect of capital structure on financial performance are dominated by studies on banks, insurance and manufacturing companies (Admassu, 2016; Birru, 2016; Kedir, 2017; Mekonnen, 2021; Mengesha, 2015; Negasa, 2016) and those who investigated this relation in the case of MFIs took ROE and ROA as dependent variables. (Getaneh, 2017). Traditional financial measures like as return on assets (ROA) and return on equity (ROE) are inadequate to assess the financial viability of a microfinance institution. (Yaron and Manos, 2007). This study, however, seeks to measure the impact of the capital structure on MFI financial sustainability as measured by operational self-sufficiency.

3. Objective of the Study

The general objective of this study is to investigate the effect of capital structure on the financial sustainability of MIFs in Ethiopia. Specifically, this study addresses the following

- To examine the effect of capital-to-asset ratio (CAR) on financial sustainability of selected MFIs in Ethiopia.
- To investigate the effect of debt-to-equity ratio (DER) on financial sustainability of selected MFIs.
- To evaluate the effect of deposits-to-loans portfolio ratio (DLR) on financial sustainability of selected MFIs.
- To explore the effect of deposits-to-total assets (DAR) on financial sustainability of selected MFIs.
- To examine the effect of the age of the selected MFIs on financial sustainability.
- To explore the effect of the size of the selected MFIs on financial sustainability.
- To investigate the effect of risk on the financial sustainability of MFI.

4. Hypothesis of the Study

The following research hypotheses were developed based on earlier empirical literature

- **H1:** There is a significant positive association between capital to asset ratio and financial sustainability of MFIs in Ethiopia.
- **H2:**There is a significant positive association between debt-to-equity ratio and financial sustainability of MFIs in Ethiopia.
- **H3:** Deposits to loans ratio is significantly positively related to the MFIs financial sustainability.
- **H4:** There is a positive significant relationship between deposit to asset ratio and financial sustainability of MFIs in Ethiopia.
- **H5:** The age of the firm has a statistically significant positive effect on the capital structure of MFIs in Ethiopia.
- **H6:**The size of the firm positively and significantly impacts financial sustainability of MFIs in Ethiopia.
- **H7:**MFIs risk has a statistically significant negative effect on the capital structure of MFIs in Ethiopia.

Based on the research objectivesthat were stated above, the following conceptual model can be constructed. The dependent variable used in this study is operational self-sufficiency (OSS) and the independent variables are capital to asset ratio(CAR), debt to equity ratio(DER), deposit to loan ratio(DLR), deposit to asset ratio(DAR). Moreover, the control variables used are risk, size of the MFIs and age of the MFIs. The interrelationship of these components completes the framework for specific expected results.

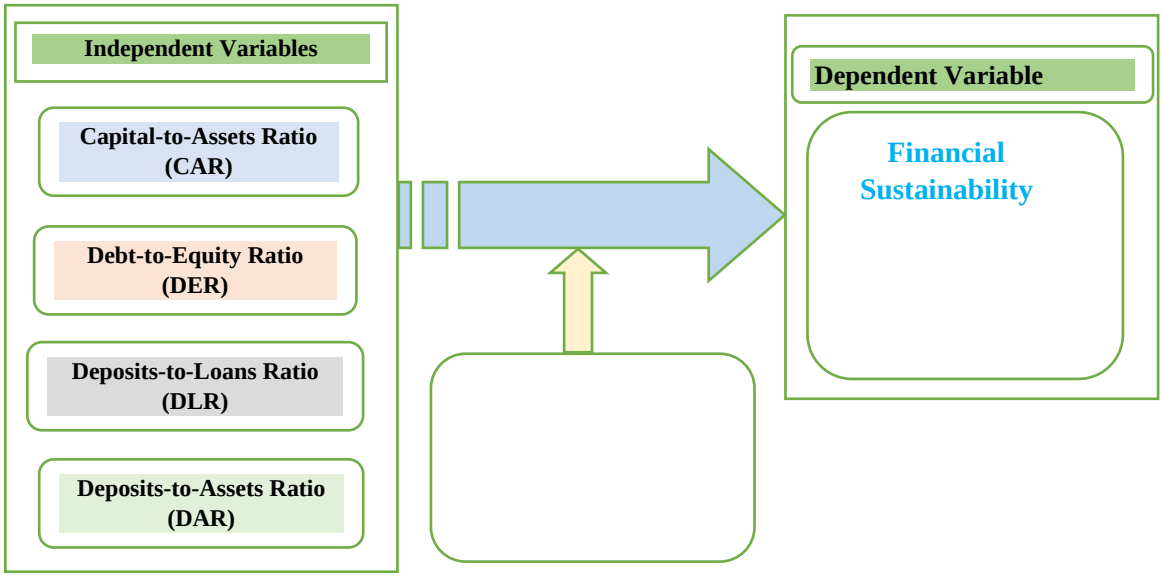

Figure 1.Relationship between Variables ***Source:****Researcher's Compilation (2022)*

5. Related Literature Review

a) Theoretical Literature Review

Theories of Capital Structure

One of the most arguable issues in finance is capital structure; as a result, when a manager decides to fund a new project, they should be aware of the aspects that may impact their decision (Bilgehan, 2014). Different theories of capital structure have been discussed in relation to how decision-makers might finance a new project. The capital structure theories are explained here below.

Modigliani-Miller Theory

Modigliani and Miller released their capital structure irrelevance theory in 1958, which is referred to as M&M throughout this work. Modigliani and Miller were two professors who studied capital structure theory and collaborated to develop the capital-structure irrelevance proposition. They created the contemporary theory of capital structure in an article published in The American Economic Review. Some assumptions underpin M&M theory, including (no taxes, no transaction, and bankruptcy costs.) M&M dealt with two ideas without levying any taxes. All external and internal users of the firm will have access to the same information (information symmetry); the cost of debt is the same as the cost of equity, and debt financing has no impact on the company's EBIT. Based on the assumptions indicated above, proposal I without tax stated that the capital structure has no effect on the company's market value. (Modigliani and Miller, 1958)

Following that, they established their argument, claiming that when debt grows, the equity shareholder perceives a bigger risk. As a result, the equity requires a high return in proportion to the risk. Modigliani and Miller (1963) announced a change to their M&M I, dubbed M&M II, in response to different critiques. They consider the benefits of the tax as determinants of the capital structure in their hypothesis. The benefit of taxes is that it offsets interest, which is referred to as tax shields, allowing the corporation to pay a reduced tax. In other words, M&M demonstrates that growing leverage will allow the organization to boost firm value and performance by allowing for tax deductions from the interest payment. (ibid)

Trade off Theory

The Trade-off Theory, introduced by Kraus and Litzenberger in 1973, states that firms choose their target capital structure by balancing the tax-shield advantage and the cost of bankruptcy. The cost-benefit analysis of debt financing is factored into the theory (Tsoy&Heshmati, 2017). As a result, according to Trade-off Theory, every company has the best capital structure at the point where marginal costs and marginal benefits of debt are equal, (Ross et al., 2008).

Pecking Order Theory

Myers and Majluf (1984) highlighted that this theory prefers the company's resources (internal financing) when it requires money to fund a new project. If retained earning is insufficient to finance the project, it is preferred to issue debt, such as (bonds), rather than issuing additional equity shares. The priority of financing from internal sources makes the cost of the capital structure the most crucial factor, followed by the option with the lowest cost (debt), and the most expensive option, issuing new common shares (Muritala, 2012).

The Market Timing Theory

According to market timing theory, the choice of the financing method can be influenced by opportunities on the capital market, which arise as a result of information skewness. It was also highlighted that business organization decision-makers should be aware of the times when their own future expectations are higher than those of investors, as well as the times when those expectations are lower. According to the confidential information, the theory suggests that decision-makers ought to recognize instances in which an organization's shares are currently under or undervalued. As a result, corporations use this information to decide whether to issue new shares or contemplate share repurchases when they believe that the stock price is high. Gearing level is influenced by profiting from market opportunities to issue new securities or buy back existing assets (Ater, 2017). Essentially, the idea contends that most of the time, opportunities in the market and market timing influenced businesses' financing decisions and that they did not have an optimal gearing level target (Abeywardhana, 2017).

Agency Theory

According to agency theory, a compromise between several funding choices (equity, loans, and hybrid securities) that provide the resolution of conflicts of interest between the capital suppliers (shareholders and creditors) and managers yields the ideal financial structure of the capital. According to the agency theory, the best capital structure is determined by settling conflicts of interest between managers and capital providers (stockholders and debt suppliers) and other funding options, such as equity, debt, and other securities.(Alnasser and Muhammed, 2017).

b) Empirical Literature Review

There have been debates on how the capital structure of corporate entities affects their performance, but empirical data from different scholars has produced contradictory and inconsistent results (Muriu, 2016).

A study by Perera (2021) entitled “Determinants of Financial Sustainability of the Microfinance Institutions in Sri Lanka”, twenty different independent variables were utilized to assess the sustainability determining factors, with financial self-sufficiency as the dependent variable. The yield on the gross loan portfolio, profit margin, MFI age, organization type, and loan officer productivity were found to be positively and statistically strongly significant at the 1% level. These elements have a significant impact on determining the financial sustainability of MFIs in Sri Lanka. Additionally, while measuring the financial viability of MFIs, the interest rate was positive with a 5% statistically significant level and active borrowers were positive with a 10% level. Operating expense ratio and capital structure were negatively impacted with a statistically significant level of 1%, and portfolio risk after 30 days was negatively impacted with a statistically significant level of 5% in assessing financial sustainability.

In his research on the financial sustainability of MFIs in Tanzania, Ganka (2010) found how the capital structure of a microfinance institution influenced the sustainability of the institution. Studies have also discovered equity financing to be a significant way to boost MFIs' sustainability. Sekabira (2013) discovered that MFIs with a stronger capital structure are more successful while researching the role of funds in the growth of MFIs in Uganda. In their investigation to confirm the impact of equity financing on profitability, Mesquita and Lara (2003) found evidence that there is little association between equity financing and firm’s profitability using Return on Equity as a proxy.

Parvin et al., (2020) has conducted study on the relationship between capital structure, financial performance, and sustainability of microfinance institutions (MFIs)in Bangladesh. The association between the capital structure and performance of MFIs is determined using a dataset of 187 MFIs. T he random effect and fixed effect models have been employed in the study’s panel data regression analysis. As

indicators of financial performance, return on assets (ROA) and net income to expenditure ratio (NIER) have been utilized. According to the research, the variables that affect NIER are size, risk, and the equity to asset ratio (EAR), as well as the debt to loan ratio (DTL). Furthermore, ROA is positively impacted by EAR, DTL, and risk while it is negatively impacted by risk. The results of this study will give MFIs the tools they need to set up their capital structures in a way that will enhance their financial performance and allow them to reach out to low-income clients who lack collateral.

To determine the profitability, Abrar and Javaid (2016) used the return on assets (ROA), operational self-sufficiency (OSS), and return on equity (ROE) performance measure as dependent variables, the deposit to asset, net deposits, and debt to equity ratio as independent variables. Approximately 70 nations from around the world's cross-sectional unbalanced panel data for the years 2004-2010 were examined in this study using the random effect model. They discovered that deposits are the most affordable form of funding for MIFs. Additionally, they discovered that highly leveraged MFIs are more profitable than less leveraged.

In Ethiopia, empirical research on the microfinance industry have been undertaken, although the topics, scopes, comprehensiveness, and depth of the studies differ. Tehulu (2013) conducted research on the determinants of financial sustainability of Microfinance Institutions in East Africa, including Ethiopia, and found that loan portfolio, size, and management efficiency are important determining factors for financial sustainability of East African MFIs, including Ethiopia. This study examined that leverage has a significant and negative impact on financial sustainability of MFIs. Financial sustainability is positively and significantly influenced by the gross loan portfolio to total asset and size of the firm whereas efficiency and credit risk have a negative and significant impact on financial sustainability of MFIs.

Feyisa (2017) investigated the factors affecting capital structure in the MFI sector in Ethiopia. The researcher used secondary data of 15 sample MFIs from the MIX market database for the years 2003 2009 that meet the requirements for data availability. The study's findings revealed a substantial negative association between MFI profitability and leverage, as well as positive relationships between MFI size and tangibility. Moreover, it was discovered that business risk had a negative but minor impact on leverage.

To sum up, the empirical findings on capital structure's impact on financial sustainability were mixed. Several studies have discovered that capital structure has a significant effect on financial sustainability (Bogan 2008; and Nyamsogoro 2010). Kinde (2012), on the other hand, claimed that capital structure had a minor impact on MFI financial sustainability. Coleman (2007) discovered that highly leveraged MFIs in Ghana performed better because they were able to reach out to more clients and benefit from economies of scale. Berger and Patti (2006) and Dinh and Pham (2020) also claimed that there is a positive correlation between financial sustainability or profitability performance measures and leverage. In contrary to this, there are findings that revealed negative correlation between financial sustainability or profitability and debt financing according to studies by Bhushan and Mohinder, 2016;and Khan, 2012. This is one of the justifications why this study seeks to investigate the effect of capital structure on the financial sustainability of in Ethiopia.
Moreover, many of the capital structure and performance research findings in Ethiopia context came from the banking, construction, and manufacturing industries (Gebremichael, 2016; Kedir, 2017; Mesele, 2017; Tadesse and Tripti, 2021). Moreover, most research on MFIs concentrated on determinants of capital structure, financial performance analysis and outreach. (Alemayehu, 2008; Asnakew, 2012; Kereta, 2007; and Yenesew, 2014) For this reason, this study sought to investigate the impact of the capital structure on MFI financial sustainability as measured by operational self-sufficiency.

6. Methodology of the Study

a) Description of the Study Area

This study is confined only to examine the effect of capital structure on the financial sustainability of Ethiopian MFIs for the period between 2011-2020. The data is secured from the financial analysis report of Association of Ethiopian Microfinance Institutions. There are 49 MFIs, however only 20 MFIs are found to have complete data to the conduct the analysis for the period of study.

b) Research Design

This study used an explanatory research design to achieve the objectives of the study. This method was appropriate for this study because it describes the patterns of relationships between variables and shows how a change in one variable (the independent variable) affects another variable (the dependent variable). (Saunders et al., 2007).

c) Research Approach

The research is mainly quantitative, with an econometric model being developed to detect and measure the impact of capital structure on financial sustainability of MFIs. Quantitative research examines the relationship between variables to test objective theories. (Creswell, 2009).

d) Population

The target population included in this studyareall the 49 microfinance institutions in Ethiopia which provide financial services to low-income people in the country.

e) Sample and Sampling Technique

The study used a non-probability sampling technique called purposive sampling to choose samples depending on the availability of financial data and age of the microfinance institution institutions since their establishment. Accordingly, from 49 microfinance institutions currently operating in Ethiopia, 20 microfinance institutions (out of the total 35 member MFIs) have been included as a sample in the study. These MFIs were in operation for more than ten years (2011-2020) and having complete data in the annual financial analysis report of AEMFI. The selected twenty MFIs are: Amhara Credit and Saving , Addis Credit and Saving , Aggar,Africa Vilage Financial Services ,Benishangul-Gumuz Micro Financing,BuusaaGonofaa,Dedebit Credit and Saving ,Dire, Dynamic, Eshet, Harbu,Letta,Meklit,Metemamen,Oromia Credit and Saving,Omo,Poverty Eradication and Community Empowerment Microfinance,Specialized Financial and Promotional Institution S. Co.(SFPI), Sidama, and Wassa.

f) Data Collection Instrument

This study used secondary data as compiled by Association of Ethiopian Microfinance Institutions (AEMFI) in its annual financial analysis report for the period covering 2011-2020. The annual financial analysis report was produced using audited financial statements acquired from member microfinance institutions Such audited financial statements are especially useful for assessing the financial performance of microfinance institution.

g) Method of Analysis

The panel data acquired in the study was analyzed using descriptive statistics and multiple regressions with Stata software. In addition, descriptive statistics such as mean, standard deviation, minimum, and maximum values were used to define the features of the variables in the study.

7. Econometric Model

The study used the fixed effect panel regression model to examine the effect of capital structure on financial sustainability of Ethiopian MFIs. Based on the critical review of literature, the general model specification is as follows:

$$OSS_{it} = \beta_{it} + \beta_1 CAR_{it} + \beta_2 DER_{it} + \beta_3 DLR_{it} + \beta_4 DAR_{it} + \beta_5 AGE_{it} + \beta_6 SIZE_{it} + \beta_7 RISK_{it} + \varepsilon_{it}$$

Where: OSS_{it} is the operational self-sufficiency ratio(which is the dependent variable in the study) of microfinance i at time t, t = 2011…2020;β_{it} is a constant term for every MFI i at time t; β represent the estimated coefficient for specific MFI i at time t; X_{it} denotes the independent and control variables in the study; and $\varepsilon_{it}$is the error term. Table 1 provides a summary of the variables, their specificationand expected outcomes.

Table 1. Definition of Variables and their Specification

Variables		Notation	Description	Measurement	Expected Sign	Source of Data**
DEPENDENT VARIABLES	Financial Sustainability	OSS	Operational self-sufficiency	Financial Revenue/ (Financial Expense + Net Loan Loss Provision Expense * + Operating Expense)	N/A	AEMFI Report
INDEPENDENT VARIABLES	Capital structure	CAR	Capital to asset ratio	Adjusted Total Equity/ Adjusted Total Assets	+	AEMFI Report
		DER	Debt to equity ratio	Adjusted Total Liabilities/Adjusted Total Equity	+	AEMFI Report
		DLR	Deposits to Loans ratio	Voluntary Savings/Adjusted Gross Loan Portfolio	+	AEMFI Report
		DAR	Deposits to total assets ratio	Voluntary Savings/Adjusted Total Assets	+	AEMFI Report
CONTROL VARIABLES		RISK	PAR > 90 days	Outstanding balance, loans overdue > 90 days/Adjusted Gross Loan Portfolio	-	AEMFI Report
		AGE	Age of the firm	Age of MFIs since their establishment	+	AEMFI Report
		SIZE	Size of the firm	Log of assets, adjusted for inflation and standardized loan portfolio provisions and write-offs.	+	AEMFI Report

* Net Loan Loss Provision Expense also called Impairment Expense

**The source for the measurements is the Association of Ethiopian Microfinance Institution's (AEMFI's)AnnualFinancial Analysis Report (2020).

8. Result and Discussion

Descriptive Statistics

Table 2 shows the descriptive statistics for the dependent, explanatory, and control variables utilized in the subsequent analyses. The findings show that the tested MFIs' average operating self-sufficiency (OSS) is around 134%. This indicate that, on average, the MFIs investigated covered all its costs through own operations and are not relying on contributions or subsidies from donors to survive. The lowest and the highest OSS are 21% and 278%, respectively. The variability in the data set of the MFIs is considerably high as the value are not close to the mean, as validated by the standard deviation of 42%.The p50 value of OSS shows that 50% of the MFIs had registered more than the calculated 132%.

Table 2. Results of Descriptive Statistics Analysis

Variable	Obs	mean	sd	p50	min	max
oss	200	1.341	.419	1.325	.21	2.78
size	200	8.389	.936	8.255	5.97	10.53
age	200	16.8	4.512	17	3	24
risk	200	.0562	.0860	.03	0	.77
car	200	.380	.297	.33	.08	2.808
der	200	2.356	1.633	2.02	.03	11.88
dlr	200	.481	.209	.43	.14	1.3
dar	200	.375	.206	.32	.12	1.62
par	200	.825	.525	.77	.17	4.67

Source: Extract from Stata Estimations (2022)

The CAR on average was 38%. This demonstrates that the MFIs, on average, had capitalization levels above the National Bank of Ethiopia statutory minimum requirement of 12% computed as a ratio of capital to total risk weighted assets (Directives No MFI/27/2015). This ratiotells us how the MFIs' sufficient capital allows them to withstand adverse economic shocks. With a minimum CAR of 8% and a maximum CAR of 281%, the MFIs exhibit high overall fluctuation, as indicated by the standard deviation of 0.297. The p50 also revealed that 50% the Ethiopian MFIs under review had a capital adequacy of more that the calculated 33 %.

The average debt-to-equity ratio is 2.36, which shows that most MFIs are heavily leveraged and rely on debt financing. The Ethiopian MFIs under investigationwere able to obtain debt financing at amount equivalent to 236% of their equity. The debt-to-equity ratio ranges from 3% to 119% with a standard deviation of 163%, demonstrating the wide fluctuation in leverage in the MFIs industry. Additionally, the p50 showed that 50% of the Ethiopian MFIs under examination had debt-to-equity ratio that were higher than the estimated 202%.

The DLR average is 48%, while the maximum and the minimum are 130% and 14%, respectively. This means that a mobilized deposit can finance, on average, 48% of their gross loan portfolio. However, the minimum value of 14% demonstrates that only a few numbers of MFIs issue 14% loans from the mobilized savings. The maximum value of 130% shows that a few numbers of MFIs have a surplus deposit of 30% that is not used to finance loans. The study also showed a standard deviation of 21% and 50% the MFIs investigated were more than the calculated p50 of 43%.

The other independent variable, the deposits to assets ratiowas 37.5 % on average. The maximum DAR was 162 %, and its lowest was 12 %. The ratio of deposit value to asset value deviates by around 21% on either side from its mean. Moreover, the p50 value indicates that 50% of the MFIs are higher than the calculated 32%.

The fifth independent variable, portfolio to total assets, had a minimum and maximum value of 0.17 and 4.67, respectively. The mean value of portfolio to total assets is equal to 0.825 with a standard deviation of 0.525. This ratio implies that high results could point to insufficient liquidity levels, while low results could point to inefficient asset utilization. In addition, the calculated value p50 shows that 50% the MFIs included in the study recorded an amount more than 0.77.

The size of the MFIs as indicated by the natural logarithm of the total assets had maximum and minimum values of 5.97 and 10.53, respectively. Additionally, the MFI's size had a mean of 8.39 and 0.94 standard deviation. Moreover, according to the predicted value p50, 50% of the MFIs included in the study had a size of higher than 8.25.

Table 2 also indicates that the MFIs under study average age is 16.8, with the maximum MFI age of 24 and the minimum 3. The high standard deviation of 4.51 illustrates very high variances among the MFIs under investigation. Furthermore, according to the p50, 50% of the Ethiopian MFIs under investigation had age of the MFIs that were higher than the predicted value of 17.

The summary statistics for risk (as measured by PAR > 90 days) indicates that the MFIs under study had a minimum and maximum value of 0.00 and 0.77, respectively; with a mean value of 0.06. Additionally, the amount of the MFI's standard deviation was 0.09. Thus, the mean value of 6% implies that the value was not a cause for worry. (MciroRates's, 2019 as cited AEMFI, 2021). Also, the p50 indicated that 50% of the reviewed MFIs had recorded more than the calculated amount, 3%.

Diagnostic Tests for Multiple Regression

It is crucial to evaluate the time series features of panel data before analyzing the relationship that exist among the variables because the non-stationary panel data pose some issues in regression analysis. Regression results when employing non-stationary data produce erroneous estimates, as has been well proven in the literature. Thus, the diagnostic tests (i.e., normality, model specification test, endogeneity, multicollinearity, and heteroscedasticity) that were carried out to determine if the data meets the basic assumptions of the classical linear regression model or not. However, the first test for multicollinearity reveals that there is a problem with multicollinearity between the independent variables. As a result, the portfolio-to-assets ratio (PAR) was eliminated from the model and the MFI's capital structure was instead represented by the remaining four independent variables (CAR, DER, DLR and DAR). The study also has carried out the Hausman specification test to pick between the random effect (RE) and fixed effect (FE) models for this investigation.

Correlation Analysis

The correlation matrix revealed various levels of associations among the variables. For instance, operational self-sufficiency (OSS) exhibits a weak positive but insignificant association of 0.0061, 0.0617, 0.0855 and 0.0231 with debt-to-equity ratio (DER), deposits-to-loans ratio (DLR), deposits-to-assets ratio (DAR) and portfolio-to-assets ratio (PAR), respectively. Additionally, the correlation matrix demonstrates that OSS has a strong positive significant link with the size and age of MFIs, respectively, with values of 0.4619 and 0.1842. Finally, it was discovered that risk, as determined by PAR > 90 days, and OSS had a negative significant relationship of -0.2401 at 5% significance.

DER, DLR, DAR, PAR, size and age are positively correlated with the MFIs financial sustainability, as determined by OSS. There will be a multicollinearity issue in the model if the degree of correlation between variables is large, that is, if the absolute value of the correlation coefficient is greater than 0.8. (Guajarati, 2008; Garson, 2012). Table 2 revealed a modest association among the explanatory variables, with the correlation coefficients absolute value less than 0.8 (a benchmark value) indicating that multicollinearity is not a concern.

Discussions of Multiple Regression Analysis

The findings of the key study variables are discussed below.

Capital-to-Asset Ratio (CAR) and Operational Self-Sufficiency

The first objective of this study was to investigate the effect of capital-to-assets ratio (CAR) on the financial sustainability of MFIs in Ethiopia. The study findings revealed that CAR has a positive significant impact on OSS with a p-value of 0.000. The regression result indicates that when CAR is increased by 100%, OSS is also increased by 17.3%. This supports that there is greater financial sustainability as more equity is used to finance assets. This result is in line with those of Muigai (2017) and Daniel (2018). These results support the Pecking-Order theory's findings that internal resources are less expensive than external ones and help businesses make more money.

Table 3. Fixed Effect Regression Results

loss	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
lrisk	-.037	.019	-1.95	.067	-.078	.003	*
size	.282	.067	4.23	0	.142	.421	***
lage	-.417	.128	-3.27	.004	-.684	-.150	***
lcar	.173	.039	4.39	0	.091	.256	***
lder	.028	.022	1.30	.208	-.017	.074	
ldlr	.208	.079	2.62	.017	.042	.374	**
ldar	-.057	.048	-1.19	.247	-.158	.043	
Constant	-.821	.386	-2.13	.047	-1.629	-.014	
		22.148					
F-test							
Number of observations		182					

*Note: *, **, *** indicate significance at the 10%, 5% and 1% levels of significance, respectively.*
Source: Extract from Stata Estimations (2022)

Debt-to-Equity Ratio (DER) and Operational Self-Sufficiency

In respect to the second objective which sought to explore the effect of debt-to-equity ratio (DER) on financial sustainability of microfinance institutions in Ethiopia, DERhad a positive insignificant impact on operational self-sufficiency (OSS). The regression analysis result tells us that when DER is increased by 100%, OSS is also increased by 2.8%, keeping other factors constant. The agency theory also endorses using debt to control agency costs and increase profitability (Kumar, 2012). Coleman (2007) supported the agency hypothesis by pointing out that highly leveraged MFIs can manage risk, minimizing moral hazard and adverse selection, as well as reaching out to a wider range of customers.

Deposit-to-Loan Ratio (DLR) and Operational Self-Sufficiency

Regarding the third objective of the study, which examined the effect of deposit-to-loans ratio (DLR) on Ethiopian MFIs, the result of fixed effect model Table 3 revealed that DLRhad a statistically significant positive relationship with operational self-sufficiency with a (p- value = 0.017) a 5% significance level. The positive co-efficient of 0.208 implies that a one unit change in deposit-to-loan, keeping the other things constant had resulted 0.017 unit change on the level of OSS in same direction. This implies that increased deposit access leads to an increase demand for MFI loans, which could turn away potential borrowers from informal moneylenders and boost MFI efficiency. This finding is in consistent with other studies. (Ahlin et al 2010; Campion, 2002; Morduch, 1999 and Sara, 2011).

Deposit-to-Asset Ratio (DAR) and Operational Self-Sufficiency

Concerning the fourth objective which sought to explore the effect of deposit-to-asset ratio (DAR) on financial sustainability of microfinance institutions in Ethiopia, the result of fixed effect model in Table 3 showed a negative relationship between operational self-sufficiency (OSS) and the deposit to total asset ratio that was statistically insignificant (p-value = 0.247) at the 10 % level of significance. This is contrary to the prior expectation.

Size of MFI sand Operational Self-Sufficiency

Regarding the study's fifth objective, which explored how Ethiopian MFIs were affected by the size of the firm, the size of the MFIs exhibited significantly positive impact on OSS, with a p-value of 0.000. Hence, it follows that as OSS increase by 28.2% when size is increased by 100%. This indicate that large microfinance institutions are therefore more sustainable than their counterpart smaller ones. It also means that MFIs benefited from economies of scale because of managerial efficiencies in managing its assets. This is finding was also evident in the works of various studies. According to studies by Bogan, 2008; Daher and Saout, 2015; Mersland and Storm, 2007; and Nyamsogoro, 2010; the correlation between MFI sustainability and size is positive and strong, indicating the cost advantages of size (economies of scale).

Age of MFIs and Operational Self-Sufficiency

The six objective of this study was to evaluate the impact of age of the MFIs on financial sustainability. The study's findings showed that MFIs age had a statistically significant negative association with operational self-sufficiency, but not in the way that was anticipated. This indicates that microfinance institutions tend to be inefficient when they become older. The result for the regression model shows that age of the firm impact on OSS was statistically significant at 1% (p-value 0.004). The estimation has specified that as age increased by 100%, OSS decreased by 41.7 %. The finding is inconsistent with the findings of Bogan, 2012; Crombrugghe et al.,2008; Ezeoha and Botha., 2012; Lislevand, 2012; Nadiya et al., 2012; and Tchuigoua, 2015; that claimed higher OSS as MFIs get older. This is due to their reputation for attracting savings and managing cost efficiency. Additionally, the trade-off and agency theories postulate that age of the firm influence capital structure decisions positively since older businesses are more likely to be creditworthy and so more likely to borrow money from other businesses. (Orkaido,2021). In contrast, Nyamsogoro (2010) gave a different perspective, arguing that OSS is completely unaffected by the age of MFIs.

Default Risk and Operational Self-Sufficiency

Finally, the study examined the effect of risk (the proxy used was PAR > 90 days) on the microfinance institutions financial sustainability. Risk, as expected, had a negative impact on OSS, which is statistically significant at 10%, having p-values of 0.067. When risk is increased by 100%, the OSS is decreased by 3.7%. According to this finding, risk reduction can dramatically lower costs and boost financial performance because MFIs with greater nonperforming loan levels need more resources to manage the higher risk. This result also indicate that the financial sustainability of MFIs depends on a high-quality lending portfolio.The regression outcome was consistent with the findings of Lafourcade et al., 2005; Nyamsogoro, 2010; and Parvin et al., 2020.

9. Conclusion

The following conclusion were drawn based on the findings of the study.

On the scale of operational self-sufficiency, which is a measure of the sustainability of Ethiopian MFIs, the MFIs under investigation had average OSS of 134%. This indicates that the revenue generated from operations of MFIs fully covered their operating costs, financial and loan loss expenses. However, some MFIs were not achieving the required level of financial sustainability.

The findings show that capital to asset ratio (CAR) and deposit to loan portfolio (DLR) have positive relationships to financial sustainability. This relationship is statistically significant at 5% level.

On the other hand, the study found that debt-to-equity (DER) and deposit-to-total asset (DAR insignificantly related to OSS, but their impact on it was negative and positive, respectively. This may suggest that the combination of different capital sources used by microfinance institutions does not significantly affect their capacity to sustain financially.

Another important finding is that the size of the firm (SIZE) had positive impact on operational self-sufficiency. The conclusion is that larger MFIs benefit from economies of scale, which lowers their operating costs and increases sustainability.

Based on the research findings, the study concludes that there is negative relationship between financial sustainability and age of the firm. The anticipated association between these variables, however, was not as expected.

The findings also demonstrated that the portfolios' (PAR> 90days) had a negative impact on the sustainability of MFIs in Ethiopia. This result lends credence to the idea that increased risk translates into declining financial sustainability.

10. Recommendation

The major conclusions drawn from the findings is followed by the recommendations listed below.

The study makes policy recommendations for the successful and efficient operation of microfinance programs by streamlining loan distribution, improving gross loan portfolio yield, lowering operating costs, utilizing resources to generate financial revenue, and concentrating on the growth of their total assets' value in Ethiopia.

Additionally, Ethiopian MFIs need to exercise caution when creating portfolios because choosing a portfolio had a negative impact on sustainability, Microfinance institutions should, therefore, try to maximize their repayment rates.

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