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Determinants of Microfinance Institutions' Financial Sustainability; Does Depth of Outreach Matters? Evidence from MFIs in Kenya

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Abstract

The financial sustainability of microfinance institutions is vital in ensuring financial inclusion of the poor population. Moreover, it has been argued that it is better not to have MFIs than having unsustainable ones indicating how important the sustainability of MFIs is. Therefore, the present study investigated the moderating role of the depth of outreach on the relationship between determinants and financial sustainability. The study adopted an explanatory research design where a panel approach was used and a positivist paradigm. The target population was all 52 registered microfinance institutions in Kenya for the period 2010-2018. The study adopted the census approach method. The data was collected from 30 MFIs for 9 years from mix market database using a data collection schedule. The study used both descriptive and inferential statistics to analyze data. Hypotheses were tested using hierarchical multiple regression and the choice between fixed or random effect models was determined by the Hausman test. The findings showed that depth of outreach had an antagonistic moderating effect on the relationship between financial leverage and financial sustainability ($\beta = -0.12$, $\rho<0.05$) and the relationship between portfolio quality and financial sustainability ($\beta= -0.118$, $\rho<0.05$). Therefore, the study encourages MFIs to engage in the prudent use of financial leverage so that they enhance their overall profitability and financial sustainability in the long-run. Besides, managers should develop loan appraisal and monitoring mechanisms to minimize the danger of default rates as well as improve the quality of their portfolio. Finally, managers of MFIs are advised to understand the intersection between financial leverage, portfolio quality and depth of outreach, if they are to realize financial sustainability.

Keywords- *Financial Leverage, Portfolio Quality, Financial Sustainability, Microfinance Institutions, Depth of Outreach*

1. Introduction

Microfinance institutions have been feted and perceived as a panacea to poverty alleviation especially in developing countries (Barry & Tacneng, 2014) and a key contributor to the strengthening and expansion of the formal financial system (Lopatta, Jaeschke, & Chen,

2017; Vanroose & D'Espallier, 2013). Microfinance institutions envisage offering sustainable financial services to underprivileged people who are not able to access formal banking services (Nyamsogoro, 2010). The MFI industry has attracted several donors and stakeholders (De Aghion, Armendáriz, & Morduch, 2007) resulting in expanded practice across the globe, offering diverse tools for achieving the development goals.

Further, the focus of microfinance has gone beyond the issuance of microcredit (Hulme & Arun, 2009) offering micro-insurance, micro-savings, and training. Therefore, with the continued decline of donor funds, the institutionalists believe that the industry must adopt relevant measures to ensure the perpetual succession, that would promote financial sustainability (Helms, 2006). The financial sustainability of MFIs should be considered as a way of securing the future of the microfinance industry beyond subsidies and donor funds.

The main challenge facing the microfinance industry is how to offer financial and non-financial services to the marginalized population without undermining sustainability (Awaworyi Churchill, 2018) equally, attaining financial sustainability without undermining the depth of outreach to the poor. In addition, a number of MFIs have prioritized financial sustainability through increasing the interest rates and large loans to cover transaction costs which lower administrative costs (Karlan & Zinman, 2008), therefore, MFIs that charge high-interest rates may end up excluding the poorest in society (Dehejia, Montgomery, & Morduch, 2012).

Financial sustainability has recently captured the attention of many scholars and policymakers due to its enormous contributions to the success of MFIs (Nyamsogoro, 2010). This has been occasioned by MFIs' effective development strategy (Kabeer, 2005; Mahjabeen, 2008) and an anti-poverty tool (Ahlin & Jiang, 2008) in developing countries. Since inception, MFIs have been struggling to serve a substantive number of clients and their survival in serving the market to achieve financial sustainability. Nevertheless, some MFIs, especially in Africa, have either collapsed, closed or are under receivership. Kenya has not been spared either, as evidenced by the collapse of several firms Imperial Bank, Dubai Bank and Chase Bank, which has a significant controlling stake in Rafiki MFI that was hit by a tide of withdrawals, forcing it to limit withdrawals (Mbaya, 2017). Others in Africa were in the wake of 2009, some MFIs in Zambia collapsed, in 2005 Rwanda was also hit by the collapse of eight MFIs (ESGC, 2005) and over 30 MFIs in Ghana failed in the year 2013. Therefore, amplifying the focus and debate on the financial sustainability of the microfinance institutions in Africa (Chikalipah, 2017; Hermes & Lensink, 2011).

The determinants of MFI financial sustainability have not been exhaustively interrogated especially in emerging economies (Nyamsogoro, 2010). Research studies conducted have focused on the traditional indicators that influence the financial sustainability of MFIs (Wambugu & Ngugi, 2012). For instance, extant studies have found a negative and significant link between financial leverage and MFIs financial sustainability (Hartarska & Nadolnyak, 2007). Adongo and Stork (2006) and Bayai and Ikhide (2018), found a loan portfolio to be positively affected by financial sustainability. Scholars provide evidence of the complementarity of financial sustainability and outreach of MFIs (Cull, Demirgu¨ ç-Kunt, & Morduch, 2007). Yet, pointing out that in reaching out to the poorest, a trade-off occurs. As a result, the MFIs industry rather focus largely on less poor clients. Several other studies (Conning, 1999; Hulme & Mosley, 1996; Zeller *et al.*, 2003; Quayes, 2012; Kipesha & Zhang, 2013; Roy & Pati, 2019) all argue that there is a trade-off between sustainability and outreach. Although a study that examined the presence of trade-offs between sustainability, profitability, and outreach in East Africa, welfarist found that financial sustainability focus had a negative impact on outreach to the poor suggesting presence of tradeoffs, while,

Institutionalist view found a positive relationship with both sustainability and profitability measures. Their findings were mixed and therefore this study seeks to interrogate in depth the existing relationships. Previous studies have suggested that future researchers should consider the depth of outreach to have an indirect effect (Awaworyi Churchill, 2018; Churchill & Marr, 2017). This is so because the depth of outreach could compromise the relationship between the determinants and financial sustainability of MFIs. Therefore, the depth of outreach could be a potential moderator that is likely to curtail or support financial sustainability.

2.1 Theoretical Perspective

This study explores the moderating role of the depth of outreach on the relationship between the determinants of financial sustainability by drawing on **the** welfarists theory. Welfarists theory was first formulated by (Smith, 1776). Smith created the invisible hand idea that is one of the most fundamental equilibrating relations in Economic Theory, which equalize the rates of returns as enforced by a tendency of factors to move from low to high returns through the allocation of capital to individual industries by self-interested investors. The self-interest resulted in an optimal allocation of capital for society. Further, it highlighted that every individual is continually exerting himself or herself to find out the most advantageous employment for whatever capital they can command. Which they take advantage and not that of the society, which might be viewed. But the advantage naturally, or rather necessarily leads them to prefer that employment which is most advantageous to society (Aronsson & Löfgren, 2007).

Welfarists claimed that sustainability can be realized through the depth of outreach. By serving not only a huge number of clients (breadth of outreach) but also a great number of underprivileged clients known as depth of outreach (Brau & Woller, 2004). Scholars on welfarist acknowledged that microfinance has been established to reduce poverty; its objective of empowering the underprivileged clients who are economically active, thus the depth of outreach should be prioritized. Microfinance institutions should serve as a huge number of underprivileged clients, despite not being highly profitable. The deficit in operations should be filled with donor and government support or social investor (G. M. Woller, Dunford, & Woodworth, 1999). However, (Conning, 1999) compared the institutional approach and the welfarist approach and found that reaching the poorest of the poor is costlier than reaching other segments of the market, even when there are no fixed lending costs. This indicated that microfinance was not efficient towards poverty alleviation unless vastly larger sums of money can be mobilized from private sources.

Proponents of welfarists theory believe the existence of a trade-off between financial sustainability (profitability) and depth of outreach (targeting the underprivileged clients) because the poorest are cost-ineffective to serve when profitability is considered and thus, grants to MFIs must be essential (Paxton, 2003). To serve the underprivileged groups, entirely must focus on programs with donor funding (Morduch, 1999; Rhyne, 1998). Financial sustainability to Welfarists remains of less concern since they are dependent on donors or subsidies (Bos & Millone, 2015). Therefore, the future of microfinance programs should be evaluated to assess its impacts on borrowers, to ensure they are better off (Olivares-Polanco, 2005). In welfare theory, depth is a measurement of client social welfare. Therefore, Schreiner (2002)Schreiner (2002), noted the unavailability of direct measurements of depth through income or wealth, indirect proxies for depth are normally considered in the literature. The study used two measures of depth of outreach, which includes average loan balance per borrower/GNI per capita, Loan Size, and the percentage of women borrowers to total active borrowers.

Maes and Reed (2012); Reichert (2018), estimated that worldwide over 200 million clients were reached by MFIs at the end of 2017. Academicians have acknowledged transformations in the manner MFIs are financed. Johnson (2015), noted the growing tendency by MFIs to commercially finance their operations. Policymakers, donors and institutionalists have endorsed the commercialization of MFI financing despite the 'schism' on the exploits of donations in financing MFIs. Whereas welfarists are concerned, that commercialization triggers mission drift, using non-subsidized funds and 'leveraging MFI assets' as well as operating of banks by MFIs Johnson (2015). MFIs have become more profit-oriented, adopting debt and deposit financing while barring donations, grants and subsidies. Murdoch (2000), maintaining that financial sustainability may allow the programs to access commercial financial markets and subsidized programs which are inefficient and thus bound to fail in a way and must redefine MFI financing.

Kipesha and Zhang (2013), in their study, examined the evidence on the presence of trade-offs between sustainability, profitability, and outreach to the poor that was conducted in East Africa using a panel data of 47 Microfinance institutions for four years'. Using Welfarists approach the study found out that financial sustainability focus had a negative impact on outreach to the poor, implying the presence of tradeoffs. Further the results on financial sustainability did not show any presence of tradeoffs with the outreach measures. While, the Institutionalist view, finds that outreach to the poor had a positive relationship with both sustainability and profitability measures. Therefore, it concluded the possibility of the presence of tradeoffs between outreach to the poor with profitability measures as compared to the outreach with financial sustainability. Also, the presence of trade-offs between financial performance and outreach to the poor depended on the variables used and estimation model specification. Some variables indicated the existence of tradeoffs under Welfarists views did not show such impact under Institutionalist views.

The study recommended that MFIs in East Africa should put more emphasis on financial sustainability and reduce subsidy dependence to ensure survival and growth in the future. Furthermore, policymakers suggested that sustainability should not compromise the outreach to the poor. Lastly, the government should review policies governing MFIs to guarantee the institutions, mobilize savings and other financial services like deposits to broaden their activities and the outreach to the poor to attain financial sustainability (Kipesha & Zhang, 2013).

2.2 Review of Previous Studies

Financial leverage refers to the extent of debt financing in the firm's capital structure (Al-Malkawi & Pillai, 2018). Islamic Banks could have a lower leverage ratio in comparison to MFIs as they rely on retail deposits rather than the less stable interbank funding (Toumi, Viviani, & Belkacem, 2011). However, debt financing can have either a positive or negative impact on firm value or performance or financial sustainability (Stulz, 1990). On one hand, the agency theory predicts that debt financing can be considered as a value-enhancing mechanism (McConnell & Servaes, 1995). The MFIs using debt financing to be monitored by the capital market and reduce free cash flows which, therefore, in turn, mitigate agency costs.

The quality of the loan portfolio is maybe another variable that could influence MFIs' financial sustainability. The higher the loan portfolios implies low repayment rates and therefore, less financial sustainability. The quality of the loan portfolio measures how efficient an MFI is in making collections (Ayayi & Sene, 2010). Studies on factors influencing the financial sustainability found a positive association between the quality of loan portfolio and financial sustainability (Adongo & Stork, 2006; Ayayi & Sene, 2010). Whereas, Bayai and Ikhide (2018); Nyamsogoro (2010) found a negative relationship

between the quality of loan portfolio and financial sustainability. MFIs that are regulated have the chance of better quality loan portfolio, hence, improved efficiency which could lead to financial sustainability (Committee, 2010). However, if the quality of the portfolio in MFIs deteriorates, this may lead to financial unsustainability that could result to collapse of MFIs. This signifies that microfinance institutions ought to ensure that credit policies are adhered to by borrowers to maintain its financial sustainability.

Review literature indicates most determinants addressed are MFI characteristics (size, age, and type of organization), their funding sources, the quality of organizational governance and the MFIs' external context such as macro-economic, institutional and political conditions. However, evidence on these issues is rather mixed (Hermes & Hudon, 2018). Moreover, mostly on the country-specific context. Additionally, there is an absence of consensus in the literature on the measurement of financial sustainability and social performance (depth of outreach).

More emphasis has been put on the issue of financial sustainability and switching to commercialization by MFIs, which raised more concerns on the effects of the shift towards outreach, on the number (breadth) and socio-economic level (depth) of the clients that are served by microfinance institutions (Hermes & Lensink, 2007). Lately, there is an ongoing discourse regarding the outreach of microfinance programs. However, Lafourcade *et al*. (2005), focused on microfinance institutions in Africa found mixed evidence, especially regarding the depth of outreach. Some studies indicate that it is the "better off" poor rather than then "starkly" poor who stand to benefit most (Hulme & Mosley, 1996). Khandker (2005) and EDA Rural Systems (2004), also found evidence that the extremely poor benefit more from microfinance than the moderately poor.

Manos and Yaron (2009), identified a positive short-run bond linking depth of outreach and financial sustainability with the long-run association glued on a scale of operations and innovation in lending. Advocates for financial sustainability posit that, as MFIs develop, so are their clients, thus at the integration stage, loans granted to clients won't be small anymore. The trade-off between sustainability versus outreach is one that has been hotly been debated by scholars lately in the microfinance literature (Cull et al., 2007; Mersland & Strøm, 2010; Schreiner, 2000). Cull et al. (2007), found the presence of the trade-off dealing with the poor borrowers. Hartarska, Shen, and Mersland (2013) found support on the existence of a trade-off between outreach and sustainability. MFI outreach had a negative relationship with financial sustainability (Hermes *et al.,* 2011). Thus, Conning and Morduch (2011), argue that corporate governance had complementary results on outreach and sustainability in performance. Insufficient financing to MFIs has posed a key challenge to arrest poverty in developing and newly industrialized countries (De Aghion *et al*., 2007).

Also, several studies provide evidence of a trade-off between financial performance/sustainability and outreach to the poor (Crawford & McKenzie, 2011; Galema & Lensink, 2009; Hermes & Lensink, 2011). In this regard, MFIs that perform well financially do so at the expense of their outreach to the poor. Conversely, other studies report a positive relationship between profitability and sustainability with outreach to the poor, hence the absence of a trade-off (Makombe, Temba, & Kihombo, 2005). Kar (2012), explored the impact of profitability on the depth of outreach and found a significant positive relation between MFI size and average loan amount, suggesting mission drift.

This is attributed to the shift of MFIs from the depth of outreach motive coupled with inadequate grants and donations to the provision of financial services for profits, a view that has largely been ignored by most MFIs. Life cycle theory postulates that over time, managers of MFIs perfectly use the best business models and experience to widen financing options to

steer MFIs into financial sustainability. Thus, as MFIs grow into large stable institutions with extended outreach, they become financially sustainable (Hoque *et al.,* 2011). Based on the above argument the study hypothesized that:

***H_{01}**: Depth of outreach does not moderate the relationship between financial leverage and MFI financial sustainability in Kenya.*

***H_{02}**: Depth of outreach does not moderate the relationship between portfolio quality and MFI financial sustainability in Kenya.*

3. Research Methodology

The study utilized a positivist research philosophy. The positivist paradigm was used in the study to examine the empirical relationship between the determinants of microfinance institutions' financial sustainability and depth of outreach. The study adopted an explanatory research design that is quantitative and hypotheses tested by measuring the relationships between variables, while data is analyzed using statistical techniques.

3.1 Data and Sample

The study utilized data from secondary sources from MIX market databases for the period between 2010 to 2018 to investigate the determinants of microfinance institutions' financial sustainability as well as to test the moderation of depth of outreach in Kenya. Using existing data provides a viable option for researchers who may have limited time and resources (Johnston, 2017). As a result, scholars have shown that using secondary sources is important to research as it provides materials with a wide range of interpretations. Therefore, secondary data is essential in panel studies (Silva & Backhouse, 1997). However, the major drawback for using the data that is already existing in the archives is that the researcher did not participate in the data collection process and doesn't know how it was conducted (Johnston, 2017). Hence, the researcher has to mine the information of interest through other means such as documentation of the data collection procedures, technical reports, and publications (Boslaugh, 2007). Therefore, the study used a data collection schedule to collect secondary data from the MIX market database. The study utilized data extracted from secondary sources for determinants of MFI financial sustainability, outreach and control variables from the Mix Market database. The data was a panel in nature collected for the MFIs for five years. This is in line with other studies by (Chen & Hammes, 2004; Cheng & Shiu, 2007) which used panel data.

3.2 Measurement of Variables

3.2 1 Dependent Variable

Financial sustainability MFIs sustainability is generally considered at two levels: operational sustainability and financial sustainability (Morduch, 1999). The study utilized the MIX Market definitions of financial sustainability: Financial sustainability measure is defined as Adjusted operating revenue/adjusted (financial expense + loan loss provision expense + operating expense) (Yaron & Manos, 2007).

3.2.2 Independent Variables

***Financial leverage*-** the leverage indicates the proportion of a firm's total capital funded by trade creditors or lenders and determines the firm's capacity for debt repayment (Berger & Di Patti, 2006). Therefore, are measured by debt-equity-ratio which show the standard measure of the long-term financial health of an organization, also measures leverage that indicates the extent to which the business depends on debt financing to increase their outreach according to

the studies of (Hartarska & Nadolnyak, 2007) which ascertained the effect of leverage on MFI sustainability. As the debt-equity ratio increases the possibility of difficulty in paying interest and principal rises while obtaining more funding (Kyereboah-Coleman, 2007). An un-levered firm utilizes only equity finances, whereas a levered firm is made up of ownership equity and debt (Kar, 2012).

Portfolio Quality-The study measures loan portfolio quality by Portfolio at risk beyond 30 days (PAR30) which scholars revealed the potential for future losses based on the current performance of the MFIs portfolio (Godquin, 2004; Nyamsogoro, 2010). To extend and sustain the MFIs growth the mechanism discriminates questionable micro-entrepreneurs thus avert the risk of underpayments, which could accelerate the deterioration rate of the portfolio quality and contributes to the erosion of the financial sustainability of MFIs (D'espallier, Guérin, & Mersland, 2011).

Apart from dynamic loans, numerous risk management methods could be used like credit scoring and pre-default, which is based on the possibilities of staggering the repayment of microcredit (Lanha, 2004). Gibbons and Meehan (1999), emphasized that the portfolio-at-risk rather than the loan repayment rate must be controlled to improve the quality of MFIs' portfolios based ranking of different risk levels. Thus, managers may be enlightened to make the right decisions, particularly during a financial crisis (Ghatak, 1999). Portfolio quality is part of asset management measures that put emphasis on decision making by the management and how they manage the loan portfolio (Hermes & Lensink, 2007).

3.3.3 Moderating Variable

The depth of Outreach - average loan size has been used as a proxy measure of the depth of outreach using a relative level of poverty (Churchill & Marr, 2017; Hermes & Lensink, 2011). Scholars have indicated that the smaller the loans the poorer the customers (Mersland & Strøm, 2010). Nonetheless, they claimed that the average loan size may not be considered to a relative number of the poorest with small loan sizes(Cull et al., 2007). Furthermore, most microfinance clients might be average poor or known as non-poor whose loan sizes are moderately large and, thus, could easily influence the computed average loan size figure.

3.3.4 Control Variables

The study used firm-level controls that are *MFIs age* and *MFIs size* as the control variables. Gross loan portfolio indicates the scale of operations of the MFIs in terms of all outstanding loan principal due for all microfinance clients. The total amount of money lent by MFI BO(Cull *et al.*, 2007; Bogan, 2012). Aguilera and Jackson (2010) argued that country-specific traditions and institutions can be important in corporate governance studies. Hardy, (1993) showed that the representation of variables with k categories, k-1 dummy variables could be a requisite. Control variables in the regressions were employed to capture the MFI's heterogeneity. The specification of size is the natural logarithm of total assets, which reduces outlier bias.

3.4 Model specification

Hypotheses were tested by using Fixed and Random effect analysis in Panel data analysis. Panel data collected was analyzed based on F-statistics amongst fixed effect and random effect which is to be used. If the presence of fixed or random individual effects is understood in the F test, the Hausman test indicates the model to be used (Wooldridge, 2009). The study analyzed the moderation effect using hierarchical moderated linear regression. The regression method which also allows each variable to be entered one at a time. Therefore, every stage R^2 was determined to show the rate at which the variance change can be accounted for, by the

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independent variables with an additional predictor (Little *et al.*, 2012). The method was chosen due to its prediction of the independent variables and the moderator variables and also the interaction of the independent and moderator variables improves prediction. The study utilized hierarchical regression models to test the direct effects of determinants of financial sustainability and the moderating role of outreach.

$$FSS_{it} = \alpha_{0it} + \beta_{1it}AGE_{it} + \beta_{2it}Size_{it} + \beta_{4it}LEV_{it} + \beta_{5it}QLP_{it} + \varepsilon_{it} ...Model.....2$$

$$FSS_{it} = \alpha_{0it} + \beta_{1it}AGE_{it} + \beta_{2it}Size_{it} + \beta_{4it}LEV_{it} + \beta_{5it}QLP_{it} + \beta_{9it}DO + \beta_{10it}LEV_{it} * DO_{it} + \varepsilon_{it} .....Model.....3$$

$$FSS_{it} = \alpha_{0it} + \beta_{1it}AGE_{it} + \beta_{2it}Size_{it} + \beta_{4it}LEV_{it} + \beta_{5it}QLP_{it} + \beta_{9it}DO + \beta_{10it}LEV_{it} * DO_{it} + \beta_{11it}QLP_{it} * DO_{it} + \varepsilon_{it} ..Model.....4$$ Where:

FSS_{it} = Financial sustainability for MFI *i* in year *t*

LEV_{it} = Financial leverage for MFI *i* in year *t*

QLP_{it}=Portfolio quality for MFI *i* in year *t*

DO_{it} = Depth of outreach for MFI *i* in year *t*.

$Size_{it}$ = MFI size for firm *i* in year *t*

AGE_{it}= Age of MFI *i* in year *t*

α_{0it} = *constant*

$\beta_{1it} - \beta_{13it}$ = *coefficients of the regression*

ε_{it} = *error terms*

i = *MFIs*

t = *Time*

4. Results and Discussion

The summary table of the study variables is as illustrated in table 1. Based on the findings financial sustainability among MFIs realized a mean of .35 while financial leverage was at a mean of 1.04. Furthermore, portfolio quality had a mean of -2.63 while the mean depth of outreach was 5.84. On average, the firms have been in operation for 4 years and had a mean size of 1.86.

Table 1: Summary of Descriptive Statistics for the Research Variables

Variable	Obs	Mean	Sd	Min	Max
Financial sustainability	270	0.35	0.93	-0.86	4.91
Financial leverage	270	1.04	1.33	-3.91	4.82
Portfolio quality	270	-2.63	1.39	-6.91	2.85
Depth of outreach	270	5.84	1.27	2.20	8.98
Firm Size	270	1.86	0.18	1.15	2.24
Firm Age	270	4.29	0.84	1.00	1.00

Pearson correlation results in the table showed that financial leverage is positively related to financial sustainability with a Pearson Correlation coefficient of r = .162 which is significant at p < 0.05. The output also shows that portfolio quality is positively related to financial sustainability, with a coefficient of r = .351 which is also significant at p < 0.05. Also, deposit outreach is positively related to financial sustainability, with a coefficient of r = .162 which is significant at p < 0.05. Besides, firm size is negatively related to financial sustainability, with a coefficient of r = - 0.271 which is also significant at p < 0.05. However, firm age was not correlated with financial sustainability.

Table 2 Pairwise Correlation Matrix

	Fns	**fl**	**pq**	**doo**	**fs**	**fa**
Financial Sustainability	1					
Financial leverage	.162**	1				
Portfolio quality	.351**	.332**	1			
Depth of outreach	.162**	-0.143	0.061	1		
Firm Size	0.039	.315**	.273**	-0.038	1	
Firm Age	-.271**	.383**	-0.097	-0.105	.459**	1
*** Correlation significant at 5%*						

4.1 Diagnostics tests

For the Jarque-Bera Test, if the p-value is lower than the Chi (2) value then the null hypothesis cannot be rejected. It can, therefore, be concluded that the residuals are normally distributed. As per table results, the chi (2) is 5.09 which is greater than 0.05 meaning that the null hypothesis cannot be rejected. The implication is that there is no violation of the normal distribution assumption of error terms as the residuals are coming out to be normal.

Multicollinearity test was used to check whether a high correlation existed between one or more variables in the study with one or more of the other independent variables. Variance inflation factor (VIF) measured the correlation level between the predictor variables and estimated the inflated variances due to linear dependence with other explanatory variables. A common rule of thumb is that VIFs of 10 or higher (conservatively over 5) points to severe multi-collinearity that affects the study (Newbert, 2008). The results of the VIF test ranged between 1.44 and 7.34. All the variables are less than 10 thereby; our model does not suffer from multicollinearity problems.

To conduct the heteroskedasticity test, this study uses the Breusch-Pagan test for heteroskedasticity. The findings indicated that Chi2 (1) was .50, a p-value of 0.4808 revealing that the null hypothesis was not rejected suggesting that assumption of constant variance was not violated.

The study tested homoskedasticity using the White test. The findings indicated that Chi2 (35) was 52.47, a p-value of 0.0592 revealing that the null hypothesis was rejected suggesting that the assumption of homoskedasticity was not violated.

Autocorrelation in panel data can be detected using several tests such as the Baltagi-Wu test, the Durbin-Watson test, and the Breusch-Godfrey test. According to Drukker (2003), these

tests employ many specification assumptions such as individual effects types, need for non-stochastic regressors and inability to work in the presence of heteroscedasticity. Drukker (2003) further argues that the autocorrelation test of Wooldridge (2002) does not have such limitations and can also deal with unbalanced panel data with and without gaps in the observations, thus the null hypothesis cannot be rejected at the 5% significance level, which means that there is no autocorrelation in the data.

4.2 Unit root test

This current study applies Fisher and Phillips test. The following hypothesis was considered for this test.

Null hypothesis (Ho): All panels contain unit root.

The alternative hypothesis (H1): At least one panel is stationary.

Looking at the *p*-values in Table 3, the null hypothesis can be rejected at all conventional significance levels for all the variables of the study, which means that there is no unit root in our data. This implies that the means and variances in our data do not depend on time, hence the application of OLS can produce meaningful results (Gujarati, 2012).

Table 3: Unit root test

	Inverse chi-squared(58) P	**Inverse normal Z**	**Inverse logit t(144) L***	**Modified inv. chi-squared Pm**
Financial Sustainability	155.46	-3.52	-6.31	1.15
p-value	.00	.00	.00	.00
Financial leverage	188.05	-4.59	-7.74	12.07
p-value	.00	.00	.00	.00
Portfolio quality	88.21	-1.89	-4.17	5.04
p-value	.00	.03	.00	.00
Firm age	52.28	.39	.14	-.71
p-value	.00	.00	.00	.00
Firm size	215.27	-5.36	-8.84	14.60
p-value	.00	.00	.00	.00
Depth of Outreach	139.62	.41	-2.47	7.58
p-value	.00	.00	.01	.00

Source: Research Data, (2019)

4.3 Hypotheses

Moderation implies that the causal relationship between two variables changes as a function of the moderator variable. Moderation is said to exhibit if the amount of variance accounted for with the interaction is significantly more than the variance without the interaction and coefficient of the interaction term is different from zero (Hayes, 2013). To test the moderation effect of depth of outreach the study used the hierarchical regression model (baron and Kenny, 1986). The effect of the dependent variable such as financial sustainability was regressed on controls, exogenous variables, and interaction terms. The hierarchical regression method was used by entering variables in a lump; controls, the

exogenous variables, the moderator as well as each of the interaction terms and observing their results.

The findings were analyzed and interpreted in order to evaluate whether the determinants of financial sustainability had an effect on depth of outreach and thus the model 1 presented the dependent and controls variables, model 2 presented the dependent, controls and independent variables, model 2 presented the dependent, controls, independent and moderator, while model 2 to model 5 presented controls, independent and moderation with interactions to test the hypothesis.Baron and Kenny argued that an increase in R change indicates a significant model.
Based on the study findings R squared within from random effect increased from 87.5% to 88.5% ($R^2\Delta$ = 10%) after moderating the relationship between financial leverage and financial sustainability of MFI by the depth of outreach. Similarly, there was an increase of 36% ($R^2\Delta$=.36%) after moderating the relationship between portfolio quality and financial sustainability of MFI by the depth of outreach.

Table 4 presents results on the moderating effect of depth of outreach. It can be seen from the table that there is a negative and significant moderating effect of depth of outreach on the relationship between financial leverage and financial sustainability (β = - *0.19*, ρ < *0.05*). Consequently, the use of debt financing to provide small loans to the poor and marginalized is a deterrent to financial sustainability. The beta value (β= - *0.102*, ρ < *0.05*) in table 4 shows that portfolio quality has a negative and significant moderating effect on the relationship between portfolio quality and financial sustainability. Thus, the depth of outreach weakens the relationship between portfolio quality and financial sustainability. The results are in line with prior findings which have indicated that when market penetration rates exceed 8% of the total population, portfolio quality diminishes leading to a decline in financial sustainability (Gonzalez, 2010). The results also conform with that of Bos and Millone (2015) which showed that there is a decline in efficiency as the loan portfolio becomes larger.

Table 4: Regression Analysis Results

	Model 1 Coef. (Std. Err.)	Model 2 Coef. (Std. Err.)	Model 3 Coef. (Std. Err.)	Model 4 Coef. (Std. Err.)	Model 5 Coef. (Std. Err.)
_cons	4.5(1.07)**	1.163(.07)**	11.98(.91)**	1.16(1.23)**	12.018(1.102)**
Firm age (FA)	.66 (.16)**	.117(.033)*	.49(.17)**	.37(.18)*	.387(.147)*
Firm size (FS)	2.49(.58)**	-5.449(.08)	9.04(.98)**	8.57(.98)**	-7.831(.833)**
Financial leverage (FL)		.264(.067)**	.21(.07)**	.89(.33)**	.387(.294)
Portfolio quality (PQ)		.087(.448)	.1(.03)**	.08(.03)*	.678(.12)**
Depth of Outreach (DOO)			.49(.15)**	.66(.16)**	.169(.168)
FL*DOO				-.12(.06)*	-.029(.051)
PQ*DOO					-.118(.024)**
sigma_u	.520	.653	.680	.640	.643
sigma_e	.644	.255	.220	.210	.178
Rho	.395	.867	.910	.900	.929
R-sq: within	.173	.822	.875	.885	.921
between	.265	.733	.723	.726	.739
overall	.207	.519	.572	.576	.629
R-sq: change	.207	.412	-047	.004	.053
F	13.570	43.740	53.920	5.730	67.020
Prob > F	.000	.000	.000	.000	.000
Hausman Test					
chi2	31.06	46.37	45.80	57.55	60.01
Prob>chi2	0.000	0.000	0.000	.000	0.000

**significant at 0.01 level; *significant at 0.05 level; Figures in parenthesis are t –statistic

4.4 Moderating effect of Modgraph

To show antagonistic and enhancing the moderating effect, the study used modgraph as recommended by (Jose, 2008). To understand the nature of the interaction of depth of outreach on the relationship between determinants of financial sustainability (financial leverage and portfolio quality), Aiken & West (1991) suggested that the moderated results be presented on a moderation graph. Further-more, indicated that it is insufficient to conclude that there is interaction without probing the nature of that interaction at different levels of the moderator. Therefore, the significant of the coefficient of the depth of outreach was assessed at low, medium and high levels of financial leverage and portfolio quality. The examination of the graphical plots from .1 show that under low level of financial leverage, financial sustainability is high with all levels of depth of outreach. However, as financial leverage increases financial sustainability decreases with all levels of depth of outreach but the slope drops drastically with high depth of outreach while the lope drops marginally for a low level of depth of outreach.

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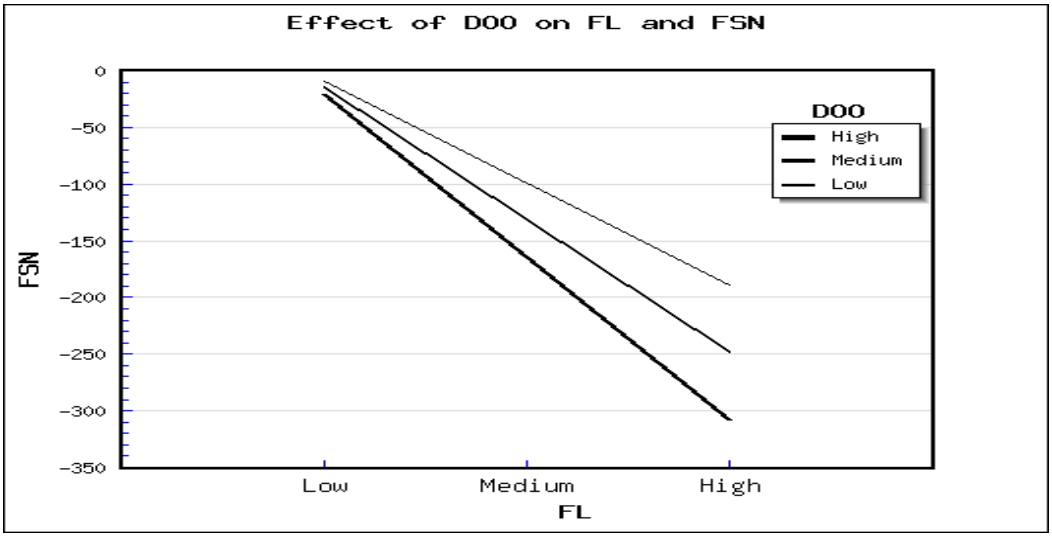

Figure 1: Modgraph for Moderating Effect of Depth of Outreach on the Relationship between Financial Leverage and Financial Sustainability

Similarity, findings in figure 2 show antagonistic effects since at the low level of portfolio quality, financial sustainability is high with all levels of depth of outreach. However, as portfolio quality increases financial sustainability decreases with all levels of depth of outreach but the slope drops drastically with high depth of outreach compared to a low level of depth of outreach.

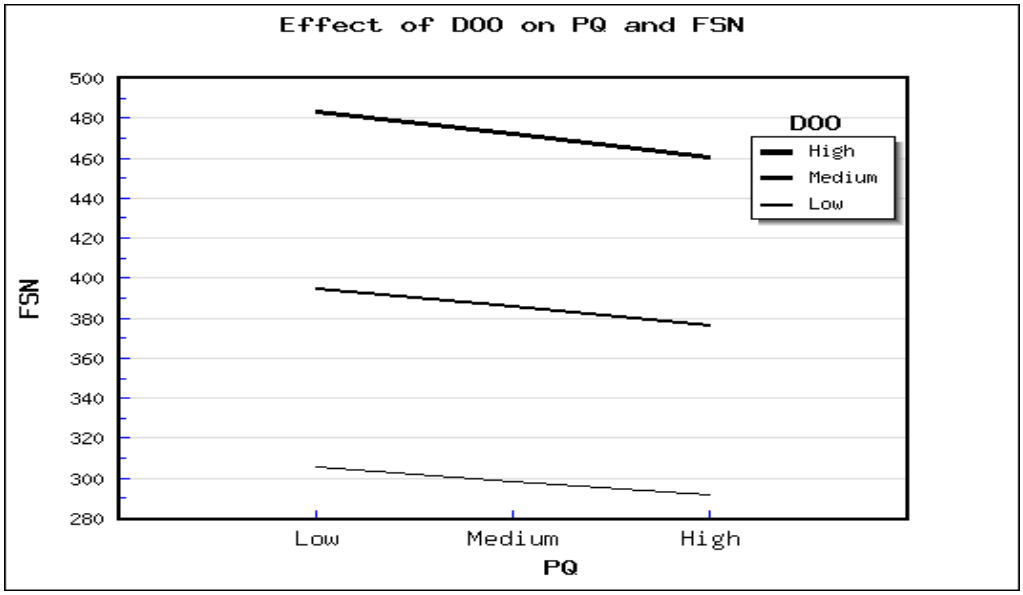

Figure 2: Modgraph for Moderating Effect of Depth of Outreach on the Relationship between portfolio quality and Financial Sustainability

5.1 Conclusion

This study sought to establish the determinants of MFIs' financial sustainability and the moderating role of the depth of outreach. The focus was on the Kenyan MFIs. The findings indicated that financial leverage was a positive determinant of MFIs' financial sustainability.

Similar results were reported by Nyamsogoro (2010) in Tanzania. As argued in the finance literature, debt capital is cheaper and usually leads to higher profitability and ultimately improved financial sustainability. Moreover, the use of debt capital mitigates agency costs through external monitoring, which is likely to force managers to engage in prudent financial management. Although financial leverage has a direct effect on financial sustainability, the study found an indirect effect through the depth of outreach. Increased outreach affects MFIs in two ways. First, the demand for loans will increase, thus necessitating the need for external financing to fill the gap. Second, improved outreach may boost MFIs' internal finances, through increased customer deposits, thus lessening the demand for external borrowing. Either way, the depth of outreach will influence the financial leverage and financial sustainability causality.

Further, the study found an important connection between portfolio quality and financial sustainability of MFIs. Similar findings were reported by Adongo and Stork (2006) and Ayayi and Sene (2010) but contradict those of Bayai and Ikhide (2018) and Nyamsogoro (2010). As such, whenever there is a higher loan portfolio at risk, MFIs become inefficient thus leading to a decline in their financial sustainability. Arguably, MFIs with a lower portfolio at risk suffer from swelling Non-performing loans and increased expenses of loan recovery. However, when the relationship between portfolio quality and financial sustainability of MFIs is moderated by the depth of outreach, the relationship is weakened. This is an indication that, as MFIs increase their market access, they are likely to suffer from lower repayment rates of their loans thereby impacting negatively on their sustainability.

Since portfolio quality enhances financial sustainability, efforts should be on ensuring that loan repayment rates are controlled to improve the quality of MFIs portfolio. Also, the management of MFIs needs to monitor the social ties and have local knowledge of targeted clients as it has the potential to determine repayments thereby minimizing the costs incurred in recovering loans. Besides, MFIs need to capitalize on the group loan mechanism to minimize the danger of default rates as well as improve on the quality of their portfolio. This may lead to financial sustainability.

6.1 Managerial and Theoretical Implication

For managerial implication, the study has identified the two key determinants of the financial sustainability of MFIs as financial leverage and portfolio quality. Thus, managers of MFIS must focus their attention on ensuring that they maintain an optimal balance between external and internal capital, while at the same time developing effective systems for appraising and monitoring borrowers. Based on the gaps identified in previous studies, this study has filled it by demonstrating that the depth of outreach moderates the relationship between financial leverage and portfolio quality on the financial sustainability of MFIs in Kenya. Thus, this study contributes to the existing body of literature and maybe a fertile ground for future studies.

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