

Financial Characteristics and Innovations in Microfinance Institutions in Ghana

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Abstract The relationship between the financial structure of Microfinance Institutions (MFIs) and their innovativeness remains unexplored in the microfinance literature. This paper represents an attempt to fill this void using a random sample of microfinance institutions in the three northern regions of Ghana -Northern, Upper East and Upper West regions. The impact of financial characteristics on innovation was ascertained using a combination of Analysis of Variance (ANOVA) multiple regression, and binary logistic regression. The findings revealed that the loan repayment rate, and interest rate affect the introduction of new savings products (product innovation), and number of branches (location innovation). Sources of funding involving banking funding, and equity of owner were found to encourage the development of new loan products. The findings call for the need for MFIs to diversify their funding sources as a means of enhancing innovativeness and mitigating risk.

Keywords: *analysis of variance, multiple regression, binary logistic regression, northern Ghana, financial characteristics, innovation, microfinance institutions*

1. Introduction

Policymakers and development practitioners who have been trying to improve the lives of billions of people living with per capita incomes of less than one dollar per day face an uphill battle [1]. Poverty has been identified as the principal problem confronting developing countries and is at the centre of development policy [2]. This is made worse by the lack of access to productive capital, with most formal financial institutions not serving the poor because of perceived high risks, high costs involved in small transactions, perceived low relative profitability, and inability of the poor to provide the physical collateral usually required by such institutions [3]. To solve the problem of poverty all over the world, especially in the 'less developed' countries of the world, there are countless Non-Governmental Organisations (NGO's) and international aid agencies operating with the aim of helping the poor better their standards of living by providing them incentives in the form of small credits and loans to start their own small enterprises [4]. These institutions according to [1] are united under the banner of microfinance and share a commitment to serving clients that have been excluded from the formal banking sector. [5] has argued that, improved access to financial services can raise the expected value of income and therefore of consumption and future investment and asset accumulation of the poor.

[6] further added that microcredit, a component of microfinance has been successful in allowing micro entrepreneurs to increase both output and income. These

improvements in physical living standards, though small, often make the difference between abject poverty and independent subsistence. Access to financial services according to [7] provides critical investment opportunities for the poor who have been traditionally shut out of financial markets, and liquidity for consumption smoothing when confronted with economic and social shocks such as sudden sickness in the household, crop failure, etc.

Microfinance has grown to become a much favoured intervention amongst international development agencies. There is scarcely a multi-lateral, bilateral or private development donor organisation not involved in the promotion of a microfinance programme [6,8] have observed that, the last twenty-five years have witnessed rapid expansions in the numbers and size of MFIs in many parts of the world with estimates suggesting that by 2000, MFIs worldwide served about 12.5 million individuals. They further argued that the primary clientele of MFIs consists almost of those who face severe barriers to access financial products from conventional financial institutions. These barriers comprise mainly high operational costs and risk factors. To overcome these barriers, MFIs have to be innovative. Innovative products, services and processes can create additional value and expand the frontier of finance if they: create access to the formal financial system by groups previously without access; reduce transaction and risk costs of the financial services provider or of the clients or both; increase the term of loans and of savings, and/or provide larger loans to clients by refining valuation processes [9].

In the last decade, microfinance institutions have experienced a boom in innovations of lending products,

partly fuelled by donors who see microfinance as the next promise to alleviate poverty. Examples of these new products are the combination of credit with health or life insurance, business and health education, savings products, and the adoption of (or conversion to) individual loan liability. The add-in features generally aim at reducing the vulnerability of clients while contributing to asset creation, hence improving their repayment rate and the sustainability of the service. The product innovations typically result from organizations striving to extend outreach, increase impact, and promote sustainability [10].

In Ghana, more than three-fourth of the population lives under two dollars a day [11]. According to the fourth round of Ghana Living Standard Survey (GLSS 4), access to capital credit is one of the most important factors that hinder progress of most businesses in Ghana. The report further indicated that about 60 per cent of non-farm enterprises have no access to capital or credit. The regions with the highest incidence of poverty are Upper East, Upper West and Northern regions. Since majority of the people in Ghana and particularly the northern regions lives in poverty, micro finance is probably the most appropriate way to provide financial services to a majority of Ghana's poor population. It is therefore, not surprising that the present government perceives microfinance to be central to achieving the greater goal of poverty alleviation. Through microfinance the government aims to provide poor entrepreneurs, especially those in the informal sector, with greater access to customized financial services [11].

While microfinance is widely celebrated as a possible solution to the financing problems of smaller firms and microbusinesses, there is remarkably little examination of the connection between microfinance and product innovation as observed by [12]. Studies in Ghana have also largely concentrated on the role of MFIs in poverty reduction and their challenges. Even the few studies that have tried to look at aspect of innovations in MFIs such as [13] have largely lacked analytical rigour. Even more lacking in the empirical literature is the relationship between the financial characteristics of MFIs and the introduction of innovations. This current study attempts to fill the void in literature by examining the relationship between financial features and innovations adoption in MFIs in northern Ghana. This is more critical not only to the successful operation of these MFIs, but also to their survival in a financially liberalised economy like Ghana. The study unravels the various innovative strategies that could be adopted by MFIs to enhance their operations and how these innovations relate to their financial characteristics. This information is relevant not just to the MFIs, but also to the policymakers who have recognised microfinance as a tool for poverty reduction

2. Methodology

Primary data were obtained in 2011 from a random sample of 41 MFIs operating in the three northern regions of Ghana –Northern, Upper East and Upper West regions. A total of 14 MFIs were covered each in Northern region and Upper East region and 13 from the Upper West region. The categories of MFIs covered in this study include credit unions, savings and loans companies, and rural banks.

A semi-structured questionnaire was administered to each institution. The questionnaire covered product and marketing innovations being offered by the said MFIs and some financial characteristics such as sources of funding, average repayment rate over the past 3 years and loan term. The study's main focus was to look at the relationship between innovations and these financial characteristics of MFIs. The Analysis of Variance (ANOVA) tests, multiple regression and binary logistic regression were employed to achieve this objective.

2.1. Analysis of Variance (ANOVA)

Specifically, ANOVA is designed to test if two or more populations have the same mean. Though the purpose of ANOVA is to test for differences in population means it entails an examination of the sample variances; hence the term analysis of variance. In more specific terms the procedure can be employed to ascertain whether a particular "treatment" (factor) when applied to a population will have an impact on its mean [14]. The factor refers to the force whose impact on the dependent variable is being ascertained. In this study the factors comprise firm financial characteristics while the dependent variables (experimental units) include the different types of innovations rolled out by MFIs.

ANOVA is not the only test that can be used to test differences in population means. T-test and Hotelling's T^2 can also be used. However, these two alternatives can handle only two groups for the dependent variable. ANOVA on the other hand can handle analysis where the independent variables have more than two categories [15]. Sometimes to correct the defect inherent in the t-test, separate t-tests for the difference between each pair of means is conducted. However, such multiple t-tests inflate the Type I error rate. The use of ANOVA avoids this Type I error inflation as a result of making multiple comparisons across treatment groups by determining it in a single test whether the entire set of sample means suggests that the samples were drawn from the same general population [15]. On the basis of the above reasons, this study uses the ANOVA approach. In ANOVA test, the F-ratio is a ratio of the variation between samples to the variation within samples. The ANOVA F-ratio for a test of means is given by:

$$F = \frac{MSTR}{MSE} \quad (1)$$

Where MSTR is the mean squares treatment and is given by:

$$MSTR = \frac{SSTR}{c-1} \quad (2)$$

Where c is the number of treatments, SSTR is the sum of squares treatment and is given by:

$$SSTR = \sum r_j (\bar{X}_j - \bar{\bar{X}})^2 \quad (3)$$

Where $\bar{\bar{X}}$ is the grand mean of all observations, \bar{X}_j refers to each treatment mean and r_j is the number of rows in each treatment.

MSE is the mean squares error and is expressed as:

$$MSE = \frac{SSE}{n - c} \quad (4)$$

n is the total number of observations and SSE is sum of squares error algebraically written as:

$$SSE = \sum_{i=1}^r \sum_{j=1}^c (X_{ij} - \bar{X}_j)^2 \quad (5)$$

X_{ij} is the i^{th} observation in the j^{th} sample.

The hypothesis to be tested is that all treatment means are equal against the alternate hypothesis that not all treatment means are equal. That is:

$$H_0 = \mu_1 = \mu_2 = \dots = \mu_n$$

$$H_1 = \text{not all means are equal}$$

Note that the MSTR measures the variation between treatments. If the treatments are having different effects, MSTR will reflect this by increasing. The F-ratio itself will then increase. Thus if the F-ratio gets significantly large because MSTR exceeds MSE by such a great margin, then treatment effects probably exist. The theoretical F-value is read from the F-table and compared with the empirical value obtained from Equation (1). If the calculated F-statistic is greater than the theoretical value then the null hypothesis is rejected in favour of the alternative, and vice versa. In this study we test the null hypothesis that there is no relationship between financial characteristics (treatments) of MFIs and innovations (experimental units) against the alternative hypothesis that there is a relationship.

2.2. Econometric Analysis

To complement the ANOVA discussed above, multiple regression analysis and binary logistic analysis were performed. Where the dependent variable is a metric variable, regression analysis was employed. However, where the dependent variable is non-metric but binary, the binary logistic model was used. Multiple regression analysis as an econometric technique can be used to analyse the relationship between a single dependent variable and several predictor variables. In multiple regression analysis, the objective is to use the independent variable, whose values are known, to predict the single dependent value chosen by the researcher [15]. Series of regression analysis was run using measures of innovation such as R&D, number of branches/outlets, number of new loan products introduced in the past three years, and number of new savings products introduced in the past three years as dependent variable in each case. The independent variables include financial characteristics and other control variables. The financial characteristics employed include funding sources (consisting of funding from donors, savings, shares, banks, equity of owner), average interest rate, average repayment rate, average maximum loan amount given to clients, average minimum loan amount given to clients, average maximum loan term, average minimum loan term, and average clientele base. The averages refer to means of the concerned variables over a 3 year period. The control variables used in the analysis include size of workforce, educational profile of workers, and board size. The sources of funding entered the models as dummy variables, taking a value of 1 if MFI had access to a source of funding and 0 otherwise. The general specification of the regression model is:

$$\text{Innovation} = f(X_i, Z_i, u_i) \quad (6)$$

Where Innovation is a measure of innovation such as R&D, number of branches/outlets, number of new loan products introduced in the past three years, and number of new savings products introduced in the past three years as dependent variable, X_i is a vector of financial characteristics of MFIs, Z_i is a vector of control variables, u_i is stochastic error which is assumed to be normally distributed.

Binary categorical dependent variables such as whether or not MFIs offer microinsurance, and whether or not MFIs made modification to marketing products were analysed using binary logistic regression. Several multivariate techniques are available for analysing situations where the dependent variable is non-metric, some of which include discriminant analysis and logistic regression analysis. The use of discriminant analysis requires the fulfilment of assumptions of normality of the independent variables, and equality of variance-covariance structures across groups defined by the dependent variable. In a binary dichotomous dependent variable situation when these assumptions are violated, it is more suitable to use logistic regression analysis, since it is less affected by the violation of these assumptions. Also, logistic regression analysis in many ways is comparable to regression analysis in terms of estimation, interpretation, incorporating non-metric independent variables and dealing with issues of nonlinearity [15]. For these reasons, logistic regression was chosen over discriminant analysis since the dependent variables in this study, in each case has only two levels –innovator or non-innovator. The logit model is specified as:

$$\text{Logit} = \ln \left[\frac{\text{prob}_{\text{event}}}{1 - \text{prob}_{\text{event}}} \right] = b_0 + b_i X_i + b_j Z_j \quad (7)$$

Or in terms of odds

$$\text{Odds} = \left[\frac{\text{prob}_{\text{event}}}{1 - \text{prob}_{\text{event}}} \right] = e^{b_0 + b_i X_i + b_j Z_j} \quad (8)$$

Where $\text{prob}_{\text{event}}$ is the probability of an MFI introducing innovation, X_i is the vector of financial characteristics with associated coefficients b_i , and Z_j is a vector of control variables with associated coefficients b_j . Two main models were run. One model used microinsurance (given a value of 1 if microinsurance is offered and 0 otherwise) as the dependent variable, while the other used modification to marketing innovations (given a value of 1 if modification was made to marketing innovation and 0 otherwise) as the dependent variable.

Given the sample size of 41, in order to meet the sample adequacy requirement of 1 explanatory variable to 5 observations, and to avoid over fitting and multicollinearity, a 2-step estimation procedure was employed in both the multiple regression and the logistic regression models. The first step involved using a Backward Wald estimation method to ensure that only important explanatory variables are selected. The procedure starts with a regression model that includes all independent variables and then uses a trial and error method to delete all the independent that do not contribute significantly. The significant variables in the first step are then used in the second step to formulate a new model to

be estimated using the ENTER estimation procedure. The ENTER estimation procedure uses all the dependent variables specified by the researcher in the analysis. The use of the Backward Wald estimation procedure guaranteed that irrelevant explanatory variables were eliminated to ensure model parsimony. The 2-step procedure also ensured that in all cases the sample adequacy requirement was met. These estimation methods are in-built in the Statistical Package for Social Sciences (SPSS) software. SPSS version 21 was used to estimate all the models in this study.

3. Results and Discussion

3.1. Sources of Funding for MFIs in Northern Ghana

The sources of funding for the MFIs studied are presented in Table 1. The results show that savings mobilization is an important component of the portfolio of activities of MFIs. Ninety five percent (95%) of the MFIs collect and uses savings to fund their loan portfolios. According to [16], savings can be a cheaper source of funding for MFIs and the higher the proportion of the loan

portfolio funded with clients' savings, the lower the overall cost of funding for the MFI. About 49% of the MFIs raise funds through shares to finance their operations while MFIs who fund their lending activities with loans from commercial banks constitute 36.6%. Most MFIs' priority sources of funding may not include loans from commercial banks due to the high funding cost that may be incurred. However, low cost funding sources such as clients' savings, donors, shareholder/owner equity may be limited and/or absent in relation to loan demands from clients necessitating accessing and using commercial loans. Following [16], the overall cost of funding for an MFI may be high if the proportion of the loan portfolio funded with commercial loans is high. MFIs that benefit from donor funding constitute 12.2%, suggesting that the role of donors in these institutions is very limited. In general, access to donated funds by an MFI to fund its loan portfolio result in relatively low financing cost to the MFI [16]. Equity funding is very essential at the beginning stages of most businesses including private MFIs. Only 7.3% of the MFIs use owner equity in funding their loan portfolios suggesting that these MFIs may be in their formative stages.

Table 1. Sources of Funding for MFIs

Funding Source	Frequency	Percent
Donor		
Yes	5	12.2
No	36	87.8
Savings		
Yes	39	95.1
No	2	4.9
Shares		
Yes	20	48.8
No	21	51.2
Bank		
Yes	15	36.6
No	26	63.4
Owner Equity		
Yes	3	7.3
No	38	92.7

Table 2. Relationship between Financial Characteristics and Innovation in MFIs –ANOVA Test

Factor	Dependent Variable	F-statistic	Sig.
Average repayment rate over past 3 years	Number of new savings products offered in the past 3 years	3.349	.032**
	R and D expenditure	7.064	.002***
	Number of new loan products offered in the past 3 years	4.737	.007***
Average Max. loan term over past 3 years	Number of branches/outlets	3.264	.012**
	Number of branches/outlets	8.699	.000***
Donor funding	Microinsurance	3.005	.091*
Funding from savings deposits	Number of branches/outlets	3.326	.076*
	Number of new loan products offered in the past 3 years	3.526	.068*
Funding from bank	Number of loan products offered in the past 3 years	3.760	.060*
	Micro insurance	4.280	.045**
Owner equity	Number of loan products offered in the past 3 years	3.541	.067*

***, **, * depicts significance at 1%, 5%, and 10% respectively

3.2. Financial Characteristics and Innovation in MFIs -ANOVA

As earlier stated, the aim of this study is to establish the relationship between financial characteristics of MFIs and innovations by the same. The financial characteristics of MFIs are depicted in Table 3. These comprise average interest rate over the past 3 years, average minimum loan

amount over the past 3 years, average maximum loan amount over the past 3 years, average repayment rate over the past 3 years, and average clientele base over the past 3 years. A number of innovations have been introduced by MFIs over the past three years. These include the introduction of new savings and loan products (product innovation), the introduction of new marketing strategies (marketing innovation), modification to old savings and loan products and modification to old marketing strategies

(incremental innovation). Other innovations that have been introduced include microinsurance, R&D investment (input innovation), and number of branches/outlets (location innovation). These innovation variables were used as experimental units (dependent variables) and

analysed against financial characteristics of MFIs within the ANOVA framework presented in the methodology section. The results of significant relationships alone are presented in Table 2. The details of the significant relationships are discussed in ensuing subsections.

Table 3. Descriptive Statistics of Financial Characteristics of MFIs in Northern Ghana

Financial Characteristic	N	Min	Max	Mean	Std. Dev. he details of the significant relationships are discussed as follows:bles) and analysed against financial and loan products, mod
Average interest rate for the past 3 years	39	11.00	78.00	25.1967	13.14
Average repayment rate for past 3years	30	39.67	100.00	55.76	36.74
Average loan portfolio over the past 3 years	32	846.67	895666.67	107826.35	178263.62
Average clientele base for the past 3 years	39	16.67	5375.00	871.19	1199.22
Average minimum amount of loan given to clients over the past 3 years	39	1.61	500.00	144.39	114.26
Average maximum loan amount given to clients over the past 3 years	39	250.00	68333.33	7198.78	11725.20
Average maximum loan term over past 3 years(in months)	40	4.33	72.00	33.67	18.76
Average minimum loan term over the past 3 years (in months)	39	1.00	12.00	5.38	3.71

3.2.1. Repayment Rate and Innovation

The average repayment rate among MFIs over the past 3 years (2009-2011) has averaged approximately between 40% and 100% with a mean of 56%. The mean repayment rate is quite low and has implications for sustainability. The average repayment rate over the past three years has a significant relationship with the introduction of innovations such as the number of new savings products offered in the last 3 years, R&D expenditure, and number of new loan products offered in the last 3 years, and number of branches/outlets. This finding underscores the importance of ensuring high repayment rate. A reduction in the default rate makes more money available to MFIs for investment in the introduction of innovations. This revelation calls for the need for MFIs to put in place structures that enhance repayment of loans. Clients should be properly screened and as much as possible the solidarity group approach to lending should be employed. Government should also continue to stabilise the national economy to boost the earning capacity of borrower households, and hence increase their credit worthiness. Thus, when loans are paid in time and fully, both MFIs and customers benefit. MFIs benefit as a result of increased profits resulting from high loan recovery. The increased profit of MFIs is used to introduce new innovations for the benefit of customers.

3.2.2. Loan Term and Innovation

The average loan term over the past 3 years ranges from 4 months to 72 months. The maximum loan term refers to the maximum number of years a borrower is given to repay a loan. The longer the loan term the more flexibility a borrower has in terms of investment choices. Access to long term finance has been a major problem in developing countries. Even commercial banks are cautious in giving long term loans. Short to medium term loans are the most common with short term working loans dominating the portfolios of most MFIs. [9] argued that innovativeness can help MFIs increase loan term for clients. The average minimum loan term over the past three years was found not to have a significant relationship with innovation while the average maximum loan term had. The maximum

loan term was found to have a significant relationship with the number of branches/outlets and the introduction of micro insurance. The rationale behind this relationship is not clear.

3.2.3. Donor Funding and Innovations

The findings point to the fact that those MFIs that had access to donor funding were able to introduce microinsurance. This is shown by the significant relationship between access to donor funds and the offer of microinsurance. Given the number of clients MFIs have, internal sources of funding may not be enough to serve their clientele. Even though, as noted by [16], donor funds enable MFIs to provide comparatively cheaper services to their clients, such funding sources may not be sustainable. Moreover, most donors emphasize social objectives over financial objectives and hence are not inclined to funding purely commercial entities. In this regard, MFIs must explicitly demonstrate in their portfolio of activities the pursuance of key social objectives in order to attract additional and cheaper funding from donors, which enhances their ability to enter into the microinsurance market.

3.2.4. Savings Deposits and Innovation

A significant relationship is found between funding from savings deposits on one hand, and the number of branches/outlets and the introduction of new loan products on the other hand. This finding makes a lot of sense. Since mobilisation of savings is the main source of funding for MFIs, the more the amount of savings mobilised, the more money is available for MFIs to open new branches/outlets and introduce new loan packages. Imbedded in this finding is the intermediation role of MFIs and financial institutions in general. In the finance literature, the process of providing indirect finance using financial intermediaries is called financial intermediation [17]. This source according to the authors is the primary route for moving funds from surplus spending units to deposit spending units. MFIs play this role by obtaining deposits from several households and packaging them into loans for customers.

As depository institutions playing their intermediation function, deposit taking MFIs are becoming popular by the day. According to [18], depository institutions are popular because they offer deposit accounts to accommodate the amount and liquidity characteristics desired by most surplus units; they repackage funds received from deposits to provide loans of the size and maturity desired by deficit units; they accept the risks on loans provided; they have more expertise than individual surplus units in assessing the credit worthiness of deficit units, and they diversify their loans among numerous deficit spending units and therefore can absorb defaulted loans better than individual surplus units could. Therefore as MFIs increase their deposit mobilisation drive, they enhance their capacity to introduce new innovations pertaining to location (branching) and new loan packages.

3.2.5. Bank Funding and Innovations

Some MFIs obtained funding from conventional banks and in turn packaged them into loans for their clients. The study established a significant relationship between bank funding and innovations described in terms of the introduction of new loan products and microinsurance. Having access to loans from commercial banks complemented with other sources of funding increases the funding base of MFIs to diversify their portfolio of activities including the offer of new loan products and microinsurance. This may explain the observed relationship between accessing loans from commercial banks on one hand and microinsurance and loan product innovation on the other. The caveat however is that, loans given out by MFIs through bank funding are likely to attract higher interest rate [16]. This is because MFIs will have to pay back the moneys from banks at commercial interest rate and for that matter will have to include this cost and their own spread on their loans. This may account for the high interest rate charged by some MFIs. In this sample, some MFIs charge as much as 78% interest rate per annum. This definitely defeats one of the purposes of microfinance – to offer “cheap” credit for poverty alleviation.

3.2.6. Owner Equity and Innovations

As discussed earlier, very few MFIs obtained funding through owner equity. However, the findings indicate that those MFIs that received funding from owner's own resources were able to introduce new loan products. Thus additional funding from the owners increases the ability of MFIs to introduce innovations. This is because owners' funds can be applied with a lot of flexibility than the other sources.

Other financial features of MFIs such as average interest rate over the past 3 years, average loan portfolio over the past three years, average maximum loan amount given to clients, average minimum loan given to clients, and funding from shares had no significant impact on innovation by MFIs in northern Ghana.

3.3. Financial Determinants of Innovation in MFIs -Regression Analysis

Table 4, Table 5 and Table 6 contain results of regression analysis. From model 1 in Table 4, financial determinants of innovation (measured in terms of number

branches/outlets) such as funding from savings and average repayment rate have a negative effect, while the average interest rate has a positive impact on innovation. The negative impact of savings deposit and average repayment rate on number of branches is quite strange. The explanation may be that proceeds arising out of these are not used for opening new branches. The negative sign of savings deposits is quite contradictory to the discussion under the ANOVA results. In the view of the authors, the discussion under the ANOVA results seem more plausible. The positive impact of average interest rate on new branches implies that a higher interest rate increases the profit margin of MFIs, which they use to open more outlets or branches. However, too high an interest rate may cause clients to look for funding elsewhere, which may increase default rate, and also defeat the pro-poor objectives of MFIs.

In model 2, the financial determinant of innovation as measured by R&D expenditure is maximum loan amount given to clients, which has a positive sign. This implies that MFIs with a larger maximum loan term spend more on R&D. This is plausible because, as the loan amount increases sophisticated processes and monitoring must be put in place to reduce the risk of default. And these require more investment in R&D.

Two key determinants of loan product innovation from model 3 in Table 4 are funding from bank and equity of owner which both have positive effects. This confirms the ANOVA results. Loans from banks are in turn packaged into new loans and loaned to customers at a higher cost.

In model 4 from Table 4, average repayment rate, average interest rate, maximum loan amount and minimum loan term all have a positive impact on development of new savings products. A higher repayment rate makes more money available to MFIs which can be used to develop new savings products in other to attract more savings deposits. This finding reinforces the need for MFIs to develop strategies that will shore up repayment of loans, since a higher loan recovery rate is in the interest of both MFIs and their clients. MFIs with shorter repayment period are able to turn their cash around quickly making money immediately available for the development of new savings products. Sometimes having a savings account is a prerequisite for the granting of loans. And if loans have short duration, effective savings plans must be outlined to reduce default to the barest minimum.

On the other hand, funding from shares, and maximum loan term have a negative impact on the development of new savings products. Shares are usually raised to expand operations such as opening new outlets and not necessarily to introduce new savings products. This may explain why shares impact negatively on introduction of new savings products. A longer loan term leaves MFIs with little funds in the immediate period. This affects the ability of MFIs to introduce new savings products since money is required to do so.

From Table 5, the adjusted R-square which is a superior measure of model fitness ranges from 35.5% to 70.1% and is fairly good. This is confirmed by the measure of overall significance (F-statistic) of the model in Table 6. The F-statistic is significant at 1% level for all the models. Thus, overall, the models have a good fit. The regression

analysis results largely agree with the results of the ANOVA.

Table 4. Financial Determinants of Innovation – Multiple Regression Results

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Model 1: Number of Branches/Outlets as Dependent Variable					
(Constant)	22.557	6.674		3.380	.002***
Source of funding Savings	-20.546	5.710	-.486	-3.598	.001***
Average interest rate for the past 3 years	.193	.091	.275	2.123	.041**
Average repayment rate	-.091	.033	-.361	-2.728	.010***
Number of employees that attain tertiary education	1.321	.458	.381	2.881	.007***
Number of employees that attain secondary education	-1.231	.540	-.298	-2.279	.029**
Model 2: R&D Expenditure as dependent Variable					
(Constant)	-4686.724	2749.399		-1.705	.097*
Number of employees that attain tertiary education	804.380	507.457	.177	1.585	.122
Number of employees without formal education	9074.057	1358.389	.743	6.680	.000***
Maximum loan amount given to clients	.250	.105	.267	2.393	.022**
Model 3: Number of New Loan Products as Dependent Variable					
(Constant)	1.739	.261		6.665	.000***
Source of funding Banks	1.061	.415	.375	2.555	.015**
Source of funding Owner Equity	1.928	.768	.369	2.509	.016**
Model 4: Number of New Savings Products as Dependent Variable					
(Constant)	-.114	.391		-.291	.774
Source of funding Shares	-.932	.242	-.413	-3.851	.001***
Average interest rate for the past 3 years	.063	.012	.560	5.157	.000***
Average repayment rate	.009	.004	.297	2.536	.018**
Maximum loan term	-.029	.008	-.470	-3.570	.001***
Number of employees that attain basic education	1.632	.301	.547	5.426	.000***
Maximum loan amount given to clients	3.524E-005	.000	.397	3.659	.001***
Average minimum loan term	.093	.036	.312	2.570	.017**

***, **, * means significant at 1%, 5%, and 10% respectively

Table 5. Model Summary for Multiple Regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.660	.436	.355	7.409
2	.766	.587	.550	7643.50379
3	.466	.218	.176	1.25133
4	.875	.766	.701	.62731

Table 6. ANOVA for Multiple Regression

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1483.648	5	296.730	5.405	.001***
	Residual	1921.376	35	54.896		
	Total	3405.024	40			
2	Regression	2818216441.097	3	939405480.366	16.079	.000***
	Residual	1986387104.298	34	58423150.126		
	Total	4804603545.395	37			
3	Regression	16.547	2	8.274	5.284	.009***
	Residual	59.501	38	1.566		
	Total	76.049	40			
4	Regression	32.223	7	4.603	11.698	.000***
	Residual	9.838	25	.394		
	Total	42.061	32			

*** means significant at 1%

3.4. Determinants of Innovation in MFIs - Logistic Regression

Table 7, Table 8, Table 9 and Table 10 contain results of binary logistic regression analysis. Model 5 in Table 7 indicates that the average interest rate (AveInteret) and the average loan portfolio (AvLportfolio) positively impact on the probability of an MFI modifying existing marketing products. A reasonably high interest rate gives MFIs a higher profit margin which could be used to modify existing marketing products. But given that microfinance institutions are geared towards bettering the lot of the poor, the conduit of introducing innovations via high interest charges is definitely an anti-welfare strategy. Therefore,

MFIs should devise more effective and pro-poor strategies that enable the introduction of innovations while at the same time being affordable to the poor. The average loan portfolio impacts positively on the probability of an MFI modifying marketing products because, the effective utilization of the loan portfolio base requires new or modified marketing strategies to effectively mobilize clients to patronize attractive loan products that are designed from the huge portfolio base.

Model 6 in Table 7 indicates that the average loan portfolio (AvLportfolio) and the average minimum loan term (AvMinLt) increase the probability of an MFI introducing microinsurance. A larger loan portfolio base widens the options available to MFIs for innovating. And

one of the options could be investment in microinsurance, which is a largely underserved product in northern Ghana. Also, a shorter loan term increases liquidity in MFIs which makes money readily available for the introduction of microinsurance products.

The goodness of fit tests in Table 8, Table 9 and Table 10 such as the -2loglikelihood, Cox & Snell R Square, Nagelkerke R Square, hit-ratio as per the classification matrix, and the Omnibus Tests of Model Coefficients, altogether give both models a reasonable goodness of fit.

For instance, from the classification matrix (Table 8), the overall hit ratio is 73.2% and 92.7% respectively for models 5 and 6. This depicts a reasonably high predictive accuracy. The classification matrix measures classification accuracy. This measure of predictive accuracy is based on the hit ratio which is the percentage of cases correctly specified. Thus, the percentage of cases correctly classified is 73.2% and 92.7% respectively for model 5 and 6 respectively.

Table 7. Financial Determinants of Innovation -Results of Binary Logistic Regression

Model 5:Modification to Marketing Products as Dependent Variable	B	S.E.	Wald	Df	Sig.	Exp(B)
AvInterest	.105	.052	4.163	1	.041**	1.111
AvLportfolio	.000	.000	3.391	1	.066*	1.000
Constant	-2.368	1.222	3.754	1	.053*	.094
Model 6: Micro insurance as Dependent Variable	B	S.E.	Wald	Df	Sig.	Exp(B)
AvInterest	-.029	.061	.217	1	.641	.972
AvLportfolio	.000	.000	4.222	1	.040**	1.000
AvMinLt	.428	.185	5.338	1	.021**	1.534
Bank funding(1)	20.334	9053.603	.000	1	.998	677413144.662
Constant	-24.576	9053.603	.000	1	.998	.000

** , * means significant at 5% and 10% respectively

Table 8. Classification Matrix

Observed		Predicted		Percentage Correct
		Whether MFI has introduced any modification to an existing marketing innovation in the past 3 years		
		No	Yes	
Whether MFI has introduced any modification to an existing marketing innovation in the past 3 years	No	23	2	92.0
	Yes	9	7	43.8
Overall Percentage				73.2
Observed		Predicted		Percentage Correct
		Offer MicroInsurance?		
		No	Yes	
Offer MicroInsurance?	No	33	2	94.3
	Yes	1	5	83.3
Overall Percentage				92.7

Table 9. Model Summary for Logistic Regression

Model	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
5	41.462	.279	.378
6	17.031	.341	.604

Table 10. Omnibus Tests of Model Coefficients

Model	Chi-square	Df	Sig.
5	Step	13.384	.001
	Block	13.384	.001
	Model	13.384	.001
6	Step	17.106	.002
	Block	17.106	.002
	Model	17.106	.002

4. Conclusion

The sustainability of MFIs hinges on their capacity to innovate. On the other hand, the capacity to innovate depends on several factors, some financial, others non-financial. This paper assessed the impact of some financial characteristics of MFIs on their ability to innovate. The measures of innovation employed in this study include number of branches (location innovation), R&D, number of new loan and savings products, marketing innovation, and microinsurance. The paper found that the loan repayment rate, loan term, maximum loan ceiling, size of loan portfolio and the interest rate on loans impact on the capacity of MFIs to innovate in various ways. In particular,

the impact of the repayment rate on innovation is important since the repayment rate directly affects the survival of MFIs. MFIs in northern Ghana are encouraged to develop, strengthen and implement strategies that will boost the repayment of loans by clients. Also worth mentioning is the positive impact interest rate has on innovation. Much as a high interest rate on the whole is found to encourage innovation, an unreasonably high interest rate may price loans of MFIs out of the reach of the poor and hence defeating the pro-poor agenda of MFIs.

Sources of funding comprising equity funding from owner, share, and bank funding, were also found to affect different aspects of innovation by MFIs in northern Ghana. Equity funding from owner and bank funding positively impact on the introduction of new loan products; funding from shares negatively impact on the introduction of new

savings products. It costs money to innovate and therefore an MFI's sources of funding and the amount thereof affect its innovativeness. Though bank funding stimulates the introduction of innovation, over-reliance on bank funding for innovation may hurt the provision of affordable microfinance services to the poor, since it is generally acknowledged that, microfinance products issued from bank funding are usually expensive. Also, the significant nature of funding sources in fuelling innovation calls for the need for MFIs to procure the services of professional fundraisers to assist them tap into the resources of current and potential investors and donors. The diversification of funding will enable MFIs to reduce risks and enhance their capacity to innovate.

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