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An Econometric Evaluation of Microfinance Institutions Performance through Savings Mobilization and Loan Deployment in Northern Uganda

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Abstract
The study investigated microfinance institutions performance through savings mobilization and loan deployment in the Acholi sub region using an econometric approach. The specific objective was to examine the structural stability of the districts on micro savings mobilization and loan deployment within the sub region. The study was carried out in the seven districts of the sub region. Panel data were pooled for all the microfinance institutions in the sub region on the levels of savings, loans, capitalization funds and the number of beneficiaries for the period 2008 to 2011. The application of the econometric techniques were in sequence from the Pooled Regression Model to the differentiation in choice between the Fixed Effect Model and Random Effects Model. Further, the data were tested for heteroscedasticity and covariance structure of the variables so as to ascertain the robustness of the estimators. The districts were structurally unstable due to differential intercepts, which is the underlying average loan deployed for each of the districts and not slopes, which indicate the variations in loan deployment resulting from a unit change in the covariates savings, capitalization funds and the number of borrowers. There is need to increase both equity and debt funds as components of total loanable funds so as to enhance the operations of SACCOs across the districts. Equity funds should be increased internally through upward revision in the per unit share capital to be bought upfront by members who are joining the SACCO. Debt funds could be sourced externally from both local and foreign lending agencies.
Keywords: District Structural Stability Tests, Micro Savings and Loans, Acholi Sub Region, Uganda

1. Introduction

The two decades (1986-2006) of war in northern Uganda between the Lord's Resistance Army and Uganda People's Defence Forces led to the displacement of an estimated 1.8 million persons out of which 1.1 million persons were in the Acholi sub region, 0.5 million persons in Lango sub region and an estimated total of 0.1 million persons in Karamoja sub region. (UNHCR, 2011). The displacement and encampment led to community impoverishment through loss of economic empowerment due to the abduction and/or killing of active labour forces, inability to access agricultural farmland, looted livestock and stock of food reserves amongst others. Consequently, the northern region recorded the highest Human Poverty Index (HPI) at 30.70 in 2005 compared to 29.56 for western region, 27.11 for eastern region and 20.19 for central region (UNDP, 2007).

Microfinance programmes and institutions have become increasingly important as a strategy to reduce poverty and promote micro and small enterprise development (Hulme 1997). Microfinance institutions (MFIs) have remained one of the FIs that are widely available in rural areas and in low income urban neighbourhoods that help the poor to improve financial security, allow them to take advantage of business opportunity and facilitate the growth of their enterprises (Robinson,2002). According to IMF (2004), a variety of microfinance institutions has emerged over time to meet the unsatisfied demand for financial services in Africa. This has been due to lack of access to financial services from the formal financial system which is quite striking in many African countries where the poor represent the largest share of the population.

Thus, strengthening provision of microfinance services to reach the rural poor has been in line with Poverty Eradication Action Programme (PEAP) of the Government of Uganda as early as 2004/5 to 2007/8 fiscal years (MoFPED, 2008). PEAP was supplemented by Rural Financial Services Programme (RFSP) with the main aim of deepening financial services delivery in rural areas. RFSP then focused on rural savings mobilization, credit deployment, investment in productive activities to increase production and processing of value addition as well as access to markets. Besides PEAP, a number of economic policies and programs such as the Structural Adjustment Pro-grams (SAPs), Economic Recovery Pro-gram (ERP), Poverty Eradication Action Plan (PEAP) have been successfully implemented leading to a boost in economic growth which averaged of 6.4 percent since 2002 (NPA, 2010). The success has been incorporated into the Comprehensive National Development Planning Frame-work policy (CNDPF) which provides for the development of a 30 year Vision to be implemented through: three 10-year plans; six 5-year National Development Plans (NDPs); Sector Investment Plans (SIPs); Local Government Development Plans (LGDPs), Annual work plans and Budgets (NPA 2010).

In order to strengthen and expand rural financial services, there was need to develop an appropriate

policy and institutional framework for delivery of financial services to the rural poor. The institutional framework developed places responsibility for formation, strengthening and quality assurance of Savings and Credit Cooperative Organizations (SACCOs) with Uganda Cooperative Savings and Credit Union (UCSCU) (MoFPED, 2008). SACCOs are microfinance institutions at Tier 4 level of financial institutions in Uganda. The institutional framework for the delivery and recovery of wholesale funds to SACCOs and eligible Small and Medium Enterprises (SMEs) was placed with the Micro Finance Support Centre Limited (MFSCL).

According to Brau, Hiatt and Woodworth (2009), there are a number of recent developments by various universities, research centres, and institutions that focus on the impacts of microfinance but as yet, there is no identifiable list of best practices, because this field of research is relatively new. Zeller, Lapenu, and Greeley (2003), contend that reporting on social performance by micro-finance institutions (MFIs) is still largely anecdotal in the absence of a clear, industry-wide and accepted framework for social performance reporting. Similarly, a framework for financial performance reporting and analysis of MFIs is still in its developmental stage. The vast majority of MFIs do not submit financial data on a uniform reporting format, which creates selection, consolidation and analytical problems (Tucker and Miles 2002).

The study investigated microfinance institutions performance through savings mobilization and loan deployment in the sub region using an econometric approach. The specific objective was to examine the structural stability of the districts on micro savings mobilization and loan deployment within the sub region during the period 2008 to 2011 in Acholi sub region. The null hypothesis was that the district structural heterogeneity does not affect micro savings mobilization and loan deployment.

2. Methods

2.1 Study Site

The study was carried out in seven districts in Acholi sub region of Gulu, Amuru, Nwoya, Kitgum, Lamwo, Agago and Pader in Uganda as shown in Figure 1. The sub region was the epicentre of the civil war between the various rebels groups and the NRM Government from the 1990's to 2006. These districts have different endowment in terms of infrastructural developments and leadership capabilities. The study was implemented between April 2012 and May 2013.

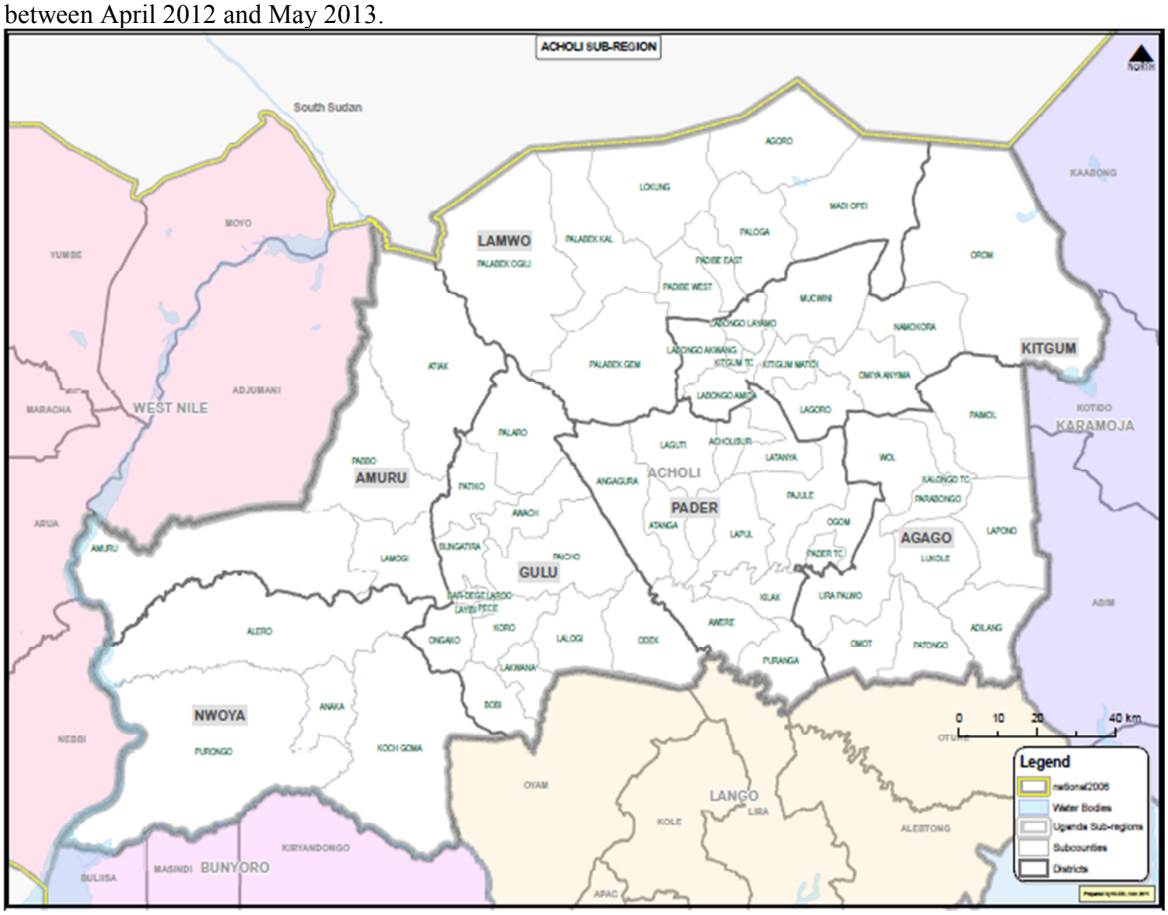


Figure 1. Map of Acholi Sub Region

2.2 Study Design

A panel of secondary data set was pooled on the intermediation role of MFIs from March 2009 to Dec 2011. The data were obtained at district levels from the Uganda Cooperative Savings and Credit Union (UCSCU) Regional office in Gulu. UCSCU is the apex organization responsible for the supervision of MFIs under the category of Tier 4 financial institutions in Uganda.

2.3 Study Population and Distribution by Districts and Sub Counties

The study considered all microfinance institutions that are registered as SACCOs which were operating in the specified districts and report their operations to the Uganda Cooperative Savings and Credit Union (UCSCU) Regional office in Gulu. It excluded all depository Financial Intuitions at Tier One to Tier Three which are supervised by the central Bank of Uganda under the Financial Institution Act 2004, Bank of Uganda Act 2000 and Microfinance Deposit taking Institutions (MDI) Act 2003. This gave a total population of 117 SACCOs in 64 sub counties in the sub region of Acholi as shown in Table 1.

Table 1: Population Frame for SACCOs by District and Sub County

District	**Number of Sub Counties**	**Total Number of SACCOs**
Gulu	15	46
Amuru	5	13
Nwoya	5	7
Kitgum	10	19
Lamwo	9	10
Pader	9	10
Agago	11	12
Total	**64**	**117**

2.4 Data Measurements and Collection

The study assigned Ratio measurement scales to measure the number of administrative units, SACCOs, individuals, amount of savings and loans. The monetary amounts were expressed in Uganda shillings (UGX). Secondary data were collected from the Uganda Cooperative Savings and Credit Union (UCSCU) Regional office in Gulu.

2.5 Quality Assurance

Data quality were ensured by standardizing forms to suit each category of secondary data. In addition, data were cross checked with the information existing in the offices of the MFIs. Content validity was reinforced through cross checking and agreeing on the secondary data by the advisors and principal investigator for use in the model of the conceived intermediation role of MFIs.

2.6 Panel Data Analysis Techniques

Panel data have space as well time dimensions and by combining time series of cross section observations, we get more informative data, more variability, less collinearity among variables, more degree of freedom and more efficiency (Gujarati, 2003). Panel data is currently one of the most active, innovative and rich methods which is rapidly emerging to incorporate several aspects of conventional pure cross section and pure time series econometric (Ocaya, 2012). Thus in this study, the cross sectional units consisted of districts in the sub region which were tracked on quarterly basis over a 3 year period to obtain information on microfinance loans, savings, capitalization and beneficiaries.

2.7 Data Management and Analysis

The data were stratified by districts in the sub region to carry out structural differences tests on the effects of the infrastructural influences in mobilization of savings and loan deployment using the dummy variable approach. Dummy variables are specially constructed variables which may be useful to represent various factors such as temporal effects, spatial effects, qualitative effects and broad groupings of quantitative effects (Johnston and Dinardo 1997). This study considered spatial factors representing shifts in the microfinance operational performance between one district with another as a consequence of regional differences in economic structure and prospects where the microfinance institutions were operating.

The Panel data were captured using Excel spread sheet version 2003 and analysed using the EViews versions 5.0 and 7.0 as well as Stata 11.0. As in Okello et al (2015), the regression model was based on the determinants of financial intermediation function of deposit taking financial institutions and represented by the estimation equation as follows; -

$$LNS=\alpha_1+\alpha_2 SVS+\alpha_3 CAP+\alpha_4 BEN+\varepsilon \quad \text{..... (1)}$$

Where; - $LNS=$ Levels of loans deployed in the community

$SVS=$ Levels of Micro savings mobilized in the community

$CAP=$ Levels of Capitalization funds mobilized in the community

$BEN=$ Number of Microfinance clients in the community

ε = the error terms

$\alpha_1,\alpha_2,\cdots\alpha_4=$ The coefficients of the regressors including the constant

The key hypotheses tested were in sequence and themed by sub objectives as follows;-

a) Relationship between microfinance savings mobilization and loans deployment based on the pooled regression model (PRM) as in Okello et. al (2015).

$H_0=$Loans deployment does not depend on the savings, capitalization funds and willingness to borrow in the community

$H_a=$Loans deployment depend on the savings, capitalization funds and willingness to borrow in the community

b) Stability of fixed effects model (FEM) against random effects model (REM) to determine the regression model to select and interpret.

$Ho;\delta_u^2=0$ or $\text{Corr}\left[w_{\text{it}},w_{js}\right]=0$ There are random effects

$H_a;\delta_u^2\neq 0$ or $\text{Corr}\left[w_{\text{it}},w_{js}\right]\neq 0$ There are fixed effects

c) Structural Characteristics of the Districts on Savings Mobilization and Loan Deployment based on the FEM as the selected model to analyse and interpret

$H_0=$ The district heterogeneity does not affect micro savings mobilization and loan deployment in Acholi sub region

$H_a=$The district heterogeneity affects micro savings mobilization and loan deployment in Acholi sub region

d) Covariance Structure for the Pooled Data to determine the robustness of the regression model.

$H_o;Var(e_{it})=\delta^2$ The error variances are all equal (Homoscedasticity)

$H_a;\ Var(e_{it})\neq\delta^2$ The error variances are a multiplicative function of one or more variables (Heteroscadesticity)

2.7.1 Model 1; Common Parameters (Complete/Pooled Model) for the Seven Districts

The basic model for the analysis of data was the Pooled Regression Model (PRM). It assumed all coefficients for the intercepts and slopes were constant across time and districts and took the following generic matrix and algebraic forms;-

In matrix notation;

$$\begin{pmatrix}\mathbf{y}_1\\ \mathbf{y}_2\\ \vdots\\ \mathbf{y}_n\end{pmatrix}=\begin{pmatrix}\mathbf{i}_1 & \mathbf{x}_1\\ \mathbf{i}_2 & \mathbf{x}_2\\ & \vdots\\ \mathbf{i}_n & \mathbf{x}_n\end{pmatrix}\begin{pmatrix}\alpha\\ \boldsymbol{\beta}\end{pmatrix}+\begin{pmatrix}\boldsymbol{\varepsilon}_1\\ \boldsymbol{\varepsilon}_2\\ \vdots\\ \boldsymbol{\varepsilon}_n\end{pmatrix} \quad \text{where} \quad \underset{(T\times 1)}{\mathbf{y}_i}=\begin{pmatrix}y_{i1}\\ y_{i2}\\ \vdots\\ y_{iT}\end{pmatrix},\ \underset{(K\times 1)}{\boldsymbol{\beta}}=\begin{pmatrix}\beta_1\\ \beta_2\\ \vdots\\ \beta_k\end{pmatrix},\ \underset{(T\times K)}{\mathbf{x}_i}=\begin{pmatrix}x_{1i1} & x_{2i1} & \cdots & x_{2i1}\\ x_{1i2} & x_{2i2} & & x_{2i1}\\ \vdots & & \vdots & \\ x_{1iT} & x_{2iT} & \cdots & x_{2i1}\end{pmatrix},\ \underset{(T\times 1)}{\boldsymbol{\varepsilon}_i}=\begin{pmatrix}\varepsilon_{i1}\\ \varepsilon_{i2}\\ \vdots\\ \varepsilon_{iT}\end{pmatrix},\quad i=1,2,\ldots,n$$

where $i=$number of districts

$t=$Time period

$j=$ Explanatory variables

$\beta'_j=(\beta_1,\beta_2,\ldots\beta_k)$ Common slopes to all explanatory variables

$y_{i,t}=$ set of n dependent variables for district i and time period t

$x'_{jit}=(x_{1it},x_{2it},\ldots x_{Kit})$ Set of K explanatory variables for district i and time period t

$\alpha=$Common intercept across districts

ε_{it} = the error term for district i and time period t

PRM was estimated under the assumptions that OLS is BLUE and satisfies the following conditions;-

$\varepsilon_{it} \sim iid(0,\sigma^2)$ for all i and t , namely;-

$E[\varepsilon_{it}]=0,\ Var[\varepsilon_{it}]=\sigma^2$ and $\text{Cov}[\varepsilon_{it}\varepsilon_{js}]=0$ if $t \neq s$ or $i \neq j$.

The corresponding statistics in the tests consisted of;-

i) Test of differential intercept and differential slope vectors

Comprised the 't' statistics on the coefficients of respective dummies and covariates as follows;-

$H_0=\alpha_1=\alpha_2=...=\alpha_n,\ \beta_1=\beta_2=...=\beta_7$ (β_i Being the slope vector for unit i).

$H_a \neq \alpha_1 \neq \alpha_2 \neq ... \neq \alpha_7,\ \beta_1 \neq \beta_2 \neq ... \neq \beta_7$ (α_i Being the intercept vector for unit i).

ii) The general test statistic for 'p' partitions

The probability is given by the $F-$statistic which is derived from the residual sum of squares (RSS) as;-

$$F=\frac{(RSS_1-RSS_3)/k(n-1)}{RSS_3/n(T-k)} \sim F\left(k(n-1),n(T-k)\right).....(3)$$

where k is the number of estimated coefficients from the pooled model.

$p=$ The number of partitions which are districts

$RSS_{1-3}=$ The residual sums of squares for models1-3

$nT=$ Total number of panel data set

The t-statistics and F-statistic were generated automatically as output of the software, Eviews5. These tests were carried out to establish the robustness of the relationship equation.

2.7.2 Model 2; Differential units' intercepts from base Category

Model 2 tested for differences from a common intercept from the base category unit and varying intercepts for other units leaving the slope coefficients constant. This model analyses how the intercepts of other units differ from the intercept of the comparison (base category) unit.

This is the Least Square Dummy Variable model. Spatially, the study investigated whether there were shifts in the operational performance of microfinance institutions between one district and another in the sub region as a consequence of differences in economic structures and prospects amongst the districts.

Thus assuming unit one was the comparison unit, the differential units' intercepts model would now become;-

$$y_{it}=\gamma_1+\gamma_2 d_{2t}+\gamma_3 d_{3t}+...+\gamma_n d_{nt}+\beta_j' x_{jit}+\varepsilon_{it}.....(4)$$

Where $\gamma_1=\alpha_1$ and $\gamma_2=(\alpha_2-\alpha_1),(\alpha_3-\alpha_1),...,\gamma_n=(\alpha_n-\alpha_1)$ represent differential intercepts of respective units from unit one.

The compact matrix form of this model would also be expressed as;-

$$\begin{pmatrix}\mathbf{y}_1\\ \mathbf{y}_2\\ \vdots\\ \mathbf{y}_7\end{pmatrix}=\begin{pmatrix}\mathbf{i}_1 & \mathbf{0} & \cdots & \mathbf{0} & \mathbf{x}_1\\ \mathbf{0} & \mathbf{i}_2 & & \mathbf{0} & \mathbf{x}_2\\ \vdots & & \vdots & & \vdots\\ \mathbf{0} & \mathbf{0} & \cdots & \mathbf{i}_7 & \mathbf{x}_7\end{pmatrix}\begin{pmatrix}\alpha_1\\ \gamma_2\\ \vdots\\ \gamma_7\\ \beta\end{pmatrix}+\boldsymbol{\varepsilon}.$$

The corresponding statistics in the tests consisted of;-

i) Test of differential intercepts

The restricted model for this test was model 1 while the unrestricted was model 2. The hypotheses being;-

$H_0;\alpha_1=\alpha_2=\alpha_3=\alpha_4=\alpha_5=\alpha_6=\alpha_7$, (there are no differences in the intercepts representing the average loans deployed amongst the districts)

$H_a;\alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq \alpha_5 \neq \alpha_6 \neq \alpha_7$, (there are differences in the intercepts representing the average

loans deployed amongst the districts)

ii) The general test statistic for p' partitions was given by equation;-

$$F=\left(\frac{(RSS_1-RSS_2)/(P-1)}{RSS_2/(n-p-k+1)}\right)\square\ F\left((p-1),(n-p-k+1)\right) \quad \text{..... (5)}$$

Where k = estimated numbers of coefficients (including a constant) from the pooled model.

p = The number of partitions which are districts

RSS_{1-3} =The residual sums of squares for models1-3

nT = Total number of panel data set

2.7.3 Model 3; Differential coefficients across units with common intercept:

Allows both intercept and slope vectors to vary with differential slopes being multiplicative terms of the regressors and the respective unit dummies (interaction effects). For an arbitrary base category represented by the first unit this model may be expressed as;-

$$y_{it}=\alpha_1+(\alpha_2-\alpha_1)d_{2t}+\ldots+(\alpha_n-\alpha_1)d_{nt}+x_{jit}\beta_{j1}+\left(d_{2t}x_{j2t}\right)(\beta_{j2}-\beta_{j1})+\ldots+\left(d_{nt}x_{jnt}\right)(\beta_{jn}-\beta_{j1})+\varepsilon_{it}$$

…….. (6)

Which in matrix form becomes;-

$$\begin{pmatrix}\mathbf{y}_1\\ \mathbf{y}_2\\ \vdots\\ \mathbf{y}_7\end{pmatrix}=\begin{pmatrix}\mathbf{i}_1 & \mathbf{0} & \cdots & \mathbf{0} & \mathbf{x}_1 & \mathbf{0} & \cdots & \mathbf{0}\\ \mathbf{i}_2 & \mathbf{i}_2 & \cdots & \mathbf{0} & \mathbf{x}_2 & \mathbf{x}_2 & \cdots & \mathbf{0}\\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots\\ \mathbf{i}_7 & \mathbf{0} & \cdots & \mathbf{i}_7 & \mathbf{x}_7 & \mathbf{0} & \cdots & \mathbf{x}_7\end{pmatrix}\begin{pmatrix}\alpha_1\\ (\alpha_2-\alpha_1)\\ \vdots\\ (\alpha_7-\alpha_1)\\ \boldsymbol{\beta}_1\\ (\boldsymbol{\beta}_2-\boldsymbol{\beta}_1)\\ \vdots\\ (\boldsymbol{\beta}_7-\boldsymbol{\beta}_1)\end{pmatrix}+\boldsymbol{\varepsilon}.$$

This model is frequently used to test for differential coefficients (intercept and slope) from an arbitrary chosen base category.

Model 3 tested for intercepts and slopes in the individual partitions/districts using RSS_1 and RSS_3. the test is determined from equation 7;

$$F=\left(\frac{(RSS_1-RSS_3)/k(p-1)}{RSS_3/(n-pk)}\right)\approx F(k(p-1),(n-pk)) \quad \text{..... (7)}$$

where k = were estimated numbers of coefficients (including a constant) from the pooled model.

p = the number of partitions which are districts

RSS_{1-3} =the residual sums of squares for models1-3

n = total number of panel data set

2.7.4 Model 4; Separate regression for each unit:

Basically this is the dummy variable multiplicative model for each of the district covering the entire time period. This has been algebraically expressed as;-

$$y_{it}=\alpha_1 d_{1t}+\alpha_2 d_{2t}+\ldots+\alpha_n d_{nt}+\left(d_{1t}x_{j1t}\right)\beta_{j1}+\left(d_{2t}x_{j2t}\right)\beta_{j2}+\ldots+\left(d_{nt}x_{jnt}\right)\beta_{jn}+\varepsilon_{it} \quad \text{…… (8)}$$

or in matrix notation as;-

$$\begin{pmatrix} y_1 \\ y_2 \\ \vdots \\ y_7 \end{pmatrix} = \begin{pmatrix} i_1 & 0 & \cdots & 0 & x_1 & 0 & \cdots & 0 \\ 0 & i_2 & \cdots & 0 & 0 & x_2 & \cdots & 0 \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & \cdots & i_7 & 0 & 0 & \cdots & x_7 \end{pmatrix} \begin{pmatrix} \alpha_1 \\ \alpha_2 \\ \vdots \\ \alpha_7 \\ \beta_1 \\ \beta_2 \\ \vdots \\ \beta_k \end{pmatrix} + \varepsilon.$$

These models (1-4) were used to carry out the necessary tests for the above mentioned sub objectives.

3. Results

3.1 Distribution of SACCOs and Clients by District in Acholi sub region.

Table 2 shows the distribution of SACCOs and clients by district and sub county in Acholi sub region. There were a total of 117 SACCOs operating in 64 sub counties in the sub region as at 31 March 2011 with a total of 57,806 clients.

Table 2: Distribution of SACCOs and Clients by District as at 31 March 2011

District	Sub County	SACCOs	Population of Individual and Micro Enterprises Clients			
			Individuals		Micro Enterprises	Total Clients
			Female	Male		
Gulu	15	46	14,867	8,768	102	23,737
Amuru	5	13	629	1,131	21	1,781
Nwoya	5	7	1,209	1,512	96	2,817
Kitgum	10	19	5,918	8,918	1,833	16,669
Lamwo	9	10	1,031	1,410	114	2,555
Pader	9	10	695	855	192	1,742
Agago	11	12	2,575	4,872	1,058	8,505
Total	**64**	**117**	**26,924**	**27,466**	**3,416**	**57,806**

Source: UCSCU Regional Office Gulu, 2012

A total of 46 SACCOs were in Gulu, 19 in Kitgum and 13 in Amuru amongst the top three districts with the most populous SACCOs. In terms of administrative units, the average of SACCOs per Sub County were 3 each in Gulu and Amuru. Kitgum had 2 SACCOs per Sub County while the rest of the districts had one SACCO per Sub County on the average.

The clients comprised 27,466 (47.5%) males, 26,924 (46.6%) females and 3,416 (5.9%) microenterprises. In Gulu there were more female 14,867 (62.6%) than to male 8,768 (36.9%). In all the other districts, the males were more than the female. Gulu district had the highest number of clients followed by Kitgum while the lowest number of clients was in Pader followed by Amuru. Notably, Lamwo who had the lowest amount of microloans deployed but had a higher number of beneficiaries than Amuru and Pader. In terms of clients per SACCO, Kitgum had the highest number of members per SACCOs on the average at 877. This was followed by Agago at 709 members, Gulu at 516 members and Nwoya at 402 members. The others were Lamwo at 256, Pader at 174 and Amuru at 137 members respectively. Gulu had the highest number of clients per Sub County at 1582 individuals. This is followed by Kitgum at 1667 and Agago at 773 individuals per Sub County.

3.2 Levels of Loans, Savings and Capitalization Funds in Acholi sub region.

As shown on Table 3, a total of UGX 8.9 billion in micro finance loans were deployed in Acholi sub region. This has been against a total of UGX 9.3 billion in loanable fund with the MFIs in the sub region. The loanable funds were composed of UGX 7.7 billion in mobilized savings and UGX 1.6 billion in capitalization funds. The ratios of total loans to loanable funds were highest at 186% in Gulu and lowest in Lamwo at 28%.

The highest volume of micro loans had been deployed in Gulu of UGX 3.7 billion despite a total of UGX 2.0 billion in loanable fund, giving unprecedented gap in demand for loanable funds of 86%. The next highest level of loan deployment was in Agago district with UGX 2.7 billion in loans deployed against total loanable funds of UGX 3.4 billion. Kitgum district was at UGX 1.7 billion against UGX 2.8 billion in loanable funds, Nwoya at UGX 0.6 billion against UGX 0.8 billion in loanable funds, Pader at UGX 0.06 billion against UGX 0.07 billion in loanable funds and last was Lamwo at UGX 0.03 billion against a loanable funds of UGX

0.1 billion.

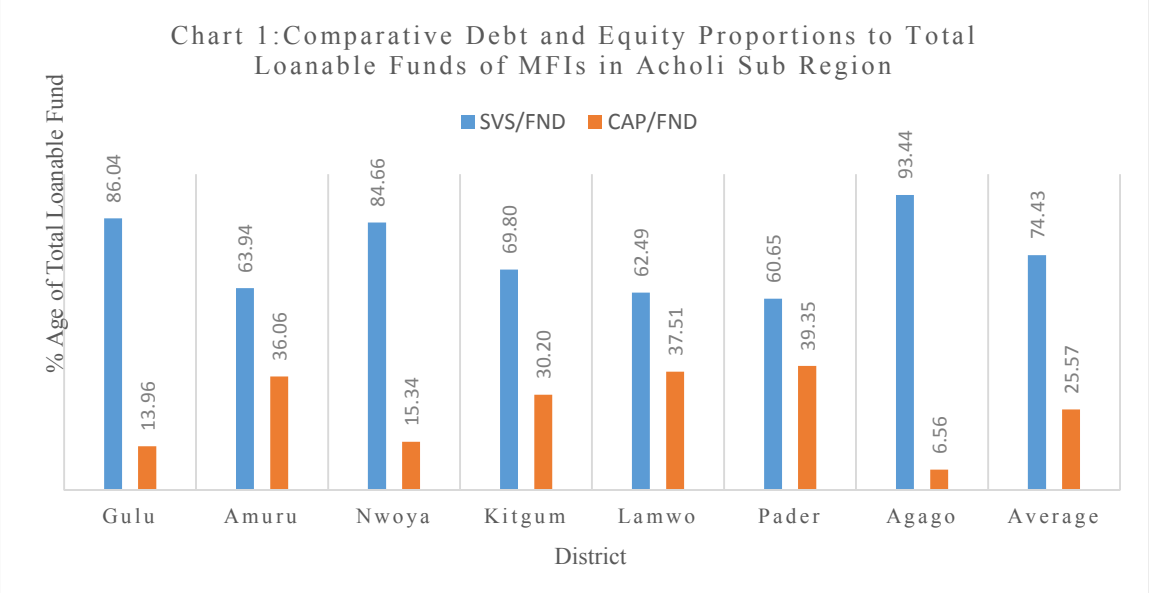
Table 3: Levels of MFIs Loans, Savings and Capitalization Funds for the Period ending 31 March 2011 in UGX'000

District	Loans	Loanable Funds			Ratios of Loans to Total Loanable Funds
		Savings	Capitalization Funds	Total	
Gulu	3,676,845	1,701,689	276,130	1,977,819	186%
Amuru	126,580	102,763	57,954	160,717	79%
Nwoya	639,884	692,240	125,386	817,626	78%
Kitgum	1,695,817	1,940,288	839,398	2,779,686	61%
Lamwo	30,810	67,623	40,590	108,213	28%
Pader	60,641	41,163	26,710	67,873	89%
Agago	2,694,816	3,203,344	224,999	3,428,343	79%
Total	**8,925,393**	**7,749,110**	**1,591,167**	**9,340,277**	**96%**

Source: UCSCU Regional Office Gulu, 2012

Total loanable fund is composed of the savings mobilized (debt) and capitalization fund (equity). Thus the ratios of loan deployment to total loanable fund is lower than that of loan to total savings mobilized for all the districts as shown in Table 3 due to the contribution of capital. Gulu had lent in excess of both the levels of savings mobilized and total loanable fund by 116% and 86% respectively during the period. Loan deployment in Pader and Amuru surpassed the levels of savings mobilized by 47% and 23% respectively.

As shown in Chart 1, debt funds contributed a higher proportion of loanable fund than equity capital in all the districts during the period. The gap between debt and equity was highest in Agago district at 87% followed Gulu district at 72% and Nwoya at 69%. The other districts had gaps below 30% with lowest gap at 21% in Pader district.



Source: UCSCU Regional Office Gulu, 2012

3.3 The Fixed Effects Model/Least Square Dummy Variable Model Results for the Districts in the Sub Region

As shown in Table 4, the Fixed Effects Model/Least Square Dummy Variable Model was used to establish the structural characteristics of the districts on savings mobilization and loan deployment under the hypothesis that;-

$H_o =$ The district heterogeneity does not affect micro savings mobilization and loan deployment in Acholi sub region

$H_a =$ The district heterogeneity affects micro savings mobilization and loan deployment in Acholi sub region

Table 4: Separate Regression Model of Microloan Deployment in the Acholi Sub region

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D1(Gulu)	-875380.1	199470.2	-4.388527	0.0000
D2 (Amuru)	-292428.1	76067.91	-3.844304	0.0003
D3 (Nwoya)	-399805.6	137786.8	-2.901625	0.0049
D4 (Kitgum)	-3288195.	757268.6	-4.342178	0.0000
D5 (Lamwo	-362042.3	67531.33	-5.361101	0.0000
D6 Pader	-250590.8	66565.63	-3.764567	0.0003
D7Agago	-1373904.	403273.5	-3.406880	0.0011
SVS	0.707552	0.164814	4.293041	0.0001
CAP	2.202045	1.052470	2.092263	0.0398
BEN	110.0235	14.87195	7.398055	0.0000
R-squared	0.972809	Mean Loan Deployment		1012312.
Durbin-Watson statistic d	1.851579			

The test yielded the relationship equation as;-

$$LNS = -(875380D1 + 292428D2 + 399805D3 + 3288194D4 + 362042D5 + 250590D6 + 1373904D7) + (0.71SVS + 2.20CAP + 110BEN) \quad \text{..... (6)}$$

Where

$D_1, D_2, D_3, D_4, D_5, D_6, D_7$

Represent the intercept terms for districts of Gulu, Amuru, Nwoya, Kitgum, Lamwo, Pader and Agago respectively.

All the variable coefficients including the (F-statistic) were significant at $(p \leq 0.00)$ as shown on Table 4 except for the capitalization funds at $(p \leq 0.05)$. The null hypothesis was therefore rejected on the basis of the (F-statistic) and this infers that that the district heterogeneity affects micro savings mobilization and loan deployment in Acholi sub region

The coefficients for the covariates were all positives as expected. Therefore, the results suggested that, *ceteris paribus*, as the level of savings goes up by UGX 1.00 on average, the level of loans would increase by UGX 710. As the level of capital goes up by UGX 1.00 on average, the level of loan would increase by UGX 2,200 and as the number of beneficiary goes up 1 member, on average, the loans requested would go up by UGX 110,000.

Similarly, the David Watson statistic of $d = 1.85$ was greater than $R^2 = 0.97$, showing that the data set in the model was non spurious. The coefficient of determination R^2 had improved slightly from 96% under PRM to 97% under FEM/LSDVM.

3.4 Structural Differences amongst Districts in Savings Mobilization and Loans Deployment

In order to determine differences amongst the districts, LSDVM was used and Gulu district was chosen as the base category from which to establish the differences because all these other districts were initially counties within Gulu before they were made independent. As shown on Table 5, the test statistic for p partitions which represented the 7 districts which is given by the F- statistic was significant at (p = 0.00). The null hypothesis was rejected, hence the alternative hypothesis that there were differences among the district from the base category (Gulu) was accepted except for Agago. The estimated slope coefficients for these districts were highly significant at p=0.01, hence statistically, the average loan levels were different from Gulu except for that of Agago which was not significant at p=0.24 hence statistically about the same with Gulu.

As shown in table 5, the average loan level under Gulu in absolute terms, was UGX 875,380 while that of Amuru was less by UGX 582,952, Nwoya less by 475,575, Lamwo less by 513, 338, and Pader less by 624, 789. However, the average loan level of Kitgum was more than the base category by 2, 412,815 and that of Agago was more by 498,524.

Table 5: Differences amongst Districts with Gulu as Base Category (Model_3)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Gulu (D1)	-875380.1	199470.2	-4.388527	0.0000**
Amuru (D2)	582952.0	179197.2	3.253132	0.0017**
Nwoya (D3)	475574.5	184444.6	2.578414	0.0119**
Kitgum (D4)	-2412815.	659023.5	-3.661197	0.0005**
Lamwo (D5)	513337.8	185188.9	2.771968	0.0070**
Pader (D6)	624789.3	191068.9	3.269968	0.0016**
Agago (D7)	-498524.2	427249.0	-1.166824	0.24700
SVS	0.707552	0.164814	4.293041	0.0001**
CAP	2.202045	1.052470	2.092263	0.03980*
BEN	110.0235	14.87195	7.398055	0.0000**

R-squared	0.972809	Mean dependent var	1012312.
Log likelihood	-1144.080	F-statistic	294.1642
Durbin-Watson stat	2.103190	Prob(F-statistic)	0.000000**

Key: ** p<0.01, *p<0.05: SVS=savings; CAP=capitalization funds; BEN=beneficiaries

3.4.1 Test for equality of intercepts as a cause of district heterogeneity

The test for equality of intercepts was carried using the Wald Test. The F statistic was significant at (p = 0.00) and the null hypothesis that the intercepts for seven districts were equal was rejected. Hence the district heterogeneity was due to differential intercepts.

We further carried out the test for differential units/districts intercepts from the base category by allowing common intercept for the base category unit/district and varying intercepts for the other units/districts. Three trends emerged from the tests as shown in Table 6;-

1. Gulu and Agago districts unique qualitative characteristics; the unique qualitative characteristics of the two districts was discerned by carrying out stability tests where;-

$H_0 =$; D1 = D7 (The intercepts districts of Gulu and Agago are not different)

$H_a =$; D1 ≠ D7 (The intercepts districts of Gulu and Agago are different)

Since Hausman test had confirmed FEM as the appropriate model to use rather than REM, we therefore carried out comparison of all intercepts with Gulu (D1) as the base after running FEM. It was not significant in the case of Agago (D7) at the value of $p = 0.25$. We therefore, accepted the null hypothesis that there was no structural differences between Gulu and Agago. All the other intercepts were significantly different at the value of $p = 0.00$ from Gulu. Similarly, comparison of all intercepts with Agago (D7) as the base was not significant in the case of Gulu (D1) and all the other intercepts were significantly different from Agago. We therefore, re-affirmed the null hypothesis that there were no structural differences between Gulu and Agago and further that the two districts were structurally different from Amuru, Nwoya, Lamwo, Pader and Kitgum as shown in Table 16. It therefore explains that the unique characteristics of Gulu and Agago in comparison with the rest of the country accounts for 25% of the structural differences amongst the seven districts.

Table 6: Equality of Intercepts with Interchange of Base Categories (Nwoya, Amuru, Lamwo and Pader) in Probability Terms

Districts	Prob. (F-statistic)						
	Gulu	**Agago**	**Amuru**	**Nwoya**	**Lamwo**	**Pader**	**Kitgum**
Gulu	**0.00**	**0.25**	0.00	0.00	0.00	0.00	**0.00**
Agago	**0.25**	**0.00**	0.00	0.00	0.00	0.00	**0.01**
Amuru	0.00	0.00	**0.00**	**0.43**	**0.44**	**0.65**	**0.00**
Nwoya	0.00	0.00	**0.43**	**0.00**	**0.79**	**0.33**	**0.00**
Lamwo	0.00	0.00	**0.44**	**0.79**	**0.00**	**0.21**	**0.00**
Pader	0.00	0.00	**0.65**	**0.33**	**0.21**	**0.00**	**0.00**
Kitgum	0.00	0.01	0.00	0.00	0.00	0.00	**0.00**

2. Amuru, Nwoya, Lamwo and Pader unique qualitative characteristics; Comparison of all intercepts with

Amuru (D2) as the base were not significant in the case of Nwoya (D3) at $p = 0.43$, Lamwo (D5) at $p = 0.44$ and Pader (D6) at $p = 0.65$. We, therefore, accepted the null hypothesis that there were no structural differences among the districts of Amuru, Nwoya, Lamwo and Pader. All the other intercepts for Gulu, Agago and Kitgum were significantly different from Amuru. When we changed the intercepts to Nwoya (D3), Lamwo (D5) and Pader (D6) as the base category, similar results were obtained, making the group unique in terms of those qualitative characteristics pertaining in those districts. Thus the unique characteristics of Amuru and Nwoya in comparison with the rest of the country accounts for 43% of the structural differences amongst the seven districts. Similarly, Amuru and Lamwo, in comparison with the rest of the districts accounts for 44% of the structural differences, Amuru and Pader, in comparison with the rest of the districts accounts for 65% of the structural differences, Lamwo and Nwoya , in comparison with the rest of the districts accounts for 79% of the structural differences, Lamwo and Pader, in comparison with the rest of the districts accounts for 21% of the structural differences and Nwoya and Pader in comparison with the rest of the country accounts for 33% of the structural differences respectively from the rest of the districts. Based on the above analysis, the differential intercept between Lamwo and Nwoya accounted for the highest structural differences amongst the districts.

3. Kitgum unique qualitative characteristics; Comparison of all intercepts with Kitgum (D4) as the base was significant for all the other intercepts at $p = 0.00$ and $p = 0.01$ for Agago. We, therefore, rejected the null hypothesis that the intercepts were equal to those of other districts. Hence making Kitgum the base category in comparing with other districts confirms that the structural differences amongst the districts was due to differential intercepts.

3.4.2 Test for equality of slopes as a cause of district heterogeneity

Test of differential slopes was based on the Wald test after running the separate regression model. The F statistic was not significant at p=0.24 as shown in Table 7. Hence we accepted the null hypothesis that the slopes were equal. Thus the district structural differences were not due to differential slopes coefficient among the districts. Basing on the tests for equality of intercepts and slopes, it can be inferred that the district heterogeneity was due to differential intercepts rather than differential slopes. The intercepts for each of the districts represented the average loan outstanding in the districts during the period.

Table 7: Wald Test for equality of Slope Coefficients

Test Statistic	**Value**	*df*	**Probability**
F-statistic	1.276377	(18, 56)	0.2387
Chi-square	22.97478	18	0.1916

3.4.3 Stability of FEM against REM

Sensitivity analysis test was carried out to determine the choice between FEM and random effects model (REM) or error component model (ECM).The null hypothesis of a REM was rejected in favor of the fixed effects specification at $p = 0.00$ and when the $X^2(1)$ statistic of 10.19 on Table 8 was greater than the critical values for $X^2(1) = 3.84$ from the X^2 distribution table.

Table 8: Breusch and Pagan Lagrangian Multiplier Test for Random Effects Results

VARIABLES	**VAR (δ^2)**	**SD(δ)**	$X^2(1)$ **VALUE**	**PROB** X^2
$\ln s$	1.47e+12	1214056		
e	4.50e+10	212019.2		
u	2.83e+10	168091.1		
X^2			10.19	0.0014

The use of FEM was appropriate because the cross sectional units which were districts were not a random drawing from a large population with in the Acholi sub region. However, if the cross sectional units were regarded as a random drawing from a larger sample then REM/ECM would have been appropriate (Guajarati, 2003).

3.4.4 Covariance Structure for the Pooled Data

The covariance structure for the pooled data looked at the autocorrelation and heteroscadesticity of error structures of the individual units. Both autocorrelation and heteroscadesticity were first considered through visual detection of the scatter diagram of the residual terms obtained from the output tables of E-views results. The scatter plot of the residual shows an “envelope” of even width of the error terms falling within the

acceptable range of the fitted observations. As shown in Figure 2, the plot of residuals along the horizontal X-axis show that there is no discernable pattern for the set of 84 observations.

Non autocorrelation was further confirmed from the output table of E-views where the David Watson value was within the acceptable range where the ideal would be within the range of 2.0 (Gujarati, 2003). Heteroscadesticity was further tested using Breusch-Pagan / Cook-Weisberg test for heteroscadesticity using STATA 11.0. From Prob. of 0.1741>0.05, the test is not significant at 95% confidence level, and therefore, we asserted that there is no heteroscadesticity. Moreover the calculated value of 1.85< 3.84 the value from the table, hence not significant. Therefore the ordinary least square assumptions were not violated due to absence of autocorrelation and heteroscadesticity.

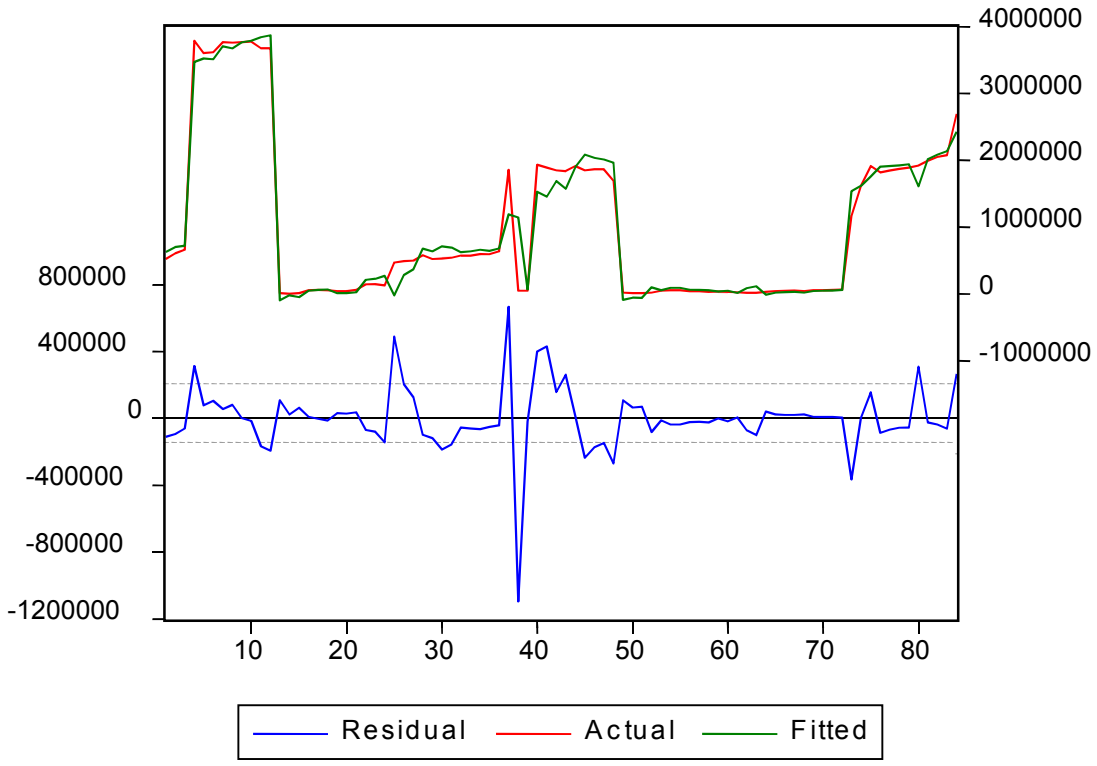


Figure 2: Loan Deployment Residual Plots Against Actual and Fitted Observations

4. Discussions

4.1 Distribution of SACCOs and Clients by District in Acholi sub region

There is no distinct patterns that the more the administrative units the district has, the more the number of SACCOs and clients. The exception being Gulu District, which had more administrative units than all the other districts and had more SACCOs and clients than the rest of the districts. Kitgum District had comparable number of administrative units with Agago District but had more SACCOs and clients than Agago. The density of SACCOs in each sub county was at least one per Sub County in all the districts. Thus the strengthening of provision of microfinance services to reach the rural poor has been in line with Poverty Eradication Action Programme (PEAP) of the Government of Uganda (MoFPED, 2008).

Gender inequality in access to microfinance services was exhibited in all the districts in the sub region. Except in Gulu district, the average number of male clients was more than that of female clients in all the other districts in the sub region. As in Dyar et al (2006), microfinance has other benefits besides potentially impacting gender inequality, such as reducing income inequality and thus should be considered in conjunction with a variety of policy options of which access could be a deliberate option. The findings is also in line with CGAP(2009), where Microfinance in Asia had been observed as an incredibly diverse industry reflecting the wide-ranging contexts of social, political and geographical dimensions in which financial services for the poor are being provided. In line with the post conflict period in Acholi sub region, Manalo (2003), observed that the experiences of SMCP in Eretria, FATEN in West Bank and Gaza, and MCN in Haiti demonstrated that the distortionary effects on an MFI's operations are magnified as the intensity and persistence of conflicts affect a country's economy, security, and social cohesion.

4.2 Levels of Loans, Savings and Capitalization Funds in Acholi sub region

The lowest average size of outstanding loan per client was UGX 12,000 or USD 4.50 in Lamwo District. Meanwhile the highest average loan per client is in Agago (UGX 317,000) followed by Nwoya (UGX 227,000). This was in line with the findings in table 4, where 52% of SACCOS have minimum start up loan ranging from UGX 20,000 to 100,000 while maximum start up loan ranges from UGX 300,000 to UGX 20 million. The low average level of savings and loans underscore the basic concept of microfinance services which is characterized by smallness in the size of savings, loans, insurance and all other products (Bank for International Settlements, 2010).

Debt funds (savings) contributed a higher proportion of loanable fund than equity capital in all the districts during the period. The gap between debt and equity was highest in Agago district at 87% followed by Gulu district at 72% and Nwoya at 69%. The other districts had gaps below 30% with lowest gap at 21% in Pader district. This is to the extent that Gulu had lent in excess of both the levels of savings mobilized and total loanable fund by 116% and 86% respectively during the period.

4.3 Structural Differences amongst Districts in Savings Mobilization and Loans Deployment

The key covariates in the analysis of structural differences were the levels of savings mobilized and the capitalizations funds attracted by the MFIs/SACCOs. These were besides the number of MFIs/SACCOs and clients in each of the districts. The regression model was based on core intermediation role of deposit taking financial institutions where loan deployment as the explained variable is a function of the above covariates. Loan deployment represents a set of core activities for FIs to enhance their profitability (Rengasamy, 2014).

Through the Wald test it was established that the cause of heterogeneity was the differential intercepts. The intercepts which represent the average loan holdings for each of the seven districts were significantly different from one another during the reporting period. Through the Haussmann test, REM/ECM was rejected and FEM was established as the appropriate model to be used in the analysis of the performance of MFIs as was expected. The use of FEM was appropriate because the cross sectional units which were districts were not a random drawing from a large population with in the Acholi sub region. However, if the cross sectional units were regarded as a random drawing from a larger sample then REM/ECM would have been appropriate as observed in Guajarati (2003) and Greene (2005). Through the introduction of 7 dummy variables to represent the districts, 7 degree of freedom was reduced from the total of 84 observations. A further 3 degrees of freedom was reduced because of the independent variables savings, capital and beneficiaries thereby brining the degree of to 74 which was considered appropriate for the statistical analysis of the model. In addition, none of the variables (loans, savings, capital and beneficiaries) in the model were time invariant and therefore their effects could all be picked through the FEM.

The covariance structure of the pooled data sets on loans, savings, capitalization and beneficiaries were tested for autocorrelation and heteroscadesticity as their presence without correction would have affected the results of the analysis. Autocorrelation was ruled out through both visual detection of the scatter plot and the David Watson test which was within acceptable range. Similarly, heteroscedasticity was ruled through the Breusch-Pagan / Cook-Weisberg test which means that the variance for each of the districts are fixed (homoscedastic) over the time period of observation and analysis. Therefore the ordinary least square assumptions are not violated due to absence of autocorrelation and heteroscedasticity.

5. Conclusion

The district heterogeneity affected micro savings mobilization and loan deployment in Acholi sub region. The distribution of SACCOs and clients by district and Sub County in Acholi sub region is uneven and historically based on the administrative boundaries of the districts. The study reaffirmed that the micro loan deployment in Acholi sub region depended on micro savings mobilized, capitalization funds and the number of clients willing to borrow as expected.

6. Recommendations

At tier 4 level of financial institutions, the appropriate unit of capitalization through government subvention should be each individual SACCO rather than clients in their capacities as individuals or interest groups. There is need to increase both equity and debt funds as components of total loanable funds so as to enhance the operations of SACCOs across the districts. Equity should be increased internally through upward revision in the per unit share capital to be bought upfront by members who are joining the SACCO. Debt funds could be sourced externally from both local and foreign lending agencies. SACCOs are involved in deposit mobilization, hence the government should strengthen the regulatory framework to protect the depositors from loss of savings from failing SACCOs. The apex organization, UCSCU should ensure that all SACCOs are registered with them after meeting mandatory capitalization and institution of the governing board according to statute. Longitudinal study of a cohort of individuals SACCOs or any of the selected units over a longer time period could be done.

This should be in addition to qualitative study of the unique characteristics of each district.

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