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# Efficiency of Microfinance Institutes (MFIs) in Cameroon: A Comparative Analysis of MFIs Affiliated to CamCCUL and MC² Using DEA Approach and the Tobit Censored Model

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## Abstract

Microfinance is a means of the struggle against poverty in developing countries through financing activities that generate incomes for poor households. The concern of trying to render effective financial services to the impoverished has brought up an in-depth argument among the Institutionalists and Welfarists school of thought. This opposition faces two requirements of Micro Finance: targeting the poorest among the poor (social performance) and enhancing the profitability of the institution (financial performance). The main research question is asking if there is a trade-off or mutuality between financial sustainability and outreach of MFIs affiliated to CamCCUL and MC² while the main objective is to investigate if there is trade-off or mutuality between financial sustainability and outreach of MFIs. After due research on 40 MFIs affiliate to CamCCUL and 40 from MC² on the Efficiency of these MFIs using Data Envelope Analysis (DEA) and the Censored Tobit model for the period of 2015 and 2016, we can say that on an average base, both networks are not efficient and averagely, there is trade off in both network; however, those affiliated to MC² are socially performing than CamCCUL and on the other hand those affiliated to CamCCUL are financially performing than MC². We also realised that, the size of an MFI, its location, subsidies and other related factors have a great influence on their efficiency.

## Keywords

Financial Performance, Microfinance Institutions, Social Performance, Institutionalists Welfarists, DEA, Censored Tobit Model

## 1. Introduction

Most people find their selves in a dilemma when asking the question if Micro Finance Institutions (MFIs) are sustainable and at the same time socially performant. This question is ironic but nevertheless relevant if MFIs keep to their "promise" of being an important tool of development [1].

For MFIs to be sustainable, they need to be financially performed but yet most MFIs that lack the efficient infrastructure and human resources and who are serving highly vulnerable populations tend to face huge challenges as far as sustainability is concerned. Since funds of private investors will permit MFIs to scale up, MFIs need to attract these private investors and in order to do so; they are expected to cover their operation cost and even generate profit to finance their growth. This will attract these private investors and will on the other hand enable them to be sustainable. In order to evaluate effectively, manage and incentitize improvements in financial performance, transparent financing reporting is the key [2].

Most sector stakeholders have taken for granted the social utility of MFIs due to their rapid expansion and visible success stories among its clients. This relative marginalization of social performance assessment resulted in a wealth of information on the financial aspects of MFIs but very little on the social side despite it being Micro finance raison d'etre [3].

Some bystanders suggest a conflict, pointing to problems of mission drift experienced by MFIs that pursue profitability by emphasizing physical collateral, large loans and targeting the better-off [4]. Others think synergy is very necessary because according to them, social performance strengthens mutual trust, clients' participation and satisfaction which gives rise to higher repayment rates and lowers transactions cost [5].

While these assertions draw on case studies, the research has not been extensive enough to draw sector wide conclusions. Our research work brings empirical evidence or proves to this debate, drawing on the main findings of an in-depth analysis of the relationship between financial performance and social performance. After taking stock of the evidence that spark conventional wisdom regarding the trade-off between MFIs' contribution to development and their financial sustainability based on our key parameters such as loan size, saving, number of women, we highlight the diversity and pertinent trends of these service providers. A data envelopment analysis and the Tobit Model have been used to assess the social performance and financial performance of MFIs to determine whether or not there is a trade-off between FP and SP making a comparative analysis of MFIs affiliated to CamCCUL and $MC^2$ for the period of 2015 and 2016. In order to do so, we need to formulate a hypothesis.

Fraenken and Wallen 2000 contend that a hypothesis is a prediction of some sort concerning the possible outcomes of a study. In another sphere, Feldman 1999 equally defined a hypothesis as a prediction stated in a manner that permits them to be tested. In order to have a comprehensive stand at the end of this re-

search work, we will state the hypothesis that will enable us to analyse and have a stand at the end of this research work. In this light, the hypotheses of this study can be stated as follows:

**H1:** The Financial Performance of MFIs affiliated to CamCCUL is higher than that of MFIs affiliated to MC2.

**H2:** The Social Performance of MFIs affiliated to CamCCUL is higher than that of MFIs affiliated to MC2.

**H3:** The size of a MFI has a significant impact on the Efficiency of the MFI.

## 2. Assessing the Double Bottom_Line of MFIs

### Performance as a Multidimensional Concept

This is a subjective measure of how well a firm can use assets to attain its objective. It is a multidimensional concept which is very difficult to define. Two problems arise when it comes to performance studies: how to define it and how to measure it. Performance can be broken down in two sub concepts: effectiveness and efficiency. While the former measure the ability to attain the organisational goal, the later measure the ability to attain the organisational goals at the minimum costs. Different dimensions of performance include: financial performance, social performance, societal performance, environmental performance, global performance. The microfinance sector faces a dual objective usually referred to as the microfinance schism that is how to reach the maximum number of poor (social performance) while remaining financially sustainable (financial performance) [6].

As microfinance firms are viewed predominantly as instruments of social change, their performance has been often measured by non-financial parameters. The concept of social performance has seemed to overshadow the state of financial health of these enterprises. However, the accepted criteria in a number of studies to study the performance of any MFI have been the twin of Financial Performance and Outreach [7]. However, there exist various social performance assessment tools and institutionalized rating processes but assessment of financial performance has yet to gain ground.

Traditionally, some financial ratio like return on asset (ROA) and return on equity (ROE) are used to measure financial performance [8]. However, with the evolution of quantitative techniques, more sophisticated and inclusive measures have been developed. This study focuses on the efficiency of microfinance institutions and to be more precise, on the financial and outreach efficiency of MFIs in Cameroon.

## 3. Methodology

In order to achieve our objectives, our study will be articulated mainly around two models: the Data Envelopment Analysis (DEA) model and the censored Tobit model to analyse the social performance of micro finance institutions affiliated to CamCCUL and $MC^2$ using the combined method following the Output

Oriented Approach.

### 3.1. The DEA Approach

Data Envelopment Analysis is a linear programming application aimed at evaluating the efficiencies of similar decision-making units (DMUs) based upon the inputs and outputs associated with the DMUs [9].

DEA was initially proposed by Farrell (1957) He adopted the principle of frontier analysis for firm's efficiency assessment. Later, Charnes, Cooper, & Rhodes (1978) consolidated this concept as a nonparametric analysis in using efficiency measurement [10]. DEA uses a linear programming methodology to convert inputs used into outputs produced [11]. The attribution of this method is an unfunctional model that is able to analyze multi-inputs and multi outputs. In addition, DEA defines a "frontier" in order to compare the relative performance of units/firms against the best producers. The efficiency score in DEA model is ranged from zero to one. The highest score (one) defines maximum efficiency, while a score of less than one shows a firm's inefficiency, indicating the relative displacement away from the frontier. The two ways to consider efficiency are to produce a greater quantity of outputs with the same number of inputs and to use fewer levels of inputs with the same quantity of outputs.

The different concept of DEA depends on whether it is an input-oriented or output oriented model and whether its condition presents a constant or variable-return-to-scale model. The input-oriented DEA model tries to minimize quantity of input, producing the same level of outputs as the unit in question. Meanwhile, the output oriented DEA model finds the way to maximize quantity of output with the same amount of inputs as the unit in question. The constant-return-to-scale (CRS) model supposes that output level is proportional to the input level for a given unit. On the other hand, the variable-return-to-scale (VRS) model allows the output level is proportionally higher or lower than an increase in inputs.

As adapted from Charnes, Cooper, & Rhodes (1981), the output-oriented CCR-DEA model measure the efficiency scores ($E_j$) for peer decision making units or DMUs ( $j=1,\cdots,z$ ). The efficiency assessment depends on the selected outputs ( $Y_{ai}, a=1,\cdots,n$ ) and inputs ( $X_{bi}, b=1,\cdots,m$ ), expressed by the linear programming methodology: the mathematical program used for the CCR ratio is:

$$\begin{aligned} &Max_{u,v}\left(u'y_i/v'x_i\right) \\ &ST \;\; u'y_i/v'x_i \le 1 \;\text{ with } J=1,2,\cdots,N \\ &\quad u,v \ge 0 \end{aligned} \tag{1}$$

where $u$ is a vector of dimension $(M\times 1)$, and $v$ is a vector of dimension $(K\times 1)$ representing respectively the weights of the outputs and the inputs determined by solution of the problem: that is to say, by the data of all the credit unions used as reference set. Since that type of ratio allows an infinite number of solutions, Charnes and Cooper (1962) developed a fractioned linear program. The latter

selects a representative solution in each equivalence class and the dual linear program which is associated is:

$$\begin{aligned} &Min_{\theta,\lambda}(\theta) \\ &ST - y_i + Y\lambda \geq 0 \\ &\quad \theta x_i - X\lambda \geq 0 \\ &\quad \lambda \geq 0 \end{aligned} \tag{2}$$

where $\theta$ is a scalar that gives the measure of the technical efficiency of the considered cultivation, $\lambda$ is a vector $(N \times 1)$ of constants called multipliers. They indicate the way that MFIs combine together to create the frontier to which the i$^{th}$MFI will be compared, according to Farrell definition (1957). The problem is solved $N$ times, one time for each MFI in the sample, and generates $N$ optimal values of $\theta$ and $\lambda$. In the DEA program (2), the performance of a producer is evaluated in terms of the producer capacity to reduce his vector of factors up to the level of the best practice that has been observed [12].

The CCR model can be modified considering the hypothesis of variable returns to scale. We just have to add a constraint $N1'\lambda = 1$ to the previous programme. Then we have:

$$\begin{aligned} &Min_{\theta,\lambda}(\theta) \\ &ST - y_i + Y\lambda \geq 0 \\ &\quad \theta x_i - X\lambda \geq 0 \\ &\quad N1'\lambda = 1 \\ &\quad \lambda \geq 0 \end{aligned} \tag{3}$$

where $N1$ is a vector of dimension $(N \times 1)$.

Freixas *et al.* (1997) distinguish three main approaches to the measurement of financial institutions efficiency, the production approach, the intermediary approach, the financial approach (combination of production and intermediary), the social approach, the gobal approach (combination of financial and social) [13] and in addition to this, there is a most recent approach known as the modern approach which takes into account asymmetry of information and risk management.

### 3.2. The Censored Tobit Model

Tobit model is also of considerable interest to explain DEA efficiency scores by investigating the determinants of technical efficiency. as defined above, the DEA score Falls between the interval 0 and 1—making the dependent variable a limited dependent variable. A commonly held view in previous studies is that the use of the Tobit model can handle the characteristics of the distribution of efficiency measures and thus provide results that can guide policies to improve performance. In recent years, many DEA applications use a two-stage procedure involving both DEA and Tobit. DEA efficiency measures obtained in the first stage are the dependent variables in the second stage Tobit model.

The goal of the second stage is to explore relationships between the technical

efficiency measure and other relevant variables such as farm size, number of plots, farmer's age, and off-farm income.

The Tobit model was first suggested in the econometrics literature by Tobin (1958). These models are also known as truncated or censored regression models (the model is truncated if the observations outside a specified range are totally lost and censored if one can at least observe the exogenous variables) where expected errors do not equal zero [14]. Therefore, estimation with an ordinary least squares (OlS) regression of DEA scores would lead to a biased parameter estimate since OlS assumes a normal and homoscedastic distribution of the disturbance and the dependent variable (Maddala 1983; Amemiya 1984).

The standard Tobit model can be defined as follows for observation (farm i:

$$y^* = x\beta + u$$

$$i = 1,2,\cdots,n$$

$$y = y^* \quad \text{if} \quad y_i^* < 0$$

$$y = 0\text{, otherwise}$$

where $u_i \sim N\left(0,\sigma^2\right)$, $X$ and $\beta$ are vectors of explanatory variables and unknown parameters, respectively.

They * is a latent variable and y is the DEA score (Amemiya 1984).

### 3.3. Data and the Specification of Variables

Though many research studies adopted the production approach, this study intends to use a combined approach known as the intermediation approach in order to capture the mission oriented role of MFI. More precisely, we consider a financial intermediation and outreach approaches of efficiency measurement in our study [15]. Both the financial and social DEA models will consist of the following inputs:

**INPUTS**

Capital, Savings And Other Deposits, Personnel Charges And, Bank operating charges and Other Charges

**OUTPUT**

Lending volume (LOANS), Deposit volume (savings), Bank operations income, Other income, Number of members, Number of woman borrowers and Number of poor.

The efficiency coefficients and all the efficiencies analysis will be obtained by using the Data Envelopment Analysis Program DEAP Version 2.1®.

**As Concerns the Censored Tobit Model**, the following Variables will be used; After assessing these levels of efficiency, we are going to use a censored Tobit model in order to identify factors affecting these levels of efficiency. Here we are going to use the level of efficiency estimated with the DEA as the dependent variable. Regulation ratios and other traditional factors will be used as independent variables. Explicitly, we are going to estimate the following equation: Performance = f (SIZE, $SIZE^2$, CAR, EFC, LIQUIDITY, RISK, FACR, SUB).

CAR = Capitalisation or Capital Adequacy, RISK = risk coverage ratio, LIQUIDITY = liquidity ratio; EFC = External Funding Coefficient measured the share of debts in equity, FACR = fixed assets coverage ratio: SIZE = size of the MFI measured by the Logarithm of total assets can lead to economy of scale in the distribution of financial services and SUB = subsidies measured by a dichotomous variable that 1 if the MFI received subvention in that particular year and 0 if not.

## 4. Results and Discussion

### 4.1. Description of Variables and Expected Signs

Table 1 shows the description of variables and the expected signs we will be basing our analysis on as a point of reference.

### 4.2. Summary of Descriptive Statistics

Prior to the Data Envelopment Analysis and the Tobit estimation, a descriptive analysis of all the variables used for the analysis is conducted. Table 2 present the summary of descriptive statistics of CamCCUL data for 2015.

Results from Table 2 indicate that the average capital of the 40 MFIs affiliated to CamCCUL selected for the study stands at 245 million with a standard deviation of 406 million indicating very high variability of MFIs size measured by capital with capital values ranging from 520,326 to 2.35 billion francs. In terms of labour captured by payroll expenses, the average value for the CamCCUL MFIs selected is estimated at 43.1 million while the standard deviation stands at 61.9 million which is far higher than the mean and which shows that there is high disparity of size of MFIs measured by the number of employees. Labour varies between 60,000 and 384 million. The mean value of other expenses excluding financial expenses is 61.8 million with a standard deviation of 89.3 million revealing that there is wide dispersion of values around the mean with these values evolving from 85,160 to 567 million. The average savings of CamCCUL is 1.27 billion while the mean value of loan stands at 1.28 billion indicating very

Table 1. Description of variables and expected signs.

| Variables | Description | Expected sign |
|---|---|---|
| Capital Adequacy Ratio (CAR) | Capital/total Assets | Positive |
| Risk Coverage Ratio (RISK) | Capital/total risk incurred | Positive |
| Liquidity Ratio (LIQUIDITY) | Current financial assets/current liabilities | Negative |
| External Funding Coefficient (EFC) | Equity/Debts | Positive |
| Fixed Assets Coverage Ratio (FACR) | Permanent resources/total fixed assets | Positive |
| Size of the MFI (SIZE) | Natural logarithm of total assets | Ambiguous |
| Subvention (SUB) | Quantitative variable | Ambiguous |

Source: Computed by the author.

**Table 2.** Summary of descriptive statistics for CamCCUL 2015.

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| capital | 40 | 2.45e+08 | 4.06e+08 | 520,326 | 2.35e+09 |
| labour | 40 | 4.31e+07 | 6.19e+07 | 60,000 | 3.84e+08 |
| otherexp | 40 | 6.18e+07 | 8.93e+07 | 85,160 | 5.67e+08 |
| savings | 40 | 1.27e+09 | 1.43e+09 | 5,276,785 | 7.52e+09 |
| loan | 40 | 1.28e+09 | 1.79e+09 | 3,194,640 | 9.97e+09 |
| otherinc | 40 | 2.31e+08 | 3.01e+08 | 163,990 | 1.80e+09 |
| nab | 40 | 4064.175 | 4281.97 | 176 | 25047 |
| pwb | 40 | 0.33055 | 0.1336923 | 0.002 | 1 |
| alb | 40 | 165,045.3 | 560,624.1 | 37.96944 | 3,574,956 |
| assets | 40 | 2.15e+09 | 3.33e+09 | 1.18e+07 | 2.05e+10 |
| car | 40 | 0.121055 | 0.0638601 | 0.0192 | 0.3437 |
| risk | 40 | 0.157365 | 0.0798098 | −0.0203 | 0.4707 |
| liquidity | 40 | 12.88836 | 48.31846 | 0.2727 | 220.6221 |
| facr | 40 | 3.944507 | 7.587734 | −0.6603 | 35.4445 |
| efc | 40 | 2.88396 | 2.47511 | 0.355 | 9.1045 |
| sub | 40 | 0.3 | 0.4640955 | 0 | 1 |

Source: Computed by the author.

high coefficient of transformation in the network (more than 100%). The average value of other income than financial income (bank operating income and other income) is 231 million with a standard deviation of 301 million which reveals that there is wide dispersion around the mean. The minimum of other income is 163,990 while the maximum is 1.8 billion.

On average the 40 MFIs count 4064 members with an average percentage of women members of 33.055%. The huge disparity among the MFIs is also expressed in terms of number of members and percentage of female members as values of number of active members fluctuate between 176 and 25,047. While some MFIs had as low as 0.2% female members, others had all their members who are female making a maximum value of female members (percentage of women borrowers as named by scholars) of 100%. The average loan per borrower mean value stands at 165,045.3 with a standard deviation of 560,624.1 which, once again depicts very high variability in the sample with values ranging from 37.97 to 3,574,956.

The average value of total assets for the sample for the year 2015 is calculated at 2.15 billion with huge disparity as indicated by the standard deviation of 3.33 billion. Values of total assets range between 11.8 million and 20.5 billion. Performance in terms of regulatory ratios indicates that the average value of capital adequacy ratio (CAR) is 12.11% while that of risk coverage ratio is 15.74%, 1288.84% for liquidity ratio and 394.35% for fixed assets coverage ratio (FACR)

and 288.4% for external funding coefficient (EFC as a proxy for debt to equity).

These figures indicate that the network is averagely over liquid with lot of disparities among the MFIs. Some MFIS exhibit very poor performances in terms of risk coverage ratio and fixed assets coverage ratio with minimum values being negative for both variables. In terms of subventions, results from descriptive analysis indicate that 30% of the MFIs received subventions in 2015 as against 70% of the MFIs which did not receive.

Comparatively, from Table 3 it should be noted that there was an increase in the average value of capital of the selected MFIs affiliated to CamCCUL since average capital move from 245 million to 263 million while labour experienced a drop from 3 to 42.3 million which may be an indication of contraction in the number of personnel or a more efficient management of payroll. Similarly, other expenses excluding financial expenses also experience a fall between 2015 and 2016 moving from 61.8 million to 61.1 million on average. On the contrary, there has been an increase of the mean value of savings and loan by about 0.6 billion and 0.28 billion respectively. However, the transformation coefficient (loan/savings ratio) has drop as the volume of loans in 2016 is lower than that of savings. Other income also drops from 231 million in 2015 to 212 million in 2016.

There is an increase in the average number of members with the values calculated at 4793 as against 4064 in 2015 while the percentage of women borrowers

**Table 3.** Summary of descriptive statistics for CamCCUL 2016.

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| capital | 40 | 2.63e+08 | 3.99e+08 | 315,973 | 2.31e+09 |
| labour | 40 | 4.23e+07 | 5.15e+07 | 642,000 | 3.19e+08 |
| otherexp | 40 | 6.11e+07 | 7.49e+07 | 1,012,775 | 4.54e+08 |
| savings | 40 | 1.87e+09 | 3.48e+09 | 1.57e+07 | 2.20e+10 |
| loan | 40 | 1.56e+09 | 2.51e+09 | 1,248,400 | 1.51e+10 |
| otherinc | 40 | 2.12e+08 | 2.75e+08 | 285,815 | 1.63e+09 |
| nab | 40 | 4793.475 | 6149.288 | 540 | 38,188 |
| pwb | 40 | 0.322 | 0.0592777 | 0.18 | 0.44 |
| alb | 40 | 137,462.5 | 474,627 | 47.3282 | 3,012,575 |
| assets | 40 | 2.38e+09 | 3.99e+09 | 2.76e+07 | 2.50e+10 |
| car | 40 | 0.424025 | 1.952099 | −0.0419 | 12.45 |
| risk | 40 | 0.1193675 | 0.2156294 | −0.8998 | 0.7956 |
| liquidity | 40 | 2.252262 | 2.833477 | 0 | 13.1717 |
| facr | 40 | 3.37164 | 6.385266 | −2.6668 | 35.5396 |
| efc | 40 | 2.996065 | 2.770005 | −1.3489 | 10.2545 |
| sub | 40 | 0.325 | 0.4743416 | 0 | 1 |

Source: Computed by the author.

(percentage of female members) reduces from 33.06% to 32.2% in 2016 with increase in the minimum value to 18% (as compared to 0.2% in 2015) and a fall in the maximum value to 44% (as opposed to 100% in 2015). The average loan per borrower also experienced in 2016 a drop moving from 165,045 to 137,462.

First and foremost, it should be noted that as seen in Table 4 the same number of Decision Making Units (40 MFIs) affiliated to $MC^2$ were used to carry out the analysis as well. The average capital level is calculated at 76.2 million with a standard deviation of 44.9 million revealing that there is a wide dispersion of capital around the mean value ranging from a minimum capital of 11.7 million to a maximum value of 242 million. These values revealed that though all the MFIs belong to the same network, they are disparities of size of MFIs measured in terms of capital. Furthermore, the mean value of total assets is 903 million and the standard deviation is 549 million indicating that there high variability of values around the mean. Total assets values range from 45.2 million to 1.99 billion confirming the fact that there is a diversity of MFIs within the same network. The same analysis can be made with payroll charges. In fact, the mean value of personnel charges is 11.8 million with a standard deviation of 7,249,345 with a minimum value of 1,444,320 and a maximum value of 32.6 million.

Furthermore, the average savings of $MC^2$ in 2015 is 711 million with a standard deviation of 473 million indicating huge differences in terms of savings mobilisation among the MFIs with values ranging from 42 million to 1.69 billion.

**Table 4.** Summary of descriptive statistics for $MC^2$ 2015.

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| capital | 40 | 7.62e+07 | 4.49e+07 | 1.17e+07 | 2.42e+08 |
| labour | 40 | 1.18e+07 | 7,249,345 | 1,444,320 | 3.26e+07 |
| otherexp | 40 | 1.18e+07 | 7,249,345 | 1,444,320 | 3.26e+07 |
| savings | 40 | 7.11e+08 | 4.73e+08 | 4.20e+07 | 1.69e+09 |
| loan | 40 | 2.80e+08 | 2.03e+08 | 2.32e+07 | 9.18e+08 |
| otherinc | 40 | 6.39e+07 | 4.15e+07 | 2,330,563 | 1.73e+08 |
| nab | 40 | 3182.55 | 1679.242 | 567 | 7325 |
| pwb | 40 | 0.25945 | 0.716121 | 0.08 | 0.45 |
| alb | 40 | 19,549.06 | 6780.73 | 4110.34 | 32,603.04 |
| assets | 40 | 9.03e+08 | 5.49e+08 | 4.52e+07 | 1.99e+09 |
| car | 40 | 0.104355 | 0.0581284 | 0.0415 | 0.3329 |
| risk | 40 | 0.1329238 | 0.0576816 | 0.019 | 0.2885 |
| liquidity | 40 | −2.496463 | 30.48055 | −189.9234 | 13.7565 |
| facr | 40 | 3.466305 | 3.11688 | 0.3087 | 10.2935 |
| efc | 40 | −71.20931 | 471.5748 | −2979.087 | 9.8965 |
| sub | 40 | 0.3 | 0.4640955 | 0 | 1 |

Source: Computed by the author.

Similarly, on average, the 40 institutions sampled for study distributed 280 millions in terms of loans. Just like savings, there is a wide variability around the mean value given that the standard deviation is estimated at 203 million with values ranging from a minimum of 23.2 million to 918 million.

The average number of members (clients) is calculated at 3183 and the standard deviation is 1679 indicating that there is a diversity of customer portfolio from the MFIs. Number of clients in 2015 MC$^2$ sample ranges from 567 to 7253. Also, average percentage of women clients is 25.95% with values ranging from 8% to 45%.

From Table 5, we realize that the 2016 descriptive analysis confirms the 2015 trend. The mean value of capital in 2016 for MC$^2$ MFIs is calculated at 81.2 million as compared to 76.2 million in 2015 which indicates that there has been an increase in average capital from 2015 to 2016. Similarly, there has been an increase in the average total assets value in 2016 as the mean value is calculated at 934 million as compared to 903 million in 2015. The same comment can be made for personnel charges which increased from 11.8 million to an average value of 14 million in 2016.

There has been an increase in other charges of MC$^2$ in 2016 moving from 11.8 million in 2015 to 14 million in 2016. This therefore suggests that despite attempt to reduce expenses in CamCCUL in 016, other charges keep on increasing in MC$^2$ network in 2016. However, this may also result in the expansion of

Table 5. Summary of descriptive statistics for MC$^2$ 2016.

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| capital | 40 | 8.12e+07 | 4.73e+07 | 1.31e+07 | 2.47e+08 |
| labour | 40 | 1.40e+07 | 8,638,735 | 2,136,421 | 3.89e+07 |
| Other exp | 40 | 1.40e+07 | 8,638,735 | 2,136,421 | 3.89e+07 |
| savings | 40 | 7.38e+08 | 5.01e+08 | 5.09e+07 | 1.81e+09 |
| loan | 40 | 2.96e+08 | 2.17e+08 | 2.31e+07 | 9.10e+08 |
| Other inc | 40 | 6.94e+07 | 4.67e+07 | 3,469,299 | 1.97e+08 |
| nab | 40 | 3388.85 | 1801.164 | 592 | 8111 |
| pwb | 40 | 0.256 | 0.0793176 | 0.08 | 0.59 |
| alb | 40 | 19,588.84 | 6765.652 | 5860.302 | 33,900.39 |
| assets | 40 | 9.34e+08 | 5.81e+08 | 5.15e+07 | 2.07e+09 |
| car | 40 | 0.10711 | 0.0551568 | 0.0433 | 0.2989 |
| risk | 40 | 0.1350825 | 0.053119 | 0.0185 | 0.278 |
| liquidity | 40 | 7.211396 | 31.16928 | 0.0535 | 198.995 |
| facr | 40 | 3.624757 | 3.265309 | 0.3489 | 10.2909 |
| efc | 40 | 3.473526 | 3.245768 | 0.2565 | 10.2367 |
| sub | 40 | 0.3 | 0.4640955 | 0 | 1 |

Source: Computed by the author.

some MFIs. Like many variables retained for the analysis, savings and loans increased from 2015 to 2016 indicating a better savings mobilisation and more loans distributed as they move from 711 million and 280 million in 2015 to 738 million and 296 million in 2016 respectively.

### 4.3. Results of Correlation Analysis

As a prelude to the data analysis proper, the study also carried out a correlation analysis in order to detect possible problem of multicolinearity. However, it should be noted that the multicolinearity problem concerns more of the Tobit model variables given that problem of multicolinearity is not much a concern in the DEA analysis.

Table 6 reports the pairwise correlation results among the main variables and explore the potentials for multicollinearity, using a benchmark of 0.8 (Kennedy 2003). As we can see from Table 6, we can observe there is only one correlation coefficient (0.9702) which is higher than our benchmark of 0.8 (Kennedy 2003). The rest of the results therefore from the correlation analysis of the Tobit model regressors reveals that there is no strong correlation among the independent variables which therefore permits us to conclude that multicolinearity was not a major concern in the model.

In Table 7, just like the previous correlation analysis, no correlation coefficient

**Table 6.** Pairwise correlation matrix for CamCCUL 2015.

| | assets | car | risk | liquidity | facr | efc | sub |
|---|---|---|---|---|---|---|---|
| assets | 1.0000 | | | | | | |
| car | −0.0752 | 1.0000 | | | | | |
| risk | 0.0917 | 0.1719 | 1.0000 | | | | |
| liquidity | 0.0676 | −0.1862 | −0.0799 | 1.0000 | | | |
| facr | 0.0554 | −0.1894 | −0.0353 | 0.9702 | 1.0000 | | |
| efc | 0.2281 | 0.0728 | 0.0805 | 0.1120 | 0.1330 | 1.0000 | |
| sub | 0.2914 | 0.0802 | 0.3829 | 0.3570 | 0.3627 | 0.2168 | 1.0000 |

Source: Computed by the author.

**Table 7.** Pairwise correlation matrix for CamCCUL 2016.

| | assets | car | risk | liquidity | facr | efc | sub |
|---|---|---|---|---|---|---|---|
| assets | 1.0000 | | | | | | |
| car | −0.0512 | 1.0000 | | | | | |
| risk | 0.0770 | 0.0606 | 1.0000 | | | | |
| liquidity | 0.0029 | −0.0857 | 0.1457 | 1.0000 | | | |
| facr | 0.0117 | −0.0532 | 0.1682 | 0.6417 | 1.0000 | | |
| efc | 0.2138 | −0.0713 | 0.2850 | 0.0834 | 0.1432 | 1.0000 | |
| sub | 0.2070 | 0.2202 | −0.2133 | 0.2119 | 0.1493 | −0.0990 | 1.0000 |

Source: Computed by the author.

reaches 0.8 which indicates that there exist only weak correlations among the variables. As such multicolinearity is not a serious problem in the model.

Again, as seen in Table 8 no strong correlation could be established among independent variables of the $MC^2$ variables for the year 2015. Conclusively, we fail to suspect any major issue of multicolinearity among the variables.

From the analysis in Table 9, we realize that just like the 2015 correlation analysis several strong and very strong correlation were established among variables of the DEA. However, they have very little significance on the quality of the results obtained through the DEA. However, as concerning the regressors of the Tobit model, none of the correlation coefficient exceeded 0.6 which reveals that there exist weak and very weak correlations among the variables.

### 4.4. Factors Affecting Financial and Social Efficiency of CamCCUL and $MC^2$

In order to identify and examine some determinants of the social and financial performance of the two networks included in the study, we use the censored Tobit model given the continuous but in a limited range of the efficiency scores which fluctuate between ]0; 1]. However, it should be noted that the censored Tobit model accommodate dependent variables which fluctuate in a limited

**Table 8.** Pairwise correlation matrix for $MC^2$ 2015.

| | assets | car | risk | liquidity | facr | efc | sub |
|---|---|---|---|---|---|---|---|
| assets | 1.0000 | | | | | | |
| car | −0.5771 | 1.0000 | | | | | |
| risk | 0.1368 | 0.2818 | 1.0000 | | | | |
| liquidity | −0.0145 | 0.0496 | 0.2689 | 1.0000 | | | |
| facr | 0.1648 | −0.1436 | 0.0733 | 0.0068 | 1.0000 | | |
| efc | 0.0043 | 0.0245 | 0.2399 | 0.9972 | 0.0383 | 1.0000 | |
| sub | −0.0539 | −0.1174 | 0.1967 | 0.1225 | −0.0000 | 0.1055 | 1.0000 |

Source: Computed by the author.

**Table 9.** Pairwise correlation matrix for $MC^2$ 2016.

| | assets | car | risk | liquidity | facr | efc | sub |
|---|---|---|---|---|---|---|---|
| assets | 1.0000 | | | | | | |
| car | −0.5958 | 1.0000 | | | | | |
| risk | 0.0539 | 0.2585 | 1.0000 | | | | |
| liquidity | −0.2331 | 0.4941 | 0.2112 | 1.0000 | | | |
| facr | 0.1072 | −0.1347 | 0.1114 | −0.1477 | 1.0000 | | |
| efc | 0.1444 | −0.0658 | 0.5905 | 0.0173 | 0.5107 | 1.0000 | |
| sub | −0.0322 | −0.1507 | 0.2664 | −0.0837 | −0.0790 | −0.0017 | 1.0000 |

Source: Computed by the author.

range that include 0 which is not the case with efficiency score since it is impossible to have a zero efficiency score. In order to fulfil this requirement and to overcome this challenge, the study rather examine the determinants of financial and social inefficiency (inefficiency is measured by 1 minus efficiency score). Therefore inefficiency scores now vary in the interval [0; 1[ and thus, rendering the censored Tobit operational. As such, a positive effect of a variable on inefficiency will imply that the variable exert a negative influence of efficiency and vice versa.

Therefore, a left censoring is used to analyse the data and results presented in Table 10.

Table 10 shows that the coefficient of size of the MFI is positive which implies that there is a positive effect of size of the MFI on the financial inefficiency of CamCCUL in 2015. Said otherwise, as the size of the MFI increases, its financial efficiency reduces. Further results indicate that the coefficient of size squared is

Table 10. Determinants of efficiency of CamCCUL 2015.

| VARIABLES | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Financial inefficiency | P > \|t\| | Social inefficiency | P > \|t\| |
| size | 1.103 | 0.152 | 1.906 | 0.124 |
| | (0.752) | | (1.206) | |
| $size^2$ | −0.0286 | 0.134 | −0.0464 | 0.125 |
| | (0.0188) | | (0.0295) | |
| car | −0.835 | 0.264 | −0.490 | 0.575 |
| | (0.735) | | (0.865) | |
| risk | 0.694 | 0.189 | 1.217 | 0.111 |
| | (0.517) | | (0.742) | |
| liquidity | −0.00867*** | 0.003 | 0.000390 | 0.939 |
| | (0.00268) | | (0.00507) | |
| facr | 0.0593*** | 0.001 | −0.0192 | 0.476 |
| | (0.0169) | | (0.0266) | |
| efc | 0.0302* | 0.070 | −0.000695 | 0.975 |
| | (0.0161) | | (0.0223) | |
| sub | −0.148 | 0.106 | −0.0881 | 0.494 |
| | (0.0889) | | (0.127) | |
| Constant | −10.69 | 0.165 | −19.51 | 0.124 |
| | (7.529) | | (12.35) | |
| sigma | 0.174*** | | 0.273*** | |
| | (0.0294) | | (0.0452) | |
| Observations | 40 | | 40 | |

Note: Standard errors in parentheses; ***p < 0.01, **p < 0.05, *p < 0.1. Source: Computed by the author.

negative which implies that there is negative effect of size squared on the financial inefficiency of CamCCUL. Since the coefficient of size squared is different from that of size, we can conclude that there is a quadratic effect of size of the MFI on their financial performance. In effect, there is a minimum size of the MFI after which the MFI starts enjoying economies of scale. However, it should be noted that both coefficients are statistically insignificant.

The coefficient of capitalisation measured by capital adequacy ratio is negative which means that there is a negative effect of capitalisation on the financial inefficiency of CamCCUL in 2015. In other words, the higher the MFIs capital to assets ratio, the higher will be the MFI financial efficiency. However, this outcome is statistically insignificant. In addition, there is a negative effect of risk coverage ratio on the financial efficiency of CamCCUL in 2015 given that the coefficient of risk coverage is positive (0.694). Once again, no significant relationship could be established with the variable.

The coefficient of liquidity ratio is negative (−0.00867) as seen in Table 10 which implies that there is negative effect of liquidity on the financial performance of CamCCUL in 2015. In fact this result suggests that there is positive effect MFI liquidity on the financial performance of CamCCUL in 2015. An increase in the liquidity of MFIs affiliated to CamCCUL will bring about an increase in the financial performance of these MFIs by about 0.009 everything being equal. It should be noted that this result is significant at 1% level implying that the variable is crucial for policy recommendations towards improving the financial performance of CamCCUL microfinance institutions.

Unlike liquidity, the coefficient of fixed assets coverage ratio is positive (0.0593) which indicates that there is a positive effect of FACR on the financial efficiency of CamCCUL in 2015. Put differently, higher fixed assets coverage reduces the financial efficiency of CamCCUL by about 0.059 in 2015. Just like the previous variable, this finding is statistically significant at 1% level. We can therefore conclude that there is a negative and significant effect of fixed assets coverage on the financial efficiency of CamCCUL in 2015.

Similarly, there is a negative effect of external funding coefficient on the financial efficiency of CamCCUL in 2015 as the coefficient of EFC is positive (0.0302) as shown in Table 10 indicating that external funding increases financial inefficiency of the MFIs affiliated to CamCCUL. More precisely, an increase of external funding coefficient by 1 unit will lead to 0.03 fall in the financial efficiency score of the network. It should further be noted that this result is significant at 10% level which renders the variable important for policy designing.

A negative coefficient of subvention simply indicates that MFIs which receive subsidies in 2015 were less likely to be financially inefficient as compared to those who did not receive. Put otherwise, receiving subventions increased the financial performance of CamCCUL affiliated MFIs in 2015. However, this outcome is not significant at all.

Looking at factors affecting the social performance of CamCCUL in 2015, re-

sults from data analysis in Table 10 indicates that social efficiency is positively determined by capitalisation, external funding coefficient, fixed assets coverage ratio and subventions. The positive effects of subventions on both financial and social efficiency somehow confirm the welfarist postulate indicating that MFIs needs assistance in order to meet up with their dual mission of financial and social performance. on the other side, risk coverage ratio and liquidity ratio compromise the social efficiency of CamCCUL in 2015. Though the quadratic effect of the size of the MFI indicating the existence of a minimum size of MFI after which the effect of size of MFI on the social efficiency CamCCUL in 2015 becomes positive, it should be noted that none of the variables included in the model were found to be statistically significant.

Going by the results of $MC^2$ network in 2015 as seen in Table 11, results from data analysis show that there also exists a minimum size of the MFI after which the effect of size of MFI on the financial and social efficiency of $MC^2$ in 2015

Table 11. Determinants of efficiency of $MC^2$ 2015.

| VARIABLES | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Financial inefficiency | P > \|t\| | Social inefficiency | P > \|t\| |
| size | 8.659*** | 0.001 | 7.820** | 0.011 |
| | (2.395) | | (2.906) | |
| $size^2$ | −0.218*** | 0.001 | −0.196** | 0.010 |
| | (0.0596) | | (0.0720) | |
| car | 1.463 | 0.261 | −1.230 | 0.390 |
| | (1.280) | | (1.413) | |
| risk | 0.699 | 0.435 | −0.0952 | 0.923 |
| | (0.884) | | (0.973) | |
| liquidity | −0.0288 | 0.159 | −0.00137 | 0.950 |
| | (0.0199) | | (0.0217) | |
| facr | −0.00516 | 0.677 | −5.80e−05 | 0.997 |
| | (0.0123) | | (0.0135) | |
| efc | 0.00180 | 0.166 | 1.05e−05 | 0.994 |
| | (0.00127) | | (0.00139) | |
| sub | −0.0983 | 0.251 | −0.0528 | 0.505 |
| | (0.0840) | | (0.0784) | |
| Constant | −85.89*** | 0.001 | −77.55** | 0.013 |
| | (24.09) | | (29.33) | |
| sigma | 0.196*** | | 0.188*** | |
| | (0.0312) | | (0.0341) | |
| Observations | 40 | | 40 | |

Note: Standard errors in parentheses; ***p < 0.01, **p < 0.05, *p < 0.1. Source: Computed by the author.

becomes positive. While results of size and size squared are significant at 1% level in the financial efficiency model, the same variable is significant at 5% level in the social efficiency model. These findings therefore imply that the MFIs affiliated to $MC^2$ start by experiencing diseconomies of scale until a certain point after which they start enjoying economies of scale both in terms of financial efficiency and social efficiency.

Contrary to the finding from the CamCCUL network analysis of the same year, results from $MC^2$ in 2015 as shown in Table 11 indicate that there is a positive effect of capitalisation (CAR) on the financial efficiency of the network given that the coefficient of CAR is positive (1.463). An increase of capital adequacy ratio by 1 point will result in a more than one point increase in financial inefficiency (reduction in financial efficiency). However, just like the finding in the CamCCUL model, this result is not significant. Though the effect of capitalisation on social efficiency is positive, again, the result from data analysis fails to establish any significant relationship.

Further results from Table 11 also reveal that risk coverage ratio has a negative effect on the financial performance of $MC^2$ in 2015 whereas the variable increases social efficiency. Again, no significant effect could be established as both coefficients were found to be statistically insignificant. Liquidity ratio and fixed assets coverage ratio increase the financial and social efficiency of $MC^2$ network given that the coefficients of both variables are negative. Just like the previous outcome, these coefficients are all insignificant. The same results could be observed with subvention given that the variable has a negative but insignificant effect on both financial and social inefficiency. On the contrary, external funding coefficient exerts a positive effect on financial and social inefficiency of $MC^2$ in 2015, though this result is not significant. It can therefore be concluded that the only significant determinant of $MC^2$ financial and social efficiency in 2015 is the size of the MFI.

Consistently with the results of the CamCCUL network in 2015, results from the same network in 2016 as seen in Table 12 indicate that there is quadratic effect of size of the MFI on the efficiency of MFIs affiliated to CamCCUL. This U-shape relationship is materialised by the existence of a minimum size after which the MFIs affiliated to CamCCUL begin to enjoy economies of scale. It should also be noted that the results are significant 1% for the financial efficiency coefficients and, 10% and 5% respectively for size and size squared in the social efficiency model.

The coefficient of capitalisation is negative (−0.0751) which indicates that there is a negative effect of capital adequacy ratio on the financial inefficiency of CamCCUL in 2016. Put otherwise, higher capitalisation of MFIs affiliated to the CamCCUL network increases the financial efficiency in 2016 whereas the effect is reverse when looking at social efficiency. Both coefficients are statistically insignificant.

Both coefficients of risk coverage ratio in the financial and social inefficiency

**Table 12.** Determinants of efficiency of CamCCUL 2016.

| VARIABLES | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Financial inefficiency | P > \|t\| | Social inefficiency | P > \|t\| |
| size | 14.35*** | 0.001 | 2.222* | 0.052 |
| | (4.103) | | (1.103) | |
| $size^2$ | −0.337*** | 0.001 | −0.0584** | 0.042 |
| | (0.0967) | | (0.0275) | |
| car | −0.0751 | 0.808 | 0.0226 | 0.384 |
| | (0.306) | | (0.0256) | |
| risk | −0.195 | 0.118 | −0.650** | 0.027 |
| | (0.122) | | (0.281) | |
| liquidity | −0.000486 | 0.979 | 0.0189 | 0.401 |
| | (0.0186) | | (0.0222) | |
| facr | 0.00224 | 0.678 | −0.000508 | 0.958 |
| | (0.00533) | | (0.00963) | |
| efc | −0.0218* | 0.087 | 0.0661*** | 0.008 |
| | (0.0123) | | (0.0233) | |
| sub | −0.120* | 0.072 | −0.109 | 0.403 |
| | (0.0642) | | (0.129) | |
| Constant | −152.7*** | 0.001 | −20.77* | 0.070 |
| | (43.50) | | (11.07) | |
| sigma | 0.123*** | | 0.283*** | |
| | (0.0222) | | (0.0427) | |
| Observations | 40 | | 40 | |

Note: Standard errors in parentheses; ***p < 0.01, **p < 0.05, *p < 0.1. Source: Computed by the author.

models are negative signifying that there is a negative effect of risk coverage on the financial and social performance of CamCCUL in 2016. In fact, increase in risk coverage ratio by a unit will lead to an increase in financial and social efficiency by 0.195 and 0.65 respectively. However only the coefficient of risk coverage in the social efficiency model is significant at 5%.

Liquidity ratio reduces financial inefficiency of MFIs affiliated to CamCCUL given that the coefficient of liquidity ratio is negative in the financial inefficiency model. This therefore suggests that, increase in the liquidity of the MFIs will bring about an increase in financial efficiency. The effect on social efficiency is the reverse as the more liquid were the MFIs affiliated to CamCCUL in 2016, the less is their social efficiency score. Contrary to liquidity, fixed assets coverage ratio reduces financial efficiency of CamCCUL in 2016 while increasing social efficiency. However, just like liquidity ratio, the coefficients of fixed assets coverage ratio are statistically insignificant.

Higher external funding coefficient (EFC) reduces financial inefficiency as the coefficient of EFC was found to be negative (−0.0218) as shown in Table 12. This result suggests that an increase of external funding coefficient will lead to an increase of the financial efficiency of the network. This result is significant at 10% level. Moreover, the external funding coefficient was found to compromise social efficiency of CamCCUL in 2016 as the coefficient of EFC in the social inefficiency model is positive. This therefore implies that, increase in the debt to equity ratio of the MFIs affiliated to CamCCUL will bring about a fall of the social performance of the network. This second outcome is significant at 1% level.

Another key determinant of CamCCUL network financial efficiency in 2016 is subventions. The negative sign of subvention in the financial inefficiency model simply indicates that MFIs which receive subsidies in 2016 are less likely to be financially inefficient (and therefore more likely to be financially efficient) as compared to the MFIs which did not receive any subventions. This finding is significant at 10% level. Also, though the coefficient of subvention in the social inefficiency model is negative, no significant effect can be established. This implies that there is a positive but insignificant effect of subvention on the social efficiency of the network in 2016.

Results from Table 13 reveal that the U-shape relationship between size of the MFI and both the financial and social efficiency of the $MC^2$ network in 2016 is validated. In effect, the size of the institution has a negative effect on the financial and social performance of $MC^2$ until a minimum point after which the effect of size of the MFI on its financial and social performance becomes positive. These results are statistically significant and consistent with results of 2015 and also that of CamCCUL for the same year.

The coefficient of capital adequacy ratio (CAR) is negative in the financial inefficiency model but positive in the social inefficiency model which implies that there is a positive effect of capitalisation on financial efficiency of $MC^2$ network in 2016 whereas the effect is negative on social efficiency. However, both coefficients are not significant. Unlike capitalisation, risk coverage ratio (RISK) was found to exert a negative but insignificant effect on the financial efficiency of $MC^2$ network in 2016 while the effect is positive and yet statistically insignificant on the social efficiency.

Contrary to expectation, higher liquidity ratio (LIQUIDITY) has a positive effect on both the financial and social inefficiency of the network. In other words, increased liquidity reduces the financial and social efficiency of the $MC^2$ network in 2016. Again, both coefficients are statistically insignificant. Similarly, fixed assets coverage ratio (FACR) was also found to influence financial and social efficiency of the $MC^2$ network in 2016 negatively. But only the coefficient of FACR in the financial model was recorded to be statistically significant at 10% level. Finally, external funding coefficient (EFC) and subventions (SUB) exert a positive effect on financial efficiency while the effect on social efficiency is negative. However, none of these variables are found to be statistically significant.

**Table 13.** Determinants of efficiency of MC² 2016.

| VARIABLES | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Financial inefficiency | P > \|t\| | Social inefficiency | P > \|t\| |
| size | 3.984* | 0.078 | 5.897** | 0.048 |
| | (2.189) | | (2.872) | |
| size² | −0.101* | 0.071 | −0.146** | 0.048 |
| | (0.0539) | | (0.0706) | |
| car | −0.270 | 0.872 | 1.734 | 0.375 |
| | (1.659) | | (1.927) | |
| risk | 0.237 | 0.858 | −0.504 | 0.733 |
| | (1.308) | | (1.462) | |
| liquidity | 0.00202 | 0.161 | 0.00196 | 0.249 |
| | (0.00141) | | (0.00167) | |
| facr | 0.0239* | 0.095 | 0.0153 | 0.332 |
| | (0.0139) | | (0.0156) | |
| efc | −0.0238 | 0.256 | 0.00143 | 0.950 |
| | (0.0206) | | (0.0225) | |
| sub | −0.0706 | 0.458 | 0.0580 | 0.579 |
| | (0.0940) | | (0.104) | |
| Constant | −39.17* | 0.088 | −59.81** | 0.049 |
| | (22.24) | | (29.21) | |
| sigma | 0.216*** | | 0.233*** | |
| | (0.0334) | | (0.0400) | |
| **Observations** | **40** | | **40** | |

Note: Standard errors in parentheses; ***p < 0.01, **p < 0.05, *p < 0.1. Source: Computed by the author.

### 4.5. Comparative Analysis of Efficiency Scores of CamCCUL and MC²

Recall that the intermediation approach was used to generate the efficiency scores since the study do not consider MFIs like any other production unit (production approach) which primary role is to achieve profit, but the study views MFIs like financial intermediaries which collect savings from individual with excess liquidity in order to lend them out to those in need of liquidity. In addition, it should be noted that the output oriented DEA was used in computing the efficiency scores. Table 14 provides a summary of CamCCUL and MC² average efficiency scores (financial and social) for the year 2015. The scores include the constant return to scale technical efficiency (CRSTE), variable return to scale technical efficiency (VRSTE) and the scale efficiency (SCALE) which is the ratio of CRSTE/VRSTE.

Results from Table 14 show that the average financial efficiency scores of

Cameroon Cooperative Credit Union league (CamCCUL) are consistently higher than those of Mutuelle Communautaire de Croissance ($MC^2$). Difference between the constant return to scale technical efficiency (CRSTE) and the variable return to scale technical efficiency (VRSTE) indicates that most of the MFIs operate at variable return to scale. Also, the CamCCUL network is averagely more scale efficient than the $MC^2$ network. Unlike the financial efficiency, the CamCCUL network is less efficient socially than the $MC^2$ network given that all the scores of social technical efficiency for $MC^2$ exceed those of CamCCUL.

Furthermore, 7 MFIs affiliated to CamCCUL were found to be financially efficient in the short run while 12 MFIs were financially efficient in the long run (operate at their optimal level) while 8 MFIs affiliated to $MC^2$ were found to be financially efficient in the short run ans 9 MFIs were financially efficient in the long run. In a nutshell, 19 MFIs affiliated to CamCCUL were technically and financially efficient in 2015 as against 17 MFIs for $MC^2$ in the same year. As per social efficiency, 18 MFIs of the CamCCUL network were socially efficient while 21 MFIs affiliated to $MC^2$ were social efficient.

Table 15 shows results from the 2016 data analysis from both networks which indicates that, once again, on average the CamCCUL network was more efficient financially than the $MC^2$ network as the average constant return to scale technical efficiency (CRSTE), the variable return to scale technical efficiency (VRSTE) and scale efficiency (SCALE) of the CamCCUL network has consistently and respectively exceeded the efficiency scores of $MC^2$ network.

On the contrary, the $MC^2$ network was more socially efficient than the CamCCUL network given that the technical efficiency scores of the former exceeds that of the later in all aspects (CRSTE, VRSTE and SCALE). This result suggests that there is possibility of trade-off between financial and social performance in the two networks since the more financially efficient network is the less socially efficient.

Table 14. Comparative efficiency scores for 2015.

| | Financial efficiency | | | Social efficiency | | |
|---|---|---|---|---|---|---|
| | CRSTE | VRSTE | SCALE | CRSTE | VRSTE | SCALE |
| CamCCUL | 0.837 | 0.880 | 0.953 | 0.798 | 0.847 | 0.938 |
| $MC^2$ | 0.778 | 0.849 | 0.920 | 0.875 | 0.895 | 0.975 |

Source: Computed by the author.

Table 15. Comparative efficiency scores for 2016.

| | Financial efficiency | | | Social efficiency | | |
|---|---|---|---|---|---|---|
| | CRSTE | VRSTE | SCALE | CRSTE | VRSTE | SCALE |
| CamCCUL | 0.892 | 0.931 | 0.959 | 0.681 | 0.714 | 0.959 |
| $MC^2$ | 0.753 | 0.831 | 0.911 | 0.855 | 0.866 | 0.987 |

Source: Computed by the author.

### 4.6. Summary of Findings

From Table 16, we can realise that the MicroFinance Institutes that are affiliated to CamCCUL are performing better in terms of financial performance than those affiliated to MC². On the other hand, we realise that the MicroFinance Institutes affiliated to MC² are performing better in terms of social Performance than those affiliated to CamCCUL.

Verifying the hypothesis partially, we can draw inspiration from the discussion of findings and from Table 17, we realised that in the CamCCUL network, out of 40MFIs, there is trade-off between FP and SP in 30MFIs and Mutuality in 10 during the year 2015 and in 2016 the number of trade off increased to 33. On the other hand, we realised that in the MC² network, there is trade off n 28 MFIs whereas there is mutuality in 12 during the period of 2015 and also the number of trade-off increased to 31 in 2016.

From all this analysis, we say that on an average base, both networks are not efficient and averagely, there is trade off in both network however, those affiliated to MC² are socially performing that CamCCUL and on the other hand those affiliated to CamCCUL are financially performing than MC². This is due to the differences in their size, location, capital, policy, management style, etc.

## 5. Limitation and Recommendations

#### 1) LIMITATION

First of all, we have faced several problems at the level of data collection. Indeed

Table 16. Summary of results on both networks.

| NETWORK | YEAR | No. of MFIs that are Financial efficiency | | | No. of MFIs that are Social efficiency | | |
|---|---|---|---|---|---|---|---|
| | | CRSTE | VRSTE | SCALE | CRSTE | VRSTE | SCALE |
| **CamCCUL** | 2015 | 12 | 19 | 13 | 16 | 18 | 16 |
| **MC²** | 2015 | 9 | 17 | 9 | 19 | 21 | 19 |
| **CamCCUL** | 2016 | 17 | 22 | 17 | 10 | 14 | 11 |
| **MC²** | 2016 | 7 | 15 | 9 | 17 | 19 | 17 |

Source: Author.

Table 17. Trade off and mutuality compared.

| | Trade off | MUTUALITY |
|---|---|---|
| **2015** | | |
| CamCCUL | 30 | 10 |
| MC² | 28 | 12 |
| **2016** | | |
| CamCCUL | 33 | 7 |
| MC² | 31 | 9 |

Source: Author.

social and financial data concerning Cameroon's Microfinance institutes are very limited. However the existing data are difficult to access and sometimes there are not available and classified as confidential especially those affiliated to CamCCUL.

In addition, the DEA approach we used in this research work is a relatively new technique in measuring the FP and SP of MFIs which have been used by just some few authors in Cameroon. So not being an economist, it was very difficult for us to find someone who could analyse the data and it was also very costly.

We would have love to carry out this finding over a period of five years to really see the impact of social performance on financial performance of MFIs affiliated to CamCCUL and $MC^2$ but the lack of data over several periods made us to work just for the period of two years, made it impossible timing analysis that would allow us to better appreciate the impact of financial performance on the degree of social significance and vice versa.

### 2) RECOMMENDATIONS

#### a) FOR IMPROVEMENT

Firstly, we suggest the implementation a national regulation taking into account national and local realities. The microfinance regulatory framework was merely a transposition of banks regulatory framework to the microfinance sector with some little adaptation. The fact that it is designed at regional level does not account for the national and local environment especially for the rural institutions.

Secondly, the creation of a rating agency in order to evaluate and publish the performance of MFIs so that problems will be detected at early stage and tackled in order to avoid crisis in the sector. This is because most Microfinance are not being evaluated by expert and so the reality on ground is never reflected and so we find MFIs which are being created today and in few years' time they die up because of poor performance. So if a rating agency is put in place comprising of experts, after their evaluation, a holistic view of the various MFIs will be pictured and after the rating is done, those performing poorly can do a sector benchmarking and copy from exemplary MFIs to improve their practices before the situation gets out of hand.

Thirdly the provision of support either financially or in kind (water, electricity, telephone, building…) especially to rural microfinance whose operational costs are usually higher than those of their urban counterparts due to the lack of some basic infrastructure.

Finally, both the government authorities and microfinance stakeholders should sensitize the population especially those of the northern part of the country on the importance of microfinance as a whole and micro saving in particular.

#### b) FOR FUTHER STUDIES

The present research work has covered a just a sample size of 40 MFIs both from CamCCUL and $MC^2$ in Cameroon during the period of 2015-2016. The future research can be carried out on a more comprehensive sample in terms of

MFIs and time span.

Other method of DEA should be used and also in combination with different approach other than Tobit to find out if the results will turn out to be the same or not.

Some factors like technological advancement as telecommunication networks, electricity, infrastructures, and ATMs are not incorporated in this research whereas all these aspect also have a role to play as far as the performance of Micro Finance Institutions is concerned. The future research can be conducted by incorporating such factors as well.

## 6. Significance and Main Contribution of the Research

This study titled "Efficiency of Microfinance Institutes in Cameroon, a comparative analysis of MFIs affiliated to CamCCUL and $MC^2$ using the Data Envelopment Analysis (DEA) approach and the Tobit Censored Model".

This study which is integrating social performance and financial performance will help provide microfinance practitioners with the skills, knowledge and tools to develop financial statements and reports for meaningful analysis and monitoring, and that are in accordance with International Financial Reporting Standards.

Also it will help authors who have been writing on the topic of measuring the performance of MicroFinance Institutions but who have been neglecting the social aspect to have a more comprehensive view and to see the importance of integrating social performance before carrying out the measurement of performance of MicroFinance Institutions.

Furthermore, this work will also be important to the less privilege and the poor because integrating their aspect in the measurement of the MicroFinance Institutions' performance will make them know that they are important and form an integral part of these Institutions.

In addition, it is also going to serve as secondary data to those who wish to carry out further studies on this subject matter.

## 7. Conclusion

After due research on 40 MFIs affiliate to CamCCUL and 40 from $MC^2$ on the Financial Performance and Social Performance of these MFIs using and intermediation oriented DEA model for the period of 2015 and 2016 we can conclusively say that, there is trade-off between Financial Performance and Social performance of MFIs affiliated to CamCCUL while there is Mutuality between Financial Performance and Social Performance of MFIs affiliated to $MC^2$. This might be because of the differences in: The lending style employed by the two groups of MFI, The range of the services they offer, their size, The profit status, The ownership structure, The sources of funds, The contract design, The Organizational structure, The Client targeting policies and Management techniques.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

## References


[1] Morduch, J. (1999) The Microfinance Promise. *Journal of Economic Literature*, **32**, 1569-1614. https://doi.org/10.1257/jel.37.4.1569

[2] Navajas, S., Schreiner, M., Meyer, R.C., Gonzalez-Vega, C. and Rodriguez-Meza, J. (2000) Microcredit and the Poorest of the Poor: Theory and Evidence from Bolivia. *World Development*, **28**, 333-346. https://doi.org/10.1016/S0305-750X(99)00121-7

[3] Lapenu, C., Zeller, M., Greeley, M., Chao-Béroff, R. and Verhagen, K. (2004) Performances sociales: Une raison d'être des institutions de microfinance et pourtant encore peu mesurées. Quelques pistes. *Mondes en développement*, **32**, 57-74. https://doi.org/10.3917/med.126.0057

[4] Christen, R. and Rosenberg, R. (2000) The Rush to Regulate: Legal Frameworks for Microfinance. Occasional Paper, CGAP, Washington DC, CGAP.

[5] Cull, R., Demirgüç-Kunt, A. and Morduch, J. (2007) Financial Performance and Outreach: A Global Performance of Leading Microbanks. *Economic Journal*, **117**, F107-F133. https://doi.org/10.1111/j.1468-0297.2007.02017.x

[6] Nzongang, J. (2014) The Measure of Efficiency in Micro Finance Institutions: The Case of the $MC^2$ in Cameroon.

[7] Yaron, Y., Benjamin, M.D. and Charitonenko, S. (1998) Promoting Efficient Rural Financial Intermediation. *The World Bank Research Observer*, **13**, 147-170. https://doi.org/10.1093/wbro/13.2.147

[8] Piot-Lepetit, I. and Nzongang, J. (2018) Performance Assessment and Definition of Improvements Paths for Microfinance Institution: An Application to a Network of Village Banks in Cameroon. *International Transactions in Operational Research*, **26**, 1188-1210. https://doi.org/10.1111/itor.12572

[9] Nzongang, J. (2011) The Measure of Performance of Micro Finance Establishments in Cameroon: A Combined Application of DEA and Multicriteria in the Case of $MC^2$ Networks.

[10] Nzongang, J., Piot-Lepetit, I. and Kamdem, D. (2013) The Measure of Financial and Social Efficiency of Micro Finance Institutions Affiliated to the $MC^2$ Network in Cameroon.

[11] Charnes, A., Cooper, W.W. and Rhodes, E. (1978) Measuring the Efficiency of Decision Making Units. *European Journal of Operational Research*, **3**, 429-444. https://doi.org/10.1016/0377-2217(78)90138-8

[12] Charnes, A., Cooper, W.W. and Rhodes, E. (1981) Evaluating Program and Managerial Efficiency: An Application of DEA to Program Follow Through. *Management Science*, **27**, 668-697. https://doi.org/10.1287/mnsc.27.6.668

[13] Lafourcade, A.L., Isern, J., Mwangi, P. and Brown, M. (2005) Overview of the Outreach and Financial Performance of Microfinance Institutions in Africa. http://www.mixmarket.org

[14] Tobin, J. (1958) Estimation of Relationship for Dependent Variables. *Econometrica*, **26**, 24-36. https://doi.org/10.2307/1907382

[15] Kablan, S. (2012) Efficiency of MicroFinance Institutions in UEMOA: An Outreach and Financial Intermediation Approach.