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# Empirical Analysis of Efficiency of Community Banks in Tanzania

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**Abstract**

Efficient utilization of resources is critical for effective performance of banks. This paper measured efficiency of community banks in Tanzania and compares performance between two community banks' categories during 2002-2014. Efficiency was estimated using Data Envelopment Analysis (DEA) approach while the independent samples t-test was applied on means of efficiency to compare performance between the banks' categories. The paper establishes that, most community banks were inefficient, suggesting that there was effect of unnecessary additional costs on the banks performance. Despite the general poor performance, community banks in Tanzania were generally operating at a decreasing part of the average cost curve, which granted an opportunity for expansion and exploitation of scale economies. The paper further establishes that efficiency of respective categories of community banks did not differ significantly; implying that the bank type did not matter as regards efficiency issue. The policy implications are; community banks should effectively manage their cost structure in order to improve performance, and a separate regulatory framework should be applied to community banks to take care of their uniqueness.

**Keywords:** community banks, bank efficiency, data envelopment analysis

## 1. Introduction

Efficiency in the resource use is critical for bank's successful performance in terms of service value to customers, sustainability, and economic growth (Gwahula, 2013; Kumar & Gulati, 2008; Aikaeli, 2006; Maudos & Pastor, 2001). While massive efficiency studies have been carried out in the traditional commercial banks, little is known about efficiency of Community Banks (CBs), given that these banks focus their services to low income communities and bear unique characteristics that set them apart. Moreover, the literature lacks information on comparative analysis of efficiency between categories existing in the community banking sub-sector. This paper therefore measured efficiency of CBs in Tanzania and compared efficiency levels between the community banks categories.

Efficient banks enhance efficacy of the intermediation process and promotes economic growth (Olawepo & Ariyo, 2011; Aikaeli, 2008). Empirical evidence attest that provision of efficient financial services in low income communities leads to improvement of household welfare and facilitates development of small and micro-enterprises (Ledgerwood, 2013; Berger et al., 2004). Efficient financial intermediation services do also facilitate better financial access and reduce income gaps in low income communities. For communities which are financially excluded, efficient and regulated banking services help to meet the increasing financial services demand, which in turn fosters economic growth (Ledgerwood, 2013; Berger et al., 2004).

Over the past five decades, the demand for financial services in low income working communities has been significantly high (Ledgerwood, 2013; Robinson, 2001). According to World Bank (2014), about 2.5 billion working-age adults, who were more than half of the total adult world population in 2011 had no access to financial services delivered by regulated financial institutions. Although the number improved to 2.0 billion by 2014, it was still significantly high as it accounted for about 38% of the world's adults. Such a considerable demand for financial services has raised necessity for efficiency in the provision of financial services to low income households (World Bank, 2014; Ledgerwood, 2013).

Parallel to these developments, CBs all over the world have demonstrated their capabilities in providing appropriate regulated banking services to low income communities (Olawepo & Ariyo, 2011; Berger et al., 2004).

As grassroots level financial intermediaries, CBs promote financial inclusion, which is a essential condition for economic development and poverty reduction (Qin & Ndiege, 2013). Despite the fact that CBs focus on a similar clientele, CBs have been defined differently in different countries. The Financial Dictionary defines a community bank as an independent, locally-owned bank (having no national presence) operating exclusively in, and deriving its funds from the community in which it is based. In Tanzania, CBs appeared for the first time during the financial sector reforms which started in 1991after the enactment of the Banking and Financial Institutions Act (URT, 1991). The Banking and Financial Institutions (Capital Adequacy) Regulations 2014 defines a community bank as a financial institution serving a defined geographical area and whose primary activities are restricted to acceptance of deposits, lending and such other activities as may be specified by the Bank of Tanzania (BOT, 2014).

Two major types or categories of CBs (Note 1), based on ownership status, have evolved in Tanzania, and they include Co-operative Community Banks (CCBs) and Non-Co-operative Community Banks (NCCBs). These are the two categories of CBs in the country. Both categories are poverty focused; apart from financial objective, to intrinsically provide social intermediation/interaction services. The kind of social intermediation services provided to clients include financial literacy training, business counselling, networking, and groups formation (Lalika, 2006). Such kind of development-focused services help in elevating the poor to a level where they can confidently manage their own micro-enterprises and finally accessing fully fledged financial services in the mainstream financial system (Owusu-Frimpong, 2008; Lalika, 2006).

In order for CBs to serve low income communities while operating competitively in the current banking environment, they have to employ their resources more efficiently. Furthermore, efficiency is more critical for small banks since they have less financial and human resources than traditional large commercial banks (Li & MacMahan, 2015; Hays et al., 2009). Despite the importance of efficiency in CBs, little effort has been devoted to investigate CBs efficiency. This paper measures performance of community banks in Tanzania in terms of efficiency and compares performance between community banks' categories. Understanding efficiency status of CBs in the wake of financial sector reforms is paramount to prediction of their long term survival. Due to data limitations, however, this study is focused on efficiency based on the CBs financial objective of only.

While massive efficiency studies have been carried out in the traditional commercial banks, there is no evidence that the unique characteristics of CBs, as provided in Section 2, were taken into account (see, for instance, Sanchez et al., 2013; Ohene Asare, 2011; Musonda, 2008; Aikaeli, 2008; Berger, 2007; Aikaeli, 2006). Moreover, the literature lacks information on the general efficiency performance based on various CBs categories, i.e. there is a gap as regards comparative analysis of efficiency performance between the two CBs categories. The purpose of this paper is to establish efficiency status of CBs in Tanzania and compare performance between the CBs categories.

The specific objectives of the paper were: (a) to measure efficiency performance of CBs in a multiple inputs-output framework; and (b) to compare efficiency status between categories of CBs in Tanzania. The study was guided by the following research questions: (i) are the CBs in Tanzania operating efficiently given their cost and technical efficiency frontier? (ii) what has been the trend of efficiency of CBs since 2002 when a number of CBs started operating in Tanzania? (iii) What has been a major source of X-inefficiency in CBs? That is, either technical or allocative inefficiency. To compare efficiency between community bank categories, the following null hypothesis was developed: the efficiency levels of Cooperative Community Banks (CCBs) and Non-Cooperative Community Banks (NCCBs) do not differ.

The rest of the paper is organized as follows: the next Section 2 provides a brief account of the emergency and unique features of community banks, Section 3 presents theoretical and empirical background of the study and Section 4 underscores the adopted methodology. Empirical results are presented and discussed in Section 5, while Section 6 makes conclusions and policy implications.

## 2. Emergency and Distinctiveness of Community Banks

According to Grigorian and Manole (2006) the objectives of any bank management are generally two, namely profit generation (which combines profit maximization and risk management) and customer service provision (which combines the features of development service provision, intermediation and utility provision). While all banks may strive for these two goals, the degree of importance they attach to each goal differs among banks and across various categories of the bank (Bergendhal & Lindblom, 2008; Grigorian & Manole, 2006). In general, poverty-focused banks, by the very nature of their clients, tend to underline the development services before allowing their clients to access financial services (Ajagbe et al., 2007; Hein et al., 2005). Consistent with the development focus, the two strands of literature have emerged attempting to expound theoretical evolution of community banks in the financial system. One strand attributes the emergency of CBs to lack of reliable and flexible banking services for the informationally-opaque low income clients (Berger et al., 2014; Berger et al., 2004; Keeton & Holloway, 2000). Therefore, CBs have emerged to fill this gap by providing development with flexible regulated banking services to this group of clients. The other strand accounts for the emergency of CBs on the quest for reliable and permanent financial services that would facilitate the realization of local economic pride (Lalika, 2006; Hein et al., 2005). This perspective corresponds with the view that CBs symbolize patriotic interests and stand as icons of the indigenous people's efforts for financial independence to curb capital flight. In either perspective, emergency of CBs underpins the poor people's initiatives for development and growth which, according to Olawepo and Ariyo (2011) and Lalika (2006) should be encouraged through supportive and affirmative government policies.

Olawepo and Ariyo (2011) argue that CBs are better suited to deal with development financing in poor communities through financial and social intermediation services functions they provide, among which include: (i) provision of regulated financial services such as micro savings, micro credit and micro investment in rural based industries; (ii) employing community members in capacity building within the grassroots rural communities; (iii) being involved in local development programmes such self-help projects within the rural environment; (iv) provision of opportunity for the majority of members of the local communities to own the larger portion of the bank share capital; and (v) helping the communities in performing banking and non-banking functions that can promote low level development within and outside the communities. Through these functions, CBs develop expertise and gain specialized knowledge to serve their low income customers.

Because of the nature and focus, CBs tend to make financing decisions based on local knowledge and non-standardized data obtained through long-term relationships with clients; so they are considered to be "relationship" lenders as opposed to "transactional" lending practiced by the most Traditional Commercial Banks (TCBS) (Berger et al., 2014; Berger & Udell, 2006). The relationship approach to lending is particularly important to small borrowers and micro-enterprises in low income countries as these clients cannot raise equity or debt financing from public offering in stock markets (Berger et al., 2004). CBs can develop these close relationships with customers because they are small in size and tend to conduct business locally (FDIC, 2012). Because of their perspective, they may be thought to be more oriented to safeguarding local interests than traditional commercial banks. They do focus on maximizing customer value even though they have to generate profit as well in order to grow and become sustainable (Filbeck et al., 2010; Lalika, 2006; Hein et al., 2005). Because of their special focus, CBs have emerged nearly all over the world along with the other large banks to cater for the regulated financial needs of the financially excluded people. They are mostly found in Malaysia, Argentina, Barbados, and in some African countries including Ghana, Nigeria and Tanzania. In many countries, CBs form a significant part of the banking system and are considered to be a tool for economic and social development in low income communities (Olawepo & Ariyo, 2011).

## 3. Theoretical and Empirical Background

### *3.1 Efficiency Conceptual Framework*

At its basic level, the efficiency concept is rooted in neoclassical microeconomic theory, which focuses on resource allocation and utilization (Musonda, 2008; Mokhtar et al., 2006). Efficiency advocates non-wastage of resources by emphasizing cost reduction while producing the maximum possible level of output for a given level of inputs given the technology. According to Mas-Colell et al. (1995) cited in Aikaeli (2006), a production vector $y \in Y$ is efficient if there is no $y' \in Y$ such that $y' \geq y$ and $y' \neq y$. This concept means a production vector y is efficient if there is no other feasible production vector y' that generates as much output as y using no additional inputs. In the process of transforming inputs into some valuable outputs, a change that increases value is an efficient change and any change that decreases value is an inefficient change.

Similarly, the concept of efficiency tends to draw attention of various stakeholders with each group having a specific perspective (Kumar & Gulati, 2008). From the bank shareholders' point of view, an efficient bank ensures better returns through effective use of available resources and cost-minimization. From the bank management's perspective, an efficient bank has more ability to compete, and therefore enhance capacity to maintain and expand its market share, which in turn will ensure long term profitability, sustainability and job security. From the standpoint of the clients, only efficient banks can meet their demands by offering better services in terms of required quantity and quality, better prices and good customer services. From the regulators' view, efficient banks are linked to higher economic performance and economic growth (Gwahula, 2013; Aikaeli, 2008). On the contrary, inefficient banks have higher probability of failure, which endangers the whole financial system performance due to possible systemic effects (Podpiera & Weill, 2008). Consistent with the multiple interests attached to efficiency, the efficiency concept carries various meanings depending on the perspective in which it is perceived (Aikaeli, 2008). Various efficiency measures which are applied in this paper include: (i) technical efficiency, which relates to productivity of inputs and refers to the ability of a bank to maximize outputs from a given set of inputs (or minimize inputs for a given set of outputs) as compared to its maximum potential); (ii) allocative efficiency, which involves the selection of inputs mix that allocates factors to their highest use value at a minimum cost; (iii) scale efficiency, which refers to relationship between the level of output, bank size and the average cost; and (iv) operational efficiency, a wide concept, sometimes referred to as X-efficiency, which measures deviation from the cost efficient frontier that represents the maximum attainable output for the given level of inputs. Opposed to X-efficiency is X-inefficiency that occurs when a bank does not have incentive to cut costs. For example, a bank which is sure to be bailed out from losses may have no incentive to reduce excessive labour. Another efficiency concept, cost efficiency, measures how close the bank’s cost is to what the best practice bank’s cost would be to produce the same output bundle under the same conditions or technology. Overall, cost efficiency can be presented as a product of technical efficiency and allocative efficiency.

Farrell (1957) who relatively made an earlier analysis of efficiency decomposes cost efficiency into two components, namely, technical and allocative efficiency. Technical efficiency (TE) relates to the productivity of inputs and refers to the ability of a bank to maximize outputs from a given set of inputs as compared to its maximum potential as represented by its Production Possibility Frontier (PPF). Allocative Efficiency (AE) relates to firm’s ability to utilize inputs in optimal proportions given their respective prices. An alternative to economic efficiency is Cost Efficiency (CE). The relationship between CE, TE and AE is expressed as: CE=TE * AE; which implies that, AE=CE/TE. A measure of TE under assumption of constant returns to scale (CRS) is known as an overall technical efficiency or TeCRS. A bank operates under CRS if an increase in inputs results in a proportionate increase in output levels. If the input values for a unit are doubled, then the bank operating under CRS assumptions must produce twice as much output.

Under Data Envelopment Analysis (DEA), as one of the frontier techniques to estimate efficiency and which is discussed in section 3.4 and 3.5 (methodology part), the TeCRS is decomposed into two mutually exclusive components: Pure Technical Efficiency (PTE) and Scale Efficiency (SE). SE is concerned with the relationship between the levels of output against size of operation. A bank is said to be scale efficient when its size of operations is optimal so that any modification on its size will render the bank less efficient. The decomposition of TeCRS into PTE and SE facilitates a closer look into the sources of inefficiencies. The PTE measure is obtained by estimating the efficient frontier under the assumption of Variable Returns to Scale (VRS). It is a measure of technical efficiency without scale efficiency and it purely reflects the managerial performance to organize the inputs in the production process (Kumar & Gulati, 2008). It relates to management’s ability to avoid wastes by generating as much outputs as input usage allows or by using as little inputs as output production allows. PTE is also known as VRS technical efficiency (TeVRS). A bank is said to operate under Variable Returns to Scale (VRS) if a proportionate increase in all its inputs results in greater or less than the proportionate increase in its outputs. The PTE measure or TeVRS is obtained as a ratio of CRS technical efficiency (TeCRS) to SE, i.e. since TeCRS = TeVRS * SE, it implies that, SE = TeCRS/TeVRS. Therefore, to calculate SE we estimate TeCRS and TeVRS upon the same data. The TeVRS are always higher or equal to TeCRS and the difference between TeVRS and TeCRS is scale inefficiency (SIE).

*3.2 X-Efficiency and Agency Theories of the Firm*

The X-efficiency theory originated from a series of Leibenstein’s papers of 1966, 1975, 1977, and 1978. X-efficiency describes the general efficiency of a firm in transforming inputs into outputs. Leibenstein (1966) identifies two possible sources of inefficiency. One is a divergence between price and marginal cost, named allocative inefficiency. This divergence may be caused by monopoly, taxes, regulations and other impediments to competitive output rates. Another type labelled X-inefficiency is the one which stems from the failure of firms to achieve the lowest possible cost functions for producing their goods, and this can account for wasted resources. Leibenstein (1966) showed that inefficiency deriving from X-inefficiency is significant in comparison to inefficiencies deriving from allocative inefficiency.

The degree of X-inefficiency is primarily determined by the level of effort of individuals within the firm. The problem of principal–agent relationships is an important source of X-inefficiency. Due to the feature of incomplete contingent contracts between principals and agents, agents can evade the consequences of cost overruns and have no motivation to keep costs down. In order to monitor the behaviour of the agent, the principal has to spend additional money, known as agency costs. Overall, the principal-agent problem reduces the firm’s profit and induces inefficiency in the firm. The extent to which the agents’ behaviour may encroach on the principal's interest depends on the amount of stake in jeopardy (Gorton & Schmid, 1999). High stake principals will increase monitoring effort to deter agents from causing losses while low stake and free-riding principals will not monitor effectively, hence suffer more losses by the agents (Gorton & Schmid, 1999). Following this, NCCBs are expected to exhibit higher efficiency performance than their CCBs counterparts.

As noted earlier, CBs in Tanzania appear in two categories, namely Cooperative Community Banks and Non-Cooperative Community Banks. The kind of ownership and governance mechanisms between the two categories differ, which reflects the extent of insurable interest exhibited by the owners. Accordingly, effective monitoring from the high-stake equity shareholders in NCCBs should significantly reduce X- inefficiency (Gortons & Schmid, 1999). On the contrary, low stake equity shareholding in CCBs associated with more dispersed equity ownership leads to greater incentives for the owners to free ride on each other's efforts in monitoring the agents, leading to lower efficiency performance (Gorton & Schmid, 1999). Using the frameworks of X –efficiency and the principal-agent relationship, this study analysed key sources of inefficiency and made comparison of efficiency performance between CBs categories in Tanzania. While X-inefficiency theory posits that the key source of inefficiency is non-maximizing behaviour of managers, this study sought to confirm whether empirical results in CBs are consistent with X-inefficiency theory.

*3.3 Empirical Background*

The recurring bank crises that have ruined the national and international banking systems in history, have necessitated the increased research in bank efficiency studies. On the other hand, globalization of the financial markets and the growing competitions in the banking sector, especially in the low-income countries, has posed ever increasing challenges that calls for researches on efficiency of banks (Sanchez et al., 2013; Ohene-Asare, 2011; Siudek, 2008). The general conclusion from the bank efficiency studies indicates that significant inefficiencies exist in banks and there are still rooms for efficiency improvement. Berger et al. (1993) when doing earlier generation of bank studies of US banks argue that X-inefficiency constitutes 20% or more of bank costs. Despite the numerous bank studies in developed countries, only a handful studies have been done in developing countries, and particularly in traditional commercial banks. Efficiency studies for community banks are lacking (see Ohene-Asare, 2011; Berger & Humphrey, 1997; Berger et al., 1993), and so this study intends to make contribution in this area.

Pasiouras et al. (2007) examined cost, technical and allocative efficiency in Greek cooperative banks using DEA and established that the bank size had an impact on all measures of efficiency, but the impact of capitalization depended on the efficiency measure. They also found that the source of inefficiency was allocative rather than technical. The current study similarly applies DEA to provide insights on Tanzanian CBs efficiency status as one of the specific country cases.

Ayadi and Hyman (2006) assessed the performance of 10 Nigerian banks using DEA and established that poor bank management (technical inefficiency) was the source of inefficiency. Hauner and Peiris (2004) studying 14 Ugandan commercial banks analysed the effect of financial sector reforms on competition and efficiency for the period 1999-2004. Using DEA to measure efficiency, Panzar and Rosse's (1987) modelled competition among banks, and they ascertained that the level of competition had increased significantly, and it had been associated with a rise in efficiency. Further findings indicated that, on average, larger banks and foreign-owned banks had become more efficient, while smaller banks were less efficient in the face of increased competitive pressure. These studies focused on commercial banks without special attention to CBs. However, it is imperative for a developing economy with CBs to undertake efficiency studies for this category of banks as they are significant part of their financial sector.

Kamau (2011) measured efficiency and productivity in the Kenyan banking sector during 1997-09. Applying DEA and using data from 40 commercial banks, found that the average technical efficiency was 47% and 56% under constant return to scale and variable return to scale, respectively, while scale efficiency was 84%. Mensi and Zouari (2010) investigated a sample of 10 Tunisian commercial banks using DEA and estimated efficiency measures under technical efficiency, scale efficiency and allocative efficiency. The study revealed that among other things, Tunisian banks were efficient at 67%. By decomposing the total efficiency, they found that inefficiency resided mainly in allocative efficiency.

Aikaeli (2008) studied efficiency of commercial banks in Tanzania for 1998-2004 period. He employed DEA estimation of technical and scale efficiency, while X-inefficiency was estimated using a multi-product translog cost function. Aikaeli established that commercial banks operated on the decreasing part of their average cost curves, which gave them a room to expand with increasing returns to scale. Despite the contribution made by this study on commercial banks in Tanzania, the aspect of CBs was not taken into consideration specifically, and thus leaving an important gap to be bridged by this study.

Efficiency studies have also been extended to microfinance institutions. Magali and Dickson (2013) employed DEA approach to assess the technical efficiency of rural Savings and Credit Cooperative Societies (SACCOS) in various regions of Tanzania. The study found that technical efficiency varied across regions and ranged between 46% to 62%. They also noted that high costs of operations for rural SACCOS attributed to low efficiency. Similarly, Kipesha (2012) estimated efficiency of a sample of 35 Microfinance institutions operating in East Africa using DEA production approach under both constant and variable returns to scale in three years from 2009 to 2011. The results showed that, MFIs in East Africa had modest efficiency scores on average. The findings also show generally that banks and non-bank depositing taking financial institutions were relatively more efficient compared to financial Non-Governmental Organisations (NGOs) and cooperatives while the country efficiency averages showed that, Kenya and Rwanda had higher average efficiency scores under constant returns to scale while Tanzania and Uganda had higher average efficiency scores under variable returns to scale. This is a good initiative to look at microfinance efficiency as a specific category of financial institutions that is increasingly becoming prominent at the present. It should be noted that microfinance institutions often operate as competitors to CBs at the local environment of the community. In view of this, the level of efficiency may have an important bearing on growth of CBs versus microfinance institutions, which are much costlier in terms of interest they charge and lack mandate to collect deposits from the public as opposed to CBs.

From the foregoing discussion it is evident that most efficiency studies have concentrated on traditional commercial banks, and a few studies on microfinance institutions. Our study attempts to extend banks' efficiency literature by making the efficiency studies more specific as regards the singular banks categories, and hence to avoid too general analyses and conclusions on banks efficiency.

## 4. Methodology

### *4.1 Research Design, Data and Sampling*

For a study like this which addresses dynamic changes such as bank efficiency, panel data have the priority of addressing research questions/hypothesis (Hsiao, F. & Hsiao, M., 2006). Nevertheless, to exploit the advantages of both quantitative and qualitative analyses, the study makes use of the mixed research design. In our research design, efficiency findings are generated through quantitative analysis and validated by applying the qualitative data from selected key informants at the respective CBs. This analytical approach enhances the robustness of research findings by providing a more complete picture of the research phenomenon (Wachira, 2015; Kaleshu, 2013).

The study covers 2002-2014. The period from year 2002 onwards was chosen to capture the effects of the first and second financial (banking) reforms in the country. This was also the period when a significant number of Community Banks (CBs) started to feature prominently in response to the financial reforms in Tanzania. Secondary quantitative data were a key source of information, and were accessed from the Bank of Tanzania and from audited accounts in the respective CBs, which provides good evidence of data reliability given that these sources are reputable. The other source was primary data gathered from key informants at BOT and CBs using survey instruments. Since banks that have been in the industry for less than five years are considered inappropriate for gauging their general performance (Richard, 2010), the study applied purposeful sampling in selecting the included CBs. Accordingly, only CBs that existed by 2010 were included in the sample. The sample therefore consisted of an unbalanced panel of 9 CBs during 2002-2014, with a total of 92 panel observations for years of the study (Note 2). With more than 90% of observations having been included in the sample, the findings are considered quite representative of CBs of Tanzania.

### *4.2 Choice of Inputs and Outputs of Banks' Production Function*

The choice of inputs and outputs for analysis of banks production has to reflect the objective of banks and availability of data (Bergendahl, 1998). Because banks use multiple inputs and generate multiple outputs and have varying focus in terms of objectives, there has been a long–standing debate on the appropriate type of input–out variables to analyse efficiency of banks (Ohene-Asare, 2011; Bergendhal & Lindblom, 2006). In the literature there are different ways of modelling bank inputs-outputs relationship for efficiency estimation. The commonly used methods are two, namely, production and intermediation approaches (Ohene-Asare, 2011; Berger & Humphrey, 1992).

The production approach views a bank as generating multitude of services to customers. The diverse services generated (i.e. outputs) include deposit accounts, loans and other services. Banks use physical capital, labour, materials and floor space to generate these services (Ohere-Asare, 2011; Mester, 1987). Consequently, the bank inputs in this approach are personnel expenses (salaries, medical expenses, and pension expenses), depreciation and other operating expenses but excluding interest expenses incurred on deposits. This approach treats deposits as an output. Intermediation approach considers banks as agents that receive funds from the net savers and channel them to net borrowers by using inputs such as labour and physical capital. The inputs are used to convert deposits and other funds into assets such as loans and investments. Contrary to the production approach, deposits are treated as an input and both non-interest and interest expenses combine to form the total input cost of the bank (Ferrier & Lovell, 1990). Hughes and Mester (1993) in an attempt to resolve the controversy on whether deposits were inputs or output, showed by calculus on a translog cost function that deposits are an input in the bank production process. Consequently, this study takes deposits as input and applies intermediation approach as a method of banks production. The intermediation approach is appropriate for most CBs in Tanzania as they collect deposits (savings) from clients and transform those deposits into loans and investments (Aikaeli, 2006). Moreover, this method is more commonly used in banking efficiency studies (Sanchez et al., 2013; Ferrier & Lovell, 1990). To measure cost, technical and scale efficiency, inputs and outputs for Profit DEA are specified in Table 1.

Table 1. Specification of inputs and outputs for profit-based DEA

| **Inputs** | **Outputs** |
|---|---|
| Deposits | Loans |
| Number of employees | Investments |
| Non-financial long term assets (NFLA) | |

Source: Constructed by authors based on literature review.

Data for analysis of bank production were gathered from balance sheets (statements of financial position) and income statements of individual banks accessed from the Bank of Tanzania, and were cross-checked with available data from the annual audited financial statements kept at the CBs. To estimate cost efficiency, annual prices of inputs vector had to be calculated. Price of deposits was calculated as total annual interest on deposits over total deposits; price of labour as total annual labour cost over total number of employees, while price of non-financial long term assets as total non-interest capital and administrative related expenses (NICARE) over total fixed assets (NFLTA) had also to be calculated.

### *4.3 Approach to Data Analysis*

The Data Envelopment Analysis (DEA) technique was employed to estimate cost, technical and scale efficiency. Three important advantages of DEA justify its use in this study: first, it makes no assumptions about the form of the production technology (or function), thus avoiding arbitrary suppositions about its frontier shape (Coelli et al., 2005); second, it is a widely used method in efficiency studies, reflecting its appropriateness; third, it works well with a small data set, which characterizes this study (Sanchez et al., 2013; Pasiouras et al., 2007). DEA is a mathematical programming approach for the development of production frontiers and the measurement of efficiency. In DEA methodology, efficiency is defined as a ratio of weighted sum of outputs to weighted sum of inputs, whereas the weights are computed by means of linear programming technique.

DEA appeared for the first time in the literature in 1978 through the work of Charnes, Cooper and Rhodes, and hence the acronym CCR version of DEA. Charnes et al. (1978) had utilized the optimization techniques of linear programming to generalize on Farrels (1957) single inputs-output technical efficiency measures to the multiple inputs-outputs frameworks. The CCR version was used for analysis of constant returns to scale problems in Decision Making Units (DMU (Note 3)). The CRS assumptions do not work properly when some market failure characteristics exist. Banker, Charnes and Cooper (1984) extended the earlier version of CCR to variable return to scale so as to accommodate market failure situations, hence the acronym BCC version of DEA.

### *4.4 DEA Model Specification*

The Constant Return to Scale (CRS) form of DEA is presented as (Charnes et al., 1978):

$$\text{Maximize} \quad h_o = \frac{\sum_{r=1}^{s} u_r y_{ro}}{\sum_{i=1}^{m} v_i x_{io}}$$

$$S.t\ \frac{\sum_{r=1}^{s} u_r y_{rj}}{\sum_{i=1}^{m} v_i x_{ij}} \le 1;\ j = 1,\dots,n \tag{1}$$

$$u_{r,} v_i \ge 0; r = 1,\dots,s; i = 1,\dots,m$$

Where $y_{rj}$ and $x_{ij}$ (all positive) are the observed amounts of outputs and inputs of the r^th type for the j^th decision making unit; and $u_r, v_i \ge 0$ are the variable weights to be determined by Linear Programming (LP) problem (Coelli *et al*, 2005). The j^th bank uses an m-dimensional input vector to produce s-dimensional output vector. In our case, $(x_{i0}, y_{i0})$ is the input-output vector of the DMU. The objective function $h_0$ attempts to maximize the ratio of virtual outputs to virtual inputs subject to constraint $0 \le h_0 \le 1$. When $h_0 < 1$, it represents some relative inefficiency; otherwise 100% efficient when $h_0 = 1$. Equation (1) tells us that the maximum level of efficiency we can get is 1. A notable problem with equation (1) is that it has an infinite number of solutions. This is avoided by introducing an additional constraint $\sum_{i=1}^{m} v_i x_{i0} = 1$. The notations ($u, v$) change to ($\mu, v$) to reflect the intended transformation. In this way, we obtain the multiplier form of LP problem:

$$\max_{\mu} Z_0 = \sum_{r=1}^{s} \mu_r y_{ro}$$

$$S.t\ \sum_{r=1}^{s} \mu_r y_{rj} - \sum_{i=1}^{m} v_i x_{ij} \le 0,\ \text{j=1,…,n} \tag{2}$$

$$\sum_{i=1}^{m} v_i x_{i0} = 1$$

$$\mu_r, v_i \ge 0'; r = 1,\dots,m$$

The equations above are known as the multiplier form of DEA linear programming problem. Using the duality property of this LP problem, the dual for $DMU_0$ can be derived:

$$\min_{\lambda} z_0 = \phi_0 \tag{3}$$

$$S.t\ \sum_{j=1}^{n} \lambda_j y_{rj} \ge y_{r0}, r = 1,\dots,s$$

$$\phi_0 x_{i0} - \sum_{j=1}^{n} \lambda_j x_{ij} \ge 0, i = 1,\dots,m$$

$$\lambda_j \ge 0, j = 1,\dots,n$$

Where $\lambda$ is N x 1 vector of constant and $\phi_i$ is the efficiency score for the i^th DMU. If $\phi_i$ is equal to 1, the DMU is located on the efficiency frontier under Constant Return to Scale (CRS) conditions as per Charnes, Cooper and Rhodes (CCR) model. The CRS assumptions under CCR model are appropriate only when all banks are operating at an optimal scale. For non-optimal situation, the Variable Return to Scale (VRS) is required. To account for the VRS in the LP, it is necessary to add a convexity condition $\lambda_j$, $\sum_{j=1}^{n} \lambda_j = 1$. The model to incorporate VRS, which is known as Banker, Charnes, and Cooper (BCC) model, is written as:

$$\min_{\lambda} z_0 = \phi_0 \tag{4}$$

$$S.t \sum_{j=1}^{n} \lambda_j y_{r0} \geq y_{r0}, r = 1,\ldots,s$$

$$\phi_0 \; x_{i0} - \sum_{j=1}^{n} \lambda_j x_{ij} \geq 0 \;\; i = 1,\ldots,m$$

$$\sum_{j=1}^{n} \lambda_j = 1$$

$$\lambda \geq 0, \; j = 1,\ldots,n$$

The BCC version of DEA differs from the CCR version in that the BCC model is able to analyse efficiency in variable returns to scale cases and does not require a DMU to be scale efficient in order to be technically efficient. Technical efficiency scores are estimated from both CCR (5) and BCC (6) to enable decomposition of efficiency score from CCR into scale efficiency and pure technical efficiency. Where there is a difference between CCR and BCC scores, it means there is scale inefficiency for a bank, and this is calculated accordingly.

We assume that Community Banks (CBs) minimize cost. The cost model can be written as:

$$\text{Min} \; \sum_{i=1}^{m} c_{i0} x_{i0}$$

$$S.t. \; x_{i0} \geq \sum_{j=1}^{n} x_{ij} \lambda_j, \;\; \text{(i=1,….,m)} \tag{5}$$

$$y_{r0} \leq \sum_{j=1}^{n} y_{rj} \lambda_j, (r = 1,\ldots,s)$$

$$\sum_{j=1}^{n} \lambda_j = 1$$

$$\lambda_j \geq 0$$

Where j=1, n are number of DMUs, i=1,…m are input volumes used by DMU j, r=1,…,s measures volume of output r; and $c_{i0}$ is the unit cost of the input I of $DMU_0$ (which is the benchmark) that can be different from one CB to another. Based on the optimal solution in (5), the cost efficiency of $DMU_0$ is defined as in Jimborean and Brack (2010),

$$CE_0 = \frac{c_0 x^*}{c_0 x_0} \tag{6}$$

Where $CE$ is the ratio of minimum cost ($c_0x^*$) to observed cost ($c_0x_0$) for the $0^{th}$ CB. Having estimated technical and cost efficiency in the same data set, allocative efficiency can be calculated as a ratio of cost efficiency to technical efficiency, thus:

$$AE = CE/TE \tag{7}$$

and scale efficiency is derived from (8),

$$CE = TeVRT * SE*AE \tag{8}$$

*4.5 Comparing Efficiency Performance between CBS Categories*

According to agency theory, high stake equity owners tend to monitor managers' "hidden actions" more effectively than low stake equity owners. Effective monitoring from the high-stake equity shareholders leads to higher efficiency performance (Jensen & Meckling, 1976). On the contrary, low stake equity shareholding associated with a more dispersed equity ownership leads to greater incentives for the owners to free ride on each other's efforts to monitor the management of the firm, leading to low efficiency (Gorton & Schmid, 1999). This means NCCBs efficiency should significantly be higher than that of CCBs. To test the difference of the two means, the independent samples t-test is applied on means of CE, TeCCR, TeVRS, SE and AE for the two groups. The t-test is appropriate for the test as the two groups are independent (unrelated) and one of the groups has less than 30 observations (Bluman, 2009).

In order to apply the test, the normality condition and the homogeneity of variances of the data are checked first. The normality condition is tested by using the Shapiro-Wilk test (Ho: Sample drawn from normally distributed population). Transformation is undertaken in order to attain an appropriate functional form when the normality test fails. The homogeneity of variance is tested by a robust-equal variance test (robvar) (Ho: samples drawn from populations of equal variances). The decision to reject the null hypothesis would be reached when calculated value > critical value (i.e. p< $\alpha$ =0.05). The t-test formulation:

$$t = \frac{(X_1 - X_2) - (\mu_1 - \mu_2)}{\sqrt{s^2 / n_1 + s^2 / n_2}} \tag{9}$$

Where: $X_1 - X_2$ represents the observed difference between sample means and where the expected value $\mu_1 - \mu_2$ equals to zero when difference between population means is hypothesized. The denominator is the standard error of the difference between means. The decision to reject the null hypothesis would be reached when p< $\alpha = 0.05$; otherwise, there is no basis for rejection.

## 5. Empirical Results and Discussions

This part presents and discusses findings as regards the objective and focus of the study. Empirical estimations and discussion of the results are accordingly done.

### *5.1 Efficiency Levels of CBs in Tanzania*

Table 2 provides summary statistics for various DEA efficiency measures. It should be noted that, for ethical and confidentiality reasons, there was no mentioning of any particular bank in this analysis. However, the general presentation and discussions provide ample analysis of the results.

Table 2. Summary statistics of various efficiency measures

| Variable | Obs | Mean | Std. Dev | Min | Max |
|---|---|---|---|---|---|
| CE | 92 | 0.355 | 0.234 2 | 0.000 2 | 1 |
| TeCRS | 92 | 0.634 | 0.211 7 | 0.002 4 | 1 |
| TeVRS | 92 | 0.698 | 0.216 4 | 0.002 5 | 1 |
| SE | 92 | 0.919 | 0.141 3 | 0.183 6 | 1 |
| AE | 92 | 0.519 | 0.228 6 | 0.002 5 | 1 |

Source: Summarized from data set.

The mean Cost Efficiency (CE) for the period was 35.5%. during the study period technical efficiency under constant returns to scale (TeCRS) was 63.4%, while technical efficiency under variable returns to scale (TeVRS) was 69.8% implying an average of 6.5% in terms of scale inefficiency. Scale Efficiency (SE) was at an average of 91.9% while Allocative Efficiency (AE) stood at 51.9%.

Table 3, which is an extension of Table 2, provides a trend of efficiency in terms of annual average and overall average score of CBs in Tanzania. Except for scale efficiency, a general noticeable observation on efficiency performance score is that, by and large, CBs in Tanzania performed poorly during the study period (2002-2014), with cost efficiency performance being the lowest of all applied efficiency measures. As explained later, low cost efficiency seems to be a result of additional expenses incurred to build social capital of the poor customers, and excessive regulatory burdens imposed to community banks in Tanzania.

Despite the general poor efficiency performance, CBs in Tanzania were operating at a decreasing part of the cost curve with an average cost efficiency extending from 29.4% in 2002/2005 to 36.3% in 2014. The overall average cost efficiency for the study period was 35.5%. This implies that CBs in Tanzania could produce the same outputs with approximately 64.5% less costs than they actually incurred. Analysis by periods shows an upward-and-downward pattern but overall increasing efficiency trend. For instance, during 2002/2005 to 2007 there was a remarkable improvement in cost efficiency from 29.4% to 51.4% was realized, respectively;

probably because CBs were starting to gradually benefit from learning curve in the use of input resources as evidenced by increasing technical and allocative efficiency overtime. This period was followed by an abrupt decline to reach a lowest minimum of 23.3% in 2009, this suggesting negative effects caused by global financial crisis during 2007-2009. The subsequent period from 2010-2012 witnessed improving cost efficiency to a score of 45.3% in 2012 implying that CBs were recovering from global financial crisis. However, there was another slight decline during 2012-2014 to reach a score of 36.3% in 2014, indicating short term effects of competition from other banks and microfinance institutions which are increasingly eyeing the traditional markets of CBs.

Table 3. CBs' annual and overall average efficiency scores over the study period

| Efficiency | 2002-2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CE | 29.4 | 51.1 | 51.4 | 38.1 | 23.3 | 24.9 | 37.4 | 45.3 | 35.7 | 36.3 | 35.5 |
| TeCRS | 51.9 | 68.3 | 71.0 | 69.0 | 55.9 | 53.7 | 72.0 | 76.5 | 69.7 | 64.7 | 63.4 |
| TeVRS | 70.5 | 69.3 | 72.7 | 76.1 | 57.5 | 55.9 | 74.4 | 78.4 | 74.1 | 68.6 | 69.8 |
| SE | 73.6 | 98.6 | 97.4 | 91.9 | 96.2 | 95.8 | 96.5 | 97.6 | 94.2 | 93.5 | 91.9 |
| AE | 47.8 | 67.9 | 67.7 | 53.4 | 37.8 | 44.1 | 53.7 | 59.2 | 50.5 | 51.2 | 51.9 |

*Note*. i) The second column takes average efficiency scores for 2002-2005.

ii) Average scores for the overall period of the study are on the extreme right column.

Source: Constructed from Appendix 1(a).

During the interview with some key informants at CBs regarding the future of CBs in Tanzania, CBs demonstrated high optimism that they could uplift their efficiency scores by increasing application of group lending methods and extending to rural markets which have not been adequately harnessed. One interviewee made a comment as:

> *"*Our future is bright because we are now penetrating well in the rural financial markets. We have accumulated a wealth of experiences in dealing with low income people including those in the rural areas…. This gives us a competitive edge. Linking with rural financial institutions including SACCOS and VICOBA (Note 4), and the use of group lending methodology are our strategies to deal with competition and improve our cost efficiency performance*"* (Interview, 18 March 2015).

This quotation relates closely with Kaleshu (2013) who advocates linkage banking between regulated institutions and semi/ informal institutions in order to exploit the rural financial market and deal with increasing competition. Regarding cost efficiency, another interviewee said:

> "we have mobilized our clients into groups. They open group account; they borrow as a group, and when we offer training to the group it becomes more cost-effective" (Interview, 1 April, 2015).

This implies that, operating CBs with client groups instead of individuals, CBs could be saving on some operational costs consistent with the transaction cost theory that many transactions administered under group approach lead to a reduction in transactions cost.

Other efficiency measures, including technical and allocative efficiency more or less mirrored the cost efficiency performance trend. Technical efficiency in production reflects effectiveness of management in employing available input resources to generate maximum outputs. Average Technical Efficiency under TeCRS, a restrictive version of DEA reached a maximum average score of 76.5% in 2012 and registered a minimum score during 2002/2005 at 51.9%. The overall technical efficiency under constant returns to scale average score for the study period was at 63.4%, implying that CBs in Tanzania could produce the same outputs with approximately 36.6% lower inputs than actually employed at constant returns to scale environment. On the other hand, technical efficiency under variable returns to scale assumptions reached its maximum at 78.4% in 2012, while the minimum score was 55.9% in 2010, and had an overall average score of 69.8% over the study period. This implies that CBs in Tanzania could produce the same amount of output with approximately 30.2% less resources under than they actaully employed.

Allocative efficiency, a measure of the ability of the banks to use an input mix in an optimal combination at a given input prices, registered a maximum average score of 67.9% in 2006 and a minimum average score of 41.7% in 2009 with an overall average score of 51.9% over the study period. This suggests that CBs in the sample were operating at a point where prices were divergent from marginal costs, hence failing to utilize the optimal input mix to minimize cost for the given output.

In terms of scale efficiency, which refers to optimal use of productive capacity, the DEA estimates of overall scale efficiency indicates that CBs enjoyed high economies of scale almost throughout the period. In the 2002/2005 period CBs were 73.6% scale-efficient, and it was the period when the overall scale efficiency was at the minimum. Thereafter, CBs generally operated under increasing returns to scale, and there was a significant improvement to reach a thrilling level of 98.6% in 2006. Scale efficiency recorded a slight decline from 2007 to reach 91.9% in 2008, possibly due to the effects of global financial crisis, but it steadily rose to reach a relatively higher score of 97.6 in 2012 as banks were gradually recovering from the crisis. During 2013-2014 there was a slight decline to a score of 93.5% in 2014, when CBs faced the rising average cost, a situation owing from increasing competitive pressures. The overall average scale efficiency score was 91.9% during the study period, recording an overall divergence from the most productive scale of 8.1%, showing that the same proportion of the production opportunities was underutilized.

Although the non-maximizing behaviour arising from underutilization of resources might have contributed to low cost efficiency, However it is evident from the findings that overall, cost inefficiency in CBs in Tanzania was basically associated with inability to allocate input resources to the most beneficial outputs (allocative inefficiency). These findings are consistent with Pasiouras et al. (2007) and Mensi and Zouari (2010) who found that the major source of cost inefficiency was allocative rather than underemployment of input resources to generate maximum outputs (technical inefficiency) or underutilization of productive opportunities (scale inefficiency). On the other hand, the findings are inconsistent with the X-efficiency theory which posits that the major source of inefficiency is rather technical than allocative (Leibenstein, 1966).

The divergence from X-efficiency theory could be attributed to external factors including excessive regulatory requirements and additional costs to support social capital formation of poor clientele. The issue of excessive regulatory burden was significantly pointed out during interviews with CBs managers. Most managers complained over some regulatory requirements that resulted into significant opportunity costs especially to smaller banks like CBs. They said they were spending a lot of time and resources trying to implement regulations or/and prepare regulatory reports than attending to the core banking functions. One bank manager said:

> “One of the regulations forces us to publish our accounts in two newspapers covering full page; Kiswahili and English newspapers. I don’t see the logic of spending our meagre financial resources for publication in two newspapers. One Kiswahili newspaper would have been adequate to serve the purpose, given the fact that all of our stakeholders are Kiswahili users” (Interview, 12 May 2015).

The point is that CBs managers were suggesting that the “one-size-fits-all” model of banks regulation is not appropriate as it remains unfriendly to small banks while relatively favourable to large ones.

*5.2 Efficiency Status between CCBs and NCCBs Categories*

A 2-tailed t-test was run on a sample of 92 observations to determine whether there were differences in efficiency between NCCBs and CCBs categories. Five contexts of efficiency measures under the study were analysed, whereas the NCCBs group consisted of 66 observations and the CCBs had 26 observations. Table 4 presents a summary of means and standard deviations for various efficiency measures in each of these banks’ category.

Table 4. Summary statistics for efficiency CBs categories

| Category | CE | | TeCRS | | TeVRS | | SE | | AL | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | Std | Mean | Std | Mean | Std | Mean | Std | Mean | Std |
| NCCBs | 0.342 | 0.221 | 0.637 | 0.209 | 0.706 | 0.218 | 0.918 | 0.135 | 0.499 | 0.24 |
| CCBs | 0.388 | 0.245 | 0.625 | 0.224 | 0.677 | 0.216 | 0.936 | 0.156 | 0.519 | 0.2 |

Source: Summarized from data set.

Tests of normality and homogeneity of variances preceded the independent sample t-test in order to underpin the robustness of results of the t-test. The normality assumption was tested using Shapiro-Wilk (Tables 5 and 6) while the homogeneity of variances was tested by the robust equal-variance test (robvar) (Tables 7 and 8) at $\alpha = 0.05$).

Table 5. Tests of normality before transformation (Shapiro-Wilk test)

| variables | observations | W | V | Z | Prob >Z |
|---|---|---|---|---|---|
| CE | 92 | 0.94597 | 4.162 | 3.149 | 0.00082 |
| TeVRS | 92 | 0.93992 | 4.628 | 3.383 | 0.00036 |
| TeCRS | 92 | 0.95857 | 3.191 | 2.562 | 0.00520 |
| SE | 92 | 0.50376 | 38.225 | 8.0646 | 0.0000 |
| AE | 92 | 0.98452 | 1.192 | 0.388 | 0.34901 |

*Note*. Ho: sample is drawn from normally distributed population.

As indicated in Table 5, the null hypothesis (Ho) was rejected for all efficiency measures except for the allocative efficiency, implying that CE, TeVRS, TeCRS and SE were not normally distributed. This called for an attempt to transform them into normality by squaring up their original identity. The transformation effort enabled only the TeVRS to change to normality as indicated in Table 6 (i.e. the null hypothesis, Ho, was not rejected for TeVRSsq after transformation).

Table 6. Tests of normality after transformation [Generate variable sq = (variable)^2]

| variables | observations | W | V | Z | Prob>Z |
|---|---|---|---|---|---|
| CEsq | 92 | 0.97222 | 2.140 | 1.680 | 0.04652 |
| TeVRSsq | 92 | 0.98230 | 1.363 | 0.684 | 0.24695 |
| TeCRSsq | 92 | 0.96312 | 2.841 | 2.306 | 0.01056 |
| SEsq | 92 | 0.62593 | 28.814 | 7.422 | 0.0000 |

*Note*. Ho: sample is drawn from normally distributed population.

The two efficiency measures AE and TeVRSsq were then subjected to homogeneity of variance (robvar) test as demonstrated in Tables 7 and 8.

Table 7. Test for homogeneity of variance for TeVRssq (Robvar test)

| Category of CB | Observations | Mean | Std Dev |
|---|---|---|---|
| NCCBs | 66 | 0.54488814 | 0.27824569 |
| CCBs | 26 | 0.50265324 | 0.28547072 |
| Total | 92 | 0.53395219 | 0.27938223 |

W0 =0.02042454 df (1,90) Pr > F= 0.88667723

W50 =0.00637549 df (1,90) Pr > F= 0.9365365

W10 =0.00883358 df (1,90) Pr > F= 0.9253283

*Note*. Ho: samples drawn from populations of equal variances.

Table 8. Test for homogeneity of variance for AE (Robvar test)

| Category of CB | Observations | Mean | Std Dev |
|---|---|---|---|
| NCCBs | 66 | 0.49925452 | 0.23627431 |
| CCBs | 26 | 0.56939551 | 0.20341106 |
| Total | 92 | 0.51907697 | 0.22858443 |

W0 = 1.6170558 df (1,90) Pr > F= 0.20677912

W50 = 1.8325448 df (1,90) Pr > F= 0.17921713

W10 = 1.5863400 df (1,90) Pr > F= 0.2111064

*Note*. Ho: samples drawn from populations of equal variances.

The null hypothesis of homogeneity of variance was not rejected for both TeVRSsq and AE, signifying that their variances were homoscedastic, and hence qualifying for the independent sample t-test. The t-test result for difference of means showed that there was no enough evidence to reject the null hypothesis that the mean efficiency of NCCBs and CCBs do not differ (Tables 9 and 10). The results suggest that, the mean efficiency performance between CCBs and NCCBs is statistically insignificant.

Table 9. Independent two-sample t test of means for TeVRSsq

| Category | observations | Mean | Std.Err. | Std. Dev. | [95% confidence interval] | |
|---|---|---|---|---|---|---|
| NCCBs | 66 | 0.5448881 | 0.0342497 | 0.2782457 | 0.4764868 | 0.6132895 |
| CCBs | 26 | 0.526532 | 0.0559854 | 0.2854707 | 0.3873491 | 0.6179574 |
| Combined | 92 | 0.5329522 | 0.291276 | 0.2793822 | 0.4750938 | 0.5908106 |
| Diff | | 0.0422349 | 0.0648954 | | -0.0866911 | 0.1711609 |

Diff= Mean (NCCBs)-Mean CCBs t=0.6508

H0: Diff=0 degree of freedom= 90

H1: Diff<0 H1: Diff! =0 H1: Diff >0

Pr (T<t) = 0.7416 Pr (|T|>|t|)=0.5168 Pr(T>t)=0.2584

*Note.* Ho: The mean TeVRS of NCCBs and CCBs do not differ.

Table 10. Independent two-sample t test of means for TeVRSsq

| Category | observations | Mean | Std.Err | Std. Dev | [95% confidence interval] | |
|---|---|---|---|---|---|---|
| NCCBs | 66 | 0.4992545 | 0.0290834 | 0.2362743 | 0.441171 | 0.557338 |
| CCBs | 26 | 0.5693955 | 0.0398922 | 0.2034111 | 0.487236 | 0.651555 |
| Combined | 92 | 0.519077 | 0.0238316 | 0.2285844 | 0.4717385 | 0.5664155 |
| Diff | | 0.070141 | 0.0527047 | | -0.1748481 | 0.0345662 |

Diff= Mean (NCCBs)-Mean CCBs t=-1.3308

H0: Diff=0 degree of freedom= 90

H1: Diff<0 H1: Diff! =0 H1: Diff >0

Pr (T<t) = 0.0933 Pr (|T|>|t|) = 0.1866Pr(T>t)=0.9067

*Note.* Ho: The mean AE of NCCBs and CCBs do not differ.

These findings do not agree with the agency theory assumption that shareholders with higher stake who are in NCCBs would monitor management more effectively than those in the CCBs who have dispersed low stake shareholding. One of the explanations for the indifference in efficiency could be that, as far as prudential regulatory requirements are concerned, both categories have to adhere to the rules, and there is no room for practicing individual unique characteristics.

## 6. Conclusions and Policy Implications

While efficiency researches in traditional commercial banks are enormous, there is scanty research done on the community banking industry. The study contributes to efficiency literature by specifically bringing into the picture the community banking efficiency analysis in different dimensions. On the basis of the findings, it is evident that most efficiency measures for community banks were low with overall cost inefficiency being associated with allocative inefficiency rather than technical inefficiency and scale inefficiency. However, Community Banks were operating at a decreasing part of the average cost curve during the study period, which gave a room for expansion and taking advantage of scale economies. Overall, it was established that, regardless of their category, community banks had similar performance.

These results underpin some policy implications: the Bank of Tanzania's window that deals with community banks should strategize supervision of the management of community banks so as to improve cost-effectiveness in the use of bank resources. Since CBs are operating at a decreasing part of the average cost curve, they should exploit the opportunities by expanding operations to attain scale economies. Similarly, the government and development partners should take affirmative action to support these institutions as they serve the best interest of low income earners, and they have the potential to foster financial inclusion in the rural sector. In view of this, Tanzania could also use these banks to implement its financial inclusion drive. Moreover, the Bank of Tanzania should establish a separate regulatory framework that accommodates the unique characteristics of community banks.

Future research should address efficiency based on development/social intermediation objective pursued by community banks in order to capture a wider picture of community banks' performance. This suggestion is based on the fact that, apart from financial objective, community banks do pursue social capital objective aimed at building capacity of its clients.

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## Notes

Note 1. In this study we are comparing these categories in the analysis.

Note 2. The sample consisted of Mufindi Community Bank (1998), Kilimanjaro Cooperative Bank (1996), Mwanga Community Bank (2002), Kagera Farmers Cooperative Bank (2002), Mbinga Community Bank (2003), Uchumi Commercial Bank (2005), Tandahimba (2008), and Efatha (2009). The sample size per year was as follows: 4(2002); 5(2003), 5(2004), 6(2005), 6(2006), 6(2007); 7(2008); 8(2009); 9(2010); 9(2011); 9(2012);

9(2013); 9(2014). This makes up a total of 92 panel observations for the years of study.

Note 3. A DMU can be conceptualized in two perspectives: (i) as an institution that makes decisions; or (ii) as the respective times (periods) of decision making, i.e. as if each year, for example, stands as decision making period that is different from the other and institutionalized that way. It is this second view that is adopted in this study.

Note 4. VICOBA means Village Community Banks, the non-regulated, informal self-help financial groups which mobilize savings from members and use the funds for on lending purposes to its members.