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The Link Between Cost Efficiency and Non-Performing Loans of Community Banks in Tanzania

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Abstract

The link between bank efficiency and non-performing loans (NPLs) has generally been used to predict the effect of either variable on bank failure. The results have, by and large, remained inconclusive in the bank efficiency literature, falling mainly under either 'bad management' or 'bad luck' hypothesis camps. This study applied the Tobit simultaneous regression to explore the effects of 'bad management' and 'bad luck' on the incidence of low cost efficiency and NPLs of community banks (CBs) in Tanzania. Secondary data from 9 CBs in a span of 13 years were sourced from the Bank of Tanzania (BoT); and from audited accounts of CBs. The paper establishes that although both bad management and bad luck contribute to NPLs increase, bad luck was the dominant source of high NPLs and cost inefficiency in CBs. The policy implications of the results are that the banks regulator (BOT) should limit risk exposures of CBs by controlling excessive risk-taking and loan concentration; and by insisting on diversification. Further, the BoT should provide managerial training and knowledge-sharing aimed at increasing management efficiency. The government and other stakeholders can also provide financial and technical support to CBs to enable them to effectively serve risky sectors, including agriculture, as a way of enhancing financial inclusion of the avoided rural sector.

Key words*: community banks, cost efficiency, NPLs ratio, bad management, bad luck.*

1. Introduction

Bank instabilities and subsequent bank failures in the world's financial systems have become major concerns of bank regulators, and the focal point of many bank studies following the global financial crisis in 2007 (Sanchez et al., 2013; Ohene-Asare, 2011). The world's financial system, which is largely integrated and liberalized, brings with it business opportunities linked with numerous bank risks that call for bank regulators to hedge against increasing possibilities of bank failures (Koutsomanoli-Filippaki & Mamatzakis, 2009). The two major predictors of bank failures singled out in the literature are non-performing loans (NPLs) and bank inefficiency (Greenidge & Grosvenor, 2009; Podpiera & Weill, 2008). The deterioration of assets quality associated with higher NPLs ratios have been observed in many failing banks (Elegbe, 2013; Nkusu, 2011; Hou & Dickinson, 2007; Kithinji & Waweru, 2007). Similarly, bank cost inefficiency, which is a proxy for poor management quality, has also been associated with bank failures (Berger & DeYoung, 1997). A number of studies have observed that failing banks tend to be located far from the efficient frontier (Karim et al., 2010; Wheel & Wilson, 1995).

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Higher possibilities of bank failures are more pronounced in smaller banks such as community banks (CBs) as they lack enough resources to compete and cope with high risk situations (Li & MaCMahan, 2015; Podpiera & Weill, 2008; Hays et al., 2009).

In Tanzania, NPLs in CBs have been on the increase, while efficiency has generally been low (Ernst & Young, 2012; BoT, 2013). The BoT (2014) defines NPLs as loans whose principal or interest remains unpaid 90 days or more after the due date. The increasing NPLs, coupled with low efficiency measures, seem to present a high possibility of CBs failure in Tanzania. Moreover, CBs in Tanzania exist in various ownership categories, which include cooperative community banks (CCBs) and non-cooperative community banks (NCCBs). Furthermore, CBs in Tanzania have been initiated in different generations of banking reforms. The kind of category in which these banks belong and the phases in which they started could inform how these banks are stable or how vulnerable they are to failure. This paper focuses on the link between predictors of bank failure of CBs in Tanzania so as to provide input for regulatory policy formulation, serve as a reference for CBs managers, and expand the frontier of knowledge in this area.

Despite the seemingly straight forward link between NPLs and cost efficiency, the issue of how these parameters are related and the direction of the relationship between them have remained largely inconclusive in the bank efficiency literature (Koutsomanoli-Filippaki & Mamatzakis, 2009; Rossi et al., 2005; Berger & De Young, 1997). Generally, empirical findings on the relationship between NPLs and cost efficiency differ along the 'bad management' and 'bad luck' hypothesis camps. The 'bad management' hypothesis, as related to NPLs and cost efficiency, asserts that it is low cost efficiency that drives NPLs in banks. The underlying argument is that low cost efficiency, which signals poor management as per Berger and DeYoung (1997), is associated with poor administration of daily operations; including ineffective evaluation of loan applicants as well as monitoring of loan portfolios. Subsequently, poor evaluation of loan applications and inadequate loan monitoring culminate into high NPLs. The implication of this proposition is that the increase in NPLs is a result of low cost efficiency associated with internal management weaknesses rather, than external factors.

The 'bad luck' hypothesis, on the other hand, posits that it is NPLs that influence low cost efficiency in banks. The argument here is that when NPLs increase due to some factors beyond the control of a bank, bank management would try to put forth additional managerial efforts in terms of time and other resources to recover problem loans (Berger & DeYoung, 1997). The additional efforts may include resources to track down borrowers, repayment renegotiation, loan restructuring plans, and such related endeavours. The efforts to manage such unexpected events lead to increased overall costs; a result of which is cost inefficiency. As indicated before, the 'bad luck' hypothesis assumes that increase in NPLs arises due to uncontrollable factors such as the occurrence of an unexpected drought or financial crises that may negatively affect borrowers' ability to repay loans, resulting into a pilling up of NPLs. Thus, the term 'bad luck' refers to the occurrence of NPLs due to factors beyond a bank's control.

Podpiera and Weill (2008) and William (2004) argue that huge NPLs, especially in small banks, are a result of poor management other than bad luck, essentially because small banks cannot afford to hire good bank managers. While this argument might be true to some banks, we cast doubt on its relevance, especially to CBs in Tanzania. A significant number of bank managers in CBs in Tanzania have previously worked in larger traditional commercial banks (TCBs) before joining CBs; implying that they have acquired adequate bank management competencies. Besides, the kind of regulatory mechanisms that apply to larger TCBs almost equally apply to smaller banks, including CBs. Thus, it is apparent that poor management as an internal factor may not be adequate to explain the prevalence of NPLs in CBs in Tanzania, implying that a study was needed to uncover the missing link. As such, this study explores the effects of bad management and bad luck on the incidence of low-cost efficiency and NPLs in Tanzanian CBs. The study contributes to the bad management and bad luck efficiency literature by uncovering the relationship between cost efficiency and NPLs ratio in CBs in Tanzania. To the authors' knowledge, this seems to be the first study that examines the effect of bad management and bad luck on the incidence of low cost efficiency and NPLs in CBs in the country. Understanding the effect of bad management and bad luck on the performance of CBs is essential for the regulatory authority (BoT) and bank management (Podpiera & Weill, 2008).

Further, the paper aims to shed light on the relationship between cost efficiency and NPLs ratio, extending the extant literature in two fronts. First, unlike previous studies that have dwelt on larger traditional commercial banks (TCBs), this paper utilized a sample of small banks: community banks (CBs) in Tanzania, a developing country. Tanzania has undergone two generations of financial sector reforms that focus on efficiency and financial inclusion to support the current highly growing economy (BoT, 2013). Second, contrary to previous studies (Podpiera & Weill, 2008; William, 2004), this paper investigates the efficiency-NPLs relationship by involving various categories of CBs. Previous studies mostly focused on the commercial banking industry as a whole (Podpiera & Weill, 2008; William, 2004; Berger & DeYoung, 1997). Investigating the relationships among various categories of CBs is important to inform prospective policy decisions (Aikaeli, 2006). Thus, the main objective of the paper is to investigate the relationship between bank efficiency and NPLs of CBs in Tanzania. Specifically, the study examines the relationship between cost efficiency and NPLs by focusing on:

(a) The community banking industry as a whole
(b) Cooperative Community Banks (CCBs) sub-sector
(c) Non-Cooperative Community Banks (NCCBs) sub-sector

To avoid confusion in the use of the word 'hypothesis' as it has been applied in 'bad management' and 'bad luck' context, the paper uses the word 'assumption' to mean the hypotheses developed to guide this study. This paper is guided by the following assumptions:

(i) There is no significant relationship between cost efficiency of NPLs in community banks (CBs)
(ii) There is no significant relationship between cost efficiency of NPLs in cooperative community banks (CCBs)
(iii) There is no significant relationship between cost efficiency of NPLs in non-cooperative community banks (NCCBs)

2. Literature Review

2.1 Cost Efficiency and NPLs Framework

The seminal work of Berger and DeYoung (1997), carried out in the US commercial banks for the period 1985 to 1994, provides a major platform for the analysis of the relationship between cost efficiency and NPLs. Using the Granger causality test, the study developed four hypotheses, namely: bad luck, bad management, skimping and moral hazard. The first three hypotheses examined the relationship between bank efficiency and NPLs, and the fourth examined the nexus between bank efficiency and bank capitalization. The following major findings on the relationship between cost efficiency, NPLs and bank capitalization came out.

First, there is a two-way (negative) causality between cost efficiency and NPLs. Berger and DeYoung (1997) accounted for the causality from NPLs to cost efficiency as 'bad luck,' driven mainly by the deterioration in macroeconomic conditions and related uncontrollable events. The possible causes for negative causality from NPLs to cost efficiency is that poor quality loans force banks to increase spending on monitoring, administering and/or selling off these loans, resulting in bank inefficiency. The negative causality from cost efficiency to NPLs was explained through the hypothesis of 'bad management'. Low cost efficiency is a signal of sub-par management practices associated with suboptimal loan appraisal, monitoring and control; ultimately resulting in the increase of NPLs. This hypothesis is consistent with the findings of Podpiera and Weill (2008) and Williams (2004).

Second, there is a positive relationship between cost efficiency and NPLs in banks explained under the skimping hypothesis, suggesting a possible positive causality between high cost efficiency and NPLs. The plausible explanation is that high cost efficiency may reflect little resources allocated to monitor lending risks, which therefore results into higher NPLs in the future (Berger & DeYoung, 1997).

Third, there is a negative relationship between bank capitalization and NPLs, which accounts for the moral hazard hypothesis. Keeton and Morris (1987) and Ahmad and Bashir (2013) have also analysed the moral hazard hypothesis and provided explanations that there is a tendency for thinly capitalized banks to take excessive risk aimed to increase earnings fast through increased loan portfolio, which later results into increased NPLs due to extension of loans to sub-prime borrowers. Such conduct exhibited by thinly capitalized banks is referred to as moral hazard behaviour because these banks have little to lose in case the lending transaction fails, but they stand to gain much if the transaction succeeds. This paper examines the cost efficiency-NPLs relationship by confining itself to the 'bad management' and 'bad luck' hypotheses camps, with reference to the increasing NPLs and low-cost efficiency in community banks in Tanzania.

2.2 Empirical Literature

Abid et al. (2014) studied 16 Tunisian banks over the years 2003 to 2012. Using the dynamic panel data method, the paper examined the determinants of households' NPLs. The results indicated that the NPLs of households in the Tunisian banking system were explained particularly not only by macroeconomic variables (GDP, inflation, and interest rates); but also by bad management quality. The paper further established that bank-specific variables—represented by performance (measured by ROE) and inefficiency (determined as the ratio of operating expenses to the operating income)—had an additional explanatory power when incorporated in the baseline model. These variables support the 'bad management' hypothesis, which links these indicators to the quality of management. Louzis et al. (2011) found that bank-specific variables such as performance and efficiency had additional explanatory power, thus lending support to the 'bad management' hypothesis linking these indicators to the quality of management.

Tracey and Leon (2011) assessed the impact of non-performing loans (NPLs) on loan growth in Jamaica, and Trinidad and Tobago banks. The study was based on the assumption that, in making lending decisions, banks are assumed to react differently to NPL ratios above or below a threshold, with NPLs above the threshold having an adverse effect on lending. A NPLs threshold was defined as the level of NPLs above which banks become reluctant to commit new loans, leading to a credit crunch phenomenon. The results suggested that a threshold range for NPLs was determining the differential loan behaviour of banks. The implication of the finding was that bank lending behaviour could restrain economic activity, especially in periods of stress when NPLs are high.

Karim et al. (2010) investigated the relationship between NPLs and bank efficiency in Malaysia and Singapore. Cost efficiency was estimated using the stochastic cost frontier approach, assuming a normal-gamma efficiency distribution model. The cost efficiency scores were then used in the second stage Tobit simultaneous equation regression to determine the effect of non-performing loans on bank efficiency. The Tobit simultaneous equation regression results indicated that higher NPLs reduce cost efficiency; consistent with the 'bad luck' hypothesis. Likewise, lower cost efficiency increases NPLs, consistent with the 'bad management' hypothesis. In a similar attempt, Koutsomanoli-Filippaki and Mamatzakis (2009) supported the 'bad luck' hypothesis when analysing banks in 27 European Union member countries in the period 1998 to 2006. However, the study did not reject the bad management hypothesis, especially in the case of underdeveloped financial markets.

Applying the data envelopment analysis (DEA) to data for 40 commercial banks over a five-year period (2000-2004), Chang et al. (2010) found that while banks in Taiwan had lower operating efficiency on average during the reform period (2002-2003) compared to the pre-reform period (2000-2001), improved operating efficiency was reflected in the post-reform period (2004). Their results remained unchanged even after controlling for NPLs ratio, capital adequacy ratio, bank ownership and size. Overall, the results indicated that the improved efficiency in the post-reform period was possibly due to the reduction of NPLs rather than the boosting of capital adequacy in the reform period.

Podpiera and Weill (2008) examined the causality relationship between NPLs and cost efficiency to find out which of the two factors was the major determinant of bank failures in Czech banks. The study extended the Granger causality model developed by Berger and DeYoung (1997) by applying GMM dynamic panel estimators on a panel of Czech banks between 1994 and 2005. Their findings support the 'bad management' hypothesis, which asserts that worsening in cost efficiency precedes increases in bank NPLs; and reject the 'bad luck' hypothesis, which predicts the reverse causality. The implication of their findings is that bank regulators should ensure that banks are managed efficiently to control NPLs. Examining Japanese commercial banks between 1993 and 1996, Altunbas et al. (2000) also found that the level of NPLs was positively related to bank inefficiency.

Based on the findings of the aforementioned studies, it is noticeable that the relationship between cost efficiency and NPLs has been studied widely. However, it is also clear that the relationship between these variables has remained open to doubt. Moreover, most of these studies have been confined to traditional commercial banks (TCBs), leaving a large gap for small banks such as community banks (CBs). Given that CBs have characteristics that differ significantly with TCBs in terms of objective focus, coverage, and types of customers, the findings observed in TCBs might not necessarily be quite consistent with those in CBs. This paper, *inter alia,* attempts to fill this gap. Therefore, it extends the extant literature by providing some insights in the community banking industry.

3. Methodology

3.1 Research Design, Data and Data Collection

The study employed explanatory sequential research design in which the findings generated from secondary data were cross-checked and validated by key informants at CCBs. The study covered a period of 13 years—from 2002 to 2014—and captured the effects of the first and second phases of the banking sector reforms in Tanzania. Secondary data were the key source of information; and were obtained from the BoT and from audited accounts of CBs; while primary data for triangulation were generated from key informants at respective CBs. As newer banks are considered inappropriate as far as performance assessment is concerned, the sample included only those banks that had been in operation for five years and beyond (Richard, 2010). The final sample consisted of an unbalanced panel of 9 CBs in the period 2002-2014, with a total of 92 bank-year observations constituting 26-year observations in CCBs and 66-year observations in NCCBs.

3.2 Methods of Analysis

Most studies that explore the relationship between NPLs and cost efficiency have employed the Granger causality method (Berger & DeYoung, 1997; William, 2004). Others have extended the Granger causality method by applying the generalized method of moments (GMM) (Podpiera & Weill, 2008). However, these methods require a larger dataset; they may not be appropriate for a small sample (Santos & Baros, 2011; Soto, 2009; Zachariadis, 2006), which is the case with the data set in this study. Thus, to investigate the link between cost efficiency and NPLs as per assumptions (hypotheses) (i), (ii) and (iii) mentioned earlier, a Tobit simultaneous regression model

was employed to control for simultaneity (Karim et al., 2010; Altunbas et al., (2007; Gujarat, 2004). Moreover, the Tobit model was applied since the efficiency scores laid between zero and one. The Tobit regression model for this study is expressed as:

$$\gamma_i = \beta_i' X_i + \xi_i, \xi_i \sim N(0, \sigma^2), \text{if } 0 \leq \gamma_i{}^* \leq 1$$
$$\gamma_i = 0 \text{ if } \gamma_i{}^* = 0$$
$$\gamma_i = 1 \text{ otherwise} \ldots\ldots\ldots\ldots (1)$$

where γ_i is the cost efficiency (*CE*) estimated by (DEA as in Table A1), β_i represents a vector of parameters to be estimated, X_i is a vector of regressors, and ξ_i is a normally distributed error term.

Table 1 presents a summary of the variables and their definitions in the Tobit simultaneous regression model used to test the main hypothesis stating that: "There is no significant relationship between cost efficiency and NPLs in community banks in Tanzania."

Table 1: Variables and Variable Definitions in Tobit Simultaneous Regression Model

Variable	Definition	Measurement unit	Variable status	Hypothesis	Exp. sign
NPLsRt	Yearly NPLs obtained as a ratio of end of year NPLs to total loans outstanding	ratio	Dependent	Bad management	
CE	Cost efficiency Score relative to the best bank in the year	ratio	Independent	Bad management	(-)
CE	Cost efficiency Score relative to the best bank in the year	ratio	Dependent	Bad luck	
NPLRt	Yearly NPLs ratio obtained as a ratio of end of year NPLs to Total Loans	ratio	Independent	Bad luck	(-)
Gen	variable to control for age/experience of bank	dummy	Independent	Bad management/ bad luck	
logAssts	Logarithm of total assets to control for bank size	TZS	Independent	Bad management/ bad luck	
Capratio	Capitalization to control for capital differences in banks	ratio	Independent	Bad management/ bad luck	
dumcoop	variable to control for bank category	dummy	Independent	Bad management/ bad luck	

Variables to control for individual factors were included in the model as follows. To control for bank size effect, natural log of assets (*loassts*), representing the value of total assets, was included; *capratio* to control for the effect of bank capitalization; dummy variable *dumcoop* to control for the effect of the cooperative banking factor, which takes a value of 1 if the bank is a CCB, or zero if otherwise.

The variable Gen was added to control for the effect of age and experience. It is assumed that banks that were established during the first financial sector reforms

of 1991 are more efficient than those initiated during the second financial sector reforms of 2002 because of accumulated experience. The Gen takes a value of 1 if a bank was established in the first reforms, and 0 if otherwise. The financial sector reforms in Tanzania, which mark the introduction of CBs in the banking industry, are categorized into two phases or generation-reforms. The first-generation reforms started in 1991 when the Banking and Financial Institutions Act (BAFIA) was enacted to facilitate the liberalization of the financial sector, enhance the effectiveness of monetary policy instruments, and promote competition for efficiency improvement (URT, 1991). In the first-generation reforms, interest rate regimes were decontrolled and private banks, including community banks, were allowed entry. The second-generation reforms, which started in 2002, focused on addressing banking dynamism and efficiency, increasing the depth of full-fledged market-based financial systems and improving access to financial services by the majority, especially in the rural sector (BoT, 2008).

3.3 Modelling the Relationship Between NPLs Ratio and Cost Efficiency

NPLs ratios for each bank were obtained from the dataset. NPLs ratio (NPLsRt) is the proportion of NPLs to total loan portfolio. The cost efficiency (CE) of a CB was estimated using data envelopment analysis (DEA) (Table A1).[1] The relationship between NPLs and CE is represented by the Tobit simultaneous regression model. The reasons for the choice of the model are described in section 4.4.2. A complete Tobit simultaneous regression model for the whole community banking industry as per assumption (hypothesis) (i) is presented in equations (2) and (3), respectively:

$$CE_{it}{}^{*} = \beta_0 + \delta NPLR_t + \beta_1 \log Assts_{it} + \beta_2 capratio + \beta_3 Gen_{it} + \beta_4 dumcoop_{it} + \xi_{it} \dots (2)$$

$$NPLsRt = \alpha_0 + \delta CE_{it}{}^{*} + \beta_1 \log Assts_{it} + \beta_2 capratio + \beta_3 Gen_{it} + \beta_4 dumcoop_{it} + \xi_{it} \dots (3)$$

Equation (2) is a proxy for the 'bad luck' hypothesis; and equation (3) represents the 'bad management' hypothesis.

To model the relationship between cost efficiency and NPLs in the CCBs sub-sector as per assumption (ii), the paper employed equations (4) and (5). It should be noted that all the CCBs in the sample were established in the first-generation reforms; therefore, the control variable for generation was not included in the model.

$$CE\tau_{it}{}^{*} = \beta_0 + \delta NPLR\tau_{it} + \beta_1 \log Assts\tau_{it} + \beta_2 capratio\tau_{it} + \xi_{it} \dots \dots \dots \dots (4)$$

$$NPLsT\tau = \alpha_0 + \delta CE\tau_{it} + \beta_1 \log Assts\tau_{it} + \beta_2 capratio\tau_{it} + \xi_{it} \dots \dots \dots \dots (5)$$

1. The Data Envelopment Analysis (DEA) technique was employed to estimate efficiency scores. The rationale for the application of DEA lies on its three major advantages: (i) 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); (ii) it is a widely-used method in efficiency studies, reflecting its appropriateness; and (iii) it works well with a small dataset, which characterizes this study (Sanchez, et al., 2013; Pasiouras et al., 2007). The DEA was used to estimate efficiency scores we are using, but for tractability and focus, its mechanics and estimations are out of the scope of this paper. If one wants to follow the DEA estimation process of the same scores used in this study, s/he can find it in Mataba and Aikaeli (2016), "Empirical Analysis of Efficiency of Community Banks in Tanzania," *International Journal of Economics and Finance*, 8(12), December 2016.

The relationship between CE and NPLs ratio in the NCCBs sub-sector as per assumption (iii) is represented by equations (6) and (7), respectively:

$$CE\varphi_{it}^{*} = \beta_0 + \delta NPLR\varphi_{it} + \beta_1 \log Assts\varphi_{it} + \beta_2 capratio\varphi_{it} + \beta_3 Gen\varphi_{it} + \xi_{it} \dots\dots (4)$$

$$NPLs\varphi_{it} = \alpha_0 + \delta CE\varphi_{it} + \beta_1 \log Assts\varphi_{it} + \beta_2 capratio\varphi_{it} + \beta_3 Gen\varphi_{it} + \xi_{it} \dots\dots (5)$$

4. Empirical Findings and Discussions

This section presents and discusses the findings. Sub-section 4.5.1 dwells on the relationship between CE and NPLs ratio in the whole community banking industry, corresponding to the specific objective (a) in sub-section 4.2; while sub-section 4.5.2 deals with the relationship between cost efficiency and NPLs ratio in the CCB and NCCB sub-sectors, corresponding to the specific objectives (b) and (c) in sub-section 4.2.

4.1 Relationship Between CE and NPLs Ratio in Community Banks

4.1.1 Descriptive Analysis

Table 2 presents a descriptive analysis of the variables used in examining the relationship between cost efficiency (CE) and NPLs ratio (NPLsRt). CE ranges from around 0.02% to 100%; with a mean of 36.2% and a standard deviation of 23.2%. Generally, the findings indicate low cost efficiency status in CBs in Tanzania. Full efficiency ought to be 100%. The standard deviation is high, indicating a substantial difference of efficiency status across banks. On the other hand, the NPL ratio (NPLsRt) varies between a minimum of 0.3% to a maximum of 46.0%; with a mean of 11.4% and a standard deviation of 9.7%. The mean NPLs ratio is far higher than the industry average of 7.2% during the study period, indicating an adverse loan portfolio situation in the community banking sector in Tanzania.

Table 2: Descriptive Statistics

Variable	Mean	Std Dev.	Min	Max
NPLsRt	0.114	0.097	0.003	0.460
CE	0.3624	0.2319	0.000171	1.00
Gen	0.5652	0.4984	0.000	1.00
Capratio	0.127	0.192	-0.745	0.906
dumcoop	0.283	0.453	0.000	1.000
logassts	9.588161	0.5576	8.379422	12.134

Source: Generated from BoT data set

4.1.2 Relationship Between Cost Efficiency and NPLs in CBs

Table 3 presents a summary of the results of the Tobit simultaneous regression models. The coefficients of the independent variables and the p-values for both hypotheses—namely 'bad management' and 'bad luck' hypotheses—are presented. As it can be seen in Table 3, when the NPLs ratio is a dependent variable ('bad management' hypothesis), the coefficient CE is negative (-0.077486), and statistically significant at 10% ($p = 0.086$).

Table 3: Tobit Regression Results for All CBs

Variable	Dependent Variable: NPLsRt (Bad Management Hypothesis)	Dependent Variable: CE (Bad Luck Hypothesis)
CE	-0.077486* (0.0446591)	-
NPLsRt	-	-0.434865*(0.2428)
Capratio	0.0944432**(0.0458129)	-0.633342(0.1094505)
Gen	0.003333(0.0212175)	0.0868173*(0.0488364)
logassts	0.0227182(0.0184034)	0.2322744*(0.0380259)
dumcoop	0.1193091***(0.0229042)	0.0289927(0.0609297)

Note: *, **, and *** denote significance level at 10%, 5% and 1% respectively. Standard errors are shown in brackets.

Source: Summarized from BoT bank data

This means the assumption (hypothesis) that there is no relationship between cost efficiency and NPLs in CBs is rejected; implying that cost efficiency has a negative impact on NPLs ratio, which is consistent with the 'bad management' hypothesis. The results show that cost inefficiency arising from poor management is associated with increase in NPLs ratio in CBs. On the other hand, when CE is a dependent variable (i.e., 'bad luck' assumption), the coefficient on the NPLsRt is also negative (i.e., -0.434865); and is statistically significant at 10% ($p = 0.077$). This implies that cost inefficiency is associated with increasing NPLs, which is due to uncontrollable events, i.e., bad luck.

Generally, three implications can be deduced from these results. First, the relationship between cost efficiency and NPLs ratio is bi-directional and negative, confirming both the 'bad management' and 'bad luck' assumptions; hence consistent with Berger and DeYoung (1997), and partly consistent with Podpiera and Weill (2008). Second, although both bad management and bad luck seem to contribute to poor performance of CGs in Tanzania, the size of the coefficients indicates that bad luck was more influential with a coefficient of 0.43, than bad management with a coefficient of 0.077. This implies that bad luck contributes more to NPLs accumulation (and hence cost inefficiency) than bad management in CBs. Third, the results are relatively statistically weak, i.e., the variables are statistically related at higher probabilities of incorrectly rejecting the null hypothesis ($p = 0.086$ for bad management, and $p = 0.077$ for bad luck). The weak relationship could be due to the relatively small sample that was involved in the study. To support the argument, the study was extended backward to include bank data from the year 1999, making a total of 98 observations instead of the previous 92 observations. Table 4 provides a summary of the Tobit regression results.

As we can observe in Table 4, the relationship between the NPLs ratio (NPLsRt) and CE is statistically significant at 5% ($p = 0.014$ for bad management, and $p = 0.011$ for bad luck). It is also negative and bi-directional, confirming the bad management and bad luck hypotheses. Moreover, the coefficient for bad luck (i.e., 0.6485153) is greater than the coefficient for bad management (i.e., 0.099598), upholding the earlier finding that bad luck was more influential for the increase of NPLs, resulting in low CE in the community banking industry in Tanzania.

Table 4: Tobit Regression Results for All CBs (Covering 1999-2014)

Variable	Dependent Variable: NPLsRt (Bad Management Hypothesis)	Dependent Variable: CE (Bad Luck Hypothesis)
CE	-0.099598** (0.0398003)	-
NPLsRt	-	-0.6485153**(0.250589)
Capratio	0.0262917**(0.0175734)	-0.0978649(0.1172463)
Gen	0.0044135(0.0208277)	0.0932135*(0.0518073)
logassts	0.0262917(0.0175734)	0.2378678***(0.0400086)
dumcoop	0.1124928***(0.0222249)	0.1044164(0.0623376)

Note: *, **, and *** denote significance level at 10%, 5% and 1% respectively. Standard errors are shown in brackets.

Source: Summarized from BoT bank data

This finding is inconsistent with Pedpiera and Weill (2008) and William (2004) who found that bad management was a dominant factor in NPLs accumulation in small banks. The dominance of the 'bad luck' hypothesis makes sense as it is further supported by the occurrence of economic slowdown that impacted on NPLs performance of CBs in Tanzania. During the global financial crisis of 2007-09, CBs in Tanzania that were traditionally involved in financing export-based agriculture—including coffee and tea production—found most of their borrowers unable to repay their loans due to low prices of exports (Mwamunyange, 2009). During interviews with key informants to validate the effect of the global financial crisis of 2007-09 on NPLs, there seemed to be a common agreement among the interviewees. One said:

> *The effect was huge on coffee business. Our borrowers who produce coffee for export sold at very low prices during the first payment. They expected they would be compensated during the second payment, but the prices did not improve anyway. As a result, many of them defaulted.* (Interview, 4 May 2016).

Another one said:

> *We are involved in lending to agricultural production, including tea. During the financial crisis tea farmers complained bitterly about low prices paid to them. As a result, some could not pay their loans on time; and a few defaulted altogether.* (Interview, 3 May 2016).

These quotations reveal the effects of the financial crisis brought to farmers and also to NPLs in community banks that lends to export-based produce. The problem was more serious to those banks that lend to coffee production because it resulted into a phenomenon known as a 'credit crunch' problem; i.e., a situation whereby banks are reluctant to take new risks by avoiding committing themselves to new loans (Hou & Dickinson, 2007). The occurrence of this credit crunch is evidenced by the fact that the total loan portfolio in the top three community banks that lend to coffee production decreased significantly from TZS 7.9bn in 2008 to TZS6.8bn in 2009. The balances dropped further to TZS6.8bn in 2010 before bouncing back to TZS 11.3bn when it was clear that the financial crisis had subsided.

When the informants were asked whether the increasing NPLs were a result of bad management as some literature claims, they were not in agreement; and some responded bitterly. One said:

> *I think such allegations are unfair to us. We are competent because we have the necessary qualifications and experience, and frequently attend bank training offered by* BoT *and other trainers. After all we are highly motivated and committed. We want to show that we can perform even under the harsh environment surrounding us. I don't think managers in traditional commercial banks would show the kind of perseverance we demonstrate, given the unfriendly surroundings facing us. It is unfortunate that our efforts are not adequately recognized by the government and you academicians.* (Interview, 4 May 2016).

In demonstrating the kind of harsh environment in which they operate, one informant alleged that while most community banks are located at regional or district headquarters, their customers live as far as 200km or more away in the rural areas. The case with traditional commercial banks is quite different as their customers live within a radius of hardly 20km. Despite the fact that community banks lend to risky sectors of the economy, which are normally avoided by TCBs, community bank management seemed to show a high level of commitment and clear vision to serving the poor. Looking at the kind of environment in which these banks operate, one could be tempted to give them a credit. Thus, although one cannot rule out completely the presence of bad management, empirical evidence shows that bad luck contributed more significantly to the incidence of increasing NPLs in CBs.

4.1.3 Relationship of Cost Efficiency and NPLs Ratio in CCBs and NCCBs

Table 5 presents Tobit regression results regarding the relationship between cost efficiency and NPLs ratio in cooperative community banks (CCBs) as per assumption (hypothesis) (ii).

Table 5: Tobit Regression Results for CCBs Only

Variable	Dependent Variable: NPLsRt (Bad Management Hypothesis)	Dependent Variable: CE (Bad Luck Hypothesis)
$CE\tau$	-0.0853047 (0.0756146)	-
$NPLsR\tau$	-	-0.615377(0.5168907)
Capratio	0.5518655***(0.1893938)	0.1987321(0.5596139)
logassts	0.3874609***(0.0756055)	0.1586529(0.2771326)

Note: *, **, and *** denote significance level at 10, 5 and 1% respectively. Standard errors are shown in brackets

Source: Summarized from BoT Bank data

The results in Table 5 regarding the relationship between CE and NPLs ratio in CCBs as per hypothesis (ii) indicate that the relationship is negative but statistically insignificant. This means the assumption (hypothesis) that there is no relationship between cost efficiency and NPLs in cooperative community banks is not rejected. These results, however, may have been influenced by a small dataset of the cooperative banking sub-sector.

Likewise, similar results were found in NCCBs. Table 6 provides a summary of the Tobit regression in NCCBs in line with hypothesis (iii) for the NCCBs sub-sector. The assumption that there is no relationship between CE and NPLs in NCCBs is not rejected, implying again that increase in NPLs was neither associated with bad management nor bad luck.

A surprising result, however, is the positive relationship between cost efficiency and NPLs ratio in NCCBs, consistent with the skimping hypothesis (Berger & DeYoung, 1997). Nevertheless, the result was insignificant at 10, 5 and 1%. Just like in the CCBs sub-sector, these results are most likely associated with small dataset of NCCBs. A further study may be necessary to confirm these results in future when the dataset is relatively large for CCBs and NCCBs.

Table 6: Tobit Regression Results for NCCBs Only

Variable	Dependent Variable: NPLsRt (Bad Management Hypothesis)	Dependent Variable: CE (Bad Luck Hypothesis)
CE	0.0155706 (0.0406535)	-
NPLsRt	-	0.1175782(0.3820185)
Capratio	-0.1118314***(0.0325324)	0.633342(0.1094505)
Gen	-0.047396(0.0144746)	0.0887763(0.035723)
logassts	-0.24(0.0144746)	0.2450487***(0.0354418)

Note: *, **, and *** denote significance level at 10, 5 and 1% respectively. Standard errors are shown in brackets.

Source: Summarized from BoT bank data.

4.2 Consistency of Empirical Results with Theories and Hypotheses

This study was guided by 'bad management' and 'bad luck' hypotheses based on the NPLs-efficiency relationship framework developed by Berger and DeYoung (1997). The 'bad management' hypothesis holds that the increase of NPLs in banks is a result of inefficiency. According to this hypothesis, low cost efficiency, which signals poor management, is associated with poor administration of daily operations, including ineffective evaluation of loan applicants as well as monitoring of the loan portfolio, which culminates into high NPLs. The 'bad luck' hypothesis, on the other hand, perceives that it is NPLs arising from uncontrollable factors (bad luck) that results into inefficiency in banks. According to this hypothesis, when NPLs increase due to some factors beyond the control of a bank, bank management use more time and other resources to recover problem loans. Such additional managerial efforts lead to increased overall costs, hence low-cost efficiency.

The empirical findings agree with both 'bad management' and 'bad luck' hypotheses that both bad management and bad luck contribute to NPLs and inefficiency in community banks. However, empirical findings further establish that the 'bad luck' hypothesis was more influential in NPLs increase than the 'bad management' hypothesis in community banks in Tanzania. The finding that bad luck, rather than bad management, is more influential is inconsistent with the general knowledge that NPLs increase in smaller banks, including community banks, due to bad management. Furthermore, the results in Table 3 reject the null hypothesis that

there is no relationship between CE and NPLs. The fact is that the relationship is significantly negative and bi-directional; and corresponds to both the 'bad management' and 'bad luck' hypotheses.

5. Conclusions, Policy Implications and Areas for Further Study

5.1 Conclusions

This study contributes to the cost efficiency-NPLs literature by examining the effect of 'bad management' and 'bad luck' hypotheses on NPLs in CBs in Tanzania. The study establishes that both bad management and bad luck contributed to the increase of NPLs in CBs. However, bad luck had an upper hand in the increase of NPLs due to the incident of the global financial crisis that had a negative impact on NPLs in CBs. The increase in NPLs resulted in low cost efficiency in CBs. On the other hand, the relationship between cost efficiency and NPLs in individual bank categories was statistically insignificant, implying that there was no relationship between cost efficiency and NPLs in neither CCBs nor NCCBs. These results were not theoretically expected, but they reflected the effect of the use of small dataset in the analyses of bank categories.

5.2 Policy Implications

With regards to the effect of bad luck on increasing NPLs in CBs, the banks supervisor (notably the BOT) should limit risk exposures to CBs by controlling excessive risk-taking and loan concentration. They should also insist on diversification in various sectors of the economy. Moreover, the government and other development partners should recognize the efforts made by CBs in serving low-income people, given the harsh environment in which they operate. As a way of sustaining them, they can provide both financial and technical support to CBs to enable them to effectively serve the agricultural sector, and thus increase financial inclusion of the avoided rural economy. Since these banks have accumulated a wealth of experience in banking with the poor, they are well-positioned to serve the rural sector if they are enabled financially and technically. On bad management, the banks regulator should continue to provide training to bank managers to improve cost efficiency.

References

Abid. L., M. Ouertani & S. Zouari-Ghorbel; 2014. Macroeconomic and Bank-Specific Determinants of Household's Non-Performing Loans in Tunisia: A Dynamic Panel Data. *Procedia Economics and Finance,* 13: 58–68.

Ahmad, F. & T. Bashir. 2013. Explanatory Power of Bank Specific Variables as Determinants of Non-Performing Loans: Evidence from Pakistan Banking Sector. *World Applied Sciences Journal,* 22(9): 1220–1231.

Aikaeli, J. 2006. Efficiency and the Problem of Excess Liquidity in Commercial Banks in Tanzania. PhD dissertation, University of Dar es Salaam, Tanzania. 162pp.

Altunbas, Y., S. Carbo, E.P.M. Gardener & P. Molyneux. 2007. Examining the Relationships Between Capital, Risk and Efficiency in European Banking. *European Financial Management,* 13 (1): 49–70.

Altunbas, Y., M. H. Liu, P. Molyneux & R. Seth. 2000. Efficiency and Risk in Japanese Banking. *Journal of Banking and Finance,* 24 1605–1628.

Berger, A.N. & R. Deyoung. 1997. Problem Loans and Cost Efficiency in Commercial Banks, *Journal of Banking and Finance,* 21(6): 849–870.

Bank of Tanzania (BoT). 2014. The *Banking and Financial Institutions (Capital Adequacy) Regulations. 2014*.Government Printers, Dar es Salaam. 13pp.

—. 2013. Directorate of Banking Supervision Annual Report 2013. 2013. https: //www. bottz.org/BankingSupervision/Reports/DBS%20ANNUAL%20REPORT%202013.pdf.]

—. 2008. *Report On the 14th Conference of Financial Institutions.* BoT Conference on Second Generation Financial Sector Reforms, 6–7 November. 2008 Arusha, Tanzania. 84pp.

Chang, H., A.M. Cianci, H.C. Hsiao. 2010. First Financial Restructuring and Operating Efficiency: Evidence from Taiwan Commercial Banks. *Journal of Banking & Finance,* 34(7): 1461–1471.

Ernst & Young. 2012. Tanzania Banking Sector Performance Review Year Ending 31st December. 2011. [http: //monfinance.files.wordpress.com/2012/07/2011-tanzania-banking- sector- performance-review-final.pdf] site visited 20/12/2013.

Elegbe, A. 2013. Bank Failure and Economic Development in Nigeria: An Empirical Approach. *British Journal of Economics Finance and Management Sciences,* 8(1): 46–63.

Greenidge, K. & T. Grosvenor. 2010. Forecasting Non-Performing Loans in Barbados. *Journal of Business, Finance and Economics in Emerging Economies,* 5: 80–107.

Gujarat, D.N. 2004. *Basic Econometrics* 4th Edn. Mac-Graw-Hill Companies, New York.

Gup, B.E. & J.R. Walter. 1989. *Top Performing Small Banks: Making Money the Old-Fashioned Way*. Economic Review, Federal Reserve Bank of Richmond.

Hays, H. F., A. Stephen & H. Arthur. 2009. Efficiency Ratios and Community Bank Performance. *Journal of Finance and Accountancy,* 5(2): 1–15.

Hou, Y. & D. Dickinson. 2007. The Non-Performing Loans: Some Bank-Level Evidences. Asia-Link Programme. Research Conference on Safety and Efficiency of the Financial System, 27August, University of Limoges: France.

Karim M., K. Chan, S. Hassan. 2010. Bank Efficiency and Non-Performing Loans: Evidence from Malaysia and Singapore. *Prague Economic Papers. 19* (2): 117 – 132.

Keeton W. & C.S Morris. 1987. *Why Do Bank Loan Loss Differ?* Federal Reserve Bank of Kansas City Review.

Kithinji, A. & N. Waweru. 2007. Merger Restructuring and Financial Performance of Commercial Banks in Kenya. *Economic, Management and Financial Markets Journal,* 2(4): 9–39.

Koutsomanoli-Filippaki, A. & E. Mamatzakis. 2009. Performance and Merton- Type Default Risk of Listed Banks in the EU: A Panel VAR Approach. *Journal of Banking & Finance,* 33(11): 2050–2061.

Louzis, D.P., A.T. Vouldis & V.L. Metaxas. 2010. *Macroeconomic and Bank - Specific Determinants of Non-Performing Loans in Greece: A Comparative Study of Mortgage, Business and Consumer Loan Portfolios*. Working Paper No.118, Bank of Greece. 16pp.

Li, W. & P. Mcmahan. 2015. A Case Study on Loan Loss Analysis of Community Banks. *Journal of Finance and Data Science,* 1(1): 11 – 32.

Mataba L. & J. Aikaeli. 2016. Empirical Analysis of Efficiency of Community Banks in Tanzania. *International Journal of Economics and Finance,* 8(12), December 2016.

Mwamunyange, J. 2009. An Ambitious $1.3b Stimulus Package for Tanzania. *The East African*. [http: //www.theeastafrican.co.ke/news/-/2558/610810/-/r2hev7z/-/index.html] site visited on 15/11/2015.

Nkusu, M. 2011. *Nonperforming Loans and Macro-Financial Vulnerabilities in Advanced Economies*. IMF Working Paper Strategy, Policy, and Review Department, WP/11/161, International Monetary Fund. 27pp.

Ohene-Asare, K. 2011. Nonparametric Efficiency and Productivity Change Measurement of Banks with Corporate Social Responsibilities: The Case for Ghana. PhD thesis, at the University of Warwick, United Kingdom. 301pp.

Podpiera, J. & L. Weill. 2008. Bad Luck or Bad Management? Emerging Banking Market Experience. *Journal of Financial Stability,* 4: 135–148.

Richard, E. 2011. Factors That Cause Non-Performing Loans in Commercial Banks in Tanzania and Strategies to Resolve Them. *Journal of Management Policy and Practice,* 12(7): 50–59.

Rossi, S., M. Schwaiger & G. Winkler. 2005. *Managerial Behaviour and Cost/Profit Efficiency in the Banking Sectors of Central and Eastern European Countries*. Workingpaper No. 96, Austrian National Bank. 42pp.

Sanchez, B., K.M. Hassan, J.R. Bartkus. 2013. Efficiency Determinants and Dynamic Efficiency Changes in Latin America Banking Industries. *Business and Economics Research Journal,* 6(1): 27–52.

Santos, L. & E. Baros. 2011. Small Sample Estimation in Dynamic Panel Data Models: A Simulation Study. *American Open Journal of Statistics,* 1: 58–73.

Soto, M. 2009. *System GMM Estimation with Small Sample*. Barcelona Economics Working Paper Series No.395: Spain. 27pp.

Tracey, M. & H. Leon. 2011. *The Impact of Non-Performing Loans on Loan Growth*. International Monetary Fund Resident Representative Office in Jamaica, Working Papers. 29pp.

United Republic of Tanzania (URT). 1991. *Banking and Financial Institutions Act (BAFIA) 1991*, Dar es Salaam: Government Printers.

Wheelock, D. & P. Wilson. 1995. Evaluating the Efficiency of Commercial Banks: Does Our View of What Banks Do Matter? *Review of Federal Reserve Bank of Saint-Louis*, 77(4): 39–52.

Williams, J. 2004. Determining Management Behaviour in European Banking. *Journal of Banking & Finance,* 28(10): 2427–2460.

Zachariadis, T. 2007. Exploring the Relationship Between Energy Use and Economic Growth with Bivariate Models: New Evidence from G-7 Countries. *Energy Economics,* 29(6): 1233–1253.

Appendix

Table A1: Summary of Estimates of CBs' Annual and Overall Average Efficiency Scores

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

- The mean Cost Efficiency (CE) for the period = 35.5%.
- Technical efficiency under constant returns to scale (TeCRS) = 63.4%
- Technical efficiency under variable returns to scale (TeVRS) = 69.8%
- Scale Efficiency (SE) = 91.9%
- Allocative Efficiency (AE) = 51.9%.