Journal of Research in International Business and Management (ISSN: 2251-0028) Vol. 2(8) pp. 204-212, August, 2012
Available online @http://www.interesjournals.org/JRIBM

Full Length Research Paper

The effect of income classification on bank efficiency in Africa

Roseline Oluitan

Department of Accounting and Finance, Lagos State University
E-mail: roselinetoyin@yahoo.com

Abstract

The role of financial institutions in enhancing growth is settled in the literature. However, banks in Africa are classified as under-developed. This paper examines the situation of these institutions whether they are discharging their duties efficiently. Also considered is the effect of income classification of the countries whether it has any impact on the level of efficiency of the financial institutions. SFA method is applied along with a multi input and output approach. In all, about nine different estimations were conducted. The result suggests about 18 – 26% of inefficiency and that income level is one of the determinants of efficiency within countries in Africa. The study covers ten years for 47 African countries.

Keywords: Income Distribution, Bank Efficiency, Africa.

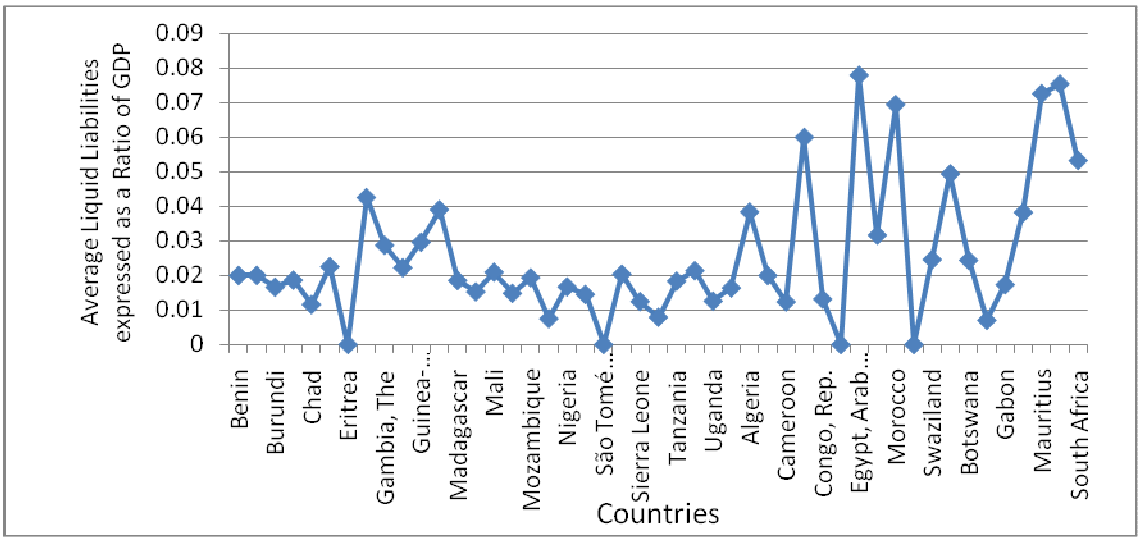
INTRODUCTION

The view that financial institutions enhance the productive base of the economy is prevalent in the literature. However, studies find that the financial sector notably the banking industry in Africa are under-developed and not well positioned to assist their respective economies to grow. Due to these reasons, several firms within the continent will rather seek funding outside the region (if opportune) rather than approach the local financial institutions. This situation suggests a detrimental effect on growth and banking sector development of the continent. Consequently, it is important to examine the efficacy of this institution within the continent.

Efficiency studies which are gaining wider interest in the economic literature can be defined as the ratio of output to the input of any system. The estimation allows a measure of diligence exhibited in the course of performing a specified task which calculates the ability to reduce or avoid waste without reducing the expected output. However, the outputs and inputs of the financial firm must be appropriately classified by considering the criteria on which the financial firm makes decision and analysing the technical aspects of the production and cost for the financial firm (Sealey and Lindley, 1977). They opined that it will prevent inadequate and incomplete use of the fundamentals of firm theory.

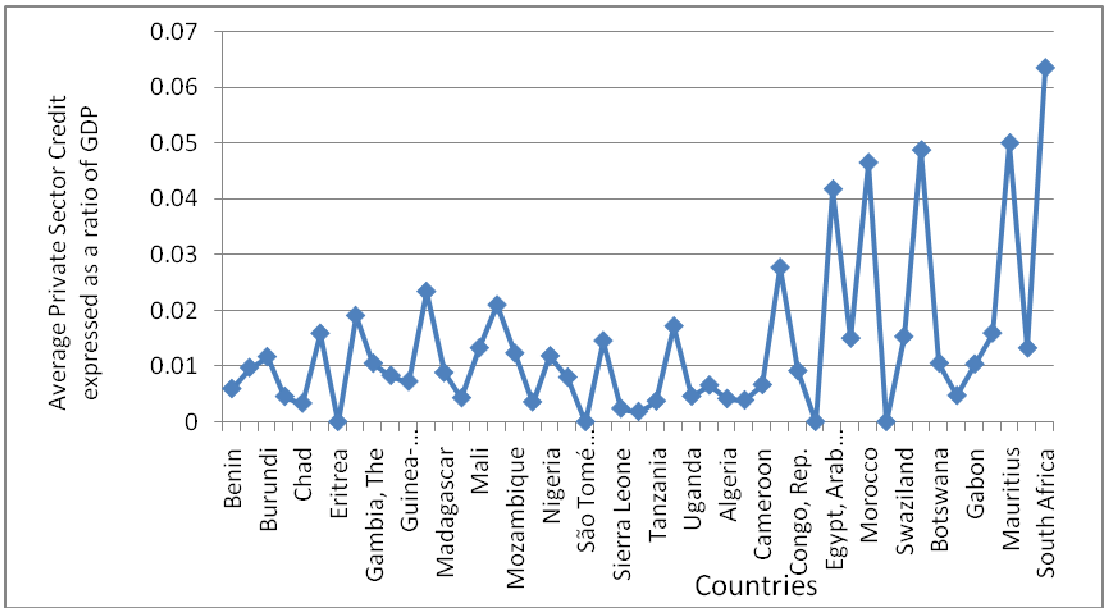
The depth of financial intermediation is low for Africa and may suggest that the level of income for the respective countries is an important determinant. This observation is similar to the postulations of Allen and Ndikumana (1998) that financial development enhances efficiency in the allocation of resources and stimulates the growth process. He further explained that, in economies with unsophisticated financial systems, there are fewer investment opportunities which implies a higher probability that they waste resources on unproductive uses. The situation for the African countries typifies what Allen and Ndikumana (1998) describes above. This is because evidence abounds for areas where investment opportunities exist, but the deposit mobilising institutions does not fund these projects. This scenario, Hao (2006) describes as earlier stated in his study of the relationship between financial intermediation and economic growth in China. According to findings in the study, financial intermediation development only contributes to growth through two channels for the economy. The first is the substitution of loans for state budget and the mobilization of household savings. Loan expansion for the Chinese economy does not contribute to growth because the distribution by the financial intermediaries is inefficient.

To further explain the importance of income classification of the countries in the efficient discharge of banking services, some proxies of financial development such as ratio of average liquid liabilities to GDP and the



Note: Countries are arranged according to their income level classification in ascending order from the left to the right

Figure 1. Ratio of Average Liquid Liabilities to GDP for African Countries between 1998 – 2007



Note: Countries are arranged according to their income level classification in ascending order from the left to the right

Figure 2. Ratio of Average Private Sector Credit to GDP for African Countries between 1998 – 2007

ratio of average Private Sector Credit by the Deposit Money Banks to GDP are presented in scatter plots in figures 1 and 2 below. The countries are arranged based on the income classification of the respective economies. This will assist to examine the type of relationship that exists amongst them. The plots were limited to private sector as a percentage of GDP and liquid liabilities as a percentage of GDP that are considered necessary to show some sort of relationship with countries income classification.

The scatter plots as expected show positive cluster to the right side, which suggests that income classification and financial development are positively related. As earlier mentioned, this observation supports the finding of previous researchers (Beck et al., 2007; Allen and Ndikumana, 1998). It may be difficult to conclude this

statement at this stage, Further enquiry about this will be made in the course of this work. In view of this, the analysis will focus .n the importance of income classification on the level of efficiency by the banks.

There are numerous studies on bank efficiency, but most of them are on the developed and transition economies. These papers focused on different aspects of the banking industry. Berger and Humphrey (1997) conducted a study based on survey of 130 previous studies that covered 21 countries. They find that the various methodologies do not produce consistent result. The concept of inefficiency is not a phenomenon associated with the under-developed, but cuts across levels of development. Berger et al.'s (1997) study on 760 branches of a large US commercial bank suggests that "there are twice as many branches that would minimise cost with the X-inefficiencies more than 20% of operating costs". Casu and Molyneux (2003) support this view in their study of the European banking system using Tobit regression model approach. They find that following the EU legislative harmonisation, there has been a small improvement in bank efficiency levels.

A concept discussed in the literature is the inclusion of firm/country specific variables that could account for some of the variations in the inefficiency term. Battese and Coelli (1995) tried this approach in their panel study on 14 paddy farmers from an Indian village. They find that the model for the technical inefficiency effects, which includes a constant term, age, schooling of farmers and year of observation were a significant component in the stochastic frontier production function. Hollo and Nagy (2006) further discussed this view in their study on bank efficiency in the enlarged European Union and considered the impact of controlling for factors that are country specific but originate from the banks operational environment. They find that controls for such factors reduce the size of the actual gap between the old and new member states (and vice versa). They also find the existence of an X-efficiency gap.

Some studies on efficiency have equally focused at examining the concept of ownership of the banks. Hauner (2005) in his study of the large German and Austrian banks observed that state owned banks are more cost efficient (possibly due to availability of cheaper funds) while cooperative banks are as cost-efficient as private banks. The premise of this study is similar to that of Chen (2009) who examines the efficiency of banks in Sub-Saharan African middle-income countries. They find that banks on average could save between 20-30% of their total costs if they operate on the efficient frontier. Similarly, they opined that foreign banks are more efficient than public banks and domestic banks. The study by Ikhide (2009) on commercial banks in Namibia follows the same line of argument as those discussed above. He opines that commercial banks in the country can increase their efficiency by increasing their current scale of operation while the current level of input combination does not make for maximum efficiency.

The efficiency of the banking sector is an important point that aids the actual realisation of the purpose of the financial sector. One of the major reasons for the establishment of banks is to facilitate the concept of intermediation through re-directing funds from the surplus sector to the deficit sector of the economy. This issue transcends the soundness of banks, but involves positioning sounds banks to provide efficiently the much-needed credit for growth. According to Ikhide (2009), the solvency, strength and soundness of the banking system are germane to the performance of the entire economy. Without a sound and efficiently functioning banking system, the economy cannot function. Due to this reasons amongst others, banking supervisors place a lot of emphasis on banks operational efficiency.

There are two main techniques in the literature to determine the efficiency of institutions. These are the Data Enveloping Analysis method (DEA) and the Stochastic Frontier Analysis method (SFA). These two methods are in use widely and it is somehow difficult to say which is better although they have differing abilities. However, the DEA is a tool that is not efficient with unbalanced panel, whereas SFA is able to cope with it. The panel data available is unbalanced hence the SFA is considered more suitable for the study. In estimating efficiency with SFA, two measures are available in literature, which are the cost function and the production function.

The Stochastic Frontier Analysis

The SFA is a tool useful in estimating the technical inefficiency for both the production and cost estimation. The process involved are essentially the same, but the underlying assumption differs for the two forms of estimation. The cost function approach considers the banks sources of funding as input while the usage of funds proxied by loans are output. This seems rational for the type of the operation of the banking sector, which uses the customers' deposits to create loans. In view of this, the cost function is appropriate and used for the study.In this study, the cost function is used to estimate the efficiency of the banking sector in Africa.

The SFA allows a decomposition of the error term to obtain the level of efficiency and the random error (white noise). Now, let us consider a model in the panel form:

$$Y_{it} = \beta X_{it} + \varepsilon_{it} \qquad (1)$$

Where: -

Y_{it} is the cost (or log) of the i-th firm at time t

X_{it} is a kx1 vector of input and output prices of the i-th firm at time t

β is the vector of unknown parameters

ε_{it} is the error component of the i-th firm at time t which the frontier decomposes further.

When the error term is decomposed, the model with the

SFA becomes

$$Y_{it} = \beta X_{it} + (V_{it} + U_{it}) \quad (2)$$

Where

V_{it} is the symmetric random variable representing errors of approximation and other sources of statistical noise of the i-th firm at time t which is assumed to be iid $[N(0,\sigma_v^2)]$and U_{it} is the non-negative random variable which is assumed to account for technical inefficiency in production and are often assumed to be iid $[N(0,\sigma_u^2)]$. Using the Battese and Coelli (1995) specification, the random variables could be assumed to be iid with a normal or half normal distribution as truncations at zero of the $[N(m_{it},\sigma_u^2)$ and m_{it} represents $Z_{it}\delta + W_{it}$

Z_{it} is a vector of px1 variables, which are capable of influencing the efficiency of a sector specific firm/country while δ is the unknown coefficient for the estimation. W_{it} represents the truncation of the distribution with zero mean and variance σ^2. Therefore the point of truncation is $Z_{it}\delta$; implying that $W_{it} \geq Z_{it}\delta$

Technical efficiency is used to depict the current level of output over maximum output given the level of input. It is the ratio of observed output to the corresponding stochastic frontier output:

$$TE_{it} = \frac{Y_{it}}{exp(X_{it}\beta + V_{it})} = \frac{exp(X_{it}\beta + V_{it} + U_{it})}{exp(X_{it}\beta + V_{it})} = exp(U_{it}) \leq 1 \quad (3)$$

Therefore $TE_{it} = exp(U_{it}) = exp(Z_{it}\delta + W_{it})$

METHODOLOGY

The analysis involves estimating the cost function and assumes that the errors exhibit half-normal distribution. Due to the nature of the banking service sector, a multi-output/input approach is used. Following Sealey and Lindley (1977), the intermediation approach that assumes bank deposits are inputs in the operational cycle is used. The model consists of a three output and three input variables. The variables used for the estimation follow the definition of Hollo and Nagy (2006). The input variables are labour, capital and cost of borrowed funds while the output variables are loans, other earning assets and non-interest income. Unlike the approach of Hollo and Nagy, the output variables are separated and the model estimated with each of the output variables. The model is varied with the inclusion of some variables that are country specific and may likely affect the level of the efficiency as postulated by Battese and Coelli (1995) and Hollo and Nagy (2006). The analysis is further extended by calculating the x-inefficiency after dividing the continent based on the income categorisation of the countries. Data for the study are from datascope – a rich source of financial information. The study covers ten years from 1998 to 2007, for 47 African countries.

The Translog model that is estimated is stated in equations 4 below:

$$Y_{it} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + 0.5\beta_5 X_1^2 + 0.5\beta_6 X_2^2 + \beta_7 X_3^2 + \beta_8 X_4^2 + \beta_9 X_1 X_2 + \beta_{10} X_1 X_3 + \beta_{11} X_1 X_4 + \beta_{12} X_2 X_3 + \beta_{13} X_2 X_4 + \beta_{14} X_3 X_4 + V_{it} + U_{it} \quad (4)$$

Where:

Y_{it} is the logarithm of Total Cost for the firms (banks);

X_1 is the logarithm of output (total loans; other earning assets; other operating income); X_2 is the cost of labour (wages); X_3 is the firm's capital and X_4 represents the cost of borrowed funds.

To examine the level of inefficiency, U_{it} is modelled as a half normally distributed random variable that can be influenced by some macro-economic variables. Similar to the input an output variables, these macro-economic variables follow the definition of Hollo and Nagy (2006) and they are inflation (INF), private sector credit as a percentage of GDP (PSCRGDP), liquid liabilities as a percentage of GDP (LLY) and domestic bank assets as a percentage of GDP (DBAGDP). All the macro-economic variables are from Beck et al (2000) database. Thus the technical efficiency equation is:

$$U_{it} = \delta_0 + \delta_1 PSCRGDP_{it} + \delta_2 DBAGDP_{it} + \delta_3 LLY_{it} + \delta_4 INF_{it} + W_{it}$$

Where: -

PSCRGDP is Private Sector Credit by the Deposit Money Banks as a percentage of GDP

DBAGDP is Domestic Bank Assets as a percentage of GDP

LLY is Liquid Liabilities as a percentage of GDP and

INF is Inflation Rate

These variables are not in log form in the regression because they are expressed as a ratio by definition.

DATA – ANALYSIS AND SUMMARY RESULT

The bank specific data used for this study is from BankScope. The data covers forty-seven African countries. Data obtained are in respect of banks classified as commercial bank by the database. The exchange rate obtained from the IFS is used to change the data to their respective dollar value. Beck et al database is the source for the macro-economic variables.

The three outputs employed in the analysis are - Loans, Other Earning Assets and Other Operating Income. The input and netput variables are Labour, Physical Capital and Cost of Funds. Labour data is personnel expenses as a ratio of total assets. The Physical Capital is the difference between non-interest expenses and personnel expenses as a ratio of total assets. Lastly, cost of funds is interest expenses as a ratio of total deposit. The dependent variable is total cost, which is obtained from the addition of interest expenses and non-interest expenses (including personnel expenses). All the variables are in log form for the estimation.

In total about three hundred and twenty nine (329)

Table 1. Summary Statistics for Bank Related Variables in Africa 1998-2007

	Cost of Funds	Labour Expenses	Loans	Other Earning Assets	Other Operating Income	Physical Capital	Total Cost
Mean	-2.070	-1.923	1.388	1.320	1.586	-1.112	0.852
Median	-1.950	-1.815	1.540	1.410	1.810	-0.550	0.790
Maximum	1.460	0.240	5.130	4.560	5.160	1.940	4.220
Minimum	-5.870	-5.730	-1.270	-2.340	-1.090	-4.950	-2.190
Std. Dev.	1.860	1.922	1.111	1.093	1.198	1.364	0.818
Jarque-Bera	314.383	383.986	100.185	77.383	122.016	264.974	190.986
Observations	3290	3290	3290	3290	3290	3290	3290

banks are included in the analysis from forty-seven African countries (comprising of medium and low income). Summary Statistics presented in Table 1 below shows that the variables are widely dispersed from each other. The figure for all the variables average about 6.0 as shown by the minimum and maximum values. This is anticipate because of the difference in the income level of the countries. Nonetheless, the variables exhibit normality with the Jarque-Bera result.

Interpretation of Analysis

The result contains three different estimations that have the dependent variable different. As mentioned earlier, the three output variables, namely Loans, Other Earnings and Other Operating Income are the dependent variable, applied individually in each of the regressions. Due to the type of modelling involved with the translog function estimation, it therefore means that all the variables for each of the regressions will not essentially be the same.

To account for estimation based on the level of income and ascertain whether it plays a role in the level of efficiency of the financial system, the countries are divided based on the two main income levels within the continent i.e. medium or low while the third estimation is on the continent.. The result of this estimation is presented in tables 2, 3 and 4 below for each of the output variables. The result in table 2 represents when bank loan is the output variable. This approach is to facilitate comparison amongst the three different types of combination included in the analysis. The same procedure applies to the other output variables and their results shown in tables 3 and 4 below.

When bank loan is the output variable, the likelihood ratio test affirms the joint significance of the sum of variance ($\sigma 2$) and gamma (γ). Both $\sigma 2$ and γ are significant for the three estimations. This posits that efficiency is important for these banks. The efficiency level for the medium income countries, which is 0.94, is significantly higher than 0.74 obtained for the countries grouped together. The efficiency level for the low-income countries is 0.11. This implies that banks in medium income countries are far more efficient than the low-income countries. It also suggests that while inefficiency in the medium income economies is limited to below 10 percent that of low-income countries is as high as possibly 90 percent. Domestic bank assets as a percentage of GDP has a negative coefficient for the low-income countries, which may suggest poor asset base by the financial institutions in these countries.

This result supports the importance of income classification and suggests that the poor level of development of the financial sector in the low-income economies is a major factor for inefficiency. It also suggests that efficiency is important for banks in Africa (including medium and low-income countries), but the current level of efficiency in the low-income countries is poor. The result did not make any appreciable difference when other earnings are the output variable. Rather, the coefficient for gamma (γ) for low-income countries is not significant. Other variables follow similar line of discussion as enumerated above in all the results. The same observation applies when other operating income is the output variable in table 4 below.

From these results, it is possible to postulate that bank loans is a better output variable than the other two output variables. Despite the poor level of the development of the financial sector in the low-income economies, use of bank loans produced some level of significance for the measure of inefficiency (gamma - γ). It is able to explain efficiency in cost estimation function more than the other output variables. The study also suggests that the model is responsive to the definition of the output variable (bank loans).

CONCLUSION

In this paper, the level of efficiency of banks in Africa over ten years is estimated. The SFA methodology is used and the countries divided according to the level of income of the respective countries. The work involves use of three output variables and three input/netput variables.

Table 2. Estimation Output of Cost Efficiency with Loans as Output Variable for African Countries 1998 – 2007

Bank Specific Variables/Country Combination	All Countries	Medium Income	Low Income
Constant	-0.11*** (0.01)	-0.17*** (0.01)	-0.13*** (0.03)
Loans	0.44*** (0.02)	0.28*** (0.03)	0.24*** (0.03)
Labour	-0.08*** (0.02)	-0.05 (0.04)	-0.21***(0.02)
Physical Capital	0.24*** (0.03)	0.19*** (0.08)	0.23*** (0.03)
Cost of Funds	-0.07*** (0.03)	-0.19*** (0.05)	-0.01 (0.03)
Half Square of Loans	0.15*** (0.01)	0.08*** (0.01)	0.28*** (0.02)
Half Square of Labour	-0.04*** (0.01)	-0.09*** (0.02)	-0.05***(0.01)
Half Square of Physical Capital	-0.03 (0.02)	-0.14*** (0.03)	0.05*** (0.02)
Half Square of Cost of Funds	-0.05*** (0.01)	-0.05*** (0.02)	-0.05***(0.01)
Loans *Labour	-0.00 (0.01)	-0.05*** (0.01)	0.02** (0.01)
Loans *Physical Capital	0.00 (0.01)	0.06*** (0.02)	0.01 (0.01)
Loans * Cost of Funds	-0.01 (0.01)	-0.13*** (0.01)	-0.04***(0.01)
Labour* Physical Capital	0.04*** (0.01)	0.16*** (0.01)	-0.01 (0.01)
Labour* Cost of Funds	-0.02*** (0.01)	-0.08*** (0.01)	-0.01** (0.01)
Physical Capital * Cost of Funds	0.06*** (0.01)	0.00 (0.02)	0.07*** (0.01)
EFFICIENCY RESULT			
Economy Specific Variables	All Countries	Medium Income	Low Income
Constant	-0.82*** (0.07)	-2.31*** (0.29)	0.09** (0.04)
Private Sector Credit as % of GDP	-5.99### (0.57)	-7.86### (0.96)	-1.40### (0.57)
Domestic Bank Assets as a % of GDP	2.43*** (0.28)	6.23*** (0.84)	0.45 (0.32)
Liquid Liabilities as a % of GDP	-0.27 (0.28)	-3.33*** (0.54)	0.08 (0.16)
Inflation	0.00*** (0.00)	0.00*** (0.00)	0.01*** (0.00)
σ2	0.25*** (0.01)	0.77*** (0.07)	0.06*** (0.00)
γ	0.74*** (0.01)	0.94*** (0.01)	0.11** (0.05)
Log likelihood	-506.86	-282.07	76.44
Likelihood ratio test	388.22	355.44	126.67

Note: Figures in parenthesis ( ) are the Standard error of the variables. The symbols of ***; ** and * depicts 1%; 5% and 10% level of significance for the coefficients and with the expected sign while ###; ## and # depicts 1%; 5% and 10% level of significance but the sign of the coefficient does not tally with the literature

Table 3. Estimation Output of Cost Efficiency with Other Earnings as Output Variable for African Countries 1998 – 2007

Bank Specific Variables/Country Combination	All Countries	Medium Income	Low Income
Constant	-0.15*** (0.01)	-0.20*** (0.02)	-0.13*** (0.02)
Other Earnings	0.47*** (0.02)	0.33*** (0.03)	0.26*** (0.03)
Labour	-0.05** (0.02)	-0.01 (0.05)	-0.16*** (0.03)
Physical Capital	0.04 (0.03)	-0.19*** (0.08)	0.11*** (0.03)
Cost of Funds	-0.12*** (0.03)	-0.27*** (0.06)	-0.07*** (0.03)
Half Square of Other Earnings	0.07*** (0.01)	0.05*** (0.02)	0.22*** (0.02)

Table 3. Continue

Half Square of Labour	-0.04*** (0.01)	-0.07*** (0.02)	-0.04*** (0.01)
Half Square of Physical Capital	-0.03 (0.02)	-0.04 (0.04)	0.02 (0.02)
Half Square of Cost of Funds	-0.09*** (0.01)	-0.12*** (0.02)	-0.07*** (0.01)
Other Earnings*Labour	-0.02*** (0.01)	-0.03** (0.01)	-0.01* (0.01)
Other Earnings* Physical Capital	0.05*** (0.01)	0.07*** (0.02)	0.02 (0.02)
Other Earnings* Cost of Funds	-0.04*** (0.01)	-0.10*** (0.02)	-0.03*** (0.01)
Labour* Physical Capital	0.03*** (0.01)	0.07*** (0.02)	-0.00 (0.01)
Labour* Cost of Funds	-0.02*** (0.01)	-0.02 (0.01)	-0.02*** (0.01)
Physical Capital * Cost of Funds	0.05*** (0.01)	-0.06*** (0.02)	0.06*** (0.01)
EFFICIENCY RESULT			
Economy Specific Variables	All Countries	Medium Income	Low Income
Constant	-1.19*** (0.16)	-1.20*** (0.26)	0.09*** (0.01)
Private Sector Credit as % of GDP	-1.98### (0.32)	-2.90### (0.62)	2.54### (0.27)
Domestic Bank Assets as a % of GDP	6.23*** (0.72)	7.70*** (1.28)	-1.46*** (0.28)
Liquid Liabilities as a % of GDP	4.82*** (0.60)	-6.21*** (1.02)	-0.21 (0.13)
Inflation	-0.00*** (0.00)	-0.01*** (0.00)	0.00*** (0.00)
σ2	0.33*** (0.02)	0.53*** (0.07)	0.06*** (0.00)
γ	0.76*** (0.02)	0.83*** (0.03)	0.00 (0.00)
Log likelihood	-912.22	580.71	-52.09
Likelihood ratio test	209.31	164.18	111.46

Note: Figures in parenthesis ( ) are the Standard error of the variables. The symbols of ***; ** and * depicts 1%; 5% and 10% level of significance for the coefficients and with the expected sign while ###; ## and # depicts 1%; 5% and 10% level of significance but the sign of the coefficient does not tally with the literature.

Table 4. Estimation Output of Cost Efficiency with Other Operating Income as Output Variable for African Countries 1998 – 2007

Bank Specific Variables/Country Combination	**All Countries**	**Medium Income**	**Low Income**
Constant	-0.11*** (0.01)	-0.18*** (0.01)	-0.17*** (0.04)
Other Operating Income	0.41*** (0.02)	0.28*** (0.03)	0.11*** (0.03)
Labour	-0.10*** (0.02)	-0.04 (0.05)	-0.25*** (0.02)
Physical Capital	0.05 (0.03)	-0.12 (0.09)	0.21*** (0.03)
Cost of Funds	0.15*** (0.02)	-0.00*** (0.06)	0.07*** (0.02)
Half Square of Other Operating Income	0.11*** (0.01)	0.05*** (0.02)	0.28*** (0.02)
Half Square of Labour	-0.05*** (0.01)	-0.06*** (0.02)	-0.04*** (0.01)
Half Square of Physical Capital	-0.07*** (0.02)	-0.13*** (0.03)	0.03** (0.02)
Half Square of Cost of Funds	-0.02*** (0.01)	-0.09*** (0.02)	-0.05*** (0.01)
Other Operating Income*Labour	-0.02** (0.01)	-0.04*** (0.01)	0.01* (0.01)
Other Operating Income* Physical Capital	0.05*** (0.01)	0.11*** (0.03)	0.01 (0.01)
Other Operating Income* Cost of Funds	-0.07*** (0.01)	-0.18*** (0.02)	-0.07*** (0.01)
Labour* Physical Capital	0.04*** (0.01)	0.12*** (0.02)	-0.01 (0.01)
Labour* Cost of Funds	-0.03*** (0.01)	-0.06*** (0.01)	-0.02*** (0.00)
Physical Capital * Cost of Funds	0.07*** (0.01)	0.00*** (0.02)	0.07*** (0.01)

Table 4. Continue

EFFICIENCY RESULT			
Economy Specific Variables	All Countries	Medium Income	Low Income
Constant	-5.46*** (0.17)	-1.52*** (0.20)	0.15*** (0.04)
Private Sector Credit as % of GDP	-3.78### (0.63)	-3.85### (0.53)	0.38# (0.22)
Domestic Bank Assets as a % of GDP	8.82*** (0.82)	7.65*** (0.95)	0.07 (0.21)
Liquid Liabilities as a % of GDP	4.28*** (0.28)	-5.74*** (0.73)	-0.36*** (0.10)
Inflation	0.01*** (0.00)	0.00 (0.00)	0.01*** (0.00)
σ2	0.60*** (0.02)	0.53*** (0.04)	0.04*** (0.00)
γ	0.82*** (0.00)	0.90*** (0.01)	0.00 (0.06)
Log likelihood	-254.55	-313.94	319.66
Likelihood ratio test	582.04	351.97	71.39

Note: Figures in parenthesis ( ) are the Standard error of the variables. The symbols of ***; ** and * depicts 1%; 5% and 10% level of significance for the coefficients and with the expected sign while ###; ## and # depicts 1%; 5% and 10% level of significance but the sign of the coefficient does not tally with the literature

The estimation with countries income classification includes introducing the output variables individually into the model. This results in nine different estimations. The translog function estimated shows that the level of inefficiency of the financial sector within the Continent ranges from about 18-26 percent. The result for the estimation according to the income classification of the countries shows that much of the inefficiency within the continent is attributable to the low-income countries. The efficiency of the medium income countries is even higher than the average within the continent..

Much of the inefficiency within the continent is a result of poor intermediation and possibly low skilled staff. This is because the labour cost is tiny and is negatively correlated. Similarly, the macro-economic variable proxied by private sector credit expressed as a percentage of GDP also carries a negative coefficient. This explains the under-development of the sector.

An observation from this study is that the level of intermediation to the private sector by these banks is important for inefficiency. This is in addition to the seeming under development of the capital market, places a lot of reliance on the money market. Where inefficiency exists, it is bound to have serious impact on the economies. Banks in Africa, mostly those in the low-income countries should be poised to eliminate inefficiency through reduction in cost of banking transactions and by ensuring good level of intermediation mostly for the real sector of their economies.

REFERENCES

Aigner DJ, Lovell CA, Schmidt P (1977). "Formulation and Estimation of Stochastic
Frontier Production Function Models.," *J. Econometrics* 6, 21- 37.

Allen DS, Ndikumana L (1998) "Financial Intermediation and Economic Growth in Southern Africa" Working Paper Series 1998-004, *The Federal Reserve Bank of ST. Louis*, available On-line: http://ressearch.stlouifed.org/wp/1998/98-004.pdf

Battese GE, Coelli TJ (1995). A model for technical inefficiency effects in a stochastic frontier production function for panel data. Empirical Economics, 30: 325-332

Bauer P, Berger A, Humphrey D (1992). Efficiency and productivity growth in US banking. In Fried, H. O., Lovell C. A. and P. Schmidt (eds), *The Measurement of Productivity Efficiency; Techniques and Applications*. Oxford: Oxford University Press, 386-413.

Beck T, Demirguc-Kunt A, Levine R (2007). "Finance, Inequality and the Poor" *J. Economic Growth* 12(1) pp 27 – 49.

Berger A, Humphrey D (1997). Efficiency of Financial Institutions: International Survey and Directions for future Research. Journal of Operations Research, Special issue on New Approaches in Evaluating the Performance of Financial Institutions.

Berger AN, Leusner JH, Mingo JJ (1997). The Efficiency of Bank Branches. J. Monetary Economics, vol. 40, pp141-162.

Berger AN, Hasan I, Klapper LF (2004). Further Evidence on the link between Finance and Growth: An International Analysis of Community Banking and Economic Performance. Bank of Finland Discussion Papers.

Casu B, Molyneux P (2003). "A Comparative Study of Efficiency in European Banking" *Applied Economics, Taylor and Francis J.,* vol. 35(17), pages 1865-1876,

Chen C (2009) Bank Efficiency in Sub-Saharan African Middle-Income Countries. IMF Working Paper No. 14

Coelli TJ (1996) A Guide to Frontier Version 4.1: A Computer Program for Stochastic Frontier Production and Cost Function Estimation. CEPA Working Paper

Duffy J, Papageorgiou C (2000), "A Cross-Country Empirical Investigation of the Aggregate Production Function Specification," Journal of Economic Growth 5, 83 - 116.

Hao C (2006) "Development of Financial Intermediation and Economic Growth: The Chinese Experience" *China Economic Review*, Vol 17, Issue 4, pp 347-362

Hauner D (2005) Explaining Efficiency differences among large German and Austrian banks. J. Applied Economics, 37:9, pp 969-980.

Hollo D, Nagy M (2006). Bank efficiency in the enlarged European Union. Bank for International Settlement, vol. 26, part 13: 217-235.

Ikhide S (2009). Measuring the Operational Efficiency of Commercial Banks in Namibia. South African J. Economics, 76(4):586-595.

IMF (2007). Namibia: Financial system Stability Assessment. IMF Country Report No. 07/83. IMF, Washington, DC.

Rioja F, Valev N (2003). “Does One Size Fit All?: A Re-examination of the Finance and Growth Relationship” *Social Science Research Network*

Sealey C, Lindley J (1977). Inputs, Outputs and a Theory of Production and Cost at Depository Financial Institutions. *The J. Fin.* 32(4):pp 1251-1266.

Stiglitz J (2002) *Globalization and Its Discontents*; W. W. Norton and Company Inc; April.

Vittas D (1991). Measuring Commercial Bank Efficiency Policy Research Working Papers Series, Country Economic Development, *The World Bank*, Washington DC, November.