

The Effect of Regional Classification on Bank Efficiency in Africa

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Abstract

This study examines the efficiency of the financial sector in African countries based on the five regional classifications. It investigates the relevance of the financial institutions in ensuring efficient distribution of economic resources. Empirical evidence supports a sound intermediation process and efficiency in the banking system (Vittas, 1991; Howard & Haynes, 2001). The paper estimates the cost function with the use of a single-output (loans) and multi-input approach. The input variables consist of capital, deposits and labour (overhead). The study observes that regions with more high income countries are less efficient hence made postulations in respect of the causes for the inefficiency and the possible remedies. The research comprises of Commercial banks from about forty seven African countries for a period of ten years.

JEL Classification: G21, N27, O16.

Keywords: Bank, Efficiency and Africa

1.0 Introduction

The concept of bank efficiency is assuming wider interest in economic literature. This can be defined as the ratio of output to the input of any system which is a measure of diligence exhibited in the course of performing a specified task. An efficient system is a viable tool for the reduction or possible elimination of waste without reduction in the expected output. A similar view was postulated by Sealey and Lindley (1977), the lack of success of previous studies in developing a positive theory of the financial firm can be attributed to the inadequate or incomplete use the fundamentals of firm theory. They observed that previous researchers failed firstly to “appropriately classify outputs and inputs of the financial firm by failing to consider the criteria on which the financial firm makes decision and secondly to analyse the technical aspects of the production and cost for the financial firm”. Knowledge of this assists the management to make decisions that are consistent with economic principles.

Other studies examine access to finance by firms and households as a bane to bank efficiency. The study by World Bank (2006) on “Making Finance work for Africa” postulates that finance within the continent is shallow and fraught with limited access. The economic environment is difficult with little progress made over time. In this paper, the efficiency of the financial institutions posited by the deposit money banks is examined based on regional classification of the sample.

Previous studies on bank efficiency have focused more on the developed and transition economies though examined 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. The efficiency of the banking sector is an important point that aids the actual realisation of the purpose of the financial sector. 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, bank supervisors place a lot of emphasis on banks operational efficiency. The paper also considered the inclusion of firm/country specific variables which is considered as capable of taking care of the variations in the inefficiency term. (Battese and Coelli,1995; Hollo and Nagy, 2006).

This study is a follow up on previous studies that examined efficiency of banks in Africa. According to Oluitan (2012), the level of inefficiency of the financial sector in Africa ranges from about 10-26 percent. A subsequent study based on 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. In view of this, this paper analyses the efficiency of banks in Africa based on sub-regional groupings. There are five sub-regions within the continent namely North Africa; West Africa; South Africa; East Africa and Central Africa.

All these sub-regions will be included in the analysis.

Efficiency studies usually involve estimating the efficient frontier and determining the extent of deviations from the efficient frontier by each cross-section. It involves the use of either the Data Enveloping Analysis (non-parametric) or the Stochastic Frontier Analysis (parametric). The difference lies on the assumptions imposed on the data, although there is no consensus on the preferred method for determining the efficient frontier (Berger and Humphrey, 1997). In essence, the approaches differ in the extent of the shape imposed on the frontier along with the distributional assumptions imposed on the random error and inefficiency.

The DEA assumes that there is no random error in the estimated relationship and suites best a balanced panel. However, the SFA allows for the specification of the functional form for the estimated relationship and provides random error, which is decomposed to allow for estimation of the technical efficiency. The procedure assumes that part of the error component (composed) captures the inefficiencies of the system and that these errors are asymmetrically distributed. The random error component is symmetrically distributed. Due to this reason, the SFA is used, not because it is a better tool (as that cannot be asserted), but rather because it suits the study being proposed and more suitable for unbalanced panel which characterises the data that is used for the analysis.

2.0 Methodology

SFA analysis involves the estimation of either or both the cost and the profit function. In this paper, the cost function which assumes that the errors exhibit half-normal distribution is estimated. This will involve the estimation of Translog methodology to explain the model.

To determine the variables, the intermediation approach that assumes bank deposits are inputs in the operational cycle is used (Sealey and Lindley, 1977). The model involves the use of one output (loans) 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. 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 Translog model that is estimated is:

$$Y_{it} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + 0.5\beta_5 X_1^2 + 0.5\beta_6 X_2^2 + \beta_7 X_3^2 + \beta_8 X_4^2 + \beta_9 X_1 X_2 + \beta_{10} X_1 X_3 + \beta_{11} X_1 X_4 + \beta_{12} X_2 X_3 + \beta_{13} X_2 X_4 + \beta_{14} X_3 X_4 + V_{it} + U_{it} \quad (8)$$

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 and 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 (PSCR GDP), 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:

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

Where: -

PSCR GDP 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.

2.1 Data – Definition 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 data is transformed by changing the various countries currency to their respective dollar value using the exchange rate obtained from the IFS. Data for the macro-economic variables are from Beck et al database. According to Oluitan (2012) three outputs can be employed for the SFA analysis. These are - Loans, Other Earning Assets and Other Operating Income. However, bank loans is considered more potent is determining the efficiency of banks in Africa hence used for this estimation. The variables are as defined by datascopes. 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 I obtain 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) banks are included in the analysis from forty-seven African countries. 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 anticipated because of the difference in the income level of the countries. Nonetheless, the variables exhibit normality with the Jarque-Bera result.

Table 5.1: 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

3.0 Analysis and Interpretation

As earlier mentioned, bank loans is the only output variable used against three input/netput variables and four macro-economic variables. The result for the estimation is presented in tables 2 and 3 below.

Table 2: - Estimation Output of Cost Efficiency for the Sub-Regions in Africa 1998 – 2007

Bank Specific Variables/Country Combination	NORTH AFRICA	WEST AFRICA	SOUTH AFRICA
Constant	-0.18*** (0.02)	-0.07*** (0.01)	-0.12*** (0.01)
Loans	0.22*** (0.04)	0.39*** (0.03)	0.04 (0.03)
Labour	0.04 (0.06)	-0.04 (0.05)	-0.16*** (0.04)
Physical Capital	-0.03 (0.10)	0.39*** (0.06)	0.27*** (0.07)
Cost of Funds	-0.21*** (0.07)	-0.21*** (0.04)	-0.33*** (0.05)
Half Square of Loans	0.04** (0.02)	0.23*** (0.02)	0.15*** (0.02)
Half Square of Labour	-0.14*** (0.04)	-0.06*** (0.02)	-0.21*** (0.02)
Half Square of Physical Capital	0.08* (0.05)	-0.11** (0.06)	-0.23*** (0.04)
Half Square of Cost of Funds	-0.27*** (0.04)	-0.08*** (0.02)	-0.09*** (0.03)
Loans *Labour	-0.03* (0.01)	-0.04** (0.02)	0.18*** (0.02)
Loans *Physical Capital	0.13*** (0.03)	-0.03 (0.02)	0.11*** (0.03)
Loans * Cost of Funds	-0.26*** (0.02)	0.05** (0.02)	-0.00 (0.02)
Labour* Physical Capital	0.09*** (0.02)	0.04* (0.02)	0.17*** (0.02)
Labour* Cost of Funds	0.01 (0.02)	-0.02 (0.02)	-0.07*** (0.01)
Physical Capital * Cost of Funds	0.00 (0.02)	0.13*** (0.03)	0.13*** (0.03)
EFFICIENCY RESULT			
Economy Specific Variables	NORTH AFRICA	WEST AFRICA	SOUTH AFRICA
Constant	-2.89*** (0.34)	0.12*** (0.04)	-0.51*** (0.12)
Private Sector Credit as % of GDP	- 19.06###(2.05)	-0.07### (1.28)	2.33*** (0.84)
Domestic Bank Assets as a % of GDP	13.59*** (1.34)	-0.08 (0.42)	-1.18 (0.83)
Liquid Liabilities as a % of GDP	-4.38*** (0.67)	2.05*** (0.46)	-1.69*** (0.37)
Inflation	0.03*** (0.01)	0.00*** (0.00)	0.00 (0.00)
σ^2	1.17*** (0.11)	0.04*** (0.00)	0.19*** (0.02)
γ	0.96*** (0.01)	0.72*** (0.03)	0.88*** (0.02)
Log likelihood	-216.47	477.60	161.63
Likelihood ratio test	351.32	118.66	126.68

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.

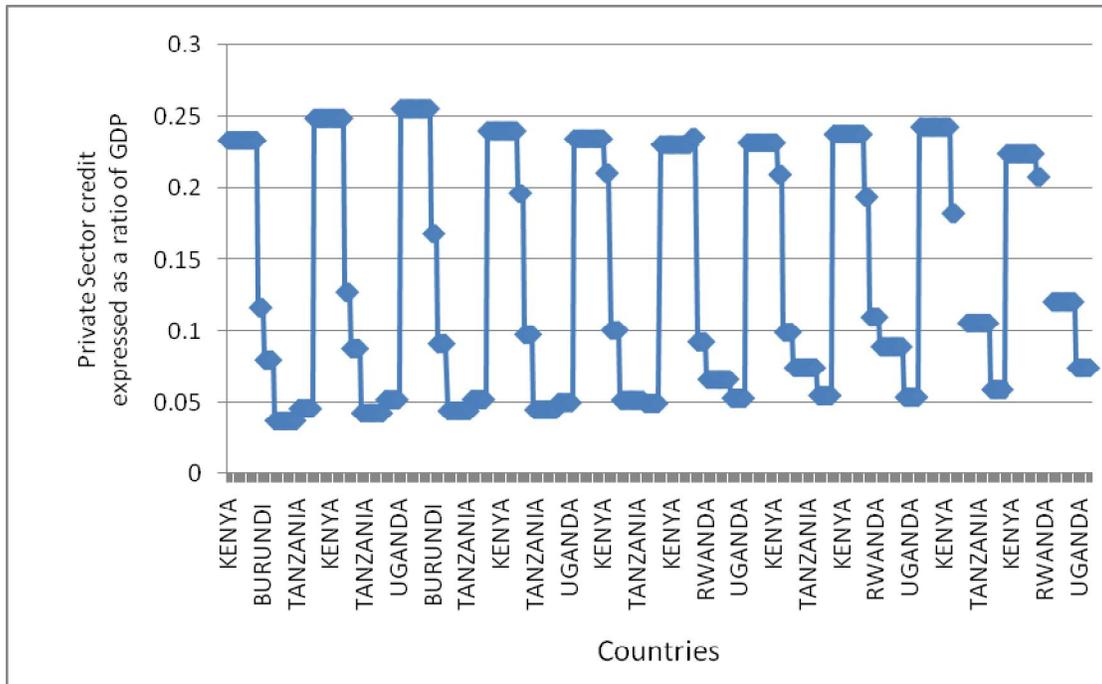
Table 3: Estimation Output of Cost Efficiency for the Sub-Regions in Africa 1998 – 2007 (continuation)

Bank Specific Variables/Country Combination	EAST AFRICA	CENTRAL AFRICA
Constant	-0.07*** (0.01)	-0.10*** (0.03)
Loans	-0.13*** (0.04)	-0.32** (0.15)
Labour	0.08** (0.03)	-0.22 (0.17)
Physical Capital	-0.49*** (0.06)	-1.20*** (0.23)
Cost of Funds	0.05 (0.03)	0.09 (0.11)
Half Square of Loans	0.17*** (0.03)	0.61*** (0.14)
Half Square of Labour	-0.01 (0.02)	-0.20** (0.10)
Half Square of Physical Capital	-0.22*** (0.03)	-0.23*** (0.04)
Half Square of Cost of Funds	-0.08*** (0.01)	-0.05*** (0.02)
Loans *Labour	-0.06*** (0.01)	-0.11 (0.08)
Loans *Physical Capital	0.07*** (0.02)	0.15* (0.09)
Loans * Cost of Funds	-0.17*** (0.02)	-0.02 (0.03)
Labour* Physical Capital	0.01 (0.01)	-0.09 (0.06)
Labour* Cost of Funds	-0.01*** (0.01)	0.06 (0.04)
Physical Capital * Cost of Funds	0.05*** (0.01)	-0.02 (0.04)
EFFICIENCY RESULT		
Economy Specific Variables	EAST AFRICA	CENTRAL AFRICA
Constant	-5.23*** (1.23)	0.17*** (0.05)
Private Sector Credit as % of GDP	11.29*** (2.76)	-0.85 (2.11)
Domestic Bank Assets as a % of GDP	-21.70*** (4.96)	-7.81*** (3.00)
Liquid Liabilities as a % of GDP	18.79*** (4.19)	3.15*** (1.07)
Inflation	-0.03*** (0.01)	-0.00*** (0.00)
σ^2	0.46*** (0.10)	0.03*** (0.00)
γ	0.98*** (0.00)	0.52*** (0.14)
Log likelihood	352.01	76.99
Likelihood ratio test	119.64	15.13

*Standard error in parenthesis while ***, ** and * denotes 1%, 5% and 10% level of significance*

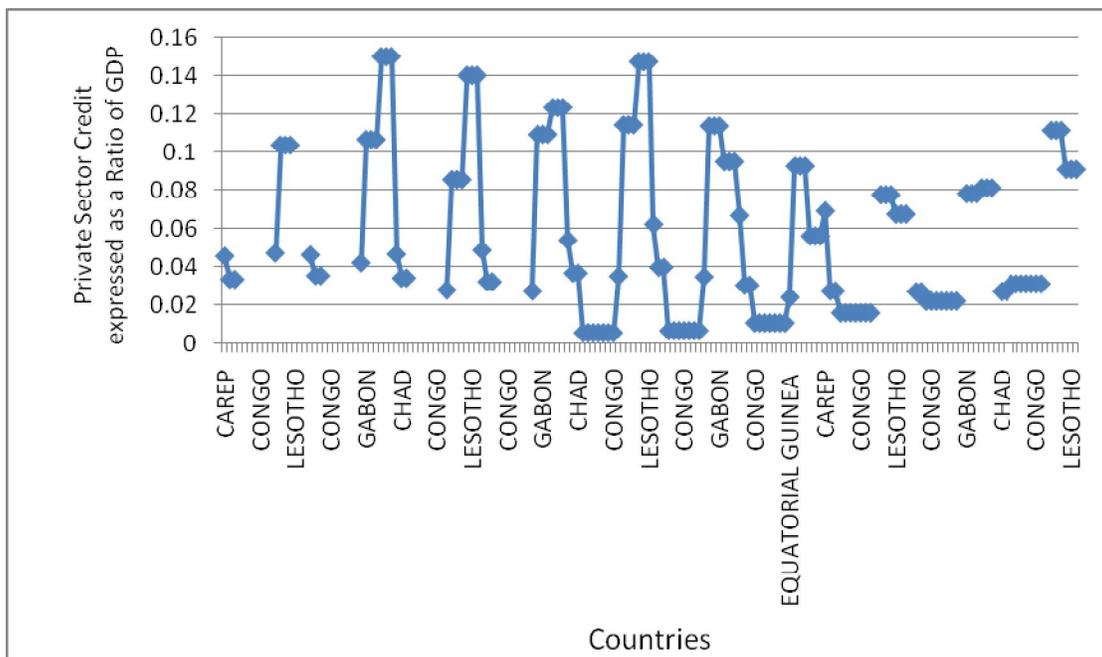
From the result, the highest efficiency is attributable to East Africa with 0.98, followed by North Africa with 0.96; South Africa with 0.88 and West Africa with 0.72. The astonishing aspect is the result for Central Africa, which shows an efficiency level of 0.52. This implies that most of the inefficiency attributable to the continent is a result of the inefficiency of the Central African countries. One basic observation is that this sub-region is the only place where private sector as a percentage of GDP is not significant. Consequently, the variable for the most efficient sub-region and the least efficient sub-region is presented in graphical form. A perusal of the charts in figures 1 and 2 presented below show that the private sector credit for the most efficient sub-region in Africa (East Africa) ranges between 0.03 and 0.26 while that of the least efficient sub-region ranges between 0.00 and 0.15. This suggests that when private sector credit is below a specified minimum level, it may not be capable to support the efficiency of the institutions sufficiently.

Figure 1: Private Sector Credit as a ratio of GDP for East African Countries



Source: - The World Bank Development Indicator (2007)

Figure 2: Private Sector Credit as a ratio of GDP for Central African Countries



Source: - The World Bank Development Indicator (2007)

This assumption therefore supports the postulation of Rioja and Valev (2003) which postulates that there is a minimum threshold of 14% for private sector credit to attain before it can positively impart the economy. If we apply this postulation to the Central African countries, only three countries attain this minimum threshold. This could be one of the reasons why there is high level of inefficiency within the sub-region.

4.0 Conclusion

In this paper, the level of efficiency of banks in Africa is investigated over ten years. The SFA methodology is used and the countries are classified according to the sub-regions in Africa. The Central African sub-region that has more middle-income countries such as Gabon, Lesotho and Congo Republic than areas like the West African sub-region is the least efficient. The sub-region also has the coefficient for private sector credit insignificant. East Africa and North Africa have very high and comparable efficiency output. Other sub-regions are not below 0.70 efficiency level.

The study also finds that the coefficient for Private Sector Credit which is not significant in the Central African sub-region has opposite effect in the other regions. A further look at this variable shows that this sub-region actually has the lowest ratio of Private Sector Credit to GDP over the years. This suggests that the volume of intermediation to the growth-promoting sector of the economy (private sector credit) is important in determining the level of efficiency of the financial institutions and by extension the level of development within the continent. It also suggests that low volume of Private Sector Credit affects the efficiency of the financial sector negatively and vice versa.

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 small and has negative correlation with total cost. 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, which 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. Therefore, any form of inefficiency by the so much relied upon banks is likely to have a serious impact on the economies.

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