The Review of Finance and Banking
Volume 04, Issue 2, Year 2012, Pages 115–122
S print ISSN 2067-2713, online ISSN 2067-3825

# BANK EFFICIENCY AND OPENNESS IN AFRICA: DO INCOME LEVELS MATTER?

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Abstract. The business of this study is to investigate the role of openness in bank efficiency with respect to income levels. From a panel of 29 low and middle income African countries with data spanning from 1987 to 2008, we provide evidence that, openness (trade and financial) breeds less bank efficiency in low income countries. As for middle income countries, while financial openness has the same effect, results for trade openness are not significant. These findings justify the absence of a banking comparative advantage and consequently, the issue of over-liquidity resulting from low funding of credits by deposits. For policy implications, openness will increase the economic cost of banks in sampled countries. However, trade openness will be more detrimental than financial openness. More so, banks in middle income countries play a greater role in financing activities resulting from trade openness than those in low income countries.

## 1. Introduction

Globalization and free trade have been decried by many proponents as detrimental to domestic firms, while increasing welfare. In the past two decades, structural adjustment policies imposed on indebted African countries by the World Bank and International Monetary Fund have been perceived with mixed feelings. Many view openness as a means to improving efficiency via allocation of savings into profitable and productive projects. It is argued that, openness exposes countries to the most advanced new ideas and methods of production, thereby increasing international competition and enhancing efficiency. Today, many African nations have adopted policies that encourage trade liberalization and progressive meandering towards market-based economies. Restricting ourselves to the financial side of openness, the curiosity of knowing how financial efficiency might be affected is interesting. On account that, only a few well functioning stock exchange markets on the African continent are running smoothly, we are further poised to restrict our study to the banking sector (financial intermediary development); in a bid to capture as many countries as possible.

## 2. Literature Review

The debate over Financial Development (FD) and openness has much been object of recent studies. However, many of such studies fail to pin-point what aspects of financial development are tied to openness. In this work, we shall limit ourselves exclusively to bank efficiency in financial intermediary development.

Most research on bank efficiency in developing countries has been based on Data Envelopment Analysis (DEA); which is a non parametric method in operations research used for estimating production efficiency of decision making units: production frontiers. Though this

Received by the editors November 26, 2010. Accepted by the editors November 6, 2012.
*Keywords*: Bank efficiency, Openness, Panel, Africa.
*JEL Classification*: D60, E40, O10, O55.
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This paper is in final form and no version of it will be submitted for publication elsewhere.

method has the advantage of not assuming a particular functional form (non parametric approach), it presents the short coming of being unable to provide a link between output and input (endogenous and exogenous variables). Sathye (2002) for instance, uses the DEA method to measure differing efficiency of Indian banks across sectors. Results based on data from 1997-1998, show; the mean efficiency score of Indian banks is quite comparative with that of the world. Also, the efficiency of the private sector commercial banks, as a group, is lower than that of foreign and public banks. While this study could be of pertinence in presenting a case against privatization of commercial banks, its policy implication remains purely qualitative. This thesis, of state-owned firms being more efficient is confirmed by Staub et al. (2010). Still using DEA, they probe into technical and 'allocative' efficiency of Brazilian banks from 2000-2007. Their findings reveal: compared to banks in Europe and the USA, Brazilian banks have low levels of efficiency (economic cost). Also, state-owned banks are significantly more cost efficient than those with foreign, private-domestic and private with foreign participation.

Literature on openness has been widely covered. While some authors distinguish between financial and trade openness, others don't. As to what concerns the link between openness and financial development, Rajan and Zingales (2003) put forth a hypothesis that, only through the interaction of trade openness and financial openness can, financial development be possible. They make use of a panel of twenty-four countries and their results show, closed economies will more likely benefit from financial development(particularly stock market development) if there were a free cross border capital flow. The premise of interaction between openness indicators is later verified by Baltagi et al. (2009).Their findings reject the hypothesis that both types of openness are necessary for financial development to take place. More recently, in a study of twenty-nine Asian countries, Hanh (2010) confirms the results brought forth by Baltagi et al. (2009). The work shows existence of bi-directional causality between openness and financial development. Using Pooled Mean Group on 28 countries, with data from 1960 to 2005, Kim et al. (2010), establish a long-run link between trade openness and finance. Suffice to mention here that, indicators of financial development mostly used by these authors are liquid liabilities on GDP and private domestic credit on GDP; which are indicators of financial intermediary depth and activity respectively. In our work, we shall approach this concept, exclusively from the perspective of 'bank credit on bank deposit'; which is a macro economic indicator of financial intermediary efficiency (Demirgüç-Kunt and Beck, 2009).

Beside the use of Data Envelopment Analysis (DEA) for efficiency measurement (as elucidated above), some authors look at bank sector (industry) efficiency from an Overall Economic Efficiency (OEE) perspective (product of Technical Efficiency and Scale Efficiency). Such are the likes of Al-Obaidan (2008), whom using a composite indicator for the banking industry in the Gulf region, shows with deterministic and stochastic analyses that, openness enhances technical efficiency.

As concerns literature on efficiency, according to Demirguc-Kunt and Beck (2009), there are four main indicators of financial intermediary efficiency:

- the ratio of bank credit to bank deposits: which measures the extent to which savings can fund private credit;

-net interest margin: which is the accounting value of a bank's net interest revenues as a share of its total earnings assets;

-overhead cost: the accounting value of the banks overhead cost as a share of its total assets;

-cost/income ratio; which appreciates overhead costs relative to gross revenues.

While the last three variables are profitability-oriented, our concept of efficiency in this study is best defined by the first. We therefore seek to evaluate how well "private sector credit" is funded by "deposits". This implies, a high loan-deposit ratio will indicate high intermediation efficiency. By the same token, this concept of efficiency also enables us to verify the hypothesis of the existence of surplus liquidity in the African banking sector; a low loan-deposit ratio should reflect overwhelming liquidity.

Our present research agenda will therefore differ from those of previous authors by: (1) distinguishing between trade openness and financial openness(contrary to Al-Obaidan; 2008)[1]; (2) limiting ourselves to the African region; (3) using an aggregated indicator for bank sector efficiency; unlike Baltagi et al. (2009) and Hanh (2010) ; (4) differing from Data Envelopment Analysis, contrary to Sathye (2002) and Staub et al. (2010); (5) considering efficiency as the degree to which deposits finance loans (contrary to the profitability conception of efficiency in literature); (6) integrating two welfare variables in a bid to control for 'growth-led-finance nexus'.

## 3. Data and Methodology

3.1. **Data.** Our data spans from 1987 to 2008 because, we endeavored to capture the bank efficiency implications of the structural adjustment policy that cropped from the mid 1980's as much as possible. Also, we are limited to 29 countries because of data unavailability. Regarding the quality of our proxies and data sources, we have provided justification from literature, as detailed on table 1 below. List of countries can be found in appendix A.

**Table 1: Data collection summary**

| Variables | Proxies | Signs | Sources | Usages in Literature |
|---|---|---|---|---|
| Bank Efficiency | Bank credit/Bank deposits | BcBd | FDSD | Demirguc-Kunt and Beck (2009) |
| | [2]Private domestic credit/financial system deposits | prdcfsd | FDSD | Derived from: Demirguc-Kunt and Beck (2009) |
| Trade Openness | (Import + Export)/GDP | IXgdp | ADI | Hanh (2010) |
| Financial Openness | -Foreign Direct Investment/GDP | FDIgdp | ADI | Lane and Milesi-Ferreti (2006), Baltagi et al. (2009), Hanh(2010) |
| | -Gross Private Capital Flows/GDP | PCFgdp | ADI | Lane and Milesi-Ferreti (2006), Baltagi et al. (2009), Hanh(2010) |
| Control Variables | GDP growth | GDPg | ADI | Hanh (2010) |
| | GDP growth per capita | GDPpcg | ADI | Hanh (2010) |

FDSB: Financial Development and Structure Database. ADI: African Development Indicators. Source: author's synthesis.

3.2. **Methodology.**

3.2.1. *Unit root tests.* As it is our goal to use a parametric panel method for data analysis, we begin by testing the stationary properties of our series. When a series is not integrated at level: not I(0), we endeavor to verify if it is at first difference: I(1). Integration shows stationarity and indicates a model that assumes a particular functional distribution could be used for estimation. There are generally, two types of panel unit root tests. While the first generational assume, independence across sections, the second is founded on the premise of cross sectional dependence. We opt for the first on the basis that, beside their wide application in the literature of macro economic variables (Hanh, 2010), exploratory correlation analysis of cross sections reveal weak dependency. Beyond this fact, sampled countries have independent economic policies. With regard to this generational choice, there are two types of unit root tests still: one that is homogenous and assumes a common unit root (therefore within variation)

[1]This author however fails to establish foreign direct investment as an indicator of financial openness. Just qualifying this proxy as in indicator of openness without specifying what sort of openness may be misleading.

[2]This second indicator of financial efficiency is applied for robustness test.

and another that is heterogeneous and premised on individual unit roots (therefore between variation); they are respectively, Levin, Lin and Chu (LLC-2002) and Im, Pesaran and Shin (IPS-2003). In this study, we shall perform both tests but base our decisions on the later in case of conflict of interest; for any benefit of doubt. Our choice in event of conflict of interest is founded on the ground that, the alternative hypothesis of the LLC test is too powerful. Another important consideration to take into profound account in unit root tests is the autoregressive character of their processes. Consequently, optimal lag selection for goodness of fit is crucial for efficiency of tests. As pointed out by Khim and Liew (2004); when observations are below 60, the AIC (Akaike Information Criterion) and FPE (Final Prediction Error) are best at estimating optimal lags. On the other hand, when observations exceed 60 and are more or less 120, the Hannan-Quin Criterion (HQC) is best. Therefore, our LLC and IPS models will be specified by HQC and AIC respectively. Results are summarized on tables 2 and 3 below.

**Table 2: LLC Unit root test**

| | | **IXgdp** | **FDIgdp** | **PCFgdp** | **BcBd** | **GDPpcg** | **GDPg** | **prdcfsd** |
|---|---|---|---|---|---|---|---|---|
| Level | $c$ | - 2.788*** | - 5.517*** | - 4.267*** | - 2.764*** | - 11.79*** | - 12.48*** | -6.07*** |
| | $ct$ | - 5.173*** | - 7.043*** | - 6.441*** | - 3.012*** | - 11.95*** | - 12.41*** | -1.83** |
| First difference | $c$ | — | — | — | — | — | — | — |
| | $ct$ | — | — | — | — | — | — | — |

*,**,*** denote significance levels of 10%, 5% and 1% respectively. Maximum lag is 2 and optimal lags are chosen via HQC. '$c$' and '$ct$': 'constant' and 'constant and trend' respectively.

**Table 3: IPS Unit root test**

| | | **IXgdp** | **FDIgdp** | **PCFgdp** | **BcBd** | **GDPpcg** | **GDPg** | **prdcfsd** |
|---|---|---|---|---|---|---|---|---|
| Level | $c$ | - 1.736*** | - 5.609*** | - 4.717*** | -1.360* | - 11.96*** | - 12.23*** | -4.30*** |
| | $ct$ | - 4.001*** | - 5.283*** | - 5.343*** | -0.498 | - 11.05*** | - 11.21*** | -1.88** |
| First difference | $c$ | — | — | — | — | — | — | — |
| | $ct$ | — | — | — | — | — | — | — |

*,**,*** denote significance levels of 10%, 5% and 1% respectively. Maximum lag is 2 and optimal lags are chosen via AIC. '$c$' and '$ct$': 'constant' and 'constant and trend' respectively.

3.2.2. *Panel estimation method.* Estimation will be based on Generalized Least Squares (GLS) to avoid issues resulting from heteroscedasticity in the Ordinary Least Squares (OLS) assumption. Between the random effects (RE) and fixed effects (FE) models, we opt for the later because: firstly, it does not hypothetically assume explanatory variables are not correlated with the residuals and secondly, the use of FE accounts for the unobserved heterogeneity between countries.

3.2.3. *Model Formulation.* Summary statistics and correlation analysis that somewhat guided the manner in which our models are formulated can be found in appendices B and C respectively. Let's consider the following binary multivariate dummy models:

$$\begin{aligned} BcBd_{it} &= \gamma_0 + \gamma_{1l} L_{it} XI_{it} + \gamma_{1m} M_{it} XI_{it} + \gamma_{2l} L_{it} PCF_{it} + \gamma_{2m} M_{it} PCF_{it} + \\ &\quad \gamma_{3l} L_{it} GDPpcg_{it} + \gamma_{3m} M_{it} GDPpcg_{it} + \varepsilon_{it} \end{aligned} \tag{3.1}$$

$$BcBd_{it} = \gamma_0 + \gamma_{1l}L_{it}XI_{it} + \gamma_{1m}M_{it}XI_{it} + \gamma_{2l}L_{it}FDI_{it} + \gamma_{2m}M_{it}FDI_{it} + \gamma_{3l}L_{it}GDPpcg_{it} + \gamma_{3m}M_{it}GDPpcg_{it} + \varepsilon_{it} \quad (3.2)$$

The robustness of models (3.1) and (3.2) will be checked with models (3.3) and (3.4) which have different dependent and control variables.

$$prdcfsd_{it} = \gamma_0 + \gamma_{1l}L_{it}XI_{it} + \gamma_{1m}M_{it}XI_{it} + \gamma_{2l}L_{it}PCF_{it} + \gamma_{2m}M_{it}PCF_{it} + \gamma_{3l}L_{it}GDPg_{it} + \gamma_{3m}M_{it}GDPg_{it} + \varepsilon_{it} \quad (3.3)$$

$$prdcfsd_{it} = \gamma_0 + \gamma_{1l}L_{it}XI_{it} + \gamma_{1m}M_{it}XI_{it} + \gamma_{2l}L_{it}FDI_{it} + \gamma_{2m}M_{it}FDI_{it} + \gamma_{3l}L_{it}GDPg_{it} + \gamma_{3m}M_{it}GDPg_{it} + \varepsilon_{it} \quad (3.4)$$

Where:
- Countries$i = 1, 2, ..., 29$; time $t = 1, 2, ..., 20$
-for Low Income countries; $L_{it} = 1/M_{it} = 0$
-for Middle Income countries; $M_{it} = 1/L_{it} = 0$
-XI, FDI and PCF are all on GDP.

For ease in interpretation of estimators upon regression, parameters of the model in estimated form are represented as:
-constant,$liXIgdp$, $miXIgdp$, $liPCFgdp$, $miPCFgdp$, $liGDPpcg$, $miGDPpcg$ (Model 1)
-constant, $liXIgdp$, $miXIgdp$, $liFDIgdp$, $miFDIgdp$, $liGDPpcg$, $miGDPpcg$ (Model 2);
-constant,$liXIgdp$, $miXIgdp$, , $liPCFgdp$, $miPCFgdp$, $liGDPg$, $miGDPg$ (Model 3);
-constant, $liXIgdp$, $miXIgdp$, $liFDIgdp$, $miFDIgdp$, $liGDPg$, $miGDPg$ (Model 4)

## 4. Empirical Analysis

### 4.1. **Empirical Results.**

**Table 5: Presentation of empirical results**

| | **Dependent variables (Level)** | | | |
|---|---|---|---|---|
| | **Initial model(s)** | | **Robustness check model(s)** | |
| | **BcBd** | | **prdcfsd** | |
| **Independent variables** | **Model 1** | **Model 2** | **Model 3** | **Model 1** |
| **constant** | **0.86(20.79)*** ** | **0.87(20.95)*** ** | **0.91(18.70)*** ** | **0.88(20.83)*** ** |
| **liXIgdp** | **-0.43(-3.12)*** ** | **-0.41(-3.00)*** ** | **-0.35(-2.34)** ** | **-0.40(-2.94)*** ** |
| **miXIgdp** | **-0.04(-0.27)** | **-0.06(-0.39)** | **0.01(0.05)** | **-0.07(-0.46)** |
| **liFDIgdp** | — | **-0.01(-1.95)*** | — | **-0.01(-2.02)** ** |
| **miFDIgdp** | — | **-0.005(-2.21)** ** | — | **-0.005(-2.18)** ** |
| **liPCFgdp** | **-0.009(-1.44)** | — | **-0.01(-1.76)*** | — |
| **miPCFgdp** | **0.005(-2.37)** ** | — | **-0.004(-1.67)*** | — |
| **liGDPpcg** | **-0.003(-1.78)*** | **-0.003(-1.70)*** | — | — |
| **miGDPpcg** | **-0.010(-2.89)*** ** | **-0.01(2.86)*** ** | — | — |
| **liGDPg** | — | — | **-0.003(-1.46)** | **-0.002(-1.19)** |
| **miGDPg** | — | — | **-0.009(-2.47)** ** | **-0.009(-2.73)*** ** |
| **Adjusted $R^2$** | **0.63** | **0.63** | **0.78** | **0.78** |
| **Fisher** | **29.97*** ** | **30.06*** ** | **59.60*** ** | **59.82*** ** |

*, **, *** denote significance levels at 10%, 5% and 1% respectively. Student statistics in brackets (). $R^2$: coefficient of determination.

Estimated results as summarized on table 5 indicate: (1) trade openness and financial openness decrease bank efficiency in low income countries; (2) in middle income countries, only the detrimental effect of financial openness is significant; (3) the trade openness elasticity to bank efficiency is greater than financial openness elasticity to bank efficiency; (4) foreign direct investment is more significant as an indicator of financial openness than private capital flows; (5) growth and welfare decrease efficiency and more significant for middle income countries.

4.2. **Discussion.** Results appear to support the thesis that, with globalization, openness and free trade, bank efficiency in African countries is at stake. Openness could benefit sampled countries in areas where they have a comparative advantage, like the primary sector. However, tertiary sectors, with bank services would relatively be to the benefit of more developed and advanced economies. These findings partially confirm those of Asongu (2010) which did not find any linkage between financial development and openness in African countries. A possible explanation as to why growth and per capita growth decrease bank efficiency could be derived from common sense: the more people in the continent earn, the more they deposit and loans resulting from those deposits are less.

An explanation as to why financial intermediary inefficiency is more felt in low income countries than their middle income counter parts when trade accounts open could be captured from the perspective that, banks of later countries(middle income) play a greater role in the financing of activities resulting from trade openness than those of low income countries.

## 5. Conclusion

In this work, we aimed at investigating the relationship between openness and bank efficiency in selected African counties. Our negative results meet expectations for low income countries in the continent because; their banking sectors are at the disadvantage competitive speaking. What is important to point out is that, completely opening-up the financial intermediary sector would be to the detriment of bank sector efficiency. As we have point out earlier, our conception and definition of bank efficiency in this study could be assimilated to the degree by which savings can fund loans. Deteriorating efficiency with openness simply imply domestic credit is funded by foreign banks. Financial operations resulting from investment and trading activities for the most part are foreign financed. These findings support the 'common-sense' of proponents who believe, completely opening-up African economies to the tertiary sector would not be of any good to the tertiary domestic industry. The dimensions of comparative advantage and potential effect on domestic sectors should be carefully considered before complete financial and trade liberalization become policy. A recommendation to governments is that, they should relax restrictions on openness progressively with growth and development. If domestic banks should relax conditions for granting loans to operators, the degree by which deposits could finance credit would increase; there-by improving on efficiency and tackling the problem of over liquidity.

Improving financial development in Africa should not only be considered from an intermediary stand-point. Disintermediation with the advent of globalization is quite crucial for long term finance. However, stock markets in the continent have been very slow to pick-up, with just a few running smoothly. Whether openness would affect stock market efficiency in the same manner should be subject to further research. Also, another important dimension of a future study could be to investigate if this financial intermediary inefficiency is most felt by state-owned, foreign, private-domestic or private-foreign banks

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## Appendix

### Appendix A: List of African Countries

| Income Levels | Countries |
|---|---|
| Low Income | Burundi, Ivory Coast, Ghana, Kenya, Madagascar, Mali, Togo, Mozambique, Malawi, Nigeria, Rwanda, Senegal, Sierra Leon, Tanzania, Uganda, Zambia. |
| Middle Income | Angola, Botswana, Cameroon, Congo Republic, Egypt, Gabon, Lesotho, Morocco, Mauritius, Sudan, Swaziland, Tunisia, South Africa. |

Source (author)

### Appendix B: Summary Statistics (1988-2007; countries: 29)

| Variables | Source | M.Unit | Mean | S.D | Min. | Max. | Kurt. | Skew. | Observ. |
|---|---|---|---|---|---|---|---|---|---|
| IXgdp | ADI | % GDP | 0.39 | 0.21 | 0.00 | 1.37 | 4.15 | 1.81 | 580 |
| FDIgdp | ADI | % GDP | 2.61 | 5.03 | -8.62 | 42.49 | 23.44 | 4.14 | 552 |
| prdcfsd | FDSD | ratio | 0.80 | 0.43 | 0.13 | 2.60 | 3.55 | 1.65 | 550 |
| BcBd | FDSD | ratio | 0.74 | 0.32 | 0.13 | 1.84 | 0.46 | 0.75 | 567 |
| GDPpcg | ADI | % | 1.45 | 5.18 | -46.89 | 37.83 | 19.27 | -1.26 | 579 |
| GDPg | ADI | % | 3.84 | 5.38 | -50.24 | 35.22 | 21.88 | -1.84 | 579 |

M.Unit: Measurement Unit, S.D.: Standard Deviation, Min: Minimun , Max: Maximum, Kurt: Kurtosis, Skew: Skewness, Observ: Observations, ADI : African Development Indicators, FDSD :Financial Development and Structure Database.

**Appendix C: Correlation Analysis**

| | IXgdp | FDIgdp | PCFgdp | prdcfsd | BcBd | GDPpcg | GDPg |
|---|---|---|---|---|---|---|---|
| IXgdp | 1 | | | | | | |
| FDIgdp | 0.46 | 1 | | | | | |
| PCFgdp | 0.46 | 0.97 | 1 | | | | |
| prdcfsd | -0.17 | -0.22 | -0.17 | 1 | | | |
| BcBd | -0.12 | -0.22 | -0.20 | 0.88 | 1 | | |
| GDPpcg | 0.07 | 0.04 | 0.03 | -0.19 | -0.19 | 1 | |
| GDPg | 0.03 | 0.03 | 0.02 | -0.20 | -0.18 | 0.97 | 1 |